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December 2000

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The Wild World of Raymond Scott

INTERTEC /PRIMEDIA Publication

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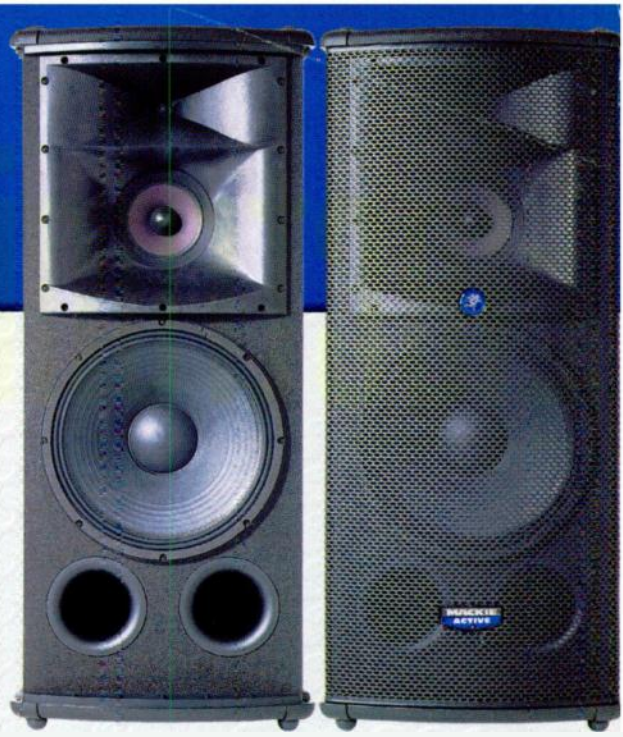
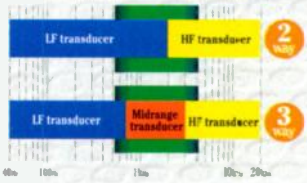
The story behind (and in front of) Mackie's new SR1530 Active 15-inch 3-way speaker system.



The potential of a 3-way system.

A properly-designed 3-way system is capable of reproducing vocals and instrumentals more accurately because it has a separate midrange transducer.



The transition range (crossover point) between transducers in a 2-way system falls in the middle of the critical midrange area (green area above). This part of the sound spectrum is being handled by the extreme high range of the LF transducer and the extreme low range of the HF transducer (where neither is most capable).

In a 3-way system, the HF and LF need only contribute in their more optimal frequency ranges. The key is melding the output of the three transducers.

The **SR1530** realizes the potential of the 3-way design by integrating:

- ***Optimized Wavefront™ horns***
- ***Electronic time compensation, equalization and crossover design***
- ***Tri-amplification***

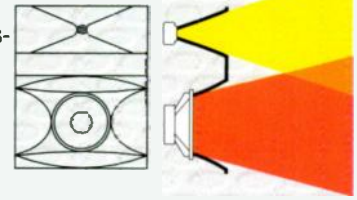
Optimized Wavefront™ Horns.

To achieve 40° dispersion, conventional systems use a high frequency horn with 20° of angle "on top" and 20° of angle "on the bottom." That beams high frequencies straight ahead, which means mids and high are actually aiming at different spots in the audience.

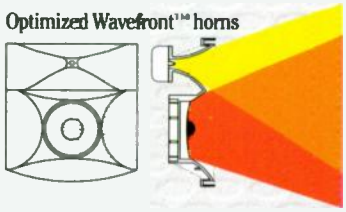
The **SR1530** is the first speaker in its class to feature a one-piece, 90° x 40° horn that includes both mid and high frequency sections. The 6-inch midrange's basket assembly is designed as part of the horn assembly and is also designed to function as an optimized compression chamber for better efficiency.

Both high and midrange sections of the SR1530's Optimized Wavefront™ horn have asymmetrical shapes with 10° angle "on top" and 30° angle below. High frequencies are directed down into the mid- range's dispersion pattern. This allows midrange and treble reach the audience as a focused, single wavefront with extreme accuracy and pin-point detail.

Brand X symmetrical horns



Optimized Wavefront™ horns



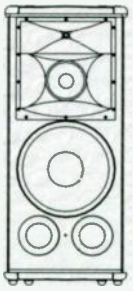
Active electronics.

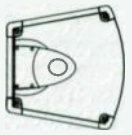
If we stopped there we'd have a better passive system. But we didn't. Because the **SR1530** is an *active* system, we could employ a sophisticated, phase-accurate electronic crossover (instead of a crude passive one), time correction (to ensure that all three transducers' outputs arrive at the same time) and equalization to optimize each drivers' response to the enclosure as a system.

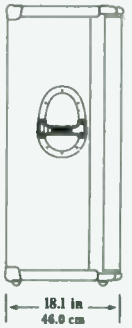
Individual FR Series™ amps.

The best way to power a transducer is to use a dedicated amplifier that's specially suited to its frequency range and power handling. Until now, that meant three separate amplifiers, a rack full of electronic crossovers and delay units, triple speaker wiring — great for huge touring systems, but very expensive and impractical for smaller applications.

The **SR1530** gives you the benefits of multi-amping without the cost and complication. Separate FR Series modules are directly coupled to LF, Mid and HF transducers, allowing maximum output with protection from distortion and burn-out.







Get the full SR1530 technical story.

These two pages are just a short introduction to the technology we've packed into the **SR1530**. Details like why the inside/outside low frequency transducer voice coil can handle intense amounts of power without damage and how solid and well-balanced the SR1530 enclosure is are covered in our free 80-page SR products brochure.

Call toll-free or log onto our web site and then sound good on stage with affordable 3-way active accuracy.

The new **SR1530** from Mackie Designs. ■

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The new **SR1530** features...

- Electronic equalization, time correction/phase alignment plus complete electronic and component protection circuitry
- Active circuitry makes the FR Series™ high-current tri-amplification more efficient than passive speakers because passive speakers have inefficient crossovers which cause significant power loss. Because of this, the on-board SR1530 amplifiers, with **500** total watts, can drive the speaker system to 126dB peak SPL.
- RCF Precision components...
- Wide-dispersion, high-output HF/mid-horn design with phase plug
- High-output, low-distortion 6-inch horn-loaded midrange transducer
- High-precision 1-inch exit, high-frequency driver
- 15-inch, high-efficiency, cast-frame woofer with heat dispersing Inside/Outside voice-coil technology
- Correctly weight-balanced with two comfortable side handles for easy carrying and set-up plus top and bottom handles for easier positioning on stage
- Weather-resistant steel grille

Sound quality that's only possible with a true active system.

Though just 44 inches tall, **SR1530**s generate the sound output of much bigger systems... and are far more accurate to boot. Our active design achieves near-perfect interaction between transducers and internal amplifiers. Together, you get transparent and precise, high-resolution audio performance... only at PA output levels, which is the beauty of properly engineered, high-end 3-way systems

SR1530 rear panel with amp heat exchanger, female XLR input and male XLR full-range through.

Optimized Wavefront™ system "marries" high frequency and midrange.

In typical 3-way designs, mid- and high-frequency horns have symmetrical cross sections which physically force their output to different parallel locations in front of the box, causing uneven frequency response across the audience.

The **SR1530**'s Optimized Wavefront™ horns have asymmetrical shapes with the high-frequency horn firing down into the six-inch midrange's dispersion pattern. Combined with built-in electronic time and phase correction, this creates a unified, wavefront with excellent phase and power response characteristics: Everybody in your audience hears the same thing.

Optimized Wavefront™ horn system

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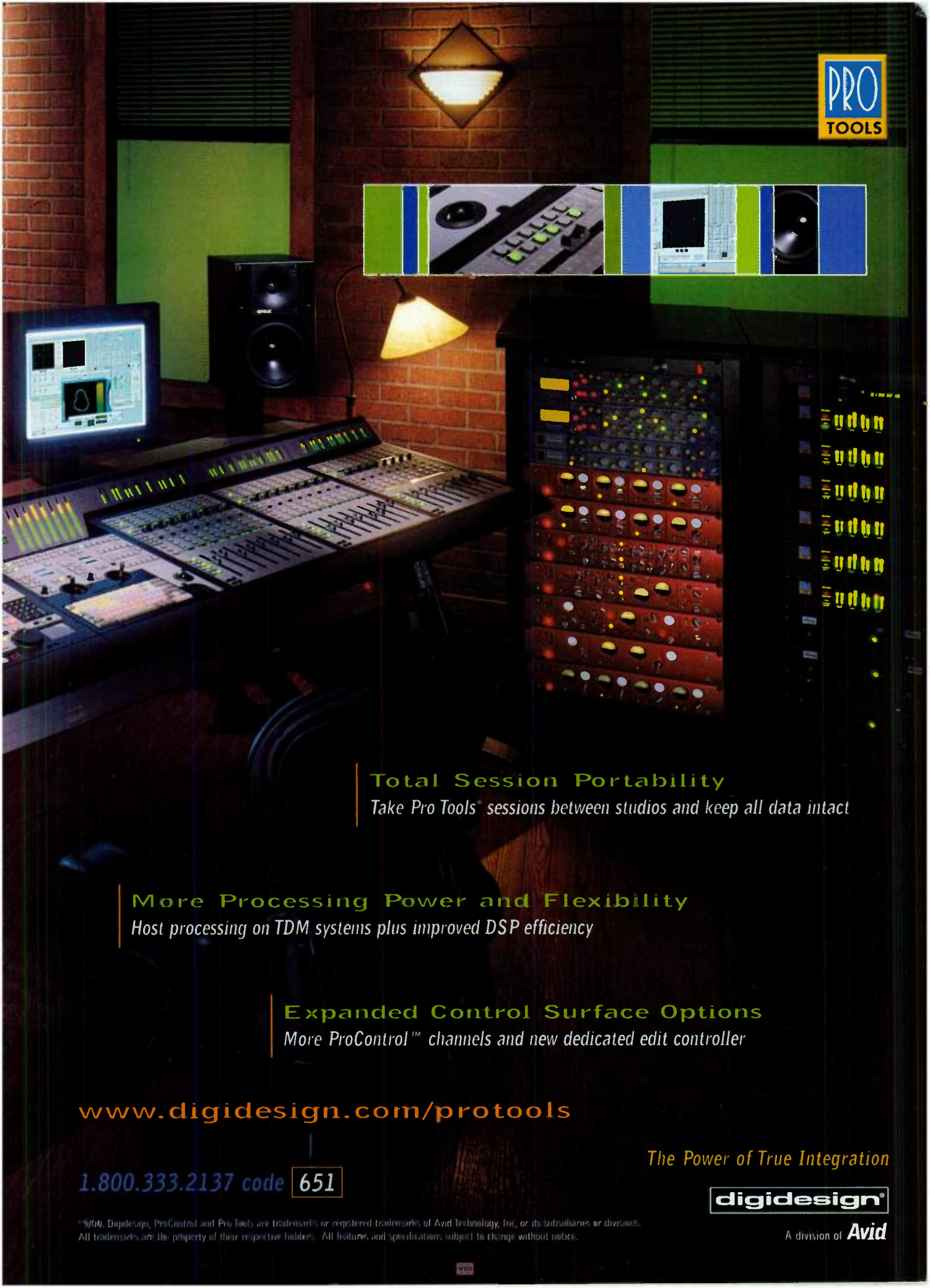
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DEPARTMENTS

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COLUMNS

REVIEWS

Pro Choice


ANTHONY PIDGEON

Some argue that tight arranging makes all the difference in a song; others insist that free improvisation is the name of the game. An engineer could reasonably believe that without good recording gear and production values, the impact of any music could be lost. Yet we still enjoy music that was recorded seven decades ago with primitive, noisy equipment.

Who's right? My answer is a firm, unequivocal, "It depends." It's tough to make good music out of a bad song, but a good arrangement can indeed sometimes work wonders. More to the point, not all music is about songs or even bands. And we certainly should strive to use quality gear and use it well, but that doesn't mean we have to spend weeks and months worrying about every detail—unless we want to. In short, we have valid choices.

At the recent TEC Awards ceremony, held in Los Angeles as part of the Audio Engineering Society's 109th annual convention, the great Sam Phillips was inducted into the TEC Awards Hall of Fame. As the founder of Sun Records and risk-taking producer of Elvis Presley, Jerry Lee Lewis, Johnny Cash, and many other seminal rock 'n' roll artists, Phillips has more than earned the right to air his views—and so he did.

In his acceptance speech, Phillips honored the power of modern multitrack recording tools but reminded everyone that the raw power of a band can be lost if a record is entirely built by composite tracks and overdubs. He advocated recording rhythm sections or entire bands "live," in a single pass. Phillips can offer his huge catalog of hit records as evidence that he knows his stuff.

In contrast, much of today's music is produced by layering and tweaking. Recording one part at a time and editing extensively is especially common in the personal studio, where one often does not have the space to record a live rhythm section or full band.

So who's right, Phillips, or those who prefer to construct their music one track—or one sound—at a time? My answer again is a firm, unequivocal, "It depends." I agree with Phillips that a good live band or rhythm section can deliver a spark that's hard to equal with overdubbing. But that doesn't mean that you must have a live feel—or even that you must record songs or bands. Some music is constructed in bits and pieces because that process is essential to the compositional approach. If you want to create soundscapes, for instance, Phillips' method is not going to cut it.

One reason I find Raymond Scott (see "Circle Machines and Sequencers" on p. 94) interesting is that he successfully composed and recorded a lot of much-loved music using traditional methods, but he went the opposite direction in his later work with musique concrète, using the Circle Machine and the Electronium.

We can learn a lot from Phillips, a master of "traditional" recording techniques who broke with tradition by recording black artists and the early rockers. We can also learn from Scott, who understood traditional recording methods and broke from them to pursue his very different vision.

I'm pro choice. I don't think there is a right way and a wrong way to record, as long as you know what you are doing or you are willing to take the risks that accompany unguided experimentation. Let's use whatever approach best suits our work style, our music, and the moment.

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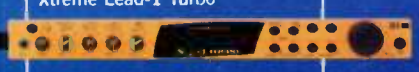

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GOOD VIBRATIONS

Singers with nice voices have a natural vibrato. For some people, this vibrato starts the instant they start a note. For others, the note begins without vibrato, but it's added after a short delay. The frequency of vibrato also varies. Dolly Parton's, for instance, is almost irritatingly shaky; vibratos faster than 7 cycles per second sound nervous. Frank Sinatra's vibrato, on the other hand, is subtle and mellow, with fewer cycles per second. A well-developed vibrato undulates at a rate between 4 and 7 Hz.

Regardless of the style, this vibrato is a trait that the singer is born with. It cannot be acquired or learned. Many individuals have very nice voices and can hold a note quite well, but they lack that nice vibrato, which becomes glaringly apparent when they sustain a note for an extended period of time.

Is it possible to design an effects device that would add this natural vibrato to a voice that doesn't have it? It seems very straightforward from an engineering perspective, given today's DSP technology. You could easily obtain a singer's vibrato "fingerprint" using a computer, then apply it to a vocal input. To enhance the effect's "naturalness," the vibrato would have to come on after a note is sustained longer than, say, one second. Such an effects device would certainly have a huge market.

Glenn Johnson
via e-mail

Glenn—Vibrato is a slight, periodic variation in pitch. Therefore, in order to add vibrato to a static singing voice, you would need to send the vocal signal through a pitch shifter that was set to shift the pitch up and down periodically over time. As you suggest, this is easy to do with today's DSP technology; all you have to do is apply the pitch shifter's low-frequency oscillator (LFO) to the pitch, specifying the frequency (typically 4 to 7 Hz), depth (amount of pitch shift from nominal), and onset delay (typically one second), if available.

The waveform of the LFO (and thus, the vibrato) would traditionally be a sine wave; however, many software synths, samplers, and sound-design systems (such as Native Instruments Reaktor, *Applied Acoustics Systems* Tassman, *Synoptic* Virtual Waves, *and Symbolic Sound's Kyma sound-design workstation) let you apply a custom waveform, such as that derived from the analysis of an actual singer's vibrato, to the LFO. Sophisticated vocal processors are available from TC Electronics, Eventide, and Digi-Tech, but they can't truly duplicate the "natural" sound of a well-trained singing voice.*

EM *author and vocal coach Joanna Cazden disagrees that vibrato is innate and not amenable to training. According to Cazden, it's difficult to teach and learn, but not impossible. Your observation that the degree of vibrato varies from one style of music to another supports the notion that it is at least partially a learned behavior, a "dialect" of singing that is no more innate or genetic than a regional speech accent. Furthermore, the ability to control vibrato—that is, to start a note "straight" and then add vibrato later—is definitely a learned skill.*

Cazden does not recommend using an effects device with a fixed delay. Musically, you would do better with a device that lets you dynamically adjust the vibrato frequency, depth, and onset delay to shape longer or shorter phrases in a more or less dramatic fashion. However, this would be difficult if not impossible to coordinate smoothly in real time with footpedals, MIDI faders, or other controllers during a performance. On the other hand, if you use software to create the vibrato, you could add the effect offline and could thus tweak it to taste. Even then, it would probably be exacting work.

So although you might be able to get the job done with sound-design software and a sequencer, the best tool for this job remains the human larynx.—Scott W.

IN-ZEN-SITIVE

I've been a subscriber for 12 or 14 years, and I'd like to make a comment about the October 2000 cover line: "Zen and the Art of Surround Mixing."

Zen, (Japanese, from the Chinese *Ch'an*, from the Sanskrit *Dhyana*, from the Pali *Jhana*) is one of the main branches of Buddhism, a religion that precedes Christianity by half a millennium. I've practiced it for 38 of my 53 years.

The title "Zen and the Art of *x*" comes originally, I believe, from *Zen and the Art of Archery*, which actually was about what its title described. Later came the much more popular *Zen and the Art of Motorcycle Maintenance*. The latter was less about Zen, but its writers were practitioners, so it had some real connections to Zen. The backpack success of that book in our culture, however, has engendered a flood of other books with similar titles. A casual search reveals *Zen and the Art of Murder* and *Zen and the Art of Standup Comedy*, among dozens of others. Frankly, they tick me off.

Looking at the **EM** article ["You're Surrounded"], I see no mention of

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Zen or any related concepts, so my conclusion is that the magazine's cover was an attempt by the editorial staff to sell more newsstand copies. May I suggest that a procedure be added to your style guide? Whenever the opportunity to slip in the term *Zen* arises, do a quick check: substitute for it the term *Roman Catholicism* or *Shiite Islam*, and see whether it swings. If, however, it seems stupid, irrelevant, or demeaning to one of those religions, it just might seem the same with mine. Thank you for your attention.

Paul Weiss
via e-mail

Paul—Point taken. We apologize to all concerned; we certainly did not mean to demean or take lightly anyone's religion.—Steve O.

IN A DITHER

Your *Personal Studio Buyer's Guide 2001* is great! Not so much because of its comprehensive product listings, but because of the very interesting "Digital Audio" article, which discussed the necessity of dithering. The idea of dithering in the analog domain, before digitizing the mixdown, is paradoxical to me: after all, everyone's obsession is getting the cleanest sound possible for recording. But the author's arguments make sense.

The best test is to try this idea with various audio material. But the article doesn't say where to get gear that allows analog dithering (as a master insert or whatever). I've browsed the Internet, but I haven't come across anything related so far. Could you list some resources for dithering/noise-shaping hardware?

Also, are you recommending only dithering of the analog signal before digitizing it? Or does noise shaping serve the same purpose? Thanks for an excellent article.

Alexei Reznick
via e-mail

Alexei—Input dithering is performed automatically in modern analog-to-digital converters (ADCs) within digital audio systems. You can certainly experiment with adding white noise to an analog signal before sending it into a digital system, but this is not generally advisable. Most manufacturers of digital systems have already determined the best way to dither the input signal, and adding your own noise will probably compromise the sound quality more than it might help in the digitization process.

Noise shaping does not serve the same purpose. This process is normally applied to a digital signal whose word length must be reduced before being converted into an analog signal. In this case, the digital signal is first dithered by adding artfully selected "pseudo" random numbers to each sample. Then the extra bits are removed, and the resulting white noise is shifted to the high end of the audible spectrum and beyond. Because our hearing is relatively insensitive to such high frequencies, we perceive less of the noise, even though its amplitude is higher than it was as white noise spread evenly throughout the entire audible spectrum.

Whereas analog input dithering is applied in the ADC, digital output dithering and noise shaping are applied to a digital signal before it is converted into analog form by a digital-to-analog converter (DAC). All digital signal processors (DSPs) perform internal digital dithering, because the results of their computations have more bits than the final output signal, but this process is not generally under user control. You're most likely to find user-controllable digital dithering and noise shaping in high-end, outboard DACs and computer-based digital audio software packages.—Scott W.

HE CAN SEE FOR MYLES

Finally, after years of reading your publication (and those published here in Germany), I get to read an article about recording violin, viola, cello, and contrabass! While it's no wonder that this vital area gets little coverage in today's market, as a classically oriented musician I found it a great pleasure to read Myles Boisen's excellent article "Recording Musician: String Fever," in your September 2000 issue.

Another Boisen article (written with Brian Knave) in the same issue, "Build a Microphone Cabinet on Any Budget," pleases me no end. Choosing microphones is particularly difficult for personal-studio musicians, because we don't always have the opportunity to try all sorts of mics. This article was well conceived and well written, and being able to rely on the expertise and experience of Boisen and Knave makes me look forward to choosing mics with confidence.

A special word of thanks to Myles Boisen—your articles over the years have been consistently interesting and valuable to me, and I've taken your advice more than once. I'm sure I'm not the only one. Thanks!

Dorian Rudnytsky
via e-mail

EX POST FACTO OMS

As long as OMS appears to be up for redesign or replacement, some consideration and comparison of the relative features and foibles of the various present and past "MIDI Operating Systems" might be productive right now. These include, in no particular order, OMS (www.opcode.com and www.saveOMS.org), FreeMIDI (www.motu.com), MIDIShare (www.grame.fr/MidiShare) (GNU License Open Source), and Apple MIDI Management Tools, also known as Apple MIDI Manager and Apple MIDI PatchBay (http://asu.info.apple.com/swupdates.nsf/artnum/n10660).

Now is the time for you in the music-tech community to brainstorm and ask for what you need, to voice pluses and peeves, and to state what backward compatibility and new functionality you want.

The design of whatever will serve OMS's purpose in the future is important. If you have thoughts on this subject, then take this opportunity to rethink and discuss—or wait passively to see if eventually this column fills with complaints about limitations and problems that timely communication might have avoided. You are the users. You and your music are who and what all this technology is for.

Laurie Spiegel
via e-mail

Laurie—Anyone wishing to comment on this subject should feel free to e-mail me at emeditorial@intertec.com.—Steve O.

ERROR LOG

September 2000, "The Musical World of USB," p. 40. The Swissonic USB Studio and Studio/D feature 20-bit (not 16-bit) input and 16-bit output.

WE WELCOME YOUR FEEDBACK. *Address correspondence and e-mail to "Letters," Electronic Musician, 6400 Hollis St., Suite 12, Emeryville, CA 94608 or to emeditorial@intertec.com. Letters may be edited for space and clarity.*

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DUAL EFFECTS PROCESSOR

DUAL EFFECTS PROCESSOR

The M-One comes with Dual Engine structure enabling you to run two of the best sounding reverbs or other quality effects simultaneously without compromising sound. The M-One gives you a wide range of high quality reverbs from the classic Halls and Rooms to new and grainy snare reverbs such as Live and Plate.

TC Electronic's M-ONE and D-TWO are very powerful yet affordable new multi-effects units from one of the most highly respected names in signal processing. I highly recommend the M-ONE and D-TWO.
Mike Collins - Electronic Musician (US)

M-ONE FEATURES

- 20 incredible TC effects e.g. Reverb, Chorus, Tremolo, Pitch, Delay and Dynamics
- Analog-style User Interface
- 100 Factory/100 User presets
- Dual-Engine design
- 24 bit A/D-D/A converters
- S/PDIF digital I/O, 44.1-48kHz
- 1/4" Jacks - Dual I/O

D•TWO
MULTITAP RHYTHM DELAY

RHYTHM TAP FEATURE

TC introduces the truly musical RhythmTap feature: Not only tempo, but actual rhythm patterns can be tapped directly - or quantized according to a specific tempo and subdivision. The delays and rhythm patterns can be up to 10 seconds each. Control the exact number of repeats with Absolute Repeat Control.

D-TWO MAIN FEATURES

- Multi-tap Rhythm Delay
- Absolute Repeat Control
- Up to 10 seconds of Delay
- 50 Factory/100 User presets
- 24 bit A/D-D/A converters
- S/PDIF digital I/O, 44.1-48kHz
- 1/4" Jacks - Dual I/O

A studio effects processor dedicated solely to providing digital delay is a rare thing in this age of all-singing, all-dancing multi-effects units. In the D-TWO, TC have produced a very attractive delay unit that sounds exemplary and offers some unique features as well as all of the expected ones.
Paul White - Sound On Sound (UK)

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WHAT'S NEW

By Marty Cutler and Gino Robair

GMEDIA M-TRON

Even though samplers have surpassed the Mellotron in flexibility and expressiveness, the quirky, tape-based sounds of the instrument are highly prized by musicians today. Gmedia's *M-Tron* ($69.95) is a VST instrument for Macintosh and Windows platforms that aims to re-create the Mellotron.

M-Tron uses samples created from original Mellotron tapes to create its 28-bank library of sounds. Among the sounds included are strings, flutes, choirs, mandolins, accordions, vibes, brass, and an assortment of rhythms. As with the original, there are no looped sounds—an individual eight-second sample is played back from each key. When the eight seconds are up, the "tape" rewinds.

Unlike the Mellotron, *M-Tron* responds to MIDI. Apart from Note On messages, you can control *M-Tron*'s volume, tone, pitch, attack, and release. *M-Tron* requires a VST 2.0-compatible host program to run. System requirements for the Macintosh are a PPC 603e/200 MHz, Mac OS 8.6, and 64 MB of RAM. Requirements for the PC are a Pentium II/200 MHz, Windows 98, and 64 MB of RAM. Gmedia Technology; tel. 44-14-9157-7147; fax 44-14-9157-6161; Web www.gmedia.com/gforce.

TC-HELICON VOICEPRISM

VoicePrism ($1,299), by TC-Helicon, features state-of-the-art voice-processing algorithms and an intelligent, formant-corrected harmonizer developed by IVL Technologies. The unit also comes with a variety of TC Electronics effects that can be applied to the voice before and after harmonization.

When a signal enters VoicePrism, it is first routed to an effects processor so you can add parametric EQ and compression. Then it is split into two signals—lead and harmony—allowing you to process each independently using reverb, delay, chorus, or flanging. You can create up to four harmonies, and real-time control through MIDI input is available. Five modifying parameters—Gender, Vibrato, Timing, Randomizing, and Scooping—are adjustable for each of the harmonizer voices. VoicePrism comes with 128 presets optimized for either lead or backing vocals.

The front panel features a microphone input with mic preamp and 48V phantom power. A host of programmable editing buttons and rotary controls are easily accessible from the front panel. A headphone jack with level control is also included.

Back panel connections include a ¼-inch balanced TRS line input jack, a ¼-inch TRS aux input jack, a pair of ¼-inch TRS line outs, a S/PDIF digital output on an RCA coaxial jack, MIDI In, Out, and Thru, and a jack for a momentary footswitch. Optional XLR and AES/EBU I/O cards are available. TC-Helicon; tel. (805) 373-1828; fax (805) 379-2648; Web www.tc-helicon.com.

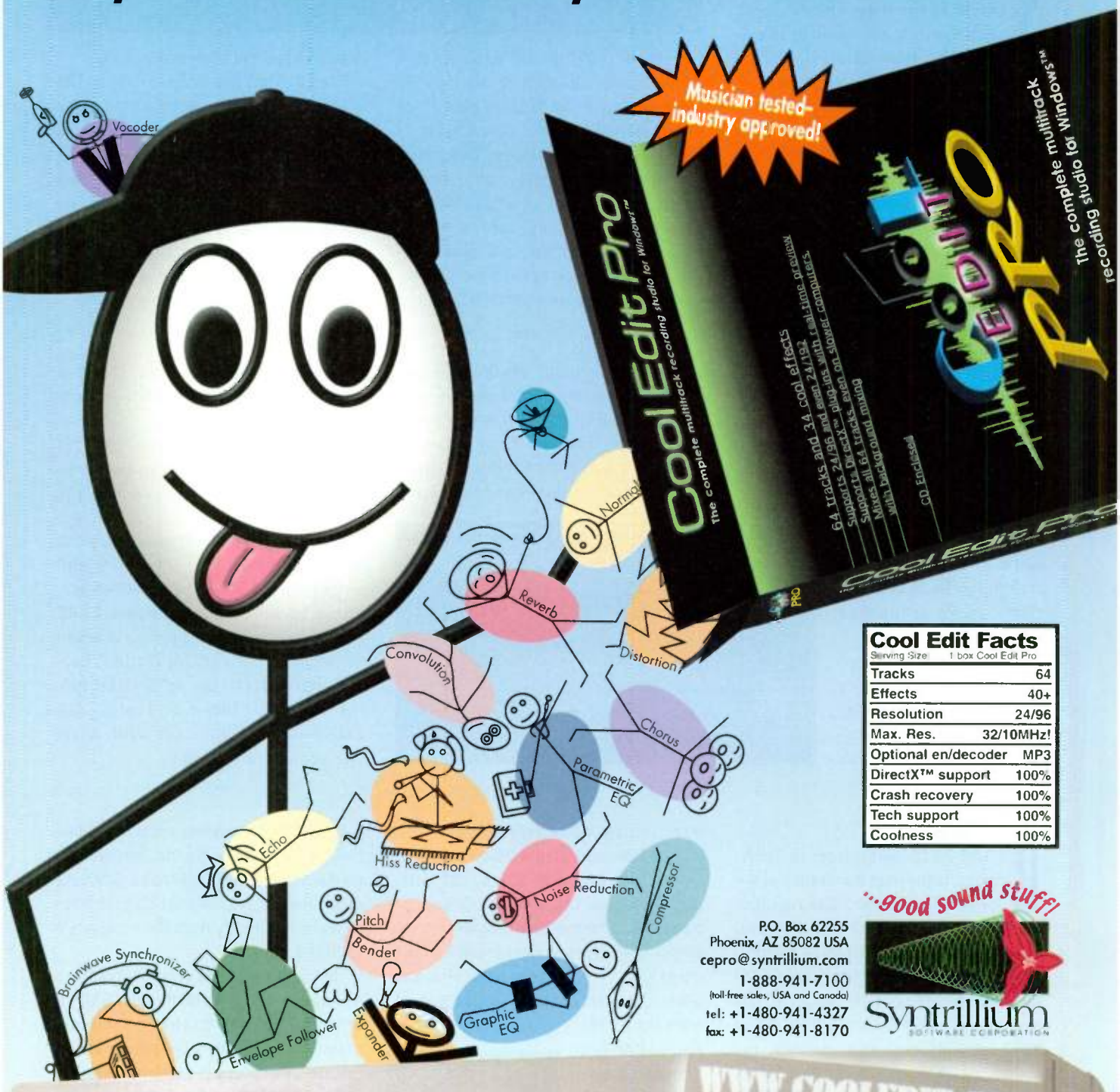
BITHEADZ TEMPO TANTRUM

Getting sampled grooves to match an ideal tempo can be problematic. To solve this, BitHeadz has created *Tempo Tantrum* ($199), which lets you alter the tempo of loops without changing their pitch. The package includes the *Unity DS-1* sample-playback engine, more than 200 MB of stereo drum loops recorded with a live drummer, and an assortment of bass lines.

An Oscillator Stretching feature takes advantage of time-sliced samples, allowing loop tempos to be modulated with the *Unity DS-1*'s Oscillator Speed control or with assignable MIDI controller messages. *Tempo Tantrum* loops can be played in BitHeadz's *Phrazer* loop sequencing program with the same time-slice advantages.

Tempo Tantrum is optimized for Macintosh G4 and Pentium III/4 processors and supports OMS, FreeMIDI, ASIO, Direct I/O, DirectConnect, MAS 2.0, ReWire, DirectSound, and Sound Manager. Mac users will need at least a 603e Power PC/200, 128 MB of RAM, and Mac OS 7.61 or better. PC users will need a Pentium II/200 processor, Windows 95 or higher, and a sound card that supports DirectSound or ASIO. BitHeadz; tel. (831) 465-9898; fax (831) 465-9899; e-mail info@bitheadz.com; Web www.bitheadz.com.

You'll find endless features and more than forty cool effects in every box of *Cool Edit Pro!*



Cool Edit Facts	
Serving Size	1 box Cool Edit Pro
Tracks	64
Effects	40+
Resolution	24/96
Max. Res.	32/10MHz!
Optional en/decoder	MP3
DirectX™ support	100%
Crash recovery	100%
Tech support	100%
Coolness	100%

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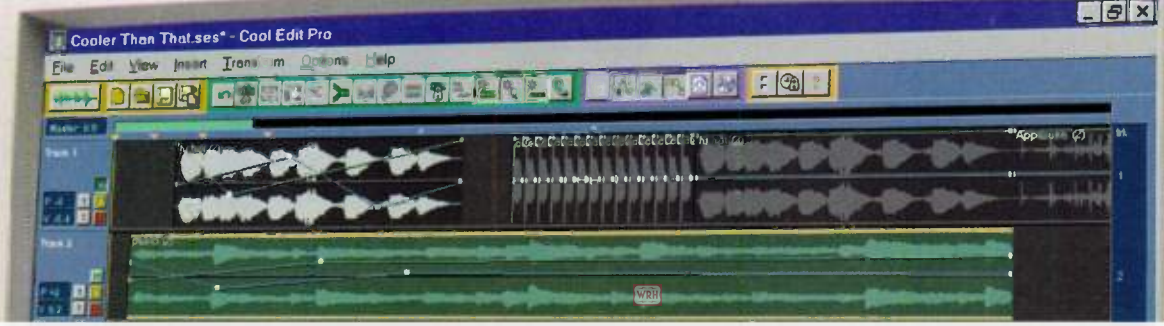


▶ KURZWEIL PC2R

Seekers of acoustic piano sounds, classic keyboards, and realistic organ timbres will want to check out Kurzweil's PC2R ($1,295). The 1U module contains 256 programs, including a triple-strike (sampled at three velocities) stereo grand piano, new stereo strings, and a variety of multi-strike classic keyboards and organs. You also get Kurzweil's KB-3 tone wheel organ models for realistic drawbar organ sounds.

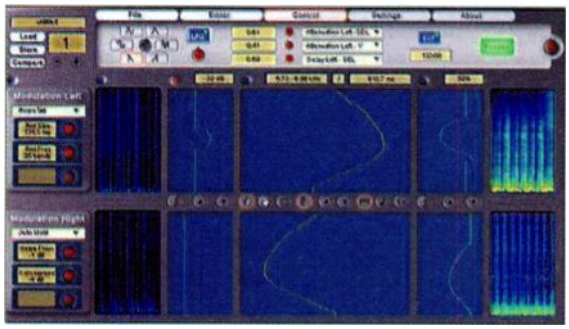
The PC2R is 64-voice polyphonic, with an option for 128-voice expansion (waveform ROM is also expandable). You can layer and split voices, and the splits can have overlapping zones with individual MIDI control assignments.

The module also includes two stereo effects processors, which offer flexible routing and a host of algorithms, including reverb, delay, chorus, flange, filters, and distortion. In addition, the PC2R features four real-time performance knobs that replicate the functions of the sliders found on the module.

The PC2R has two ¼-inch balanced TRS analog audio outputs. Although the digital outputs are on RCA coaxial jacks, you can select either S/PDIF or AES/EBU format through software. The digital outputs yield 24-bit, 48 kHz audio with a signal-to-noise ratio of >117 dB. Kurzweil Music Systems/Young Chang; tel. (800) 421-9846 or (253) 589-3200; fax (253) 983-8206; Web www.kurzweilmusicsystems.com.

▼ NATIVE SPEKTRAL DELAY

Native Instruments has just unveiled *Spektral Delay* ($199), the first in a series of Fast Fourier Transform (FFT)-based processors. *Spektral Delay* uses FFTs to divide a waveform into 1,024 frequency bands. Each of these frequencies can then be processed individually. Each channel also can be processed separately.



Once the audio is separated into frequency bands, you can perform several types of processing simultaneously on each band. The Input-Amplitude-Matrix lets you attenuate each band by up to 50 dB. The Delay Matrix gives you a maximum of 12 seconds of delay for each band, while the Feedback Matrix lets you control the amount of signal fed back into the delay. An LFO, with a choice of six waveforms, allows you to modulate each band.

All parameters can be controlled via MIDI, and *Spektral Delay* works either as a VST 2.0 plug-in or as a stand-alone processor.

Spektral Delay is compatible with both Macintosh and Windows, and works with ASIO, Sound Manager, Direct Sound, and MME drivers. RTAS and MAS versions of the plug-in are in development. Steinberg North America (distributor); tel. (818) 678-5100; fax (818) 678-5199; e-mail infoUSA@native-instruments.com; Web www.native-instruments.com.

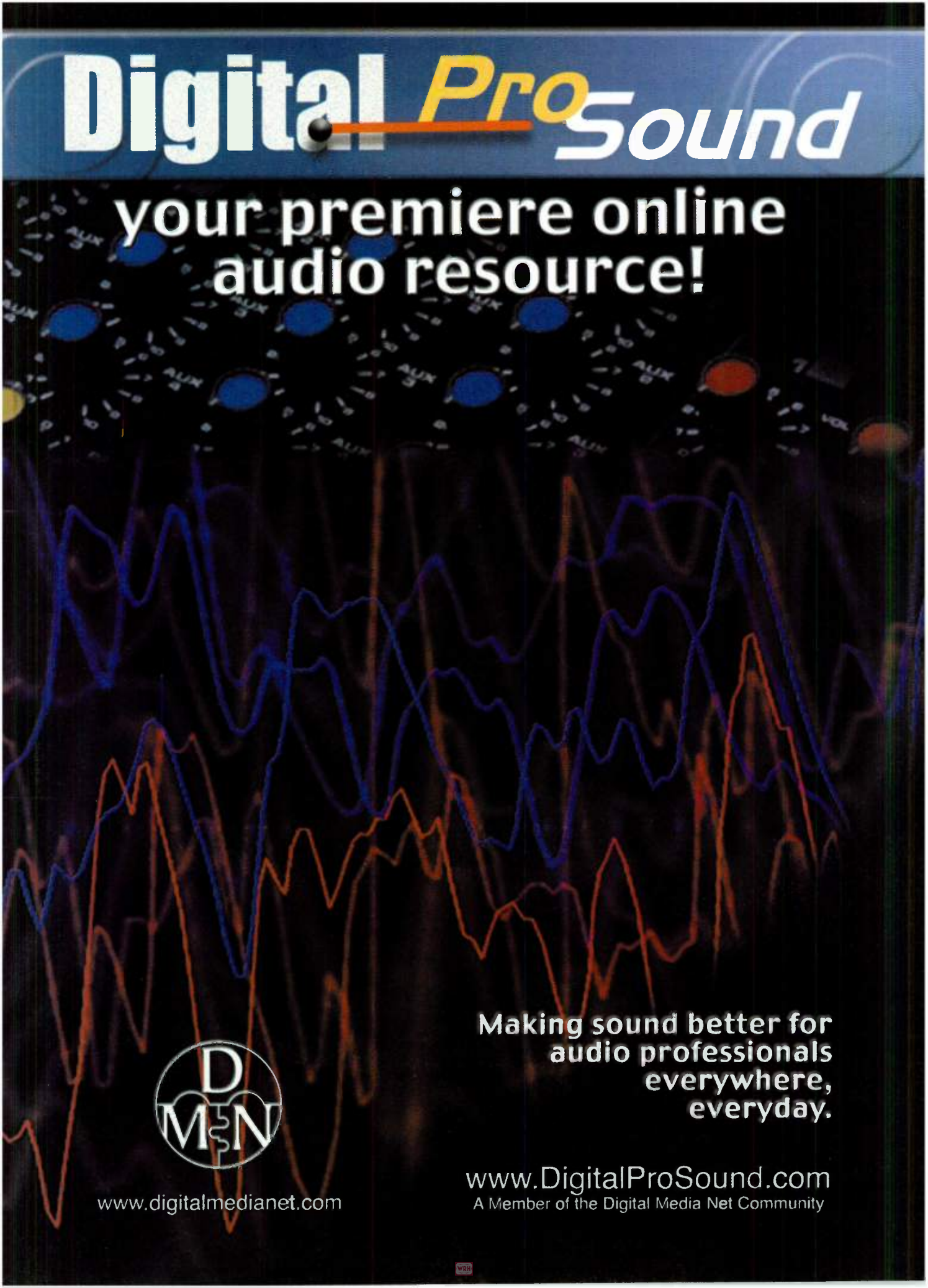
▼ IZ RADAR 24

RADAR 24 ($4,995), from iZ Technology, is the third generation of the popular RADAR hard disk recorder at a price that is just a fraction of its predecessor. The basic RADAR 24 configuration includes a 9 GB removable SCSI drive; 24 channels of TDIF digital I/O; two channels of AES/EBU and S/PDIF I/O on XLR3 and RCA coaxial cables, respectively; MIDI In, Out, and Thru jacks; sync I/O on BNC connectors; LTC/SMPTE reference I/O on XLR3 jacks; and a KC-24 remote keyboard controller with key-mapped overlay. The 9 GB drive yields 45 minutes of a 24-bit, 48 kHz, 24 track session, and up to eight RADAR 24s can be linked together using RADARLink. A port on the rear panel allows you to use any VGA monitor for waveform editing.

The company states that RADAR 24 is easy to use, extremely reliable, and capable of recording a 24-bit signal at sample rates from 32 to 192 kHz, depending on the analog I/O boards used. The Classic boards give you 24 tracks at 48 kHz and below; the Nyquist cards give you 12 tracks at 96 kHz, and S Nyquist boards give you a maximum of 6 tracks at 192 kHz. RADAR 24's frequency range is 10 Hz to 22 kHz (±.5 dB) at 44.1 and 48 kHz sample rates.

RADAR 24's operating system is called BeIA, developed by Be Inc. for use with media-rich Internet appliances. Software upgrades are available on 3.5-inch floppy disks or directly from the company's Web site.

The recorder can be controlled with the standard KC-24 remote, through SMPTE or MIDI Machine Control from a computer, or with the company's optional pro-level remote controllers (Session Controller, Eclipse, and Eclipse Elite). Other options include 24- and 48-channel meter bridges, SCSI and Network cards, and an enhanced graphics package. iZ Technology; tel. (604) 430-5818; fax (604) 430-5828; Web www.izcorp.com or www.recordingtheworld.com.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XV-88 128-Voice Weighted-Key Synthesizer

You hear it in your head. Every sound. Every note. Now there's an easy way to get exactly what you've imagined without compromise. Introducing the XV-88: Roland's first synthesizer with 88 precision hammer-action keys that feel just like the real thing, combined with the new XV synth engine for power like you've never had before. 128 voices, true stereo waveforms per tone, super expandability, expressive Matrix Control, Roland's innovative Patch Finder, a host of new studio-quality effects and a lot more. This is it. The expandable performance instrument created to take you places you've only dreamed about.

XV

Roland

REV UP ▲▲▲▲

▲ DIGIDESIGN

Digidesign's *Pro Tools* 5.1 (software upgrade $295) adds surround mixing, stereo tracks, and support for a number of multichannel mixing formats, including LCR, Quad, LCRS, 5.1, 6.1, and 7.1 (multichannel tracks and mixing require *Pro Tools* 24/Mix and Mixplus TDM systems). Surround Panning controls are now part of the *Pro Tools* interface; each track supports independent panning on outputs and sends. You can view and automate each track's panning in a large X/Y axis display or switch to a 3-knob panning mode.

Multichannel audio files are now automatically grouped hierarchically in Region lists. The redesigned mixer offers multiple destinations for each output or send on any channel; you can now create surround mixes in various formats and a stereo mix simultaneously. The new I/O Setup window lets you customize routings, which you can import and recall.

For *Pro Tools* 5.1 TDM systems only, you can add the Digidesign Machine-Control option, enabling you to control playback, arm tracks, and record in *Pro Tools* from the remote device.

Another TDM-only feature, called Beat Detective, analyzes strong transients in order to conform looped grooves into selected regions. Additionally, new MultiShell II allows TDM plug-ins to dynamically share DSP resources.

Pro Tools 5.1 allows for multiple levels of undo, and can automatically save sessions at user-defined intervals. MIDI enhancements include an event-list editor, support for recording multiple MIDI devices simultaneously, and individual track offsets. Digidesign; tel. (800) 333-2137 or (650) 842-7900; fax (650) 842-7999; e-mail prodinfo@digidesign.com; Web www.digidesign.com.

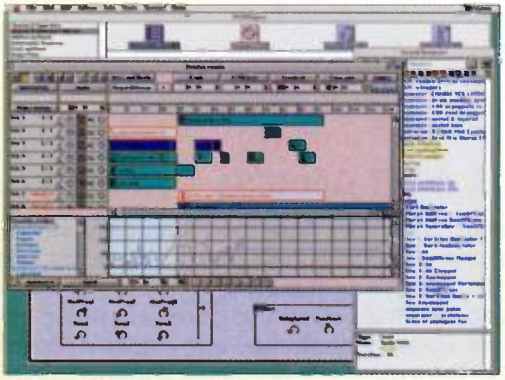
▼ SYMBOLIC SOUND

Kyma 5.07 ($3,300 bundled with base Capybara 320 hardware system), from Symbolic Sound, features a library of more than 1,000 new sounds, 369 sound design modules, a Timeline display, user-configurable control surfaces, and a Sound Browser. You can locate, play, and test combinations and effects from within the Sound Browser.

Presets are handy as jumping-off points for new sounds. With Kyma 5.07, however, you can also save and recall the entire sound development process. To add a random factor in your search for new sounds, you can step through randomized parameter settings.

You can now create virtual devices and control surfaces, and Kyma will automatically provide an initial template. You can then adjust ranges, types of controls, sizes, positions, and even names of control surfaces.

Unlike a standard sequencer or editor that shows notes or regions, the new Kyma Timeline shows the scheduling of algorithms on the Capybara. You can record fader moves, play and modify sounds, and control and record parameter changes with MIDI. To assign effects, simply drag and drop an effects icon on the timeline.



You can also assign each track to a specific audio output channel and MIDI input channel, or simply specify the location of a sound in space. Real-time panning and spatialization of up to eight audio channels is possible. Once you specify the speaker configuration, Kyma will automatically configure its Timeline to match, including Quad, 5.1, and 7.1 Surround. Symbolic Sound; tel. (217) 355-6273; fax (217) 355-6562; e-mail info-kyma@symbolicsound.com; Web www.symbolicsound.com.

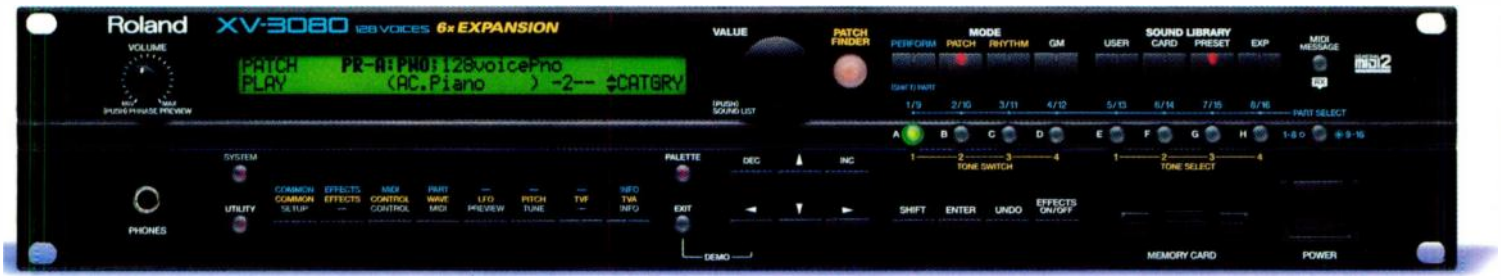
AKAI PROFESSIONAL

Available as a free download from its Web site, Akai's v. 2.0 operating system supports USB networking of S5000 and S6000 samplers. With the IB-S56USB USB expansion board ($129) and the *ak.Sys* networking software bundled with the board, you can network up to 32 samplers from a single computer. *Ak.Sys* enables drag-and-drop transfer of programs and samples between connected samplers. The software includes Program and Multi editors, and a Virtual S6000 Remote Control Panel.

Apart from networking upgrades, the v. 2.0 operating system can now format FAT 32 hard disks. Other features include support for Roland CD-ROMs and E-mu SCSI disks.

Performance enhancements include Legato and Portamento modes. The Standard MIDI File player lets you organize SMFs into set lists for playback. Akai Musical Instrument; tel. (800) 433-5627 or (817) 831-9203; fax (817) 222-1490; e-mail info@akaipro.com; Web www.akaipro.com.

Another way to get there.



XV-3080 128-Voice Synthesizer Module

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Specifications and appearance are subject to change without notice.

▲ GRACE DESIGN MODEL 101

New from Grace Design is the Model 101 ($699), a fully balanced, single-channel transformerless mic preamp and instrument DI. The elegant front panel on the Model 101 includes a ¼-inch TS high-impedance input, switches for 48V phantom power and 12 dB/octave high-pass filter, and stepped gain and trim controls. Two status LEDs on the front panel indicate signal presence/peak level and power, respectively. Back panel connections include an XLR mic input, XLR and ¼-inch TRS outputs, and a jack for the wallwart power supply.

The specs of the Model 101 are similar to those in Grace Design's high-end 8-channel 801 preamp. The frequency response of the mic input at 40 dB is an impressive 12 Hz to 170 kHz (–3 dB). The output gain range is from 10 to 60 dB in 5 dB steps. A high-output version of the Model 101, with a 20 to 70 dB gain range, is available for use with ribbon mics. At the high-impedance input, the frequency response at 20 dB gain is 3 Hz to 300 kHz (–3 dB), and the gain range is 50 dB.

The 12 dB/octave highpass filter on the Model 101 slopes to –3 dBU at 75 Hz, and THD+N is 0.005% at 60 dB. Grace Design; tel. (303) 443-7454; fax (303) 444-4634; e-mail egrace@gracedesign.com; Web www.gracedesign.com.

▶ ROYER SF-1

Royer has just released the SF-1 ($1,075), a single-element, figure-8 ribbon microphone that features the same cross-field transducer as the company's SF-12 stereo microphone. The cross-field transducer design features four diamond-shaped Neodymium magnets and two trapezoidal Permendur iron pole pieces, which the company says enhances the microphone's high-frequency response as well as its perceived "reach" in distance recordings. The overall frequency response of the SF-1 is 30 Hz to 15 kHz (±3 dB), with slight boosts in the response between 40 to 80 Hz and 900 Hz to 9 kHz.

According to Royer, the important design features of the SF-1 include an ingot-iron casing, a high-efficiency toroid matching transformer, and a gold-plated output connector. The casing forms a magnetic return circuit, which gives the microphone its high sensitivity and low self-noise in a small package. Royer adds that the SF-1's ribbon element is more delicate than the one in its R-121 microphone, but is unaffected by heat and humidity.

The SF-1, finished in matte black chrome only, is available individually or in matched pairs for an extra $50. Royer offers a lifetime warranty on the SF-1 to the original owner. Royer Labs; tel. (818) 760-8472; fax (818) 760-8864; e-mail info@royerlabs.com; Web www.royerlabs.com.

▼ HHB CDR830 BURNIT

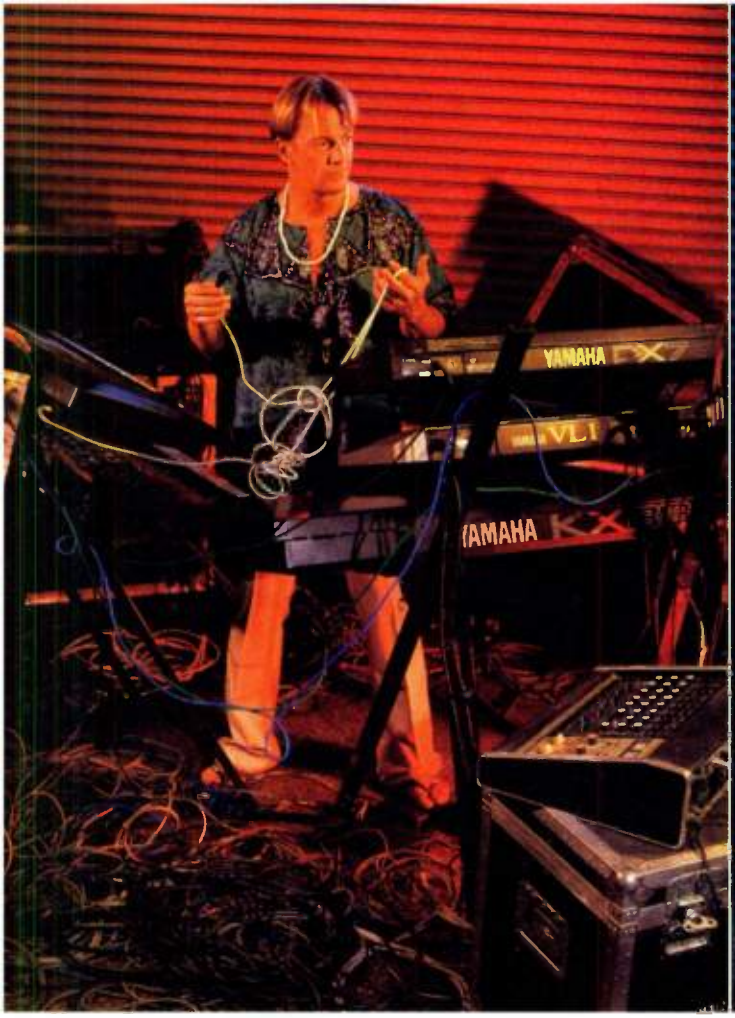
HHB's newest stand-alone CD-R recorder is the CDR830 BurnIT ($795). The CDR830 includes three synchro record modes, allowing you to record one track at a time, record the entire disc at once, or record and finalize the disc at once. In addition, finalizing can be done at double speed. The CDR830 accepts both standard and consumer CD-RW and CD-R blank media.

The CDR830 lets you add and edit text to CD-Rs, allowing each track ID to have up to 120 characters. Text entry is done through the remote control (included) or an ASCII keyboard (using a dedicated rear-panel input).

Like other HHB CD-R burners, the user interface of the CDR830 is straightforward and easy to navigate. The LCD screen includes level meters and displays text added to the CD subcode. Notably, the unit includes a front-panel digital input gain control, which allows you to match the record levels of different digital input sources. The front panel also includes an analog record-level control and a ¼-inch headphone jack with a dedicated volume control.

The CDR830 uses RCA connectors for analog I/O (with 24-bit A/D/A converters) and optical and RCA coaxial jacks for S/PDIF digital I/O. The coaxial and optical inputs each have their own digital gain control, and gain adjustments can be made in 0.5 dB steps (+12 to –12 dB), 1 dB steps (+20 to +12 dB and –12 to –24 dB), 3 dB steps (–24 to –48 dB), and 6 dB steps (–48 to –84 dB). Additionally, there is a digital stereo balance control.

The dynamic range of the CDR830 is >98 dB, S/N ratio >111 dB, and THD @ 1 kHz is <0.002%. HHB Communications USA; tel. (310) 319-1111; fax (310) 319-1311; e-mail sales@hhbusa.com; Web www.hhbusa.com.



IN THE OLD DAYS it took a pile of gear, a trunk full of cables and an army of roadies to create a completely versatile synth system. **BUT NOW** Yamaha's Modular Synthesis Plug-In System lets you easily and inexpensively expand your rig without the need for bank loans or hernia belts. And unlike other companies' expansion boards that only add sounds, when you install a PLG card into a Yamaha S80, S30, CS6X or SW1000XG, you're adding an entirely new synthesizer – complete with state-of-the-art tone generation technologies, effects and extra polyphony. So get with today's world; infinitely expand your sonic universe with Yamaha synthesizers and the Modular Synthesis Plug-In System.

PLG150-AN
Reproduce the fat and punchy sounds of vintage analog synths with this physically modeled analog synth board. $299.95

PLG150-VL
Create ultra-realistic wind instrument sounds with physically modeled Virtual Acoustic tone generation. $199.95

PLG150-VH
Add a variety of studio-quality harmony effects to your voice, from vocoder type sounds to four-part chordal harmonies, to inspire your songwriting. $169.95

PLG150-PF
Get over 130 impeccable samples from the world's best acoustic and electric pianos. $349.95

PLG150-DX
The same tone generation system as the legendary Yamaha DX7 is reborn in this 6-operator, 16-note poly synth board. $349.95

PLG100-XG
Add the exciting world of Yamaha XG and General MIDI compatibility to interact with thousands of Standard MIDI files. $249.95

All prices are manufacturer's suggested retail price. Yamaha synths have different plug-in capacities.

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THE RACK

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★ ★

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THE MAIN EVENT

RINGSIDE TICKETS NOW ON SALE

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KORG

2000 EDITORS CHOICE

MIPA

1999 MMR

▶ TC ELECTRONIC TRIPLE C

TC Electronic's latest foray into dynamics processors is the Triple C Multiband Envelope and Full-band Compressor ($699 single channel; $999 dual channel). Triple C allows you to perform 3-band, frequency-dependent compression, full-band compression, or envelope compression. It also lets you add second-harmonic distortion, and it comes with high and low shelving filters. Included are 50 presets optimized for particular tasks, and 100 spaces for storing user-defined presets.

The front panel of the Triple C features a multipurpose LCD display, four Dynamics controls (threshold, ratio, attack, and release), two Spectral Level controls (Lo- and Hi-band), controls for Input and Makeup Gain, a rotary menu knob, and the power switch.

In the single-channel processor, the right channel input serves as a sidechain input or stereo link and the right output serves as a direct output or stereo link. Back-panel connections include a pair of analog inputs and outputs using ¼-inch balanced TRS jacks, S/PDIF digital I/O using RCA coaxial jacks, MIDI In, Out, and Thru jacks, and a bypass pedal input.

Triple C has an overall frequency response of 20 Hz to 20 kHz (–0.5 dB at a 48 kHz sample rate) and uses 24-bit A/D/A converters with a choice of 44.1 and 48 kHz sample rates. TC Electronic; tel. (805) 373-1828; fax (805) 379-2648; e-mail tcus@tcelectronic.com; Web www.tcelectronic.com.

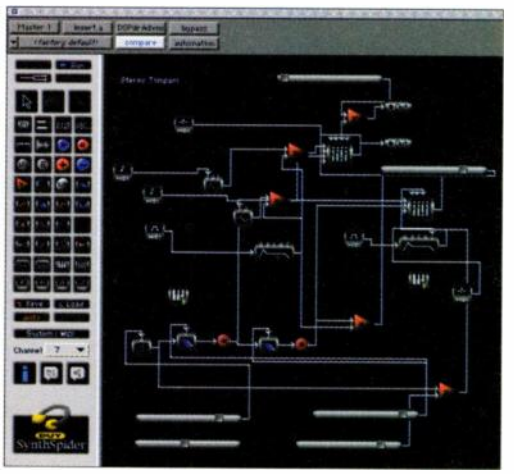
▶ DUY SYNTHSPIDER

DUY has just introduced a modular-synthesizer TDM plug-in called *SynthSpider* ($895). *SynthSpider* lets you create patches in an intuitive fashion in the graphic interface, using familiar synthesizer modules and functions. These include oscillators (such as sine, triangle, pulse), a noise generator, a dynamic wave generator, an envelope follower, sample and hold, six filter types, a 32-step sequencer, and basic logic functions (addition, subtraction, and division).

SynthSpider includes four MIDI modules: Controller, Note, Velocity, and Gate. The Controller module allows every synth parameter to respond to MIDI. Automation is also supported.

SynthSpider lets you do anti-aliasing wavetable synthesis, with the ability to draw a waveform in either the time or frequency domain. Patch Manager automates patch changes on the fly, and up to four waveforms can be morphed together in time using the Dynamic Morphing Generator. Another feature is the Scanwave Generator, which lets you use external audio sources as oscillators.

Minimum system requirements are a Power Mac 604e/200 MHz, with 48 MB of RAM, Mac OS 8.1, and *Pro Tools* TDM 4.3.1. The plug-in supports OMS and FreeMIDI. DUY; tel. 34-932-174-510; fax 34-932-176-313; e-mail info@duy.com; Web www.duy.com.



▼ WAVEFRAME FRAMEWORKS/DX

WaveFrame's latest digital audio workstation, FrameWorks/DX ($4,995), brings a variety of professional applications—including CD mastering, surround mixing, and DVD preparation—into the realm of the project studio. The DAW gives you 64 channels of 24-bit/48 kHz audio, and works with sample rates up to 96 kHz.

FrameWorks/DX relies on the Merging Technologies Mykerinos DSP card for its processing power, integrated synchronization capabilities, and time code functionality. The basic system includes one Mykerinos PCI board and 16 channels of ADAT Lightpipe I/O. Other I/O options include TDIF, AES/EBU, and MADI.

Projects can be displayed in SMPTE time code or as bars/beats/ticks, and LTC and VITC sync and external transport control (using a 9-pin RS422 connection) is available. For onscreen mixing and editing reference, digital video can be imported into FrameWorks/DX using a video capture card.

FrameWorks/DX plug-in options include dedicated Room Simulation/Reverb, Time Compression/Expansion, and Denoising DSP effects. The system can also run DirectX effects plug-ins. For 5.1 surround work and DVD preparation, available options include both DTS and AC-3 encoding. The system lets you use automation during a mix, and WaveFrame says you can mix 5.1 and stereo sessions simultaneously.

Minimum requirements for FrameWorks/DX are a Pentium II/266 running Windows 2000. WaveFrame; tel. (510) 594-9455; fax (510) 654-8370; Web www.waveframe.com. ❀

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- 128 PROGRAMS/128 COMBIS

GOLDEN GLOVES

VINTAGE ARCHIVES

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- VINTAGE AMERICAN AND JAPANESE ANALOG SYNTHS, DRUM MACHINES & TAPE-BASED KEYBOARDS
- 128 PROGRAMS/128 COMBIS

READY FOR THE BIG TIME

KORG

By Roger Maycock

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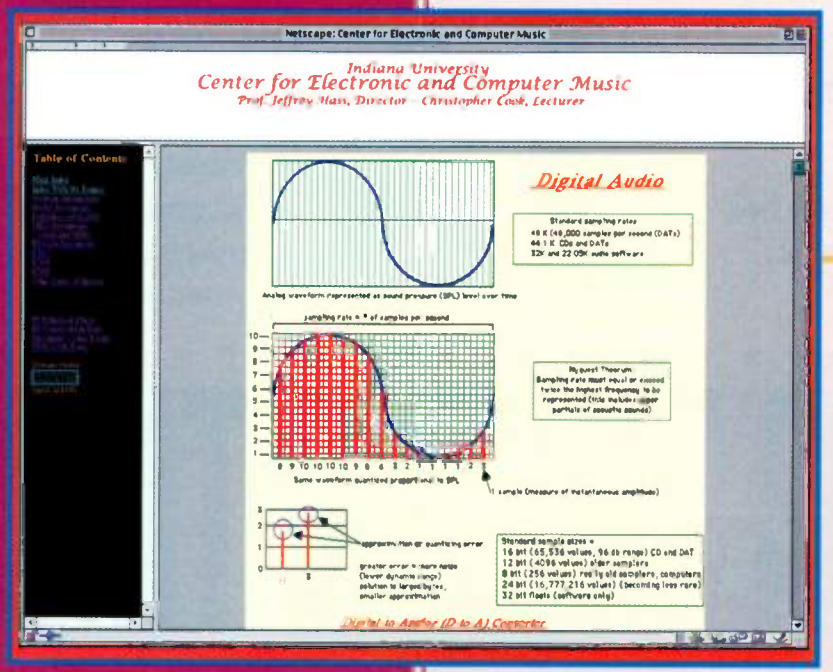
WEB SITE OF THE MONTH

The Indiana University School of Music, a leading institution of music education, offers an extensive electronic music curriculum. The Web site of the school's Center for Electronic and Computer Music (www.indiana.edu/~emusic) is intended primarily as a resource for university students, but it's also useful for anyone interested in electronic music.

The site includes an explanation of the MIDI specification, a digital audio primer, microphone and mixer basics, mixer troubleshooting tips, a historical overview of electronic music, and extensive coverage of the sound-synthesis language Csound. You'll also find links to valuable resources such as the Society for Electroacoustic Music in the United States (SEAMUS), the International Computer Music Association, and the Electronic Music Foundation.



Musicians seeking resources and contacts to further their careers will find **Musiceditor.com** (www.musiceditor.com) well worth exploring. Billed as "the new online A&R resource," the site provides several valuable services. For a $45 fee, you can submit a demo package and receive a thorough critique of your music production, vocals, lyrics, and presentation. If the reviewers consider your material exceptional, Musiceditor.com will shop your package to labels, publishing firms, and others . . . Fans of analog circuit design and other DIY types should bookmark **Music Synthesizer.com** (www.musicsynthesizer.com), the fascinating online meeting place for synth designers, builders, and enthusiasts worldwide. It's made up of links to pages that describe highly personal, one-of-a-kind systems, often including schematics and other useful design information. Many of the people behind the smaller analog synth companies (including Grant Richter of Wiard, Eric Barbour of Metasonix, and Bruce Duncan of Modcan), as well as more well-known names (such as John Simonton of PAiA, Don Buchla, and Bob Moog), are represented on the site . . . If you've ever struggled with placing MIDI files online, go to Charles Belov's **MIDI Web Tips Home Page** (www.cabelov.com/midi/midi.shtml). This site provides casual Web surfers, musicians, Webmasters, and Internet service providers with information on browser plug-ins and uploading and configuring MIDI data, tests to check your browser's MIDI response, and links to related sites. You can download HTML code for streaming MIDI data and incorporate it in your Web pages. The site will also tell you which MIDI plug-in your browser uses. Best of all is the extensive section on troubleshooting MIDI-related difficulties.

DOWNLOAD OF THE MONTH

GoldWave 4.19 for Windows (www.goldwave.com) is a shareware 2-channel digital audio editor with an intuitive interface and an extensive feature set. Provisions for configuring RAM (for fast operation) and your hard disk (for large files) help you optimize the program for any application, such as editing files up to 1 GB in size.

GoldWave lets you automatically convert samples during paste operations and perform direct sample editing using the mouse, and it gives you real-time amplitude, spectrum, bar, and spectrogram graphs. Standard effects include distortion, echo, pan, volume shaping, invert, resample, transpose, noise reduction, and time warp. Among the other features are drag-and-drop cue points, CD audio extraction, and the abil ty to import and export a number of formats, such as WAV, AU, IFF, VOC, SND, MAT, AIFF, MP3, OGG, and raw data. (To work with MP3 files, you must also have Windows Media Player 6.4 and the LAME or BladeEnc encoders.)

GoldWave 4.19 has modest minimum system requirements: a 486 processor, 16 MB of RAM, Windows 95/98/2000/NT, 3 MB of free disk space, and a sound card. *GoldWave* 3.03 is available for users running Windows 3.1.

WEBCAST

OnlineConservatory.com (www.onlineconservatory.com) is an interactive Web site that offers one-on-one keyboard lessons through the Web. You can study any style of music and choose your teacher. OnlineConservatory.com is available for Windows only and requires two applications: the company's free *Melodus* software package (which lets you play live over the Internet using MIDI instruments) and Microsoft's *NetMeeting* 3.01 (a real-time conferencing application).

Getting started is easy. When you register, the site will ask you about your musical preferences and equipment. After registration, download and install *Melodus* and *NetMeeting*, and turn on your keyboard and playback system. Next, arrange for the company's technical support department to test your system. A teacher will then contact you to schedule a free lesson.

At the appointed lesson time, log in and go to OnlineConservatory.com's student waiting room, where your teacher will meet you, establish a connection, and begin your lesson. Once you complete your first lesson and become familiar with the entire process, you can search for the teacher of your choice. The minimum system requirements for OnlineConservatory.com are a Pentium/120 MHz, 16 MB of RAM, Windows 95/98, a 28.8 Kbps modem, a MIDI-compatible sound card, a MIDI keyboard, and a microphone (preferably on a headset).

WEB APP

Liquid Audio's Liquid System

Although there are numerous encoding and playback systems available for downloading audio over the Internet, Liquid Audio (www.liquidaudio.com) is popular with artists and labels because it protects intellectual property rights through watermarking. Liquid Audio is not a retail site but a service provider; think of it as a warehouse (in the form of Liquid Audio's server) for music distribution. Links within an artist's Web page connect customers to the server, where they can preview and download music. Once you establish an account and upload your music to Liquid Audio's server, your product becomes part of the Liquid Music Network database, which contains more than 900 affiliated Web sites, including Tower Records Online, Virgin Jamcast, and CDNow.

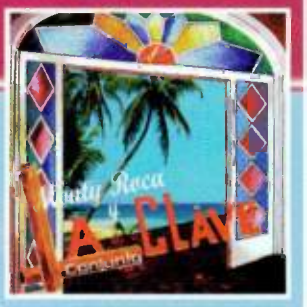
You can open a Liquid System account by contacting Liquid Audio's sales department. Basic hosted accounts for distribution and e-commerce cost less than $100 a year. Expanded hosting packages, which include additional storage and service options, are also available. Liquid Audio provides optional encoding and uploading services for artists and labels with small catalogs—just fill out the required forms and send them in with your CD.

The Liquid System is made up of three parts: Liquid Audio's server, Liquid Player Five, and *Liquifier Pro*. Liquid Player Five, available as freeware, is Liquid Audio's online version of a CD player. It's the key to conducting e-commerce, because it lets your customers preview and purchase your music. The player can also show graphics, lyrics, liner notes, and promotional material, and it includes built-in CD-burning software. You determine which permissions (such as a one-time right to burn a CD-R of the downloaded material) the consumers receive. Liquid Player Five supports a wide variety of file formats, including Dolby Digital (AC-3), Advanced Audio Coding, Sony ATRAC 3, and MP3.

Liquifier Pro, which you can download once you establish an account, is for encoding and uploading content. It also includes audio-extraction tools for transferring audio from a CD to your hard drive. Creating a file with *Liquifier Pro* takes six steps: (1) enter your text and graphics in the Media window; (2) import your audio; (3) prepare separate audio files for previews and downloads; (4) preview each component from the consumer's perspective; (5) create a Liquid Master file by integrating all images, text, and audio files; and (6) upload the Liquid Master file to the server using *Liquifier Pro*'s simple drag-and-drop methods.

For Liquid Player Five and *Liquifier Pro*, PC users need a Pentium/166 MHz; 32 MB of RAM; Windows 95/98/NT 4.0/2000; 50 MB of hard disk space; a 16-bit DirectX-compatible sound card; Netscape *Navigator* 4.x or Microsoft *Internet Explorer* 4.x; and a 28.8 Kbps modem. Macintosh users need a PowerPC/150 MHz; 32 MB of RAM; OS 7.6.1; 50 MB of hard disk space; *Navigator* 4.x or *Internet Explorer* 5.x; and a 28.8 Kbps modem.

BAND ON THE WEB



Monty Roca y La Clave

Latin music is hotter than ever. Monty Roca y La Clave (http://artists2.iuma.com/IUMA/Bands/Monty_Roca_y_La_Clave/index-0.html), a New York City–style salsa band with a huge sound, has taken to the Web to deliver its musical message. Hailing from Middletown, New York, the eight-piece ensemble infuses its Latin arrangements with a number of jazz elements, producing a sound reminiscent of Tito Puente, Machito, Ruben Blades, and Willy Rosario. The music is replete with sophisticated harmonies, colorful and dynamic horn arrangements, and driving percussion.

"We started as a group of friends who were playing with other bands, but we wanted more control over our music," says bandleader and pianist Monty Roca. "We decided to produce a CD and promote it on the Internet. The Internet seemed like the ideal vehicle to accomplish what we wanted because, without the restrictions imposed by a record company, we were able to craft our musical vision as we liked."

Music fans everywhere have shown their support. "The Internet has made it possible to reach people around the world who otherwise would have never heard our music," Roca says. "We've sold CDs in Europe, Russia, Latin America, and all across the United States."

Roca first uploaded the band's music in May. "In just a few short months, we've had several record labels contact us about the handling and distribution of our CD, and we've played at both the Copa Cabana and Casa Blanca nightclubs," he says. "I have also been hired to create musical arrangements for other bands that heard our CD."

Roca is a true believer in the Internet's ability to further a musician's career, because it allowed him to develop a following that would otherwise have required a substantial marketing budget. "You upload your music, and the public is the judge of what you create, not some executives at a record company that might stop you from reaching the masses because you did not agree to their terms," Roca says. "Out of necessity, record companies are taking notice of the Internet's potential." ●

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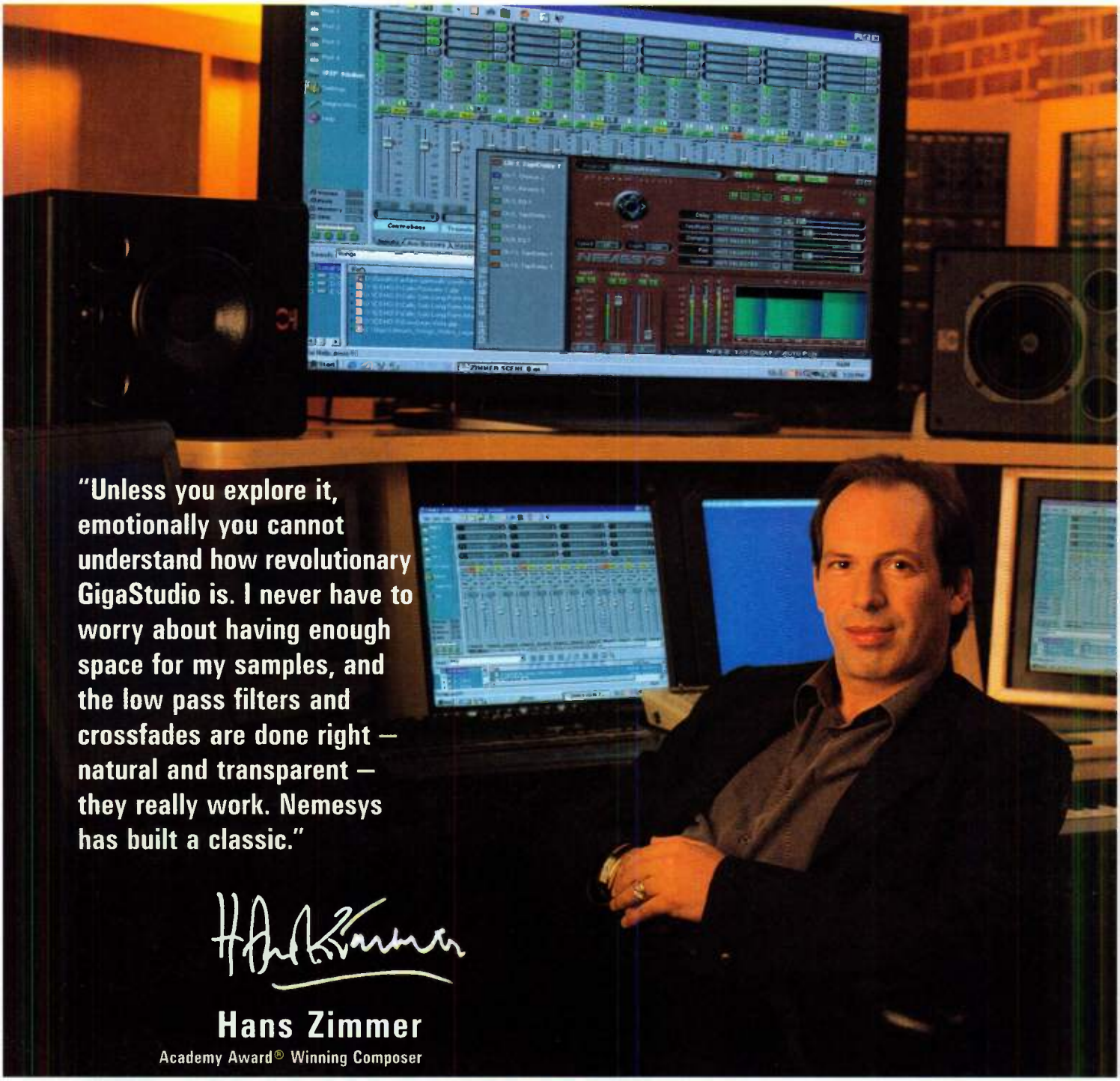

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VINTAGE PAGE

By Julian Colbeck

ARP Odyssey

Produced: 1972
Made in: United States
Designed by: Alan R. Pearlman
Number produced: 3,000
Synthesis system: analog, subtractive
Price new: $1,995

Today's prices:		
	Like new	*$700*
	Like, it's okay for its age	*$550*
	Like hell	*$300*

ARP produced the Odyssey in response to the Minimoog, with the rivalry between Moog and ARP almost stage-managed. Everything Moog did, ARP did slightly differently: a pitch wheel on the Moog—a pitch knob, and later, a pitch pad on the ARP. Rotary knobs on the Moog—sliders on the ARP. Black color scheme on the Moog—colored knobs on the ARP. Indeed, the Odyssey's front panel could not be mistaken for a Moog instrument: it's a sea of minute switches and loosely calibrated sliders with plastic color-coded blobs the size of a Tic-Tacs.

A dual-oscillator, monophonic synth (two notes can be emitted by using different pitches for each oscillator), the Odyssey is a cut-down version of ARP's earlier 2600 synthesizer. Voltage-controlled oscillators offer switchable sawtooth/pulse waveforms, and coarse and fine tuning. Pulse width can be controlled manually or modulated using an LFO or the ADSR envelope generator.

You get a static highpass filter and a dynamic lowpass filter. The lowpass filter offers variable cutoff frequency and resonance sliders and you can set the resonance high to drive the filter into self-oscillation, so you can use it as a sound source. The filter can be shaped by EG 1 (with simple attack and release parameters) or EG 2 (attack, decay, delay, and release). It can be modulated by the LFO, sample-and-hold circuit, keyboard CV, or a pedal.

The LFO has sliders governing frequency and output lag (delay), and the sample-and-hold circuit can be fed the output of VCOs 1 and 2 and the VCF for a range of those classic random space-age sound effects.

The Odyssey is well stocked with features. White and pink noise are available, the oscillators can be hard-synched, you get a ring modulator, and you can also set up repeats and auto-repeat triggering. Wide-ranging modulation permutations make this a theoretically expressive instrument to play.

Performance controls on early models included a portamento slider, 4-octave range transposer, and a far-from-accurate pitch bender that was nothing more than a rotary control with a supposedly safe central area. Later, these were joined by a rubbery pad called a PPC (proportional pitch control), which controlled LFO depth. If you are on the lookout for an Odyssey, try to find one of these.

At the other end of the performance scale, the Odyssey is an excellent sound effects synth, for wind, steam, seashore, bird noises, space effects, and so on.

But the Odyssey was not really designed as a purveyor of static, repeatable musical timbres. In fact, no matter how carefully you try to re-create a sound (ARP made little templates you can sling over the panel so you can mark control settings), even approximations are pretty hard to accomplish. There are no LEDs, and the sliders are way too sensitively calibrated.

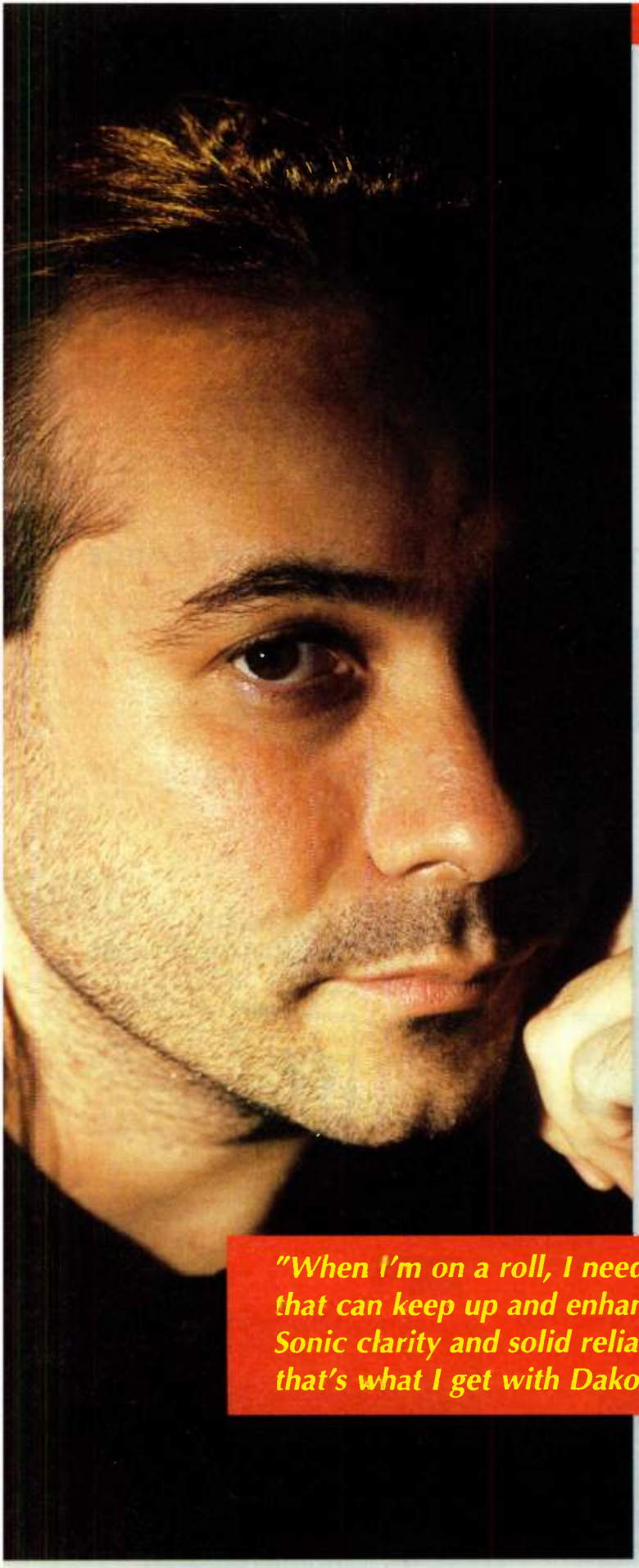
The Odyssey makes the ever-tricky problem of tuning on this vintage instrument even harder with its

(continued on p. 126)

COURTESY AUDIO PLAYGROUND SYNTHESIZER MUSEUM

Never a rock 'n' roll favorite, the ARP Odyssey's thin, sharp timbre and ability to produce weird sounds makes it popular with drum 'n' bass, jungle, and even hip-hop musicians. It's especially good for creating unique sound effects.

For manufacturer information, please see Contact Sheet, p. 203.



Artist Profile:

Shawn Clement

Profession:

Music Composer for TV and Film

Location:

Clemistry Ranch, Southern California
(a recent emigré from Beverly Hills)

Credits:

Buffy the Vampire Slayer, feature films, network TV and a long list of reality shows including *World's Most Amazing Videos*, and our favorite: *When Good Pets Go Bad*

Recent Honor:

ASCAP 2000 Award Winner
Most Performed Composer on TV in 1999

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TECH PAGE

By Scott Wilkinson

Over, Under, Sideways, Down

A new system puts you in the middle of the audio action.

First, commercially recorded sound was monaural. Then, it was stereo and—briefly—quad. Now, it often employs six channels (five full-range and one low-frequency, which is known as 5.1 surround sound), seven channels (6.1), and more. Is this trend likely to continue? Probably; after all, more is always better, right? Well, maybe not always, but this is certainly true when it comes to a sound system's ability to reproduce the directional cues that occur in a real-world acoustical environment.

This is the idea behind the patented Taylor Array Processing System (TAPS) from Dimension Audio (www.dimensionaudio.com). At the recent AES Convention in Los Angeles, the company demonstrated a 45.3-channel version of the system (45 full-range and 3 low-frequency channels). This megasystem included 45 Genelec 1029A powered monitors: eight on the front wall, ten on the right and left walls, seven on the back wall, and ten on the ceiling. Two of the three low-frequency channels were directed to four Buttkicker tactile transducers connected to a floating floor, and the third bass channel was served by a Genelec powered sub.

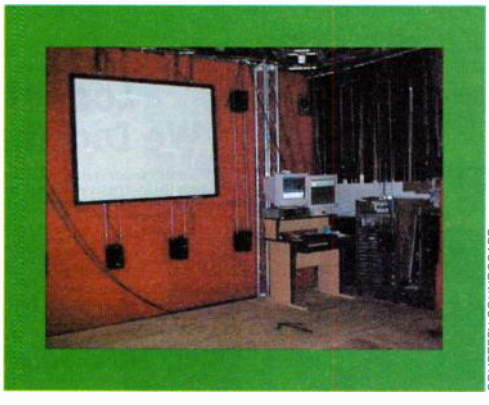
The system is intended to reproduce sound with as much spatially correct cueing as possible to create a completely enveloping sonic environment. Each full-range speaker is called a *sound pixel;* much like video pixels combine to form a complete visual image, the sound pixels combine to form a complete aural image. The entire array forms a singular surface—a sort of "meta" speaker. This surface radiates sound in a manner similar to real-world sound waves, combining both near- and far-field cues.

The source material for the AES demo included several selections that had been mixed to 48 discrete channels in the company's studio and played back from two synchronized Soundscape R.Ed 24-track hard disk recorders. Also included were several cuts from standard stereo CDs and 5.1-channel soundtracks processed through the company's patented *Sound Spreader* software running on a Windows PC and using the two R.Eds as output devices. (The software can also be used with six Soundscape Mixtreme sound cards, each of which provides eight audio outputs.)

Sound Spreader, which has been under development in various forms since 1996, is currently in an alpha version that uses Soundscape hardware. It accepts any signal and uses proprietary DSP algorithms to distribute the sonic energy throughout the array, enlarging the aural image in a relatively fixed, predetermined way. Another program, *Pather,* can redirect the source signal to any set of output channels based on various criteria.

Even more ambitious is Dimension Audio's plan to introduce a computer-aided design system called AudioCAD that will allow engineers to design multichannel sound environments visually. With this system, a sound designer specifies an ambient environment (a reverberant alleyway, for example) and places sounds at any location within that environment. These sounds can then dynamically "pan" anywhere within the speaker array with the same energy signature as if the sound was actually originating in the specified environment.

Ultimately, a TAPS system can be constructed with any number of channels, but 16 seems to be the minimum number needed to create a convincing sonic environment. Within such an environment, each speaker level (and thus, the required amplifier power) can be relatively low while the overall system maintains a high total SPL. In addition, there is no "sweet spot"; all listening positions have their own complete perspectives of the mix. Appropriate venues include commercial cinemas, dance clubs, video-game parlors, and high-end home theaters. In the studio, *Sound Spreader* can be used to expand conventional mixes, allowing the engineer to examine the mix, revealing flaws that might otherwise have gone unnoticed. This fascinating technology could have a major impact on all aspects of sound recording in the future.



COURTESY SOUNDSCAPE

The Dimension Audio demo room at AES included a front-projection video system in addition to the TAPS speaker array, computers, and other equipment.

imagine...

a loop based recorder that has unlimited memory expansion

imagine...

being able to independently change a loop's pitch and tempo in real time

imagine...

instantly making glitch-free loops that synch perfectly to your mix

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PRO FILE

By Matt Gallagher

Disappearing Act

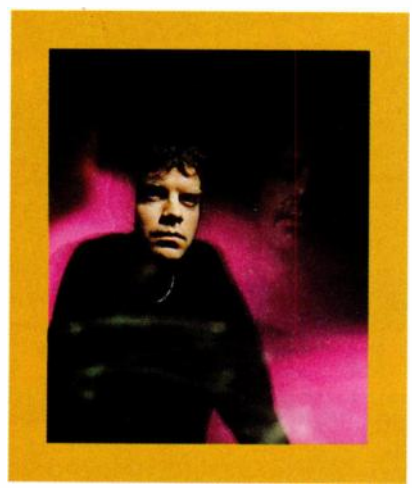
Spring Heel Jack builds a drum 'n' bass empire inside a shoe box.

Acclaimed drum 'n' bass duo Spring Heel Jack is John Coxon (a DJ and pop-music producer) and Ashley Wales (a classical composer). *Disappeared* (Thirsty Ear, 2000) is the third album this year to roar out of Spring Heel Jack's personal studio in London's East End. "We write music all the time," Coxon says. "If you can find your own space and build up your own studio, then you have the time to write. The studio is a tool, just like an instrument."

Spring Heel Jack occupies a rented room at the Strongroom, a cooperative where it has spent eight years composing, recording, and mixing seven Spring Heel Jack albums and side projects. "It's a shoe box," Coxon says, "a small, self-contained unit. It's tuned to an extent, but it's not the most accurate place to mix." *Disappeared* was produced entirely within the Strongroom. Only one guest musician, bass clarinetist John Surman, recorded his parts elsewhere. "We sent him an ADAT with two channels of a stereo mix," Coxon says. "His son recorded him playing bass clarinet on our track, and then we put that back onto hard disk and mixed it from there."

Coxon and Wales use samples to create dense, intricate electronic soundscapes. "First, we make a sound world," Coxon says. "Sometimes we start with a loop, or some kind of drum thing, so we can bounce off of something. Often, we'll take out all the drums and be left with this soundscape that we've draped around them.

"We are interested in original recorded sound sources as opposed to synthesizer noises. Look at a band such as Orbital, who are friends of ours; they are around the corner from us, actually. They tend to build up their basic tracks using synthesizers and drum machines, and then the samples are the icing on the cake. They will spend a lot of time going through a synthesizer. Our tracks are the other way around: they start with samples—building up drum tracks from old recordings of drum kits—and then the synthesizer stuff is on the top."



***Disappeared*/Spring Heel Jack**

Spring Heel Jack's method involves using the E-mu EIV and E6400 samplers as instruments, and Emagic's *Logic Audio* as the tape machine. "We used to use ADATs," Coxon says, "but now we have a decent hard disk recording system. We have a couple of [Yamaha] 02Rs and a Mac G4 400 [MHz], which runs *Logic* with a MOTU 2408 and MIDI Time Piece." Their synthesizers include the Novation DrumStation and Nova, as well as the Roland Juno-106 and JV-800. "We mainly use the two E-mus and the Novations," Coxon says.

"As far as outboards," Coxon says, "we have stuff that we've collected over the years." Two Technics turntables, a Vestax PMC20SL DJ Mixer, and the Roland RE-301 Space Echo also figure prominently. Acoustic and electric guitars, basses, and other sounds are played through a Vox AC30 amplifier, and *Disappeared* is rife with distortion.

"I like those old Jamaican records that have a lot of distortion on them," Coxon says. "We take samples and play them through guitar effects: the Line 6 Pod, wah-wah pedals, tremolos, and all sorts of things. Obviously, the more rough things that you introduce to the chain, the more levels of distortion you can get.

"I like the idea of making soundscapes that can't exist in real life," Coxon says. "The last thing we want to do is emulate reality. We want to use reality to make something which is extraordinary."

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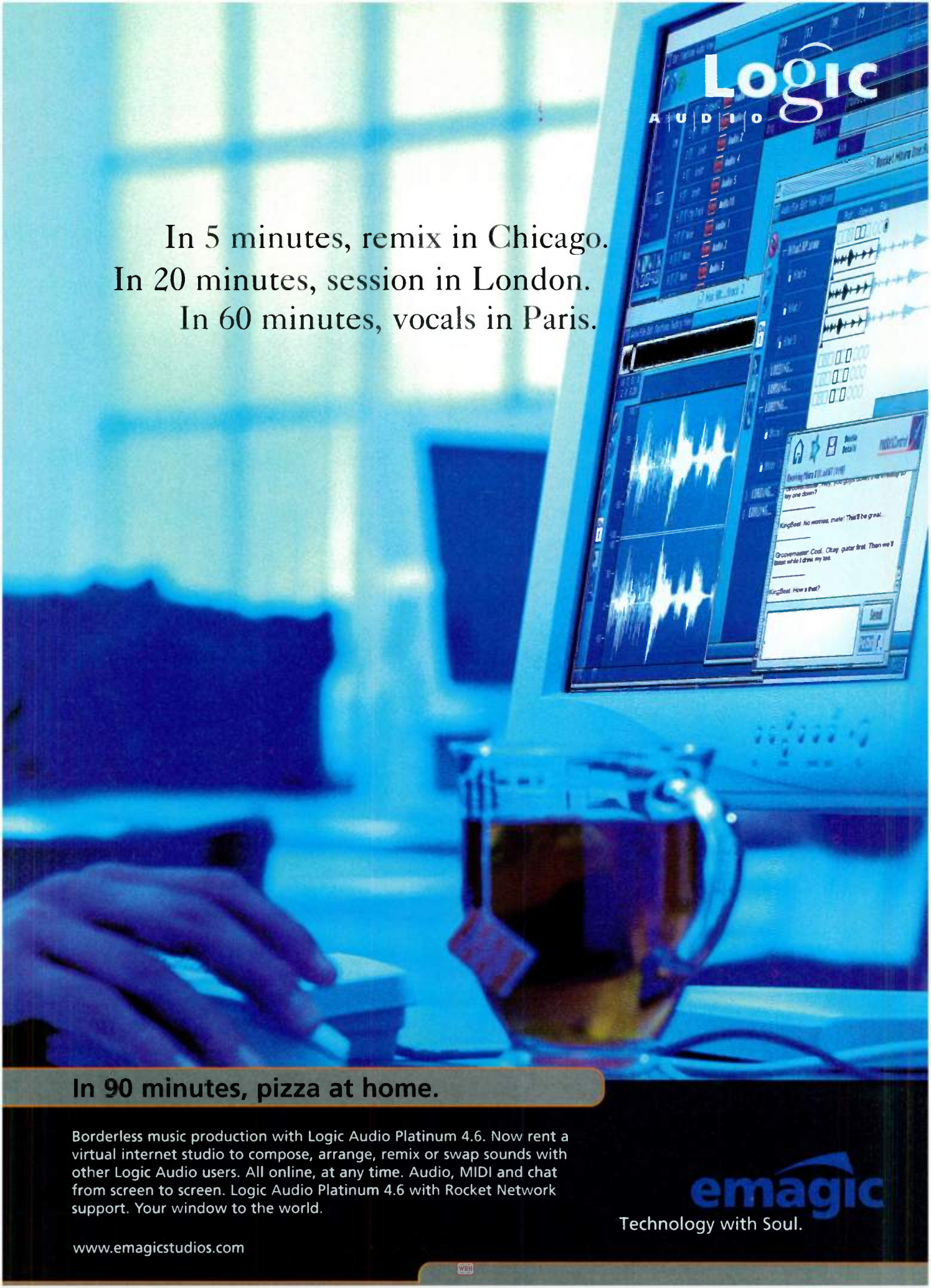
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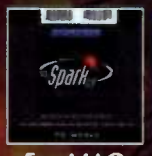

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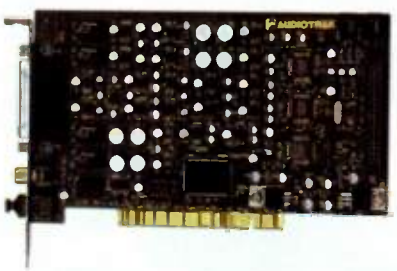

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I–IV–V–I), one section did go into a half-time backbeat, and I used it to populate track B. I also added a klezmer-like clarinet to track A and accordion (Weird Al's signature instrument) riffs to track B. For the vocals, I had the basic verse lyrics on one track and created a novelty conglomeration from sampled bits and pieces to place on the other track. The result was an awful lot of bizarrely mismatched material, but because comedic juxtaposition was the name of the game, this remix ended up

being quite amusing. Check it out for yourself at www .beatnik.com/emix/rabbi/standalone-launch.html. (As with the Queen Latifah remix, Mac users running *Internet Explorer* will not be able to access the site.)

METAMORPHOSIS

The most difficult part of putting together the eMix files was wrestling the linear parts into 16- and 32-bar loops that would work in harmony. I have always believed that it would be much easier to write music specifically designed to remix in interesting ways than it would be to "interactivize" linear songs. Drawing inspiration from a section of M. C. Escher's *Metamorphosis II*—which depicts bees that morph into fish that morph into birds—I wrote my own remixer, which you can find at www.twittering.com/metamorphosis (see Fig. 3).

The piece contains three different songs in three different styles. "Bees" is modal with a Latin beat, "Fish" boasts an up-tempo pop feel, and "Birds" is a bluesy/funky number in 6/8. Each song has similar track layouts (ostinato, melody, bass, chords, and percussion), so you can mix and match the various

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parts. For example, you could play the bass line from "Bees" with the "Fish" melody to the rhythm of "Birds." An author's mix provides a mechanism for cycling through 24 different track combinations that gradually morph the music from one song to the next. Users can also toggle tracks on and off to create their own mix versions.

JavaScript commands contained in the music-object.js file control interactivity. When the page finishes loading into the browser, the RMF file begins playing in a loop with all tracks muted. The various parts can then be turned on or off in response to mouse clicks—I set up that option using the setTracksMute() function. This simple but effective method of creating interactive music experiences is useful for a wide range of Web applications, including soundtracks that change when visitors go from page to page within a site, audio interfaces that respond to user input, and online gaming.

HARMONY AND RHYTHM

I designed my remixer to provide as many musical possibilities as it could without creating complete cacophony. The most important part of this process was choosing key areas and chord progressions that would contrast without clashing. Keeping everything in a single key with the same chords is the easiest way to do this, and it works well with certain kinds of grooves. However, I wanted the piece to surprise the listener with unexpected harmonic and rhythmic movement.

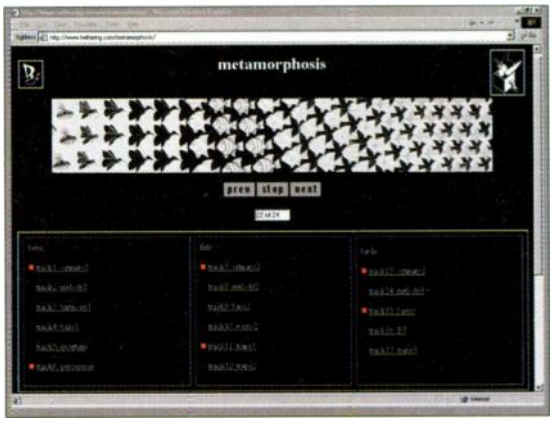

FIG. 3: M. C. Escher's *Metamorphosis II* inspired this interactive Web site, which lets you mix musical elements from three different pieces in three different styles.

I started working on "Bees" first, using a simple F maj/G maj/Am chord progression with a standard Latin-style bass line. Next, to create contrast with the first section's somewhat moody feel, I wrote the peppy, happy "Fish" tune in the key of C major with a II–V turnaround and a flowing flute solo. Then came the funky "Birds" section, which I put in the key of D minor, adding a bluesy Hammond B-3 riff and a fast, edgy synth-guitar solo. Thus, by putting all three songs in related "white note" keys, I minimized harmonic conflict, because a melody in C major or A minor usually functions over a Dm chord.

I also wanted three different rhythmic styles. The first section's Latin percussion ensemble plays a standard "2-3 clave" mambo beat. The rock backbeat of the second section can alternate between single and double time, easing the rhythmic transition from the mambo to the third section's 6/8 shuffle. Because a 150 bpm tempo continues throughout the piece, the bars of the 6/8 section are 1½ times longer than those of the 4/4 sections. That means the bar lines don't line up all the time (in fact, they line up only every other time), which creates some interesting temporal shifts in the melodic and chordal parts when users switch back and forth between the sections.

SETTING LIMITS

Being limited to related keys or simple loops does not have to be creatively stifling; in fact, it's quite the opposite when viewed as an aesthetic challenge. In his book *Poetics of Music*, Igor Stravinsky says the "sea of possibility" is so huge and daunting that it's unwritable. But if you narrow your focus to, say, a single pebble on the shore, *that* you can write. "My freedom will be so much the greater and more meaningful the more narrowly I limit my field of action and the more I surround myself with obstacles," writes Stravinsky.

Letting the user click tracks on and off raises the issue of how to limit the choices to prevent too dense a mix, because turning everything on at once results in a tumultuous racket. Though I defined a few limits in "Metamorphosis" (for example, you can have only one bass line at a time), I usually leave the options open so the listeners can produce a "serendipitous cacophony" if they wish. Choosing what and when to

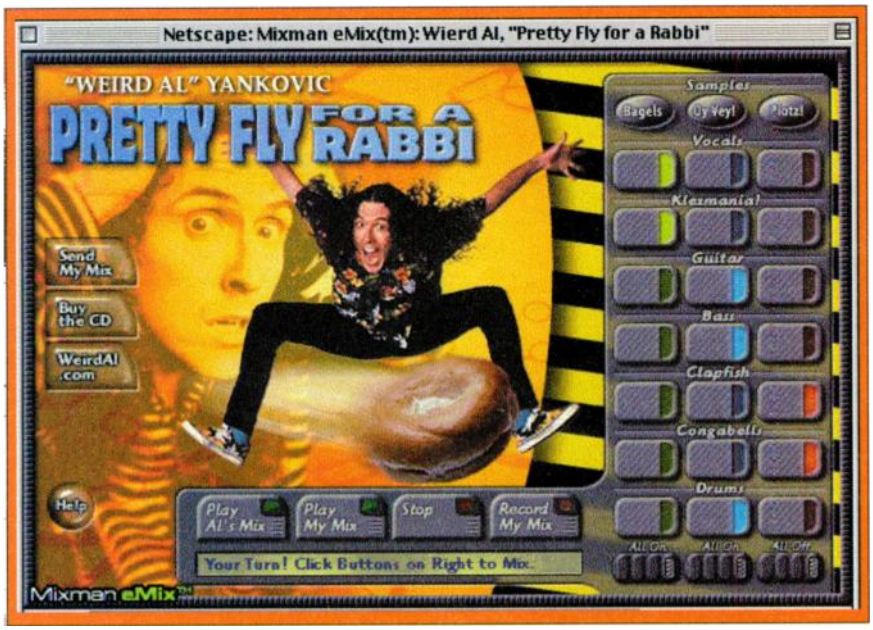

FIG. 2: You can juxtapose musical elements to create humorous rock 'n' roll remixes at this amusing Weird Al Yankovic site.

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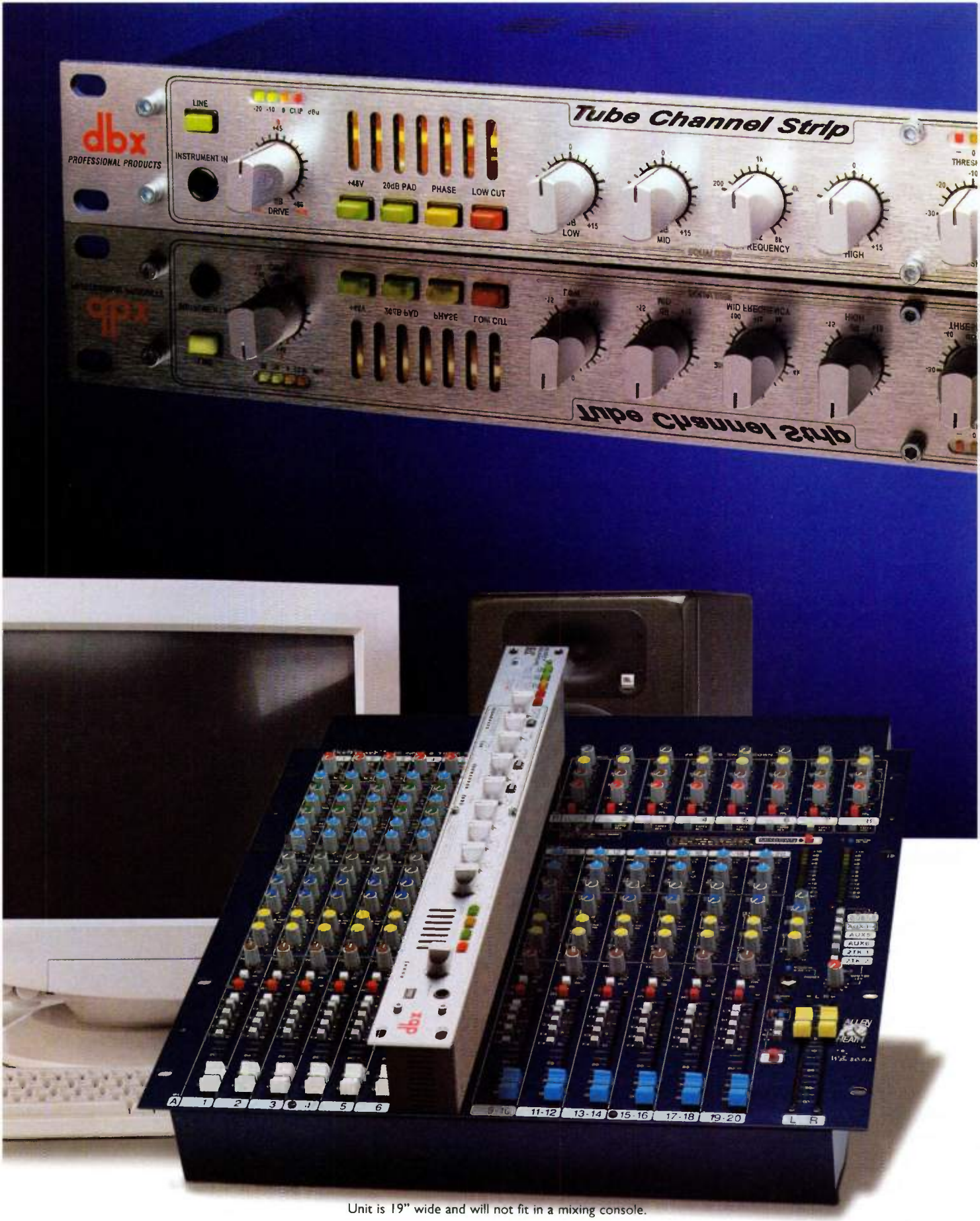

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play is one of the most important aspects of creating music.

Jeff Lipton of the Internet-audio company Sonicopia (see **Fig. 4**) takes a different approach when producing "sonified" Web sites, which are intended for a mostly nonmusician audience. The Sonicopia site (www.sonicopia.com) is a good example: a one-chord groove plays as background music on most of the pages, while various menu items and rollovers produce different musical notes. Users play along with the song by moving the mouse, and the notes are constrained to a pentatonic scale to prevent dissonances.

Lipton also extracts phrases from the background composition and applies them to different links. That way, mouse clicks can trigger flourishes in the song's key, and they can also trigger melodic motifs associated with the graphic elements. "It all works together and gives the user a sense of control over the composition, but within a narrowly defined set of parameters that you've set out," he explains.

MAPPING THE GAME

Musical scores for computer games present different kinds of challenges and limitations for composers, though many of the issues of how and when a musical transition takes place are similar to those surrounding Web-based applications. These days, many popular computer games are less like *Space Invaders* or *Tetris* and more like interactive movies. This style of "digital entertainment" frequently uses puzzles, characters, and shoot-'em-up scenes to move a story line forward.

In these situations, game music composers usually adopt a cinematic approach, producing scores intended to set up and sustain a mood. However, they must throw away any notion of locking to picture with SMPTE time code or employing film-style timing. During game play, the player can stay on a level for an indeterminate period of time and then branch to one of several environments. How then can a composer arrange for the music to flow appropriately from one section to the next?

Many game composers think of the score as a map or network, as opposed to the more traditional linear film-score form. Each level or environment is blocked out, and connections between the blocks delineate all the possible ways the player can go. The result—which can end up looking like a New York City transit system map—describes

THE PLAYERS

Clint Bajakian composed scores for *Outlaws, Indiana Jones and the Infernal Machine,* and *Star Wars: Dark Forces,* among many other games. He recently started C. B. Studios, an audio-production facility.

Michael Land and **Peter McConnell** were composers for LucasArts for ten years, where they scored *The Dig, Grim Fandango,* the *Monkey Island* series, and numerous *Star Wars* titles. They recently founded CoolerTool.com and are working on a better way to make digital media function interactively.

Jeff Lipton is a composer and engineer who has produced Web-based interactive audio for MGM, McDonald's, KFC (PepsiCo), and PBS. He's vice president of sonification at Sonicopia, an Internet-audio startup located at San Francisco's DubeyTunes Studios.

George Sanger, aka the Fat Man, is a legend in the game-audio industry. He has produced soundtracks for *Wing Commander, The 7th Guest,* and *Putt Putt Saves the Zoo* and hosts Project Bar-B-Q, a Texas-style audio technology think tank.

Tommy Tallarico, of Tommy Tallarico Studios, is one of the most prolific composers in the game industry, with more than 120 titles to his name. He has released five CDs of his game music and won numerous industry awards. He hosts the weekly video-game television show *The Electric Playground.*

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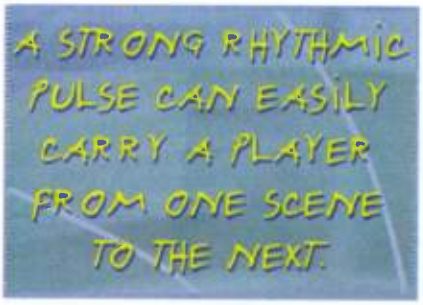
all the music that needs to be composed and helps the composer decide how to deal with the transitions between the pieces.

THE UNPREDICTABLE

Composer Clint Bajakian (see Fig. 5) calls this process "preparing for the unpredictable." To pull off this seemingly impossible task, composers create an ambient background score followed by a big flourish when the transition occurs. When properly executed, this tactic sends emotional information to the player and also smooths over any harmonic or rhyth-
, creating the illu-
it responsive piece



Tommy Tallarico, one of the industry's most prolific composers, describes the process. "Let's say you've got a *Tomb Raider*–type game where you're trapped in a cave, looking for an exit," Tallarico says. "I might have a 2-minute looping ambience in the background until the character pulls a lever to open a stone door. Then I'll quickly fade out the ambience and play a 4-second music sting, like a harp glissando or string crescendo, then quickly fade in a 30-second loop of suspense music while the character walks down the corridor behind the door. When the hallway opens into a big room—where 30 guys are waiting to attack—I'll hit with a big orchestral cue."

Tallarico isn't all that concerned with making the transitional flourishes happen on the beat or even in the same key. He avoids spending a lot of

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time and energy trying to get the pieces to fit together perfectly. Because the transitions are in response to the game play and are frequently intended to alert or surprise the user, a degree of abruptness can be a good thing. Also, the human ear wants to hear a musical flow and therefore tries to make the connection. "I'm a huge believer in just writing a great tune," Tallarico says. "It may not even match exactly what's going on at any given time in the game, but that's okay. If the player is really excited about what he's listening to, he's going to want to reach the next level just to hear the next tune."

MULTIPLE VIEWS

Bajakian takes an almost three-dimensional approach to interactive game soundtracks. He believes that aesthetically they are more akin to sculpture and architecture than to symphonies or film. Unlike an audience member who passively watches a movie from beginning to end, a player views a game from multiple angles while wandering around a virtual environment. The music must enhance that immersive experience.

Using multiple versions of the same tune is one technique for producing that feeling of immersion. In Peter McConnell's film noir score for the LucasArts game *Grim Fandango,* a song featuring a Benny Goodman–style clarinet plays in a secret casino hidden behind a café (see **Fig. 6**). As the Manny Calavera character moves through the game environment, the player hears the song in a variety of ways, not only in the casino, but also filtering through the café's walls, coming up from the floor of Manny's office, and broadcasting over an intercom system. This effective use of sound design makes the music seem to fit into a real-world setting.

Composer Michael Land also used multiple song versions in his score for *Monkey Island II: LeChuck's Revenge.* One of the environments is a shop-lined street, and a 32-bar song loop is heard as the player goes from place to place. However, each shop has its own version of the song, with different instrumentation and moods appropriate for the characters and atmosphere. The transitions from version to version take place on the bar lines. The subtle and effective technique makes each change practically unnoticeable, weaving a coherent musical structure while introducing sonic variety.

FIG. 5: Composer Clint Bajakian recently started an audio-production facility for scoring games.

VARIETY OF STYLES

The biggest challenge a game composer faces is the loop. "Repetition is the curse of interactive audio, and music is the first thing you will notice repeating," says game-music composer George Sanger. Just do the math: if a puzzle or level contains a 2-minute music loop and finding the solution or killing all the bad guys takes 20 minutes, the player will have to listen to the same tune ten times before moving on. (No wonder so many players reach for the Turn Music Off switch.) The average game can take as long as 40 hours to finish, which translates into an enormous amount of music, much more than a film needs.

Fortunately, a long-standing model for dealing with large-scale dramatic musical scores exists: Wagnerian opera. The Wagnerian concept of the *leitmotiv* (a musical phrase or chord progression associated with a character, place, or object) can help organize the huge amount of music required for a game. Orchestral music often works well for

FIG. 4: Jeff Lipton is a composer, an engineer, and the vice president of sonification at Sonicopia.

this application, thanks to its broad and flexible palette of tone colors. The percussive qualities of many of the instruments can also produce a wide range of textures and effects. Bajakian believes that the symphony orchestra lends a greater credibility to the game's subject matter. McConnell says that you can "practically cut from anything to anything else" in an orchestral score, an important advantage when he's editing a John Williams score for a LucasArts *Star Wars* game.

The game industry's other popular musical genre is techno/industrial electronic music, such as the score to the hit movie *The Matrix,* with its hard-driving drumbeat, dark textures, and heavy use of guitars. Although this overused style is on the verge of becoming passé, its powerful beat neatly solves some transitional problems. A strong rhythmic pulse can easily carry a player from one scene to the next, even if there's a momentary timing glitch or change in tempo. However, variety becomes even more important when the beat is so constant.

LOOP THE LOOP

It's a real challenge to create a looping piece that doesn't sound like it's looping. One technique in Land's score for *The Dig* employs key changes and chord progressions in measures that are not multiples of 4. "When you combine odd phrase lengths with modulation, you can really hide a loop," Land says. "There's an art to writing ambient music where you create the effect of sparseness and use random bubblings of ideas that don't really have a coherent thrust to them to create a mood." McConnell expresses a similar sentiment, which echoes the old movie cliché that good scores aren't heard. "With puzzle games, it's good to learn how to graze," McConnell says, "so that after the stinger, the music fades into the background and becomes a sort of noncommittal audio wallpaper."

Tallarico has developed a technique for more energetic soundtracks. "I don't use a song structure," he says. "If you have only two minutes, there's no need to go to a chorus. I'll never play the same part twice if I'm writing a song that's going to loop for a while. The entire two minutes is your verse, and I try to fill it with unique parts." Tallarico's approach brings to mind composer Aaron Copland's experiences as a student of Nadia Boulanger. Copland writes, "She had but one all-embracing principle: the desirability of creating what she called *la grande ligne*—the long line in music. Much was included in that phrase, the sense of forward motion, of flow and continuity in the musical discourse, a feeling for inevitability."

Sanger also has a "more is better" attitude. "I get much more mileage out of just composing more music," he says. "The changes between two different musical phrases are much more satisfactory to me than changing the mix or muting tracks. In games, where so little thematic material is budgeted, it's best not to repeat at all."

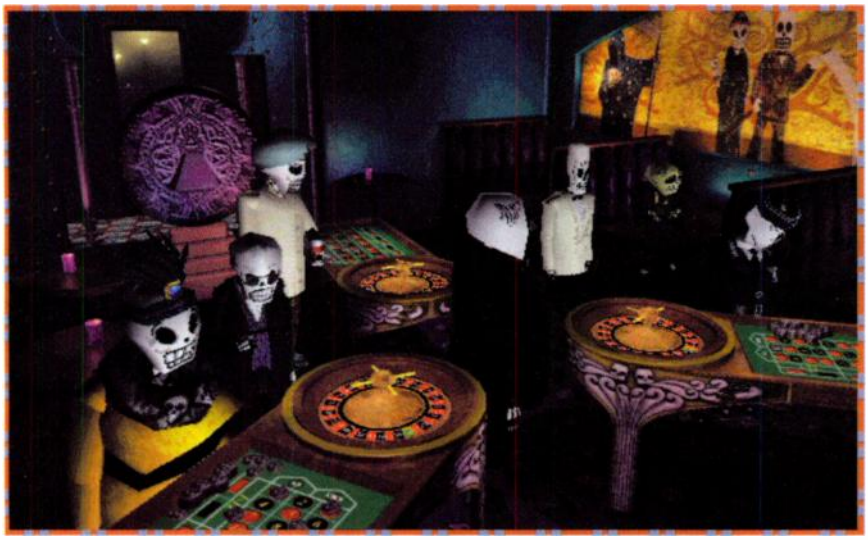

FIG. 6: In Peter McConnell's score for LucasArts' *Grim Fandango,* different versions of the parts play at different locations in the game.

THE INTERACTIVE FUTURE

Writing music for interactive media is a fledgling art form. The production tools and delivery platforms are so new compared with those of traditional musical styles that it's difficult to predict what forms interactive music might take down the road. Nonetheless, a few of the current trends point the way toward future developments.

On the Web, it's all about bandwidth. Ubiquitous broadband access will eventually eliminate the need for highly compressed, audio-compromised files and allow for a much wider instrumental palette. Ultimately, a silent Web site will resemble a silent movie. There will be many more opportunities to produce a broader range of music, sound effects, and voice-overs in the interactive medium. However, until standards evolve for delivery format and SMPTE-like synchronization, the Web will continue to be a Wild West–type frontier, with competing audio technologies shooting it out for market dominance.

In the game industry, scores produced by wavetable synthesis and MIDI are giving way to digital audio soundtracks. (This may happen on the Web as well, but not anytime soon.) As the speed and data-storage capabilities of game platforms increase, multiple-synched streams of CD-quality stereo audio will give composers and sound designers much greater fidelity and flexibility. But the most important development could be a system of standards that smooths the integration of music and sound effects into an interactive context—without involving the programmers.

New forms of music will certainly evolve to take advantage of new media capabilities. It will be interesting to hear what happens next.

Peter Drescher *is a composer, a sound designer, and the owner of Twittering Machine, a project studio in San Francisco. He produces music, sound effects, and voice-overs for multimedia and the Internet.*

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The **Boxer Voice Changer** ($20) proved to be the pick of the litter; we paired it with every noisemaker we bought, transforming even the most mundane groove into a buzzing, ticking, rhythmic paradise. The Voice Changer's three settings—Normal (filter), Robot (vocoder), and Kid (pitch shifter)—kept us entertained for hours. Whether we processed rhythms, notes, or feedback, the results were always musically satisfying.

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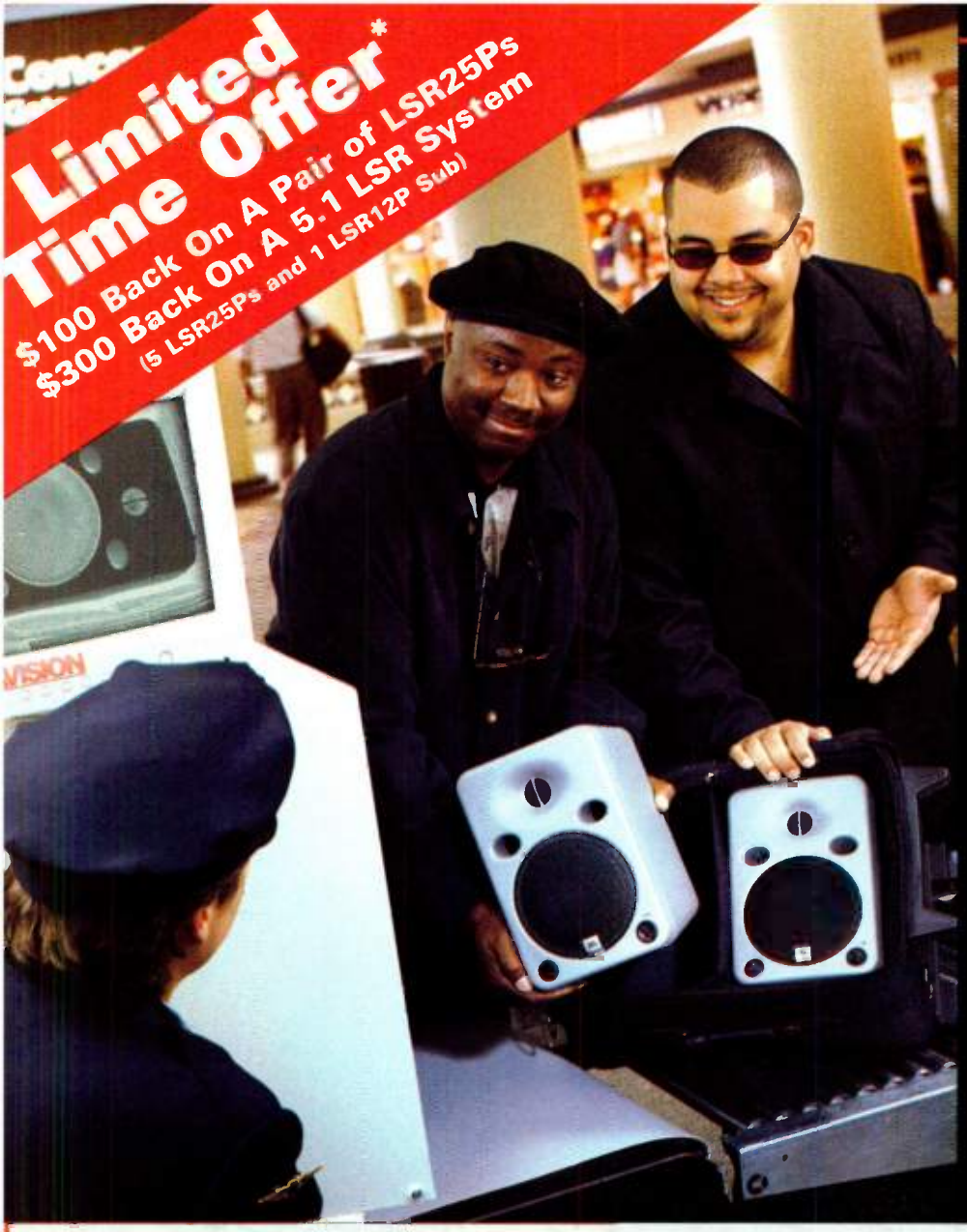
What do you get when you combine a drawing tablet and a sequencer? **Fisher-Price's Jammin' Draw** ($40) redefines the concept of an algorithmic compositional tool. Begin by selecting a solo instrument and a musical accompaniment, then put a piece of paper in the easel—and start to draw! Jammin' Draw generates melodies based on the speed and position of your pen. Once you record your masterpiece, it remains in memory when the unit is powered down.



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Sammy Peralta loves music. That pure and simple fact comes through strikingly clear as he sits at his keyboard tinkering with half-written tunes. Sammy's background includes work with talents including Tito Puente and Willie Bermudez. "I have to be careful because I can get so lost in the music, I sometimes forget I have a family that would like a little of my attention too".

One last point: Sammy Peralta's new CD ***On the One*** featuring Lenny White was mixed entirely with LSR monitors.

LSR.

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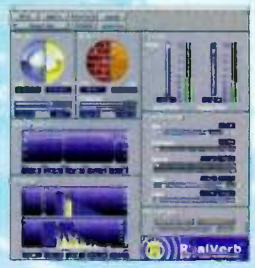

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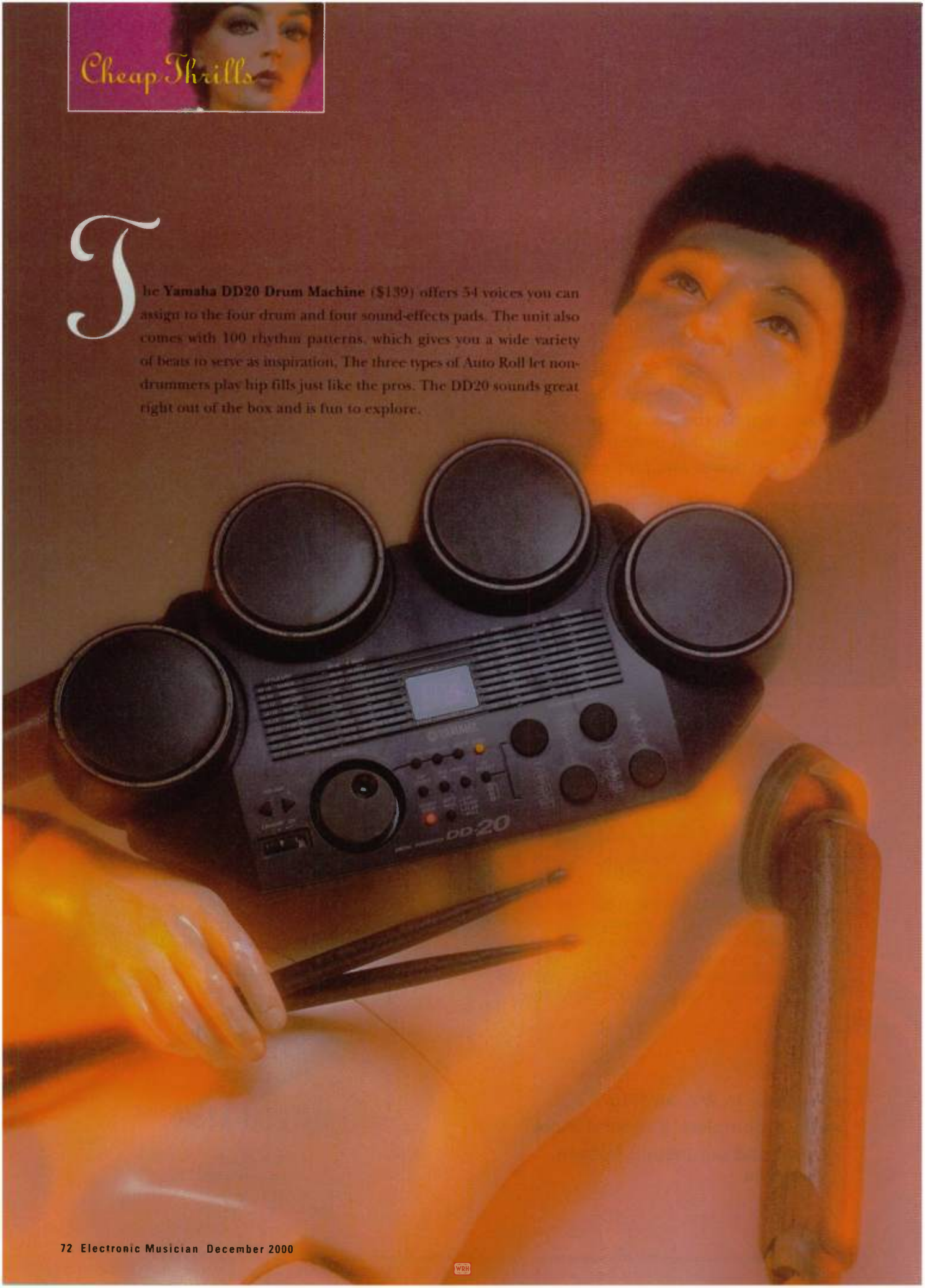
Cheap Thrills
The Yamaha DD20 Drum Machine ($139) offers 54 voices you can assign to the four drum and four sound-effects pads. The unit also comes with 100 rhythm patterns, which gives you a wide variety of beats to serve as inspiration. The three types of Auto Roll let non-drummers play hip fills just like the pros. The DD20 sounds great right out of the box and is fun to explore.
DD-20


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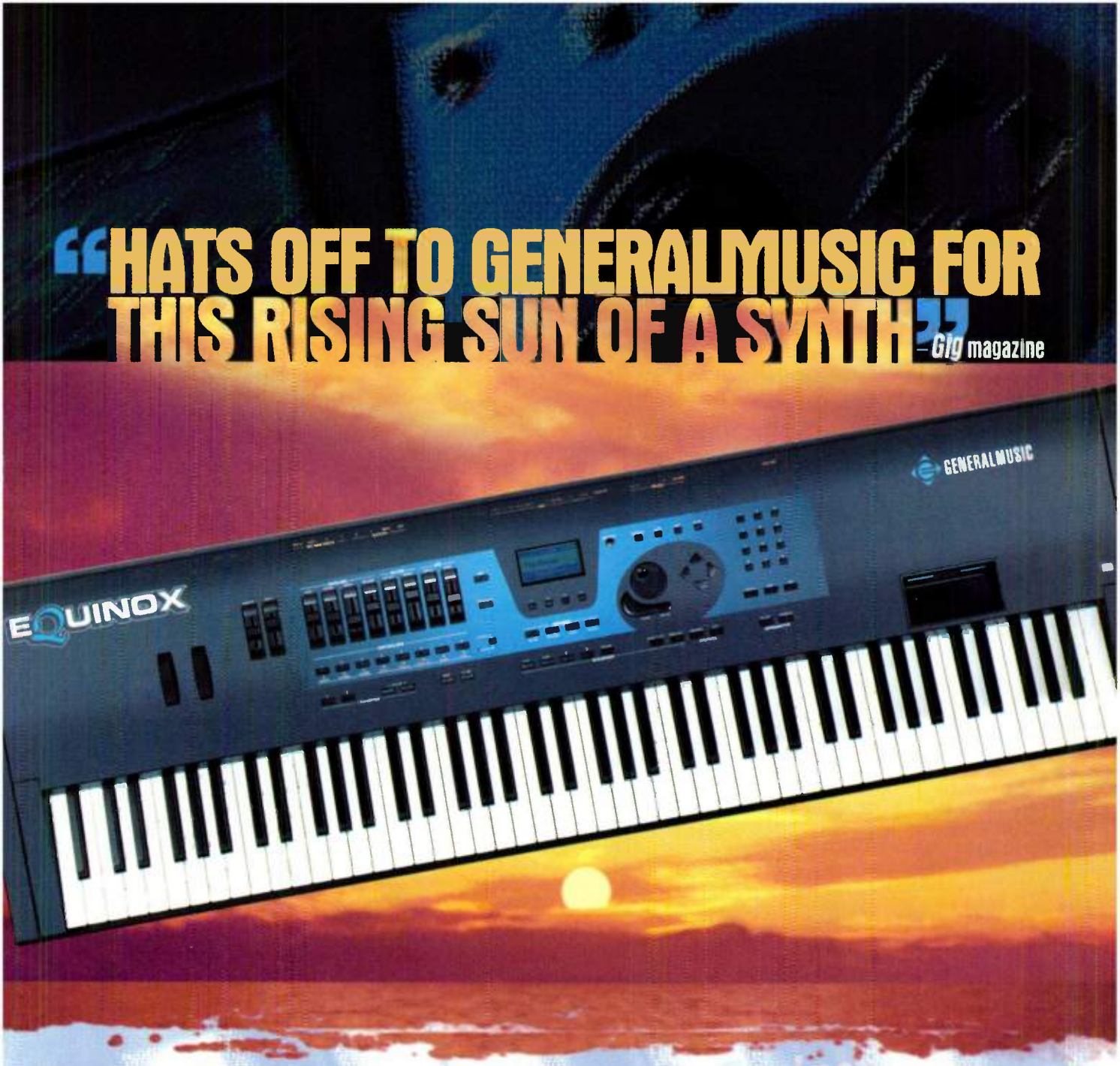

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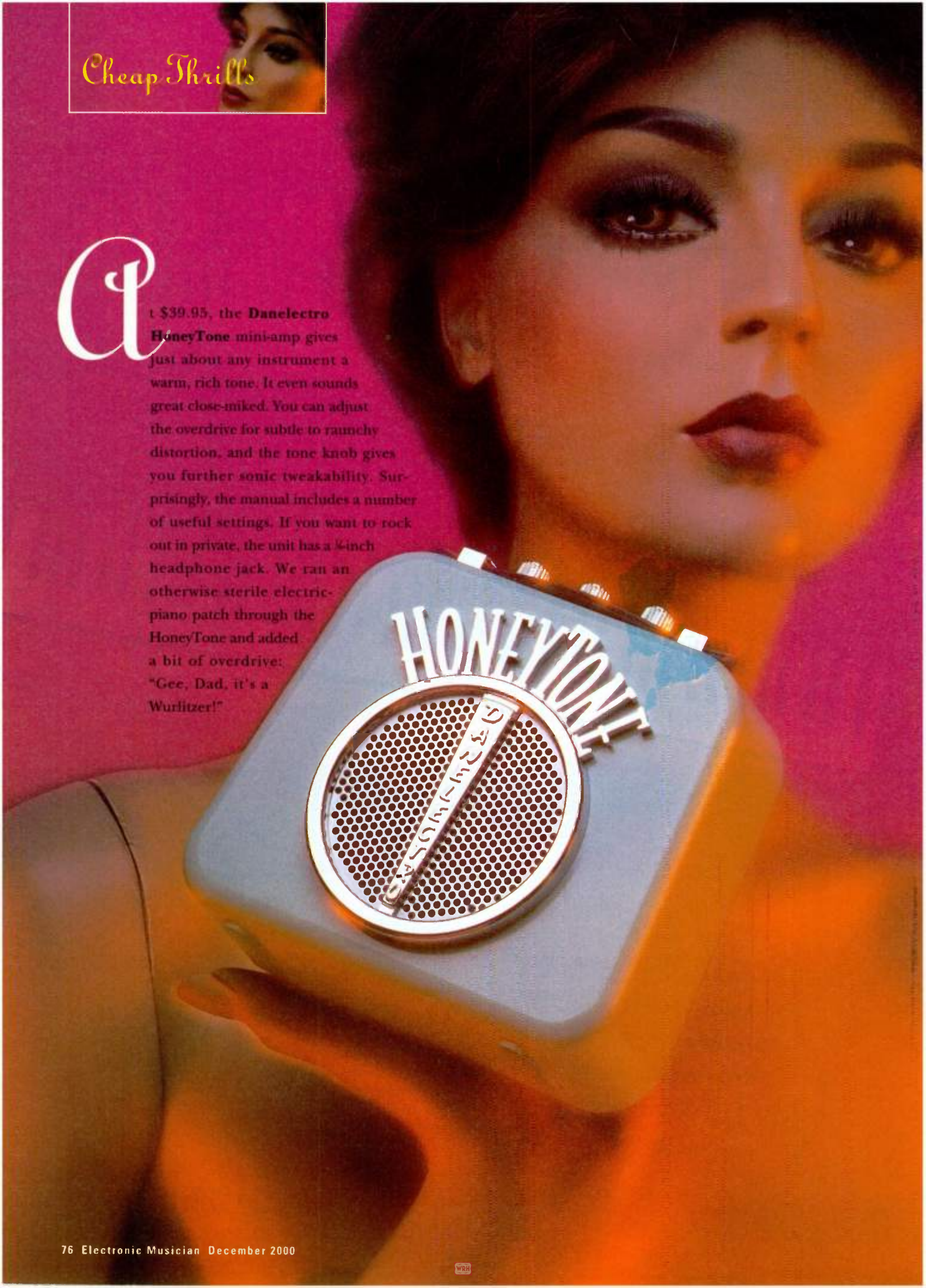

At $39.95, the **Danelectro HoneyTone** mini-amp gives just about any instrument a warm, rich tone. It even sounds great close-miked. You can adjust the overdrive for subtle to raunchy distortion, and the tone knob gives you further sonic tweakability. Surprisingly, the manual includes a number of useful settings. If you want to rock out in private, the unit has a ¼-inch headphone jack. We ran an otherwise sterile electric-piano patch through the HoneyTone and added a bit of overdrive: "Gee, Dad, it's a Wurlitzer!"

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JUST LISTEN.

If you are looking for an extra sound source and a basic MIDI controller on the cheap, look no further. **Casio's CTK-451** ($159.99) is five-part multitimbral, displays music notation on its screen, and responds to Velocity messages over MIDI. It has built-in speakers and runs on AC or batteries, so you can take it anywhere. All you need is a couple of MIDI cables and a laptop computer for composing when inspiration strikes.

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* Translation: Goodbye

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The **Alesis airFX** ($249) is what you get when you cross a theremin with a multi-effects unit. As you move your hand over the unit's infrared beam, the airFX senses its 3-D position, allowing you to simultaneously control in real time up to five parameters for any of the 50 preset effects. The presets include a variety of filtering, panning, flanging, and pitch-shifting effects. The airFX uses RCA connectors, so it can be used with stereo systems, turntables, CD players, and just about any other audio device.

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The **Crown Micro Royal Piano** ($65) is a duophonic keyboard instrument that lets you record your own melodies of up to 32 notes and features 7 accompaniments and 14 sounds. However, the most attractive aspect of this miniature grand piano is the microphone and built-in speaker. Aiming the mic toward the speaker under the piano lid gives you feedback that you can tune by proximity. When we amplified this instrument with the Boxer Voice Changer, the results were spectacular!

VLZ® PRO Series with XDR™ mic preamplifiers. Precise creative tools for serious artists.

If you're serious about your creative product, your equipment list should start with a really good mixer like our VLZ® PRO Series. The industry standard for compact mic/line mixers, they're used day-in and day-out by more professionals to create more albums, demos, movie and broadcast sound tracks, commercials and web casts than any other brand.

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Cheap Thrills

Once thought of as a toy, the **Stylophone** ($157)—and its uniquely electronic sound—has been used on records by David Bowie, Kraftwerk, Orbital, Rick Wakeman, and the instrument's staunchest proponent, Australia's Rolf Harris. The Stylophone's miniature 20-note keyboard is played with a stylus, and the instrument's organlike tone is vintage all the way. Although the instrument hasn't been made in more than 20 years, the folks at Stylophones.com have mint-condition, boxed units available through their Web site. It's the perfect gift for fans of this fascinating '70s sound. ●

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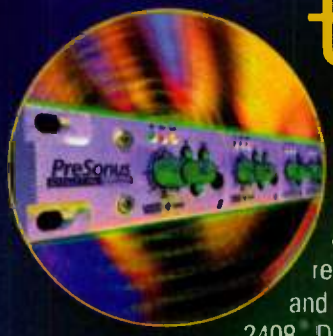

Combine eight channels of award winning, pristine mic preamplification, limiting and EQ Enhancement with 24bit digital and analog output and the Digimax seamlessly fits into any digital recording situation. The Digimax is the perfect front-end for DAW's and adding mic-pre's to digital mixers and sound cards. What do MOTU™ 2408, Digi001, Mackie™ HDR, Tascam™ MX2424, Ensoniq™ Paris, Yamaha™ AW4416, have in common? They are all compatible with the Digimax!

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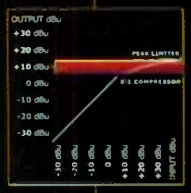

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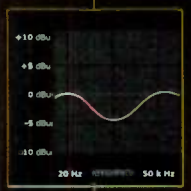

Add Some "Crystal" To Match Your Mic or Instrument!

Each channel of the Digimax features EQ Enhancement which provides a pre-set EQ curve. EQ Enhancement helps to tame excessive midrange and accentuate presence for any audio source that may possess a characteristic midrange hint. This unique feature adds sheen and punch to any signal.

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Two audio paths—digital and analog—diverge in a personal studio.

The Route Less Traveled

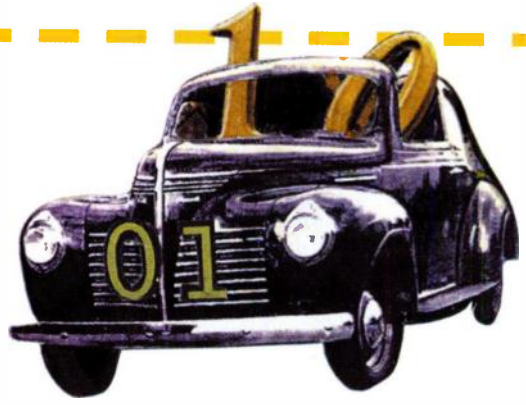
By Larry the O

There was a time when a sound studio, personal or commercial, contained only two types of connections: AC power and analog audio. Although a look behind the equipment might have shown a spaghetti of cables, everything was plugged into either a wall outlet or a patch bay. Life was simple, the animals all shared and got along with each other, and Nature reigned supreme.

No longer. Whatever the social state of the animal kingdom, life in the studio is much more involved now, as exemplified by the multiplicity of connections: MIDI, digital audio, computer interfaces such as serial and SCSI, house sync/word clock, time code, and, yes, AC power and analog audio. With each type, the demand for interconnection emerged, and the need for ways to switch, route, and combine these signals and datastreams became acute.

The biggest wrinkle, however, has been the phenomenon of the personal studio, which brought this mess into the project spaces of musicians who previously did not need much more than a way to get multitrack recorder signals into and out of a mixer and route signals to and from a reverb or effects processor. In the course of ten years or so, digital audio tape recorders, DAWs, mixers, and effects processors have proliferated and gotten cheaper.

MIDI patch bays, switchers, and processors appeared long ago and have become commonplace; many personal studios have two or more. But digital audio routing has been a tougher nut to crack. Personal studio budgets are usually much lower than,



say, a commercial audio post-production facility, yet many personal studio owners need to route 24 channels or more of digital audio between various devices. The high-end systems used by large audio-post and broadcast houses are out of range for the personal studio budget. Who will save us from being bitten by all those bytes?

BITS AND PIECES

The answer turns out to be less straightforward than in the land of MIDI or analog audio, where manufacturers have responded to the personal studio surge with low-cost ¼-inch patch bays. This intrepid reporter came face-to-face with the problem after upgrading during the last several years to a studio built around an Alesis ADAT XT20, a Panasonic WR-DA7 digital mixer, and a Mark of the Unicorn 2408 hard-disk I/O system. Although my Toys in the Attic operation has long had DAT decks and a few effects processors with digital I/O, the situation changed with the upgrade, a fact brought into sharp relief the first time I needed to fly audio from the ADAT into the 2408 and bring it back to the DA7 for mixdown.

The Route Less Traveled

As I repatched the delicate optical cables used for the ADAT Lightpipe and crawled behind equipment racks to reroute S/PDIF signals going to and from my Lexicon reverbs, I realized I had added a new and large distraction to my creative work. Thus my investigation into affordable solutions for digital audio patching and routing began. (I'm only going to discuss patching and routing here; the subject of format conversion is for another article.)

A VIRTUAL WHO'S WHO

Four flavors of digital audio are commonly found in the personal studio: the two 2-channel formats (AES/EBU and S/PDIF) and the competing multichannel formats from Alesis (ADAT Optical, aka Lightpipe) and Tascam (TDIF). To complicate things a little more, some personal studio equipment uses the coaxial form of S/PDIF, while others use the optical format employed by Lightpipe.

Handling the 2-channel formats turns out to be much easier than dealing with multichannel. For a start, AES/EBU and S/PDIF are similar; S/PDIF is a format adapted by Sony and Philips from the then-incomplete AES standard. Although there are differences in the data formats, most notably in how blocks of user data are structured, the two are close enough that most equipment purchased now will accept either format. (Although some frustrating exceptions crop up now and then.)

There are, however, significant electrical differences between the two formats. The biggest difference between the coaxial forms is that AES/EBU is a balanced signal and operates at a higher level than S/PDIF:10V for AES/EBU versus 0.5V for unbalanced electrical S/PDIF. Cable length can reach 100 meters for AES/EBU but only 10 meters for S/PDIF and 5 meters for optical. Several of the routing solutions deal with transforming the electrical characteristics between the two, but no routers convert the data format. You can always add a separate format converter.

Several routers are also capable of the electrical conversion between coaxial and optical S/PDIF. In most cases, S/PDIF coax appears on RCA connectors, but longer cable runs are sometimes achieved by using 70Ω video cable and BNC connectors (along with a transformer for the signal), so BNCs sometimes show up as S/PDIF coax ports.

Similarly, AES/EBU inputs and outputs most often appear on XLR connectors, but when there are four or more AES connections, DB25 connectors carrying four pairs of inputs and outputs are sometimes used to save panel space.

To complicate matters, every once in awhile, a company goes for a nonspec solution. For instance, Akai samplers use balanced ¼-inch TRS connectors to carry AES/EBU or S/PDIF signals (switchable), thus saving panel space and money but violating both specifications. Rarely, you find switchable S/PDIF or AES/EBU on an unbalanced RCA connector, which is proper for S/PDIF but out of whack for AES/EBU.

Multichannel routing is another kettle of fish. The starkest news first: if you're looking for a TDIF router, stop now; I found one.

The outlook on ADAT Lightpipe routing is brighter. Lightpipe and optical S/PDIF use the same interface. Because the interface is purely electrical, with no inherent data format, most devices that can route optical S/PDIF can also route Lightpipe. (Note that the signal baud rates are different. Lightpipe works at a higher frequency, and optical transceivers can have different frequency responses.)

Digital Labs' Fiber-4 is a 4 × 4 optical router that is controlled with front-panel rotary encoder switches.

Keep in mind that S/PDIF is a 2-channel interface and Lightpipe is an 8-channel interface with a different data format, and the routers examined here do not perform any data format conversion. This means the same router can connect pieces of Lightpipe gear to each other or route one device's S/PDIF output to another's S/PDIF input, but it can't deliver data from a Lightpipe port to an S/PDIF port or vice versa. If you use an optical router with both kinds of interfaces, keep your connections straight.

FROM HERE TO ETERNITY

Most options for directing digital audio route the signals electronically, so once connected to the equipment, the user never needs to touch a cable. It is possible, though, to use manual patch bays for some applications. The advantages of manual patch bays are that a large number of connections can appear on a single bay, and you can freely route signals among the connections.

That capability has its drawbacks. First, the manual digital audio patch bays I found are only for use with AES/EBU signals. (I suspect you could use a manual DB25 patch bay for TDIF patching.) Second, the cost is high compared with most routers I mentioned, especially when you factor in patch cord costs, which must be made from high-quality, 110Ω cable. Third, more physical connections mean a higher possibility of problems from dirty connectors, which digital audio is more sensitive to than analog audio. Manual patch bays are not usually an optimal choice for personal studios, but they are still a noteworthy option for those with a large number of AES/EBU connections.

Routers use an electrical, rather than a mechanical, means of routing signals, and they offer programmability. In my studio, I have presets for dumping audio from ADAT to the 2408, laying it

If you need to route a lot of digital audio streams, check out Audio-Service's D.A.I.S. The system is based on a card cage that accepts 14 interface cards covering different formats, with internal busing and front-end software for Windows.

For manufacturer information, please see Contact Sheet, p. 203.

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The Route Less Traveled

Friend-Chip's smallest router, the Digi-max 12/8, offers four simultaneously available S/PDIF coax and optical output channels, two coax-only outputs, and two optical-only outputs.

back in the other direction, bringing either or both into the DA7, or sending analog signals converted by the DA7 (which has excellent A/D converters) to the ADAT and/or 2408. Other presets move audio from the DA7's digital effects sends or the AES I/O option card to the outboard effects processors and DAT machines.

Switchers also can route a single input to multiple outputs, though they do not mix multiple outputs into a single input. Do not mult a digital audio stream with a manual patch bay.

JITTER BUGS

There are some things to be aware of with routers. It is possible for jitter, that old digital demon, to rear its ugly head. According to Z-Systems' Glenn Zelnicker, "For all intents and purposes, jitter is a playback phenomenon only. That is, post-A/D jitter (assuming that it's really post A/D) won't make its way onto a recording. As long as the bits make it from point A to point B, you're in business, and it takes pretty phenomenal amounts of jitter to make complete failure of an AES/EBU link happen. If the bits get to their destination, the jitter will be gone on playback.

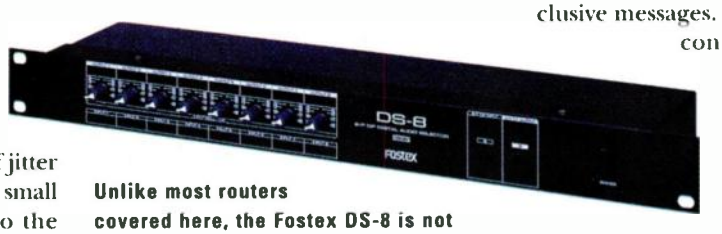
"There are a few critical exceptions, though," Zelnicker says. "For example, a jittery router can make for complicated and 'cloudy' monitoring if your post-router D/A converter doesn't have good jitter rejection. I wouldn't want to have to make intelligent decisions about dynamics, EQ, and imaging through a jittery monitoring chain. Jitter issues become more critical at larger word widths [for example, 20- and 24-bit words]. That is, to maintain the advantages that increased dynamic range brings, it's necessary to hold the jitter to an even lower level.

"That said, there are two levels of jitter about which to be concerned: first, small amounts of jitter introduced into the AES/EBU or S/PDIF stream, causing variations in the recovered clock; and second, huge amounts of jitter, making recovery of the data bits impossible. Numbers 1 and 2 can be caused by a multitude of things, but just remember that number 1 makes monitoring difficult and number 2 makes everything difficult.

"Accumulated jitter could be indicative of a problem with the design of the router in question," Zelnicker says. "The design flaw could have something to do with common-mode noise propagation, in which case, depending on the architectures of the boxes connected to the router, noise on one unit could make its way to the other units. If one of the units happens to be an A/D converter, it would be quite deleterious to the conversion quality if the common-mode noise from a bad processor made its way back through the router, down through the digital output of the A/D, and on to the A/D's power rail—which the A/D chip's clock reference happens to be using as a voltage source. A good A/D shouldn't behave this way, but I've seen plenty that do."

Routers aimed at personal studios are generally asynchronous; that is, none of the streams passing through them need to sample at the same rate or synchronize to any other. However, properly clocking all the devices from a single master source eliminates the possibility of glitches when switching.

Aside from the jitter issue, format determines the ability of routers to carry data encoded at high sampling rates and word widths (such as 24-bit, 96 kHz audio). The ADAT Lightpipe format, for example, doesn't support sampling rates above 48 kHz.



Unlike most routers covered here, the Fostex DS-8 is not programmable and uses rotary switches to set routings. This simple router has both optical and coax S/PDIF I/O and converts between the two types.

ROUTES TO TAKE

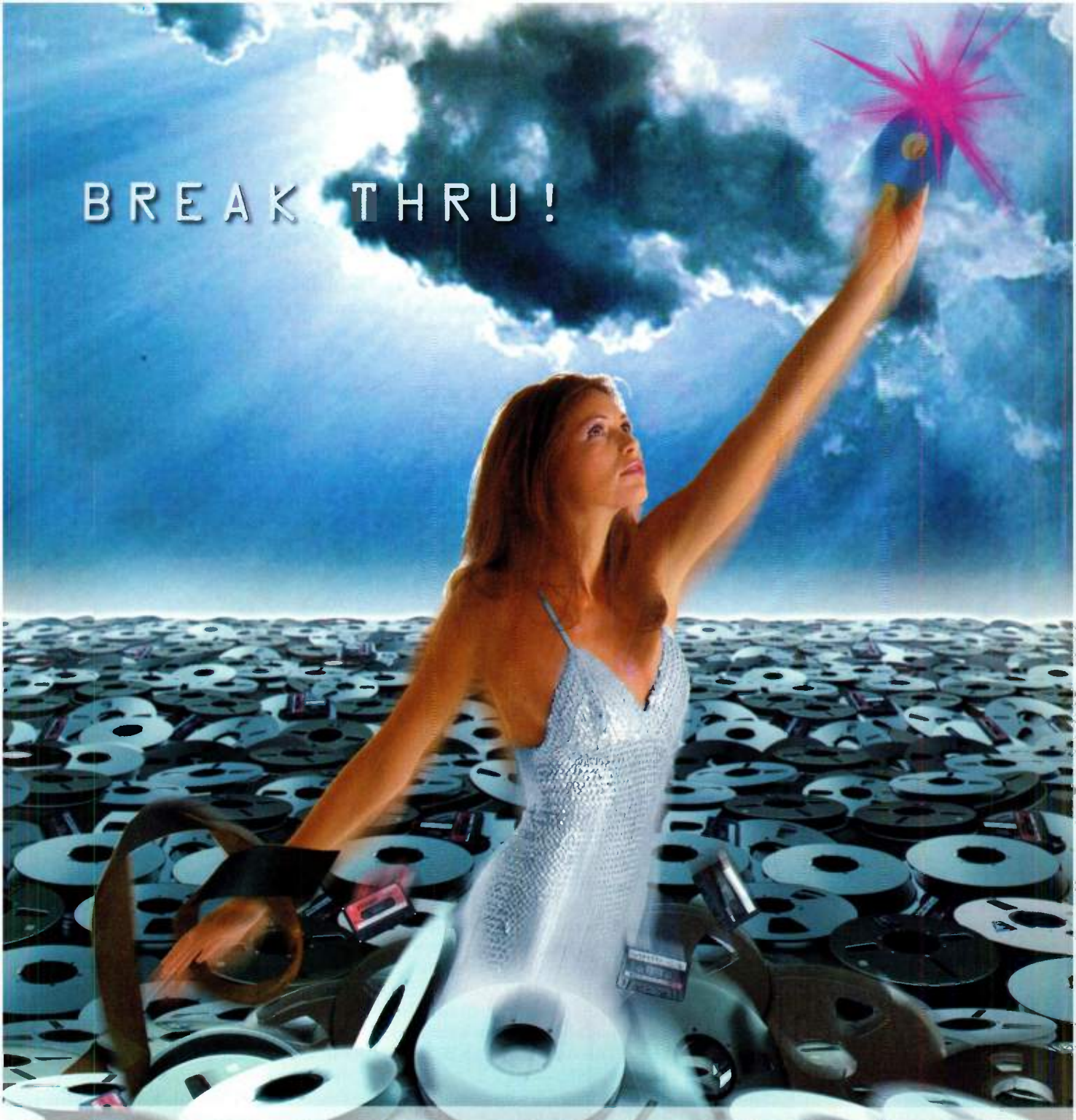
With that in mind, here's a look at options for routing digital audio in the personal studio:

Digital Labs. Digital Labs manufactures the Fiber-4 ($295), a 4 × 4 optical router. Routing is performed with rotary encoder switches on the Fiber-4's front panel. Digital Labs states that this technology allows routing without adding jitter.

Fostex. The Fostex DS-8 ($389) is a simple router with six optical and two coaxial inputs and outputs. You use the front-panel rotary switches to route data, and the unit converts between coaxial and optical S/PDIF, but the DS-8 is the only nonprogrammable switcher of the bunch. Optical I/O port 8 on the front panel makes it easy to connect carry-in ADATs or S/PDIF gear.

Friend-Chip. Friend-Chip, distributed in the United States by Ucik, offers three routers. The smallest is the Digi-max (DMX) 12/8 ($499), which includes six S/PDIF coax, and six optical inputs and eight output channels. Four of the output channels feature simultaneously available S/PDIF coax and optical; two are coax only, and two are optical only. For $199, the unit can upgrade to a 12 × 12 routing matrix. Ten presets can be stored and recalled from the front panel or via MIDI. You can dump and load the unit's settings via System Exclusive messages. Friend-Chip's remote control software for Windows also uses SysEx.

The Digi-max 16 ($399) and Digi-max 32 ($599) are modular frames that hold four and eight 4-channel I/O modules, respectively. The modules cost



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The Route Less Traveled

Midiman's DigiPatch 12 × 6 programmable router has six coax S/PDIF inputs, six optical inputs, and six output channels that can address coax or optical connections.

$199 each, and four configurations are available: four channels of coax S/PDIF I/O, four channels of optical I/O, four channels of AES I/O (on a DB25 connector), and a "two of each" module featuring two S/PDIF coax channels and two optical I/O channels. Friend-Chip also offers the only TDIF routing module I was able to find.

Like the other routers, the modular systems support MIDI Program Change and System Exclusive dump/load, and offer MIDI remote control with Windows software.

Midiman. Midiman's DigiPatch 12 × 6 ($499) was one of the first digital audio routers to appear at a personal-studio price point. The DigiPatch features 12 inputs—six each of S/PDIF coax and optical—and six output channels, each of which can be directed to S/PDIF coax or optical connections. The unit's 50 presets can be recalled from the front panel or through MIDI. You can also use MIDI to configure the DigiPatch from a Macintosh or Windows computer and to load and dump the unit's contents through System Exclusive messages.

Z-Systems. The modular Detangler line from Z-Systems includes the z-8.8 ($980 to $1,325, depending on configuration) and z-16.16 ($2,200 to $2,550), which host 8 and 16 I/O modules, respectively. Available modules provide AES/EBU on XLR connectors, S/PDIF coax on RCA or BNC connectors; or optical connectors, which can carry S/PDIF or ADAT Lightpipe datastreams. Several stock configurations are available, and custom configurations can also be specified. A module's input and output can be different types. All inputs except optical are transformer-coupled for ground isolation, and the unit performs electrical conversion between AES and S/PDIF. Detanglers store up to 99 presets, which are stored and recalled by front-panel controls. These units cannot be external controlled.

The z-8.8a ($1,500), a versatile optical router, features seven optical I/Os and four pairs of S/PDIF electrical I/O on RCA connectors. In addition to routing ADAT, S/PDIF, or AES/EBU signals over optical lines, the 8.8a converts bidirectionally between an ADAT Lightpipe stream and four coax stereo S/PDIF streams. To accomplish the coax S/PDIF-to-ADAT conversion, the z-8.8a provides eight channels of sample-rate conversion to synchronize the S/PDIF streams. Up to 99 presets can be stored.

As long as the bits make it from point A to point B, you're in business.

The Detangler Pro line contains units accepting 8 ($1,100), 16 ($1,600), 32 ($5,000), or 64 ($6,000 for 64 × 16 and $12,000 for 64 × 64) modules. The Pro units are the same as the Detanglers except they do not accept optical modules, and they make AES/EBU connections available on a DB25 connector instead of XLRs.

All Detanglers except the z-8.8 allow computer control through Mac and Windows software available from Z-Systems. Control protocols are available to Z-Systems users who would like to "roll their own" remote control system.

Z-Systems' z-8.8 is part of the company's modular Detangler series. The stock unit offers optical I/O and S/PDIF coax I/O, but you can get custom versions with AES/EBU ports. The 8.8a also can convert between an ADAT Lightpipe stream and four coax S/PDIF streams.

DOCK OF THE BAYS

ADC. ADC makes two digital audio patch bays. The DAB3-14MKIINS ($1,355) is a 96-point TT bay. The DAL207-4MKIV ($800) 48-point bay is available in TT or ¼-inch TRS configurations. The rear of the DAL207 trails a 4-foot umbilical that terminates in ADC's UltraPatch punch-down panel.

Audio-Service. The 4U rack-mount Digital Audio Interconnect System (D.A.I.S.; approximately $9,380 for 56 × 56 with 14 interface cards covering different formats) from Audio-Service of Hamburg, Germany, is designed for studios with extensive digital routing needs and is priced accordingly. Distributed in the United States by X-Vision, it consists of a card cage with internal busing and front-end software. In this cage, you mount up to 14 single-height or 4 double-height Yamaha YGDAI interface cards (the same type used in the Yamaha 02R digital mixer), which provide a variety of I/O options, such as TDIF II, ADAT Lightpipe, AES/EBU, and Yamaha Y2. The unit also supports SDIF-2, AES/EBU with sample-rate conversion, analog, and passive AES/EBU or SPDIF. Signal routing is set using the front end software; according to the manufacturer, the Windows-only application works fine on a Power Macintosh running under FWB *SoftWindows 98* or Connectix *VirtualPC* with Windows 98. Bells and whistles abound.

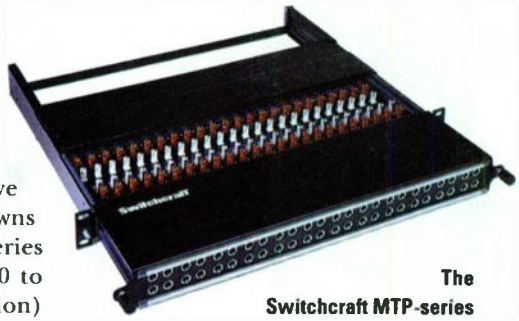
Neutrik. Neutrik's NPPA patch bay ($1,095 in the standard configuration) is digital-capable. A 96-point TT (bantam) jackfield is available with a variety of rear-panel connection options. The standard configuration is a spring-loaded terminal block, but there are units with 56-pin or 90-pin ELCO, 50-pin D connectors, or solder lugs. The jacks have two gold-plated contacts for each terminal (tip, ring, and sleeve). As with the Switchcraft bay, the NPPA offers flexible normaling schemes.

Switchcraft. Switchcraft internally wires all its patch bays with 110Ω cabling so you can use analog or AES/EBU digital signals. They are impedance-tested to meet the military specification. The company offers two lines of 48-point patch bays: the MTP and TTP series. Both series include 2U and 1U rackmount patch bays and are available with the company's Front Access option, which means the unit sits in a slide-out tray to allow reconfiguring from the front. The units offer normaling.

MTP series ($700 to $1,000, depending on the exact configuration) have ¼-inch TRS longframe jacks. The rear panels are typically outfitted with PPTs; these industry-standard push terminals, also known as "punch blocks" or "punchdowns," provide easy reconfiguration and positive connections. The MTP punchdowns are not spring-loaded. The TTP Series (which cost anywhere from $800 to $1,500, depending on configuration) uses TT jacks. Rear-panel options include punchdown terminals or EDAC/ELCO connectors.

GOTCHER ROUTER RIGHT HERE

Most personal studios accommodate a dozen or less digital I/O connections. In such cases, one or two routers probably suffice. If you deal with a variety of digital audio formats, you may be a candidate for a router with a modular architecture, in which you can choose the configuration. On the other hand, if your studio contains mostly S/PDIF coax or optical connections, you can opt for a less expensive alternative. If you have extensive patching needs, such as a number of AES devices spread around several rooms, you may consider a manual patch bay.



The Switchcraft MTP-series patch bay shown here features ¼-inch TRS jacks and has the Front Access option, which mounts the unit in a slide-out tray to allow reconfiguring from the front.

For better or worse, narrowing the field of candidates will rarely be a problem, because only a few of these units are priced for the personal studio. However, these products adequately cover most needs. If you plan your routing system carefully, you should find an affordable solution to ensure the back of your rack doesn't become a vacation spot for digital gremlins.

Larry the O *is a musician, producer/engineer, sound designer, and consultant. His music and audio services company is Toys in the Attic.*

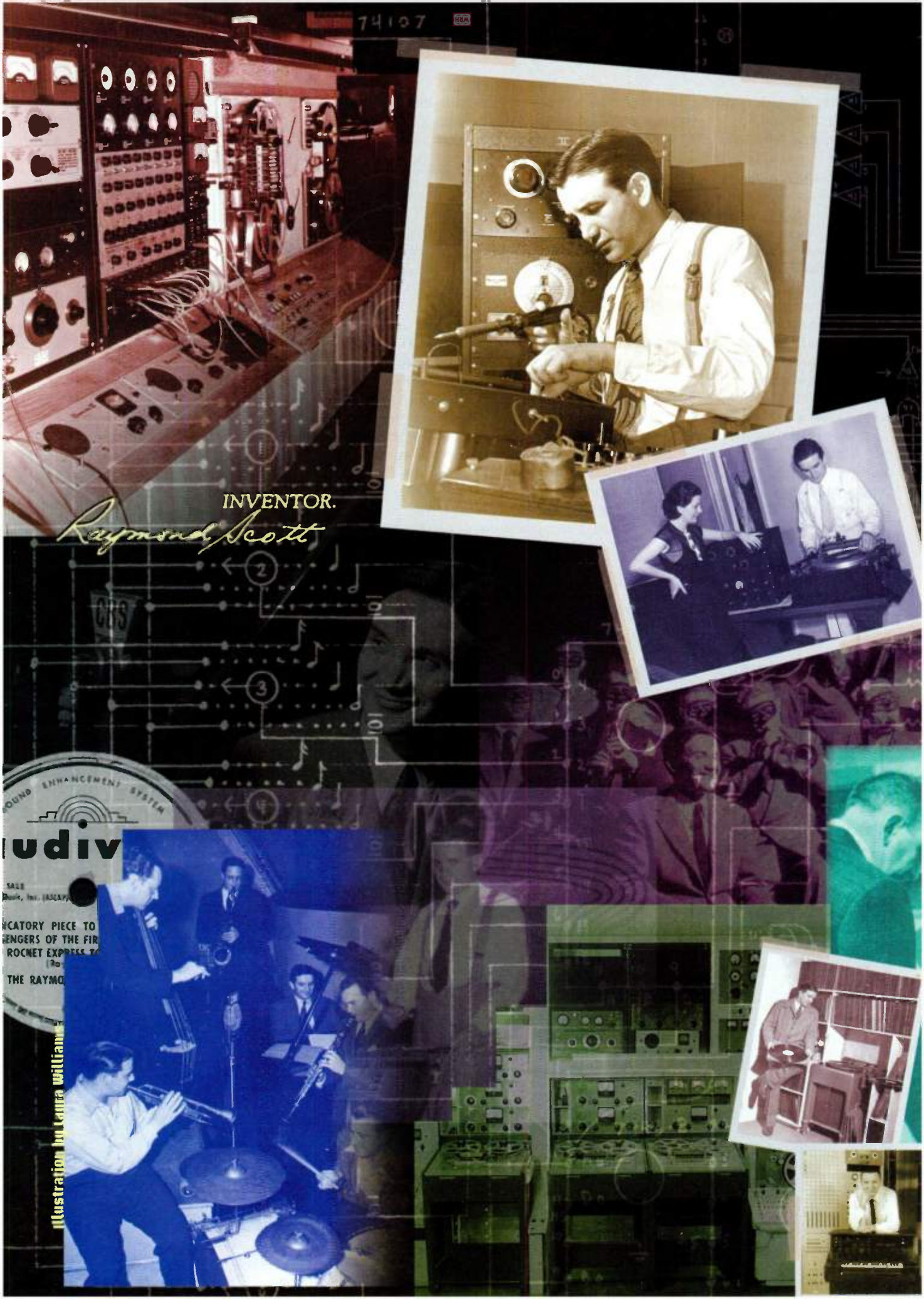


Illustration by Laura Williams

Circle Machines and Sequencers

The Untold History of Raymond Scott's Pioneering Electronica.

When the Raymond Scott revival kicked off nearly a decade ago, the composer's name was commonly confused with noir novelist Raymond Chandler and actor Randolph Scott. Lately a different case of mistaken identity has emerged. Was Raymond Scott (1908–94) a quasi-jazz alchemist from the late '30s Swing Era whose melodies later underscored Bugs Bunny and Ren and Stimpy cartoons? Or was he the unsuspecting godfather of the modern genres of techno, electronica, and ambient music?

These two historical roles might seem incompatible, yet they coexist within the same enigmatic figure. The two roles aren't paradoxical; instead, they exhibit an idiosyncratic continuity.

SCOTT'S SECRET SCIENCE

Many of Scott's playful riffs—originally recorded from 1937 to 1939 by the Raymond Scott Quintette—are genetically encoded in almost every human being, thanks to their use by Warner Bros. music director Carl Stalling in 120 episodes of Merrie Melodies and Looney Tunes animated classics. More recently, these and other themes were featured in a dozen episodes of Nickelodeon's *Ren & Stimpy Show*. The popular rediscovery of Scott's original novelty jazz recordings (which began with the 1992 Columbia CD release *Reckless Nights and Turkish Twilights*) led to a belated reappraisal of Scott's timeless—and long forgotten—genius. (See the sidebar "Raymond Scott Selected Discography.")

Throughout the 1990s, his early works were covered by the Kronos Quartet, Don Byron, Foetus, Holland's Metropole Orchestra, the Beau Hunks Sextette, and countless other admirers. David Harrington of the Kronos Quartet said his first introduction to Scott's music in 1992 "was like being given the name of a composer I feel I have heard my whole life, who until now was nameless. Clearly he is a major American composer."

Circle Machines and Sequencers

Awareness of the other side of his career, as an electronic music pioneer, began in 1997 with the reissue of Scott's 1963 *Soothing Sounds for Baby* trilogy. These albums, largely overlooked upon their original release, contained gentle—and all-electronic—works meant to calm and delight infants. Scott's pioneering and little-heard explorations of synthesized rhythmic minimalism and low-key ambience foreshadowed the subsequent conjurings of Terry Riley, Phillip Glass, Kraftwerk, and Brian Eno. That most of Scott's ethereal music was performed on vacuum tube– and transistor-rigged music machines—ones he designed and built—made the reemergence of these recordings seem like the Dead Sea Scrolls of electronica.

But *Soothing Sounds for Baby* couldn't possibly prepare the world for the exotic artifacts found on the recent two-CD set, *Manhattan Research Inc.* The 69 tracks on *Manhattan Research Inc.* cover Scott's groundbreaking electronic work from 1953 to 1969. Forays into abstract musique concrète can be heard alongside decidedly nonkiddie collaborations with a young, pre-Muppet Jim Henson.

In addition, *Manhattan Research Inc.* presents some of the first TV and radio commercials to employ electronic music soundtracks. The package moved Can's Holger Czukay to disbelief. "Raymond Scott belongs to the phalanx of unique people like Les Paul, Oscar Sala, and Leon Theremin, to whom we owe so much in developing our own musical identity today," Czukay says.

ELECTRIFIED SWING

Before Scott embarked on a professional music career in 1931—at his older brother's insistence—he intended to pursue engineering. As a result of his fascination with technology, Scott's knowledge of radio and recording studios showed a sophistication rarely seen among composers and bandleaders. Throughout his life, Scott explored

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music technology with a Nobel laureate's dedication. He revolutionized the art of microphone placement, and spent many of his band's recording sessions in the control room, monitoring the mix.

A June 1937 article in *Down Beat*, titled "Engineer-Musician Electrifies Swing World With Ideas," described Scott's New York City apartment as "divided into two parts: in one the dominant note was the piano and phonograph; and in the other was all sorts of recording equipment, with microphones all over the place and long wires trailing across the floor." The feature explored Scott's science of "creative acoustics," which involved using a mic to manipulate and capture sounds that differ from those heard by the naked ear. A November 1937 *Popular Mechanics* feature, "Radio Music of the Future," described Scott "placing a 'dead' microphone beside the piano and then turning it on only after the keys have been struck [to] catch the ghostlike effect" of aftertones that are "ethereal, disembodied, [and have] a sense of great space."

MANHATTAN R&D

As a composer, Scott was a strict perfectionist with little tolerance for improvisation, which triggered the ire of many jazz purists. He earned notoriety as a session tyrant and was commonly criticized for treating his sidemen and vocalists as hardware. "All he ever had was machines—only we had names," said drummer Johnny Williams. Singer Anita O'Day, who worked briefly with Scott's early 1940s big band, called him "a martinet" who "reduced [musicians] to something like wind-up toys."

In 1946—the same year he composed the score for the Mary Martin/Yul Brynner Broadway production *Lute Song*—Scott established Manhattan Research Inc. to expand the horizons of electronic sound generation (see **Fig. 1**). From 1950 to 1957, Scott financed his technological excursions by conducting the orchestra on NBC's cornball, but highly rated, chart-countdown show, *Lucky Strike's Your Hit Parade* (a gig he allegedly despised for its banality). Raymond and his second wife, singer Dorothy Collins, were seen on the little screen in millions of American households every week. However, few suspected the alter ego lurking behind the conductor's forced stage smile.

At the dawn of the '60s, Scott advertised Manhattan Research Inc. as "the world's most extensive facility for the creation of Electronic Music and Musique Concrète." A slogan for his venture was "more than a think factory—a dream center where the excitement of tomorrow is made available today."

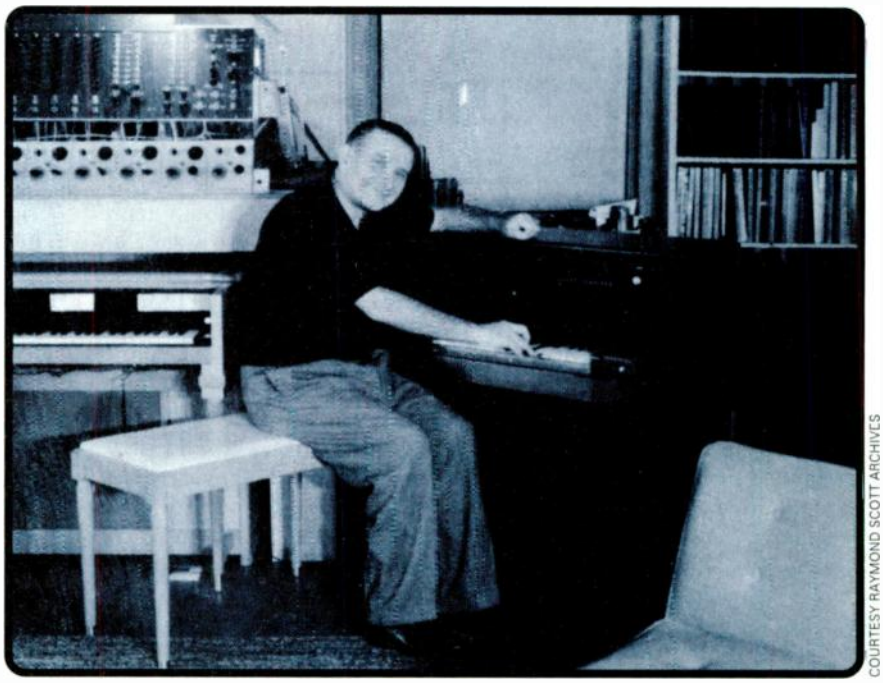
By spending more of his time soldering

COURTESY RAYMOND SCOTT ARCHIVES

FIG. 1: Raymond Scott in the studio in the 1950s. To test the sound of his recordings, he had an assortment of speakers. At his left is the studio's main audio control center.

circuits and less with union-scale sidemen, Scott eventually dispensed with the human element altogether. He was more comfortable around machines; Scott spoke their language—or taught them to speak his. As Electronic Music Foundation president Joel Chadabe says, "Scott's music is so perfectly crafted, so lyrical and easy, so completely charming and good-natured, that it seems all the more wonderful, even mysterious, that much of it was created with the sophisticated and complex technology he invented. Scott developed his instruments to make his music and did it so well that what you hear is the music."

The inventions evolved according to the whims of Scott's boundless curiosity. In March 1946, he patented an electromechanical synthesizer called the Orchestra Machine. An obscure ancestor of the tape loop–based Mellotron, it featured a keyboard that could simulate an ensemble of traditional musicians. "This machine is a device incorporating a number of multiple soundtrack units, that may be selected as would the musical instruments in an orchestra," Scott wrote in the patent disclosure. "The entire mechanical driving system's speed may be varied in order to select any particular musical pitch."



COURTESY RAYMOND SCOTT ARCHIVES

FIG. 2: Raymond Scott playing the Clavivox in the 1950s. Karloff, the instrument behind him, was a sound-effects generator that could also do simple drum-pattern sequencing.

Two years later, he began a decade of work on a behemoth sound-effects generator that he eventually christened Karloff (after horror-film legend Boris Karloff) (see **Fig. 2**). Scott demonstrated the unit to columnist Joseph Kaselow of the *New York Herald Tribune*. "The heart of the unit is a control panel with some hundred or so buttons and dials from which Scott can get an infinite number of rhythms and sound combinations—treble, bass, beeping, swishing, honking—you name it," Kaselow said. "Scott's machine, actually a control console which selects, modifies, and combines sounds produced by electronic means, has 200 sound sources and is capable of quickly producing infinite and varied musical and electronic effects. The machine uses several electronic tone generators, and others can be added. The control panel directs pitch, timbre, intensity, tempo, accent, and repetition. It can sound like a group of bongo drums. It can give impressions which suggest common noises. It can create the mood of musical tone-poems. And it can also produce limitless emotional variations to suit a variety of musical styles. All, of course, if Scott is at the controls."

WALL OF SOUND

A 20-year-old Columbia University student named Robert Moog and his father were among the privileged few who witnessed Scott's obsessions in

GENESIS OF THE SEQUENCER

Gentlemen:

I have a story that may be of interest to you.

It is not widely known who invented the circuitry concept for the automatic sequential performance of musical pitches—now well known as a sequencer.

I, however, do know who the inventor was—for it was I who first conceived and built the sequencer.

Bob Moog, who visited me occasionally at my lab on Long Island, was among the first to see and witness the performance of my UJT-Relay sequencer.

To digress for a bit: I was so secretive about my development activities—perhaps neurotically so—that I was always reminding Bob that he mustn't copy or reveal my sequencer work to anyone. I understand, now, my personal need for secrecy at that time. Electronic music for commercials and films was my living then—and I thought I had this great advantage—because it was my sequencer.

Word naturally got around about the nature of what my device accomplished, but Bob Moog continued to be loyal. I must say Bob Moog is a most honorable person. He steadfastly refrained from embodying my sequencer in his equipment line until the sheer pressure of so many manufacturers using the sequencer forced him to compete. Yet, he used the simplest version, though he knew about my most advanced sequencer. Quite a gentleman, and a super talent besides.

Now, with the passing of years, I guess I regret my secrecy and would like for people to know of what I accomplished.

—Raymond Scott, circa the late 1970s (from an unaddressed letter found in his personal papers)

Circle Machines and Sequencers

action. At the time, the Moogs were building theremins in their basement. Scott wanted to obtain the instrument's electronic subassembly, and so he invited the Moogs to tour his facility in Manhasset, New York.

"First, Raymond showed us his recording studio. Then a very large room with a cutting lathe and all sorts of monitoring and mixing equipment," Moog says. "The entire downstairs was a dream workshop consisting of a large room with machine tools of the highest quality; a woodworking shop; an electronics assembly room; and a large, thoroughly equipped stockroom of electronic parts. My father and I were there with our mouths hanging open."

This encounter commenced a social and professional relationship between Moog and Scott that lasted for nearly two decades. "When I first worked for Scott in the early 1950s, he had a very large laboratory," Moog says. "One room was completely filled with rack upon rack of relays, motors, steppers, and electronic circuits. Raymond would go around and adjust various things to change the sound patterns. I'd never seen anything like it. It was a huge, electromechanical 'sequencer.'" Scott called it his Wall of Sound. (See **Fig. 3** and the sidebar "Genesis of the Sequencer.")

Scott used the Moogs' theremin module in the first prototype of his keyboard synthesizer, the Clavivox, which he patented in 1956 (see **Fig. 4**). A few years before meeting the Moogs, Scott fashioned a toy theremin for his daughter Carrie. "I must have been 11 or 12, which would be around 1950 or 1951," says Carrie Makover. "I had seen a Broadway play called *Mrs. McThing* which used a theremin, and I loved the way it sounded. But after my dad built it, I discovered I couldn't play it. So he took it back and made it into something else."

The resulting synthesizer allowed a player to glide smoothly from one note to another without a break over a 3-octave keyboard. It could be played with an expressive portamento rather than with discrete pitches only. Subsequent improvements allowed staccato attacks, on/off vibrato toggling, and many other effects. It could also simulate many traditional instruments.

"This was not a theremin anymore," Moog says. "Raymond quickly realized there were more elegant ways of controlling an electronic circuit." In subsequent models, Scott used photocells and a steady light source beamed through photographic film graded from opaque to transparent. This varied the voltage, which changed the pitch of the tone generator. The waveform of the sound determined the tone color, and the methods of altering the waveform were similar to modern analog synths. "A lot of the sound-producing circuitry of the Clavivox resembled very closely the first analog synthesizer my company made in the mid-'60s," Moog says. "Some of the sounds are not the same, but they're close."

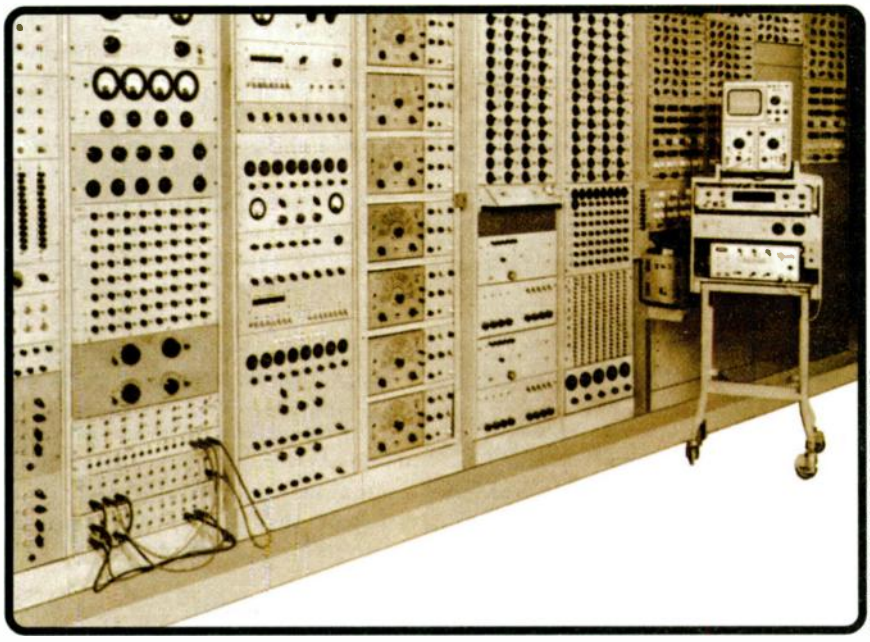
RAYMOND SCOTT SELECTED DISCOGRAPHY

Manhattan Research Inc. (Basta)
Soothing Sounds for Baby (vols. 1–3) (Basta)
Reckless Nights and Turkish Twilights (Sony/Basta)

RACE AGAINST THE CLOCK

The discipline Scott, a relentless workaholic, imposed on his musicians came naturally to himself. In 1957, at age 50, he endured his first encounter with serious heart trouble. "I had many dead spots around my body," Scott wrote in his journal. "Cardiac specialists gave me one year to live." Instead of slowing, Scott's pace increased. Perhaps Scott realized that, besides outmaneuvering competitors, he was also pitted against the undertaker's pocket watch.

Around 1959, Scott designed and built the Circle Machine, a more compact electronic sequencer. Dr. Thomas Rhea, music synthesis professor at the Berklee College of Music, visited Scott many times in the early '70s and remembers the Circle Machine as "an analog waveform generator that was this crazy, whirling-dervish thing. It had a ring of incandescent lamps, each with its own rheostat, and a photo-electric cell on a spindle that twirled in a circle above the lights." Each bulb's intensity was individually adjustable, as was the rotation speed of the photocell. As the lights brightened, the pitch ascended. Arm rotation speed governed the rhythm. The lights could be staggered in brightness, and depending on



COURTESY RAYMOND SCOTT ARCHIVES

FIG. 3: Raymond Scott's Wall of Sound, which Bob Moog later described as an electromechanical sequencer. The Wall was 30 feet long and contained thousands of stepping switches. Its music needed to be played loud in order to drown out the clicking of the switches.

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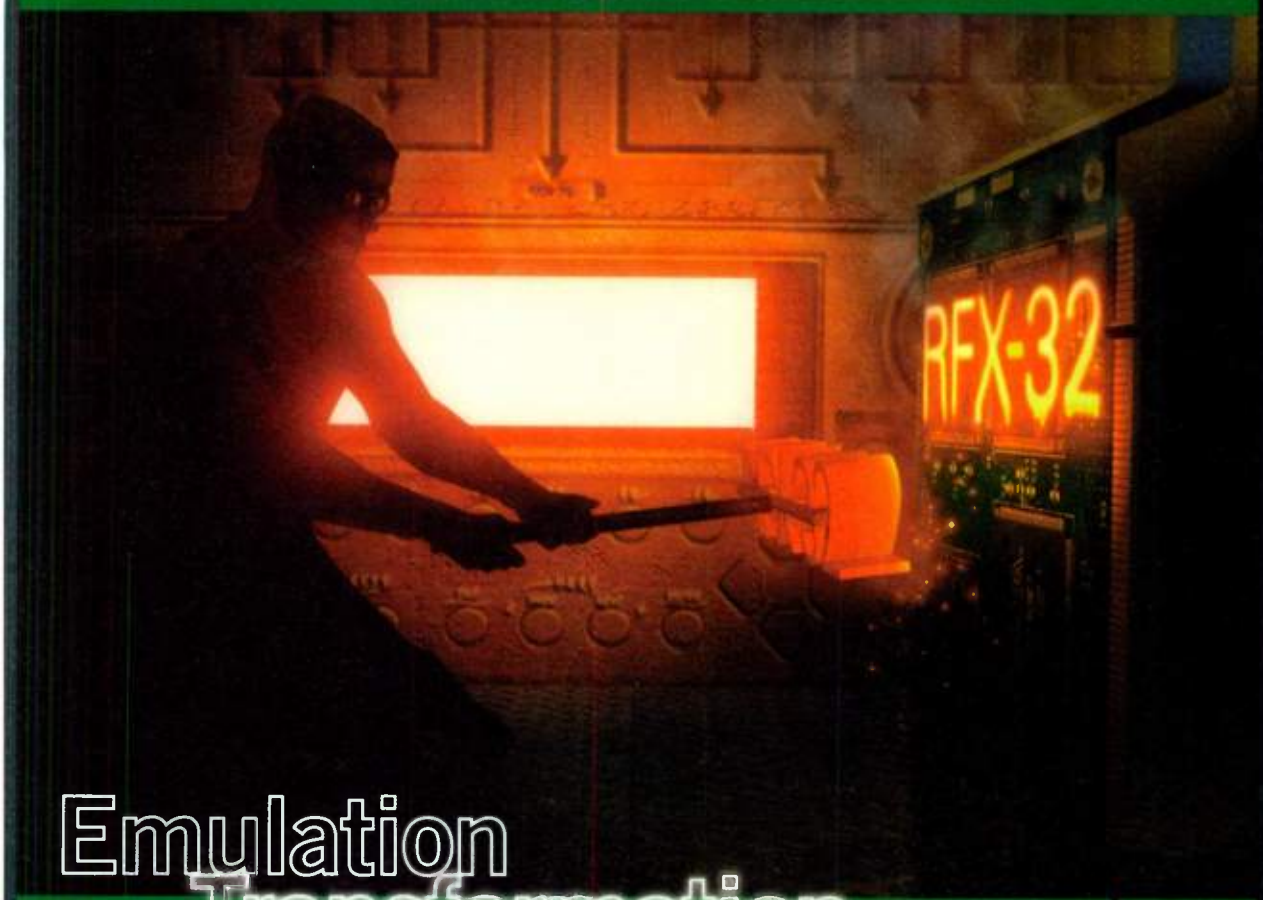

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Circle Machines and Sequencers

the pattern, the tone sequence generated would change. The Circle Machine was capable of a wide range of unearthly sounds, as heard in numerous commercial jingles Scott recorded during the late 1950s and early 1960s (many of them are included on *Manhattan Research Inc.*).

Building on the foundations of, and cannibalizing components from, his Karloff generator and Wall of Sound sequencer, Scott developed the first version of his "instantaneous composition/performance machine" in the late 1950s. He named it the Raymond Scott Electronium (no relation to the German Hohner electronium), and it became the most ambitious and resource-consuming project of his life (see **Fig. 5**). Laboring for decades, Scott developed it in many different incarnations, all of which shared his artificial intelligence technology. "The entire system is based on the concept of Artistic Collaboration Between Man and Machine," Scott wrote in a patent disclosure. "The new structures being directed into the machine are unpredictable in their details, and hence the results are a kind of duet between the composer and the machine."

Instead of a traditional, piano-style keyboard, the Electronium was "guided" by a complex series of buttons and switches, arranged in orderly rows. The system was capable of "instantaneous composition and performance" of polyphonic rhythmic structures, as well as tasking preset programs. With Scott controlling the sonorities, tempos, and timbres, he and his machine could compose, perform, and record all at once. The parts weren't multitracked; rather, voices, rhythms, and melodies originated simultaneously in real time.

"A composer 'asks' the Electronium to 'suggest' an idea, theme, or motive," Scott wrote in the user manual. "To repeat it, but in a higher key, he pushes the appropriate button. Whatever the composer needs: faster, slower, a new rhythm design, a hold, a pause, a second theme, variation, an extension, elongation, diminution, counterpoint, a change of phrasing, an ornament, ad infinitum. It is capable of a seemingly inexhaustible palette of musical sounds and colors, rhythms, and harmonies. Whatever the composer requests, the Electronium accepts and acts out his directions. The Electronium adds to the composer's thoughts, and a duet relationship is set up."

"It was always this kind of metaphysical, almost magical thing, about literally thinking things to the point where they would happen," says Herb Deutsch, a Hofstra University music professor who worked with Moog to develop the first Moog synthesizer in 1964. Deutsch, who also worked for Scott, remembered one of his colleague's visionary objectives. "He wanted to take the work out of being a musician," Deutsch says. "That used to really get me upset. He said, 'Look, I just want to sit here, and I'd like to turn this machine on, and whenever it does something good, I just want to record it at that point.' It was not that he was a lazy guy—far from it. He worked incredibly hard to take the work out of being a composer."

Circuitry expert Alan Entenman assisted Scott. "What Ray did was to recognize that music has repetitions and patterns, and he envisioned a machine that would incorporate those patterns," Entenman says. "He thought of it as 'an orchestra with a thousand voices.' It had plug-in modules, and each module was a synthesizer of his own design that was capable of making a wide variety of sounds. Each one he would give a different voice, and what he kept telling me was, that if you listen to music, it's repetition. You could repeat notes in a different tone. What made his Electronium successful was his knowledge of composition. Being a composer, he knew how to construct music from these things—and it really worked.

"This thing could make any kind of

DAVID KEAN/AUDITIES FOUNDATION

FIG. 4: Scott's keyboard synthesizer, the Clavivox, was patented in 1956. The pictured Clavivox, which resides in the Audities Foundation collection, was recently used by Tom Petty and the Heartbreakers.

WHERE ARE THEY NOW?

One Clavivox (of at least three known to have been built) still exists—and still works. It is one of many vintage electronic instruments owned by the Audities Foundation (www.audities.org) in Calgary, Alberta, Canada, under the directorship of David Kean. The Clavivox was used recently by Tom Petty & the Heartbreakers on the album *Echo*.

The Motown version of the Raymond Scott Electronium was bought from Scott's widow, Mitzi, by composer/musician and Devo cofounder Mark Mothersbaugh, who houses it at his Mutato Muzika studios in Hollywood. At Mutato, there's a room where Scott's unique device for "Machine Powered Instantaneous Musical Composition and Performance" has been collecting dust since 1996. Partly eviscerated by the inventor for spare parts, it no longer functions. Mothersbaugh has promised to restore it to working order.

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music you could imagine," Entenman says. "One time he had [what] he described as this real sexy, 'raunchy jazz' coming out of this thing. He and [electronic instrument inventor/composer] Bruce Haack were just in heaven.

"I understand the secret, to some extent," Entenman says. "The harmonics are precise mathematical multiples, and when something vibrates, there are overtones. The way you blend these overtones, and the amount of offset they have with one another, gives it warmth. That's what he would do to get it to sound rich. He'd couple that with the melodious, rhythmic patterns he built into it. He would program how it was repeated, and in what key it would be repeated, so it was like gears within gears."

MOTOWN MAESTRO

Refining the Electronium was Scott's primary focus throughout the 1960s, when integrated circuits made smaller and more efficient designs possible. Scott asked Moog to "sophisticate my equipment. The concept is the same as I've had for many years now. And you're the scientist who will make these things small, more compact, and with fewer parts." Moog replaced Scott's 8-stage "sequential timer" relays with electronic stepping switches.

Despite another bout of heart trouble in 1967, Scott continued to focus full-time on his Electronium. By the end of the 1960s, he had invested more than a decade—and more than a million dollars—in refining his brainchild. But Scott's health was failing, and his once-substantial royalties were dwindling.

In August 1970, Motown Records founder Berry Gordy read an article in *Variety* about Scott's work. The Los Angeles–based music mogul immediately phoned Scott and asked to see—and hear—this miraculous invention. Soon, a sizable Motown entourage arrived at Scott's Farmingdale, New York, facility in a fleet of limos. "It was genius meeting genius," Motown executive Guy Costa said in 1997. "Berry certainly respected Ray and his knowledge, and Ray admired Berry."

Gordy was impressed by Scott's Beethoven-in-a-box. "Berry felt that the power of the Electronium, the ability to numeralize the music process, was important," Costa said. "Berry was always a formula man; he'd find a rhythm or a

COURTESY RAYMOND SCOTT ARCHIVES

FIG. 5: This is the final version of the Raymond Scott Electronium, created for Berry Gordy of Motown. This "instantaneous composition/performance machine" was capable of playing highly complex music and is now owned by Mark Mothersbaugh.

36 WEEKENDS

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progression and build on that. The Electronium gave you the ability to play a chord, and the ability to store rhythms, and resequence those things. To have all these new effects was a turn-on."

One month later, Gordy placed an order for an Electronium. The initial down payment was $10,000, but it would eventually cost Motown millions. Costa arranged for shipment of the device from New York to Gordy's home in Los Angeles. Scott planned to spend six weeks tutoring the Motown chief on the device. When Gordy asked Scott to make further modifications, the inventor was happy to comply and continued working in Southern California, with his client involved in the progress.

Eventually, Gordy offered Scott a position as head of Motown's Electronic Research and Development department. Scott accepted, and in 1972 he relocated to the West Coast with his third wife, Mitzi. Equipped with his own research studio facility, Scott continued to develop the Electronium and other technologies. "Berry was looking at the Electronium as a source of inspiration and new ideas, and as a methodology—as a sophisticated programmable sequencer," Costa said. "It was an idea stimulator, a creative thought processor. Maybe [they would] find combinations that hadn't been tried. It could have done anything he wanted it to do."

Following a serious heart attack in 1977, Scott retired at age 69. "Ray was a wonderful guy," Costa said. "I can't tell you how much fun we had together. He was the experimenter; the mad professor." What Motown had to show commercially for its investment remains a mystery, as no tapes have yet surfaced from the company's vaults.

THE CLOCK RUNS OUT

After continued heart problems in the late 1970s, Scott was no longer on music technology's cutting edge. He tried to upgrade his devices with microprocessors but lost valuable research time due to illness. "By then, he had destroyed the Electronium by vandalizing it for parts for other things he was working on," Costa said. "And new electronics had come so far, that they could do with one little chip what he had tons of wiring doing on the Electronium. It didn't pay to keep working on it."

But Scott didn't give up. Despite deteriorating health (including heart bypass surgery), he continued to work, even while bedridden. In the mid-1980s, he modified a Yamaha DX-7 and used MIDI to connect the keyboard to his Electronium through a PC purchased in 1981. "I got involved in an exciting project," the 75-year-old wrote in his journal in June 1983. "For three months I slept an average of about 50 hours weekly. Then I folded. Symptoms of folding: extreme fatigue, wobbly walking, accumulation of chest pains, zero energy output capability." A major stroke in 1987 closed down the shop completely. Even more tragic, Scott could barely speak, rendering him unable to answer questions when interest in his work revived in 1992. He died in February 1994 at age 85.

VISIONARY OUTLOOK

"I understand his ideas about the collaboration between man and machine, which to me is the most important thing he did, in terms of electronics and music," says Berklee professor Dr. Thomas Rhea. "He anticipated some artificial intelligence concepts and some compositional concepts that people believe somebody else did. The idea of collaborating with a machine, and allowing the machine to make certain decisions, was pretty avant-garde.

"I appreciate everything Cage did, and Stockhausen," Rhea says. "But there's a whole tradition here that's being ignored, and Raymond Scott is one of those people." Moog recently spoke to the BBC about his old colleague. "Raymond was the first," Moog said. "He foresaw the use of sequencers, and the use of electronic oscillators, to make sounds. These were the watershed uses of electronic circuitry."

Jeff Winner *is the creator of RaymondScott.com and coproducer of* Manhattan Research Inc., *a two-CD and book set of Raymond Scott's early electronic work.* **Irwin Chusid** *is the director of the Raymond Scott Archives. His study of outsider music,* Songs in the Key of Z, *was recently published by A Cappella Books. For audio examples of Raymond Scott's instruments, visit www.raymondscott.com/sound.*

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The Beatnik Player

A powerful tool for interactive sound on your Web page.

By Peter Hamlin

Adding high-quality, interactive audio to a Web page can be quite a challenge. First you must confront the issue of limited bandwidth, which seriously hinders the transfer of large audio files. If you sidestep the problem by using MIDI files—even General MIDI files—you aren't guaranteed consistent playback quality, because sound-card synths and General MIDI sound sets vary so much. How about interactivity? Using HTML, you can create items such as buttons that trigger sound files, but there's a limit to how responsive and flexible such a system can be.

Fortunately, Beatnik (formerly Headspace) has developed a solution to all these problems. Beatnik technology helps integrate high-quality, interactive MIDI and digital audio into your Web site. With it you can "sonify" your site in just about any way imaginable. Beatnik supports time-saving file compression for audio-file downloads, and it can also preload files so they seem to be available instantaneously. It includes its own software synthesizer, which means your MIDI files always sound the same, no matter where they're played. You can also use commands in your scripts to control the synthesizer directly. For example, you can send Note On messages, patch changes, and other types of MIDI data.

Visitors to a Beatnik-enabled site need the Beatnik Player plug-in; it's a small, quick, trouble-free download. Beatnik supports Netscape *Navigator* for Windows and Mac OS, but it only supports Microsoft *Internet Explorer* for Windows. The Beatnik Player is free for the viewers of your site, as are the tools you need to create exciting,

FIG. 1: Beatnik's beginner's page illustrates the technology's interactive potential with a variety of "sonified" graphics, links, logos, and buttons.

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interactive musical Web pages (that is, until you need something beyond the basics).

In this article, you'll learn how to use Beatnik to play MIDI files and send commands to play the Beatnik software synthesizer. I'll also show you how to make those sounds respond to button clicks and mouse movements.

TOUR DE BEATNIK

You'll get a taste of what Beatnik can do by visiting sites that put the technology to good use. A great place to start is the Beatnik home page (www.beatnik.com), where you'll find plenty of demonstrations, information, downloads, and useful links. If you haven't already installed the Beatnik Player, you'll be asked to download it when you arrive at the site. After installation, you'll be able to hear many new and wondrous noises as you explore the site. For example, you'll notice right away that many sounds occur in response to your mouse movements, and the response is immediate.

The site's For Beginners page (www.beatnik.com/software/beginners.html) presents a good overview of Beatnik's capabilities. At the top of the page is a set of "sonified" graphics (see **Fig. 1**). Moving your mouse over each picture triggers an appropriate sound. Lower on the page are examples of sonified links (hyperlinks that produce sounds when you click on them), company logos sonified with matching music themes, "quick clips" (tiny player icons that play musical excerpts), and a set of radio buttons for selecting background music.

FIG. 2: The PBS Kids site is great fun to explore, thanks to its numerous audio and music triggers.

Another good example of how Beatnik sonification can liven up a Web site is the Public Broadcasting Service's PBS Kids site (www.pbs.org/kids). Throughout the site, mouse movements trigger a variety of musical reactions appropriate to each graphic (see **Fig. 2**). Rolling the mouse over the program names plays a familiar nursery rhyme melody, randomly chosen from several melodies each time you connect to the site.

Beatnik's GrooveTub page (www.beatnik.com/showcase/groovetub) is another site well worth exploring. The GrooveTub (see **Fig. 3**) is a virtual music-production environment that generates different rhythmic grooves in response to mouse movements and QWERTY keystrokes. You can build textures from various combinations, and when you like what you hear, you can click on the virtual guitar, harp, or flute to add distinctive melodies and harmonies—it's all under your control. Each instrument is played like its real-world counterpart. The guitar, for example, is strummed as you move the mouse over the strings, and you can select different chords as well. Strumming close to the bridge makes the sound brighter, as it would on a real guitar. These imaginative instruments offer an entertaining glimpse into the possibilities of online virtual instruments.

In the academic world, the University of Miami School of Music uses Beatnik to create its extensive collection of online ear-training drills (www.music.miami.edu/courses/et). You can practice identifying scales, intervals, and chords, and the Web site lets you know how well you're doing. Because Beatnik can send MIDI messages directly to the Beatnik Player's software synthesizer, all the test materials can be created on the fly, so the school doesn't need a large audio-file collection to cover every possible combination. (For

BEATNIK SAMPLE EXAMPLES

If you want to experiment with some samples, go to **EM**'s Web site (www.emusician.com) and download the HTML, RMF, and JS files for this article. The HTML files were created from the examples I've given. The RMF files are the MIDI files played by the examples, and the JS file is a library needed to make Beatnik's JavaScript commands work.

You can save all these files in any computer directory, but be sure to place them in the same location. Then launch your browser (assuming you have already installed the Beatnik Player), use the Open command, click on the Browse button, and open any of the HTML files to view them. Beatnik Demo Page.html is a good place to start, as it has some explanations right on the page. You can also select View/Source to see the HTML code. Try editing each file with an HTML or plain-text editor to make your own variations.

Once you have what you want, you can upload all the HTML, RMF, and JS files to your Web site (your Internet service provider should tell you how to do this), where they will be available for anyone to view and hear.

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another look at Beatnik-based interactive music on the Web, see "Music for New Media" in this issue of **EM**.)

SONIFY YOUR SITE

Now that you've seen what Beatnik can do, how do you use it to sonify your Web site? Using JavaScript commands embedded in your site is an easy way to add Beatnik features to it. JavaScript is a computer language specifically designed to work in HTML pages within Web browsers. (Browsers typically support JavaScript, so it doesn't really limit the number of people who can view your site.)

JavaScript is used to issue the commands in Beatnik's application programming interface (API). These commands let you control Beatnik's features. You'll need at least a basic understanding of HTML to make the most of the following examples. Beginners can download a simple Beatnik demonstration Web page from **EM**'s Web site (see the sidebar "Beatnik Sample Examples"). The demo shows you how some of these techniques work.

But before you start learning how to use Beatnik, get the API documentation from www.beatnik.com/software/tutorials/documentation_index.html

▼

Sounds occur in response to your mouse movements, and the response is immediate.

(you can get there from the main page by following the Documentation link). Click on the Music Object API link and select the Windows or Mac OS version. The documentation contains tutorials, examples, demos, tools, and an extensive indexed reference.

My first example is simple: a Web page that plays MIDI notes on the software synth when the mouse moves over a section of text. I'll arrange the page so the visitor sees this:

G5 F#5 E5 C5 B4

When the mouse moves over a note name, that note sounds. The HTML document needed for this program is in the table "Musical Mouse Moves." If you want to try this example, copy the code on the left side of the table. Explanations for each line are on the right.

The mousePlayer.playNote command has six items in parentheses: MIDI channel (in this case, channel 1), bank number (the default bank for GM sounds is bank 0, but I'm using a sound from bank 1, an additional Beatnik sound set), program number (program 83, a sound called Ricochet Pad), note name (C4 is middle C), MIDI Velocity (100), and duration in milliseconds (-1 makes the note continue until it decays naturally).

Copy the code in the table and save it as an HTML file. Next find the stub .rmf and music-object.js files. They'll be with the Beatnik documentation. Make copies of these two files and

MUSICAL MOUSE MOVES

1. <HTML> <BODY>	1. Tags to mark the beginning of the HTML document.
2. <SCRIPT SRC="music-object.js"></SCRIPT>	2. Tag to tell the browser to load the Beatnik music-object library. The library file must be in the same directory as your HTML file.
3. <SCRIPT LANGUAGE="JavaScript"><!— //	3. Tag to tell the browser that you are using JavaScript. "<!—//" tells earlier, non–JavaScript capable browsers to ignore the JavaScript so the browser won't print error messages when loaded.
4. mousePlayer = new Music();	4. Defines a Beatnik Music Object. You could call it anything, but choose a name (such as mousePlayer) that will help you remember it.
5. mousePlayer.stubEmbed ('stub.rmf');	5. Embeds a music player in the page. Because you are not playing a MIDI file here, but instead are producing MIDI commands directly, load a *stub* file (an empty MIDI file) into the player. The "stub.rmf" file must be in the current directory.
6. // —></SCRIPT>	6. Tag to mark the end of the JavaScript section. "//—>" marks the end of the code that is "hidden" from non–JavaScript capable browsers.
7. <A ONMOUSEOVER="mousePlayer.playNote(1,1,83,'G5', 100,-1)">G5 </A> <A ONMOUSEOVER="mousePlayer.playNote(1,1,83,'F#5',100,-1)">F#5 </A> <A ONMOUSEOVER="mousePlayer.playNote(1,1,83,'E5', 100,-1)">E5 </A> <A ONMOUSEOVER="mousePlayer.playNote(1,1,83,'C5', 100,-1)">C5 </A> <A ONMOUSEOVER="mousePlayer.playNote(1,1,83,'B4', 100,-1)">B4 </A>	7. "Anchor" tags. These create the text that shows up onscreen as the viewer's list of musical note choices, and they also instruct the mousePlayer to play the appropriate note when the mouse moves over the text.
8. <HTML> <BODY>	8. Tags to mark the end of the HTML document.

For manufacturer information, please see Contact Sheet, p. 203.

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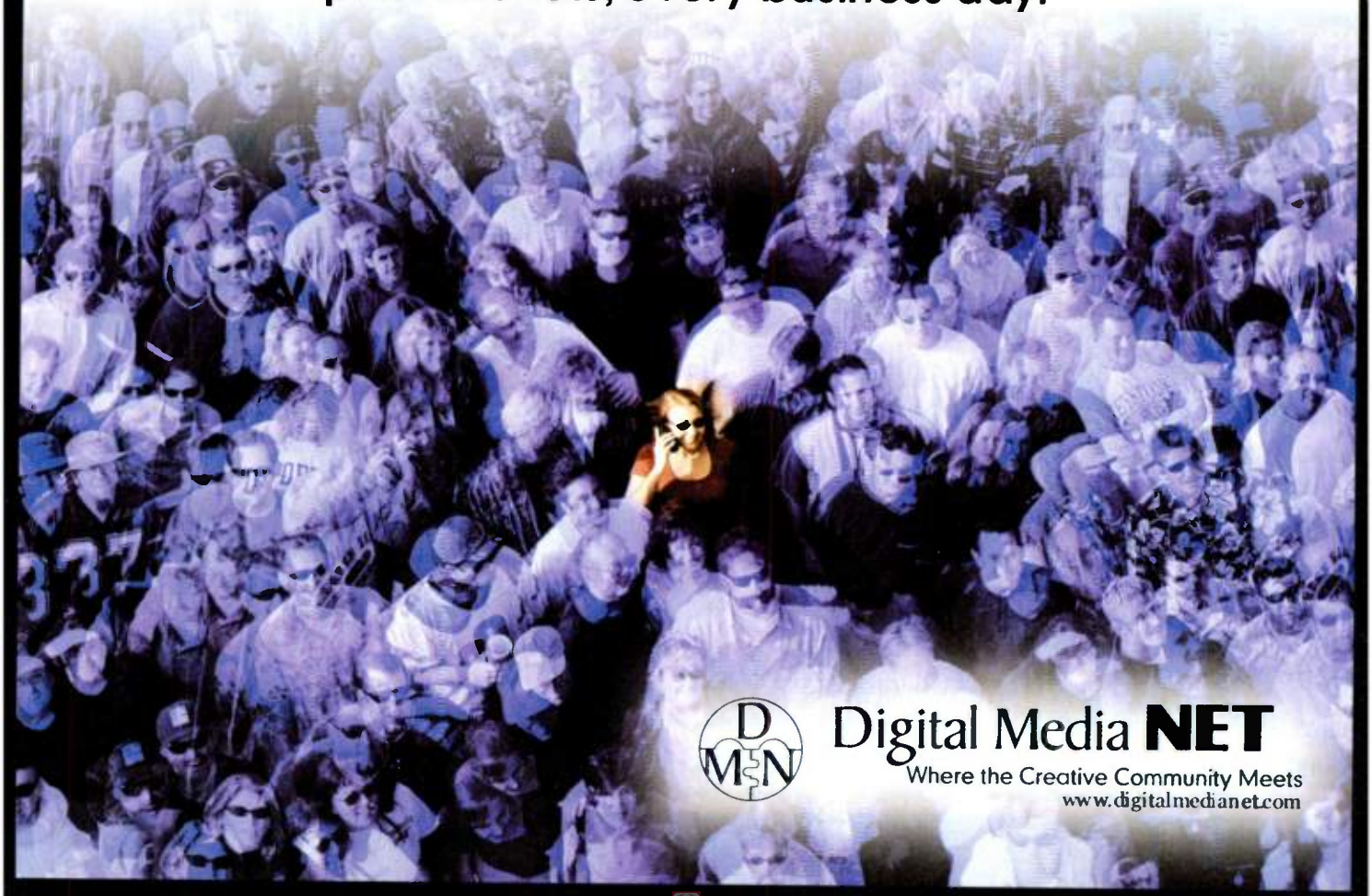


Editor at the Beatnik Web site (www.beatnik.com/software). The full version of Beatnik Editor 2.0 (Mac/Win) is available for $129.95.

To build a Web page that plays an RMF file, use the magicEmbed command to embed a Beatnik Player in the page. The JavaScript code would look like this:

```
<P><SCRIPT SRC="music-
object.js"></SCRIPT>
<SCRIPT
LANGUAGE="JavaScript"><!— //

demoPlayer = new Music();
demoPlayer.magicEmbed
('SRC="beatnik_demo_open.rmf"');

// —></SCRIPT> </P>
```

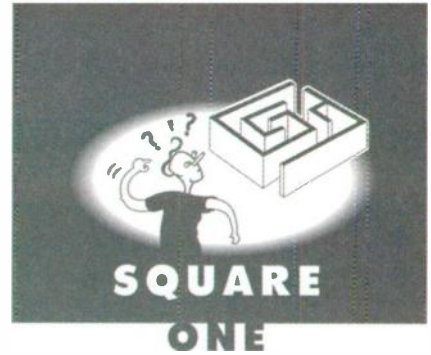
You can control the playing of this RMF file in any number of ways. For example, you could use HTML to create a Start and a Stop button; following is the code:

```
<FORM METHOD="POST">
      <INPUT TYPE="button"
            NAME="start"
            VALUE="Start"
            ONCLICK="demo
            Player.play()">
      <INPUT TYPE="button"
            NAME= "stop"
            VALUE="Stop"
            ONCLICK="demo
            Player.stop()">
  Buttons will start and stop the music.
</FORM>
```

The ONCLICK commands issue the play and stop commands to the Beatnik Player when the buttons are pushed. ONMOUSEOVER is a similar command; it simply makes the music start when the mouse passes over the indicated object (say, a graphic or a cell in a table).

You've now learned the basics of sonifying a Web site with Beatnik. As you study the Beatnik documentation, you'll discover a wide range of commands that let you control your Web page's sound. As you learn more about JavaScript, you'll devise ways to make your Web site more spontaneous, surprising, and musical.

Peter Hamlin *is a composer who teaches at St. Olaf College in Northfield, Minnesota. He is also a member of the live electronic music improv band Data Stream.*

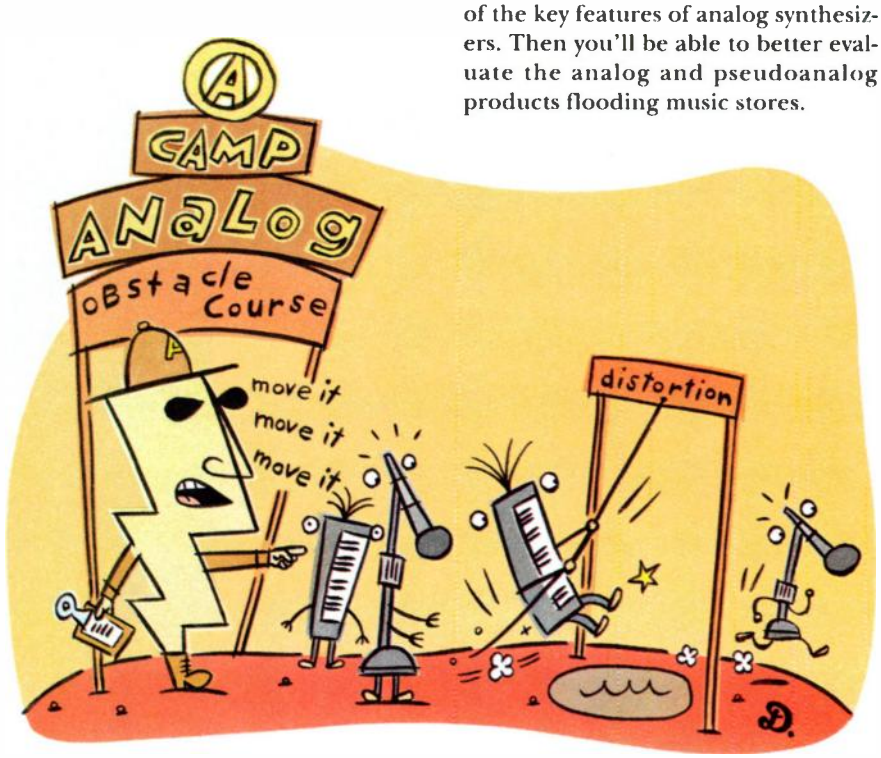


Analog Boot Camp

Learn the true meaning of the word "analog" and other '70s arcana.

By John Duesenberry

Analog synthesizers, real and emulated, are enjoying renewed popularity today. Indeed, analog devices of all types might be more numerous now than they were during the heyday of ARP, Moog, and Buchla. At the dawn of the 21st century, there is steady demand for the technologies of yesteryear. This article will help you understand some basic analog-synthesis concepts and introduce you to some of the key features of analog synthesizers. Then you'll be able to better evaluate the analog and pseudoanalog products flooding music stores.



JACK DESROCHER

The term *analog* has nothing to do with resonant filters, ring modulators, or any other widely advertised "analog" features. Vintage analog machines did have these features, but so do digital devices. *Analog* applies properly to signals and the devices that generate or process them, not to particular synthesizer options.

ANALOG DEFINED

Consider the quintessential analog device: the microphone. A mic responds to fluctuations in air pressure (that is, sound). It puts out corresponding fluctuations in electrical "pressure" (that is, voltage). If you were to plot both air pressure and voltage variations over time, the graphs would look very similar (see **Fig. 1**).

The fluctuating voltage at the mic output is a signal, not a sound. The signal is an electronic representation, or analog, of the original sound. That's all the word *analog* means—there's no mystery to it.

Whether it originates in a mic or electronic circuitry, an analog signal represents sound directly and continuously. The voltage does not move in discrete steps from one level to another; it flows smoothly in an infinite continuum of voltage levels. In the analog universe, even stepped waveforms such as square waves move continuously. A square wave's leading and trailing edges aren't truly "square." Examine a square wave closely on an oscilloscope, and you'll see slightly rounded edges, because the voltage takes a finite time to rise and

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fall. No physical oscillator can achieve the infinitesimal rise time of the ideal square wave.

Analog signals have two key properties: (1) they are continuous, and (2) their parameters—frequency, amplitude, and phase—are continuously (and infinitely) variable. These properties make analog-synthesizer signals profoundly different from digital synthesizer signals. By definition, digital synths represent signals as numbers. Digital signals are quantized into a finite number of discrete steps, and there are no levels between steps. Likewise, parameter values on a digital synthesizer are quantized into a finite number of steps. Smaller step sizes give a digital synthesizer higher resolution; the higher the resolution, the better the synth can approximate the infinite resolution of analog devices.

INFINITE CONTINUUM

It follows from properties 1 and 2 that between any two positions on an analog oscillator's frequency knob, there are an infinite number of other settings. As a result, tuning two analog oscillators to the same frequency is virtually impossible.

This statement is not as absurd as it seems. Oscillators resemble the strings that produce individual piano notes. Any piano tuner knows that two or three strings can be tuned to approximately, but not exactly, the same frequency. This slight detuning between strings produces an amplitude/timbral fluctuation called *beating*, which is considered musically desirable.

You tune analog oscillators as you do piano strings, listening for beats. Yet even if you did tune two analog oscillators to an exact unison or octave, they'd soon drift out of tune. Even the best analog oscillators are inherently unstable, unlike digital oscillators, which are referenced to a highly accurate system clock. Over time, analog oscillators will drift randomly up or down in frequency. Beating is practically unavoidable on true analog synthesizers, unless the oscillators are synchronized or otherwise artificially stabilized.

The warm sound of beating oscillators with complex waveforms is a popular characteristic of analog synthesizers. To get a similar effect on a digital synthesizer, you must detune the oscillators, preferably with a little randomized frequency variation.

These concepts also apply to filter cutoff and Q, signal gain, and all other parameters: if you want analog sounds from a digital machine, you need the highest resolution you can get. Manufacturers seldom reveal how they quantize parameter values. When you check out an analog-modeling synth, turn the knobs slowly and listen carefully for discontinuities.

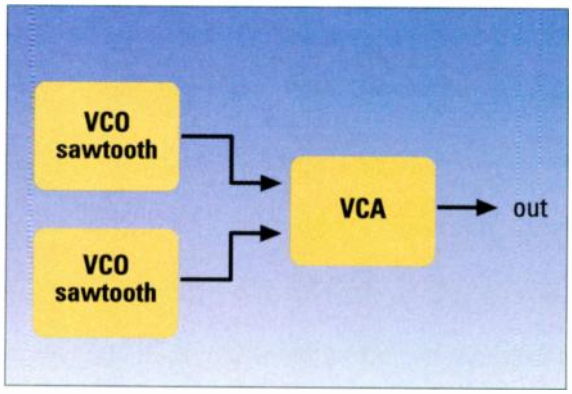

FIG. 2: This simple patch can sound noticeably different from one analog synthesizer to the next. This is because each synthesizer's voltage-controlled amplifier has different distortion characteristics.

TAKE CONTROL

Just as with audio signals, control signals determine how an analog synthesizer sounds. To understand this, you need to understand the concept of *voltage control*. Synthesizer modules such as voltage-controlled oscillators (VCOs), filters (VCFs), and amplifiers (VCAs) have one or more control-signal inputs. A varying voltage (signal) applied to a module's control input causes a particular parameter—a VCO's frequency, a VCF's cutoff frequency, or a VCA's amplitude—to vary in a similar manner. Analog control signals are just as continuous as audio signals. Any parameter under voltage control fluctuates continuously in proportion to the control signal.

Take amplitude envelopes, for instance. An analog envelope generator outputs a smoothly varying voltage. If the gain of a VCA is controlled by this envelope, it rises and falls just as smoothly.

Digital control signals work quite differently. Again, I'll use envelopes as an example. The function of a digital envelope generator is to generate a stream of numbers at some periodic rate. These numbers are used to scale the instantaneous amplitude values of audio samples. The rate at which the envelope generator produces its values is called the *control rate*. It's usually a fraction of the audio sample rate. For example, if the audio sample rate is 44,100 Hz, the envelope generator

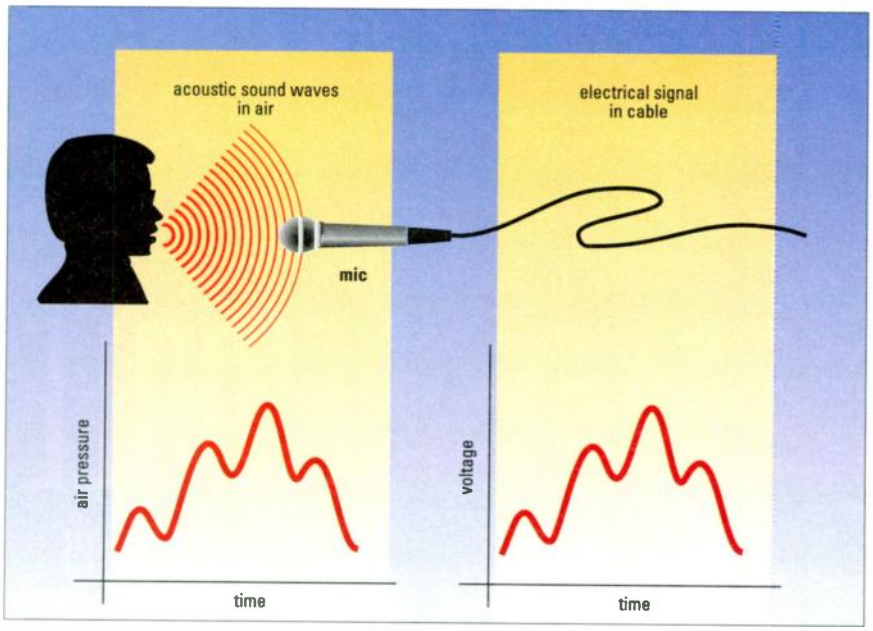

FIG. 1: A microphone converts a sound wave into an electrical signal that is analogous to the original sound wave. A graph of air pressure over time for the sound wave looks similar to a graph of voltage over time for the electrical signal.

THERE'S NOTHING TO FEAR IN SYNTH ITSELF.

The MS2000 is a synth that isn't afraid to act like one. Its meaty analog sounds and knob-packed interface harken back to a day when synths invited you to shape your sound as you played. It pays tribute to all that made synths amazing in the first place, with modern modeling technology that opens up a new universe of possibilities. Don't be timid, take a peek:

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See, that wasn't so scary now, was it?

For more on the MS2000, including links to reviews, go to www.korg.com/ms2000

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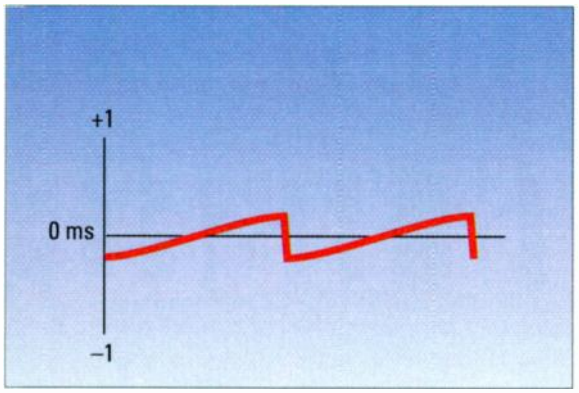

FIG. 3: A sawtooth wave distorted by "soft" clipping. The waveshaping effect of the distortion causes the sawtooth ramp to be rounded. The harmonic content of the signal is somewhat reduced in comparison with an undistorted sawtooth.

might produce values at a control rate of 441 Hz. In this case, there would be a level change every 100 samples. If the control rate is too slow, there can be an audible "staircase" effect.

MODULARITY

A modular synthesizer is constructed from an expandable number of functionally separate components called *modules*. Interconnections between modules are pretty much unrestricted. Many famous analog machines (such as the Moog 55 and ARP 2500) were modular, so the term is often associated with analog synthesizers. However, a digital synthesizer can be modular as well. (Plug-ins are the "modules" of today.)

A well-designed modular synthesizer makes almost no electrical or logical distinction between audio and control signals. Analog modular synthesizers let you control almost any module with the output of any other module. For example, you can "play" a VCA's gain with a keyboard voltage (analog synths use keyboards that generate different constant voltages for each note). You can also control a VCO's waveform with a pink-noise generator's filtered output or create complex control-signal hierarchies with feedback loops.

Most hardware synthesizers today are constrained by preset signal paths. If you want a real modular architecture, you'll have to look among the many software synthesizers currently available (see "Going Soft" in the July 2000 issue of **EM**).

TYPECASTING

Several categories of synthesizers contend in the analog marketplace. A *true analog* synthesizer fully lives up to properties 1 and 2: it boasts continuous signals and infinitely variable parameters. Companies such as Serge Modular and Technosaurus build these system types, and a new, all-analog synthesizer has been announced by Big Briar, Bob Moog's company.

A *hybrid* synthesizer employs some combination of digital and analog techniques. For example, it might have true analog oscillators, filters, and envelope generators controlled with quantized knobs. Quantization makes it possible to store parameters in memory, but it also sacrifices some degree of analog resolution. The famed Sequential Circuits Prophet-5 was an early hybrid synthesizer, and several products from Studio Electronics fall into this category.

An *analog-modeling* synthesizer is all digital. To emulate the characteristics of true analog synthesizers, it implements mathematical models of analog circuitry. Analog modeling is a type of physical modeling, but it imitates electronic hardware instead of mechanical or acoustic systems. Software synths that employ analog modeling include BitHeadz's *Retro AS-1*, TC Electronic's *Spark Modular*, and Native Instruments' *Reaktor*. Hardware devices offering analog modeling include the Clavia Nord Lead and Korg's OASYS PCI system and MS2000 synth. Guitarists are mad for devices that model tube amps, speaker cabinets, and spring reverbs, such as the Line 6 Pod.

The term *virtual analog* seems to refer to any digital synthesizer that imitates analog features. These days, any machine with a resonant filter or a bunch of knobs is marketed as "virtual analog," a term I'll avoid.

ANALOG TECHNIQUES

Now that I've covered some of the general characteristics of analog synthesizers, I'll turn to some specific features and synthesis techniques associated with analog machines. You'll find that many of these features are implemented on analog-modeling machines. If you need a quick review of modulation synthesis basics, refer to "Square One: Modulation Synthesis Methods" in the March 1999 issue of **EM** and "Square One: FM Basic Training" in the April 1999 issue.

Analog distortion. The way in which analog synthesizers distort a signal contributes significantly to their sound. A good analog model offers a choice of distortion characteristics, reflecting the operational differences among different brands of analog synthesizers.

For example, if you set up the simple patch in **Fig. 2** on an ARP 2600 and a Moog 55 modular system, you'd be surprised at how different they sound. On the ARP, you'd hear a shrill sound with audible harmonic and intermodulation distortion. The Moog would sound warmer and less piercing.

The difference stems from the VCAs' behavior. On both machines, the summed sawtooth signals exceed the maximum input level of the VCA. This produces severe clipping in the ARP VCA. But the Moog VCA's "soft" distortion characteristics somewhat reduce the signal's harmonic content. **Fig. 3** shows a soft-distorted sawtooth wave; notice the rounding of the sawtooth ramp.

The ARP 2600's high internal signal levels and its clipping characteristics made it difficult to create any patch that was free of hard clipping. This is why many '70s records made with the 2600 sound cheesy and edgy, whereas Moog recordings usually don't.

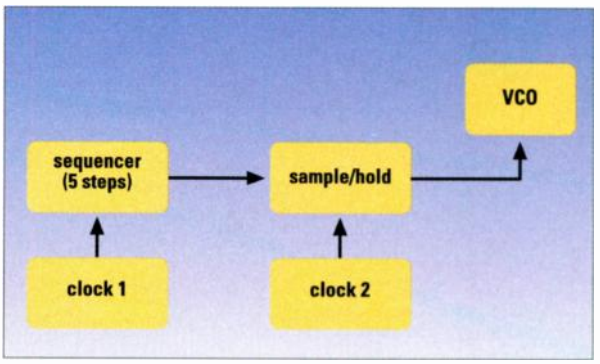

FIG. 4: In this patch, the output of an analog sequencer is sampled by a sample-and-hold circuit and patched to the frequency-control input of a voltage-controlled oscillator (VCO). The sequencer and sample-and-hold module have independent clocks. As the clocks go in and out of phase, an ever-changing pattern of pitches is produced.

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Pulse-width modulation (PWM). A pulse wave alternates periodically between a high-voltage value and a low one. Pulse width is defined as the percentage of each cycle that the pulse wave stays at the high value. For example, a square wave is a pulse wave with a width of 50 percent. In PWM, an audio-frequency modulator varies the pulse width, producing many harmonic components that sound like a complex form of amplitude modulation. With a low-frequency (below 20 Hz) modulator, PWM sounds a bit like phasing. PWM is often implemented in analog-modeling synthesizers.

Filter modulation. This type of synthesis requires a filter with a continuously variable cutoff frequency that can be controlled by an audio-frequency modulator. Most analog VCFs meet these requirements, but digital implementations of audio-rate filter modulation are rare. This is too bad; it's an interesting technique, often sounding like amplitude modulation with strong peaks in the spectrum.

Step sequencers. Analog sequencers were inspired by tape loops. They were designed to produce short, looping patterns of melodies, rhythms, and accents. An analog sequencer is driven by a clock signal and repeatedly steps through a series of individually tuned voltages. Generating pitch sequences was the most common application of analog sequencers. The stepped voltages were applied to the pitch-control input of a VCO, producing a repeating melodic sequence that was typically about 16 notes long. Most users of step sequencers never figured out how to vary the steps' duration, although it was quite possible to do so.

A few analog masters, such as Morton Subotnick and Roger Powell, devised amazing variants of this essentially boring procedure. Digitally implementing step sequencing is trivial, and it's making a comeback due to its kinship with fashionable looping devices such as samplers and drum machines.

Sample and hold. Also driven by a clock, a sample-and-hold circuit periodically takes a "snapshot" of its input signal and holds that value until the next clock pulse. This process is similar to that of a sampler's analog-to-digital (A/D) converter, which takes a snapshot of the incoming analog signal's instantaneous level many times per

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second and stores that value until the next snapshot. However, a sample-and-hold circuit takes its snapshots much more slowly than an A/D converter.

On many vintage machines, such as the ARP 2600, the preset input to the sample and hold was noise. Thus, the output was a series of random voltage values, the forerunner of the random LFO waveforms seen on almost every modern synthesizer. Fortunately, you can do many more things with a sample and hold. For example, the patch in **Fig. 4** uses a step sequencer with a sample and hold, each independently clocked. A sequence of five voltages is sampled, and the output is applied to a VCO. This produces a pattern of five pitches that varies continuously as the two clocks go in and out of phase.

FURTHER READING

If you want to delve into analog lore, you'll have to hunt for old, out-of-print publications. Check out these titles:

- James Michmerhuizen's user manual for the ARP synthesizer (originally published in 1971; reprinted in 2000 by the author). You can order it at world.std.com/~jamzen/theBachWorks/arpman.html.
- *Analog Electronic Music Techniques* (Schirmer, 1985) by James Wagoner and Joel Naumann.
- *The Technique of Electronic Music* (Schirmer, 1981) by Thomas Wells.
- *Electric Sound* (Prentice Hall, 1977) by Joel Chadabe. A historical overview of electronic musical instruments.

Frankly, the analog synthesizers of the '70s were a headache to work with, compared with today's imitations. If you find a vintage machine, play with it for fun, but don't buy it unless you're a historian or nostalgia addict. If you seek analog or analog-like sounds, you're much better off with a modern hybrid or analog-modeling synthesizer. Although it might not meet true analog specs, it will be pitch-stable and have patch memory and MIDI compatibility.

John Duesenberry *'s electronic music is available through the Electronic Music Foundation and CDemusic. Check the CDemusic catalog at www.cdemusic.org.*

 (continued from p. 34)

hertz-indicated coarse-tuning slider, and lack of an A 440 guide, button, or position. If you're trying to play with other instruments, slider-controlled oscillator coarse tuning is an almost certain recipe for disaster, as one tiny nudge creates tuning havoc. If you find a sound you really like, sample it.

The Odyssey garners major plus points for distinctively rich basic timbres (check out Edgar Winter's "Frankenstein," the unit's extensive use on Ultravox's "Vienna," and the bass on Herbie Hancock's "Chameleon" from the *Headhunters* album), creative sample-and-hold permutations, and thoughtful features such as a pedal that maneuvers the filter cutoff for wah effects.

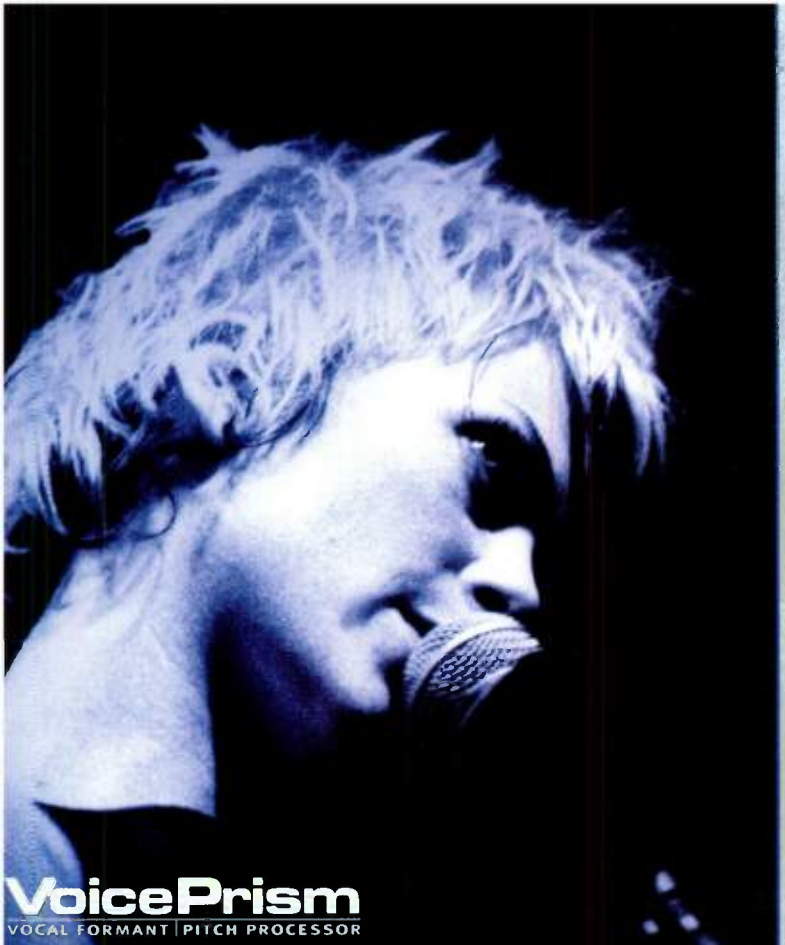
The Odyssey's fundamental weirdness makes it excellent fodder for drum 'n' bass, jungle, and even hip-hop. But whereas a Minimoog sounds fat, an Odyssey is sharper and thinner. Still, you can tap into the self-oscillating filter on a CV input-equipped model to add some bass tones to the sounds of, say, a Roland TB-303 or drum machine.

ARP made three distinctly different looking models. The Mk I—deemed to have a slightly richer sound—featured a white/gray control panel; a dark gray panel was used for Mk II instruments; and the final look on the Mk III was a gaudy black and orange.

Encasing certain components in resin was a trick that ARP employed from time to time. Some say this was a temperature-stabilizing measure to aid tuning stability; others claim it was ARP's paranoia, preventing anyone from looking too closely at the design. Either way, repairs to resin-encased modules are extremely complex.

Plenty of Odyssey resources can be found online. You can download the ARP Odyssey service manual a page at a time from http://aupe.phys.andrews.edu/diy_archive/manuals/arp, and www.netcontrol.fi/~jocke/arptech/modmain.htm contains page after page of seriously technical information.

Julian Colbeck *has toured everywhere from Tokyo to São Paulo with artists as varied as ABWH/Yes, Steve Hackett, John Miles, and Charlie.*



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REVIEWS

TASCAM

MX-2424

Are you ready for the 24-bit HDR challenge?

By Myles Boisen

At last year's Winter NAMM show, I paid close attention to the crop of unreleased compact 24-track hard disk recorders (HDRs). One such unit was the relatively inexpensive Tascam MX-2424, which was developed in association with TimeLine, a company known for its high-quality synchronization devices and digital dubbers. When this HDR became the first of its kind out of the gate, I jumped at the chance to review it.

I set aside a couple of days to acquaint myself with the MX-2424, figuring that would be more than enough time to get a grip on new technology. But my first glance at the "quick reference guide"—a four-panel, 8½-by-11-inch booklet printed on glossy card stock—should have clued me in that this was no simple plug-and-play machine. After scanning the manual for a half hour, my analog brain was swimming from the possibilities of a recorder with two dozen 24-bit tracks, onboard cut-and-paste editing, looping and auto-record, external computer control, DVD-ROM and tape backup, and virtual tracks. This is one powerful machine and its arrival at Guerrilla Recording was a loud wake-up call that catching up to the latest digital recording technology was going to require some effort.

STORAGE UNIT

Along with the review unit, Tascam supplied six D-sub-to-¼-inch TRS analog snakes and an ADAT-optical digital I/O module. An AES/EBU I/O module

FIG. 1: The Tascam MX-2424 hard disk recorder offers both 16- and 24-bit recording and a wealth of recording and editing features. Optional I/O cards must be installed to ready the machine for 24-track recording.

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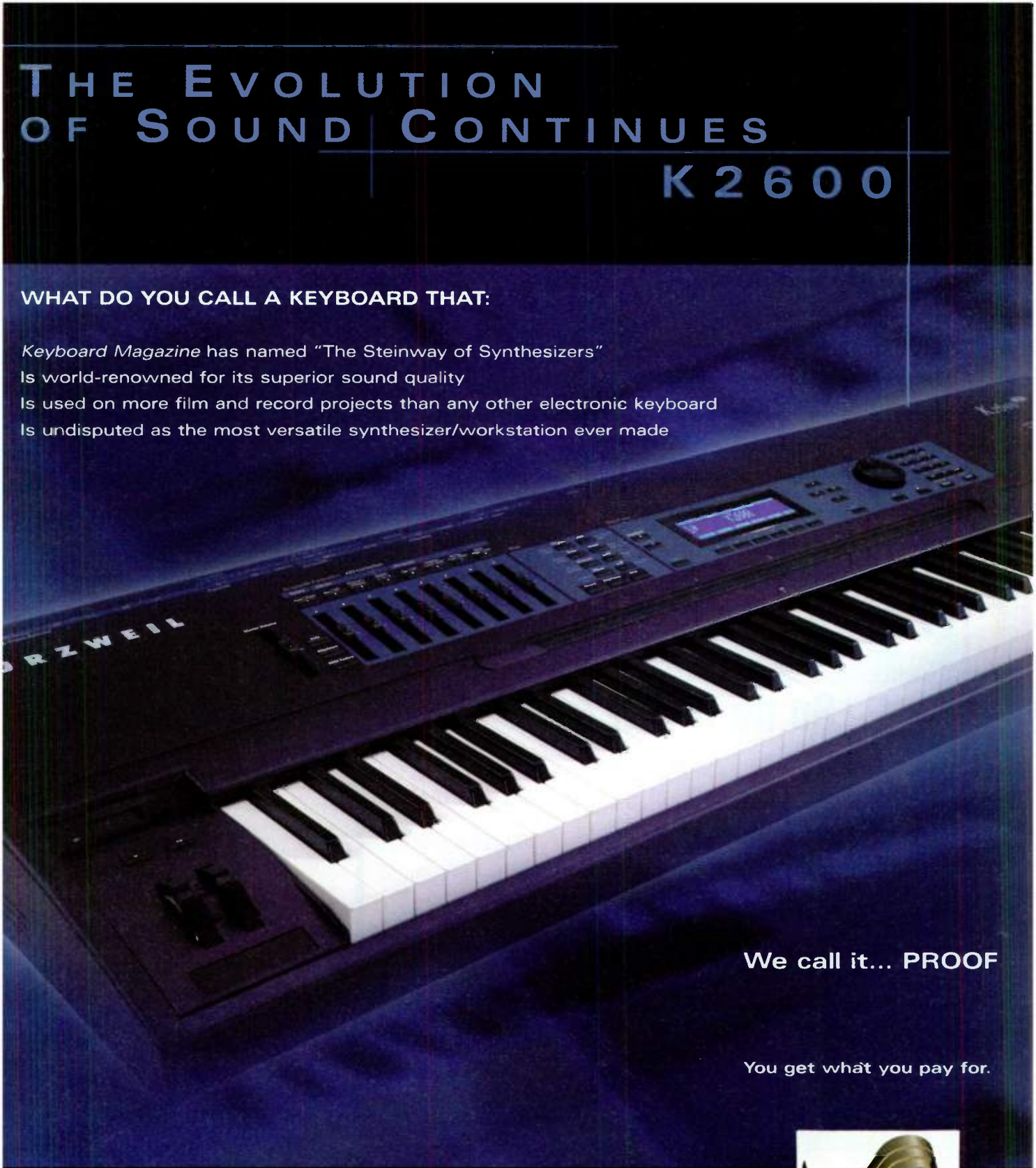

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with input sampling-rate conversion is also available, as is a Tascam TDIF-format I/O. All I/O cards are optional equipment, supplied at additional cost. It is interesting to note that Tascam, one of the biggest supporters of the personal-studio revolution, has broken with tradition by not offering any –10 dBu consumer-level analog I/O in this professionally oriented package.

An internal 9.1 GB drive comes standard with the basic MX-2424 package, and a front-loading drive bay can be configured to accept optional SCSI hard drives, DVD-RAM, and Travan tape-backup devices. (Since this review was written, Tascam has released a software upgrade, version 1.10, which is included on all shipping units. The upgrade allows access to drive volumes much larger than 9 GB, as well as to Broadcast Wave files and FAT-32 drive formatting. HFS+ for Mac volumes beyond 9 GB were scheduled to hit the market in November.)

The test unit also included a CD-ROM (Mac and Windows compatible) containing MX-OS 1.02 system software, *ViewNet* graphical-user-interface software for Mac and PC, an owner's manual, a Smart Media card, and IEC and drive power cables.

IT AIN'T HEAVY, IT'S MY HDR

After surveying the accessories, I hauled the MX-2424 out of its oversize shipping box. Although not particularly heavy, the unit is bulky. At 17 inches square, it may be too deep to fit in some portable road cases.

The MX-2424's 4U rack-mount front panel is remarkably well organized considering that there are 73 buttons (many with dedicated status lights), 20 additional status lights, 24 channel meters, a shuttle wheel, a Smart Media card slot, a blank drive-bay panel (removable for drive installation), and an AC power switch (see Fig. 1). The LCD is small—3 inches wide and less than ¾ inch high—but sufficient to display two lines of text.

Editing without *ViewNet* is not easy.

All connections—I/O, synchronization, remote, MIDI, and computer—are made on the rear panel, which is also where the user-installable I/O cards go (see Fig. 2). The absence of a single control or switch on the MX-2424's back panel underscores the device's professional nature.

When I booted up the MX-2424, the internal hard drive was mounted and apparently ready to record within 15 seconds. Fan noise was audible at a level that could be a distraction, at least during mixdowns and critical listening. Unlike earlier Tascam DA-series recorders, the MX-2424 is vented by a fan that gently pushes air out of the unit, rather than sucking air (and dust) into the case.

LE MENU

The manual has no getting-started section, so I began at the Menu Operations chapter and scrolled through the nine menu banks that govern software-based switching. The basic banks, which you access through numerical buttons or up/down scrolling, are titled as

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loaded into or out of any track for comparison purposes, and are also available for editing with full undo/redo capability.

TL-Tape mode mimics the operation of an analog-style recorder, recording over and effectively erasing previous sections of audio from the hard drive. In this mode, editing is not an option, although virtual tracks are still available. So what's the point? Well, TL-Tape mode does offer the advantage of creating tracks as contiguous Sound Designer II files, which can easily be imported into popular computer-based editing programs such as *Pro Tools* and *Digital Performer*. (The manual also neglects to mention that you can't set up a user default for saving recordings done in TL-Tape mode—another omission that left me scratching my head.)

I eventually set the manual aside and tried some simple recording scenarios. Recording from an analog source proved a snap, thanks to the familiar set of transport controls. But I hit a few snags on my first foray with a digital input, and eventually had to go back to the manual for clarification. (Thankfully, a new manual is being produced soon, according to Tascam, and the company will add tutorial information to its Web site.)

File management is another topic that could use some explaining in the manual—an instructional chapter about organizing tracks, songs, and projects would be helpful for first-time users. Fortunately, the Proj key's functions, which include loading, renaming, and deleting projects, as well as performing backup, restore, and copy functions to other drives, are thoroughly detailed on an entire page of the quick reference guide. Identifying and renaming the previous sessions' recordings proved easy enough; however, alphanumeric scrolling in an LCD window is a bit of a drag, even with a shuttle wheel.

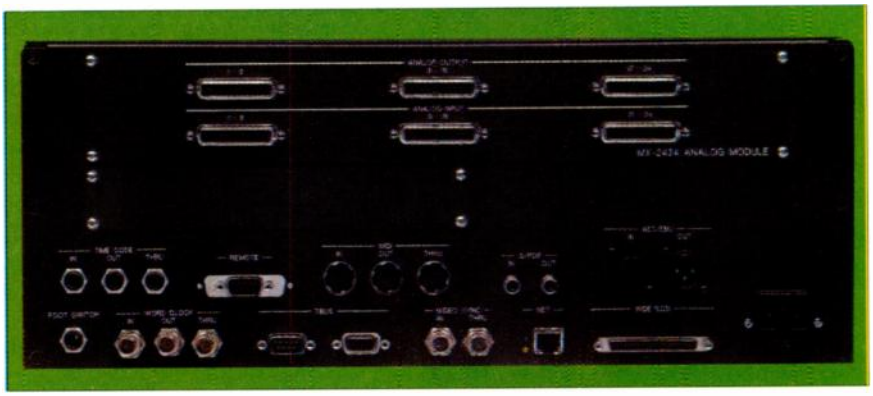

FIG. 2: When the optional analog module is installed, it provides the MX-2424 with 24 inputs and outputs on D-sub connectors. Supplied connectors include Time Code In, Out, and Thru; remote; MIDI In, Out, and Thru; S/PDIF in and out; AES/EBU in and out; ¼-inch footswitch; Word Clock In, Out, and Thru; TBus; Video Sync In and Thru; Ethernet; and Wide SCSI.

DEEP DIGITAL

Naturally, the MX-2424's multitude of I/O, clock, and sync sources makes master-clock selection a necessity; however, some of the selection processes are needlessly complicated. Recording from a 2-track digital source, for example, requires accessing one menu to locate and select the 2-channel digital input; another, nonadjacent menu to specify S/PDIF as the 2-channel source; and a third menu to specify the 2-channel input device as the sample-reference clock source—a rather cumbersome button-pushing sequence.

At the same time, flexible digital switching distinguishes the MX-2424 as a fully professional unit. However, the manual covers this topic insufficiently and doesn't serve the needs of novice users. For example, engineers used to working only with DAT, CD-R, and so on may need a reminder that they must first set a master-clock source when recording from an external digital device. For less experienced users, clocking is a complicated issue. Misunderstanding or ignoring its significance can result in various types of audio degradation.

SMOOTH MOVES

After straightening out these digital details, I was happy to discover that toggling through the connected analog, S/PDIF, and AES/EBU digital inputs was surprisingly smooth, with no muting or nasty digital glitches. I heartily applaud the MX-2424's ability to route standard S/PDIF and AES/EBU stereo signals to or from any odd/even pair of tracks. This feature should prove tremendously useful for adding instruments to a finished stereo mix, archiving 24-bit mixes, and even doing simple assembly edits for a multisong project with the aid of the *ViewNet* graphical-user-interface application.

Users can run *ViewNet*—which Tascam calls a "visual editing environment"—if the MX-2424 is linked to a host computer through the 100 MB Ethernet port. To run this application

MX-2424 Specifications

Tracks	24
Virtual Tracks	999
Digital I/O	(1 pr.) AES/EBU (XLR); (1 pr.) S/PDIF (RCA)
Digital Frequency Response	20 Hz–20 kHz (±0 dB)
Crosstalk (through)	<–95 dB between any channels (20 Hz–20 kHz)
Sample Resolution (recording)	16-bit or 24-bit linear (switchable)
Internal Processing Resolution	24-bit
Timing Reference Sources	internal, internal varispeed, follow time code in, video (either NTSC or PAL), AES/EBU, S/PDIF digital clock input, word-clock input, TL-Bus
Time Code Type and Rate	30 NDF, 30 DF, 29.97 (NTSC default), 29.97 DF, 25 (PAL default)
Dimensions	4U rack-mount × 17.5" (D)
Weight (without optional cards)	26 lbs.

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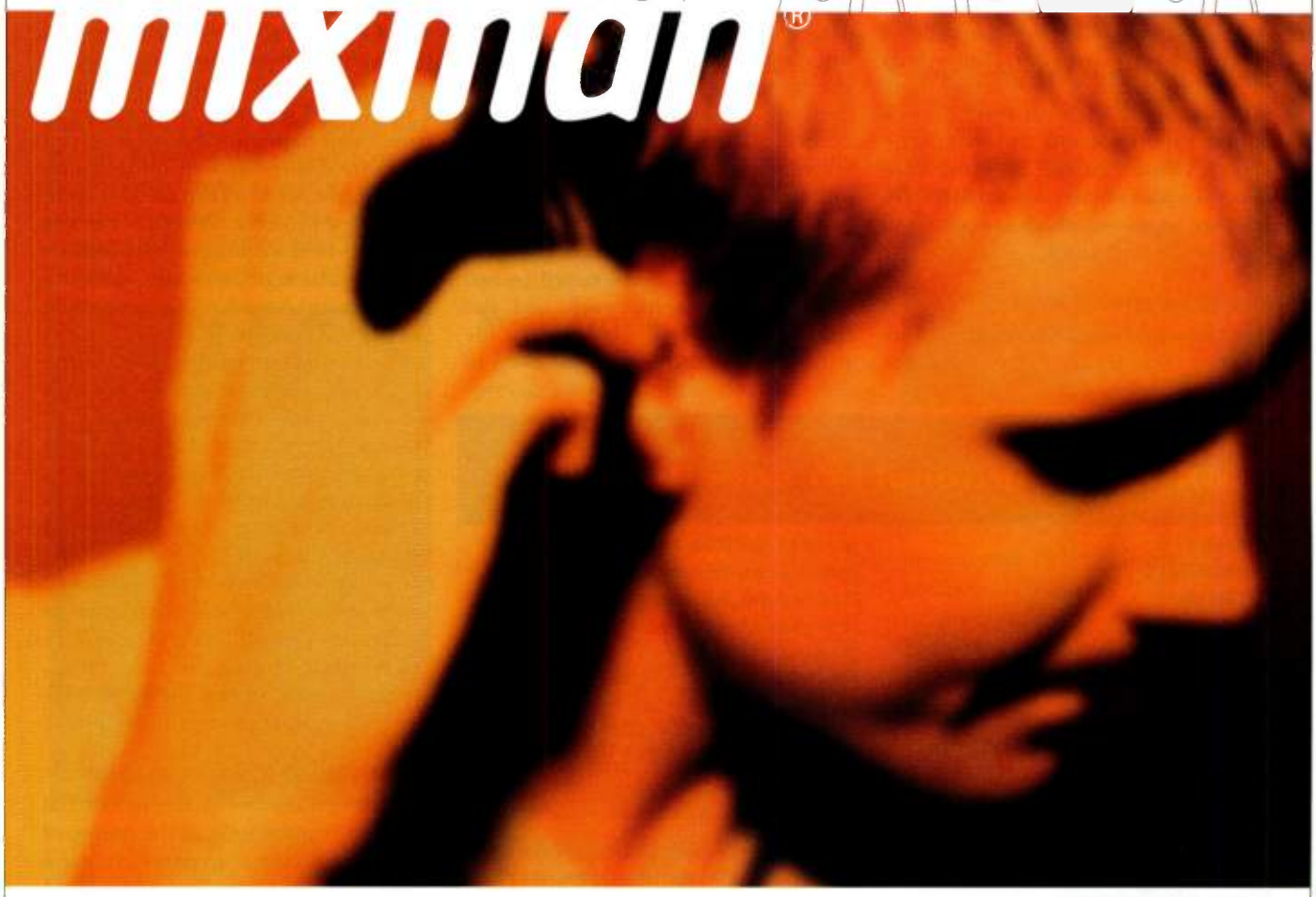

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MX-2424

by how robust the ADAT-recorded tracks sounded coming out of the MX-2424's D/A converters. A comparison of the program directly from the ADAT's analog outputs with the same program going digital in and analog out of the MX-2424 confirmed that it was easy to hear the improvements in the tracks' depth and listenability from the MX-2424's D/A converters.

Not surprisingly, the Apogee converters proved a more formidable challenge. Using a coincident pair of Neumann U 87 microphones through a Langevin Dual Vocal Combo preamp, I recorded an impromptu jam session assembled by trumpeter Darren Johnston directly to two-track, splitting the stereo-mic signals to feed both the MX-2424 and the Apogee PSX-100/Panasonic SV-3800 chain.

Compared with the Apogee-converted tracks, the top octave—or "air" range—of the MX-2424 tracks sounded dull. The cymbals lost crucial upper harmonics and "ping," and room detail on trumpet and hi-hat ambience came across as veiled or simply missing. In a passage where an aggressive bass solo masked off-mic trumpet notes, the trumpet phrase came through with dramatic clarity on the Apogee/DAT recording. The acoustic bass sound captured by the MX-2424 was very warm, though a bit tubby, with a pronounced 200 to 800 Hz range that also brought toms forward in the stereo mix. Though the bass sounded good coming from the MX-2424, the instrument had more true low fundamentals through the Apogee converter.

Overall the MX-2424 made the group recording sound more intimate and up front by downplaying the contributions of the room. The Apogee/Panasonic DAT combo conveyed a wider soundstage with more depth and openness, as well as increased realism and detail in room ambience. (These impressions were confirmed on the D/A side too. For this comparison, I toggled between the MX-2424's D/A converters and the Apogee PSX-100's converters, fed by the Tascam's AES/EBU output.)

Of course, it's understandable that a pair of $3,000 converters would outperform those in a 24-channel I/O box retailing for only $1,699. In that regard, the Tascam converters are a great deal, considering the cost of using 24 channels of high-end outboard converters.

The Tascam converters certainly have a characteristic sound that's closer, tighter, and warmer than most. These attributes could prove attractive to studios doing a lot of rock, hip-hop, R&B, and pop music. Though these converters are definitely an improvement over those found in first-generation 16-bit MDMs, to my ears they are not quite audiophile quality, as Tascam claims. I would prefer pairing the MX-2424 with higher-end outboard converters—especially for recording jazz and classical music.

HEAD OVER HEELS

Despite my lukewarm feelings about the sound of the MX-2424's converters, I fell in love with several of the unit's features, such as instantaneous rewind and locate. And how about the Tascam's potential for 24-bit mixes stored alongside the multitrack master, or as virtual tracks, not to mention the ease of tucking the unit under my arm for those little excursions from the recording studio to the mastering room?

The MX-2424's ability to do real-time sampling-rate conversion is another

COST OF DOING BUSINESS

The MX-2424 is a modular system that can be customized and expanded to match the needs of any personal or professional recording studio. The heart of the system is the MX-2424, which retails at $3,999. For multitrack work, at least one of the following modules must be installed:

IF-AN24 (24-channel analog I/O module) $1,699
IF-AE24 (24-channel AES I/O module) $999
IF-AD24 (24-channel ADAT-optical I/O module) $499
IF-TD24 (24-channel TDIF I/O module) $499

The RC-2424 ($1,499) remote control unit is a handy extra that allows remote location of the MX-2424, and even includes a few features not found on the main unit.

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big selling point. To test this DSP-based feature, I converted a 48 kHz signal (applied at the S/PDIF input) to 44.1 kHz. The MX-2424 did a decent job, with very low latency and no audible harshness or artifacts added to the source. This is no small feat. Understandably, after sampling-rate conversion, the highs above 10 kHz were dulled slightly; however, there was also a noticeable loss of bass frequencies (as compared with the original 48 kHz DAT source).

IN A REMOTE CORNER

The RC-2424 remote control arrived toward the end of the evaluation period. Installation was easy, requiring only a simple hookup of the control cable and power supply, and a 2-minute wait for software exchange. The remote's faceplate follows the general look and layout of the main unit, with some notable exceptions: the LED meter ladders have been replaced with four status lights (Input, Overload, Select, and Record); a section of multiple-machine-select and record-status buttons has been added; and a row of macro keys allows you to save complex edits and set up keystroke sequences as single-button operations. In addition, some

TASCAM
MX-2424 modular hard disk recorder
$3,999

FEATURES ■■■■
EASE OF USE ■■■
AUDIO QUALITY ■■■■
VALUE ■■■■
1 2 3 4 5

PROS: Portable and reliable. Interfaces to word clock, MIDI, SMPTE, video sync, and all common digital audio formats. Handy routing of S/PDIF and AES/EBU stereo signals to pairs of tracks. Stores 24-bit mixes. SDII-format files can be loaded into DAWs. Computer control. Basic remote-control functions.

CONS: Bare-bones manual. Complex user interface. A/D and D/A converters less than audiophile quality. Alphanumeric scrolling cumbersome. No support for –10 dBu signals. Waveform editing and 88/96 kHz recording not yet implemented.

location and looping keys have been moved around and enlarged to the same size and prominence as the transport controls. Considering all these changes, it's too bad Tascam didn't find a way to make the RC-2424's LCD a little larger.

An Alesis LRC connected to the footswitch jack can also be used for transport control of the MX-2424. However, the LRC must be connected before booting up the MX-2424—another point that is missing from the manual. The LRC allowed one-button control of the Tascam's auto-input and all-input status, and worked even when the RC-2424 was attached. I'd rather use the RC-2424 and LRC in tandem, even though triggering the auto-input from the LRC did prompt the occasional—and inexplicable—"Loop too short" error message.

ONE-STOP SHOPPING

The MX-2424 is an extremely powerful and versatile 24-track hard disk recorder with good sound quality, a vast feature set, and a very attractive price. The unit provides a variety of cut-and-paste editing functions; 99 locate points; 100 levels of undo/redo; multiple looping, rehearse, and auto-record functions; backup to hard drives, DVD-RAM, or Travan tape; word clock, MIDI, SMPTE, and video sync; software for onscreen computer editing; a 9.1 GB hard drive; and many other features. Optional 24-channel I/O modules allow for 24 tracks of 16- or 24-bit recording, as well as TDIF, ADAT-optical, and AES/EBU connections, and there is also an optional remote control. In short, there is little that this HDR can't do.

However, this groundbreaking product could have been more user friendly. Moreover, little effort has been made to provide tutorial materials that would let novice engineers, recent analog-to-digital converts, and personal-studio-level recordists take advantage of its vast potential. Getting up to speed on this HDR was a huge challenge. Even after constant grappling with myriad multiple-button procedures (which initiate all but the simplest of the unit's functions), I still didn't develop a feel for this machine.

I would prefer pairing the MX-2424 with higher-end outboard converters.

Navigational complexities aside, the MX-2424 sounds good, and with software revisions and/or souped-up converters, it has the potential for sonic greatness. For the most part, Tascam's flagship HDR cuts an impressive figure as a do-it-all unit for the digital age, with no major compatibility, expansion, or platform problems. There's an interface for every imaginable analog, digital, and visual media need; the unit is reliable and crashproof; and the price is right.

Myles Boisen *is a guitarist, producer, composer, and head recording/mastering engineer at Guerrilla Recording and The Headless Buddha Mastering Lab in Oakland, California. He can be reached by e-mail at mylesaudio@aol.com.*

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FIG. 2: The step sequencer in *Dynamo*'s Cyclane Ensemble has a scale-correction stage in the upper right section of the Control Panel that makes it easy to create and transpose tonal sequences. The sequencer plays the compact hybrid FM synth in the lower right section of the Control Panel.

To the right of this button is a CPU usage indicator. *Dynamo* wants a lot of your CPU, even on a fairly fast system. Naturally, it gives top priority to audio processing, while relegating other tasks—such as scanning the computer keyboard and mouse—to the back burner. I was locked out of my system several times while playing *Dynamo*'s demo MIDI files. You can lighten the processing load by reducing the internal sampling rate; this is recommended if you can live with less-than-CD quality. (Common rates from 22.05 to 132.30 kHz are supported.) Regardless of the internal rate you choose, *Dynamo* converts audio to your sound card's sampling rate on input and output.

Another way to save CPU cycles is to turn off some of the Instruments in an Ensemble. To maximize CPU efficiency, *Dynamo* recompiles an Ensemble each time a processing element is added or removed from the signal path. The drawback to this approach is that changing Snapshots can be a slow process when recompiling. This can result in a hiccup when playing back MIDI files that include Program Changes or when you manually change Snapshots.

The onscreen controls respond to vertical mouse motion. Under Windows (and slated for a forthcoming Mac update), the selected control can also be manipulated from the computer keyboard. This is a handy feature, because fine-tuning with the mouse can be tricky. You can also assign any of the controls to a user-selectable MIDI controller message—which means that you can automate parameters from a MIDI sequencer or hardware controller. Most of the controls in *Dynamo*'s Ensembles have default assignments, but double-clicking on the desired control can change them.

You can also click the MIDI Learn button (a MIDI-plug icon with the letter *L*) in the Toolbar to assign the next incoming MIDI controller message to the selected onscreen control. The feature is extremely useful when tweaking patches, because making temporary fader assignments in the software means you don't have to modify the controller mappings on MIDI hardware. To keep the new assignments, save the Ensemble under the same name or a different one.

Onscreen help can be toggled on or off with a Toolbar button; when help is activated, mousing over a control brings up a description of its function. Because the manual's explanation of the Premium Library Ensembles is somewhat cursory, this onscreen help is crucial to finding your way around some of these monster synths.

CAST OF CHARACTERS

As I mentioned earlier, *Dynamo*'s Ensembles are organized into six categories. Some, such as the Ensembles in the Synths – Subtractive category, are modeled after vintage hardware synthesizers, while others, including those in Samplers + Transformers, reflect the unique features of *Reaktor*. Here is a summary of what's on hand.

Synths: Subtractive. There are five Ensembles in this category. The Ensemble called 3-oSC is a generic 3-oscillator synth with a multimode filter and ADSR envelopes for the filter and amplifier. On my Mac G3/300, 3-oSC was easily able to generate eight voices at a sampling rate of 44.1 kHz with plenty of CPU cycles to spare for my sequencer. In spite of—or perhaps because of—its simplicity, 3-oSC can generate lots of nice vintage analog sounds.

At the other end of the CPU-hog spectrum is Uranus, a 3-oscillator, dual-filter Ensemble with complex modulation routing and a number of built-in effects, including a beautiful 4-delay chorus. Uranus defaults to three voices at 33.075 kHz, but its lush pads are worth the price.

The remaining three synths are modeled after vintage analog machines: the Minimoog (ManyMood), the Oberheim 2-voice (Me2SalEM), and the Roland SH-101 (SH-2k). These software versions are not emulations of those synthesizers' exact sounds, but Native Instruments has attempted to model their idiosyncrasies.

My favorite among these three is Me2SalEM (probably because the 2-voice

FIG. 3: *Dynamo*'s three drum machines provide a wide range of sounds. Here, one module from each drum machine is shown: Hat 2 (top) is from Drumatik; C4 (bottom left) is from Gonzzo; and BassDrum (bottom right) is from DSQ-32.

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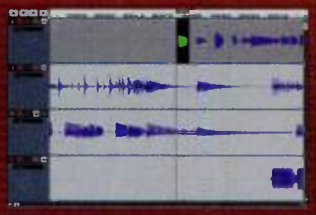

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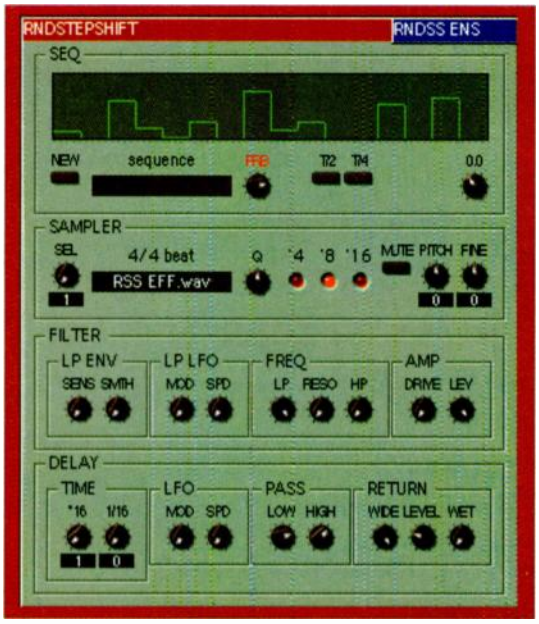

FIG. 4: The Random Step Shifter Ensemble rearranges beat loops by shuffling quarter-, 8th-, or 16th-note segments.

was my first synth); its components are shown in **Fig. 1.** The best-kept secret of the 2-voice was that lurking behind each of the two synthesizer-expander modules (SEMs) that produced its two voices were little plastic Molex connectors for patching the various components together. Me2SalEM brings a similar spirit to the front panel, with an input matrix that routes noise, an external signal, or the output of either SEM to the input of the other. (See the panel marked "Ensemble" at the bottom left of **Fig. 1.**) A stereo delay has been added at the end of the signal chain for good measure. All three models can produce four voices without taxing the CPU.

Synths: FM + Hybrid. Three of the Ensembles in this group offer variations on an FM theme; another is modular with matrix patching; and the fifth is modeled after the PPG and Waldorf wavetable synths.

Of the three FM synths, FritzFM is the closest to a classic model. It has six sine-wave operators and produces most of the typical FM sounds. InHumanLogic also has six operators, two of which offer saw and pulse waveforms. It provides a switching matrix for various modulation algorithms, including complex output configurations. Although it is capable of traditional FM sounds, it stretches far beyond these limits.

Cube-X's four operators feature all the standard oscillator waveforms, along with noise and sample playback, and in this way it deviates most from the classic FM model. A 4-by-4 switching matrix allows any operator to modulate any other (as well as itself). Each of these hybrid FM models has a battery of effects; common among these are forms of distortion, chorus, reverb, delay, phasing, and multimode filtering.

As its name implies, MatrixModular is modeled after classic modular synths such as the EMS Synthi A, whose patching is controlled by a matrix rather than patch cords. MatrixModular's sound sources include two multiple-waveform oscillators (which can be synchronized), a noise generator, a sample player, and a granular sample-resynthesis module. External audio can also be processed. The control modules include ADSR and AD envelope generators and a multiwaveform LFO. There are two 4-pole filters, a ring modulator, and distortion and delay effects for signal processing. You also get a versatile 16-step sequencer with three control/pitch tracks and separate gate tracks for two envelopes, sample trigger, and LFO reset.

The heart of MatrixModular is a 16-by-16 modulation matrix that lets you route anything to anything else and is easy to operate. As you might imagine, a synth with a preset named Insekt Jazz is capable of some pretty bizarre sounds. The CPU load depends on which modules are in use, so you can get some very economical patches out of MatrixModular. If it weren't for deadlines, I'd still be playing with this synth.

The last synth in this group, NanoWave, emulates the PPG and Waldorf wavetable synthesizers. It comes with 43 wavetables that are available to two sample-player modules. The key to wavetable synthesis is controlling and modulating the sample-location pointer in the wavetable. In NanoWave, this can be controlled by any combination of ADSR envelope, LFO, key number, and Velocity. The frequency of each sample player can be modulated by the other, and a noise generator and sine-wave oscillator provide additional sound sources. Output processing includes a multimode filter, ring modulation, chorus, and delay. Due to the variety of the included wavetables, the sample players alone give you an interesting array of sounds, and NanoWave is quite CPU efficient provided the other signal processors are turned off.

Synths: Sequenced. Each of the four Ensembles in this group has one or more built-in 16-step sequencers. These Ensembles are distinguished by their sound generators and sequencer routing. NewsCool and SineBeats are classic beatboxes. NewsCool has four sine-wave tone generators, and SineBeats has three as well as a noise source. NewsCool's sequencer is especially simple, with a single knob for each stage to control the triggering of any combination of tone generators. SineBeats has a separate 2-track sequencer for each tone generator: one track controls Velocity, and the other track controls

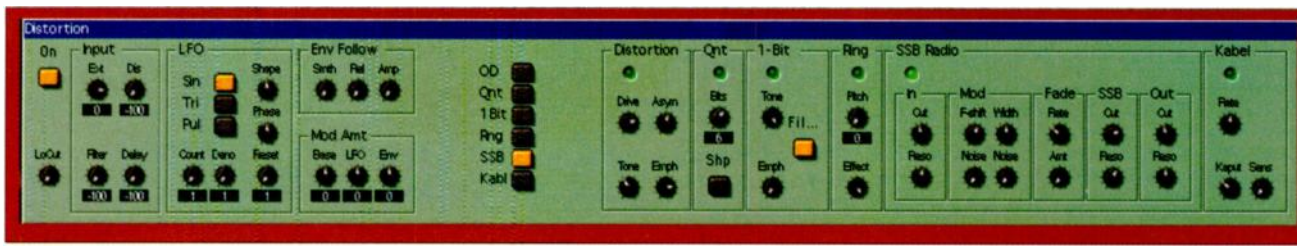

FIG. 5: GeekFX is the only dedicated effects Ensemble in the *Dynamo* collection. It provides three banks of effects that can process live audio or playback from an integrated sample player. The Distortion bank is pictured here.

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pitch and decay-time modulation.

Cyclane combines a NewsCool-style beatbox with a separately sequenced FM synth for pitched sequences (see **Fig. 2**). The FM sequencer has a scale-correction section that conforms melodic patterns to a user-specified scale. The sequencers can run forward, backward, or bidirectionally; individual steps can be gated on or off; and even-numbered steps can be "grooved."

NewPrimitive departs the most from the beatbox model, with one 2-track sequencer driving a generic subtractive synth and another driving a sample player. The first track of each sequencer controls Velocity, and the second controls modulation amount. Modulation routings include filter cutoff, pitch, and two distortion parameters for each synth. For the sample player, sample start is also a modulation destination. NewPrimitive is the most economical of the four Ensembles in this group, and it also produces the most radical (read: grungy) sounds.

Drum Machines. The drum machine called Gonzzo maps its eight sample players to the white keys from C4 to C5. It comes with a sample set that contains 79 drum sounds (you can also import your own samples). Gonzzo's output processing features reverb/delay, 3-band EQ, resonant filtering, and compression.

Drumatik and DSQ-32 use oscillators designed for individual drum sounds. Drumatik uses the General MIDI note map for its eight oscillators, and DSQ-32 uses the same map for its seven. DSQ-32 also includes a built-in 7-track, 32-step sequencer. **Fig. 3** shows example tone generators from all three drum machines.

Sample Players. This group contains seven unique sample players (the company refers to them as samplers). Beat Breaker and 6-Pack use integrated sequencers and are designed primarily for loop playback and manipulation. The 6-Pack sample player has four loop players and two sequenced sample players. With its straightforward design, synchronizing the beat loops and sample sequences is easy. Beat Breaker has

Dynamo
Minimum System Requirements
Mac: Power Mac 604e/233; 32 MB RAM; Mac OS 8.5.1; OMS or FreeMIDI
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Dynamo 1.0.1 (Mac/Win)
software synthesizer/sample player
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EASE OF USE ■■■▮
AUDIO QUALITY ■■■■▮
VALUE ■■■■■
1 2 3 4 5

PROS: Large collection of good-sounding software synths and sample players. Stable performance with low latency when used as a stand-alone application. Offers both instant gratification and room to grow.
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a loop player and a granular sample-resynthesis module. Its 4-track sequencer controls loop selection, position, transposition, and volume. It also features a complex "sound shaping" section that will quickly take you to the crumbling edge of techno.

Formantor, Plasma, and Triptonizer each take a different approach to granular resynthesis. Formantor gives you independent control of pitch, speed, and formant shifting. Plasma provides independent control of grain position and speed, and it is well suited to creating lush pads from almost any source material. Triptonizer has separate envelope generators and LFOs for position and formant shift during sample playback; it also includes a complex stereo delay processor.

The remaining two sample players, rAmpler and Random Step Shifter, bring *Dynamo* back to earth. rAmpler is a straightforward sample player—although it does have a granular resynthesis module. Random Step Shifter (see **Fig. 4**) is the simplest Ensemble in the kit: it breaks a sample (typically a beat loop) into quarter-, 8th-, or 16th-note segments, then randomly rearranges their playback order.

Effects. There's only one effects Ensemble: GeekFX. It has a sample player to load samples for processing, but it can also process external audio input on the fly. The effects are divided into three sections—distortion, filter, and delay. Each offers an interesting selection, but the distortion effects are the most unusual (see **Fig. 5**).

FINAL TAKE

Dynamo offers a lot of value for your software-synth dollar, but you'll need a fast computer. And even with a powerful machine, the program doesn't leave much room for other processing (say, by a digital audio sequencer). I found *Dynamo* easiest to use as a standalone application for creating audio files to be used later in a sequencer. I was able to use *Dynamo* successfully as a VST plug-in, but its CPU demands limited the utility in that context. I also found it to be very playable (that is, with low latency) on both laptop and desktop G3/300s using the Mac's built-in Sound Manager drivers.

Playing back a MIDI file within *Dynamo* yields sample-accurate timing.

The 25 Ensembles that come with *Dynamo* provide a diverse palette of sound- and sequence-design tools. Exploring them is educational and a lot of fun. The *Dynamo* manual takes a decidedly minimalist approach in describing the Ensembles, but the onscreen help picks up the slack—think of it as on-the-job training. Considering that you get a kit of soft synths ranging from classic virtual-analog to granular synthesis, something in *Dynamo* is bound to get your attention.

Len Sasso *is always looking for new tools and new ways to use them. To find out what corner he's painted himself into lately, visit his Web site at www.swiftkick.com.*

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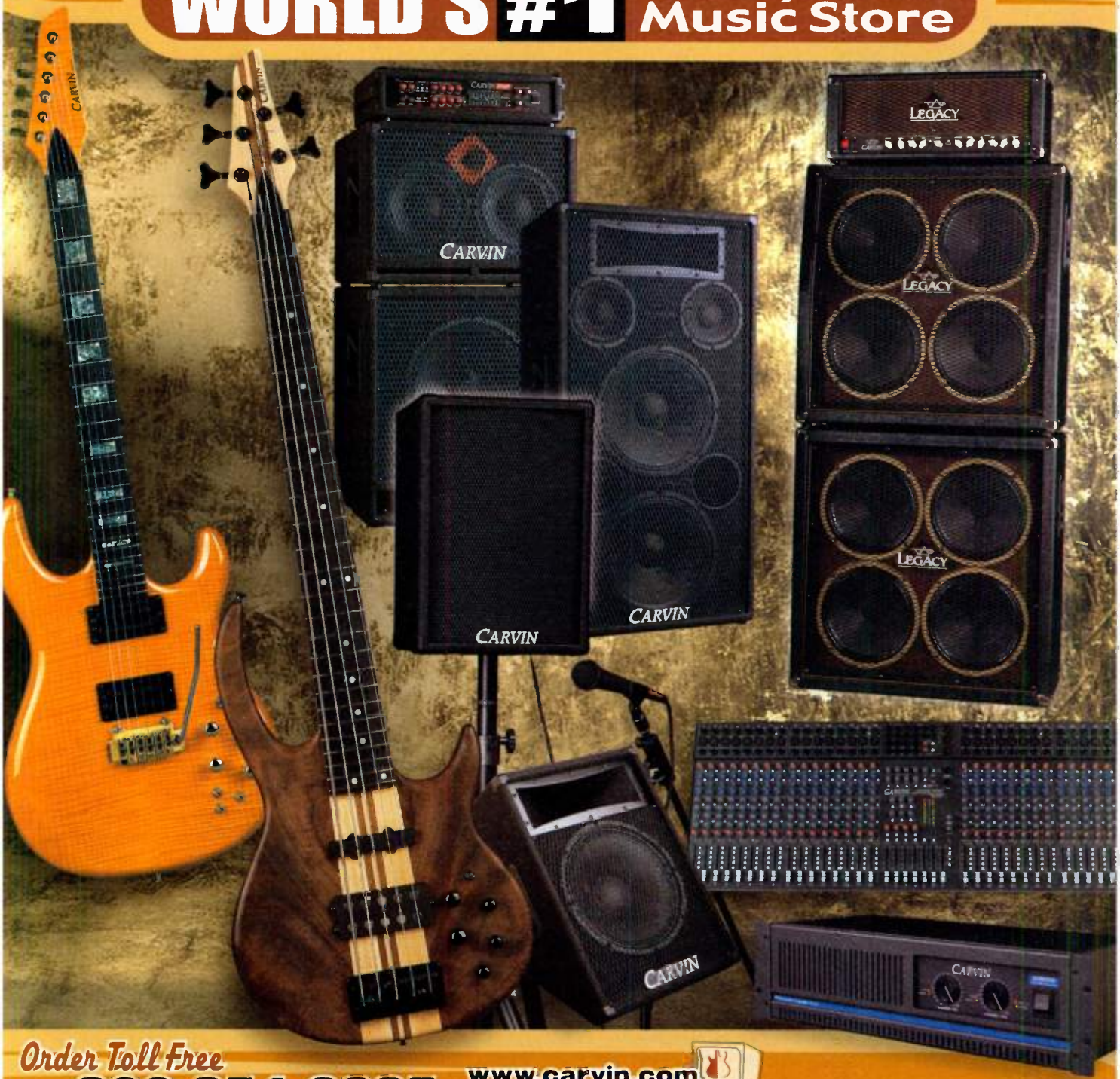

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LSR28P

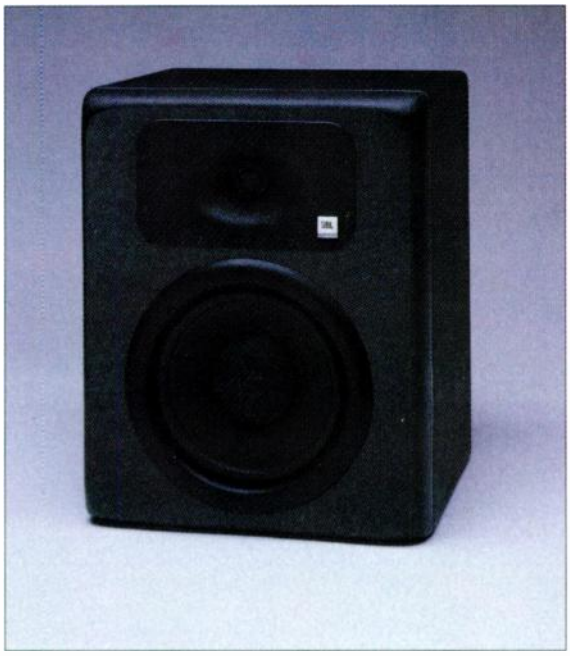
JBL monitors sport a new look and a new sound.

By Erik Hawkins

Just about everyone in the music industry has heard of JBL. The company has a long and distinguished history of manufacturing monitors for recording studios and live sound applications. However, while JBL's live sound products are as popular as ever, its studio monitors have fallen out of favor during the past decade, mostly due to their harsh, ear-fatiguing high end. But far from being down for the count, JBL has jumped back into the ring with an impressive new line of speakers, the Linear Spatial Reference (LSR) studio monitor series.

Designed completely from the ground up, the four available LSR models neither look nor sound like any of JBL's previous monitors. The LSR28P is an active 2-way with an 8-inch low-frequency driver ($2,198 per pair). A perfect example of the new line, the LSR28P is impressive-looking, with patented parts and rear-panel DIP switches for tweaking everything from input levels to frequency response.

The other three models of the LSR series are the larger LSR32, a passive 3-way with a 12-inch woofer ($1,099 each); the diminutive LSR25P, an active 2-way with a 5-inch woofer ($958 per pair); and an active subwoofer, the LSR12P ($1,199).



The JBL LSR28P powered monitors are loaded with features and boast an extremely flat response over a wide frequency range.

BUILT LIKE A TANK

The LSR28Ps are heavy at 50 pounds each. The monitors are boxed separately; otherwise they would be impossible to carry. (They're packaged and sold individually, not in pairs, which is ideal for building surround systems.) Unfortunately, I ended up straining my back when I unpacked the speakers, because I lifted them straight out of their boxes, not realizing how heavy they were. (I later discovered a paragraph in the manual explaining how to properly unpack the speakers in a way that won't damage them or cause bodily injury—I recommend reading that paragraph.)

Needless to say, these speakers must be situated on a sturdy piece of furniture. Forget about putting them on a workstation's flimsy monitor leaves—the kind that jut out from a workstation's sides and are supported by little triangular braces. Planting them on a big workstation (like the Omnirax Pro Station) or the top of a custom console desk should hold them securely. If you prefer speaker stands, make sure they are heavy-duty with wide bases so they don't tip over from top-heavy loads. For wall mounting, a wall-to-bottom bracket is a must; JBL recommends the Omnimount 100WB. However, there are no predrilled holes on the cabinet for such a bracket, so you'll have to drill them yourself—or have a licensed sound installation technician do the job.

Black with a charcoal-gray face, the LSR28Ps appear at first glance ominous and monolithic in stature. But on closer inspection, several details come to light that are all but invisible in the LSR print ads. The baffle (the faceplate to which the speakers are mounted) is separated from the cabinet body by a ¼-inch-thick silver trim. It features a bar-top-style finish of clear gloss laminate over a silver, fiberglass-like material that is actually a special carbon-fiber-composite skin wrapped around a foam core. This design purportedly cuts coloration down to a minimum by allowing little resonance. The cabinet, made of ¾-inch medium-density fiberboard, sports a glossy black finish.

The monitors have no grates, so the speaker cones are exposed. This is great for the sound but leaves the cones unprotected, so keep clumsy musicians bearing sharp objects (like pencils, picks, or fingernails) far away. There isn't any protective covering for the tweeter, neither a metal grate nor a miniature roll bar (the LSR25Ps feature these). Luckily, the tweeters are set quite deep into the waveguides, affording them some protection, but a misplaced finger could easily dent one of the cones.

DIP AND CONNECT

A power button is located on the rear of the speaker; I prefer a more accessible front-mounted power switch. If the monitors are set over a console with their backs to the wall, reaching the button can be difficult, so the LSR28Ps are best turned on and off from a power bar. An LED on the speaker's face glows green to indicate power, and it flashes red to show clipping.

The monitor draws its juice from a standard IEC Type II power cable, and a generous 9½-foot cable comes standard. Power is switchable between 115 and 230 VAC from a switch on the back of the unit. The power amp operates at either 50 or 60 Hz. A 5-amp line fuse is employed on units shipped Stateside, whereas units shipped out of the country get a 2.5-amp fuse. If you plan on taking these speakers with you outside the United States (as if hauling them to your studio isn't enough of a workout), make sure you have the right fuses packed.

The LSR28P features Neutrik dual ¼-inch and XLR input jacks (see **Fig. 1** for a view of the back panel). The ¼-inch jack is balanced but accepts unbalanced plugs. Input can be attenuated

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FLAT AND PHAT

The LSR28Ps are the flattest-sounding monitors I've ever heard. Although there's no such thing as completely "flat," these monitors are very unhyped and easy to listen to, with no unpleasant or ear-fatiguing frequency bumps. Also, despite the even, uncolored response curve, they provide plenty of sonic clarity: pianos sound warm and clear, kicks sound phat, guitars sound punchy, synth pads sound sweet, and vocals sound present. Compared with the LSR28Ps, other monitors of a similar ilk (Haflers, Genelecs, Meyers, HHBs) sound harsh, with exaggerated high ends and weak bottoms.

On the other hand, some folks may find the LSR28Ps' sound unflattering and lacking in depth. With such a total absence of excited high frequencies, mixes will sound dull to ears acclimated to monitors with pumped-up highs. (Even the 2 dB high-end boost control doesn't mimic such speakers, although a 4 dB boost might.) Without an exaggerated high end, the sonic image seems to have less depth, and you may notice less of a difference between the

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extreme high and low ends. If you're unfamiliar with these speakers, it would be easy to overcompensate by adding too much high end and rolling off too much low end, resulting in mixes that sound thin and brittle on other systems. (I advise getting to know your monitors intimately before doing a mix.)

I said these monitors sound incredibly flat, but now I'm going to tell you that the low end sounds incredibly big. Somehow, the LSR28Ps pump out bass that belies their 8-inch woofers without sounding unnatural or affected (hip-hop and drum 'n' bass aficionados, take note). I attribute the large, warm low end to the LDA bass port. A lot of air moves out of this port with very little resistance, a key factor for proper porting. However, the amount of bass these speakers put out is so great that it's more than many small studios need. Using the –2 dB low-frequency cut to decrease the bass response worked well for my room (a –4 dB cut would also be nice). Keeping the monitors away from sounding boards, such as walls and corners, also helps reduce the low end.

LISTEN TO THIS

I used the LSR28Ps while recording and monitoring DI bass tracks to Pro Tools. I also used them to mix several electronica projects (mostly drum 'n' bass and trance) as well as an acoustic-flavored adult-alternative project by singer–songwriter Lygia Ferra. The monitors were positioned close to my other main near-fields (Hafler TRM8s), so I could swap back and forth as I mixed.

This has been said before, but it bears repeating: determining whether monitors sound good is purely subjective. I thought the LSR28Ps sounded great, but I would shy away from using them as my main near-field monitors. The LSR28Ps are just too big—in size and bass—to use in a standard close-field position. About five to six feet back from the console would be fine, but I consider this distance to be more midfield than near-field, as my near-fields are placed about three to four feet from where I sit. I would be proud, however, to use a pair of these monitors in my studio as midfields.

The LSR28Ps pump out bass that belies their 8-inch woofers.

Bottom line: the LSR28Ps are solid in terms of both sound quality and technology. A bit more expensive than your average powered monitors, they are still competitively priced a few hundred dollars less than Hafler TRM8s and several thousand less than Genelec 1031As. JBL is to be commended on its new sound; the company has come a long way.

The LSR28Ps sound so much flatter than the older JBL monitors, as well as many competing models, that some folks will have difficulty warming up to them. But give them a chance. If you haven't heard JBL's studio monitors recently, have a listen; they're what flat should sound like.

Erik Hawkins *is a musician/producer working in Los Angeles County and the San Francisco Bay Area. Visit him at www.erikhawkins.com for more equipment chitchat and tips on what's hot for the project studio.*

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WAVE MECHANICS

SPEED 1.0 (MAC/WIN)

Change pitch and tempo with this elegant plug-in.

By Mike Collins

Anyone who works with audio samples knows how important time-stretching and pitch-shifting can be in getting your sounds just right. Nearly every audio editor offers some form of these two DSP algorithms, but they are likely to be fairly basic and have limited effective ranges. To address these tasks more professionally, Wave Mechanics has released *Speed*, an AudioSuite plug-in that lets you change the pitch, length, and tempo of your audio files. It's one of only a few dedicated programs that offer these features, and it can be just the right tool in many situations.

Speed doesn't require that you have any TDM hardware—all you need is *Pro Tools* or other software that supports the Digidesign AudioSuite plug-in standard (Emagic's *Logic Audio*, for example). I tested *Speed* using *Pro Tools* 5.01 on a Power Mac 9500 with a 300 MHz Crescendo G3 processor upgrade card loaded with 192 MB of RAM. Among the plug-in's several user interfaces is the Simple control panel, which makes working with *Speed* nearly automatic. You can also switch the display to the Calculator or Graphical screen (more on those features later).

SPEED ZONE

To use the plug-in, first select an audio range in the *Pro Tools* Edit window, then choose *Speed* from the AudioSuite menu. The default control panel, Simple, will appear (see **Fig. 1**). The Preview button at the bottom of the window lets you audition the current tempo and pitch settings (the default settings signify no change to your audio). Clicking on the Process button initiates DSP processing of your selected audio and saves the results to disk.

FIG.1: *Speed*'s Simple control panel, one of the plug-in's several interfaces, has knobs for controlling a sample's pitch and tempo. The Preview feature is an excellent way to get an idea of how the processing will sound.

You use the Speed Control knob (on the left) to change tempo without altering pitch, and the Pitch Control knob (on the right) to change pitch without altering tempo. You can also click on the displayed value and type in a new setting. Both Speed Control and Pitch Control have different modes, which you select by clicking on the small white triangular Mode Select tabs in the middle of the window.

Speed Control has two modes: Tempo and Length. A Tempo setting above 100 percent increases the tempo, and a setting below 100 percent reduces the tempo. For example, a Tempo setting of 200 percent will result in a tempo twice as fast as the original, and a setting of 50 percent will give you a tempo half as fast. (Settings for Tempo and Length range from 50 to 200 percent, with a resolution of six decimal places in Simple and Calculator mode and three decimal places in Graphical mode.) In Length mode, higher settings lengthen a selection, resulting in a slower tempo, and lower settings shorten the selection, creating a faster tempo. As with Tempo mode, a 100 percent Length setting has no effect on the audio.

Pitch Control has three modes: Cents, Semitones, and Percent. Both Cents and Semitones let you shift your audio a maximum of one octave in either direction. Percent mode uses a frequency ratio to define the change; a value of 100 percent, for example, won't modify the pitch. (Settings range from 50 to 200 percent.) This mode resembles the pitch-ratio control of older hardware pitch-change devices and can compensate for the pitch change produced by sample-rate conversion.

BY THE NUMBERS

Like the Simple screen, *Speed*'s Calculator control panel (see **Fig. 2**) offers speed and pitch controls: Pitch Calculator and Speed Calculator. Each has two modes. Pitch Calculator's Key mode transposes music between specific keys, and Tuning mode converts audio from one tuning reference to another (for example, A 440 to A 438). Just enter the original key or tuning reference in the Original field and the desired key or tuning reference in the Modified field.

For manufacturer information, please see Contact Sheet, p. 203.

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Speed Calculator offers Tempo and Length modes. In Tempo mode, type a new bpm value in the Modified field; then click on the Preview button to audition the altered tempo and hit Process to make the change. Length mode lets you stretch or squeeze your samples by specifying a new length measured in either samples or seconds.

Length mode also gives you access to the Length Copy feature, which is displayed on the screen as a curved arrow. You can use Length Copy to make several audio regions identical in length—a useful tool when working with drum loops. First select the region with the desired length, then click on the Length Copy arrow. The selected region's length will appear in the Modified Length field. Next select the region whose length you want to change. The Original Length field will show the region's length, and the Percentage Change field will indicate the difference between it and the desired length. Click on the Process button to make the change.

The Graphical control panel is handy for creating accelerandos and decelerandos.

BEND AND STRETCH

Speed's secret weapon is the Graphical control panel, which offers an easy way to insert pitch and timing changes at any point in your audio file. It's also handy for creating accelerandos and decelerandos. This screen displays a visual representation of the audio waveform, overlaid with two horizontal

Speed
Minimum System Requirements
Mac: PPC 604e/200; 128 MB RAM; Mac OS 8.6; Digidesign Pro Tools or Digi 001
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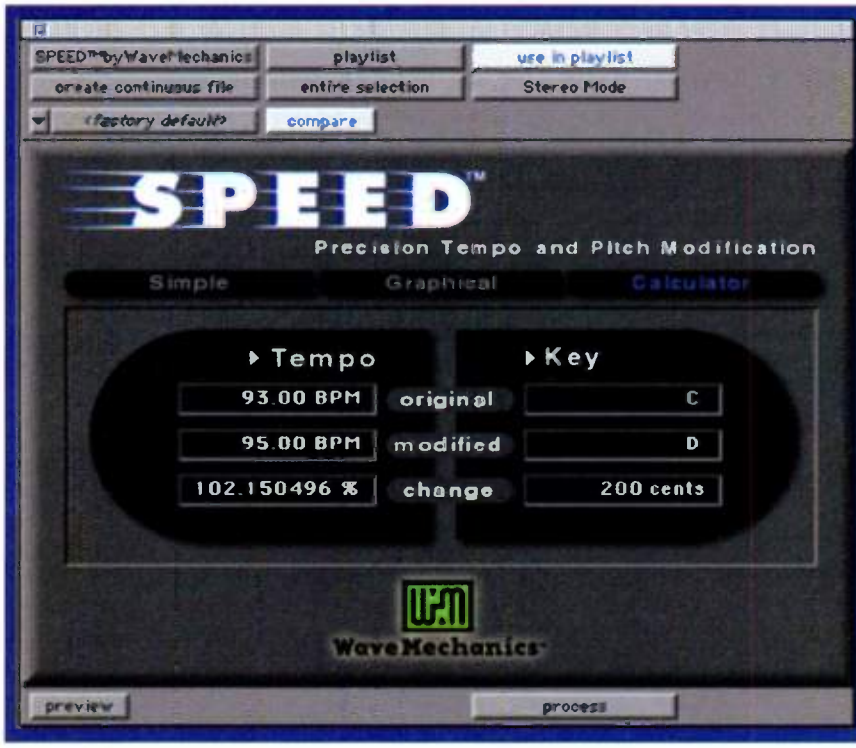

FIG. 2: Transposing a file in the Calculator control panel is a breeze—just enter the existing key in the Original field, then type the desired key in the Modified field. The Change field shows the difference between the two keys in cents.

"graph" lines (see **Fig. 3**). The white line controls tempo/speed, and the blue line controls pitch. (Both are initially set to have no effect.) Clicking on the Mode Select tabs calls up multiple display options, much as they do in the other modes.

Editing in the Graphical window is very similar to editing automation data in *Pro Tools*. Click on an existing point (shown as a tiny square) and drag it to a different location to adjust pitch or timing. To create a new point, click on the display at the desired location. You can delete any point (except the start and end points) by Option-clicking on it. If one line obscures the other, Control-click to bring the hidden line to the front. Be careful not to drag a point to a new value or insert a new point when you Control-click on the line. The process works fine with a little practice.

Shift-clicking or Command-clicking on a point will constrain it to vertical or horizontal movement, respectively. Whenever you select or move a point, its speed- or pitch-change value is shown beneath the waveform display, along with its time position (in

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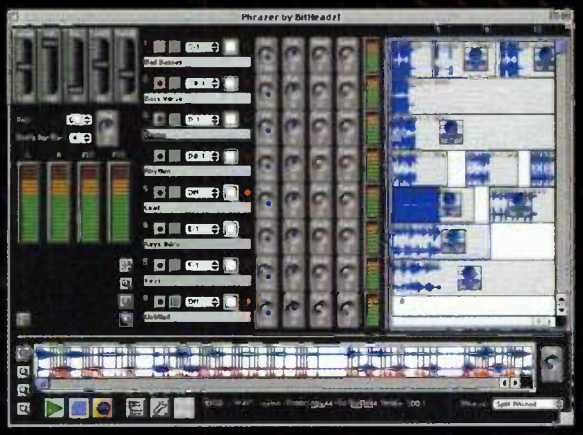

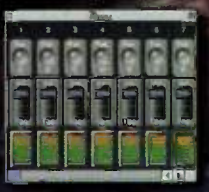

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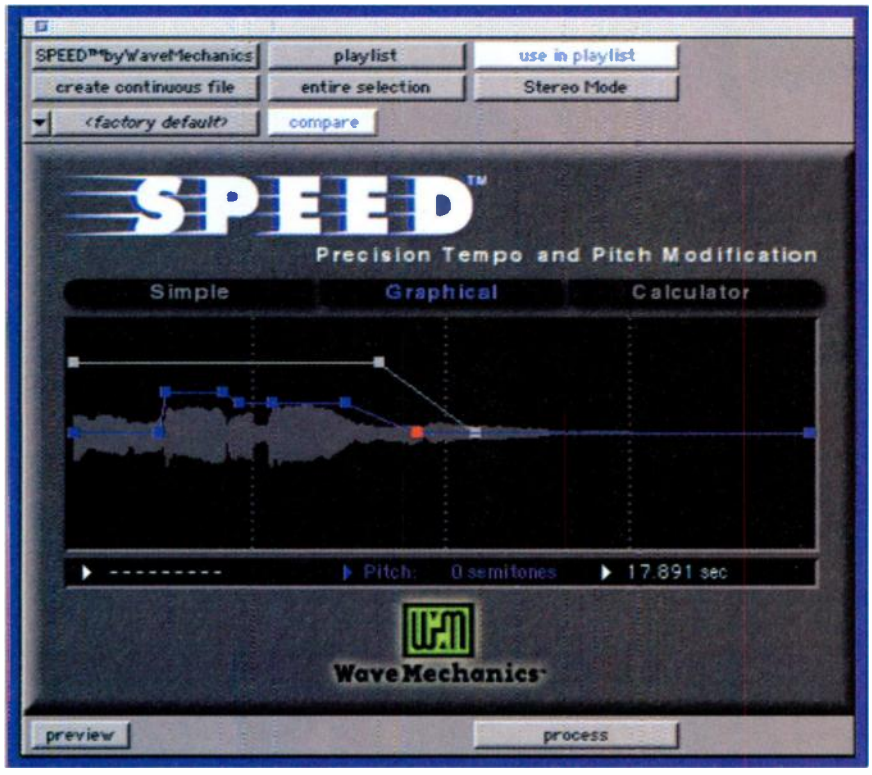

FIG. 3: In the Graphical control panel, you can change pitch and tempo by creating "handles" for the parameters and dragging them to new positions. The current parameter values appear beneath the waveform display.

either seconds or samples). You can also type specific pitch and time values directly into the fields.

IN ACTION

Speed is not the tool to use for vocals: changing a sample's pitch moves the formants as well as the rest of the sound (although that's not the case with tempo). Formants are the characteristic resonances of a human voice or musical instrument. Formant frequencies remain constant regardless of which pitch you sing in or what note you play on your guitar. Ideally, moving the formants would be optional, but *Speed* always moves them when it's processing the pitch. Also, increasing or decreasing an audio file's tempo speeds up or slows down any vibrato in a telltale way, a problem that no time-compression software has solved.

I recorded acoustic guitar arpeggios from the bottom F upward. When I moved the pitch down by one semitone from F to E, the sound was perfect. When I moved it to E-flat, however, the instrument did not sound completely natural, though it might have fooled some listeners. The imperfection became more noticeable when I lowered the pitch to D; and at D-flat the sound was too unnatural to use—the timbre took on an uncharacteristic buzz, although there were no sound glitches. When I raised the pitch four semitones, the guitar sounded as though I were using a capo, but transposing five or more semitones produced an unnatural sound.

I also used my acoustic guitar to compare *Speed*'s time-stretching capabilities with those of the standard *Pro Tools* AudioSuite plug-in. *Speed* introduced minimal artifacts into the processed sound over the entire 50 to 200 percent range, and I preferred its sound to that of the *Pro Tools* equivalent.

Next I recorded a drum pattern consisting of bass drum, snare, hi-hats, and congas. The groove sounded perfect all the way from 50 to 200 percent of the original tempo. To test the pitch-shifting, I highlighted two bars of drums and clicked on Preview, and as the sound looped I moved the Pitch Control knob. Again, the drums sounded unnatural if I shifted them more than a few semitones down or 3 or 4 semitones up. However, the unnatural quality produced by extreme stretching or shifting could suit your purposes. I time-stretched the same audio selection with both *Speed* and the standard *Pro Tools* time-stretching plug-in. *Speed* definitely won out—barely any audible artifacts were introduced into the sound.

SIMPLICITY ITSELF

Speed's documentation is brief but adequate—after all, this is not a very complex piece of software. The manual mentions a couple of applications (such as shortening a 35-second commercial to 30 seconds), but a few more examples would have been beneficial. Wave Mechanics' Web site offers little more than the manual, although its up-to-date problem list may prove helpful. The software's copy-protection scheme requires a key disk, so you'll need to keep a floppy on hand. *Speed*'s Simple control panel couldn't be more intuitive, which is exactly what you need for a busy *Pro Tools* session. The Calculator screen is very useful when you know what settings you need, and the brilliant Graphical window lets you apply detailed changes to different parts of your audio.

Speed is ideal for trying out ideas in *Pro Tools* with any kind of audio material. I appreciate *Speed*'s capabilities more with each use. I wouldn't run a *Pro Tools* session without it.

Music-technology consultant **Mike Collins** *lives in London, where he plays guitar, writes and produces music, teaches music technology, and writes for magazines around the world.*

WAVE MECHANICS
Speed 1.0 (Mac/Win)
time-compression/pitch-shifting
AudioSuite plug-in
$495

FEATURES ■■■■
EASE OF USE ■■■■■
AUDIO QUALITY ■■■■
VALUE ■■■■
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PROS: Excellent preview feature. Flexible graphical control panel.
CONS: No option for preserving formants. Available only in AudioSuite format.

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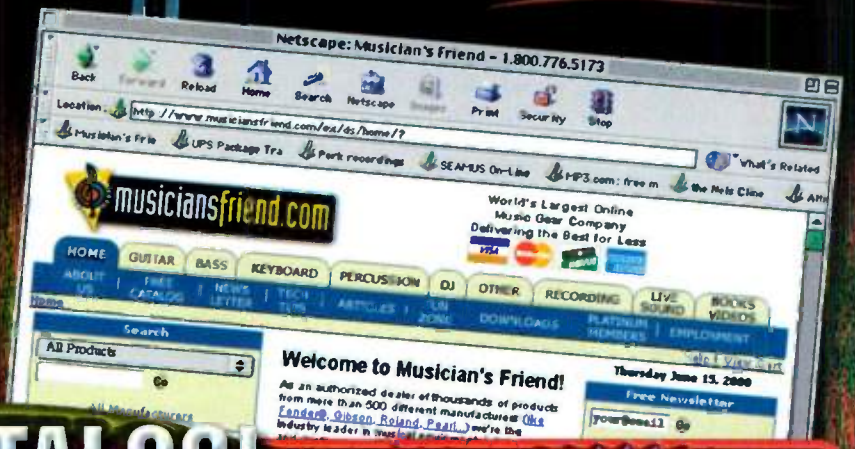

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MINDPRINT

T-COMP

Transparent dynamics processing with tube-saturation circuitry.

By Michael Cooper

The MindPrint T-Comp stereo tube compressor is a hybrid design employing both solid-state and tube circuitry. Additionally, the unit provides a control for adjusting the amount of drive sent to the tube, letting you fine-tune the tube saturation and thus dial in a range of tones from clean to distorted.

The 1U rack-mountable T-Comp uses THAT VCAs to control gain levels. It is also strictly a soft-knee compressor. You can use the T-Comp as either a stereo or dual-mono processor, and it provides both manual and semiautomatic modes of operation.

CHANNEL CROSSING

The T-Comp crams a host of useful controls and LEDs onto its nicely organized and attractive front panel. Each channel offers separate, continuously variable rotary knobs (without detents) for input and output levels, threshold, ratio, and attack- and release-time settings. The knob settings, though, are hard to discern in low light or at more than an arm's length away.

A Link button enables stereo operation, in which the left channel's threshold, ratio, attack, and release settings control the processing for both channels. This feature works well and keeps stereo imaging rock solid. An LED illuminates whenever you depress the Link button.

Each channel also sports its own bypass switch. When a channel is bypassed, the input control remains active; however, the output-level control is disabled, as it should be. When the unit is turned off, the inputs become hardwired directly to the outputs—a nice safety net for live and broadcast applications.

With processing switched in, the processed signal's output level can be increased to roughly equal that of the unprocessed signal. This operation, called makeup gain, allows critical A/B comparisons of your starting material with what you ended up with. (The input-level controls are active regardless of whether the unit is bypassed.)

Maximum input and output levels are 20 dB, which is a little on the wimpy side. However, input (and output) knobs attenuate to –∞ in full counterclockwise position, allowing plenty of compensation for use with hotter equipment (although possibly at the expense of signal-to-noise ratio). I wish the level knobs were screened in decibels instead of in arbitrary numerals of 1 to 8, to assist in proper gain staging. There are no unity-gain hash marks on these knobs, either. My tests with an oscillator, though, indicated that unity was roughly at the noon position for both knobs.

COMPRESSING ON

The T-Comp's threshold range varies from +2 to –28 dB, slightly favoring semipro operating levels. You can turn down the input level if you can't get the threshold high enough, but then you risk decreasing the signal-to-noise ratio. For tracking purposes the input level and threshold ranges are usually quite adequate; using the T-Comp as a stereo bus or mastering compressor, however, could be a little dicier, depending on your gear's output level.

The T-Comp's wide-ranging attack, release, and ratio controls provide excellent flexibility. Most of the ratio knob's turn is devoted to lower ratios. (Once you're past 10:1, additional compression through higher ratios becomes increasingly less noticeable on all compressors.) The T-Comp provides high ratios for limiting, although there is understandably some overshoot (that is, the unit does not do brickwall-type limiting).

An adaptive circuit can also be switched in independently for each channel. This is similar to the automode circuitry found in some compressors, except that the attack and release manual control settings still dramatically influence the compressor's response. Nevertheless, the adaptive mode smooths away any pumping that less-than-optimal manual settings might otherwise produce. Switching in the adaptive mode after setting ballpark manual settings yields the best results. The adaptive function lacks a status LED to indicate that it is switched in, but that's a minor gripe.

The T-Comp also features a filter switch (with LED) for each channel. This inserts a highpass filter, set at 300 Hz, into the compressor's sidechain. The idea is to roll off the bass frequencies in the sidechain so that the T-Comp responds primarily to mids and highs—a technique that is especially useful for putting a lid on soaring vocals. However, a preset filter band cannot provide nearly as much flexibility and power as do sidechain inserts, which the T-Comp regrettably does not offer. The lack of sidechain inserts prevents the unit from performing more exacting "frequency-conscious" tasks such as de-essing and debooming.

TUBE JOB

Perhaps the T-Comp's most intriguing feature is its tube-saturation circuit, which employs two 12AX7A tubes, each positioned after the VCA (that is, post-compression) on both channels. Independent Tube Sat controls—one for each channel—allow you to adjust how hard each tube is driven into saturation. (Note that the threshold knob's setting also contributes to the amount of tube saturation produced.) As the

The MindPrint T-Comp stereo tube compressor offers a tube-saturation circuit in addition to its VCA-based, solid-state topography.

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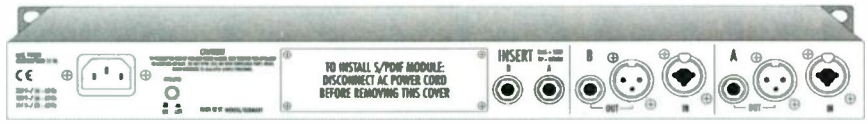

The T-Comp's rear panel provides Neutrik combo balanced XLR/¼-inch TRS input jacks, both balanced XLR and unbalanced ¼-inch output jacks, and balanced/unbalanced ¼-inch inserts.

tube is driven harder, distortion increases from 0.1 to 10 percent, and an increasing treble boost (maxing out at 2 dB) is applied from 4 to 22 kHz. A multicolored LED also transitions from green to yellow to red as saturation increases. (This same LED shines green when a compressor channel is switched in.)

METERS AND MODS

The T-Comp's metering is exceptional. Separate 6-segment, multicolored LED meters for each channel can be switched globally to display either input or output levels. In addition, separate high-resolution, 12-segment LED meters show gain reduction for each compressor channel.

A power switch (with associated LED) and an analog/digital input switch complete the unit's front panel. Lest there be any confusion, the T-Comp is an all-analog device: the digital input setting lets you send digital signals through the optional DI-MOD converter ($249), which installs on the T-Comp's rear panel.

My review unit wasn't outfitted with the DI-MOD, but here's the skinny just the same. The DI-MOD provides 24-bit Crystal A/Ds and D/As for bringing digital signals into the T-Comp's analog world through stereo S/PDIF inputs on RCA connectors. This same option is found on MindPrint's EnVoice processor, so you can freely swap it between units. The converters sport a 104 dB dynamic range—not bad for such a low price. However, dither and word-clock I/O are not provided. The DI-MOD can operate at 44.1 or 48 kHz, and an LED illuminates to show digital sync lock.

IT'S OFF TO WORK I/O

From its rear panel the T-Comp accepts either balanced or unbalanced signals straight out of the box. Combo jack inputs accept XLR and TRS/mono ¼-inch plugs for L/R inputs. Separate XLR and TRS jacks provide outputs for each channel.

Note that pin 2 of the XLR and the phone jack's tip are hot. If you insist on taking an unbalanced signal into or out of the T-Comp through an XLR connector, you must shunt pins 1 and 3 together. Thankfully, there's no need for that hassle—inserting a mono phone plug into an input or output automatically switches the unit to unbalanced operation. You can even use the XLR and TRS outputs simultaneously, so as to split the signals to two destinations (that is, as long as both outputs are balanced). This operation could prove useful in situations where, for example, you want to route the same signal to two separate mixer channels for different EQ treatments.

The T-Comp also provides ¼-inch TRS insert points on its rear panel, allowing you to insert an equalizer or other processor directly into the audio path before the VCAs. (Remember that this operation is different from inserting a processor into the sidechain.) With the DI-MOD installed, the inserts also let you patch additional analog gear between the converted S/PDIF signal and the T-Comp's compressor section. (Of course, even without the DI-MOD installed, you can daisy-chain other gear ahead of the T-Comp to achieve essentially the same results.) A detachable 3-prong AC cord and ground lift switch complete the T-Comp's rear-panel assets.

IN SESSION

I first tested the T-Comp with a strummed acoustic guitar. I dialed in a 2.5:1 ratio and was pleased with how transparently the unit achieved 4 to 6 dB of gain reduction. There was neither dulling of the guitar's timbre nor any audible pumping or breathing. The only downside was that the unit is quite noisy, adding roughly 12 dB of noise at unity gain—and that was with the tube-saturation function turned all the way down.

Except for the noise problem, the T-Comp was great on vocals. I easily attained 8 dB of gain reduction on a vocal track without introducing any audible amplitude-modulation artifacts (pumping, for example).

The T-Comp was equally transparent on a snare-drum track during a rock mixdown session. Set to a 3.5:1 ratio, 10 ms attack time, and 100 ms release, the unit delivered a fantastic "power

T-Comp Specifications

Inputs	(2) balanced combination XLR/¼" TRS
Outputs	(2) balanced XLR; (2) unbalanced ¼"
Other Inputs	(2) balanced/unbalanced ¼" inserts
Maximum I/O Levels (including inserts)	20 dB
Frequency Response	10 Hz–22 kHz (±1 dB)
Dynamic Range	92 dBA (line in, 0 dB I/O, compressor in)
Signal-to-Noise Ratio	96 dB
Total Harmonic Distortion (without tube saturation)	0.0008%, line in (10 Hz–22 kHz @ 0 dB input/output
Compressor	
Type	VCA
Threshold	+2 to –28 dB
Ratio	1:1 to ∞:1
Attack Time	0.1–150 ms
Release Time	5 ms–2 sec
Makeup Gain	0–16 dB
Tube Section	
Type	(2) 12AX7
Distortion	0.1–10% (adjustable)
Treble Boost	0–2 dB (adjustable) between 4 and 22 kHz
Dimensions	1U × 9.4" (D)
Weight	7.6 lbs.

Hey, don't just take *our* word for it.

"I found myself pulling it out for all sorts of material — not just vocals but strings, drums, sampled Wurly, you name it. Mic Modeler never ceased to amaze me."
> JOHN KROGH, *Keyboard Magazine*

"[My engineer Alan Meyerson] had experimented with the plug-in on the new Ridley Scott film *Gladiator* for composer Hans Zimmer, running the entire orchestra through Mic Modeler. For me, he was using the Mic Modeler for enhancing string samples.

All I can say is that the difference was profound and wonderful. Mic Modeler is becoming one of my favorite plug-ins to make everything sound more vibrant and interesting."
> JEFF RONA, Film Composer, Media Ventures

"the Microphone Modeler does what Antares claims: it provides a cabinet of extraordinarily solid sounding virtual mics."
> ERIK HAWKINS, *Electronic Musician Magazine*

"Mic Modeler can be a great way to bring in a new color to work with... The cool thing about this plug-in is that the tonality changes with the strength of the signal, so it's like a dynamic EQ of sorts, which is definitely a bonus for hard disk recording, where things can tend to sound flat and one-dimensional."
> BILL GOULD, Producer/Engineer

"I turned an acoustic guitar recorded with a Fishman pick-up into a AKG C12 miked thing of beauty. Wow! ...Are you sure there's no little guys with mics inside there? Pretty amazing. Pretty amazing."
> TED PERLMAN, Producer/Arranger for MTV, Chicago, Kaci, The Manhattans

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"It proved to be an amazing and powerful tool to quickly enhance any mono source I could throw at it."
> JOHN KROGH, *Keyboard Magazine*

"...an amazing sculpting and sweetening tool."
> JOHN KROGH, *Keyboard Magazine*

"Mic Modeler not only does what the name implies, it's just a great all-around processor. It's an extremely fast way to subtly shape a sound — miked or not — to fit better into a track. Way more fun than straight EQ."
> ROB SHROCK, producer/arranger for Elvis Costello, Burt Bacharach, Mikaila, Academy Awards

"Playing with the Proximity and Tube Saturation controls and adding room ambiance with Waves TrueVerb plug-in transformed a cheesy, flat, direct recording into a stunning live sound."
> ERIK HAWKINS, *Electronic Musician Magazine*

"this plug-in is an invaluable tool for just about any musician, engineer, or producer who records with computers."
> JOHN KROGH, *Keyboard Magazine*

"Microphone Modeler is a great tool for DAW-based personal studios with limited mic resources. It sounds great and is perfect for everything from mixing to tracking. Microphone Modeler definitely gets my vote as one of the most innovative plug-ins this year."
> ERIK HAWKINS, *Electronic Musician Magazine*

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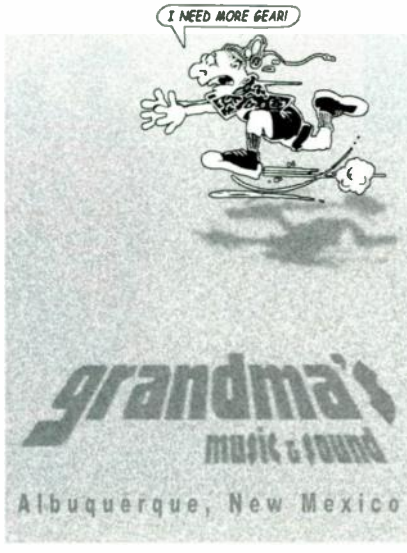

pop" snare, bringing up the attack of the stick hit and tightening up the shell resonance for a crisp and punchy sound. By varying the ratio between 3.5:1 and ∞:1 (hard limiting), I controlled how much shell resonance contributed to the overall sound.

The T-Comp also did a very good—although not superb—job as a stereo-program bus compressor. But although there was no obvious pumping when the unit was set properly, the sound was a tad choked or flattened. I don't want to overemphasize this, however, because the T-Comp did a better job in this application than most compressors I've heard.

The unit also delivered the goods on an overenthusiastic electric bass guitar track. I was able to lower the T-Comp's attack time to 0.2 ms to soften the track's attack without introducing any pumping.

Cranking the unit's tube-saturation (Tube Sat) knob on the bass track gave mixed results. On the one hand, it fattened the track, making it sound as if the amp had been turned up loud and the speaker was just beginning to break up (in a flattering way). Yet the increase in high overtones made minor fret-slap sounds obnoxiously present. Make sure to use the T-Comp's tube saturation only on cleanly played tracks, and listen closely for emphasized artifacts.

The T-Comp delivered a fantastic "power pop" snare.

SATURATED MARKET

Despite our industry's mad love affair with tubes, glowing glass alone does not guarantee the perfect tone for every application. Overall, the T-Comp's tube-saturation function was unimpressive, being more akin to a distortion pedal than to a high-quality tube preamp. Rather than making tracks sound lusher, Tube Sat mostly made them sound dirtier. It could be cool for adding grunge to a track, but if you want to fatten up tracks while preserving pristine signal quality, the T-Comp's tube-saturation feature is not the way to go.

On a related but less important note, the unit's tube-saturation LED is not very responsive. I drove the tube hard enough to clearly hear distortion, yet the LED remained green (its resting-state status).

MINDPRINT
T-Comp stereo tube compressor
$1,099

FEATURES ■■■■
EASE OF USE ■■■■
AUDIO QUALITY ■■■■
VALUE ■■■■
1 2 3 4 5

PROS: Above-average dynamics processing. Manual and semiautomatic modes of operation. Defeatable master/slave-type channel linking. Wide-ranging ratio, attack, and release controls. Comprehensive metering. Plug-and-play I/O.
CONS: Noisy and somewhat lacking in headroom. No sidechain inserts. Tube-saturation function is of limited use.

RANGE OF MOTION

MindPrint's T-Comp is a well-featured stereo compressor that delivers the goods where it matters most—transparent dynamics processing. Unlike many competing models, the T-Comp did not fall down when pressed into processing broadband percussive material (stereo mixes, for example). However, the unit is quite noisy and it lacks the headroom needed for audiophile recording applications. Moreover, the absence of sidechain inserts precludes the use of advanced frequency-dependent processing techniques.

Unfortunately, the T-Comp's tube-saturation circuit has only limited usefulness—despite being a featured function. The distortion it adds sounds fairly dirty, so it's better as an effect rather than for fattening up tracks. Just the same, the T-Comp is priced attractively enough to warrant serious consideration by budget-conscious studio owners looking for good dynamics control.

Michael Cooper *is the owner of Michael Cooper Recording, located outside the beautiful resort town of Sisters, Oregon, at the base of the Cascade Mountains.*

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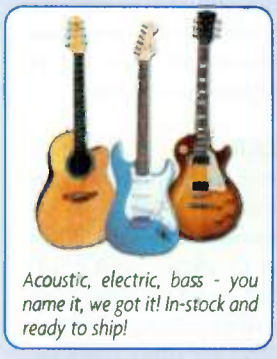

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MEDIA ASSISTANCE

AUDIO PLUG-INS PACK 1 (WIN)

High-quality effects plug-ins, but with a high price.

By Scott R. Garrigus

Created by French programmer Vincent Burel, *Audio Plug-ins Pack* 1 from Media Assistance is a bundle of four high-quality plug-ins provided in both the DirectX and VST formats. This twin-format design means that you can run these plug-ins with just about any PC-based host application. Three of the plug-ins offer traditional processing functions: compression/limiting, equalization, and reverb. The fourth one lets you "chain" the other plug-ins together as you would when patching the signal from one hardware-based effects unit to another. All of the plug-ins are intuitive and easy to use, except perhaps the reverb, which offers an impressive array of parameters that makes it seem a bit overwhelming at first.

I tested *Audio Plug-ins Pack* 1 on a Pentium II/300 MHz machine with 64 MB of RAM and Windows 98SE. I tried the plug-ins with a variety of host applications, including Cakewalk's *Pro Audio,* Sonic Foundry's *Sound Forge,* and Steinberg's *WaveLab.* All four plug-ins performed without a hitch, and they were actually fun to work with.

Audio Plug-ins Pack
Minimum System Requirements
Pentium/133; 32 MB RAM; Windows 95/98/2000/NT; DirectX 5.2 or VST compatible host application

IN COMMON

Like many plug-ins, these resemble hardware-based units; to change parameter settings or modes of operation, you twiddle onscreen knobs and buttons. Fortunately, this isn't the only input method. By right-clicking on any adjustable parameter (usually a knob), you can open a menu that offers a number of other input options. For example, you can quickly set a parameter to its maximum or minimum value or to a number of other common values (shown as a list). Most important, you can enter a precise value directly from the computer keyboard.

The documentation for *Audio Plug-ins Pack* 1 is a 42-page, spiral-bound booklet that covers the software reasonably well (although the translation from German is filled with editing mistakes). The manual lacks tutorials, but it does provide a description of each plug-in along with all parameters, and it even includes the specifications for the different operational modes of the EQ and reverb modules. The documentation is also provided on the CD-ROM in PDF format. Unfortunately, no Help files are included with the software.

FIG. 1: *FFX-16* lets you chain together any DirectX plug-ins to achieve multi-effects processing.

PATCHWORK QUILT

FFX-16 is a plug-in manager and virtual patch bay/rack that lets you route the audio signal through a series of plug-ins and then save the "virtual-rack" setup as a preset (see **Fig. 1**). For example, you can chain together the limiter, EQ, and reverb plug-ins and listen to the audio being processed in real time. Moreover, *FFX-16* works with any DirectX plug-ins, not just the ones included in *Audio Plug-ins Pack* 1.

Each of the rack's plug-ins includes a Solo and Mute button. You can change the position of a plug-in within the rack (which changes its location in the chain) by simply dragging and dropping the plug-in label with your mouse. You can also rapidly switch between different variations of your rack setup using the eight Memory Store and Recall buttons.

As you add plug-ins to the rack, the corresponding editing windows appear onscreen. Arranging the windows is easy with buttons that tile, cascade, minimize vertically, minimize all, open all, and close all windows. Peak meters let you see the level of the signal coming into and going out of the rack. You can even create racks and add them to other racks for more complex setups. (By the time you read this, a free update should be available that lets you save presets of individual plug-ins apart from the rack or host program.)

THE EQUALIZER

EQpro-G3 provides high-quality parametric equalization (see **Fig. 2**). Each of three bands provides adjustable filter type, frequency, Q, slope, and gain. (The presence of the Q, slope, and gain parameters depends on the filter type selected.) The six filter types include Lowpass, Highpass, Bandpass, Fully Parametric, Low Shelving, and High Shelving. The frequency range varies depending on the filter type, but the full 20 Hz to 20 kHz range is available overall.

In addition, *EQpro-G3*'s frequency range depends on the current sampling rate, so the frequency range can actually be adjusted up to 40 kHz if you use a 96 kHz sampling rate. The Q (available for the Lowpass, Highpass, Bandpass, and Fully Parametric filters) is adjustable from 0.666 to 34.605, and the slope (available for the Low- and

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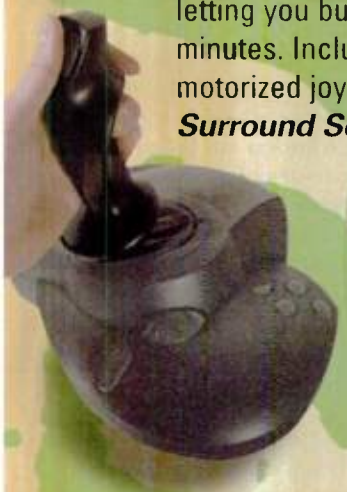

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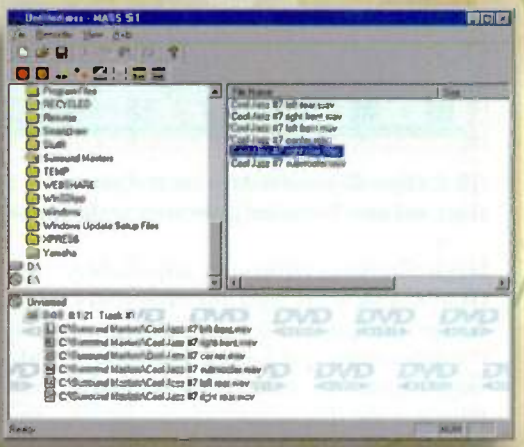

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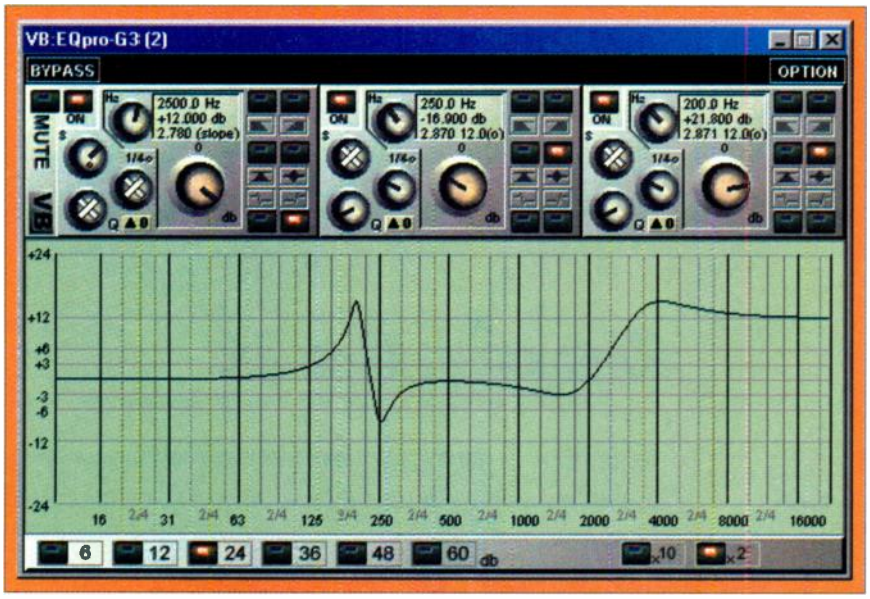

FIG. 2: *EQpro-G3* provides three bands of parametric EQ with adjustable filter type, frequency, Q, slope, and gain. You adjust parameters by clicking and dragging onscreen knobs.

High-Shelving filters) is adjustable from 0.4 to 4. As with the frequency range, the gain varies depending on the filter type, but for the Fully Parametric filter, the gain can be adjusted between ±36 dB.

In addition to the parameter controls, *EQpro-G3* displays a graph that shows the overall shape of the combined filters. You can change the vertical scale of the graph from ±6 dB to ±60 dB, and you can view the horizontal scale logarithmically (from 10 Hz to 12 kHz) or in octaves (from 10 Hz to 20 kHz). Unfortunately, the graph is only for display purposes; you can't make adjustments by directly manipulating the graph with the mouse (as you can with many other plug-ins). That was a bit of a disappointment.

LIMITED COMPRESSION

Not much can be said about the *C-Limiter* plug-in (see **Fig. 3**). It's probably one of the simplest plug-ins you'll ever use. With only four adjustable parameters, *C-Limiter* provides basic compression and brickwall limiting. The compression ratio can range from 1:1 to 8:1, and the gain can be adjusted between ±24 dB. The Velocity parameter controls how quickly the limiter reacts to the signal (1 to 100 ms), and the Limit parameter controls the highest level the signal can achieve through the output (0 to –12 dB).

C-Limiter provides no adjustments for attack or threshold, which makes it better suited to limiting than compression. It would be nice to have more control over the processing so the plug-in could be used for more advanced compression applications. That would certainly help justify the price of the package. On the other hand, you must also consider that *C-Limiter*'s sound quality is excellent. Even with the compression ratio set at 8:1, the gain set at +24 dB, and the Limit parameter set to –0.1 dB, I experienced nary a hint of distortion in the signal.

VERBALICIOUS

The *Aphro-V1* reverb plug-in is the most complex of the lot (see **Fig. 4**), but if you stick with the included 393 presets, it's quite easy to use. Just click on the LCD screen to open the Preset & Bank Interface window, select a preset, and you're off and running. You can also load and save preset banks from the right-click pop-up menu. Buttons on the main panel let you quickly compare presets, sequentially select presets and banks, and mute the plug-in. However, operating the plug-in becomes more complex when it comes to adjusting an existing preset or creating a new one from scratch.

For preset editing, *Aphro-V1* provides three separate parameter panels, which you access through the PG, CP, and AC buttons in the main window. The PG button opens the Pre-delay & Gain Interface window, where you can adjust the amount of predelay (0 to 1,000 ms) and gain of the wet signal relative to the dry signal (–∞ to +6 dB) for both channels. I especially like the fact that you can set the values independently for each channel, and you can reverse the phase of the wet or dry signals independently for each channel as well. That provides some very cool time-shifting and quasi-surround effects possibilities.

The Algorithm Control (AC) Interface window is even more impressive. It lets you specify up to three early reflections and a decay for each stereo channel independently or in sync. Each early reflection includes controls for delay (0 to 1,000 ms), feedback (number of successive echoes), and frequency response (for adjusting the amount of echo damping over time). The decay for each channel provides the same controls. What's more, each group of early reflections and each decay includes an LCD-style screen, which lets you view the reverberation time or the number of echoes as a response curve on a graph.

Finally, clicking the CP button opens the Color Panel window, which lets you manipulate the "color" of the reverb for both channels (individually or in sync). This provides a sophisticated type of filtering that you can control by selecting a mode of operation (Deadening, Tube effect, Resonance's Color, Metal effect, Chord effect, or General) and then dragging the mouse over a multicolored graph to change

FIG. 3: *C-Limiter* essentially provides one function: limiting. Some basic compression features are included, but only as they relate to limiting. No attack-time or threshold parameter is provided.

For manufacturer information, please see Contact Sheet, p. 203.

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the filter's response curve. It's difficult to explain (the manual could use some help in this area); you really have to hear it to fully understand what it does. Nevertheless, this feature, combined with the other elements of *Aphro-V1*, provides an extraordinary degree of control, and the overall sound quality is excellent.

FINAL ECHO

In terms of performance and quality, *Audio Plug-ins Pack* 1 is a great product. The user interfaces are intuitive and the sound quality of each plug-in is top-notch. *Aphro-V1* is one of the most flexible reverb plug-ins I've seen; it offers an extremely high degree of control over the sound of the reverb effect. Unlike the other plug-ins, *Aphro-V1* uses a more hardware-based approach to handling presets and banks from its front-panel display. I wish all the plug-ins handled presets in a more consistent manner.

Each plug-in also rates well in terms of CPU load. As measured in *Sound Forge*, my computer came up with the following percentages for each plug-in: 5 percent for *EQpro-G3*, 5 percent for *C-Limiter*, and 18 percent for *Aphro-V1*. In addition, a "quick" version of *Aphro-V1*, which processes the signal using half the sampling rate, puts about half as much strain on the CPU. In general, the modest processing loads required by these plug-ins mean that

MEDIA ASSISTANCE
Audio Plug-ins Pack 1 (Win)
effects plug-in package
$599

FEATURES ■■■■
EASE OF USE ■■■■
DOCUMENTATION ■■■
VALUE ■■■
1 2 3 4 5

PROS: Excellent sound quality. Intuitive user interfaces. Extremely flexible reverb. Low CPU load.

CONS: Only basic compression features in *C-Limiter* plug-in. Documentation is weak in areas and lacks tutorials. No online help files. A bit pricey.

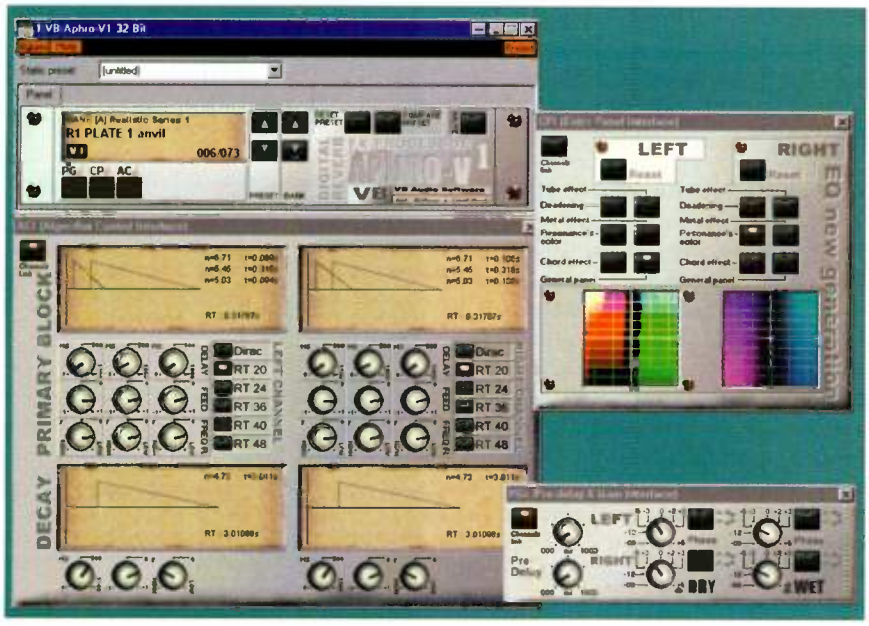


FIG. 4: *Aphro-V1* provides the most features and the greatest flexibility of the plug-ins. It allows you to create reverb effects with three adjustable early reflections, decay, color filtering, and signal-phase adjustment.

you can use multiple effects, or even racks of effects nested in other racks, without overburdening most CPUs.

Of course, there are a few improvements that would make me happy. These include direct filter-graph manipulation in *EQpro-G3*, more compression features in *C-Limiter*, better documentation (especially in the Color Panel description), and online help.

However, my main concern is the price. Even with the superb quality and performance the plug-ins provide, $599 still seems a bit steep. For less money, you could purchase TC Works' DirectX *TC Native Bundle*, which also provides excellent sound quality but has a much larger palette of processing features, including compression, limiting, de-essing, ducking, graphic EQ, parametric EQ, and reverb.

Nonetheless, *Audio Plug-ins Pack* 1 is clearly a high-quality product. If you need an extremely flexible, great-sounding reverb, and you don't mind spending the money, this package is worth considering.

Scott R. Garrigus *(www.garrigus.com) is the author of* Cakewalk Power, *the first professional guide to Cakewalk's* Pro Audio, Guitar Studio, *and* Home Studio. *He is also the publisher of the* DigiFreq *music technology newsletter.*

LUCID

SRC9624

Changing rates in an ever-changing world.

By David Miles Huber

For those who work largely in the digital domain and routinely handle all types of digital media and formats, the interfacing of the various tools and toys is an increasingly important part of production. Lucid's SRC9624 can ease the pain of getting digital devices to communicate in a fast-paced studio environment.

The 2-channel SRC9624 is a digital audio sample-rate converter meant for playback, mastering, post-production, broadcast, and any application that demands a broad range of sample-rate, bit-rate, and I/O interface capabilities. The SRC9624 essentially serves as a digital converter/patch bay that can convert any sample rate between 32 and 100 kHz (with either a 16-, 20-, or 24-bit word length) to a wide range of output rates and formats, including a few that you probably never knew existed.

THE BOX

The SRC9624's 1U rackspace design sports a brushed-aluminum, sculptured faceplate with a clean, understated layout that lends it an elegance not often encountered in this type of device. Functionally, it has two digital input and output paths (A and B). Each covers the standard digital audio connection types by offering a professional AES port (XLR), a consumer coaxial S/PDIF port, and an optical Toslink S/PDIF port. The unit's coaxial connectors are of the BNC type (a standard often found on broadcast equipment). Lucid made it easy to connect the unit to consumer digital devices by including BNC-to-RCA adapters.

The front panel provides columns of status LEDs for the unit's five functional groups: Routing, Input A, Input B, Output Sample Rate, and Output Dither (see **Fig. 1**). A tiny toggle switch in each section lets you cycle forward or backward through the settings.

GETTING THERE FROM HERE

The Routing section lets you switch the SRC9624 between four operating modes. In Independent mode, the two digital paths are kept separate; each input is routed to its own output. The Distribution mode routes the input of path A to the output paths of both A and B. The 96 kHz Dual (2>1) mode takes a stereo 96 kHz dual AES signal that has been split between two cables and converts it into any standard format, at any sample rate. And 96 kHz Dual (1>2) takes any standard format, at any rate, and converts it to a stereo 96 kHz dual AES signal.

Many people have never heard of a stereo 96 kHz dual AES signal. Transmitting digital audio over a twisted-pair AES line (usually an XLR mic cable) works just fine for sample rates up to 50 kHz. However, at higher rates, the signal can degrade over longer cable runs. To get around this problem, the AES standard was amended to allow transmission of stereo sample rates above 50 kHz (such as 24/96) over two synchronized AES cables (with one cable carrying the left-channel data and the other carrying the right-channel data).

The front panel's Input A and Input B sections indicate whether the signal is in a pro (AES) or consumer (S/PDIF) data format and whether it is audio or nonaudio data (for instance, an AC3 surround bitstream). They also let you choose between independent AES, S/PDIF, and optical input connections.

The Output Sample Rate section lets you select from rates of 32, 44.1, 48, 88.2, and 96 kHz. You can also pick any output or pull-down rate between 32 and 100 kHz by synching the rate to an external clock source.

The Output Dither section allows all word lengths to be passed without dither. However, you can dither high-bit-rate input signals down to either 16 or 20 bits using a flat, triangular PDF dither (with no noise shaping) form. This can increase the converted data's overall dynamic range, albeit with a very low level of dithered noise distributed through audible frequency ranges.

LUCID
SRC9624 sample-rate converter
$1,995

FEATURES ■■■■
EASE OF USE ■■■■■
AUDIO QUALITY ■■■■■
VALUE ■■■
1 2 3 4 5

PROS: Simple, straightforward, and elegant. Full range of sample-rate and bit-rate options. Useful as a digital patch bay.
CONS: Changing the front-panel settings causes output data (on both data paths) to glitch.

CURE FOR THE JITTERS

One digital audio recording aspect that never gets enough attention is the need for sampling-rate synchronization within a digital network. To reduce clicks, pops, and jitter distortion when using multiple digital devices, you must sometimes lock the sampling-rate timing to a single master-clock signal (so devices' conversion states occur simultaneously).

The SRC9624 can lock to an external source through a BNC word-clock connection, through an AES11 port that receives sync data from an XLR cable link, or through a standard AES digital transmission line (the audio information is stripped out at the box). The unit can also generate a master word-clock signal at any of its five internal clock rates, and can resynchronize a jittery input signal that has introduced timing errors (which can cause the audio signal to degrade and sound fuzzy) to any of these rates.

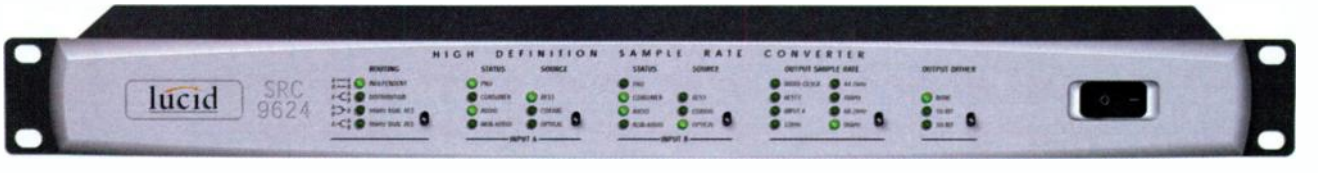


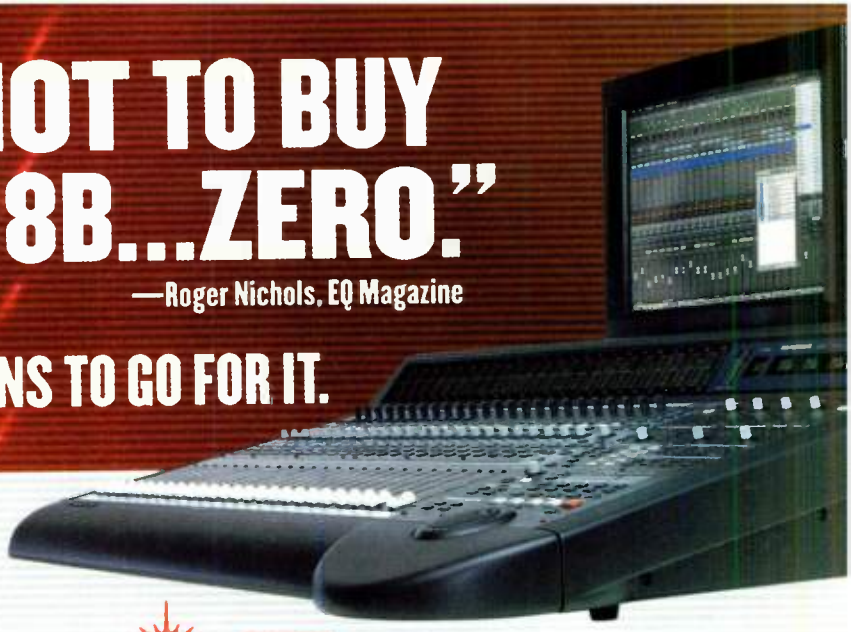
FIG. 1: Front-panel routing switches let the SRC9624 sample-rate converter work as a digital audio patch bay. Status lights indicate available signal types.

For manufacturer information, please see Contact Sheet, p. 203.

"REASONS NOT TO BUY A MACKIE D8B...ZERO."

—Roger Nichols, EQ Magazine

PLUS 3 MORE REASONS TO GO FOR IT.



1 FREE UPGRADE! NEW OS 3.0 ADDS OVER 30 NEW FEATURES!

Our Programming Department has been chugging the double lattés to create Mackie Realtime OS™ Version 3.0, packed with more new features and enhancements than you can shake a mouse at. Here's just part of what 3.0 adds to the already amazing D8B.

- **New key (sidechain) inputs** for all 48 onboard dynamic processors featuring soft knee architecture and single band 20-20k parametric EQ for frequency dependent processing such as de-essing
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- **Multiple Undo List** — 999 levels!
- New **Snapshot libraries**.
- Externally or internally accessible **inserts across Mains and Buses** plus **channel inserts pre and post DSP**.
- **Updated GUI** including 48-channel fader bank view screen.
- **Time Offset** (delay) adds a delay of up to 999 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.

The list of top engineers and producers who use the award-winning Mackie Digital 8 • Bus is growing daily. For info on the D8B, new UFX and Optical • 8 cards, 3rd-party plug-ins and how D8B owners can get their free OS upgrade, visit www.mackie.com or call your local D8B dealer.

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2 DSP PLUG-INS!

Antares' Auto-Tune for the D8B uses advanced DSP algorithms to detect the incoming pitch of a voice or solo instrument as it's being tracked and instantly pitch-correct it without introducing distortion or artifacts. Fully automatable.

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.

Drawmer offers two dynamics packages for the D8B: ADX100 includes their industry standard frequency conscious gating, plus compression and limiting; ADX200 adds variable "Peak Punch" and further Drawmer innovations.

IVL Technologies' VocalStudio provides real time vocal doubling, multi-part harmonies and pitch correction in an easy-to-use interface. A free demo is built-into the Digital 8 • Bus. Just add a second MFX card to own this innovative plug-in from a world leader in vocal processing.

TC Electronic Reverb (bundled with the D8B UFX card) provides Reverb 1 and Reverb 2 algorithms from the renowned TC Electronic M2000 Studio Effects Processor. TC FX upgrade package contains an expanded set of M2000 reverbs plus Delay, Chorus, and Pitch. TC 2000 adds the TC M2000's Reverb 3, de-essing, tremolo, phasing, and panning.

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.

SRC9624 Specifications

Input Sample Rates	32–100 kHz
Output Sample Rates	32, 44.1, 48, 88.2, and 96 kHz
External Sync	32–100 kHz
Input Resolution	16, 20, or 24 bits
Output Resolution	24 bits
Inputs	(2) male AES/EBU, (2) coaxial (BNC) S/PDIF, (2) optical S/PDIF, (1) BNC (word clock in), (1) XLR AES11
Outputs	(2) male AES/EBU, (2) coaxial (BNC) S/PDIF, (2) optical S/PDIF, (1) BNC (word clock out)
Dimensions	1U × 6" (D)
Weight	7.4 lbs.

INSIDE CONNECTIONS

Using my M Audio Delta 1010 interface, I recorded a 24-bit, 96 kHz test session with vocals, flute, and percussion. I then transferred the recorded file to my 16-bit, 44.1 kHz DAT recorder and experienced no downsampling hitches. Next I upsampled and downsampled sounds between several devices at various rates, using all three formats and various master-clock configurations. Again, I had no problems. Data paths A and B were indeed independent and passed data without interaction, except that changing any switch setting on one caused the other to momentarily glitch and mute. I just had to remember to leave the front panel settings alone when an audio signal was passing through the unit.

The input connections for the different formats are completely separate and selectable from the front panel; this simple feature lets you use the SRC9624 as a digital patch bay. For example, you could plug a DAT into AES port A, a workstation into S/PDIF port A, and a CD player with optical S/PDIF into port B, then route signals between them (or route a single input to several devices) by just flipping the front-panel switches. The input status LEDs light up only when data is present at the input, a seemingly minor feature that saves time when you can't figure out why you can't get audio into your DAT machine.

I LOVE LUCID

The SRC9624 is perfect for music, video, and broadcast production houses, where you never know what digital format or sample rate will cross your path. It also saves time and labor. Changing between sample rates, routing between digital devices, and distributing data for making duplicates is just a flick of a switch away.

David Miles Huber *is updating his best-selling book,* Modern Recording Techniques, *for its fifth edition (Focalpress.com). You'll find his musical explorations at www.51bpm.com.*

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QUICK PICKS

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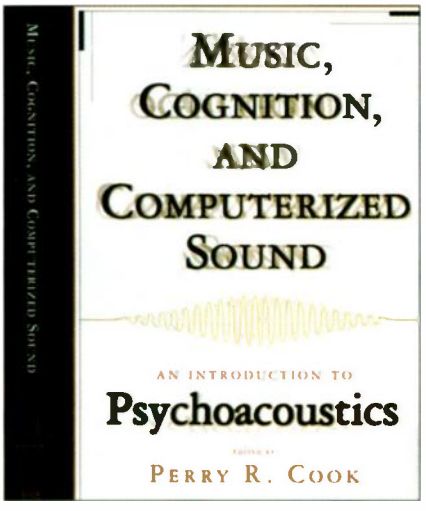
Music, Cognition, and Computerized Sound

By Douglas Geers

Many of us spend hundreds or thousands of hours (and dollars) pursuing the perfect sound, but do we ever consider how the listener hears and perceives our music? Composers and producers can benefit from understanding how the human ear and brain convert sounds into our experience of noise, speech, and music. Psychoacoustics is the study of how hearing works and how the brain processes sound. This field is explained in MIT Press's *Music, Cognition, and Computerized Sound: An Introduction to Psychoacoustics* ($62.95), edited by Princeton University Professor Perry R. Cook.



***Music, Cognition, and Computerized Sound: An Introduction to Psychoacoustics* is a new book from MIT Press edited by Perry R. Cook. It is a fascinating and informative text for anyone who wishes to better understand how the brain interprets sound.**

Psychoacoustics draws from several fields, including physiology, cognitive psychology, and physics. Books on psychoacoustics tend to focus on only one aspect of the field and provide far more detail than the average musician wants or needs. However, *Music, Cognition, and Computerized Sound* provides a useful, comprehensive introduction.

Who, What, Where

Several chapters were written by computer-music authorities, such as Max Mathews, who wrote the first program to generate sounds on a computer in 1957; John Chowning, who developed FM synthesis; John Pierce, the engineer who coined the term *transistor;* and Roger Shepard, a Stanford psychologist. Shepard's research into optical and auditory illusions and ambiguities led him to discover the perpetual-glissando effect known as the *Shepard tone.* The remaining authors—Perry R. Cook, Brent Gillespie, and Daniel Levitin—are also respected talents in the computer-music field.

The book is composed of 23 chapters. The first eight explain the crucial concepts of psychoacoustics. Chapters 1 and 2 introduce the physical apparatus of the human ear and its connections to the nervous system. Chapter 3 explains why you should be interested in the physics of acoustics and describes how our brains interpret auditory signals. In chapter 4, Pierce deftly describes the basics of acoustics, from sine waves to Fourier analysis and the sampling theorem. Chapters 5 through 8 progress to the human perception of specific sonic attributes: pitch, loudness, timbre, and spatialization. The remainder of the book offers more advanced (and often quite fascinating) situations in which the understanding of psychoacoustics solves the sonic mysteries of speech, music, and environmental noises.

Music, Cognition, and Computerized Sound introduces a wide variety of topics. The trade-off is that no single topic is discussed in great detail. However, each chapter ends with a generous bibliography of sources that gives readers the chance to delve more deeply into any topic they wish.

Hearing Is Believing

The writing style of *Music, Cognition, and Computerized Sound* remains clear throughout. Technical terms are defined when they first appear. Unfortunately, the book has no glossary of terms. The accompanying CD-ROM contains sound examples that illustrate the text discussions—a very useful addition. For any musician who is curious about the technical processes of human hearing—but who is also afraid of drowning in a sea of highly technical scientific language— *Music, Cognition, and Computerized Sound* is recommended reading and a handy reference.

Overall EM Rating (1 through 5): 4

EAST WEST

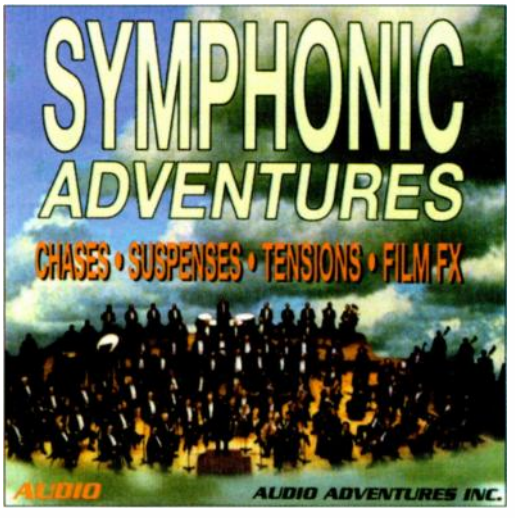
Symphonic Adventures

By David Rubin

Whether they work on small independent films, TV commercials, or blockbuster movies, producers and directors always seem to covet the big, symphonic sound that only a full orchestra can deliver. Unfortunately, most budgets can't accommodate a real orchestra and several full-blown recording sessions. So the hapless film composer is left with the age-old conundrum: how do you get a big sound from a little budget?

East West offers one possible solution well worth exploring. *Symphonic Adventures* is a collection of orchestral music samples available on a single audio CD ($99.95) and on CD-ROM in Akai, Roland, and GigaSampler formats ($199.95). The samples, which range from around five seconds to a minute in length, are designed expressly for film, TV, radio, and multimedia applications, with the accent on dramatic scoring.

Expertly composed by Dick De Benedictis,



East West's *Symphonic Adventures* lets you create classic-sounding, big-time orchestral movie scores on a shoestring budget.

For manufacturer information, please see Contact Sheet, p. 203.

BIG NEWS...

FROM

Electronic Musician®

the musical phrases and fragments focus on classic film-scoring idioms, with an emphasis on dark, sinister, and atmospheric textures. The collection is based on a concept developed by Christopher Page, who produced the CD and conducted the orchestra. The recording quality is top-notch throughout, and the performances by the Prague Philharmonic Orchestra are consistently first-rate.

Orchestral Toolbox

The samples are loosely organized into six categories: Chases, Suspense, Wild & Free, Full Orchestra FX, Small Instruments, and Film Orchestra FX. I say they are "loosely" organized because many of the samples could work well in more than one category, depending on the context.

Each musical fragment is presented in a full orchestral version followed (in most cases) by one or more variations derived from the complete orchestration. For example, an orchestral phrase labeled Tutti might be followed by alternative versions consisting of the strings alone, the strings with piano, the woodwind or brass section alone, or other elements such as looped phrases, endings, or individual hits.

The number of variants ranges from one to more than a dozen. By combining the full orchestrations with their related components, you can create a score that changes texture and density to match dialogue, sound effects, and visual transitions. This "toolbox" approach to orchestral sampling provides a uniquely interactive orchestral construction kit that lets you shift smoothly from one phrase to another.

Sound Moves

The first category, Chases, offers the greatest range of possibilities, and it's the only one with tempo indications and descriptive titles. The first 11 titles are recorded at 128 bpm; with their related variants, they provide more than 90 samples to choose from. The remaining six titles are recorded at 116 bpm and offer 23 samples at the slower tempo.

This category emphasizes energetic, highly dramatic, action-oriented music with thrusting rhythms and foreboding undertones. Most of the samples last between 10 and 20 seconds and build to a heart-stopping climax. Several of the pieces, such as Hitchcock, Psycho, and Vertigo, pay unabashed homage to the works of Bernard Herrmann. The Stravinsky sample offers a brief "Rite of Spring"–style fragment with pounding rhythmic pulses. The remaining titles deliver similar edge-of-your-seat musical phrases that are well suited to action sequences.

The Suspense category includes 13 samples—many without variants. These phrases lack the rhythmic component found in the previous section and focus instead on more free-form styles that stress dissonance, rich textures, and sudden percussive effects. Many samples have a floating quality, and all of the entries in this category induce a sense of eerie anticipation.

Wild & Free offers menacing pads and phrases with long, sustained textures that build and evolve. Some samples emphasize heavy low brass. The Full Orchestra FX and Small Instruments categories provide an assortment of accents, stings, stabs, and other orchestral effects, including short phrases, dissonant chords, and ominous motifs. The Film Orchestra FX category includes 11 dramatic phrases with numerous alternative versions. These phrases highlight classic cinematic orchestral effects, many with sustained chords, edgy textures, and dark instrumentation, along with hits, tags, bumpers, and stings.

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Final Cue

Symphonic Adventures provides a wonderful collection of musical elements suited for theatrical settings from radio dramas to action/adventure films.

The documentation is adequate, but I'd like more detailed descriptions (especially in the later sections) and timings for all the samples. Otherwise, it's hard to fault this great-sounding orchestral toolbox. You can mix and match the full samples with the variants, or you can use many of the variants as backgrounds and add your own melodies and accents. Either way, you'll end up with a big-time movie score that sounds as though you actually had a budget to work with.

Overall EM Rating (1 through 5): 4.5

RAREFACTION

RovaMatic (Mac/Win)

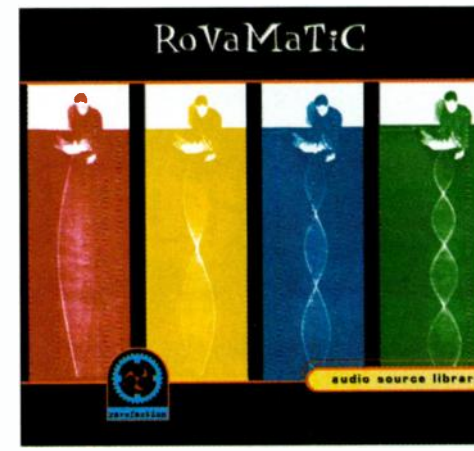
By Jeff Obee

The Rova Saxophone Quartet is an adventurous ensemble that has explored improvisational music since the late 1970s. Rarefaction also has a reputation for being adventurous and experimental, and this synergy led to the production of *RovaMatic* (audio CD, $89; CD-ROM, $149). Noted sound designer Thomas DiMuzio undertook the project and recorded saxophonists Bruce Ackley (tenor, soprano), Steve Adams (sopranino, alto), Larry Ochs (tenor, sopranino), and Jon Raskin (baritone, sopranino, alto).

Roving through RovaMatic

The samples on *RovaMatic* were recorded in an acoustically live room for ambience, with Rova in a semicircle, its standard performance configuration. The group was close-miked in tandem along with stereo overhead microphones in an XY configuration.

RovaMatic has no multisamples, velocity switches, or pitch and tempo references. Instead, you get 16-bit, 44.1 kHz stereo performances in AIFF format that you can import into your DAW, audio editor, or sampler. The 284 sounds are compiled in eight categories, each with subcategories: Beds, Chords, Chronology Loops, Drones and Tones, Loops, Sax SFX, Solo Rova, and Trills. File sizes range from approximately 150 KB in the Short Chord section to between 16 and 19 MB in the Drone Solo and Chronology Loops sections.



Rarefaction's *RovaMatic* sample CD captures a wealth of delightfully idiosyncratic, cutting-edge performances from the internationally recognized, avant-garde Rova Saxophone Quartet.

Are You Adventurous?

If you are seeking horn section hits and stabs in R&B, funk, and other mainstream styles, look elsewhere. *RovaMatic* is rife with unusual and outside improvisational playing, including whole-tone scales, abstract collective polyrhythmic explorations, and atypical tonguing techniques.

The sounds in Chronology Loops are carefully documented. Each loop has a main file and a folder with smaller, equal-length phrases snipped from the main file. For instance, Zonk Turns is an 8.9 MB performance that is divided into 14 smaller chunks. I love Zonk Turns for its insistent, percussive tonguing. The full file begins with two bars of one sax playing a fairly straight rhythm. As the performance continues, the others join in and create an outrageously polyrhythmic piece. The smaller loops isolate individual sections of the main file. Splicing these together can create some scintillating, rhythmic aural scenarios.

The Drones and Tones samples offer some real treats. The Eastern Chants folder contains five droning pieces in which the saxophones drift slightly above and below pitch for a chorused, quarter-tone effect. Drone Solos features a couple of very long files. Ceremonial Prelude is particularly good: each member of the quartet emerges for a brief solo, while the other three create shifting, atonal beds behind him. In Overtones, the players use a certain embouchure to bring out breathy, squeaking overtones.

You get oodles of loops here—too many to describe in detail—and all of them possess engaging qualities. Two loops in the Loop Dedications folder are outstanding. Claude Monet has the quartet improvising different repeating motifs; one musician plays an ascending I–II–IV–V line in the alto range while another chatters in high tones above and the other two repeat lines in the tenor range. The 1.8 MB Don Van Vliet sample (named after the artist known as Captain Beefheart) again features percussive tonguing techniques that create a captivating ditty. The first Stories in Sound loop is good: a single horn enters with a pulsing rhythmic line for a few bars, then the others chime in with a backing bed, and another player takes over the pulsing line in a new key. The piece ends with a flurry of bold improvisation.

The Short Chords folder provides 18 files of staccato chord bursts. The Low Chord and Staggered Low Chords folders have some pretty daring sustained chords. None of the Chords folders has pitch or chord definitions; Rarefaction should have described this area of the disc in more detail.

The Noir folder has some all-too-brief minisoundtracks that evoke film noir and make you visualize a shadowy, black-and-white figure on the wall. The Machines folder contains two gems that defy description, but beautifully evoke machinelike qualities. Alternating Currents has a few powerful honking sustains. The two Laugh bits are great—four saxes making laughing noises is a delight.

Rova Raves

Rarefaction CDs always entertain me, and this playfully peculiar platter is no exception. The disc is not for the meek, and it occupies new turf. It's great for infusing your music with something different. Jazz musicians in particular will like this collection.

I recommend *RovaMatic* for compositional beds, for video and film soundtracks, and for creating incidental flybys that pique the ear. You can process these samples like mad to create something altogether new. As with all Rarefaction offerings, your imagination is the limit. Rarefaction offers

MP3 samples of the disc on its Web site at www.rarefaction.com. Give them a listen.

Overall EM Rating (1 through 5): 4.5

BITHEADZ

Osmosis 1.12 (Mac/Win)

By Dan Phillips

The past decade has seen a great deal of standardization in MIDI software, audio connectivity, plug-ins, and more. Unfortunately, sample libraries have been largely excluded from this trend and still languish in the dark ages of incompatibility. Most samplers let you import libraries from other instruments, but they do so with varying degrees of success.

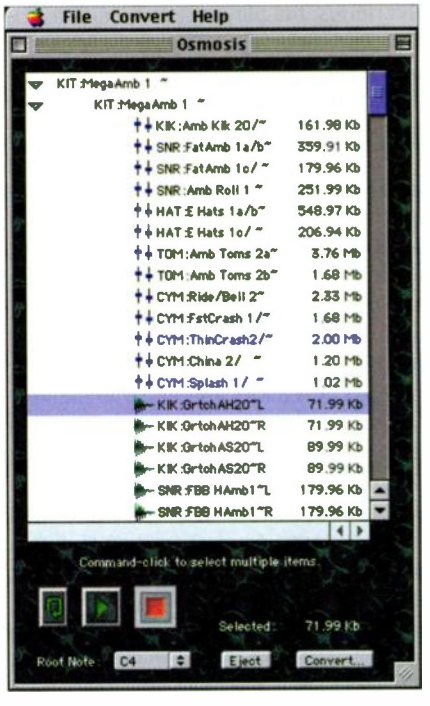
BitHeadz's *Osmosis* ($179) raises the bar for sample conversion. It can convert raw samples to Sound Designer II (a Mac-only format), AIFF, WAV, and BitHeadz Unity DS-1 formats, as well as translate Akai S1000/S3000 and Roland S700 samples into Unity DS-1 and Digidesign SampleCell formats. The program runs on Mac and Windows platforms; I tested it using a Power Mac G4/400 MHz and *Unity DS-1*.

Conversion Methods

One of Merriam-Webster's definitions for *osmosis* is an "effortless assimilation," and the software's simple, clean interface embodies this concept. Choose your output format, pop in a sample CD-ROM, select the Convert Entire Disk command, and break for coffee. Between five minutes and an hour later—depending on the size and complexity of the disc you're converting—you'll have a collection of folders that contain sounds in the format of your choice, ready to load and play. Pretty slick!

The methods for auditioning and converting single sounds are similarly painless. *Osmosis* shows the CD-ROM's directory structure in an expandable list format. You can browse through the folders on the CD, audition individual samples directly from disc, and drag selected sounds (or groups of sounds) right to the desktop.

You'll find a few more features if you care to dig in. For instance, Roland samplers use pre-emphasis/de-emphasis during sample recording and playback, which often makes the samples sound brighter than normal on non-Roland samplers. *Osmosis* can remove the pre-emphasis during conversion.



***Osmosis*, from BitHeadz, translates samples in the Akai S1000/S3000 and Roland formats into other useful formats, including Unity DS-1, WAV, and AIFF.**

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Conversion Experience

I converted a number of CD-ROM libraries in Akai S1000, S3000, and Roland formats, and in general *Osmosis* did a good job. In addition to samples and keymaps, *Osmosis* also converts filter and amplitude envelopes, filter settings, and LFO settings. The conversion goes a long way toward preserving a sample's original sound design, and it works much better on Roland CD-ROMs than other conversion methods that I've seen.

Support for modulation routings is fairly basic: Mod Wheel–to–LFO pitch amount is supported for both Akai and Roland formats, and Velocity–to–Envelope1 Attack is supported for Akai, but that's about it. Many sample libraries don't rely heavily on modulation, so in most cases, *Osmosis*'s limited support for modulation routings is not an important factor. However, if the sounds you're working with do use modulation, you'll have to re-create the modulation routing.

Mind Your Defaults

One problem with *Osmosis* is that even though filter parameters are supported, files converted to Unity DS-1 programs will have the filter turned off by default. You will need to manually enable the filter for each sound. For libraries that use filters, this feature detracts from the Convert Entire Disk command's otherwise wonderful functionality.

I also experienced some small glitches in the conversion process. For example, Roland's version of Spectrasonics' *Distorted Reality* makes extensive use of separate loop lengths for right and left samples. The converted Unity DS-1 samples produced unwanted clicks on playback, and I wasn't surprised because the Roland-to-Unity DS-1 conversion on at least one other sampler had problems with this disc as well. One drum sound was converted incorrectly, and in order to read a mixed-mode CD-ROM in Akai and audio formats, I had to disable Apple's audio CD extension (a workaround not mentioned in the *Osmosis* manual). Some sounds also relied on crossfading between two sets of samples via a MIDI controller, which is not supported in *Osmosis*.

Effortless Assimilation

Osmosis isn't perfect, but it works very well in most cases. In fact, it converts formats better than some hardware samplers. The Roland conversions, in particular, are very good. More important, the speed and ease of *Osmosis* can't be beat. At $179, *Osmosis* seems like a no-brainer purchase for anyone interested in using Akai and Roland sample libraries with *Unity DS-1*, Sonic Foundry's *Acid*, Digidesign's Pro Tools and SampleCell, or other applications that read Sound Designer II, AIFF, and WAV files.

Overall EM Rating (1 through 5): 3.5

FXPANSION

VST-DX Adapter 2.1 (Win)

By Phil Darg

Windows users often face a tough decision when choosing audio software: consider the small number of programs that directly support the VST plug-in format, or opt for the larger number of choices that support only DirectX effects. FXpansion offers a solution to this quandary with its *VST-DX Adapter* 2.1 series (formerly known as *Amulet VST-DX Adapter*). These programs convert VST plug-in effects into

FXpansion's *VST-DX Adapter* software allows VST plug-ins to be used in DirectX-host applications.

DirectX effects, giving access to hundreds of VST plug-ins—even if you don't own a VST-host program.

Expand Your Horizons

FXpansion offers three versions of *VST-DX Adapter*. With *VST-DX Adapter Basic* ($30), VST effects can run in a DirectX application. *VST Adapter* 2.1 ($60) takes it a step further by adding MIDI automation of effects parameters. It also lets you use the plug-in's effects presets and provides support for the VST Instrument format. FXpansion has also announced *VST-DX Adapter SDE* ($100), a stand-alone product with a graphic interface on which you can draw VST plug-in parameters. However, *SDE* does not include several of the real-time MIDI features found in *VST-DX Adapter* 2.1.

FXpansion says it tested *VST-DX Adapter* with DirectX-host programs such as Cakewalk's *Pro Audio* (6.0 and better); FASoft's *N-Track;* Sonic Foundry's *Acid, Sound Forge,* and *Vegas* (as Track Insert/Aux effects only); Syntrillium's *Cool Edit Pro;* and SEK'D's *Samplitude* and *Samplitude 2496.*

Where It's At

VST-DX Adapter appears in host software inside the DirectX audio plug-in menu. Selecting *VST-DX Adapter* brings up a simple interface from which you can load any plug-in in the default VST directory. The straightforward interface offers a few controls: the Load button loads the VST effect, and the Show/Hide button displays or obscures the VST plug-in's graphic user interface. Other buttons, which are not available in the *Basic* version, let you select effects presets and configure MIDI control.

VST-DX Adapter also provides MIDI control of effects parameters and support for VST Instruments. You can use these handy features only if your host program generates MIDI notes. That is no problem with a digital audio sequencer, but not necessarily the case with a dedicated audio editor. However, some audio editors—such as *Samplitude*—can generate MIDI events. If you have the right software, using these features is easy: choose your MIDI input source and channel using the arrow selectors on the screen's right side.

Smooth Sailing

I tested *VST-DX Adapter* 2.1 on two PCs, a Pentium II/233 MHz and a Pentium II/600 MHz. I also used Cakewalk's *Pro Audio* 9, Steinberg's *Wavelab* 3, and Steinberg's *Cubase VST* 5.0. The program worked well on both computers; in fact, I would never have known that the VST plug-ins I used weren't native to the host, as they pop up in the plug-in window and run exactly like DirectX effects. Both computers were able to run multiple VST effects in real time without any hiccups at all; *VST-DX Adapter* doesn't add any latency to the audio processing.

FXpansion's *VST-DX Adapter* series holds great promise, and there's no question it is a sorely needed utility. It opens up the world of VST plug-ins to all Windows desktop-music producers, who will no longer be limited to one standard or the other.

Overall EM Rating (1 through 5): 4

ELECTRIX

EQ Killer

By Edo Castro

Typically, a DJ will drastically EQ (or kill) some rhythmic element such as a kick drum or snare, and then bring this element in and out of the overall mix. The Electrix EQ Killer ($299) is a Kill Box that lets DJs and producers EQ an element without investing in expensive equipment. Built like a tank, the unit comes encased in a rugged aluminum housing that will absorb a lot of abuse. With the included joiner plate, you can connect two Electrix Mods devices in a 19-inch rack. The EQ Killer can also rest on a flat surface. The front

panel is tilted upward, making the controls easier to read.

Kill the Band

The front panel is divided into three sections: Low, Mid, and High. Each section has a Momentary switch, a Band Kill switch, and level control knobs. The level knobs dial up the amount of gain or attenuation for their respective frequency bands, offering up to 6 dB of gain per band. Unity gain is achieved when the level knob is set at 12 o'clock. Between the Low, Mid, and High level knobs are the Low X-Over and High X-Over sweep controls. The Low X-Over sets the point where the Low band ends and the Mid band starts. The High X-Over adjusts where the Mid band ends and the High band starts.

Electrix's EQ Killer brings a bag of real-time DJ tricks to your studio.

The back panel has three input/output sections. Inputs 1 and 2 have standard RCA stereo connectors. There's also a switch to select between line level and turntable input levels, and grounding posts for turntables. The third section's Send/Return loop lets you apply external effects to the killed band. At the front of the unit's bottom right-hand corner is an input selection switch for toggling between turntables or line-level devices. The button will act as a bypass switch if there's only one device connected to EQ Killer.

Freq Out

By dialing out the Low level, cranking up the Mid and High levels, and adjusting the Mid and High X-Over frequencies, you can create a mix that sounds as though it's playing through your telephone's speaker. By twirling the Mid and High level knobs to 0 dB and cranking the Low level all the way up, you can also get the familiar thud and thump of that bass-from-the-trunk-of-your-car sound. If you use it tastefully, the EQ Killer can have a stunning effect on mixes.

To focus on the hi-hat in your mix, kill the Low and Mid bands and boost the High X-Over. With help from the Band Kill and Momentary switches, you can change the groove by rhythmically adding and subtracting the low- and midfrequency elements.

To remove a vocal track, kill the Mid band and work with the Low and High X-Over knobs to fudge and smudge the vocal track out of existence. On some of my test mixes, I couldn't completely eliminate the vocal track; this probably stemmed from the way the track was mixed down. If you attempt to remove a vocal track, you'll lose related frequencies that you might otherwise want to leave in. It's not perfect—but it is interesting.

Frequency Dependent

This unit may not look like much, but there's a lot of on-the-fly sound-shaping going on here. Once you get to know the EQ Killer's functions, it can become a very cool, creative widget in your production bag of tricks.

Overall EM Rating (1 through 5): 4.5

M AUDIO
C03

By Brian Smithers

In this big, beautiful digital world, you can pass your musical bitstream from device to device as many times as you want, secure in the knowledge that its quality will not degrade during the digital transfer process. Life is good—as long as all your gear

The C03 digital audio format converter takes an S/PDIF coaxial, S/PDIF optical, or AES/EBU input and converts it to all three formats simultaneously. It also gives complete control over the SCMS status of S/PDIF output.

speaks the same digital transfer language, or you have the M Audio CO3 digital audio format converter ($249.95). The CO3 takes an input from any of the three common stereo digital audio interface formats and converts it in real time to either of the other two formats. Because the CO3 passes signals to all three outputs simultaneously, it's a great way to dub to multiple digital machines.

I/O Central

The CO3's back panel is about as straightforward as it gets. It has one group of three inputs and another of three outputs, each consisting of an S/PDIF optical (Toslink) connection, an RCA connection for S/PDIF coaxial, and an XLR connection for AES/EBU. For anyone with a relatively stationary studio setup, having the connections on the back reduces clutter. But for someone with multiple devices in one of the supported formats, reaching around to the back panel all the time can be a pain. However, because the CO3 is not quite as large as a Stephen King novel, it's not that big a problem.

The three buttons on the front are labeled Source, SCMS, and Power. Pressing the Source button cycles through the three possible inputs, as indicated by three well-marked LEDs. If the CO3 finds recognizable data at an input, the Source Valid LED lights up. SCMS stands for Serial Copy Management System, a form of copy protection that's part of the S/PDIF format. Pressing the SCMS button cycles through its four modes: none, pass through, force original, and force first generation. Four more LEDs indicate the selected mode.

Serial Copy Killer

SCMS flags audio as either an original or a first-generation copy. Consumer devices are not allowed to make copies of copies, which means that anything with a first-generation flag is supposedly a dead end for pirates. By allowing the SCMS bits to be manipulated, the CO3 lets you create a safety copy flagged as an original—therefore valid for copying. No matter what the original SCMS bits are, CO3 gives you total control over whether to change them or pass them through unaltered.

Because SCMS isn't part of the AES/EBU specification, the results at that output are a bit different. When the input is either type of S/PDIF, the AES/EBU output is valid only in pass-through mode, in which the audio stream travels to the AES/EBU output with the SCMS bits stripped away. When the input is AES/EBU, pass-through mode isn't available, because there are no SCMS bits to pass through. But the other three modes all function as expected, with the AES/EBU output an exact copy of the input.

It's hard to argue with a piece of gear that's reasonably priced, compact, and easy to use. If your studio is the digital equivalent of the Tower of Babel, the CO3 is a great way to get everybody talking the same language.

Overall EM Rating: (1 through 5): 4

DIGIDESIGN

Access Virus TDM (Mac/Win NT)

By Jeff Burger

Tons of software synthesizers have appeared on the market, but unfortunately, most of them are limited in their power and polyphony by the resources of the host CPU. Digidesign has pulled an end run on that equation with the introduction of a TDM version of the Access Virus, the in-your-face German synth that's at home emulating vintage synths or fueling dancefloor mixes. (For a full review of the Access Virus hardware synth, see the April 1999 issue of **EM**.)

The Virus hardware emulates analog synthesis using the same Motorola DSP chips that are found at the heart of Pro Tools' TDM architecture. In fact, Digidesign collaborated with Virus's designer to modify the original code rather than reinvent the wheel. As a result, the *Access*

Digidesign's *Access Virus TDM* accurately re-creates its hardware counterpart within the *Pro Tools* environment.

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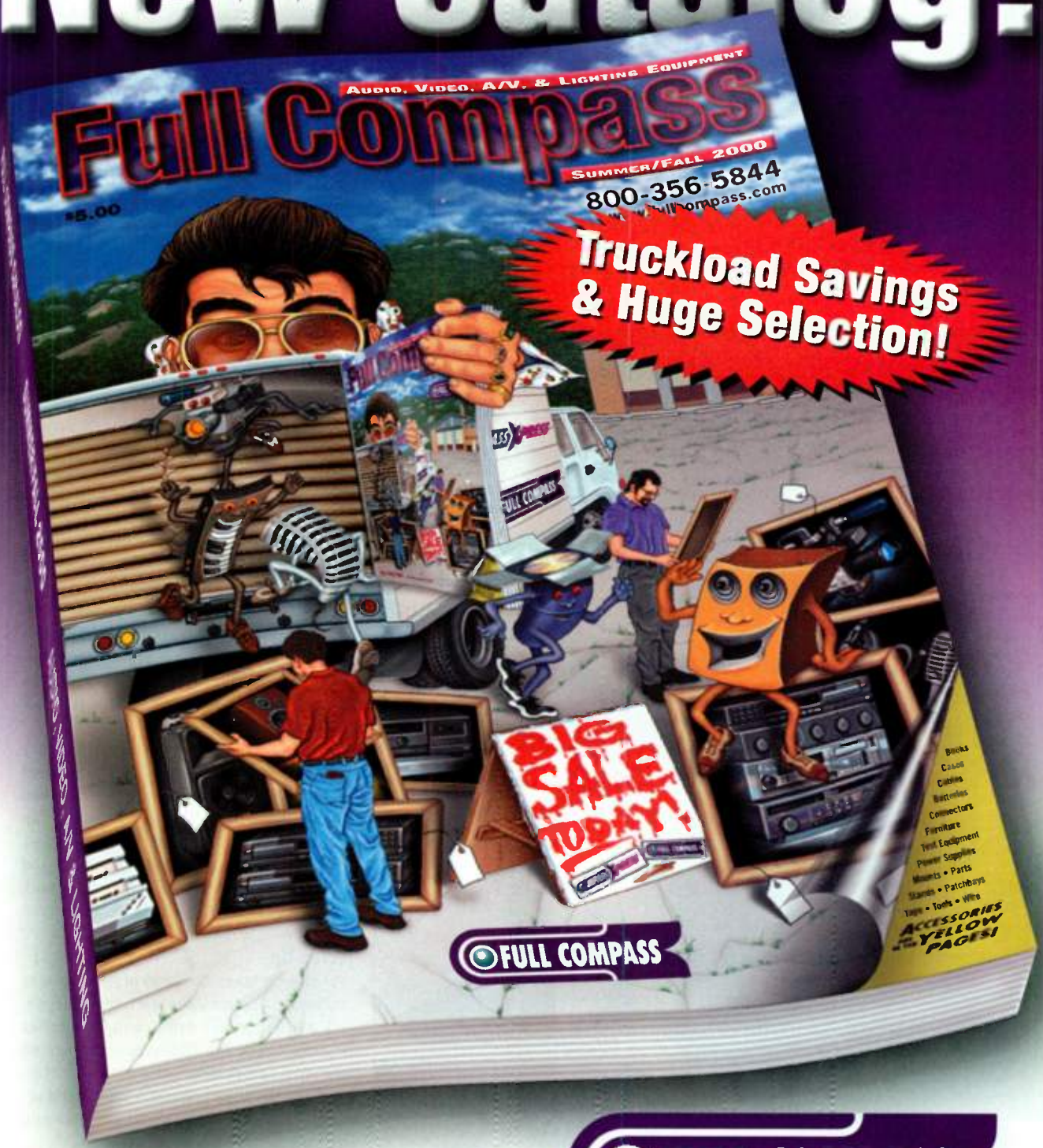

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Virus TDM plug-in ($795) is completely faithful to the hardware in both function and sound; the only differences take the form of improvements.

Spreading the Virus

You insert *Virus TDM* as a plug-in on a mono or stereo aux input channel, at which point you can play the plug-in from the onscreen keyboard or assign a MIDI track to it. You can also insert more than one *Virus TDM* plug-in on a channel strip, in which case the additional plug-ins process the audio serially. Similarly, *Virus TDM* can be inserted into a regular audio track to process the signal with *Virus TDM*'s filters and envelope follower.

The *Pro Tools* Insert menu provides for eight master *Virus TDM* plug-ins, labeled Virus 1, Virus 2, and so on, which automatically create virtual nodes in OMS (Open Music System). Each instance offers a maximum polyphony of 16 notes. An instance usurps an SRAM-class DSP chip (the kind used for the most complex processing, such as reverbs), of which there are three per Pro Tools Mix card. *Virus TDM* can access up to eight of these chips for 128-note polyphony across multiple Mix cards. Assigning multiple copies of the same *Virus TDM* number causes its 16-note polyphony to be shared by multiple timbres—up to eight inserts for up to eight timbres.

Knobs and Clocks

While the Access Virus hardware has physical knobs, many of its more obscure functions are buried behind its comparatively small LCD. Such is not the case with *Virus TDM:* all of its controls reside on six easily accessed pages, and the software displays the actual positions of all knobs instead of using the "sweep through" approach required by dedicated hardware pots. You can even use a hardware Virus as a control surface for the *TDM* version.

Virus TDM is noteworthy for its synchable LFOs, delays, arpeggiators, and other clock-based functions. It's a simple matter to assign MIDI Clock to *Virus TDM* within *Pro Tools,* paving the way for easy tempo-based experimentation. All of *Virus TDM*'s parameters can also be automated using standard *Pro Tools* automation. Beyond the simplicity of not having to deal with routing MIDI controllers, the automation system's resolution is much higher than MIDI's; the possibilities for seamless control within a mix are amazing.

Virus TDM ships with lots of factory sounds that are organized into categories like Classic, Bass, Percussion, Input, and Vocoder. Moreover, *Virus TDM* saves an unlimited number of patches and folders to disk (unlike the hardware version), and *Pro Tools* saves *Virus TDM*'s settings with the current session for total recall.

Wrap Up

Whether it takes the form of hardware or software, Access Virus is a lethal weapon. It's a great groove synth, and the sounds cut like lasers. The *TDM* version integrated with *Pro Tools* works like a dream and further encourages inspiration and productivity. The manual is slim but clear and adequate.

Assuming you already have a Pro Tools system, the *Virus TDM* plug-in is roughly half the price of the Virus hardware. Of course, you can use Pro Tools' DSP for other tasks as well. Nevertheless, you might find that *Virus TDM* is one more reason to buy another Mix card. This baby smokes! ❦

Overall EM Rating (1 through 5): 4.5

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A GUIDE TO THE COMPANIES AND ORGANIZATIONS MENTIONED IN THIS ISSUE OF ELECTRONIC MUSICIAN

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Vtech Web www.vtech.com.hk/toys.htm

Yamaha Corporation of America tel. (714) 522-9011; fax (714) 739-2680; e-mail info@yamaha.com; Web www.yamaha.com

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ADC Telecommunications tel. (800) 366-3891 or (952) 938-8080; fax (952) 946-3292; Web www.adc.com

Audio-Service/X-Vision Audio US (distributor) tel. (330) 629-9482; fax (330) 629-8054; e-mail xvisionus@hotmail.com; Web www.audio-service.com

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Z-Systems Audio Engineering tel. (352) 371-0990; fax (352) 371-0093; e-mail z-sys@z-sys.com; Web www.z-sys.com

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Beatnik, Inc. tel. (650) 295-2300; fax (650) 696-9404; e-mail info@headspace.com; Web www.beatnik.com

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Quick Pick Reviews

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Editorial content of *Internet Audio* includes step–by–step guides to putting audio files online, examination of the shifting face of music distribution, exploration of Webcasting and profiles of Internet innovators who are creating great sounds online. Pick up your FREE copy and subscription card now!

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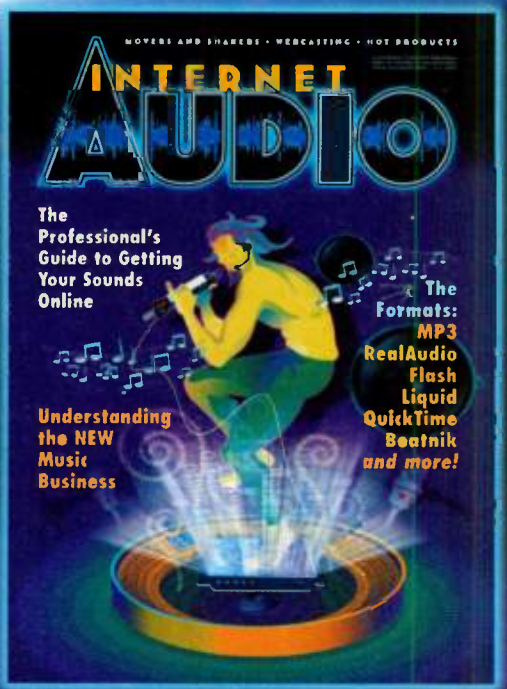

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DIGITAL MULTI-TRACK RECORDERS

TASCAM MX-2424 24-Bit 24-Track Hard Disk Recorder

Co-designed by TASCAM and TimeLine Inc., the MX-2424 is an affordable 24-bit, 24-track hard disk recorder that also has the editing power of a digital audio workstation. A 9GB internal hard drive comes standard as well as a SCSI Wide port that supports external LVD (Low Voltage Drives) hard drives from up to 40 feet away. An optional analog and several digital I/O cards are available so the MX-2424 can be configured to suit your work environment. SMPTE synchronization, Word Clock, MIDI Time Code and MIDI Machine Control are all built in for seamless integration into any studio

- Records 24 tracks of 24-bit audio at 44.1 or 48 kHz, or 12 tracks at 88.2 or 96 kHz. Up to 24 tracks can be recorded simultaneously using any combination of digital and analog I/O.
- Supplied 9GB internal drive allows 45 minutes of audio across all 24 tracks
- Wide SCSI port on the back panel allows you to add multiple drives. A front 5-1/2" bay available for installing an additional drive, or an approved DVD-RAM drive for back-up.
- ViewNet MX, a Java-based software suite for Mac and PC offers DAW style editing of audio regions, dedicated system set-up screens that make set-up quicker and easier and track load screens that make virtual track management a snap. Connects to a computer via a standard Ethernet line.
- Can record to Mac (SDII) or PC (.WAV) formatted drives, allowing later export to the computer. The Open TL format allows compatible software to recognize virtual tracks without have to load, reposition and trim each digital file.

Transport Controls-

- Jog/scrub wheel
- MIDI In, Out, and Thru ports are built-in for MIDI Machine Control.

Editing-

- Built-in editing capabilities include cut, copy, paste split and ripple or overwrite
- 100 levels of undo
- Supports destructive loop recording and non-destructive loop recording which continuously records new takes without erasing the previous version.

Build-In Synchronization-

- TBUS protocol can sample accurately lock 32 machines together for 384 tracks at 96kHz, or 768 tracks at 48kHz.
- Can generate or chase SMPTE timecode or MIDI Time Code.
- Word Clock In, Out, and Thru ports

I/O Options-

- Optional analog and digital cards all provide 24 channels of I/O. There is one slot for analog and one for digital.
- IF-TD24- T/DIF module
- IF-AD24- ADAT Lightpipe module
- IF-AE24- AES/EBU module
- IF- AN24- A-D, D-A I/O module with DB-25 connectors

Software Updates-

- System updates are made available through a front panel Smart Card slot or via computer directly from the TASCAM web site.

DA-78HR Modular Digital Multitrack

The DA-78HR is the first true 24-bit tape-based 8-track modular digital multitrack recorder. Based on the DTRS (Digital Tape Recording System) it provides up to 108 minutes of pristine 24-bit or 16-bit digital audio on a single 120 Hi-8 video tape. Designed for project and commercial recording studios as well as video post and field production, the DA-78HR offers a host of standard features including built-in SMPTE Time Code Reader/Generator, MIDI Time Code synchronization and a digital mixer with pan and level controls. A coaxial S/PDIF digital I/O allows pre-mixed digital bouncing within a single unit, or externally to another recorder or even a DAT or CD recorder. Up to 16 DTRS machines can be synchronized together for simultaneous, sample accurate control of 128 tracks of digital audio.

Features-

- Selectable 16 bit or 24 bit High Resolution audio
- 24 bit A/D and D/A converters
- >104dB Dynamic range
- 20Hz - 20kHz frequency response ±.5dB
- 1 hr. 48 min. recording time on a single 120 tape
- On-Board SMPTE synchronizer - chase or generate timecode
- On-Board support for MIDI Machine Control
- Internal digital mixer with level and pan for internal bouncing, or for quick mixes
- Track slip from -200 to +7200 samples
- Expandable up to 128 tracks (16 machines)
- Word Sync In/Out/Thru
- Analog output on DB25 balanced or RCA unbalanced
- Digital output on TDIF or 2 channels of S/PDIF

CD RECORDERS & DUPLICATORS

MICROBOARDS StartREC Digital Audio Editing/ CD Duplication System

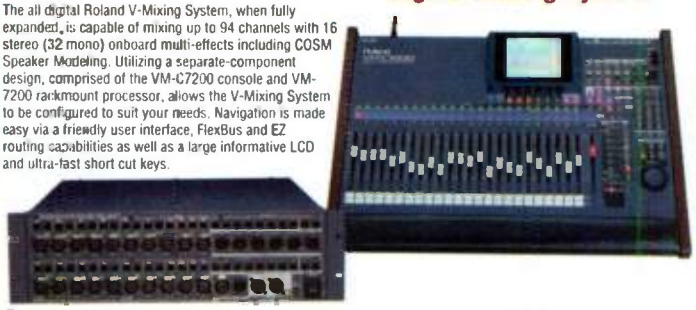
The Microboards StartREC is the first digital audio editing system combined with a multidrive CD recordable duplication system for professionals. Audio is recorded to the internal 6.2 GB IDE hard drive using analog or digital inputs. Sample rate conversion is automatic. Tracks can be edited and sequenced using the StartREC's user friendly interface and up to 4 CDs can be recorded simultaneously. StartREC is the ideal solution for studio recording, mastering, post production or any pro audio environment requiring digital audio editing and short run CD-R duplication.

Features–

- 2X, 4X, or 8X recording speeds
- 6.2GB IDE hard drive
- Editing functions include move, divide, combine or delete audio tracks, add or drop any index or sub index, and create track fade in or fade out
- Coaxial SP/DIF or AES/EBU digital input plus optical S/PDIF I/O
- XLR balanced and RCA Line inputs and outputs
- Automatic sample rate conversion from 32 and 48kHz
- Automatic CD Format Detection feature and user friendly interface provide one touch button operation
- Front panel trim pot and LCD display provide accurate input signal and time lapse metering
- SCMS (Serial Copy Management System) is supported, regardless of the source disc copy protection status
- **StartREC Models Include:** ST2000 (2) 8x writers, ST3000 (3) 8x writers and ST4000 (4) 8x writers

DIGITAL MIXERS

Roland® VM Basic 72 Digital Mixing System



The all digital Roland V-Mixing System, when fully expanded, is capable of mixing up to 94 channels with 16 stereo (32 mono) onboard multi-effects including COSM Speaker Modeling. Utilizing a separate-component design, comprised of the VM-C7200 console and VM-7200 rackmount processor, allows the V-Mixing System to be configured to suit your needs. Navigation is made easy via a friendly user interface, FlexBus and EZ routing capabilities as well as a large informative LCD and ultra-fast short cut keys.

Features-

- 94 channels of digital automated mixing (fully expanded)
- Up to 48 channels of ADAT/Tascam T-DIF digital audio I/O with optional expansion boards and interfaces
- Separate console/processor design
- Quiet motorized faders, transport controls, total recall of all parameters including input gain, onboard mixer dynamic automation and scene memory
- 24 fader groups, dual-channel delays, 4-band parametric channel EQ + channel HPF
- FlexBus and "virtual patchbay" for unparalleled routing flexibility
- Up to 16 stereo (or 32 mono) multi-effects processors using optional VS8F-2 Effects Expansion Boards (2 stereo effects processors standard)
- COSM Speaker Modeling and Mic Simulation technology
- 5.1 Surround mixing capabilities
- EZ Routing allows mixer settings to be saved as templates
- Realtime Spectrum Analyzer checks room acoustics in conjunction with noise generator and oscillator
- Digital cables between processor and mixer can be up to 100 meters long- ideal for live sound reinforcement

Options-

- **VS8F-2 Effects Expansion Board** -- Provides 2 stereo effects processors including COSM Speaker Modeling. Up to 3 additional boards can be user-installed into the VM-7200 processor, for 8 stereo or 16 mono effects per processor.
- **VM-24E I/O Expansion Board** -- Offers 3 R-Bus I/Os on a single board. Each R-Bus I/O provides 8-in/8-out 24-bit digital I/O, totalling 24 I/O per expansion board.
- **DIF-AT Interface Box for ADAT/Tascam** -- Converts signals between R-Bus (VM-24E expansion board required) and ADAT/Tascam T-DIF. Handles 8-in/8-out digital audio. 1/3 rackmount size.
- **VM-24C Cascade Kit** -- Connects two VM-Series processor units. Using two VM-7200 processors cascaded and fully expandec with R-Bus I/O, 94 channels of audio processing are available.

EFFECTS PROCESSING

Lexicon MPX-500 24-Bit Dual Channel Effects Processor

The MPX 500 is a true stereo 24-bit dual-channel processor and like the MPX100 is powered by Lexicon's proprietary Lexichip and offers dual-channel processing. However, the MPX 500 offers even greater control over effects parameters, has digital inputs and outputs as well as a large graphics display.

- 240 presets with classic, true stereo reverb programs as well as Tremolo, Rotary, Chorus, Flange, Pitch, Detune, 5.5 second Delay and Echo
- Balanced analog and S/PDIF digital I/O
- 4 dedicated front panel knobs allow adjustment of effect parameters. Easy Learn mode allows MIDI patching of front panel controls.
- Tempo-controlled delays lock to Tap or MIDI clock

t.c. electronic M-One Dual Effects Processor

The M-One allows two reverbs or other effects to be run simultaneously, without compromising sound quality. The intuitive yet sophisticated interface gives you instant control of all vital parameters and allows you to create awesome effects programs quickly and easily.

- 20 incredible TC effects including, Reverb, Chorus, Tremolo, Pitch, Delay and Dynamics
- Analog-style user interface
- 100 Factory/100 User presets
- Dual-Engine design
- 24 bit A/D-D/A converters
- S/PDIF digital I/O, 44.1-48kHz
- Balanced 1/4" Jacks - Dual I/O
- 24 bit internal processing

D-Two Multitap Rhythm Delay

Based on the Classic TC2290 Delay, the D-Two is the first unit that allows rhythm patterns to be tapped in directly or quantized to a specific tempo and subdivision.

- Multitap Rhythm Delay
- Absolute Repeat Control
- Up to 10 seconds of Delay
- 50 Factory/100 User presets
- 24 bit A/D-D/A converters
- S/PDIF digital I/O, 44.1-48kHz
- Balanced 1/4" Jacks - Dual I/O
- 24 bit internal processing

MICROPHONES

B&H is proud to announce that we are now dealers for RØDE microphones and all other Event products.

RØDE NT-2 Condenser Mic

The RØDE NT2 is a large diaphragm true condenser studio mic that features both cardioid and omnidirectional polar patterns. The NT-2 offers superb sonic detail with a vintage flavor for vocal and instrument miking . Like all RØDE mics the NT-2 is hand-assembled in Australia and is available at a breakthrough price.

Features

- Dual pressure gradient transducer
- Large diaphragm (1") capsule with gold-sputtered membranes
- Low noise, transformerless circuitry
- Omni and cardioid polar patterns
- High pass filter switch
- -10dB pad switch
- 20Hz-20kHz frequency response
- 135dB Max SPL
- Gold plated output connector
- Gold plated internal head pins
- Shockmount, Flight Case, and Pop Filter included

SHURE KSM-32SL Cardioid Condenser Mic

The reviews are raving about Shure's new "classic" microphone. The KSM32 features Class A, transformerless preamplifier circuitry, low self-noise and increased dynamic range, all necessary for critical studio recording. It has a 15 dB attenuation switch for handling high SPLs, making it suitable for a variety of sound sources including vocals, acoustic instruments, ensembles and overhead miking of drums and percussion. For studios, the **KSM32/SL** has a light champagne finish and includes an aluminum carrying case, shock and swivel mounts and a velvet pouch. For live applications, the **KSM32/CG** has a charcoal grey finish and includes a swivel mount and padded zipper bag.

- **Frequency response 20Hz - 20kHz**

AKG C4000B Electret Condenser Mic

This new mic from AKG is a multi polar pattern condenser microphone using a unique electret dual large diaphragm transducer. It is based on the AKG Solid Tube design, except that the tube has been replaced by a transistorized impedance converter/ preamp.The transformerless output stage offers the C4000B exceptional low frequency response.

FEATURES-

- Electret Dual Large Diaphragm Transducer (1st of its kind)
- Cardioid, hypercardioid & omnidirectional polar patterns
- High Sensitivity
- Extremely low self-noise
- Bass cut filter & Pad switches
- Requires 12, 24 or 48 V phantom power
- Includes H-100 shockmount and wind/pop screen
- **Frequency response 20Hz to 20kHz**

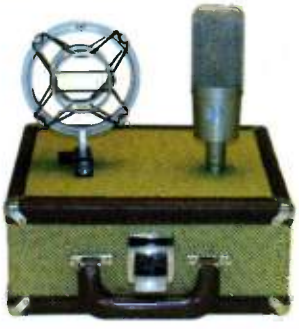
GT AM-61 Cardioid Tube

The GT Electronics AM61 offers classic tube performance in a fixed cardioid, large diaphragm condenser mic. An outstanding addition to any project studio or large commercial recording facility seeking rich, warm tube sounds and unsurpassed value.

- Groove Tubes military-spec GT5840M vacuum tube preamplifier
- Large-diameter, super-thin 3 micron gold evaporated Mylar diaphragm
- Fixed cardioid polar pattern response
- Switchable -10dB attenuation pad and 80Hz low frequency roll-off filter
- Includes hard-shell case, shock mount, hard mount, 6-pin cable and external power supply
- **Frequency response 20Hz - 20kHz**

• **ALSO AVAILABLE** AM-62 multipattern tube condenser mic

audio-technica. AT4047SV Cardioid Condenser Mic



The AT4047 is the latest 40 Series large diaphragm condenser mic from Audio Technica. It has the low self noise, wide dynamic range and high sound pressure level capacity demanded by recording studios and sound reinforcement professionals.

- Side address cardioid condenser microphone for professional recording and critical applications in broadcast and live sound
- Low self noise, wide dynamic range and high SPL
- Switchable 80Hz Hi Pass Filter and 10dB pad
- **Includes** AT8449/SV shockmount
- **Also Includes a limited edition tweed flight case while supplies last!**

STUDIO MONITORS

VERGENCE A-20 Studio Reference Monitor System

Incorporating a pair of 2-way, acoustic suspension monitors and external, system-specific 250 watt per side control amplifier, the A-20 provides a precise, neutral studio reference monitoring system for project, commercial and post production studios. The A-20's control amplifier adapts to any production environment by offering control over monitoring depth (from near to far field), wall proximity and even input sensitivity while the speakers magnetic shielding allows seamless integration into today's computer based studios.

- Type Modular, self-powered near/mid/far-field monitor
- 48Hz - 20kHz frequency response @ 1M
- Peak Acoustic Output 117dB SPL (100ms pink noise at 1M).
- XLR outputs from power amp to speakers
- Matched impedance output cables included.
- -6dB LF Cutoff 40Hz
- 5 position wall proximity control
- 5 position listening proximity control between near, mid and far-field monitoring
- Power, Overload, SPL Output, Line VAC and Output device temperature display.

Amplifier

- Amplifier Power 250W (continuous rms/ch), 400W (100ms peak).
- XLR, TRS input connectors
- Headphone output
- 5-position input sensitivity switch with settings

Speakers

- 2-way acoustic suspension with a 6.5-inch treated paper woofer and a 1-inch aluminum dome tweeter
- Fully magnetically Shielded with an 18-inch recommended working distance

EVENT ELECTRONICS PS-5 Bi-Amplified Project Studio Monitors

The PS-5s are small format, full-range, non-fatiguing project studio monitors that give you the same precise, accurate sound as the highly acclaimed 20/20 series studio monitors. The use of custom driver components, complimentary crossover and bi-amplified power design provides a wide dynamic range with excellent transient response and low intermodulation distortion.

FEATURES-

- 5-1/4-inch magnetically shielded mineral-filled polypropylene cone with 1-inch diameter high-temperature voice coil and damped rubber surround LF Driver
- Magnetically shielded 25mm diameter ferrofluid-cooled natural silk dome neodymium HF Driver
- 70 watt continuous LF and 30 watt continuous HF amplification per side
- XLR-balanced and 1/4-inch (balanced or unbalanced) inputs
- 52Hz-19kHz frequency response ±3dB
- 2.6kHz, active second order crossover
- Built-in RF interference, output current limiting, over temperature, turn-on transient, subsonic filter, internal fuse protection
- Combination Power On/Clip LED indicator
- 5/8" vinyl-laminated MDF cabinet

KRK V-6 Bi-Amplified Near Field Studio Monitors

These bi-amped studio monitors from KRK supply 90 watts of clean power. Their 6-inch woofer & 1-inch silk dome tweeter ensure consistency from top to bottom with crystal clear highs and a solid bass response.

FEATURES-

- 58Hz - 22kHz frequency response
- 1-inch silk dome tweeter and 6-inch long stroke, polyvinyl woofer
- 30 Watt HF & 60 Watt LF amplification
- Magnetically shielded
- Variable system gain +6dB -30dB
- Neutrik XLR/1/4" TRS combo connector

Also Available- V-8

- 1-inch Silk Dome tweeter and 8-inch Woven Kevlar woofer
- 47Hz - 23kHz frequency response
- 60 Watt high frequency and 120 Watt low frequency amplification
- HF adjust +1dB, Flat, -1dB
- LF adjust -3dB at 45, 50 and 65 Hz

Hafler TRM-6 Bi-Amplified Near Field Studio Monitors

Offering honest, consistent sound from top to bottom, the TRM-6 bi-amplified studio monitors are the ideal reference monitors for any recording environment whether tracking, mixing or mastering. Supported by Hafler's legendary amplifier technology that provides a wide and accurate sound field, in width, height and also depth.

FEATURES-

- 33 Watt HF & 50 Watt LF amplification
- 1-inch soft dome tweeter and 6.5-inch polypropylene woofer
- 55Hz - 21kHz Response
- Magnetically Shielded
- Electronically and Acoustically Matched

Also Available- TRM-8

- 1-inch soft dome tweeter and 8-inch polypropylene woofer
- 45Hz - 21kHz frequency response ±2dB
- 75 Watt HF, 150 Watt LF amplification

COMPUTER BASED DIGITAL AUDIO SYSTEMS

MOTU AUDIO Hard Disk Recording Systems

The MOTU Audio System is a PCI based hard recording solution for the Mac and PC platforms. At the heart of the system is the PCI-324 PCI card that can connect up to three audio interfaces and allows up to 72 channels of simultaneous I/O. Audio interfaces are available with a wide range of I/O configurations including multiple analog I/O with the latest 24-bit A/D/A converters and/or multi channel digital I/O such as ADAT optical and TDIF I/O as well as standard S/PDIF and AES/EBU I/O. Each interface can be purchased separately or with a PCI-324 card allowing you to build a system to suit your needs. Includes drivers for all of today's hottest audio software and AudioDesk, multitrack recording and editing software for the Mac.

THEY ALL FEATURE– • Mac OS and Windows compatible • Includes software drivers for compatibility with all of today's popular audio software plus AudioDesk, MOTU's sample-accurate audio workstation software for Mac OS • Host computer determines the number of tracks that the software can record and play simultaneously, as well as the amount of real-time effects processing it can support • Front panel display metering for all inputs and outputs

• **AudioDesk Audio Workstation Software** for Mac OS features 24-bit recording, multi-channel waveform editing, automated virtual mixing, graphic editing of ramp automation, real-time effects plug-ins with 32-bit floating point processing, crossfades, support for third-party audio plug-ins (in the MOTU Audio System and Adobe Premiere formats), background processing of file-based operations, sample-accurate editing and placement of audio, and more

2408 mkII FEATURES– • 7 banks of 8 channel I/O: 1 bank of analog, 3 banks of ADAT optical, 3 banks of Tascam TDIF, plus stereo S/PDIF. • Custom VLSI chip for amazing I/O capabilities • • Format conversion between ADAT and DA-88

• 8x 24-bit 1/4" balanced analog I/Os • 24-bit internal data bus for full 24-bit recording via digital inputs • Standard S/PDIF I/O for digital plus an additional S/PDIF I/O for the main mix • Sample-accurate synchronization with ADATs and DA88s via an ADAT SYNC IN and RS422

1224 FEATURES– analog audio interface • State-of-the-art 24-bit A/D/A • Simultaneously record and play back 8 channels of balanced (TRS), +4 dB audio • 24-bit balanced +4 XLR main outputs • Stereo AES/EBU digital I/O • Word clock in/out • Dynamic range of 115 dB (A-weighted) • Front panel displays six-segment metering for all inputs and outputs • Headphone jack with volume knob

308 Features– • 8 channels of coaxial S/PDIF using 4 RCA input and 4 RCA output connectors • 8 channels of optical S/PDIF using 4 toslink input and 4 toslink output connectors • 8 channels of AES/EBU using 4 XLR male and 4 XLR female connectors • Word Clock I/O allows the 308 to synchronize with digital audio environments

24i Features– • 24 high quality, 24-bit analog inputs • Balanced 1/4" analog outputs • Optical and coaxial S/PDIF outputs • Front panel headphone output with level control • Word Clock I/O • Connect up to three 24i rack I/Os to a PCI-324 audio card for a total of 72 inputs and six outs

digidesign / AVID

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DIGI001 Digital Audio Workstation For Mac And PC

A completely integrated digital recording, mixing and editing environment for the Mac and PC, the DIGI-001 offers a 24-bit multi I/O breakout interface along with Pro Tools LE software— based on Digidesign's world renowned ProTools software. The DIGI-001 interface features 18 simultaneous I/Os made up of 8 analog inputs and outputs— two of the inputs are full featured mic preamps with phantom power, and digital I/O including standard S/PDIF as well as an ADAT optical interface that can also be used as a S/PDIF I/O. ProTools LE supports 24 tracks of 16 or 24-bit audio and 128 MIDI tracks and also features RealTime AudioSuite (RTAS) effects plug-ins. For ease of use, MIDI and audio are editable within the same environment and all mixing parameters including effects processing can be fully automated.

FEATURES–
- 18 simultaneous, 24-bit ins and outs with support for 44.1 and 48 kHz sample rates
- 20Hz - 22kHz freq. response ± 0.5 dB
- 2 channel, XLR mic/1/4" line inputs with -26 dB pad, 48v phantom power, gain knob, and HP Filter at 60Hz
- 6 ch. line inputs (1/4") TRS balanced/ unbalanced w/ software controlled gain
- +4dB balanced 1/4-inch Main outputs
- Balanced 1/4" monitor outs with front panel gain knob
- 1/4-inch unbalanced line outputs channels 3-8
- Headphone output with independent gain control knob
- 2 channel S/PDIF coaxial digital I/O
- 8 channel ADAT optical I/O can also be used as 2 channel optical S/PDIF

Pro Tools LE
- Supports 24 tracks of 16 or 24-bit audio and 128 sequenced MIDI tracks
- Sample-accurate simultaneous editing of audio & MIDI
- Real-time digital mixing capabilities include recall of all mixing parameters, support for edit and mix groups and complete automation of all volume, panning, mutes and plug-ins.
- Route and mix outboard gear in realtime
- MP3 and RealAudio G2 file support (Mac)
- Two plug-in platforms offer multiple options for effects processing— Real-Time AudioSuite (RTAS) is a host based architecture that allows an effect to change and be dynamically automated in realtime as the audio plays back — AudioSuite is a file-based format, that renders a new file with the processed sound.
- Bundled RTAS plug-ins include, 1 and 4-band EQ; Dynamics II- compressor, limiter, gate and expander/gate, Mod Delay - short, slap, medium, and long delays with modulation capabilities for chorus or flange effects and dither. AudioSuite plug-ins include Time Compression/Expansion, Pitch Shift, Normalize, Reverse.

MIDI Functions
- MIDI functions include graphic controller editing, piano roll display, up to 128 MIDI tracks and editing options like quantization, transpose, split notes, change velocity and change duration.
- MIDI data can be edited on the fly

SOFTWARE

Also available with MOTU's award-winning Digital Performer audio sequencer software package

Digital Performer 2.7 MIDI/AUDIO Software for Mac

Digital Performer is an integrated multitrack digital audio and MIDI sequencing program packed with advanced tools for a wide variety of audio applications. Sample accurate editing, loop based audio capture, real time DSP effects and the best MIDI timing/resolution available insures unlimited creative potential.

FEATURES-
- Includes over 50 real-time MIDI and audio effects plug-ins • POLAR window - which provides Interactive audio loop recording • 24-bit recording and editing • 32-bit native effects processing - incredible sounding EQ and other FX • 64-bit MasterWorks Limiter and Multiband Compressor plug-ins included • Sample-accurate - the most reliable waveform editing and tightest sync you can get • Samplers window - drag & drop samples between your Mac and your Sampler • PureDSP stereo pitch-shifting and time-stretching • Unlimited audio tracks, real time editing, full automation and remote control • QuickTime digital video support

NEW FEATURES-
- Full Plug-In FX automation and increased 3rd party Plug-In support
- Drum Editor
- **Adjustable Display Resolution** from 2 to 10,000 PPQ. Tick values up to four decimal places can be set allowing 1000 times greater editing resolution. For example, if you are used to editing MIDI data at 480 PPQ, you can set your edit resolution to 480,000 for 1,000 times more precision.
- **MIDI Time Stamping** (MTS) which exists in MOTU's rack-mountable USB MIDI interfaces, delivers MIDI data from Digital Performer to MIDI devices as accurately as a third of a millisecond for every single MIDI event.

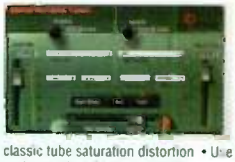
TC WORKS ULTIMATE SOFTWARE MACHINES SPARK 1.5 2-Track Editing For Mac

Spark is professional 2-track audio editing software for the Power Macintosh that provides fast access to files and powerful processing tools. Supports files up to 24-bit/96kHz and has batch processing, VST plug-in support, as well as MP3 file export built-in. Audio can be extracted from a Quicktime movie, edited and then exported along with the video to a new file. Bundled with Adaptec's Toast so you can burn your audio directly to CD.

- Browser View- File database, audio editor and play list all in one easy to use display with movable border lines- Eliminates the need for surfing several windows to access and edit files.
- Wave Editor- Perform off-line editing processing, and create markers and non-destructive regions
- Supports AIFF, Sound Designer, .WAV and QuickTime file formats.
- DSP Processing Includes- Normalize, Reverse, Fades, Crossfades, and Sample Rate conversion and **realtime Time Stretching**
- VST Plug-In compatible
- Supports file swapping with most major samplers and any sampler that supports SMDI • Batch Processing
- Bundled with Adaptec's Toast Pro you can burn your audio on CD
- Extract audio from a quicktime movie for editing and then export the audio along with the video into a new file
- **SPARK 1.5** supports MP3 audio authoring for the web directly from the file menu.

ANTARES AMM-1 Microphone Modeler

The AMM-1 Microphone Modeler uses patented technology to create precise digital models of a wide variety of microphones, from historical classics to modern exotics and even industry-standard workhorses. Simply tell the Microphone Modeler what microphone you are actually using and what microphone you'd like it to sound like. It's as simple as that. Available as a plug-in for the TDM and MAS environments, with DirectX and Mac VST not far behind.



FEATURES–
- Proprietary DSP-based acoustic modeling allows any reasonable quality microphone to sound like any of a wide variety of high-end studio mics • Models reproduce the effects of windscreens, low-cut filters, pattern-dependent frequency response and proximity effects • Create hybrid mics that combine the bass response of one mic with the treble response of another • Add a model of classic tube saturation distortion • Use during mixdown to change the mic on an already recorded track • Incredibly simple to use - simply select the mic you're using and the mic you want it to sound like • Includes an extensive collection of digital models of historical classics, modern exotics, and industry-standard workhorses • Additional models can be downloaded from the Antares web site

WAVES Pro-FX Bundle Plug-ins For Mac or PC

The latest Bundle from Waves has some of the coolest sound-design plug-ins available for the Mac and Windows platforms.

SuperTap - Six taps of mono or true stereo delay (up to Six seconds) • Global LFO modulation • 2 feedback modes • 010-style filtering for each tap • rotation (stereo panning) • Delays are adjustable in milliseconds and note values • Tap out delay times or patterns using the Tap Pad

MetaFlanger - Vintage tape-flanging, phaser-emulation, and special effects • True dual-delay flanging sounds • Wet signal include filters so you can flange or phase just part of the signal • Factory presets of vintage emulations (Mutron, MXR, Itchycoo Park) and more

MondoMod - AM, FM, and Rotation (stereo panning) modulators • Gentle wandering guitar solo panning or bizarre destructive effects • Single LFO drives all modulators with independent phase offsets between the modulator signals.

UltraPitch - Formant-corrected pitch shifter with 6-voices • Excellent gender-bending • Independent stereo panning and delay • Animator delay-randomizer. Set the pitchshift by musical intervals (with 5 cent resolution) • Manual formant mapping as well as presets that perfectly match instrumental formant responses • Creates huge and thick stereo chorusing, doubling, parallel harmonies, excellent vocal slap/spread effects, and much more

Enigma - Mysterious and innovative, Enigma combines a complex notch filter, short delay feedback loops and modulation to create distinctive sound design effects.

Doppler - Developed for post, film sound and game designers. Provides realtime doppler effects with auto and manual triggering modes, full control of air damping, panning pitch, path curve, gain, start/stop points and reverb tail.

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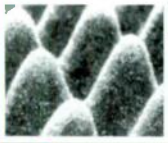

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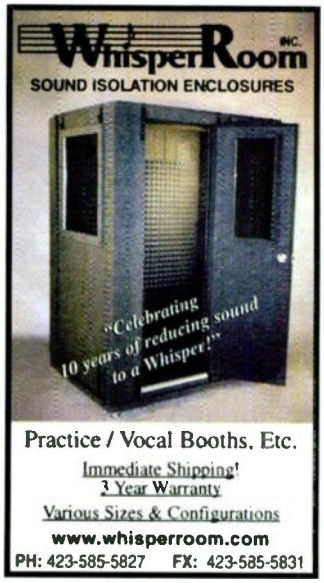

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Trak2

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HUI

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FINAL MIX

By Larry the O

Play It Forward

It's a long road from the genesis of an idea to its actual realization, with many steps along the way. In my October "Final Mix" column, I took a look at where ideas come from; this month I would like to talk about what often turns out to be the next step.

An idea might be nonspecific, in which case it will usually require a period of thrashing before it starts to take shape. Alternatively, it may be more tangible, such as a lyric or instrumental riff, which frequently suggests some direction. In either case, one of the things that can guide the process most effectively is a vision of what the raw idea can become once it is fully realized. I like to call the ability to be exposed to an undeveloped idea and envision it as completed "producer's ears," though it could just as easily be called "composer's ears" or any number of variations.

One's picture of the fully realized idea varies in its explicitness. Some musical ideas come to me in a "Mozartian" vision, with every detail of orchestration, feel, and mix in place. In my mind's ear, I hear the piece as I would listening to a playback of the final mix. Other times, I have a sense of direction with only a few specifics.

Perhaps the clearest example is when working with singer-songwriters. A good singer-songwriter's greatest strength is usually style. The artist often finds a source of power through lyrical phrasing or delivery in performance. When a songwriter plays me a new song, I listen in two passes. On the first pass, I try to just hear what is played, taking in the lyrics, composition, and performance. The second pass is when I try to hear the most potent and pertinent aspects of song and artist, and project what those suggest about where the production should go. Should it be as simple as the version I'm hearing? Does it need a little bit of backing to fill it out, or would it shine best as a full production, with oodles of overdubs? Would the song be at its best if someone else sang it? How about if it had more of an R&B groove?

Most of the time, I prefer that the process takes place entirely within my head because that gives me the most flexibility to try radically different settings without garnering reactions from anyone else. Once the vision becomes more clear, I can present it to the artist and discuss whether it feels right.

If the artist has already worked up a demo of the vision for the piece or pieces, it can cut both ways. If the setting clearly works for the idea, a demo is extremely helpful in pulling the specifics together quickly. However, if the song sounds different to my producer's ears than what is on the demo, the momentum of an existing conception may have to be overcome before another approach can be accepted.

This same philosophy can be applied to bands that don't know how to record. With producer's ears on, listening to a rehearsal or a live gig can be enough to hear how the band could translate in the studio and even what some of the issues will be in making that happen. You might realize you have to deal with something dumb—say, that someone besides the band will have to tune the guitars—or something vital, such as the fact that the vocalist will never deliver a top performance while listening through headphones.

Producer's ears are a fusion of existing reality and imagination whose importance is twofold: first, they present a road on which to travel, even if that road changes at some point. Second, they provide a source of cohesion which can tie a bunch of songs together as an album. Producer's ears are not a sixth sense one is simply born with, but a skill acquired through observation, listening, and imagination. So put your producer's ears on and play it forward. ●

STEVE CURL

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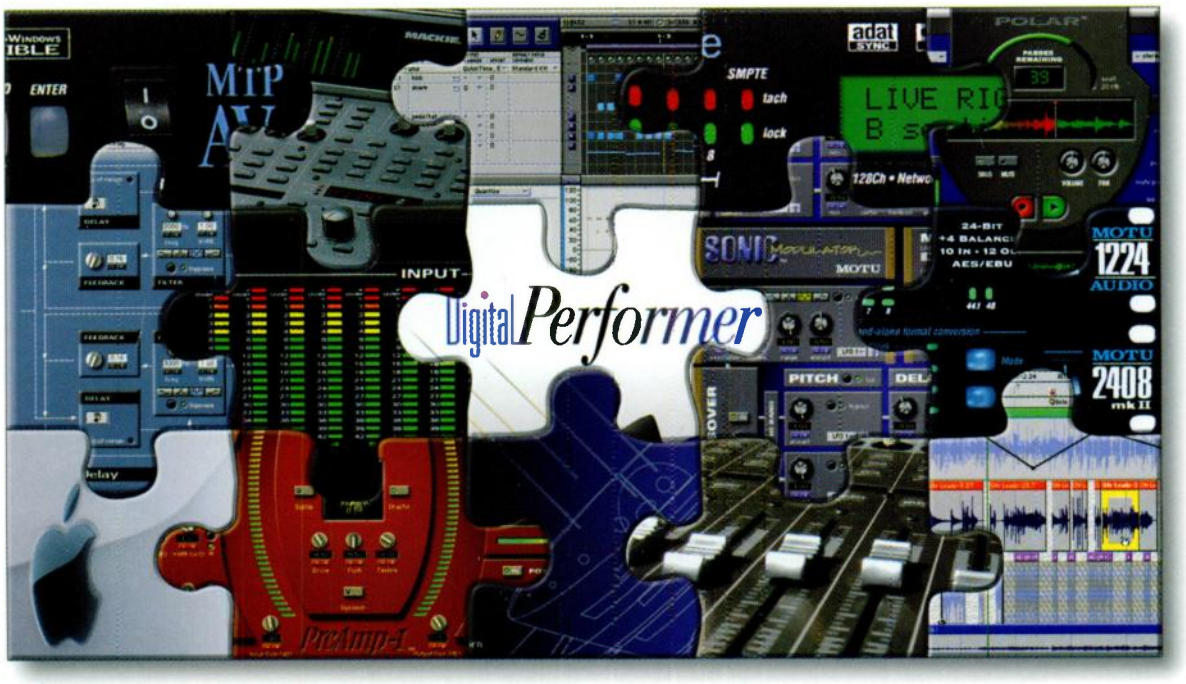

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