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April 2000

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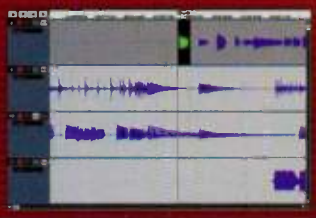

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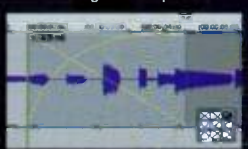

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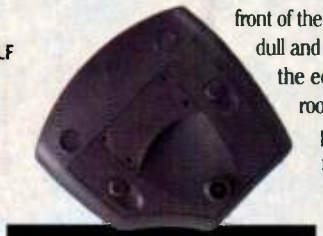

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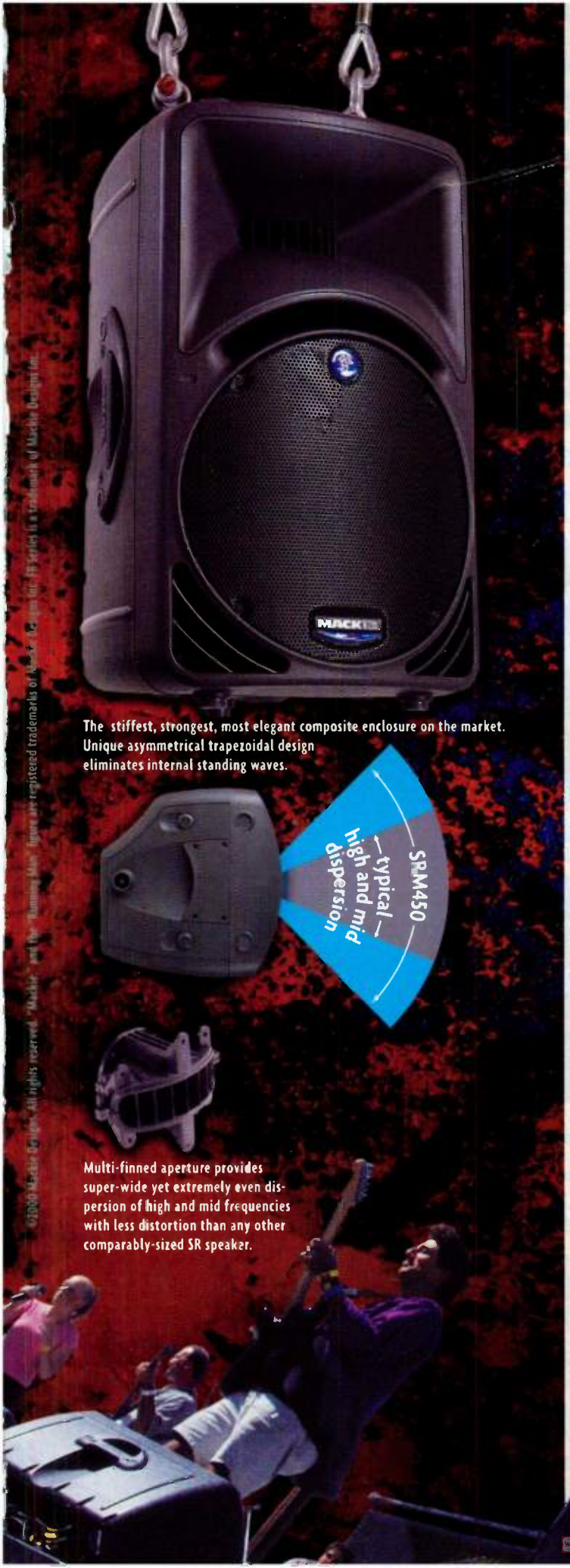

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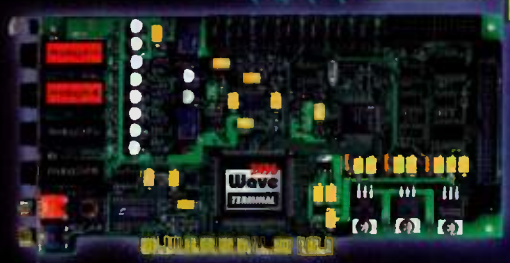

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I N S I

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30 SILENCING SIBILANCE

Sibilance can ruin a precious vocal track. We'll explain what de-essers are and how to use them, compare and evaluate dedicated units by SPL and Drawmer, and show you how to construct a de-esser using an EQ and a compressor.

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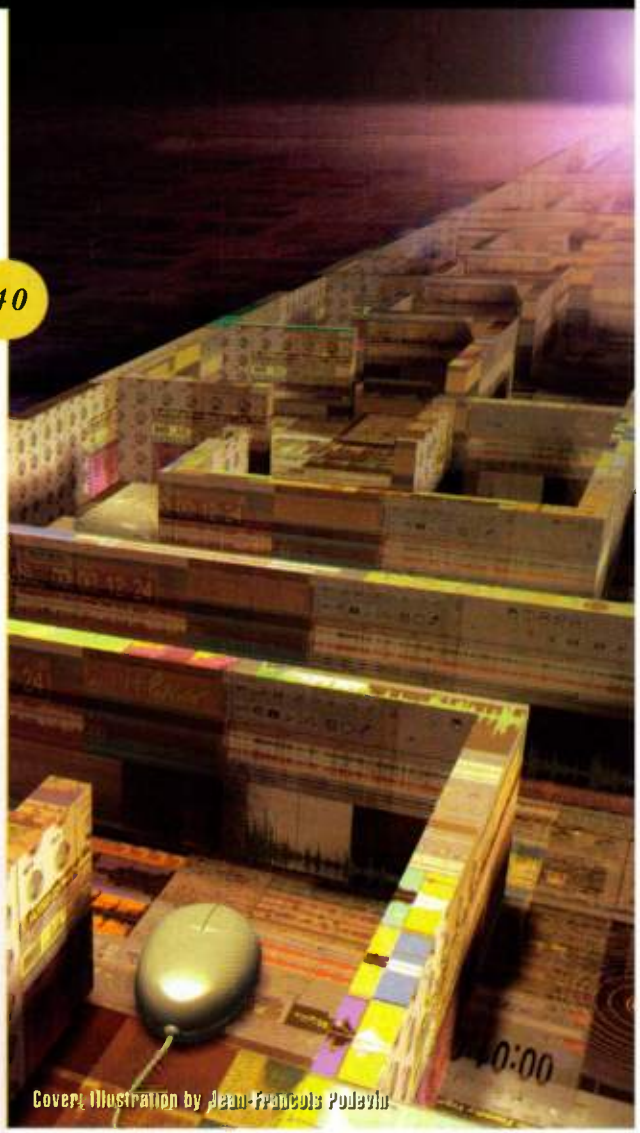
By Joel Chadabe



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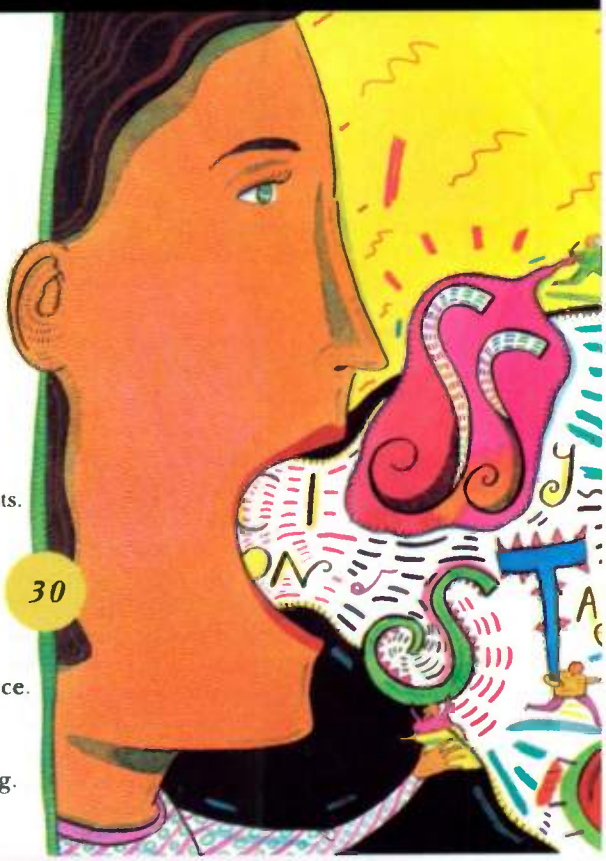

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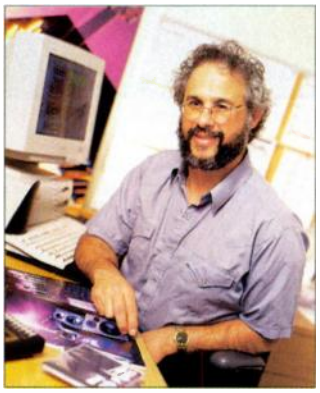
ANTHONY PIDGEON

Once upon a time, Opcode was a hotbed of invention. *Sequencer* was an early Mac favorite, and *Vision*'s graphical user interface quickly earned the program a large, loyal following. Standard MIDI Files, MIDI Time Code, and the first digital audio sequencer *(Studio Vision)* were all developed at Opcode by Dave Oppenheim, Ray Spears, and friends. *Galaxy Plus Editors* was not the first MIDI patch editor/librarian, but it did introduce refinements and innovations. IRCAM created the *Max* MIDI programming environment, but Opcode's David Zicarelli developed it into a commercial product.

Opcode Systems' apparent demise (or at least, its current MIA status) touches much of the Mac-based music community. Many Mac musicians are especially concerned about the freeware Open Music System (OMS) system extension, which provides a common timing reference for MIDI applications and routes MIDI data between compatible applications and MIDI interfaces. OMS is a de facto industry standard: a wide variety of Mac software developers have adopted OMS, and some Mac applications cannot run properly without it.

Opcode was in trouble long before Gibson Musical Instruments purchased it. The Gibson deal promised to provide cash that would enable Opcode to pull itself back together, but recovery was likely to be slow. Furthermore, Gibson's previous attempts to revive troubled high-tech companies, such as the once-proud Oberheim, had been unimpressive. Indeed, within a relatively short time, the Gibson-Opcode acquisition deteriorated into a grim nightmare of litigation that froze the Opcode product line. Meanwhile, competing products were aggressively on the move.

Today, you can still buy *Vision DSP* and *Studio Vision* online (www.opcode.com), but the engineers who created them have moved on, and development appears to have ended. Opcode's Web site makes no mention of *Galaxy Plus Editors;* presumably it is history. Fortunately, there are excellent alternatives to these programs.

Max, on the other hand, is unique, and it is a must-have for a small group of hard-core electronic musicians. Because demand is low, *Max* is unlikely to enrich Gibson, and I would love to see Gibson sell the program to Zicarelli (now the reigning guru at Cycling '74), who almost certainly would develop it further.

OMS presents a thornier problem. It is critical to many MIDI studios, but it generates no cash. And OMS 2.3.8 is written in old 680x0 code, not native PowerPC code. It's unstable under Mac OS 9 and will surely be incompatible with Mac OS X. As an industry standard, it must be rewritten or replaced by someone who has the full confidence of Mac software developers. That's not going to be Gibson. OMS is dead unless Gibson either open-sources it for public development or transfers it to someone who can solve both the technical and the political problems.

Fortunately, OMS might not be an issue for long because original OMS author Doug Wyatt recently joined Apple Computer. Apple won't comment on Wyatt's duties, but the grapevine has it that he's going to create a modern MIDI solution for the Mac OS X. I hope he'll create a native PowerPC solution for OS 9, too.

If Apple replaces OMS and *Max* finds a proper home, Mac users can settle back and calmly watch Opcode reemerge or rest in peace. And that's no April Fools' joke.

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STICKY SITUATION

I enjoyed reading your article "Ready, Willing, and Label" in the December 1999 issue of **EM**. You covered all aspects of CD labeling—except one. I've heard that in the long term a label's glue may permeate the CD layers and damage the data. I contacted Neato, and company representatives said that the glue is special and won't damage CDs. Still, I have doubts.

When I started burning CDs a couple of years ago, I used Neato's labeling system. CDs look great with labels. But after I heard that labels may damage my recordings in the long run, I stopped using them. Now I use those special CD markers (water based, not alcohol based). Of course, these CDs are not as presentable as the ones with printed labels, but better safe than sorry. My concern is keeping the CDs I burn in the best possible condition for as long as possible. Long-term conservation is my priority.

Do you think the glue is safe? I may go back to using those labels. After all, I still have a stock of them. Thank you.

Jean-Claude Elias
Amman, Jordan

Jean-Claude—I'm glad you enjoyed the article. As far as long-term glue deterioration is concerned, it's hard to draw a definitive conclusion about it without traveling to the future in a time machine. My feeling is that CD labels do not pose a significant threat to CD content even when they're used for archival purposes. After all, most CD-Rs already have some kind of protective coating on the top and bottom to ward off dust, fingerprints, pollution, and other perils of modern life.

According to a Neato spokesperson, Neato's labels "use special acrylic-based adhesives designed to stick to the CD without attacking the CD surface." He points out that Neato's labels and adhesives have undergone "extensive testing to ensure longevity," and that after selling more than 50 million labels, Neato is quite confident that its labels will last "at least as long as the CDs themselves when used under normal conditions." In fact, according to Neato, Hewlett-Packard performed its own set of rigorous tests on Neato labels and was satisfied enough with the results to include Neato labels with many of its SureStore CD-Writer drives.

As a final thought, Neato makes the following claim, which seems plausible to me: "It is important to realize that recorded CDs without labels are much more prone to damage and data loss than those with [labels]. In addition to identifying media, Neato labels protect against damage."

I can't say positively, but I believe that most CD-label manufacturers use similar materials for their labels and would support Neato's position. There are no guarantees, and only time will tell, but I'll continue to use labels on my own CDs. Best of luck.—David Rubin

COVER STORY

Black is all you could come up with for your January 2000 cover? When I first saw it, with its special pre-Y2K mood (terrorism, paranoia, and so on), I was extremely disappointed. Is this what you think music is supposed to bring to the world? A plain, ugly, faceless black cover? Isn't music (at least most music) supposed to bring hope, peace, joy, moods, and mixed colors? Moreover, I could hardly read the name of the magazine or anything else on the cover.

It occurred to me that it might have been a printing error. I'm still trying to understand. What was the intent? Regardless, it is sad that **EM** failed to have something positive for its first issue of a new millennium.

Robert Landry
via e-mail

Robert—Gee, we thought it was a pretty cool cover.—Steve O.

THE ART OF RECORDING

The only part of the February 2000 installment of "Final Mix" that made any sense was the part you are wrong about (paragraph 5).

I don't care if you're up on stage or in a broom closet recording on 4-track cassette. You are still performing for your audience. If you can't visualize them, you can't make a good recording. For that same reason, musicians make lousy music-video actors. They aren't theatrically educated enough to realize that someone will eventually watch their usually inept performances. A real actor in the same situation would appear natural.

If you want to be a recording artist, you have to learn more than how to play. A recording artist isn't simply someone who has been recorded. A recording artist is someone who has learned the art of recording. And the art of recording is to entertain the listeners in a way that makes them believe they are in intimate contact with your mind and body and can feel *you*. You ain't gonna get that if you think recording is about isolation.

Many would-be recording artists think that they don't need to know

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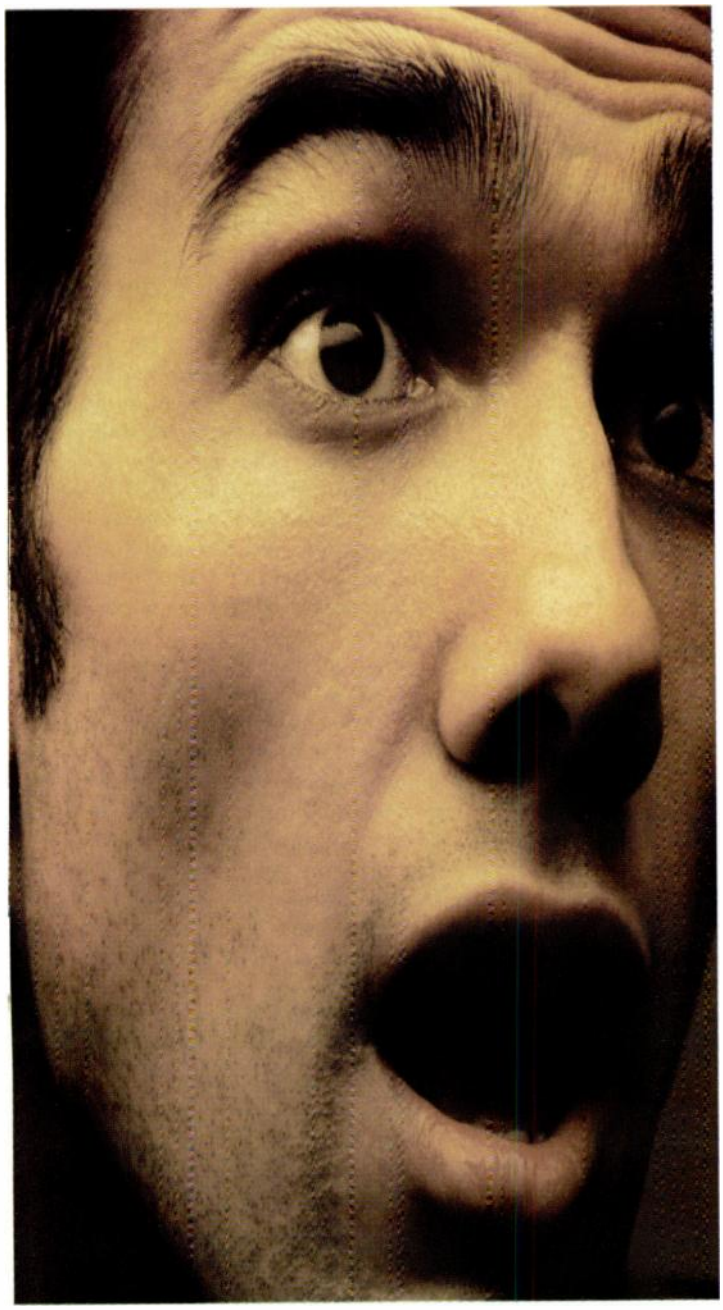

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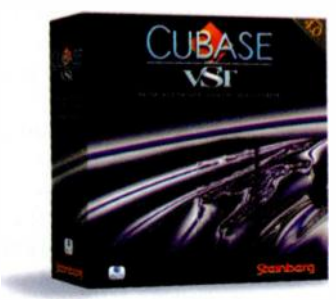

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WEB SITE OF THE MONTH

THE CSOUND FRONT PAGE

The Csound Front Page, at www.csound.org, is a phenomenal starting point for anyone interested in sound synthesis or signal processing on a computer. Not only does the site offer a vast number of resources related to the Csound synthesis language—example files, tutorials, utilities, audio examples, publications—but you can also download versions of the program for nearly any computing platform. You'll also find two complete chapters from the definitive new book on Csound, as well as links to schools, people, and organizations involved with synthesis and sound design.—*Dennis Miller*

about anything more than playing in order to record. Unfortunately, we all have to listen to the results. It's almost as bad as saying that watching a sculptor work is entertainment.

You're wrong, buddy, and you need to learn some stuff. Sorry.

Randy Green
Cottage Grove, WI

A LITTLE RESPECT

Unfortunately, sound recording and sound reinforcement are male-dominated industries. It seems that women generally don't enter the field because they are not encouraged at a young age to fiddle with computers, 4-track recorders, and other things that ultimately lead to where many of us are today.

I recall your magazine doing a feature on resources for women in the industry ("Working Musician: Resources for Women in Music" in the January 1997 issue of **EM**). Your articles regularly show respect for female musicians and engineers.

Therefore, it saddens me to see sexist ads appearing in your magazine. Most of them aren't as bad as those in other magazines, and there aren't very many, but they upset me nonetheless. These ads suggest that our female clients will be "more than a little pleased" with our work if we buy the advertised product. This kind of advertising distorts what matters—product performance.

Personally speaking, I am doubtful of any product on the market that must cater to my sex drive to get me to buy it. I am offended that companies think it's so easy to make me buy an expensive product, and I imagine the small but growing population of female audio engineers is also offended.

I do not believe that it would be feasible or advantageous for **EM** to filter out offensive ads, nor do I feel that censorship would solve the problem. Indeed, the portrayal of a sexy female performer does not necessarily constitute a sexist ad, and there is no clear place to draw a line. I can only hope that advertisers will think twice about who is buying their products and why. Hopefully, we can foster the same amount of respect in advertising that your magazine shows in its articles.

Bjorn Dittmer-Roche
Technical Director
Lang Concert Hall
Swarthmore College
Swarthmore, PA

HEARING AID

In America, the best professionals will tell you that ear damage is, with few exceptions, irreversible. But ear damage definitely has a remedy: the herb *Ginkgo biloba*. Ginkgo is commonly thought to improve mental function by increasing blood flow to the brain. Medical research in Japan, however, has also shown ginkgo to heal certain types of nerve tissue—the same types of tissue that make up the eardrum.

My doctor prescribed ginkgo after heavy feedback in my band's rehearsal garage gave me tinnitus, a chronic ringing in my ears. My bandleader and I took ginkgo for months. Both of us are now cured of tinnitus. My doctor, in fact, says that he has never seen a case of tinnitus on which ginkgo didn't work.

Now sage "experts" will chime in and claim that our recovery could be due to a placebo effect or some such thing. The arrogance of Western science rears its ugly head!

I am not a fanatic on the fringe with an agenda to push. I am a musician who has spent many nights fearing permanent damage to my ears. I'm writing to you in the hope that other music professionals will look further than the resident "experts" of America's health organizations for valid data regarding this vital issue.

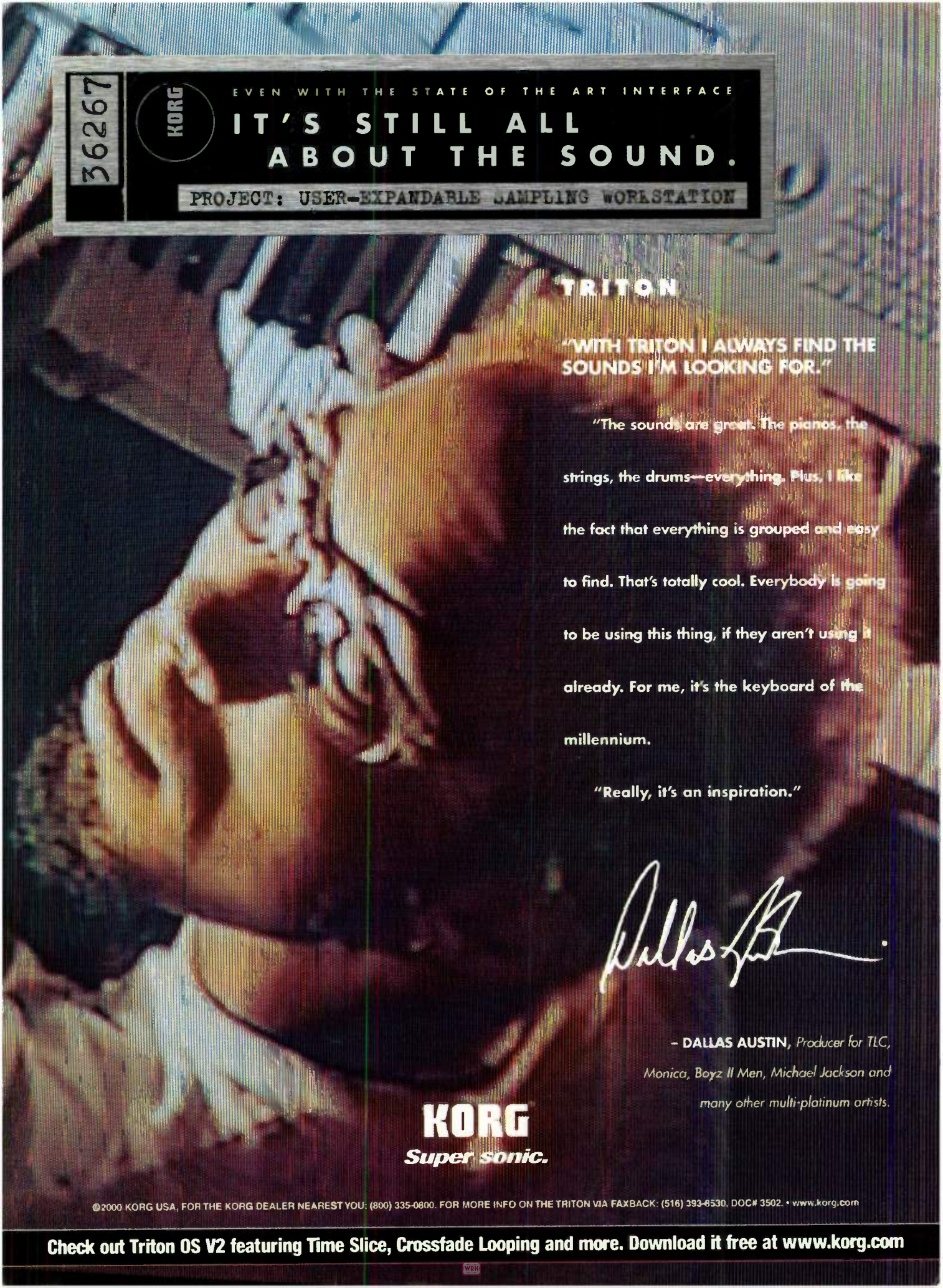
Rex Perry
via e-mail

ERROR LOG

March 2000, "To Tell the Truth," p. 44: The second sentence should have read, "Large-diaphragm condenser mics are usually favored for vocals (among other things) thanks to the presence boosting and other coloration they typically provide; smaller-diaphragm mics, on the other hand, are often the better choice when tonal accuracy is the goal."

March 2000, "To Tell the Truth," p. 56: Under the subhead "Elation KM201," the second sentence in the second paragraph should have read, "In the boxes I received, the foam was sloppily cut and it required removal of the head from the body before fitting the two pieces into the box."

WE WELCOME YOUR FEEDBACK.
Address correspondence and e-mail to "Letters," Electronic Musician, *6400 Hollis Street, Suite 12, Emeryville, CA 94608 or to emeditorial@intertec.com. Published letters may be edited for space and clarity.*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Since we introduced the MX-2424 hard disk recorder, there has been a lot of speculation about its price (which is so low it seems too good to be true).

So we get questions. Like...

"24 tracks is an upgrade?" (No, it's 24 tracks right out of the box.)

"24-bits is an upgrade?" (No, all the bits are there too.)

"Do I have to pay extra for inputs and outputs?" (No. At $3,999 estimated street price* you get a full set of 24 TDIF-1 or ADAT* optical digital inputs and outputs — plus an assignable stereo AES/ EBU - S/PDIF pair. For a little more you can get 24 channels of AES/EBU digital I/O, or analog — or both digital and analog!)

"Does it need an external computer?" (No. The MX-2424s front panel has a full set of professional transport, editing, and track assignment controls, including a shuttle/ scrub knob. So you don't have to have a computer to run it. But — if you happen to own a Mac or a PC, you can take advantage of the digital audio editing and control software that comes standard with each MX-2424 to do even more. Your choice.)

"Before I start recording do I need to buy a monitor, a keyboard, or a hard drive? Or anything else?" (No. Nyet. Nope. Not at all. Just hook up power and start recording.)

So let's make this as plain as we can: The MX-2424 is an amazing, full-featured professional 24-track digital recorder. And there's never been anything like it at this size or price.

$3,999.ESP*

Its sonic performance is outstanding. Lots of companies claim 24-bit 48k performance, but only the MX-2424 is part of TASCAM's M Series family of multitracks — the products chosen for their sonic performance by such discriminating facilities as Skywalker Sound, Universal Studios, and 20th Century Fox.

Superior reliability is guaranteed. The MX-2424 was designed from the bottom up to be a great recorder, and nothing but a great recorder. Its processors and circuitry are fully optimized for audio - not video games, spreadsheet software, or surfing the web. And isn't that absolute focus and rock solid performance exactly what your music deserves? Over the last three decades we've designed and built literally millions of professional recorders and recording systems; the MX-2424 is the culmination of everything we've learned.

So easy to operate, you could do it blindfolded. Of course that way you'd miss the great light show from the 24 tracks of level metering and channel status displays... but the real point here is simplicity. When you want the MX-2424 to start recording, just reach over and press REC + PLAY (just like a traditional tape recorder). In a fast-paced production environment, you can record to hard drives that mount into standard Kingston® carriers and plug into the front panel drive bay. Just pop in a new drive at the start of each session. It doesn't get any simpler than that.

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It's a complete professional hard disk multitrack in a portable, affordable, rack-mount box. You can plug it in, turn it on, and start recording.

Really.

The power to meet your needs. A standalone MX-2424 is an incredibly powerful unit, with enough internal hard disk capacity to hold about 45 minutes of 24-bit 24-track audio. The MX-2424's Fast/Wide SCSI port lets you connect up to 15 external drives and record directly to all of them. And if you need more than 24 simultaneous tracks, just add additional MX-2424's. Up to 32 MX-2424's can be locked together in *sample accurate sync* to act as a single recorder.

Professional recorders need to interface with increasingly complex systems.

✔ It provides video and time code lock capabilities as standard features, making it easy to integrate with external workstations.

✔ It resolves to AES/EBU, S/PDIF, word clock, TDIF-1, ADAT optical, SMPTE Time Code (LTC), and video, and chases MIDI Time Code.

✔ Available Input/Output modules include TDIF-1, AES/EBU, ADAT optical, and analog.

✔ Back panel ports include Fast/Wide SCSI, ethernet, MIDI, RC-2424 remote, and TL-BUS!

Extend your reach — Want a remote control? Get the one that's made to take advantage of the power in your MX-2424. The RC-2424 remote is a powerful, professional multi-machine controller with all of the MX-2424's front panel features, plus macros and more.

MX-2424 shipments are about to start, and there is already a waiting list. To get yours sooner instead of later, contact your authorized TASCAM dealer!

"So... what's this Estimated Street Price? Instead of quoting you some meaningless "List Price," ESP is what we expect typical U.S. customers to actually pay for an item. It gives you a better way to compare value when you shop.

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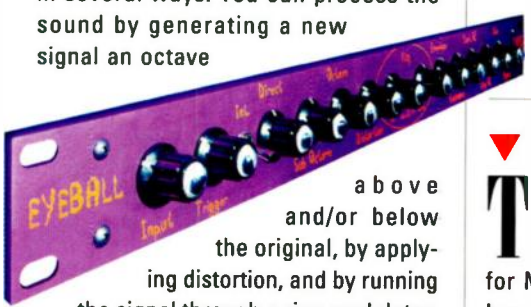
SEE US AT NAB BOOTH #L12944

WHAT'S NEW

By Barry Cleveland

▼ PURPLE EYEBALL

Purple Audio's single-channel, single-rackspace Eyeball ($799) functions much like an analog synthesizer, allowing you to process an audio signal in several ways. You can process the sound by generating a new signal an octave



above and/or below the original, by applying distortion, and by running the signal through a ring modulator. Processed signals then run through a filter with adjustable resonance, VCA envelope, stop/start frequencies, and sweep rate. The filter can be swept using an internal or an external control-voltage source.

The purple-and-orange Eyeball has both unbalanced ¼-inch and balanced XLR (pin 2 is hot) inputs and outputs. Its ¼-inch unbalanced jacks accept external control voltages for controlling the filter and ring modulator sections; another jack admits a standard bypass footswitch. The manufacturer provides no technical specifications for the Eyeball except the operating voltage, which can be either 115 or 230 VAC (50/60 Hz). Purple Audio; tel. (718) 482-8494; fax (718) 482-8159; e-mail purple@purpleaudio.com; Web www.purpleaudio.com.

▲ API 2500

API Audio Products' 2500 ($2,695) dual-channel, single-rackspace compressor is designed primarily for use on stereo mix buses. The two channels can be used as separate compressors with a single compression setting. Unlike conventional stereo links, which use either a single channel or the combined channel inputs to control both channels, the 2500 has a variable amount (0 to 100 percent in six steps) of stereo coupling. A switchable highpass filter reduces cross-coupling of low-frequency peaks.

The 2500 features parent company ATI's patented Thrust circuit, which incorporates a 2 dB/octave highpass filter that is placed ahead of the compression circuit to add low-end punch. Of course, you can bypass the Thrust feature.

The 2500 also offers a choice of "old" feedback-type compression (as used in the classic API 525, Fairchild 600, and UREI 1176) or "new" VCA-modulated compression (as used in modern dbx and SSL designs), along with a choice of hard- or soft-knee compression curves.

The output stage features an automatic makeup-gain button that allows you to vary the threshold or ratio while maintaining a constant output level. This feature can be bypassed with the gain knob, and you can trim the left channel ±2 dB to compensate for imaging problems. The threshold is adjustable between –20 and +10 dB, and the compression ratio can be set from zero to infinity. The attack time ranges from 0.03 to 30 ms, and the release time from 50 ms to 3 seconds. A pair of VU meters shows input, output, and gain-reduction levels. API Audio Products; tel. (410) 381-7879; fax (410) 381-5025; e-mail gordon@audiotoys.com; Web www.apiaudio.com.

▼ MARK OF THE UNICORN 1296

The 1296 is MOTU's newest breakout box for the company's popular PCI-based hard disk recording system for Macs and Windows PCs. The new box provides 12 channels of simultaneous 24-bit, 96 kHz input and output.

As with MOTU's other breakout boxes (such as the 2408), you can buy the 1296 interface as part of a core system comprising the 1296, a PCI-324 audio card, and MOTU's *AudioDesk* audio-editing software for the Mac ($2,095); or you can buy the new unit separately ($1,795) to expand an existing PCI-324 system. The PCI-324 card includes a 9-pin connector for ADAT synchronization and three Audio Wire ports for connecting up to three MOTU breakout boxes (including any combination of the 1296, 24i, 308, 1224, and 2408).

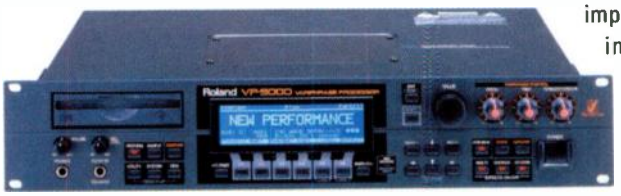
The 1296 supports sampling rates of 44.1, 48, 88.2, and 96 kHz and can perform input and output sampling-rate conversion on AES/EBU digital audio. The front panel of the 1296 hardware includes indicators for system clock and AES/EBU sampling rate, as well as a 19-step meter for each input and output channel.

The back panel has 12 inputs and 12 outputs on balanced XLR connectors, an Audio Wire jack for connecting to the PCI card, AES/EBU and word-clock I/O, and an additional word-clock input for resolving the AES/EBU I/O to an independent source.

The signal-to-noise ratio for the inputs is rated at 117 dB (A weighted), and the output signal-to-noise ratio is 116 dB. Mark of the Unicorn; tel. (617) 576-2760; fax (617) 576-3609; e-mail info@motu.com; Web www.motu.com.

ROLAND VP-9000 VARIPHRASE

Roland's VP-9000 VariPhrase sampler and audio processor ($3,295) allows real-time, independent, nondestructive manipulation of pitch, formant, and time base for up to three stereo or six mono samples at once.



The unit can divide a sample into snippets, à la Steinberg's *ReCycle*, that can be manipulated in the audio realm (rather than using MIDI as *ReCycle* does). However, you can control anything on the unit through MIDI, so you can automate your sonic experiments in unusual and powerful ways.

Time Sync mode enables you to synchronize new notes to the precise point in the sample of the first note. This means you can play a phrase and add harmonies on specific words without having each new note retrigger the entire sample. Solo Encoding mode allows you to control the formant and pitch of samples independently, using MIDI, so that portions of the sample can be raised or lowered in pitch without noticeable artifacts. This alleviates the need for multisampling and can be done in real time.

With this combination of tools, you can pull off some amazing stunts. For example, the VariPhrase can sync a group of samples in different keys and tempos to one user-defined key and tempo, add swing to a sample via MIDI or by using the front-panel controls, bend individual notes in a phrase without changing the length of the sample, and change the duration of held notes in a phrase. All of this can be done in real time.

The unit offers 6-voice polyphony; can import 8- or 16-bit samples in Roland, Akai S1000, AIFF, and WAV formats; boasts 50 onboard effects; and comes with an internal 250 MB Iomega Zip drive. The back panel includes MIDI In, Out, and Thru ports; six ¼-inch TRS outputs configured as stereo pairs; and a pair of balanced ¼-inch TRS inputs. S/PDIF digital I/O is provided on both optical and RCA connectors.

The A/D/A converters are 20-bit, and internal processing is 24-bit. The unit can sample and play back at sampling rates of 32, 44.1, and 48 kHz and can import samples at lower rates. The VariPhrase comes with 8 MB of internal memory that is expandable to 136 MB using 72-pin SIMMs. Frequency response is rated at 20 Hz to 20 kHz (±3 dB). Roland Corporation U.S.; tel. (323) 890-3700; fax (323) 890-3701; Web www.rolandus.com.

FXPANSION PLUG-INS

FXpansion has developed a new line of plug-ins. As of this writing, the first four are available for PC VST and DirectX, but Macintosh, BeOS, and CreamWare Pulsar versions should be available by the time you read this.

Phat.Sync ($25) is a programmable, 4-pole, resonant, multimode, pattern-controlled filter that syncs automatically to incoming MIDI Clock or, in the VST version, to the sequencer's clock. *MidiComb* ($30) is an 8-note polyphonic delay-line resonator plug-in that can be MIDI controlled, allowing you to add resonant effects and chords to the audio signal and to "play" the pitch of incoming audio using a set of short delays.

AutopOle ($25) features two 24 dB multimode filters that are configurable in three routings. It also has a stereo envelope generator and a multimode LFO. *RingMod* ($20) is a ring modulator that provides envelope and LFO control of the modulator frequency, four modulator and LFO waveforms, a lowpass filter, stereo panning, and multiple modulation routings. FXpansion; tel. 44 (0) 7808-157-967; e-mail info@fxpansion.com; Web www.fxpansion.com.

LUCID SRC9624

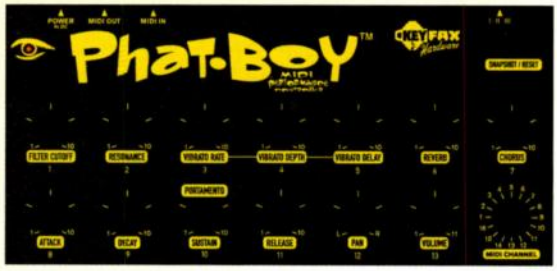
Lucid's SRC9624 ($1,995) provides real-time, asynchronous sampling-rate conversion for 24-bit audio recording, mastering, and post-production applications. It locks to all sampling rates between 32 and 100 kHz, including varispeed; works with all common pull-up and pull-down rates; and supports both S/PDIF and AES/EBU connections.

The SRC9624 has two input sections and two output sections, each with optical and coaxial S/PDIF and AES/EBU (XLR) connectors. Synchronization is via word clock and AES11 input/output (which carries just the sync signal from the AES/EBU data stream). In Independent mode, it can convert the sampling rates of two S/PDIF digital streams to any standard output rate, thereby functioning as two converters.

Additional interface problems are addressed through the SRC9624's synchronization and dithering features. Five internal clock rates (32 to 96 kHz) and three external sources (AES11, word clock, and input signal) can act as the master clock, making the unit compatible with most professional and consumer equipment. It can convert from 24-bit or 20-bit sources to 20-bit or 16-bit outputs, with dithering; dither selection is global for all outputs. Lucid Technology; tel. (425) 742-1518; fax (425) 787-3211; e-mail lucid@lucidtechnology.com; Web www.lucidtechnology.com.

REV UP

KEYFAX HARDWARE



Version 2 of the operating software for Keyfax's Phat.Boy MIDI controller increases the number of instruments and applications that can be controlled in real time with the unit's 13 rotary-controlled knobs. The number of operational modes has also been doubled to six.

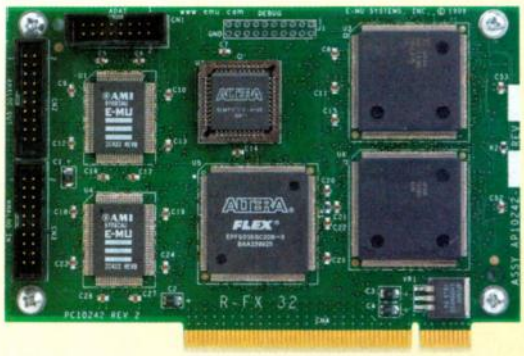
The new Mode IV gives direct access to the major programming parameters for Roland's JV-2080 and JV-1010 synthesizers. In Mode V, the Phat.Boy transmits Control Change numbers 40 to 52 for use with several new software synths and cards, such as the Yamaha PLG150 Prophet-5 card for the SW1000XG. This mode also allows you to use the Phat.Boy to control instruments and software that can remap CC assignments.

Mode VI, dubbed "Classic CC Mode," gives access to almost all pro synthesizers and samplers by transmitting such commonly used messages as CC 74 (Filter Cutoff), CC 71 (Resonance), CC 73 (Envelope Attack), CC 72 (Release), CC 91 (Reverb Level), CC 95 (Phaser Level), CC 94 (Delay Level), CC 93 (Chorus Level), CC 1 (Modulation), CC 5 (Portamento), CC 11 (Expression), CC 10 (Pan), and CC 7 (Main Volume).

Current Phat.Boy product owners can upgrade to version 2 ($34.95) with a user-installable chip; details are posted on the Keyfax Web site at www.keyfax.com/phatboy.html. Keyfax Hardware; tel. (831) 460-0172; fax (831) 460-0173; e-mail us@keyfax.com; Web www.keyfax.com.

E-MU SYSTEMS

The new RFX expansion card ($795) for the E-mu Systems Ultra series of sampler workstations adds 32-bit effects processing; 32-bit, 32-channel input and output mixing; and preset-based multi-effects and routing. In addition, the RFX allows you to use E-mu's new 24-bit I/O cards, which effectively convert any Ultra-series sampler to a full-fledged 24-bit system.



The RFX card supports up to 16 simultaneous audio inputs originating from an outside source or from the Ultra sound engine. The card allows you to mix the 16 inputs using an integrated, 15-bus stereo digital mixer that includes three main buses and 12 suboutputs that can be routed to any physical output.

The effects section offers up to 16 simultaneous 32-bit stereo effects, configured as 2 global effects and 14 insert effects. Any sample or audio input can be simultaneously assigned to up to four effects buses, each with its own effects-send level control. Each sample in a bank of presets can have a distinct effects amount and output assignment routing. E-mu Systems; tel. (831) 438-1921; fax (831) 439-0363; e-mail seanw@emu.com; Web www.emu.com.

KURZWEIL PC2

Kurzweil's PC2-series keyboard synths offer 64-voice polyphony, expandable to 128 voices. The PC2 ($2,395) has 76 unweighted keys, and the PC2X ($2,895) has 88 weighted keys; otherwise, they are identical.

The PC2 comes with 128 programs and 64 setups; you can overwrite all 128 programs and create up to 128 setups. New sounds include triple-strike stereo grand and electric pianos, stereo strings, brass sections, and assorted drums and percussion. You also get Kurzweil's KB-3 modeled tonewheel organ. Unlike the company's popular PC88, the PC2 comes with some basic sound-editing features, such as filter, envelope, and LFO settings.

Keyboard controller features include four zones that can be used for splits or layers; four sliders; two wheels; and five programmable panel switches. Inputs are provided for four footswitches, two continuous-control pedals, a breath controller, and a ribbon controller. User-programmable multi-effects include reverb, chorus, delay, distortion, rotary, phaser, flanger, and dynamics processing. The unit's four arpeggiators offer an assortment of latch modes and play orders.

The PC2 sports 24-bit, 48 kHz stereo digital output via AES/EBU or S/PDIF. Analog outputs include the ¼-inch L/R main outs and a stereo headphone output. Kurzweil/Young Chang America; tel. (253) 589-3200; fax (253) 588-6809; e-mail kurzweil@aol.com; Web www.youngchang.com/kurzweil.

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POD is the ultimate guitar direct recording/performance tool with acclaimed Line 6 modeling, built-in stereo effects and A.I.R. (Line 6's proprietary mic/room emulation technology).

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POD Pro, a 2U rackmount version of POD, features amp modeling, effects and A.I.R. With 1/4" and XLR analog outputs, 24-bit AES/EBU and S/PDIF digital outputs, Digital Clock In (sync) and a stereo effects loop, POD Pro is perfect for professional recording or live performance.

Whichever POD you choose, you get instant tonal gratification and access to an ever-expanding library of new tones from the Line 6 ToneTransfer Web Library—enough to feed the most insatiable lust for tone.

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LINE 6

SWISSONIC USB STUDIO

The Swissonic USB Studio ($699) audio interface allows you to mix eight input channels to stereo and route a stereo mix to and from a Mac or Windows PC via the Universal Serial Bus. The unit includes a 10 × 2 input mixer and has two XLR microphone inputs

with 48V phantom power, phase inversion switches, and TRS insert jacks. You also get two ¼-inch, high-impedance instrument inputs; four ¼-inch balanced TRS line inputs configured as two stereo pairs; and a stereo pair of RCA inputs that can be switched between tape and phono/RIAA. Stereo input and output mix levels are monitored through a stereo VU meter. Stereo tape, monitor, and headphone outputs are provided.

Swissonic also offers the USB Studio D ($849), which is the same as the USB Studio but adds 20-bit optical and coaxial stereo S/PDIF input/output.

You can add analog and digital I/O through several available options. Users of ADAT Lightpipe–equipped gear will want to consider the AD24 ($749), an 8-channel, 24-bit, 48 kHz analog–to–ADAT Optical converter; and the DA24 ($599), an ADAT-to-analog converter. The AD96 ($999) and DA96 ($999) converters are 4-channel, 96 kHz units that are otherwise identical to the AD24 and DA24, respectively. These four converter packages are housed in half-rackspace units.

The 1U rack-mount AD8 ($1,499) provides eight channels of 24-bit, 96 kHz analog–to–ADAT Lightpipe conversion with mic preamps on each channel. The unit has two ADAT outputs, so you can route eight channels of 96 kHz audio. (You can send only four channels of 96 kHz audio per port when using the ADAT Optical format.) The AD8 Pro ($1,899) is similar to the AD8 but comes with four stereo AES/EBU digital outputs. Swissonic America; tel. (707) 577-7691; fax (707) 577-7692; e-mail infousa@swissonic.com; Web www.swissonic.com.

WAGONTRAIN DECLAMMIFIER

In late-breaking news, Wagontrain Engineering announced the new DeClammifier ($499), which features the company's new FIRM (Fully Integrated Real Modeling) technology. The DeClammifier uses advanced artificial-intelligence algorithms to determine key, tempo, and rhythmic divisions. Using this data, the unit auto-corrects your playing, eliminating embarrassing mistakes.

Massive parallel processing minimizes latency for real-time response and glitch-free performance. You can choose from six musical styles, or slap in a CD to

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Perhaps the DeClammifier's most powerful feature is PWIM (Play What I Mean) mode. It enables the unit to apply its artificial brain to correct your mistakes, substituting the notes you *meant* to play for the clams you actually played. You won't believe that this amazing gadget is for real. At least, you shouldn't believe it. Wagontrain Engineering; e-mail info@wagontrainengineering.com; Web www.wagontrainengineering.com.

LINE 6 DL4

The DL4 is the first release in Line 6's new series of stompbox-style effects modelers. The DL4 models several popular vintage analog and digital delay units, produces numerous standard and custom delay effects (ping-pong, stereo, rhythmic, dynamic, reverse, and more), and features a 14-second loop sampler with half-speed, reverse, and overdub capabilities. The DL4 is programmable, and three custom user programs can be stored in memory.

Classic delays modeled include the Maestro Echoplex (both EP-1 Tube and EP-3 solid-state models), Roland RE-101 Space Echo, Boss DM-2 analog, and Electro-Harmonix Deluxe Memoryman. A Lo Res Delay (variable from 24 to 6 bits) approximates the extended delay-time settings found on several early digital delays, and the reverse and overdub aspects of the loop sampler are reminiscent of the Electro-Harmonix 16-second digital delay.

The DL4 features 24-bit processing, stereo inputs and outputs, and true bypass circuitry. A tap-tempo footswitch is built in, and you can connect an expression pedal to the unit for real-time control over all effects settings. Line 6; tel. (805) 379-8900; fax (805) 379-3001; e-mail info@line6.com; Web www.line6.com.

NEUTRIK MINILYZER

Neutrik has expanded its Minstruments line of products with the Minilyzer ($399.99), a handheld audio-analysis device that can continuously measure audio levels at RMS or peak values and display the results on its 100 × 64–pixel backlit LCD. Six buttons on the front of the device let you navigate through the display's drop-down menus.

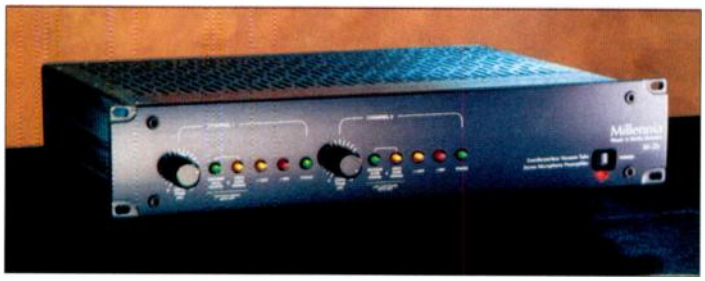
The Minilyzer performs a number of other functions, including the measurement of total harmonic distortion (THD). It displays this information either in decibels or as a percentage of the dynamic range. When used to perform frequency sweeps, the Minilyzer measures room response, which you can view either as an instantaneous level or as total frequency response.

Audio input is through a rear-panel balanced XLR or unbalanced RCA connector. A built-in microphone is provided for performing speaker polarity checks, and there's a mono, ⅛-inch headphone output.

The unit runs on three AA batteries. According to Neutrik, the Minilyzer is accurate to within less than 0.1 dB, with a residual THD+N of <0.005%. Neutrik; tel. (732) 901-9488; fax (732) 901-9608; e-mail neutrikusa@aol.com; Web www.neutrikusa.com.

MILLENNIA MEDIA M-2B

The M-2b ($2,895) from Millennia Media is a dual-channel tube mic preamplifier that uses a transformerless design throughout. The preamp is based on the company's M-2a but boasts a modified signal path and hand-selected triode vacuum tubes. The unit features an anodized aluminum faceplate, and its chassis is made of cold-rolled steel. An internal subchassis fully isolates the toroidal power supply from the audio components.



Each channel includes a phase-reverse button, 48V phantom power, and a button that supplies 130 VDC direct power for use with B&K DPA high-voltage microphones. The amount of input gain is controlled by a knob, and two accompanying buttons set the gain knob to control a low, medium, or high range. You can apply up to 50 dB of gain.

Two input options are available: B&K 130 VDC mic inputs ($200 per channel) and DC-coupled inputs ($100 per channel) that, according to the manufacturer, allow better signal reproduction when using dynamic and ribbon mics.

Millennia Media rates the M-2b's frequency response at 4 Hz to 130 kHz (+0/–3 dB). EIN is rated at –116 dB (10 Hz to 30 kHz) and THD+N at <0.02% (10 Hz to 20 kHz at 30 dB gain). Millennia Media; tel. (530) 647-0750; fax (530) 647-9921; e-mail info@mil-media.com; Web www.mil-media.com.

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To receive more information about the products that you see listed here in What's New, simply go to www.emusician.com/rs, provide the information requested, and select the manufacturers that you would like to know more about. Be sure to fill out the Rate the Articles section while you're there.

SAMSON RH SERIES

Samson Technologies has introduced three new studio-quality reference headphones: the RH600 ($69.99), RH300 ($54.99), and RH100 ($44.99). All three headphones feature an ambient open-ear design and lightweight, acoustic-mesh grilles. The drivers use 40 mm diaphragms and high-output, neodymium magnets, but each model has a different grade of transducer.

The top-of-the-line RH600 headphones have a self-adjusting fit for maximum wearing comfort. The impedance is rated at 40 ohms (±10%), and sensitivity is 115 dB SPL (at 1 kHz, ±3 dB). The midline RH300s are 32-ohm units with a 106 dB SPL sensitivity rating, and the RH100s operate at 64 ohms and are rated at 106 dB SPL sensitivity. All three models provide a 20 Hz to 22 kHz frequency response.

The RH series reference headphones come fitted with a heavy-duty cable that is terminated with a gold-plated ¼-inch phone plug. A gold ¼-inch adapter is also included. Samson Technologies; tel. (516) 364-2244; fax (512) 364-3888; e-mail sales@samsontech.com; Web www.samsontech.com.

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By Scott Wilkinson

Music on the Brain

One of the most difficult tasks facing any composer is getting a musical idea from conception to realization. Once you compose something in your head, you need to write it down in musical notation or play it on an instrument and record your performance into an audio recorder or MIDI sequencer. Then you can refine and expand the idea, develop an orchestration, and otherwise work toward a finished piece of music. But even with modern tools, preserving your inspiration can require years of training, which inhibits many aspiring composers from realizing their dreams.

New research allows the development of a brain-to-audio converter.

Recent advances in brain imaging could help overcome this obstacle. Scanning technologies, such as positron-emission tomography (PET), reveal that auditory signals are processed in specific regions within the temporal lobes of the cerebral cortex (the outer surface of the brain, where most higher functions occur). The temporal lobes are just inside the skull, near the top of the ears. (Near the regions recognized in highly paid rock stars as "temperamental lobes.")

Experiments with musical stimuli indicate that melody is processed mostly in the right temporal lobe and meter is processed mostly in the left. Rhythm probably involves subcortical processing in a deeper, more primitive part of the brain, which might explain why it's difficult to resist dancing (or at least bobbing your head) to music with a strong groove.

Another interesting finding of this research is that the left hemisphere of the brain tends to dominate musical processing in trained musicians, whereas the right hemisphere dominates in untrained listeners. This makes sense when you consider that trained musicians can't avoid thinking analytically about any music they hear, while untrained listeners are more likely to simply enjoy the music. Naturally, the real story is much more complicated than this—many other parts of the brain are also involved in the complex relationship necessary to process music (or any other stimulus, for that matter)—but cognitive scientists are coming to understand the general patterns of neural activity that arise from musical perception.

In fact, it has been demonstrated that the same neural activity occurs when someone merely thinks of a musical phrase ("hears" music in their head). If the electromagnetic flux generated by this neural activity can be isolated and analyzed, it might be possible to actually hear a person's musical thoughts!

This is the theory behind the Mindophone, a remarkable device invented by Dr. Spanky N. R. Ganglia of Callosum Corp. US. In its current prototype form, the Mindophone consists of a headpiece (see **Fig. 1**) with very sensitive electromagnetic detectors embedded throughout its inner surface. The headpiece is connected to a computer that analyzes the signals from the detectors and converts them into audio signals that can be played through any normal sound system.

Initial experiments have been very promising. When radio personality Don Thalamus tried it, researchers immediately heard "If I Only Had a Brain" issuing from the speakers. Singer Ray Charles quickly conjured up "Georgia on My Mind" from his roots in the Cerebellum South. Other test subjects easily produced a meditative test chant that Dr. Ganglia developed based on the movie *The Karate Kid*: "axon, axoff, axon, axoff."

The potential applications of this technology are truly mindboggling. For one thing, you'll finally be able to hear yourself think. In addition, Dr. Ganglia is working on a synaptic syntax called M-Dopa (musical dopamine) that would act like an online neurotransmitter, thus allowing Mindophone signals to be streamed over the Internet in real time. Now all we need is some way to get the inevitable throngs of mental composers to think in tune! ❀

COURTESY CALLOSUM CORP. US

FIG. 1: Dr. Ganglia's first prototype of the Mindophone includes a flexible headpiece to accommodate brains of various sizes. This test subject is thinking of the ever-popular tune "Jesus Is Just Dendrite with Me."

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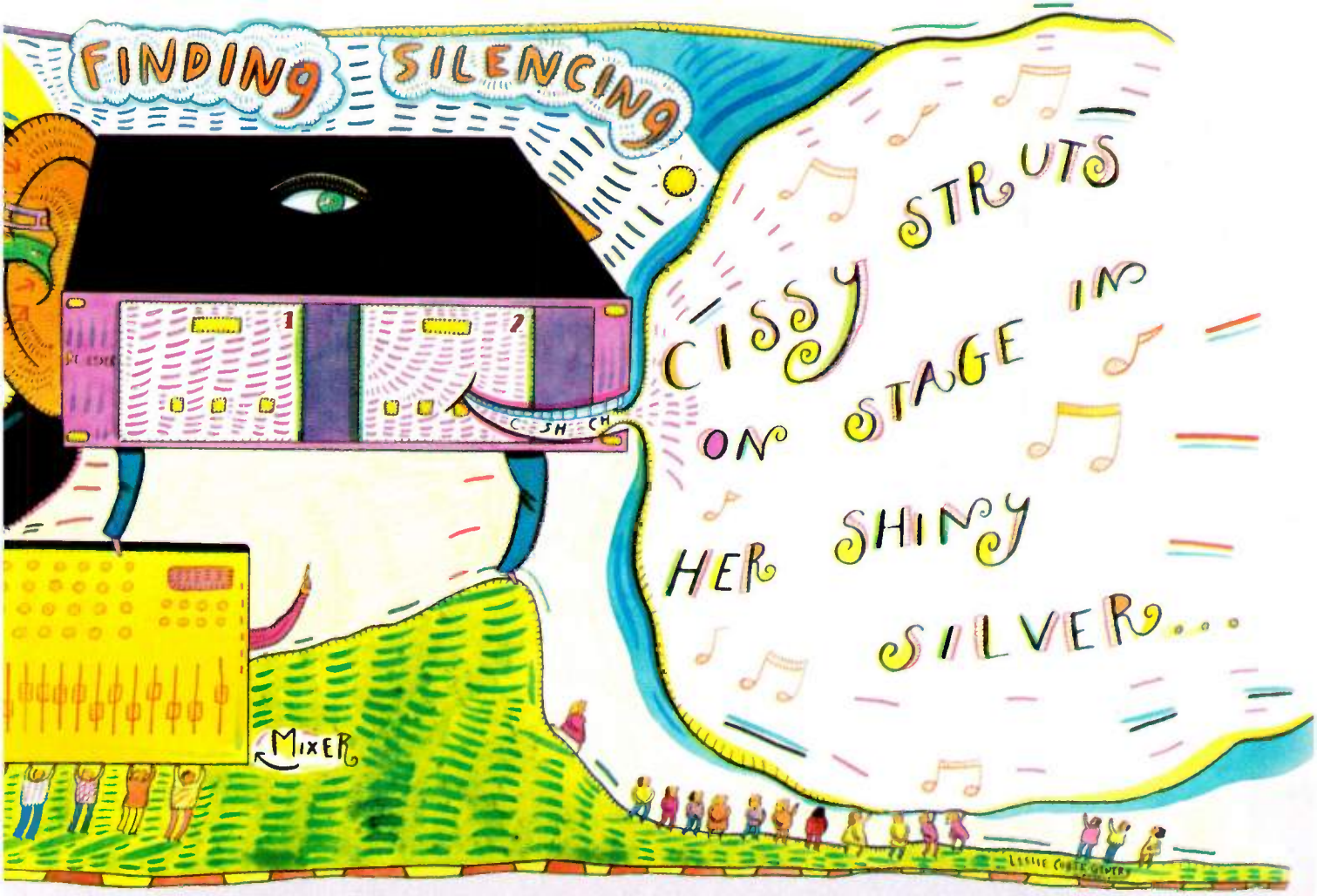
ALESIS

ILLUSTRATION BY LESLIE COBER-GENTRY

A look at how de-essers work, how to use them, and how a couple of stand-alone units compare with do-it-yourself de-essing.

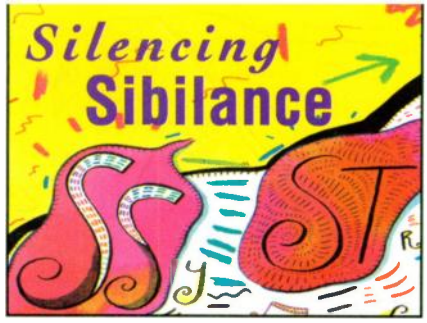
For my way of working in the studio, a de-esser is a last-resort type of device. That is, I do everything within my power to avoid having to use one. Specifically, when recording vocals, I almost always spend time testing different microphones so as to select the one that works best for the singer and the song. Also, I position the microphone carefully, angling it to minimize both sibilance and plosives. Moreover, I nearly always use a pop filter in front of the mic (a pop filter can help reduce sibilance as well as plosives), which I may also spend time positioning. Finally, before committing to any of the above, I record and listen back—through the monitors—to at least a verse and chorus of the song, to make sure I'm getting the sound I want, minus any gremlins.

• Assuming the performance is good, these safeguards usually ensure the capture of a keeper vocal track. But then, there's not always time to work through each of those steps, nor is the best mic for the job always available. And even when everything is dialed in just perfectly, well, all the care in the world can't guarantee sonic perfection. So what to do when you get a stellar, once-in-a-blue-moon performance that's marred by some sibilance? Rather than throwing the baby out with the bathwater (that is, rerecording the track), some "fix it in the mix" magic is definitely in order. And a de-esser is the magic ingredient. • This article will serve as both an introduction to de-essers and a review of two stand-alone units: the Drawmer MX50 Dual De-Esser and the Sound Performance Laboratory (SPL) Model 9629 Dual Channel Auto Dynamic De-Esser. We'll also compare those two units with the traditional, do-it-yourself method of de-essing (described later). De-essers have other uses, of course, such as attenuating string noise from acoustic guitar tracks and air sounds from flute tracks. The focus here, however, is on vocal de-essing.



Silencing Sibilance

by Brian Knave



WHAT IT IS

For those not in the know, a de-esser is just what the word suggests: a device for getting rid of unwanted esses, or sibilance, from vocal tracks. Sibilance can be caused not only by the consonant *s*, but by several other consonants and digraphs as well, including *c*, *sh*, and *ch*. What's so bad about sibilance? Well, it can sound ugly, even to the point of being painful to listen to. Interestingly, though, people have different tolerance levels for sibilance. I don't mind a little of it, but I know many engineers who can't bear even a trace. On the other hand, I recently mixed an album for two Latin American musicians who wanted me to *emphasize* the esses on their vocal tracks, as they felt the emphasis helped clarify their Spanish pronunciation. (Most of the time, a bright plate and some high EQ was all it took to make the emphasis.)

The point is, there's nothing wrong with esses per se: after all, they are required for the proper pronunciation of our language (and others). The problem arises, however, when they are significantly louder than the rest of the track. It's not uncommon for an inexperienced singer to generate esses that are ten or more decibels hotter than the other consonants and vowels in the performance. Moreover, some singers just have very sibilant voices, no matter how experienced they are in the studio. For such singers, it's especially important to find a mic that will help play down the esses.

Another problem is that signal processing often accentuates sibilance. A compressor with a slow attack time, for example, may let the initial sibilant sound in a word pass untouched, while compressing—and thus lowering the level of—the rest of the word. Also, certain effects (for example, bright plates, bright reverbs, and spectral enhancers) may further enhance esses. For that reason, it's generally best to de-ess *before* applying other signal processing.

TRIED AND TRUE

The conventional de-esser is basically a fast-acting compressor that is set to attenuate the high frequencies present in sibilant sounds. (Other de-essing technologies are also available, as we'll see.) Nowadays, de-essers are frequently built into voice processors, and, as noted earlier, some companies also offer stand-alone units.

The traditional, do-it-yourself approach to de-essing (which is still viable today, of course) requires two pieces of gear: an equalizer and a compressor featuring a sidechain or a key input (also known as a control input). Sidechains and key inputs access circuits that let you customize the response of the dynamics processor. Ordinarily, the compressor's level detector (which responds to amplitude only) is controlled by the main input signal. However, you can take control away from the main signal by introducing a different signal into the sidechain or key input.

Pretty much any equalizer, whether parametric or graphic, will work with this application. The quality doesn't matter much, because the EQ is used only to control the operation of the compressor—it's not in the signal path, so it's never actually heard.

To make this type of de-esser, first insert the EQ into the compressor's sidechain or key input. A sidechain has send and return jacks, so here it's simply a matter of patching cables from those to the EQ's input and output, respectively (see **Fig. 1a**). The usual ¼-inch TRS Y-cable connects the compressor's audio ins and outs to the vocal track's channel-insert point.

A compressor with a key input requires that you first split, or "mult," the signal. This can be done by using a mono Y-splitter connected to the send portion of the ¼-inch TRS Y-cable (see **Fig. 1b**). (An option for those working on an MDM, a digital audio workstation, or a hard disk recorder is to clone the track rather than multing it—a better solution in my book because it avoids level anomalies and signal irregularities endemic to Y-splitters.) After multing the signal, send one to the compressor's audio input and the other to its equalizer input. Last, patch the equalizer's output to the key input on the compressor and the compressor's output back to the channel insert on the receive portion of the TRS Y-cable.

Once you're set up, the trick is to boost the frequencies of the sibilant sounds you want to get rid of (these usually occur in the 2 to 10 kHz range) while cutting other, nonproblematic frequencies. Because the equalizer now controls the level detector in the compressor, and it is set to amplify the sounds you *don't* want, it tells the compressor to reduce those sounds first.

DE-ESS THIS!

Want to try your hand at de-essing? Record this poem, lingering over every ess, and have at it!

Cecily sings a seasonal song
Of seedlings seeping sap
While sullen Sally swathes her sorrows
In sheaths and swirls of scrap

Supercilious sunstruck studs
In swimwear sewn from scrim
Survey the strident sprays of surf
Where suckers sink or swim

Shapeless sluts in chamois chaps
And sexy satin smocks
Shake and shimmy by the shack
Where Santa stuffs his socks

Smelly stallions stain surcingles
And sadists strangle sheep
While salesgirls with stupendous sagas
Sing their swains to sleep

MESSIN' WITH DE-ESSIN'

To test the de-essers, I fished through old master tapes and pulled out some

The Drawmer MX50 Dual De-Esser features a split-band mode that helps avoid unwanted compression of nonsibilant sounds. Used in combination with the Air circuit, which restores high harmonic content, the split-band mode provides impressively transparent de-essing.

For manufacturer information, please see Contact Sheet, p. 195.

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tracks I knew had sibilance problems. These were helpful; however, none had enough esses to let me keep the tape rolling and really put the de-essers through their paces. So I wrote and recorded a song and a poem—each brimming with esses—just for the occasion (see the sidebars "De-Ess This!" and "The De-Esser Challenge"). I then made two digital clones of each vocal track, which allowed me to patch all three de-essers simultaneously to the same source material on different channels.

ROLL YOUR OWN

For the traditional de-esser, I used a Symetrix 552E dual parametric EQ patched into the sidechain of an Aphex Expressor 651 compressor/limiter. I chose the Expressor because, out of five compressors in my rack, it was the most fully featured, offering very exacting attack- and release-time controls, as well as other helpful extras.

Getting good results from the compressor/EQ combination took patience and considerable tweaking. Though not rocket science, this de-esser was considerably more difficult to use than either of the stand-alone units, both in terms of setting it up and in finding the optimal settings. Also, it seemed slightly less effective overall. Of course, this was hardly a comprehensive test: many variables are involved in this type of de-essing, and changing any one of them—the source material, the brand and make of the compressor, and so on—would almost certainly yield different results.

There are several ways to arrive at usable settings; here's an approach that works for me. Start with a high ratio (10:1, for instance), a moderate threshold (–5 to –10 dB), and fast attack and release times on the compressor. Now, if you're using a parametric EQ, dial in the maximum decibel cut in the de-ess frequency range and then sweep the frequency (with, for example, a one-octave Q) until you hear an increase in sibilance. (With a graphic EQ, raise the bands between 2 and 10 kHz.) After finding the frequencies that emphasize the sibilance, go from cut to boost, boosting until you hear a reduction in sibilance. You can also adjust the bandwidth at this point, broadening it if you need to address a bigger frequency range and tightening it to pinpoint singular esses.

Now fine-tune your compressor settings. A higher ratio and/or lower threshold will determine the amount and intensity of ess reduction. Also, play with the attack and release times, the goal being to set an attack that's fast enough to catch initial esses and a release fast enough so as not to compress the rest of the word. This is no time to get creative; rather, strive for a natural, unaffected sound minus the unwanted sibilance. Use the compressor bypass switch to compare processed and unprocessed signals; use makeup gain to balance the levels.

Obviously, it's hard to suggest specific settings here, as each situation (and compressor) is different. For the source material I worked with (mostly my own voice), I ended up using a ratio of about 7:1, with the threshold set at around –2 dB for a maximum gain reduction of 12 dB. Attack time was set at 0.05 milliseconds and release time

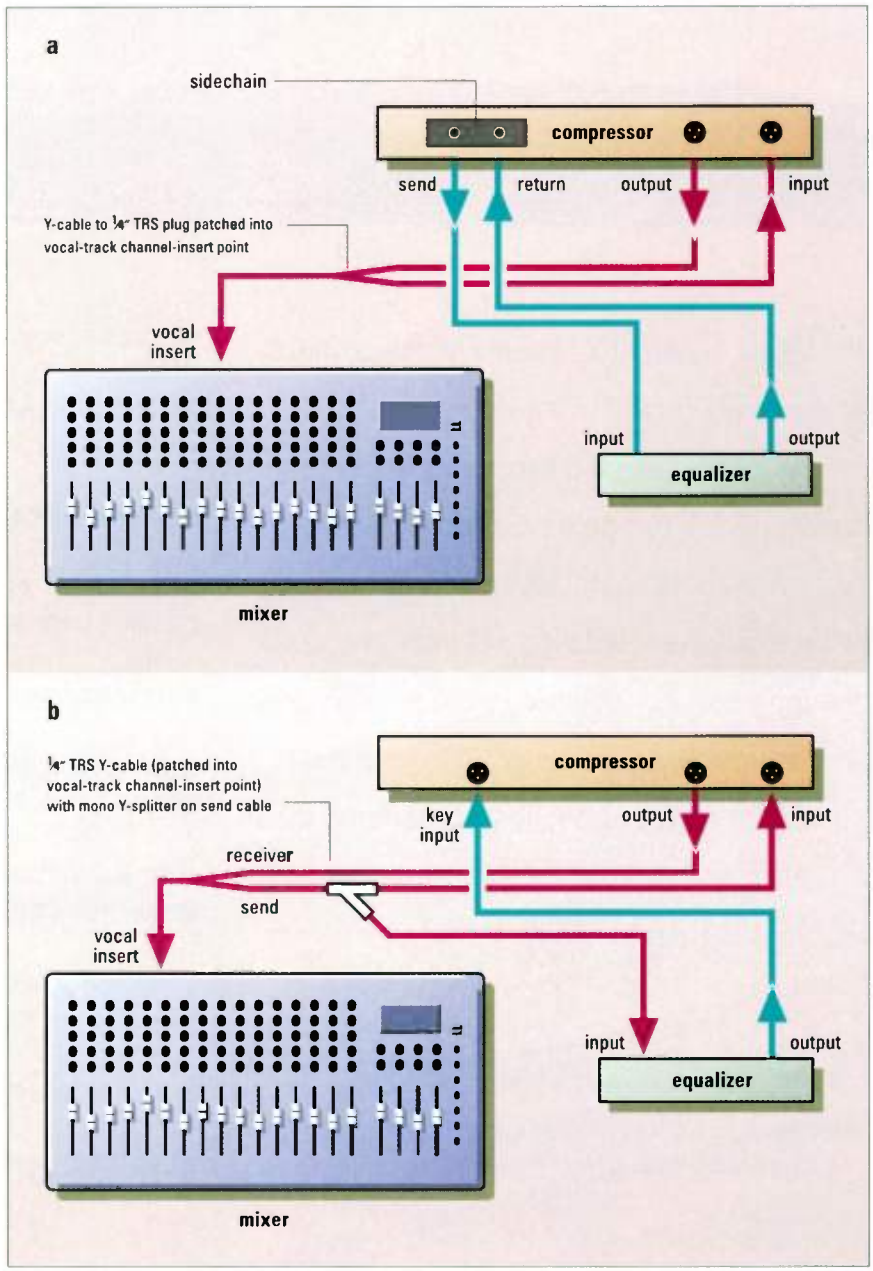

FIG. 1: The setup at the top (a) shows de-esser signal routing when using a compressor with sidechain access. The bottom diagram (b) shows routing for compressors with a key input only.

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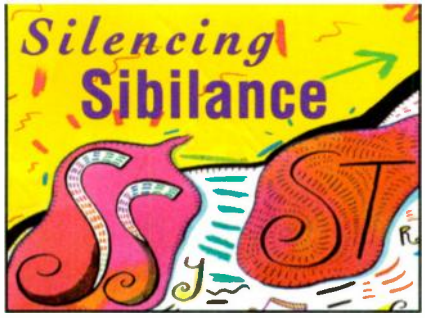

at around 50 milliseconds. I fine-tuned the sound using other features on the Expressor, including a high-frequency "retrieval" circuit comprising two controls: HFX Ratio and Frequency. I dialed in a bit of the HFX Ratio (0.3) at 15 kHz to add some "air" to the processed signal, which helped. I also disengaged the unit's soft-knee control—sibilance transients are fast, and hard-knee compression kicks in faster than soft-knee.

But wait—that's not all. To refine the sound further and keep the effect as transparent as possible, I employed two bands on the parametric EQ: one, as described, to reduce esses (via boosting) and the other to instruct the compressor to ignore frequencies below the de-ess range (via cutting), so the whole signal wouldn't compress whenever a sibilant sound occurred. For the de-ess band, I applied 12 dB of boost at around 6 kHz with a 1-octave Q. For the second band, I applied a 10 dB cut at around 1.2 kHz with a 1.5-octave Q. For good measure, I also dialed in the 552E's low-cut filter at 260 Hz—there wasn't likely to be much energy down that low, but just in case, the compressor would know to overlook it.

DRAWMER MX50

The Drawmer MX50 Dual De-Esser ($549) employs a conventional de-esser design with both amplitude- and frequency-detection circuits (compressor and EQ), among others, in a single easy-to-use 1U box. Each channel provides four controls (two knobs and two button switches), as well as a bypass switch, and the rear panel provides both balanced XLR (+4 dBu) and unbalanced ¼-inch (–10 dBV) I/O. You can use channels independently or link them (via the Stereo Link switch) for stereo operation, which allows both channels to track together without image shifting. The unit has a floating threshold that adapts automatically to the dynamics and level of the incoming signal, so no threshold adjustment is necessary.

From left to right, the controls are Frequency, De-Ess, Air, and De-Ess Band. The De-Ess Band control offers two modes of operation: Full and Split, with Split mode functioning similarly to the dual-band application described in the "Roll Your Own" section. That is, in Full mode, when the unit detects user-selected ess frequencies, the complete signal level gets reduced, whereas in Split mode, only the selected frequencies get reduced.

The MX50's upper-frequency cutoff is preset at "around 8 kHz," according to the user manual; the lower range is set by the Frequency control, which ranges from 800 Hz to 8 kHz. This makes it possible to specify a very narrow or wide band of operation, or any width in between. In Split mode, the Frequency control determines the split point above which de-essing will occur. The De-Ess control determines the amount of gain reduction (up to 20 dB). Beneath it, a 9-segment LED displays the amount of reduction, which is helpful when setting the unit.

A unique bonus is the Air switch, which allows frequencies above the sibilant band (12 kHz) to remain unaffected by de-essing. When the switch is engaged, upper harmonics are preserved, which helps to maintain transparency of processing and naturalness of sound.

The MX50 is a very effective de-esser, and it couldn't be much simpler to operate. I consistently got the best results in Split mode with the Air switch engaged. Beyond that, it's simply a matter of using the Frequency control to find the esses you want to squash and then determining how much to squash them with the De-Ess control. As with any de-esser, moderation is recommended, as extreme settings predictably result in "lisping" and other unnatural sounds.

In my tests, the MX50's Frequency control typically ended up somewhere between 3 and 4 kHz and the De-Ess control between –5 and –10 dB. With the De-Ess Band in Split mode and the Air switch engaged, those settings produced an appreciably

THE DE-ESSER CHALLENGE

In an effort to foil the de-essers reviewed in this article, I wrote and recorded the following song. Impressively, each unit proved up to the de-essing task.

SALACIOUS CHANTEUSE

Cissy struts on stage in her shiny silver boots
Singing sexy songs for all the salaried suits
See-through sequins and a slit down the side
Sure to send a sinner down the slippery slide

Salacious chanteuse
Sultry siren done stewed my goose
Sautéed, stir-fried, seduced
By that salacious chanteuse

Slummy salutations and a satin-smooth smile
Shoulder straps slipping, sliding—slinking's
Cissy's style
Supersonic sycophantic swizzle and swoop
Chartreuse chantilly shake a saint off his stoop

Salacious chanteuse
Sultry siren done stewed my goose
Sautéed, stir-fried, seduced
By that salacious chanteuse

The SPL Model 9629 Dual Channel Auto Dynamic De-Esser parts company with conventional de-essers, employing a special circuit that scans the signal for esses and then reduces them by feeding a phase-inverted signal of the unwanted frequencies back into the signal path.

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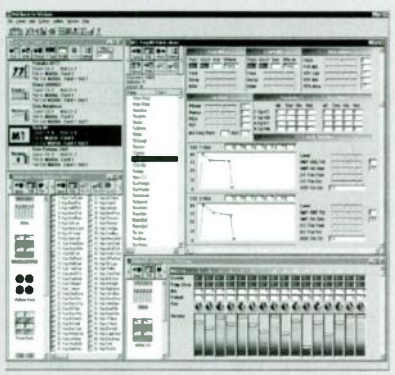

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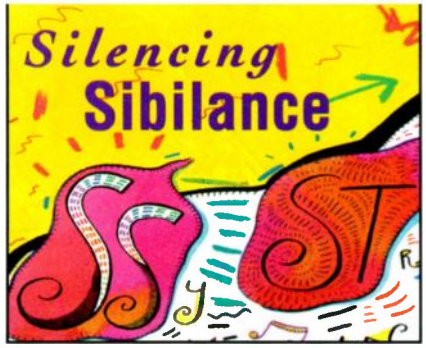

de-essed signal that otherwise sounded nearly identical to the original—very impressive.

SPL DE-ESSER

As the name implies, SPL's Model 9629 Dual Channel Auto Dynamic De-Esser ($599) detects and reduces sibilance automatically. What the name doesn't tell you, though, is that the unit employs a radically different technology from that used in traditional de-essers. Rather than use frequency-controlled compression to squash unwanted esses, the SPL De-Esser eliminates them by feeding a phase-inverted signal of the unwanted frequencies back into the signal path. Like the Drawmer MX50, the unit also features a floating threshold that adjusts automatically based on the dynamics and level of the incoming signal. Rear-panel I/O includes ¼-inch and XLR connectors (both +4 dBu).

Moderation is recommended with any de-esser.

SPL's De-Esser is a dream come true for the engineer short on time, patience, or technical savvy. The unit's two channels provide only one knob and three backlit switches each. The switches are labeled Auto Threshold, Male/Female, and Active. In Male mode, the unit starts scanning for ess frequencies at 6 kHz; in Female mode, at 7 kHz. The only variable control is the S-Reduction knob (labeled simply 1 through 10), which determines the intensity of de-essing. Gain reduction is displayed in 2 dB steps on a 10-segment meter.

It would be hard to ask for an easier-to-use de-esser. The unit always seemed to function most transparently with the Auto Threshold engaged, and, ostensibly at least, deciding between Male and Female is a no-brainer. That leaves the S-Reduction knob as the only thing to really tweak. Even there, I found, the choices are pretty much limited to the left side of the dial, as settings above the halfway point (5) tend to produce increasingly muffled-sounding results. When used sparingly (and with Auto Threshold engaged), though, the SPL Auto Dynamic De-Esser worked very well, smoothly reducing sibilance while maintaining an impressively natural sound.

There was, however, an interesting anomaly: for some reason, the unit worked better on my voice in the Female rather than Male mode. In fact, on one long-held note (a vowel, not an ess), the unit produced a strange, crackling kind of distortion in Male mode. However, this disappeared immediately when I switched to Female mode. So it's definitely worth comparing the two settings.

HEAD-TO-HEAD

In comparison, though the three de-essers tested here had slightly different sonic attributes, all performed about equally well. Not surprisingly, the two dedicated units were easiest to use. I especially liked the Drawmer MX50, not only for its natural sound and helpful Air circuit, but also because it allows for a range of fine-tuning without overwhelming the user with too many options.

If ease of use is your primary concern, the SPL Auto Dynamic De-Esser is hard to beat. I would especially recommend this unit for live-sound applications, as it truly does have "Auto" as its copilot. The sound is sufficiently transparent for professional studio applications, too (though some engineers may prefer to have more control of the signal).

For those who frequently require de-essing, I think a stand-alone unit makes a lot of sense, primarily because it streamlines the procedure. And for live-sound applications, a dedicated de-esser would be my pick every time. On the other hand, if you only rarely need to de-ess tracks and you already own an equalizer and a good-quality, full-featured compressor, the roll-your-own option can provide comparable results and save you some dollars, to boot. Plus, you'll have the satisfaction of knowing you did it yourself.

Brian Knave *is an associate editor at* **EM.**
Special thanks to Kim Cahail and Symetrix.

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FIND YOUR PATH TO MULTITRACK HEAVEN WITH

MAKING

By Dennis Miller and David Rubin

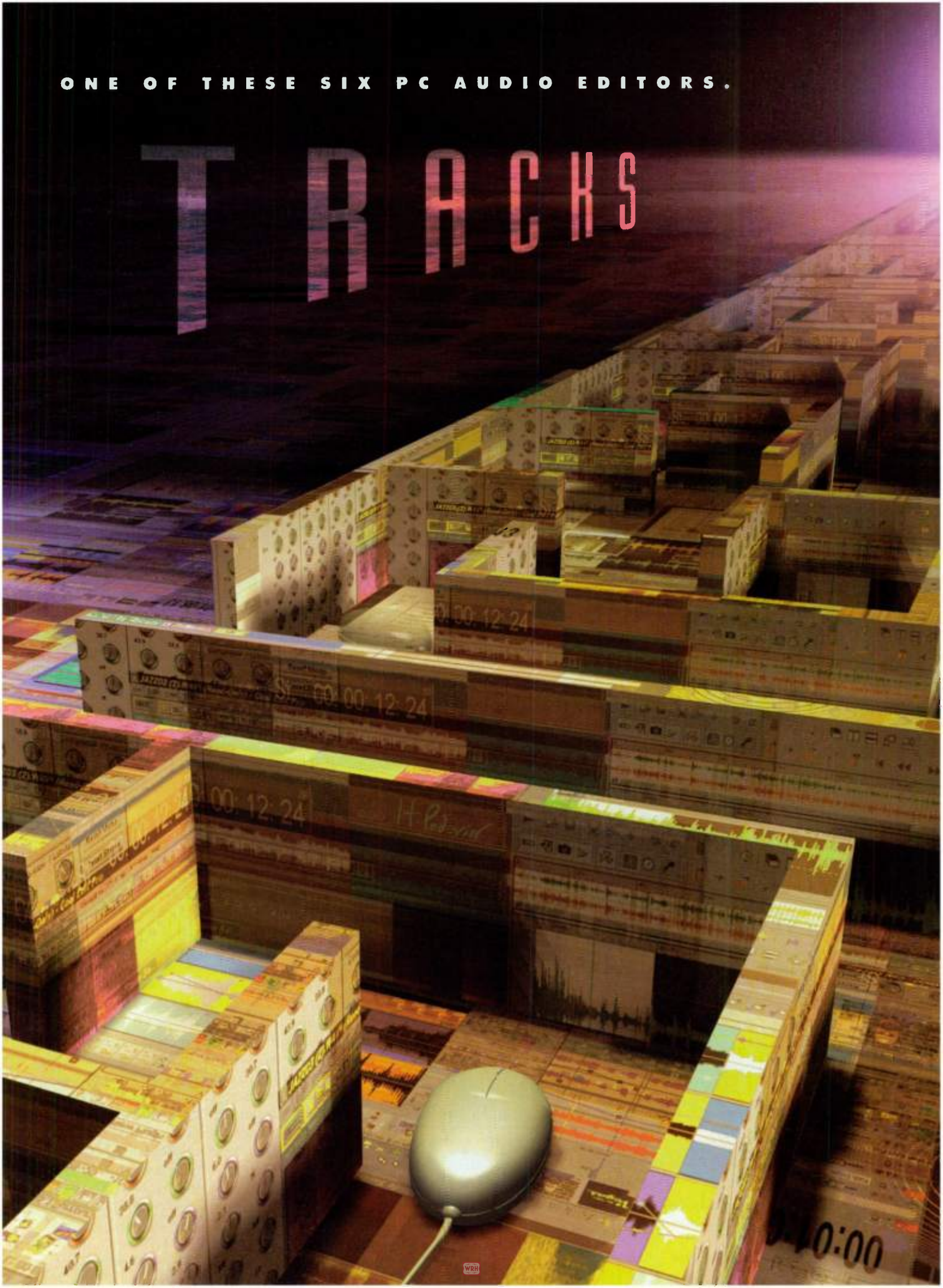
With the audio-editing power available in today's digital audio sequencers and hardware-based editors, do you still need a stand-alone multitrack audio program in your arsenal? We took a look at six professional Windows multitrack editing programs and found some very good reasons why you might want one in your studio. Multichannel recording and playback; sophisticated, nondestructive editing; support for a wide range of file formats; and versatile mixing, panning, and processing capabilities are just the beginning. As you'll see, these programs pack a wallop.

The six audio editors in our roundup are Syntrillium's *Cool Edit Pro* 1.2 ($399), Canam Computers' *Quartz Audio Pro 32* 4.05 ($399), SEK'D's *Samplitude 2496* 5.5 ($799), Innovative Quality Software's *SAWPro* 2.0 ($950), Sonic Foundry's *Vegas Pro* 1.0b ($599), and Steinberg's *WaveLab* 3.0 ($599). Each is a mature program with feature sets that run deep and wide. (Two newcomers, Steinberg's *Nuendo* and Minnetonka's *MxTrax Native*, were not available in time for this article. Keep checking **EM** for reviews of these programs.)

To give you a clear picture of how these audio editors compare in several key areas, we'll discuss the main features of each, including interface and navigation details, mixing and editing options, recording and processing features, supported file formats, and documentation. We'll finish with a few words on each program's distinctive features.

You won't find a single "winner" here, because one size doesn't fit all. Musicians who record live, multimedia musicians who do video work, broadcasters who produce commercial spots, and Website sound designers all have different requirements. So consider each program carefully and find the one that best meets your creative needs.

Illustration by Jean-François Podevin


ONE OF THESE SIX PC AUDIO EDITORS.
TRACKS

DISPLAY CASE

The overall look and feel of a program and the way it meshes with your working style are essential considerations when you're evaluating a multitrack editor. Our test group contained dramatically different interface styles, perhaps because some of the programs were developed quite recently, whereas others originated in the early days of the Windows operating system. Each focuses on different aspects of mixing and editing and takes a different approach toward handling audio files.

Our first area of comparison encompasses palettes and toolbars, preset screen arrangements, and various aspects of scrolling, zooming, and selecting regions. Some of the programs present their features in a very direct way, while others employ multiple layers of detailed operation.

Cool Edit Pro. *Cool Edit Pro*'s Multitrack View is a model of clarity and user friendliness (see **Fig. 1**). The program's overall design is intuitive and accessible; the layout is uncluttered and offers plenty of customization options. You can change the color of various screen elements, rearrange the tracks, and select from different measurement units. The toolbars at the top of the screen, which are grouped and color-coded to match their corresponding menus, provide shortcuts to most operations. At the bottom of the screen, a thin set of level meters with peak-hold and clipping indicators extends across the window. You can easily read the large time display from across a room.

Mono and stereo waveform displays occupy most of the Multitrack View's central area. You move the individual waveform blocks by right-clicking and dragging; you select regions by left-clicking and dragging.

Each display can also include rubber band–style volume and pan envelopes. In Edit Envelopes mode, clicking anywhere on the envelope lines creates a new grab handle for changing the envelope shape. To the left of each waveform, a Track Console provides fields and sliders for adjusting the overall level and pan settings. Three colored buttons let you mute, solo, and record-enable each track, and two other buttons afford quick access to each track's input and output hardware assignments.

Between the waveform displays and the toolbars, a narrow black strip graphically represents the total length of the session. A green Display Range bar within the strip indicates the currently visible part of the file (its size changes as you zoom in and out). *Cool Edit Pro* uses this bar in lieu of a horizontal scrollbar. You simply grab the green bar and drag it left or right to scroll quickly to a new location. Right-click dragging on the bar turns it into a variable zoom control—it's very cool. And speaking of zoom controls, six horizontal zooming buttons are located on a toolbar between the transport controls and the time display; vertical zoom buttons are on the far right. You can zoom in to the single-sample level, at which individual samples appear as small boxes on a line.

A large button in the upper left takes you to the Edit View screen, where you can perform more extensive audio-file editing. The Edit View looks much like the Multitrack View, except that only a single mono or stereo audio file occupies the central area. The file can appear in a traditional waveform display or in the colorful Spectrum View, which shows the waveform's harmonic content (see **Fig. 2**). Switching between screens is quick and easy.

Quartz Audio Pro 32. The user interface in *Quartz Audio Pro 32* is not as intuitive as it could be, but the program is relatively easy to use once you understand its approach to multitrack manipulation. The main screen consists of three sections (see **Fig. 3**). The lower part of the screen, called the Mixing Grid, displays tracks and waveforms in the familiar multitrack format. The center section holds the transport controls, time and position displays, and buttons for various functions.

The upper view changes according to the operation. The Recording display, for example, includes a pair of nifty "mechanical-style" VU meters along with buttons and menus for setting recording parameters (see **Fig. 4**). The impressive Spatialisation display uses a 3-D grid to show the "positions" of your tracks (based on pan and volume settings) as they exist in their virtual environment. A simple Mixer screen provides the usual set of sliders, knobs, and buttons.

You begin a project by recording or importing audio files and adding them to the list in the Edit Elements display (the primary option for the interface's upper portion). In Edit Elements, you can view and edit each individual file's waveform. A colored bar beneath the waveform display graphically represents the entire sound file. Dragging through

FIG. 1: *Cool Edit Pro* offers a clear, well-designed user interface with VU meters along the bottom and color-coded toolbars along the top.

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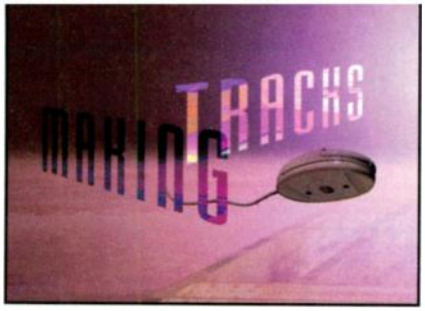

a section of the bar places that section in the display.

The program provides adjustable pan and volume envelopes, but only two break points are available for each, which limits you to three-segment envelopes. (You can create multisegment envelopes in the Mixer Grid, however, by using the Automation tool.) The Edit Elements display also lets you create a single loop segment by right- and left-clicking to set the starting and ending points. You can then adjust the loop points as the music plays.

Once you've made your preliminary edits (you can always change them later), the next step is to add the audio clip to the Mixing Grid. But rather than simply dragging the file from the Edit Elements display onto the Mixing Grid, you must first open the Toolbox palette and select the Insert (pencil) tool. Clicking in the Mixing Grid then adds the selected audio file at that location. You can also press the Insert key on your keyboard, and the clip will appear on the grid at the current position on the active track.

The Toolbox palette includes 12 waveform-editing tools, a number of which have confusing icons. The magnifying glass, for example, is not a zoom control—it's the Edit Element tool. The FX icon does not open a DSP window; it's the Multiple Element Insert tool. Labels for some but not all of the tools appear at the bottom of the screen, and not when you roll over the tools with the mouse. You have to select a tool (which closes the palette) to see what it does—not very helpful.

Quartz Audio Pro 32's user interface is enhanced by a certain amount of visual redundancy. For instance, when you double-click on a track name, a small set of controls called a mixer slice pops up at the head of the track. Pan and volume changes are clearly visible in the Mixer Slice and are also reflected in the track's waveform envelopes (in Automation mode). Above each track name, a blue band grows as the volume increases, and a small red mark moves left and right to indicate the current pan position. When the Spatialisation display is open, you can even view the changes on a 3-D grid. (More on this later.)

Both the Edit Elements display and the Mixing Grid provide a set of vertical and horizontal zoom controls that enable you to scan through the zoom levels by holding down the buttons. In the Mixing Grid, however, the "plus" and "minus" buttons are inconveniently located at opposite ends of the scrollbars. Neither control set lets you zoom in to the single-sample level.

Samplitude 2496. Most of *Samplitude*'s multitrack activities occur in its Virtual Project (VIP) window, where tracks appear as waveforms against brightly colored backgrounds (see **Fig. 5**). Recordings and imported audio files are termed Hard Disk Projects (HDPs). You add the HDPs as Objects to the VIP window (performing destructive editing in a separate window beforehand if you wish). The Objects are simply representations of the original recordings, so you can add multiple copies to the VIP window and apply a variety of nondestructive processes to them. Objects can also represent RAM recordings and even MIDI files, and all the file types can appear together in a single VIP. MIDI tracks are indicated by a miniature multichannel piano-roll display instead of the usual waveform.

Samplitude offers a unique Comparisonics option that lets you render waveforms in variegated colors that depict the harmonic content of the sounds. This helps you pinpoint the subtle differences between similar sounds. A sophisticated Search algorithm can even locate sections with similar harmonic material.

To the left of the waveforms, each track has a set of peak-hold meters, sliders for controlling overall volume and pan, and mute, solo, and record-enable buttons. The L button locks the Object in the track to prevent horizontal movement. The V and P buttons activate a set of rubber band–style volume and pan envelopes with an unlimited number of grab handles; just double-click on the line where you need a break point. (The volume envelope is yellow, the pan envelope blue.) When the Custom Envelope function is active, the volume and pan sliders resize the envelopes without changing their shapes.

Each Object also has its own dedicated volume/fade envelope with five grab handles, one in each corner and the fifth at the top center. You can scale an Object's volume by dragging the center handle downward with the mouse. The waveform and its background shrink to show the changes, and a pop-up label shows the deviation in dB from the original level. To create a simple linear fade-in or fade-out, just drag the upper corner handles left or right. Drag the bottom two handles left or right to adjust the start and end times of the Object (change its borders). With all of these track and Object envelopes visible at once, the VIP window can look pretty busy, but fortunately the program makes it easy to view only the relevant envelopes.

Samplitude 2496 has several Mouse modes, but the default Universal Mouse Tool is the most useful. In this mode, the upper half of each track is designated as the Play Cursor and Range Manipulation area; the lower half is the Object Manipulation area. When you click in the lower half of an Object, the five grab handles appear, allowing you to change volume, fade settings, and Object borders as we just described. You can also drag the Object to a point elsewhere in the track or to another track. Clicking in the upper half of the Object lets you select a region for editing by dragging with the mouse. Although it's easy to get used to, this arrangement can be a bit

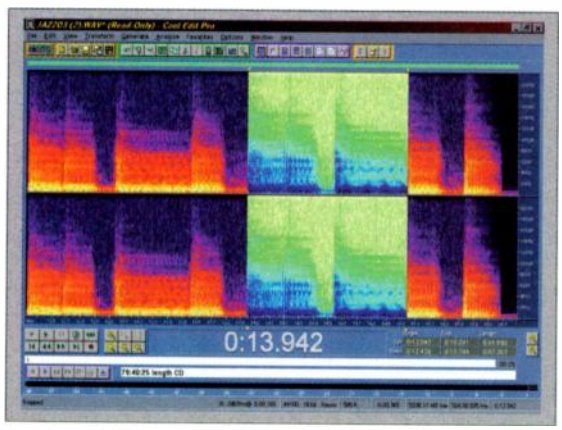

FIG. 2: *Cool Edit Pro*'s Edit View screen can show audio files in the usual way or in a colorful Spectrum View, which provides an analysis of the file's harmonic content. Here the region in the middle is selected for editing.

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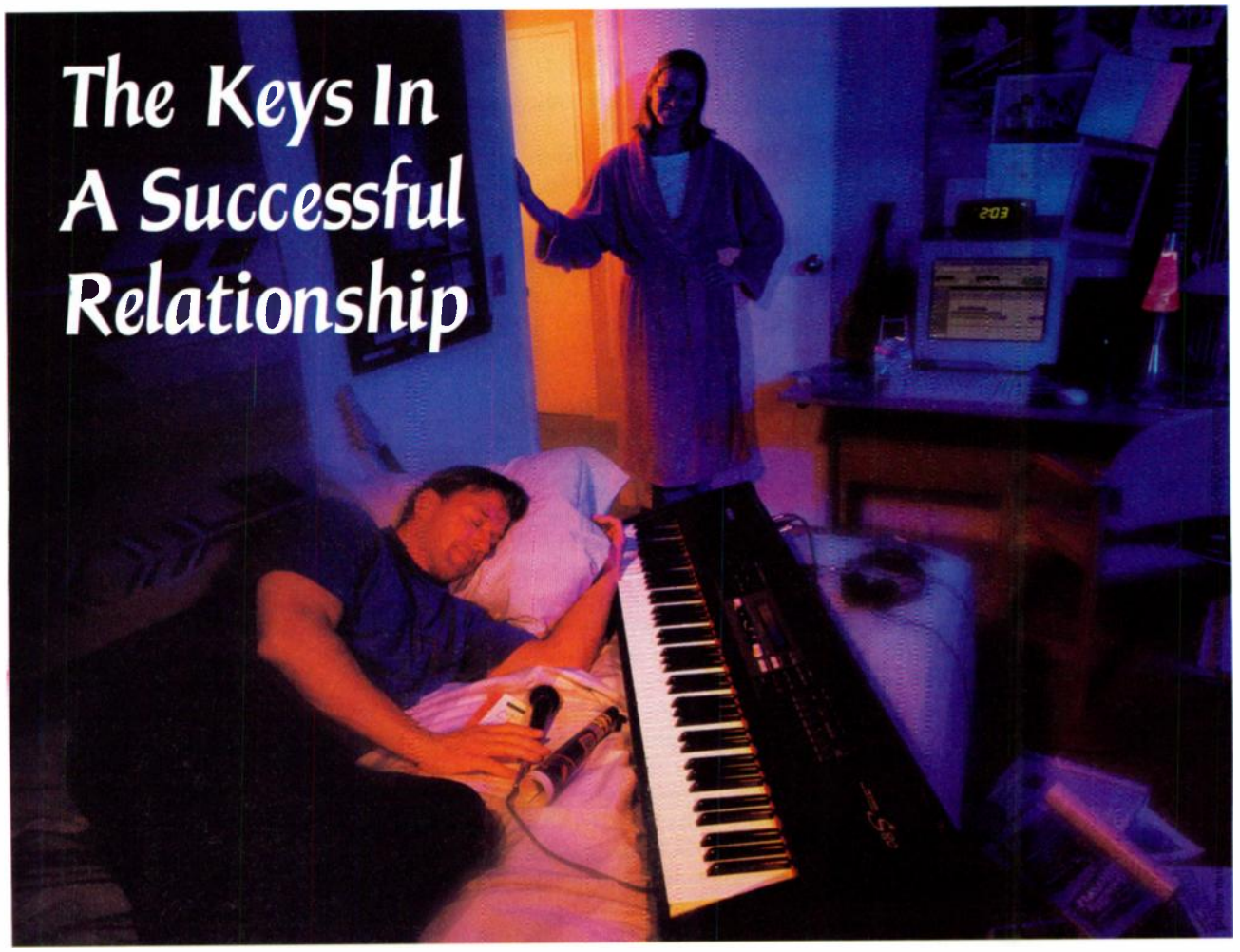

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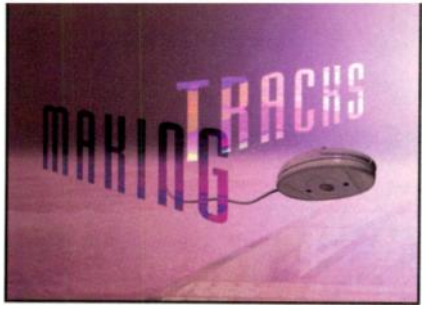


confusing at first. For example, an Object with a reduced volume may appear below the track's midpoint. That forces you to select a region by dragging above the waveform display rather than inside it. Other Mouse modes restrict the mouse to specific actions (like selecting ranges or changing envelopes).

At the top and bottom of the VIP window, five toolbars offer easy access to a variety of functions and a surprising number of highly specific options. For example, well over a dozen zoom controls line the bottom of the window: horizontal zooming buttons are in red, vertical in blue. Zoom in and out to several levels of magnification, or fill the whole screen with the Project or a selected region (some of these controls are also in the scrollbar area). In addition, you can set the display level so that one pixel equals one sample. Not enough options? Four more buttons let you set the zoom level so that the screen width equals 1 second, 10 seconds, 1 minute, or 10 minutes. What's more, if you grab either side of the horizontal scrollbar slider and drag left or right, you can zoom smoothly through a wide range of levels.

If you suffer from chronic indecision, *Samplitude*'s many choices may just send you over the edge. Those who take zooming seriously, however, will appreciate all the options. You can even zoom in so close that individual samples look like mammoth buildings against the horizon. But that's not all. Four Z buttons allow you to store and recall your favorite zoom settings, and four S buttons let you save and recall different screen-position/zoom-level combinations. With other buttons you can change Mouse modes, access editing functions, work with regions and Sections (alternate views), and open *Samplitude*'s great-looking automated mixer with surround-sound 5.1 mixing—but not encoding—capability. (SEK'D sells a Dolby Digital encoder.) Fortunately, you can also hide any of the toolbars.

SAWPro. Based on Innovative Quality Software's popular *SAWPlus32* design, *SAWPro* offers an improved user interface, many new features, and a slightly different approach to creating and editing multitrack projects. The main screen's default setup consists of a collection of windows that provide most of the primary tools you'll need in a typical session. Brightly colored pop-up sliders and 3-D buttons with deep shadows combine with clearly marked timelines to create a colorful and appealing look (see **Fig. 6**).

At the top of the screen, the MultiTrack View window displays a horizontal band for each of 32 tracks. Audio clips, called Entries, appear on the right; a set of buttons for each track appears on the left. Along with the usual solo and mute buttons, you get a fader button that brings up a graphic fader and pan control (much like the Mixer Slice in *Quartz Audio Pro 32*), an FX button that opens the Effects Patch Builder for adding effects to a track, and the Record button, which reveals a colorful recording window with peak-hold meters. Other buttons let you zoom in and out horizontally, set the sampling rate and resolution, change the editing mode, and show or hide the Entry waveforms.

SAWPro also provides 12 dedicated Output tracks that appear in a different color scheme below the standard tracks. They enable you to control fades, effects, and other settings you're sending to specific sound cards. A yellow FX button lets you add pre- or postfader 24-bit effects; a purple FX button allows you to add dither and postfader effects.

Clicking on a track activates it and gives it a white border; it is then called the Hot track. You can have only one Hot track at a time, and it is the only track you can edit. Clicking in a Hot track with the mouse sets the position of the MultiTrack View cursor. It establishes the start point for playback and recording as well as the location for various editing operations. For example, the MultiTrack View can show volume and pan envelopes (as in most multitrack programs), but you don't shape the envelopes with grab handles. Instead you position the MultiTrack View cursor where you would like a break point, and use the pop-up fader and pan control to change the setting at that spot. You then move the cursor to the next position and repeat the procedure. (Unfortunately, the envelopes are visible only when the fader control is onscreen.) Another cursor, Playback, scrolls through the waveforms during playback and recording to indicate the current playback position, so you'll often see two cursors showing at once.

In the center of the main screen, the SoundFile View window provides a close-up look at an individual mono or

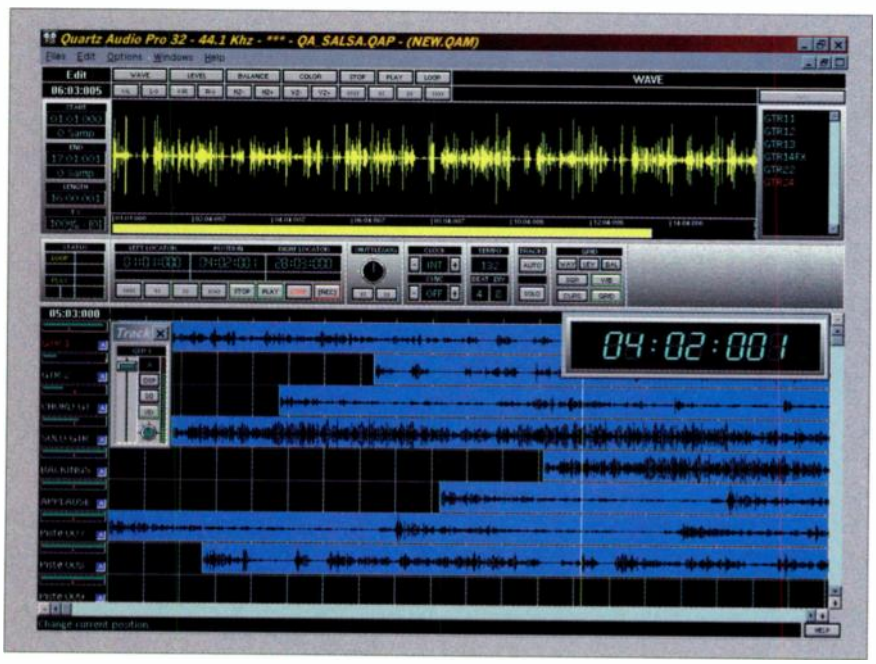
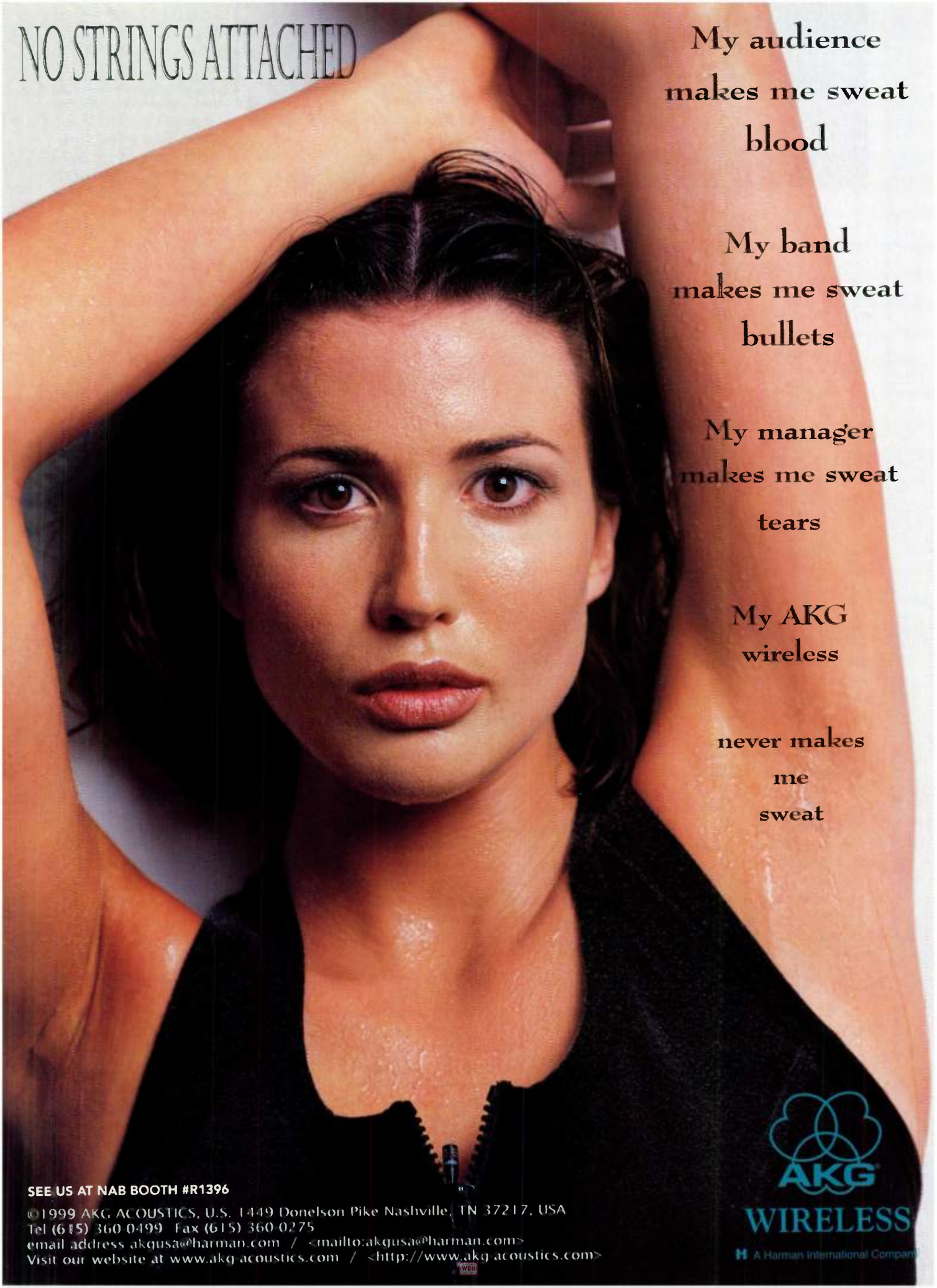


FIG. 3: The main screen in *Quartz Audio Pro 32* includes the Mixing Grid in the lower part, a set of transport controls in the middle, and a changeable display at the top. The Edit Elements display (shown here at the top) lets you import and edit audio files before adding them to the mix.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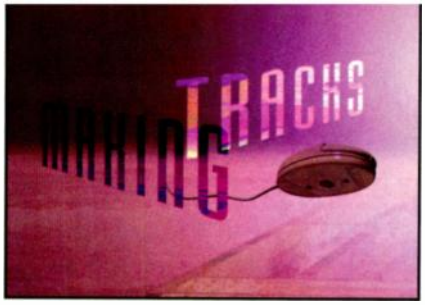


stereo waveform for trimming, editing, and marking of regions. Dragging left to right (but not right to left) through the Time Line display beneath the waveform selects an area for exporting to the Regions View window on the left. From there any region can be added to the current Hot track in the MultiTrack View window.

Located above the SoundFile View window, the Full View window serves as an overview display and shows the complete sound file with its own timeline. Left-clicking in this timeline jumps the SoundFile View to that location; right-clicking starts playback at that point. When you double-click an entry in the Regions View window, the corresponding region appears highlighted in both the SoundFile View and Full View windows.

The SoundFile View window supplies a single row of buttons. The yellow buttons let you zoom in and out horizontally, the red buttons zoom in and out vertically (the 0 dB button returns you to the original level), the blue buttons let you set region boundaries without dragging through the waveform, and the red button opens the same recording palette as in the MultiTrack View.

You might assume that the In Full button zooms you in as far as the program can go, but it really only brings you to the one-pixel-equals-one-sample level. *SAWPro* can actually zoom in much closer than that. In fact, with the Zoom In button you can view individual samples spread across the screen like beads on a string. You can then grab a single sample and drag it up or down with the mouse. (This is a destructive edit and can't be undone.)

At the bottom of the main screen, the Sequence View window lists the current Hot track's regions with their in and out locations and lengths. In the lower right the Remote Transport panel provides buttons for various playback functions.

If you're a fan of multiple toolbars, you may be disappointed by *SAWPro*'s complete lack of icon-based tool palettes. Instead, the program relies heavily on keyboard-mouse combinations for most operations. Once you get accustomed to keeping one hand on the mouse and one hand on the keyboard, you can maneuver quickly through the program and easily switch from one editing mode to another. The program's speed is enhanced by the fact that it was "hand-coded" in 32-bit assembly language, which seems to yield a nimble yet stable work environment.

Nevertheless, *SAWPro*'s emphasis on offering an intuitive user interface belies many of the program's most useful capabilities. For example, in the MultiTrack View window, if you click in the gray area to the right of any Record button, the Playback cursor snaps to the beginning of the session. Why not simply include a button so we know that this function is there? In a similar manner, buttons are provided for zooming tracks horizontally—but if you want to enlarge the tracks vertically, you have to use the Page Up and Page Down keys. (This function is not offered in any of the menus.) A few small vertical-zoom buttons in the scrollbar or next to the other zoom buttons might have come in handy.

In a few cases, *SAWPro* violates standard Windows user-interface guidelines, which may cause a bit of confusion at first. For instance, clicking in the gray area on either side of the horizontal scrollbar slider shoots you to the beginning or end of the session or sound file (depending on the window), instead of moving you one screen at a time as you might expect. The vertical scrollbar, on the other hand, works in a more traditional manner.

Overall, *SAWPro* is not especially difficult to learn; you simply have to spend some time getting acquainted with it, because many of the program's features are not immediately obvious. Once you learn the appropriate keystrokes, however, much of *SAWPro*'s power becomes readily available.

FIG. 4: The Recording display in *Quartz Audio Pro 32* provides a set of retro-style VU meters along with buttons and menus for setting recording parameters.

Vegas Pro. After exploring *Vegas Pro* for only a few minutes, it quickly becomes apparent that Sonic Foundry has successfully tackled many of the user-interface issues that have long bedeviled other companies' multitrack editors. The result is one of the friendliest and most accessible programs around. True, *Vegas Pro* offers no destructive editing capabilities, which definitely simplifies things, and its remaining feature set is not as deep as some of the other programs in this group. But for working nondestructively with voice-overs, multitrack songs, multimedia, and video soundtracks, its ease of use is hard to beat.

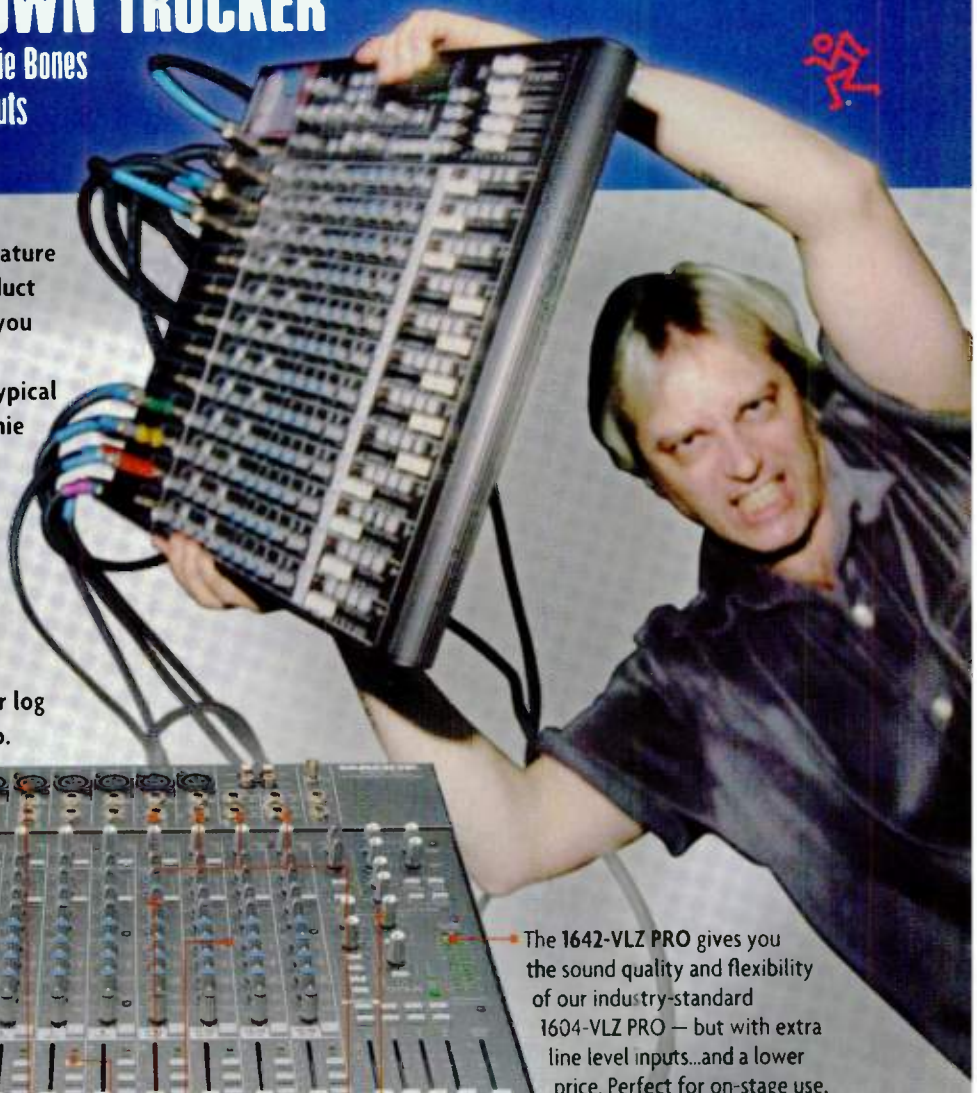
The key to *Vegas Pro*'s appeal is the direct nature of its interface, which shares many characteristics with another Sonic Foundry creation, *Acid.* Drag-and-drop functions abound, dialog boxes are kept to a minimum, and most basic editing tasks are performed directly onscreen without key combinations (although shortcuts are plentiful) or unnecessary steps.

For example, tracks can have their own Volume (blue) and Pan (red) envelopes, which are superimposed over the waveform displays in the Track View section of the main screen (see **Fig. 7**). Simply double-click anywhere on an envelope to create a grab handle, and drag to change the shape. Click and drag on any envelope segment, and you can change the level at that section. Click on any Event (audio clip or sound file) to select it, and you can drag it to another location or to any other track. (It then adopts the new track's color.) Click on an Event's left and right edges, and you can drag its borders to edit the playable start and end points. Drag its top edge down to lower the Event's amplitude. You can also select multiple Events and drag them around, combine Events into Groups, and copy Events and tracks. It's quick, easy, and intuitive.

Next to the waveforms in the Track View section, the Track List section provides separate Volume and Pan sliders and a "Scribble Strip" for naming each track; just double-click and type to change a name. A set of buttons for each track allows you to apply effects (noise gate, EQ, and compression), enable recording, select the output bus, and toggle the Solo and Mute functions. At the bottom of the Track List, a handy Scrub control lets you vary the playback rate and perform forward and reverse scrubbing.

NEW 1642-VLZ PRO ROCKS KID ROCK AND TWISTED BROWN TRUCKER

Kid Rock's keyboardist Jimmie Bones gets mo' stereo line level inputs plus XDR™ mic preamps.



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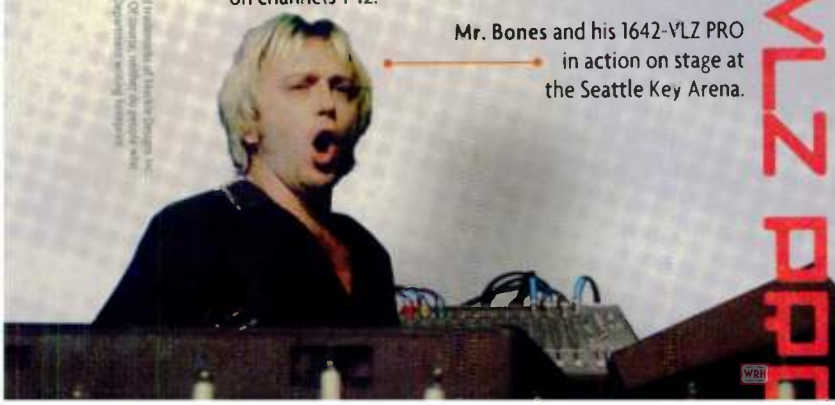

Mr. Bones and his 1642-VLZ PRO in action on stage at the Seattle Key Arena.

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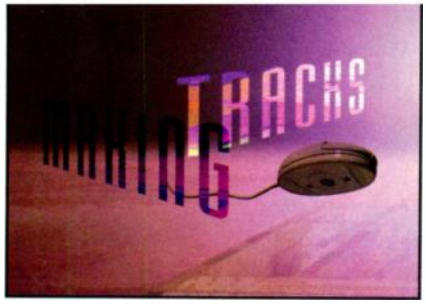


The bottom of the main screen is occupied by the Window Docking Area, where you can deposit up to four frequently used editing windows for viewing and ready access. Simply open an available window, drag it to the Window Docking Area, and drop it into place. The docked windows are resizable to accommodate their individual display requirements, and if one window ends up covering another, a tab appears at the bottom of the window so you can switch between them.

One of the available windows is *Vegas Pro* Explorer, which emulates Microsoft's *Windows Explorer*. It offers a handy way to find and audition files (without leaving the program) for inclusion in the Track View. A dedicated Play button allows you to preview a file before adding it to your project—very useful.

The Video Preview window displays video files during playback, the Trimmer window lets you view and define ranges in the waveforms of individual Events before dragging and dropping them into the project, and the Mixer window provides individual level faders and VU meters for each output bus. Two other windows let you view Event information in list form and locate, organize, and rename plug-ins.

At the top of the main screen, a modest set of buttons gives you access to the most common commands and tools. Beneath the tools, the Video Ruler section displays an imported video file as a string of individual frames aligned with the waveforms below, similar to how AVI files are handled in *Sound Forge*. And just above the rather diminutive timeline, the Marker bar shows markers as red flags with attached labels.

Vertical and horizontal zoom buttons are provided in the Track View's scrollbars to cycle through several waveform zoom levels. You can also drag either end of the horizontal scrollbar slider for infinitely variable zooming through the full range. It works quite well and can get you up to the single-sample level. Aside from enlarging the Track View window overall, you can increase or decrease individual track heights to better display the Track List controls or to get a clearer view of important waveforms and how they correlate to the envelopes.

WaveLab. *WaveLab* has been around as a stereo editor for several years, and during that time it has matured into one of the most powerful editors on the market. With the introduction of version 3.0, however, the program has taken a quantum leap into the world of multitrack audio, and the result is truly impressive. *WaveLab*'s user interface boasts a level of flexibility and versatility that is seldom seen in audio software, yet the program retains an intuitive look and feel that makes it approachable in spite of its depth.

Nevertheless, *WaveLab* lacks a few important track-related features that many of the other multitrack editors offer, because it operates within a somewhat different paradigm for handling recordings. Its main multitrack window is called Audio Montage to reflect this difference. It is here that you assemble and edit individual audio clips and apply effects processing and crossfade functions, do CD burning preparation, and perform other operations (see **Fig. 8**). Steinberg is quick to point out, however, that Audio Montage "is not a multitrack tape-machine emulator" but is more like a "workbench for assembling audio pieces." As such, it does not come with a mixer window, nor does it offer the track-oriented volume and pan envelopes and faders found in most other programs. (It does provide Volume and Pan envelopes for each separate audio clip, though.)

You can record directly into a track in the Audio Montage window where new recordings appear as clips, but most of the time you'll probably begin a project in the Wave window. Imported or recorded files can be examined and edited in great detail in the Wave window before you drag and drop them into a track in the Audio Montage. Both windows use the same sets of toolbars and most of the same interface design features; instead of the track area, however, the Wave window provides a large waveform display with an overview (see **Fig. 9**).

WaveLab offers several excellent ways to manage windows. For example, you can edit the same audio file in more than one Wave window by simply selecting the Duplicate View command or by dragging with the mouse to create a box for the new window. You can then edit different areas of the waveform without scrolling back and forth. Individual window settings can also be saved as Snapshots, so you can quickly switch between various views of a file. In addition, different Screen Layouts

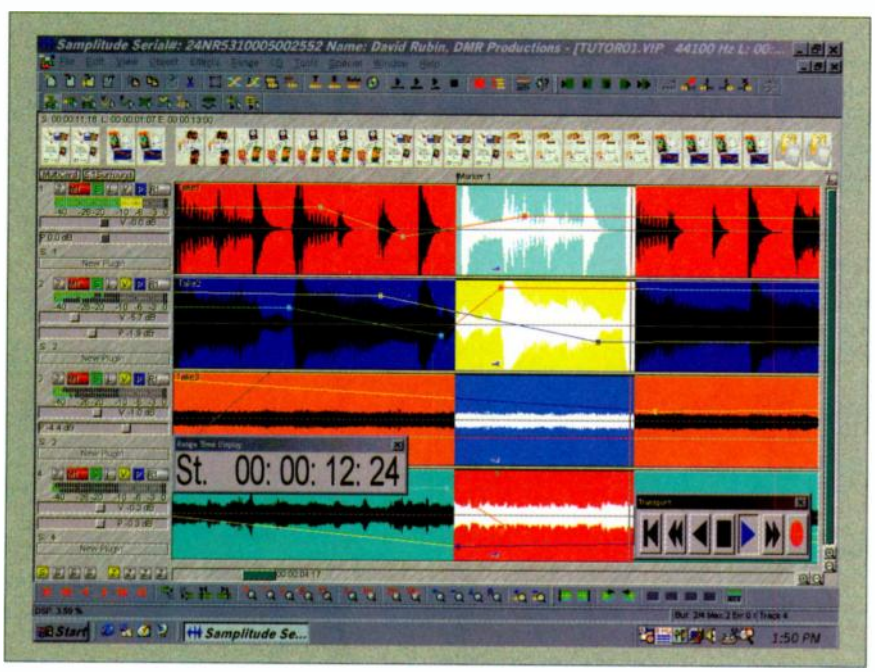


FIG. 5: *Samplitude*'s Virtual Project window lets you combine audio and MIDI files in the same session. Imported video files appear along the top as a string of individual frames. At the bottom of the window, more than a dozen icons let you change the zoom level.

that preserve the size and placement of windows and dialog boxes can be stored for later recall. And *WaveLab*'s use of nonmodal dialog boxes improves efficiency by allowing you to audition or edit files even when a dialog box is onscreen.

WaveLab's dedication to interface customization is further exemplified in its six toolbars, which appear initially at the top of the window. The toolbars can be rearranged, docked to any window edge, or converted into resizable floating palettes. The six toolbars are the Switcher, for showing or hiding the other toolbars; the Standard Commands, for quick access to common menu items; the Toolbox, for changing the cursor when performing various operations; the Snapshot toolbar, for recalling different window settings; the Transport, for recording and playback controls; and the Marker toolbar, for marker-related activities.

At the bottom of the window the narrow Status bar provides information about the current file as well as current editing activity. Just above the Status bar, a set of tabs—the Document Switch bar—lets you quickly switch to another Wave window or to the Audio Montage window if it's covered up. As you might expect, you can hide the tabs or move them to the top or sides of the window.

If you're using a Microsoft Intellimouse or a compatible input device, you'll really appreciate *WaveLab*'s extensive support for the scroll wheel. Just point to a waveform and you can scroll horizontally through the window by rolling the wheel. Hold down the Control key, and the wheel zooms the waveform horizontally; Control-Shift zooms it vertically. Point to an edit field, and the wheel can be used to change the value. And perhaps best of all, in the Master Section window you can use the wheel to adjust the Master volume faders in 1 or 6 dB increments. Hold down the Alt key, and you can even adjust the faders when another window is active. It works like a charm!

Zooming with the Intellimouse is actually only one of many zoom options offered by *WaveLab*. For starters, the scrollbars in the Overview and main waveform displays have their own independent sets of vertical and horizontal zoom sliders. You can drag with the mouse to change levels quickly, click anywhere on the scale to jump to that level, or click on the small arrows to step through the settings, from full-out to the single-sample levels.

As an alternative, you can simply place the cursor in the ruler area over the main waveform display and drag up or down with the mouse. (It works in the Overview as well.) With this approach, you can still drag the cursor horizontally through the waveform to scroll along and locate edit points while continually zooming in and out to examine points along the way. This is a clever and very cool feature that works quite smoothly.

For another approach to zooming, you can use the Magnifying Glass tool. Drag a selection box around any part of the main waveform or Overview, and *WaveLab* zooms in on that area and fills the main display with it. Moving the cursor into the Overview activates the tool automatically. A striped line beneath the Overview waveform shows which part of the audio file is currently visible in the main display.

The same zooming options are available in the Audio Montage window, where the main display is taken over by a multitrack view containing clips. Small magnifying-glass buttons in the vertical scrollbar let you change the track heights to get a better look at clips or to squeeze more tracks onto the screen.

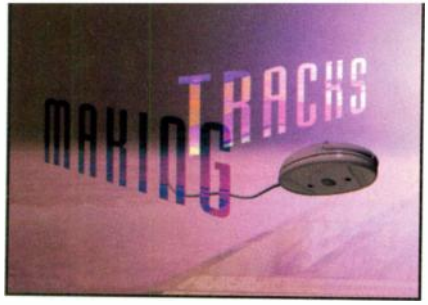
The Audio Montage Overview shows the locations and relative lengths of the clips with color-coded bars that match the clip colors below. The Track View rectangle that appears in the Overview indicates which part of the project is currently visible in the Audio Montage. You can zoom in or out on a project by simply resizing the rectangle with the mouse. As in the Wave window, you can save different views and zoom levels with the Snapshot tool.

Clips can be lengthened, shortened, copied, repositioned, and dragged around from track to track without the need for keyboard combinations. This is accomplished through the use of six Mouse Zones, areas within a clip that determine how the cursor functions. (They're similar to the Universal Mouse Tool mode in *Samplitude*.) For example, dragging on the left or right edge lengthens or shortens the clip (exposes more or less of the sound file for playback); dragging in the lower

COOL TOOLS

As powerful as these multitrack editors are, a couple of third-party utilities can add even more features to any of them. The first is FXpansion's *VST to DirectX Adapter* 2.0 ($60; www.fxpansion.com), which allows you to convert VST plug-ins into DirectX format. The *Adapter* appears in the same list as your other DirectX plug-ins, and once you select it you can load VST plug-ins that reside in the directory that you designate as the default. The new 2.0 version of the software, which should be available by the time you read this, includes additional capabilities such as MIDI automation of VST effects parameters and support for VST Instruments. If you're not a *Cubase* or *WaveLab* user, you may not be aware of the range of both free and commercial plug-ins that are available in VST format. FXpansion's utility gives you access to a huge number of new processing resources.

Another useful application to add to your toolbox is *Virtual Audio Cable* 2.0, from Ntonyx Software (www.ntonyx.com). This program, which is available in a fully functional free version or a more powerful commercial release ($29 for Windows 95/98, or $39 for Windows NT), allows you to route audio from one application directly into another, much like a "virtual MIDI router." For example, you can capture the sound coming from a software synth or sampler directly into a track in your multitrack editor, or "perform" effects parameters in one application while capturing the output in real time into another. The utility offers very low latency (1.5 milliseconds, the manufacturer claims), and the cables are multiclient—which means you can pass several discrete streams of audio simultaneously. You can also route the audio through a Virtual Audio cable directly out your sound card so that you can monitor what's going down the line.



half moves the clip; dragging in the upper half makes a selection. The Info Line at the bottom of the display lets you know which is the current function.

Each clip also has rubber band–style volume and pan envelopes that let you add as many grab handles as you want. And you can mute individual clips to try out different arrangements without making a commitment.

Above the Overview, a row of tabs lets you replace the Overview display with any of a dozen options including a specialized Zoom View for working with crossfades; lists of files, markers, CD tracks, clips, and snapshots; a random-access edit history; a colorful peak-hold frequency-spectrum display; and a sophisticated set of multifunction output meters with a companion Phase meter (see **Fig. 10**).

ON THE MOVE

Being able to move easily through an audio file or multitrack project is something that all musicians can appreciate. Not only does quick navigation offer huge time savings, but you'll feel more comfortable trying out different editing options if you can go back and forth to different locations without getting lost in the waveforms or losing your creative energy.

In this section, we'll take a look at several features that each program offers to help you find your way around and get you where you need to go. These include scrubbing, markers, transport controls, shortcuts, and various playback options.

Cool Edit Pro. *Cool Edit Pro*'s ten Transport controls are available on both the Multitrack View and Edit View screens. Aside from the usual Stop, Play, Pause, and Record buttons, the program includes Go to Beginning, Go to End, and Play to End controls. A Play Looped button loops a selected region or the entire session. *Cool Edit Pro* lacks a dedicated scrub control or jog/shuttle wheel, but it provides some of those capabilities through its Fast Forward and Rewind controls. They shuttle the cursor forward or backward at a user-defined speed from two to eight times normal. In the Edit View screen you can listen to the audio as you scan through it. A separate jog/shuttle wheel would be a welcome improvement, however.

In addition to the main transport controls, *Cool Edit Pro* also provides a complete set of CD transport controls, so you can play audio CDs from within the program. That can be quite handy when you're importing sound effects and music for a session. *Cool Edit Pro* doesn't allow you to insert labeled markers in the waveform display, but it does support saving selections and cursor positions in its Cue List. (Region boundaries and locations from the Cue List are marked in the waveform display.) You can then name the entries and return to any one by double-clicking on the name.

In addition to its customizable toolbars, *Cool Edit Pro* provides access to its myriad commands and menu items through hundreds of keyboard shortcuts and MIDI triggers. The Keyboard Shortcuts dialog box can also be used to create your own QWERTY or MIDI assignments.

Quartz Audio Pro 32. Most of the transport controls in *Quartz Audio Pro 32* are grouped in the Transport and Status display just above the Mixing Grid. The Status indicator on the left shows the functions (Play, Loop, Record, Solo, and so on) that are currently active. A set of Fast Forward and Rewind buttons rapidly scroll the playback cursor or move it in steps. If you click on the small elapsed-time display under the Status indicator, it opens a menu that lets you jump to one of several locations, such as the start or end of the Project. (The 0 key on the numeric keypad serves as a return-to-zero button.) The Edit Elements display provides its own set of playback controls, including a similar pop-up menu.

In the center of the Transport and Status display, an excellent jog/shuttle wheel lets you smoothly scrub the audio in a single track or the entire multitrack mix. The remaining buttons are used to toggle between various clock, sync, automation, and display options.

Each Project in *Quartz Audio Pro 32* can have up to 32 markers, which appear chronologically in the Markers display. A dialog box lets you name each marker, assign it a keyboard shortcut for quick access, and add several lines of comments (in your choice of fonts). You can add markers at any cursor location or drop them in on the fly. When you select a marker in the Marker display, the cursor in the Mixing Grid jumps to that position. Unfortunately, the markers don't appear in the Mixing Grid, so you don't get a graphic view of their locations. As mentioned

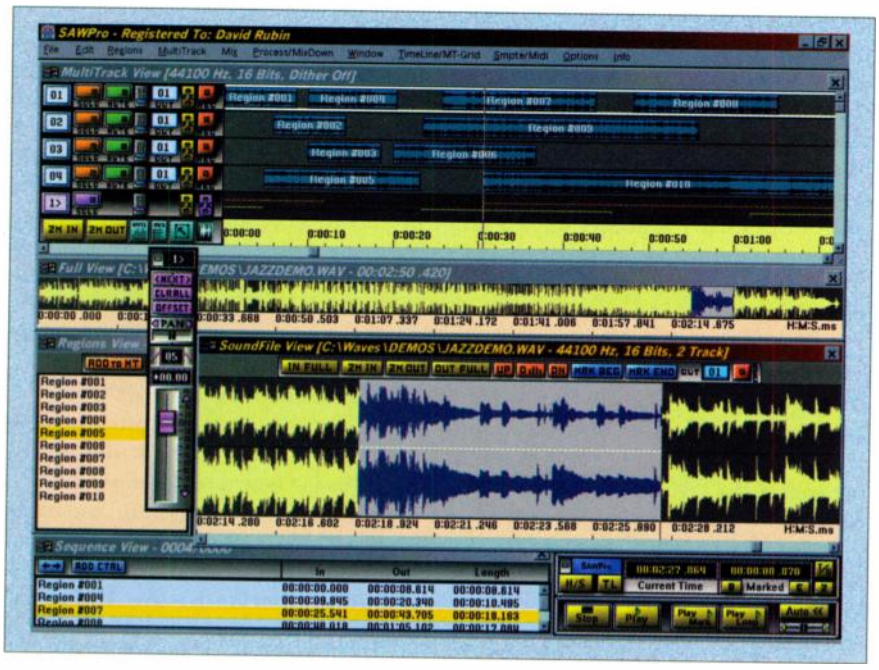


FIG. 6: *SAWPro*'s main screen consists of a collection of windows for editing audio files, organizing regions, and mixing audio clips. Buttons and pop-up sliders in the MultiTrack View appear in different color schemes to distinguish the 32 standard tracks from the 12 Output tracks.

For manufacturer information, please see Contact Sheet, p. 195.

Manual, Shmanual

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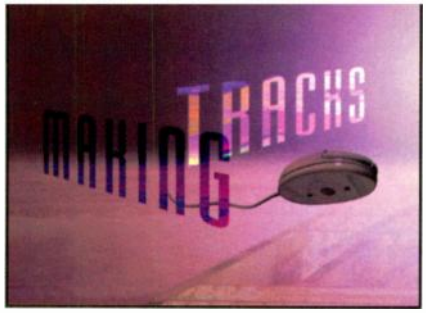

earlier, *Quartz Audio Pro 32*'s looping capability is limited to a single loop.

Quartz Audio Pro 32 supports a large number of keyboard shortcuts for menu items, zoom levels, tools, and transport controls. In addition, you can use an external MIDI device to trigger playback functions.

Samplitude 2496. *Samplitude*'s main transport controls reside in a dedicated, resizable Transport window with Play (forward and reverse), Fast Forward, Rewind, Record, and Return to Zero buttons. The toolbar at the top of the VIP window also offers Play Once, Play Loop, and Play into Loop buttons. (You can easily create loops with or without crossfades using the Build Loop Object command.) Other toolbar buttons are for accessing punch-in recording functions, grouping and ungrouping Objects, toggling the Auto Crossfade function, and playing to and from edit points.

Samplitude doesn't provide an on-screen jog/shuttle wheel, but its scrubbing feature is always close at hand. Just hold down 0 on the numeric keypad, and the pointer turns into a double-headed arrow and snaps to the center of the screen or to the current cursor position (depending on your settings). The farther you drag the arrow cursor in either direction from its starting position, the faster the playback in forward or reverse. Surprisingly, there's no button in *Samplitude*'s toolbars to activate scrubbing, and although the feature works quite well, it's a bit cumbersome to use two hands for the task. A Varipitch function is also offered as a playback option. It lets you change pitch and speed together (as on a tape deck) in a forward or backward direction.

Samplitude's marker functions are extensive and nicely implemented. You can add up to ten markers with simple numeric key combinations during playback or when playback is stopped; the marker numbers appear in the VIP window above the waveforms. You can change a marker's location by dragging it to a new position, and you can recall it by simply pressing its corresponding number key during playback or when the music is stopped. Marked regions are handled similarly and recalled with function keys.

You can also drop in non-numeric markers and label them with text, in a dialog box that lets you recall markers from a marker manager. The Marker on Range Border option places S and E markers at the start and end of a selected range. (You can move and rename them if you like.) A Set Markers on Silence command places markers at silent sections of the waveform (based on your Threshold and Minimum Time settings).

Samplitude 2496 supports user-defined QWERTY keyboard shortcuts for any of its menu items. The Edit Keyboard Shortcuts dialog box provides a list of commands and lets you assign available keyboard combinations. (MIDI control will be discussed later.)

SAWPro. *SAWPro*'s Remote Transport window provides the program's main set of playback controls. The floating window is designed to remain visible even when *SAWPro* is hidden with the H/S (Hide/Show) button; the TL (Top Latch) button connects the Remote Transport window to other windows with H/S buttons. These buttons allow you to hide *SAWPro* while working with other programs and still access the essential playback and navigation functions.

The B and E buttons let you jump to the beginning or end of a marked region, and the T/S (Time/Samples) button toggles the display units. The Z (Return to Zero) button snaps the cursor to the start of a sound file or multitrack session after playback is stopped. This button also serves as a "relative" zero-position control when you press the Shift key with it. It lets you establish a new zero position anywhere in the waveform or session; the Current Time display doesn't start counting until playback reaches the new position.

The small slider in the lower right corner acts as a fast-forward/rewind control when playback is stopped, and the Auto button toggles on and off the Auto-Rewind function. The remaining buttons let you play a marked area once or loop a marked area. (You can also lead into a marked area and then loop it.)

Using the Remote Transport window is not the only way to play sound files, though; right-clicking in the Full View or SoundFile View windows also initiates playback from the current cursor position. As the music plays, you can left-click anywhere in the waveform to snap playback to a new location, which makes it easy to find your way around a long file, and it nicely complements the program's scrubbing feature.

SAWPro's Loop Scrub mode is similar

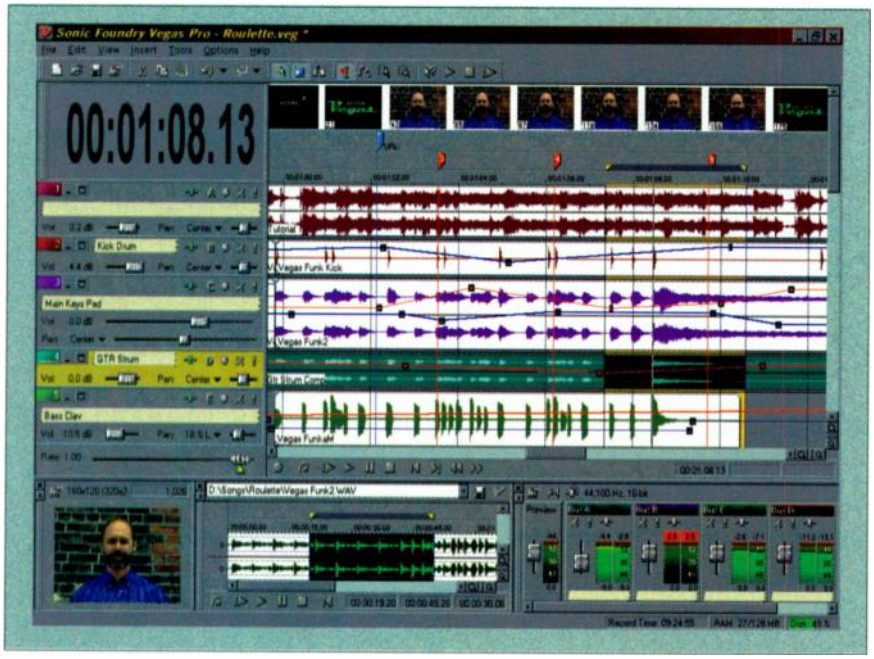

FIG. 7: *Vegas Pro* offers a user-friendly interface that is easy to configure the way you want. The Docking area at the bottom of the screen provides ready access to any of several windows, and you can enlarge tracks independently. Imported video files appear as a row of frames along the top of the screen.

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to the Auto Event Locator feature in Sonic Foundry's *Sound Forge*. (Tape-style scrubbing is not offered.) The program loops a very short segment of audio as you drag slowly back and forth through the waveform. It works quite well at the default loop size, but you can fine-tune the loop length in increments as you scrub by hitting the Up and Down arrow keys. (You can also change the zoom level while scrubbing is active.)

SAWPro's implementation of markers is not extensive, but the Markers View window does offer some handy features. You can drop in markers during playback or at the current cursor location when stopped. Markers don't appear in the waveform displays; they're simply listed in the Markers View window where they can be named and relocated if necessary. Two buttons let you designate a pair of markers as Marker 1 and Marker 2 and then view the elapsed time between them—a very handy tool.

SAWPro makes extensive use of keyboard shortcuts, most of which are preassigned. Many of the commands are not duplicated onscreen or in menus. You can also save up to 12 different screen views and assign them to function keys for easy recall.

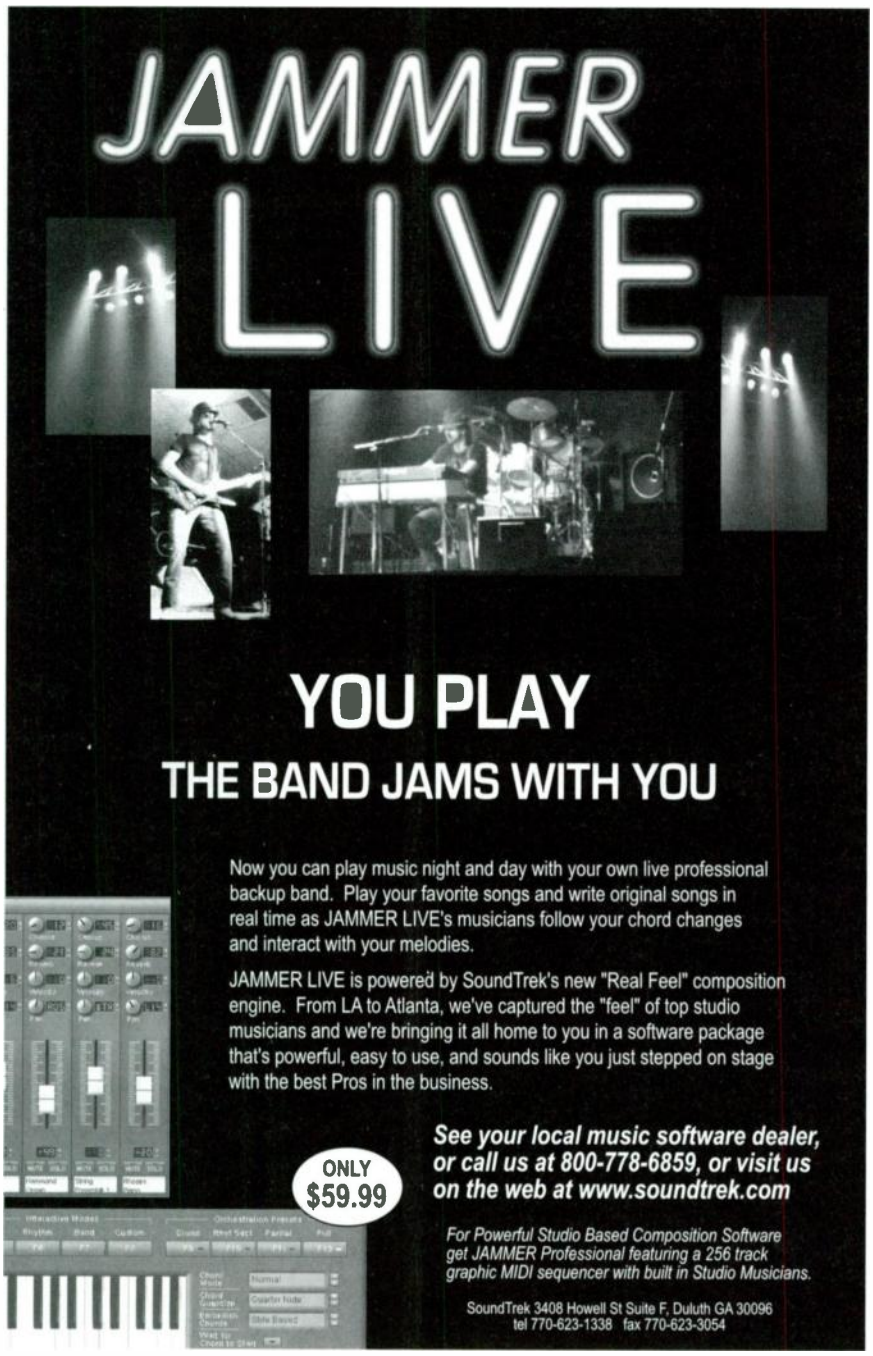
Vegas Pro. *Vegas Pro*'s transport bar is a bit small, but it offers an excellent set of controls for moving around in a project. You can play back from the current cursor position or from the beginning of the project (return to zero), you can jump to the end or the beginning, and you can continuously loop a selected region. The Skip Forward and Skip Backward buttons snap the cursor to the next grid increment. To the left of the toolbar, the Scrub control provides tape-style scrubbing with a separate Play Speed control to set the "normal" playback speed.

Of course, keyboard equivalents are also provided, and they're included in the pop-up labels that appear as you roll over the buttons. In fact, *Vegas* provides keyboard shortcuts for most of its activities that are preassigned and can't be changed. You can, however, customize the toolbar by adding or removing buttons. For example, you can add a second set of transport controls (in any order), if you like.

Vegas Pro's marker implementation is very intuitive yet surprisingly powerful. You can drop markers on the fly during playback or at the current cursor position when stopped. A marker appears as a red flag above the timeline, and you can drag it to any location. Right-clicking on the flag brings up a menu that lets you label the marker; the marker's label (which can be several words long) appears next to the flag and in the Markers List display.

Markers can also be used to define region boundaries (the flags appear in green), which are labeled in the same way. The labels, along with region start and end times, appear in the Regions List display. If the cursor is offscreen, you can easily jump it to any marker by right-clicking on the marker's flag and choosing Go To.

For those who work with multimedia, *Vegas Pro* offers a third type of marker, designed for use with stream-



ing media and HTML layouts. Command markers appear with blue flags in the Command Ruler above the other markers. They are used to display headlines, captions, Web site links, copyright notices, and other functions that are intended for the final streaming-media files.

WaveLab. *WaveLab* offers a comprehensive set of navigational tools that extends the program's overall versatility. The transport controls reside on the transport toolbar, which you can reposition or convert into a floating palette. The toolbar includes all the usual suspects like Play, Record, Rewind, Fast Forward, and Return to Zero. A handy Start Point button pops up a menu that lets you specify where playback is to begin when you click the Play button. Among the ten options are starting from the cursor, from a marker, from the side of the window, and from a selection.

A Stop Point/Loop button offers some similar options along with options that affect the neighboring Loop Switch (used to toggle looping on and off). *WaveLab* lets you loop the entire file, a selected region, or a marked area. It also supports nested loops and is well suited to working with samplers.

In the center of the transport toolbar, a handy jog/shuttle button enables *WaveLab*'s two scrubbing options. With the button active, clicking in the upper part of the display initiates tape-style scrubbing where you drag the waveform past a fixed point; clicking in the lower part provides the more common shuttle-style scrubbing.

You can also jump over specified areas during playback by adding Mute markers or Mute regions and then clicking the Skip button. It's a good way to try out variations without actually editing anything. As an alternative to the Play button on the transport toolbar, you can also use the Play tool in the Toolbox. When it's active, playback begins wherever you click in the waveform. This tool is great for locating edit points, because you can click repeatedly as you adjust the mouse position; in many cases it works better than scrubbing.

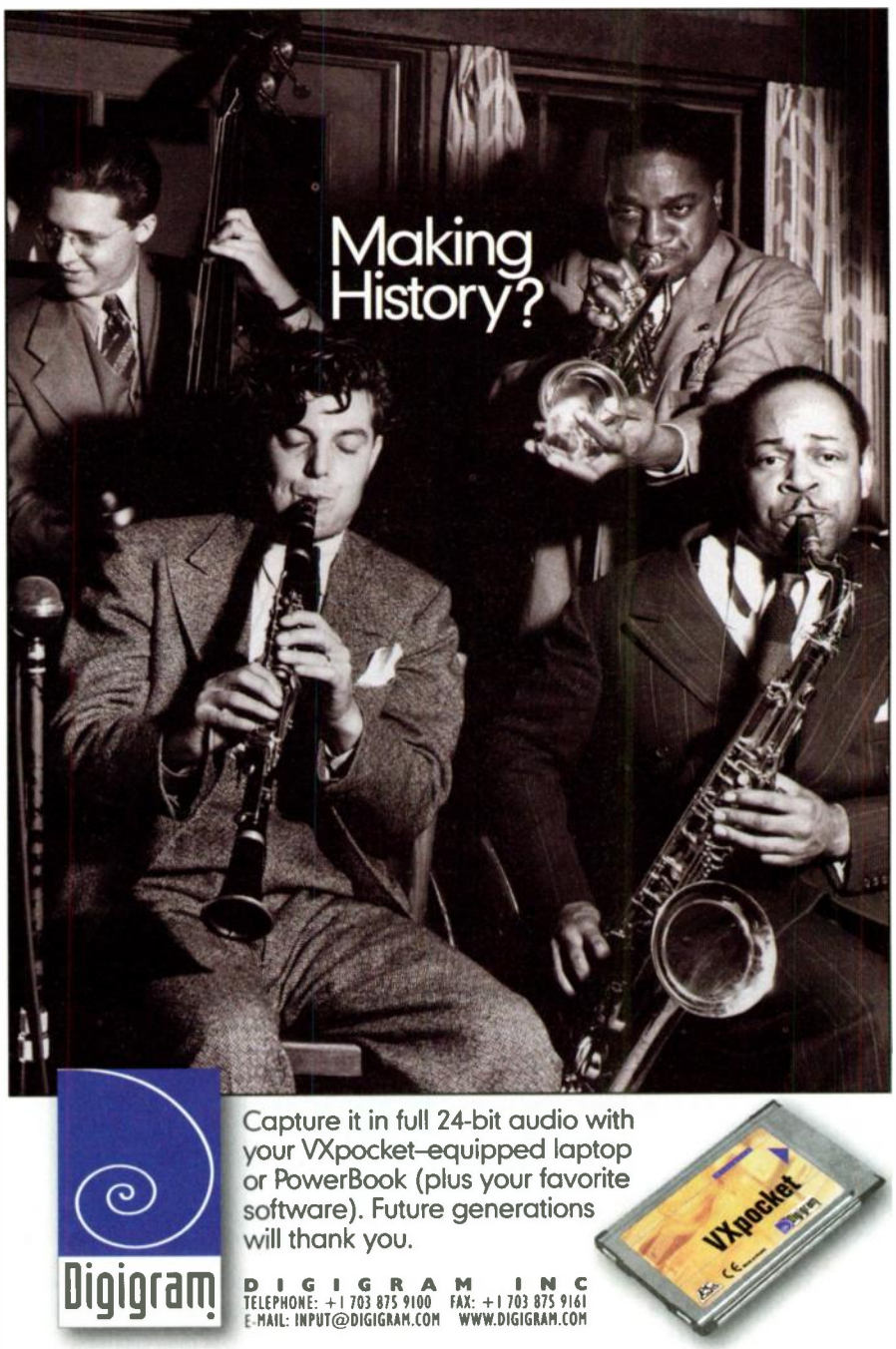
WaveLab's implementation of markers is excellent and intuitive. You can insert more than a half-dozen types of markers to perform such services as marking cursor locations, selecting or muting regions, defining CD tracks, and looping. You can also add temporary markers that aren't saved with the file. Markers can be added at the current cursor location or during playback or recording. They appear in the Wave or Audio Montage window with a small triangle that you can drag to a new location. Markers appear in the Markers List display, where they can be named and selected.

WaveLab has a large number of preassigned keyboard shortcuts to help speed editing operations. It also lets you define several of your own shortcuts, for a variety of functions, in the Key Commands dialog box.

COLLECTION BOX

Where's your music headed? Are your eyes on the Internet, are you doing music for the media, or is there a small plastic disc in your life that you would like to share with the world? In this section we'll look at the file formats that each program supports and also grapple with the fundamental task of recording audio into each program. There are some vast differences among the contenders in this category, so look closely at what each has to offer.

Cool Edit Pro. *Cool Edit Pro*'s recording



options are as straightforward as any of the programs covered. In the Edit View screen, a one-button record feature gets audio flowing to your drive instantly, or, if you prefer, you can establish some conditions in advance of recording using the Record Time dialog box. For example, you can set a limit on the duration of recording or use the Autostart feature to trigger recording at a particular point in the future.

Additional options appear in the Multitrack window, such as one-click access to all input devices on your system and, of course, the ability to record onto multiple tracks simultaneously. You can also record multiple takes while punching in; the takes appear in a Take History list, but you'll need to try each one in the mix before making your choice, since you can't preview them directly from the list. If you have data already recorded on your drive, you can drag and drop files from an *Explorer* window to either the Edit View or Multitrack View screens. It's also easy to move files between the two main work areas.

Cool Edit Pro supports an extensive number of file formats—but several of them are nearly obsolete (Turtle Beach SampleVision format, for example), and the all-important MP3 format is available only with a $29 plug-in option. Still, for many musicians it's very handy to be able to create files for formats outside of the traditional pro-audio world. (Numerous broadcast formats are especially well supported.) *Cool Edit Pro* is also the only program to support sampling rates beyond 96 kHz.

Quartz Audio Pro 32. *Quartz Audio Pro 32* supports fewer file formats than most of the other programs. In fact, it reads only AIFF and WAV files at a resolution of up to 16 bits at 44.1 kHz and can write only CD-quality WAV and compressed ADPCM formats. It is smart enough, however, to automatically create a new version of a file at its current "working" sample rate if you attempt to load a file of another rate from your hard disk. This allows you to mix files of different sample rates in the same project.

Pressing the Record button opens the Recording display, which offers a number of options, including splitting stereo recordings into mono tracks, enabling and disabling playback of existing tracks when recording, and pausing a recording (see **Fig. 4**). You can also modify the record-buffer size directly from the Recording display, which is a convenient option, but like many other dialogs, you can't enter a value for the buffer size by typing; instead, you must select from a long list of choices (from 50 to 200 ms in 10 ms increments).

After you make a recording, you have several options. You can insert it directly onto a track in the Mixing Grid or use the Save option to send it to your hard drive and to the Records list (similar to the Take list in some other programs). From the Records list, the audio can be sent directly to the Mixing Grid or edited using the various trimming, volume, and pan adjustments that the program provides. This system is logical enough, but it isn't really optimized for creating multiple takes or retakes, primarily because you have to name and save each take before moving on to the next.

Samplitude 2496. Like many aspects of the program, *Samplitude*'s recording options are highly configurable. There are two basic recording modes, one that writes your files directly to disk and the other that stores them in RAM. Other options allow you to record onto any number of tracks simultaneously and determine whether data is captured in 16-bit linear or 32-bit floating-point format (32-bit files can be dithered down to 16 or 24 bits after the fact.) There are also many ways to conserve resources while recording, such as turning off waveform drawing, disabling monitoring, and turning off the playback of existing tracks.

One-button punch-in on the fly and predefining a punch-in region using markers are both supported in *Samplitude*. Performing retakes is easy, and the Looped punch-in feature is as good as it gets: define a region, press Punch-in Record, and do as many takes as you want. Then simply pick your preferred take from the Take Manager and insert it into your file. Not only can you preview the takes in the Take Manager, but you can even choose to have a new Project window created automatically with each take positioned on a new track. That allows you, for example, to play every part in your composition in succession and build a mix simultaneously in just a few steps.

Samplitude's real-time sample-rate conversion is useful for many purposes; for example, if you have a DAT or other media recorded at 48 kHz and your current Project is headed for CD. You can even pass audio directly

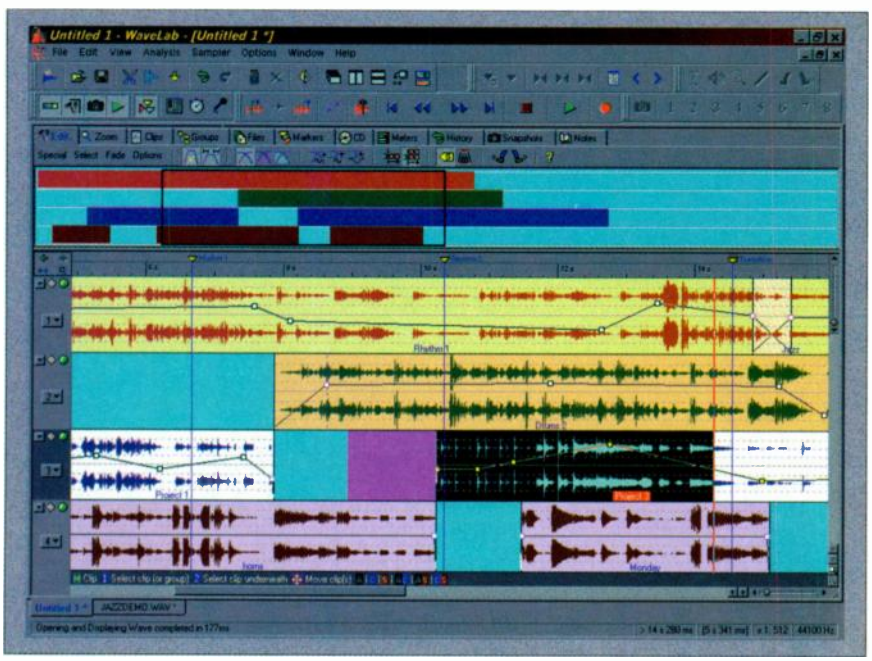


FIG. 8: *WaveLab*'s Audio Montage window provides several sets of tools for performing a wide range of editing functions. The color-coded Overview display, which shows the relative size and position of the audio clips below, can be replaced with a variety of other editing displays.

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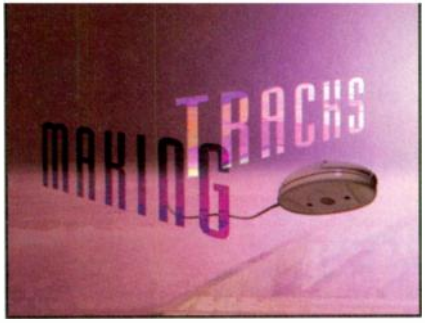

"through" the program to another device while converting, without writing anything to disk. (This feature, called Live Mode, will be detailed later.) Markers can be dropped in while recording, and both AVI and MIDI files can be triggered to play back as you record. That's a great option if you're performing a live soundtrack or need to use some MIDI tracks as a timing reference while you play.

Samplitude supports numerous file formats and would be suitable for projects headed in many directions. In addition to reading and writing WAV and AIFF formats, you can load MP3 and Windows Media Audio (WMA) files directly into a Project. (To encode a file as MP3, you must have an encoder installed on your system.) You can also extract audio from an AVI file and load MIDI files onto a track. (MIDI editing features will be discussed later.) As its name implies, files of resolutions up to 24 bits and 96 kHz are supported.

SAWPro. *SAWPro*'s flexible recording options allow you to record directly into either of its main work areas. Clicking on the Rec button in either the MultiTrack or SoundFile Views brings up the Record Remote Transport window, in which you can set a number of different parameters (see **Fig. 11**). In addition to selecting standard options such as sample rate and bit depth, you can quickly scan to see how much space is remaining on any of your drives or adjust the input level before recording begins. You will need to name and save the new file before recording, but if you choose not to keep your takes, the file disappears.

Takes are added to the Regions list if you keep them and also appear in the MultiTrack View if you began your recording there. (*SAWPro* automatically numbers the takes, saving you that step.) And even after doing several takes, you can bail out by pressing the All button, which kills everything you've done up to that point in the session but keeps the Record window open so you can give it another go.

If you're recording from an MDM such as a Tascam DA-88 or ADAT, you'll appreciate the MultiChannel record mode that lets you assign inputs and outputs for each track independently. This mode is very flexible: you only have to supply one file name, and *SAWPro* appends a card and channel identifier to all the files it creates (for example, newage_card3_R.wav). A meter appears for every track you're recording onto, and an input fader also becomes accessible. You can reassign any input channel to a new track by simply using the Track list that appears when you click at the top of the meter (this isn't possible while recording), and there's no problem performing multiple takes in this mode.

SAWPro is also adept at loading WAV files into its work areas directly off your hard drive, and it's happy to incorporate formats up to 24/96. When converting a mix into a stereo file on your drive, it offers three types of dither, and using a free third-party plug-in it supports MP3 output in addition to WAV format.

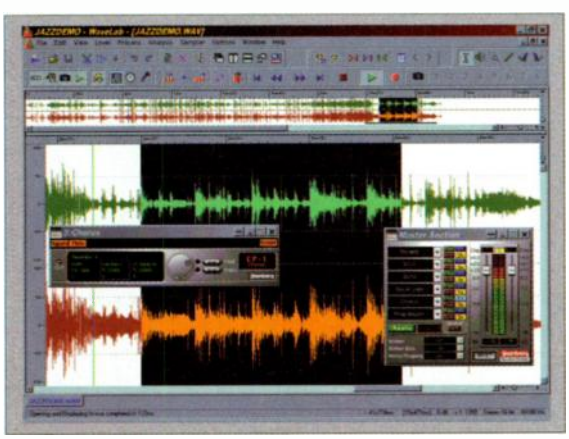

FIG. 9: *WaveLab*'s Wave window provides tools for examining and closely editing files before they're added to the Audio Montage window. The Master Section display provides VU meters and master faders as well as buttons and menus for adding up to six effects to a project.

Vegas Pro. *Vegas Pro*'s recording features are found exclusively in its Track View window. You begin recording by arming one or more tracks and then hitting the Record button. There aren't any record-triggering options, nor is there an option to pause recording, but it's easy to punch in or perform retakes, which we'll cover in a moment. A unique recording source for each track can be selected directly on the track's control area; otherwise, recording defaults to the global input device you've specified in the Preferences dialog box. You can also select whether to record the left, right, or both channels of the input to your card.

Punching in is simple: highlight the region you want to punch in by dragging with the mouse, or select an entire Event by clicking on it. Position the Selection bar to cover the range before and after you want recording to occur, then hit Record, and you're off. If you want to do multiple takes, press the Loop button before recording, and *Vegas Pro* rewinds to the preroll point and continues to record takes until you click on Stop (or press the Spacebar). You can then access and preview your takes from the Take manager.

Vegas Pro provides several helpful options for loading files from your drive. For example, if you've selected several files from a directory for inserting into a project, you can choose to drop each one onto a separate track, insert them all sequentially on the same track, or even overlay them at the same point in time as discrete takes. The command to determine which of these options is used pops up with a right-button mouse-click, which means you don't have to decide which you want until your cursor is positioned on the Track View. In other words, you're not locked into an "insertion mode" from which you have to back out if you change your mind.

When it comes to file formats, *Vegas Pro* has you covered. You can load popular audio formats such as WAV, AIFF, and MP3, or extract the audio from a QuickTime or AVI file, and you can save in even more formats, including WMA and RealNetworks G2. (MP3 encoding is available via an optional plug-in.) You can even use multiple file formats with different sample rates and resolutions in the same project or on the same track.

WaveLab. *WaveLab*'s Record dialog box offers a host of triggering options that are well suited to unattended recording. For example, there's an option to set a volume threshold above which recording starts and below which it stops automatically, as well as an autostart feature for setting a time at which recording begins. You can

FIG. 10: *WaveLab* offers a set of sophisticated VU/peak-hold meters (with numerical readouts) as well as a handy Phase meter on the right.

specify a finite recording duration and pause recording, and, if you want, *WaveLab* will even drop a marker automatically if the level of your source falls below a predetermined threshold for some length of time.

Here's a unique twist: a continuous recording can be split into multiple files automatically. Just designate what the maximum size or length of each separate file should be, and *WaveLab* automatically creates a new file every time you exceed the limit. And if you are a visual sort of person, you can choose to display a real-time spectrum analysis of the incoming audio as opposed to the default level meters.

Recording on multiple tracks simultaneously isn't possible in *WaveLab*. The only new option that appears when you enable recording in the Audio Montage window is the recording of audio into an existing track. This is a fairly significant deficiency for those who want to use *WaveLab* like a multitrack recorder. Fortunately, it's very easy to move files from the Wave area to the Audio Montage screen.

WaveLab loads files of many different formats, including WAV, AIFF, and MP3. From the Wave window, it can read and write Next (AU) and Sun (SND) formats, as well as Ensoniq Paris (PAF) files, but in the Audio Montage window, you can save projects only in WAV or MP3 format (an encoder is built-in). WAV files of up to 32 bits can be employed (up to 24 bits for most other formats), and even if your sound card doesn't support formats above 16 bits, you can still open and edit high-resolution files.

WaveLab also has a special mode called "dual mono" that is especially useful if you work with files created on the Macintosh. Many Mac audio programs split stereo files into two associated mono files, and during editing *WaveLab* lets you choose whether these are merged into a single stereo file or preserved as mono files. Even if you choose to merge them into a stereo file for editing, you can save them as mono files when you're done.

COMMAND PERFORMANCE

For most people, the main function of a multitrack editor is the ability to precisely edit and mix multiple layers of audio. Any of these programs will do the job admirably. Even the program with the fewest tracks, *SAWPro*, checking in with 32, should be more than adequate for nearly any project, and of course if real-time, multitrack playback starts to overload your system, you can simply bounce down tracks in any of the programs and continue to build your mix.

Now we'll look at the various editing and mixing options each program provides, as well as laying out other important considerations such as the number of tracks you'll have available. Some of the programs are very deep in this category, and we'll try to give a good picture of what's in the toolshed.

Cool Edit Pro. *Cool Edit Pro* offers a host of tools for tweaking your data. Traditional cut, copy, and paste options are available in the Edit View screen, where you'll also find less familiar features such as loop pasting, which can repeatedly paste data directly from a file on your hard drive into the current file. Bordering on the special effects category is the ability to "modulate" the current waveform by the data in the Clipboard. This effect produces ring modulation but lacks parameters to control the modulator directly. (Other modulation effects can be found elsewhere in the program.)

In the Multitrack View you can drag blocks of data around on the screen or enter an exact start point for a block using a text-entry dialog box. You'll also find a handy option in the ability to autoalign start times of blocks on different tracks. As mentioned earlier, you can adjust volume and pan settings for individual blocks as well as for an entire track, but there's no dedicated mixer display for quickly adjusting the levels on all tracks. There is a global volume control, though it's hardly noticeable tucked away in the upper left corner of the screen.

You can "link" data that's copied in the Multitrack View to the original or you can make "unique" copies of the data. (Linked copies reflect any changes made to the original, while unique copies do not). Splicing or merging (combining) blocks is easy, and various types of multitrack edits, such as cutting data from multiple blocks on different tracks, can be a real time-saver.

Cool Edit Pro offers 64 tracks of audio for your projects and allows you to route them to up to 16 physical audio channels. A track can contain either mono or stereo data, and the program uses "background mixing" to continuously create a stereo mix of all your tracks. This keeps the mix updated and ready to play, though you'll notice a very minor delay when performing operations such as cuts and pastes in the Multitrack View. Background mixing also ensures reliable track throughput, even on slower systems.

Like the other programs, *Cool Edit Pro* offers unlimited Undo, but be sure you remember to enable this option as there's no message warning you that it's disabled when you make a change. (Undo is on by default.) You can also use the Revert to Saved feature

FIG. 11: A colorful record meter in *SAWPro* provides access to input level meters as well as the other recording options the program offers.

if you've made a large number of changes and want to restore the original version of your file.

Quartz Audio Pro 32. *Quartz Audio Pro 32*'s Mixing Grid provides 128 virtual tracks and supports up to eight physical outputs. To ensure acceptable performance on different systems, three play modes are offered, one of which, for example, lowers the playback resolution of your audio to 8 bits to increase the number of tracks you hear at once. This option is also available during recording. (You can bounce all tracks down to disk at full resolution once the project is complete.)

As with the other programs, you build a mix in *Quartz Audio Pro 32* by loading an audio file from your drive (or recording a new file), then selecting the portion you wish to use. As mentioned earlier, you can adjust the volume and pan levels of the data before or after you send it to the Mixing Grid. One very handy option is an automated mixdown feature that mixes all or selected tracks and creates a new project with the new bounced track loaded and ready to edit. The program automatically reapplies any effect that was previously assigned to the track the new file is placed on, so remember to disable this effect after you do the mixdown.

In addition to dragging segments of data around on the screen, a text-based playlist allows you to set start times of Events with 0.01-second resolution and also gives you quick access to level and pan-adjustment windows. Yet another list can be used to "sequence" volume and pan adjustments. Like the Event list of many sequencers, the Automation list presents an overview of Event start points and allows you to edit their individual pan and volume levels directly. You can also set the start points of Events onscreen using the Move command, which provides similarly high-precision values, or use the Align command to left- or right-justify Events, or separate them by some amount (for example, automatically position any number of Events to start exactly 2 seconds apart).

Quartz Audio Pro 32's Spatialisation display (see **Fig. 12**) is unique among these programs and offers an intuitive way to set the stereo position and level of tracks. This three-dimensional grid represents each track as a small sphere and allows you to move the spheres around, with left/right movements representing pan and forward/backward movements representing volume. The Rapid Positioning tool moves the spheres to the extremes of the parameters, and the Transform command applies a process that you've designed (such as a fade or pan curve) to multiple Events simultaneously. During playback, you can watch the balls jump around in response to automated pan and volume changes in each track. It's very handy indeed. A traditional Mixer display, which allows groupings of up to 8 tracks, is also on hand for those who prefer more traditional pan and level controls.

Samplitude 2496. *Samplitude* offers numerous variations on the ubiquitous cut, copy, and paste commands, such as cutting audio and leaving a gap, cutting and filling in the gap, pasting over a section, pasting and mixing data, and trimming (cropping). Not every option is available in both the VIP and HDP (or RAP) screens, however. For the most part, the edits you perform in a VIP window are nondestructive; those that you do in an HDP or RAP window are destructive. (The impact of effects processing will be covered in a moment.) However, there's a new Undo option that you can enable for HDP and RAP edits if you wish.

A number of dedicated editing windows provide tremendous capability for fine-tuning your material. The Crossfade Editor window, for example, provides access to powerful tools for shaping customized fades, and, of course, the fade-out and fade-in segments can be edited independently. (You can also manipulate crossfades by moving Objects directly on screen.) Every Object also has an associated Object Editor, which gives you a screenful of parameters that affect its playback. Here you can use graphic controls to create fade-ins and fade-outs, adjust volume and pan levels, normalize the Object, and apply a DirectX plug-in. You can also tweak the EQ level and dynamics-processing values, or access advanced controls for these and other functions. Relevant changes you make in the Object Editor are reflected in the Waveform view, and are independent of track-level parameters you set in the Mixer. (More on the Mixer in a moment.)

In the main Project window, you'll find numerous options for editing multiple Objects simultaneously. As with a sequencer, you can move Objects onscreen using various "quantized" distances. For example, by setting the Step Width parameter to 100 samples (other increments are beats/bar, milliseconds, and SMPTE time), you can bump the start time of one or more Objects exactly that amount. You can also group Objects and perform many different types of operations on the group, from changing the color of the waveform display to adjusting the volume and pan settings.

Samplitude supports an unlimited number of virtual tracks, and the manufacturer claims that a new, optimized audio engine in version 5.5 offers far greater track throughput than earlier versions. (We weren't able to make definitive comparisons.) The large Mixer window adapts to reflect the number of tracks you have in your current Project, and each Mixer strip includes controls for Aux 1 and 2 amounts, Delay and Reverb, Dynamics, EQ, and Pan, as well as Mute/Solo buttons and a button to toggle channel automation (see **Fig. 13**). This is a truly user-friendly interface.

A 5.1 surround sound–mixer mode can be toggled on and off with the

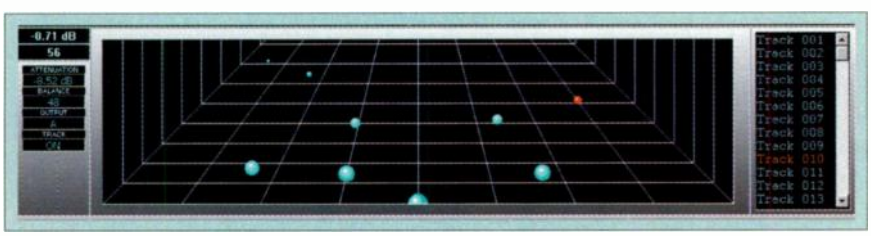

FIG. 12: *Quartz Audio Pro 32*'s Spatialisation screen is a unique way to set volume and pan levels. The colored spheres move onscreen in real time to reflect parameter changes.

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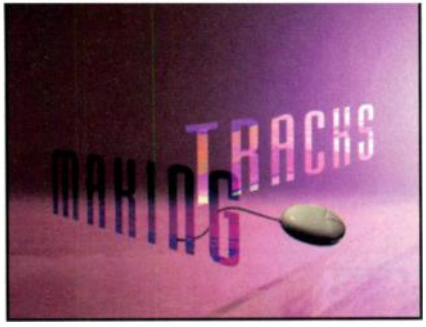

click of a button, and a dedicated, graphic surround-panning module appears when you press the Pan button associated with any surround channel. You can draw panning automation with your mouse or with a joystick if you have one, and you can adjust the position of the speakers if your own 5.1 setup is a nonstandard configuration. Additional windows let you modify the sound field, and you can specify the crossover frequency for an LFE using the aptly named 5.1 Surround LFE Channel Master FFT Filter window (see **Fig. 14**).

SAWPro. *SAWPro* has one of the most versatile mixing environments you're likely to find. Like in the other programs, most sessions begin by loading or recording files into the stereo SoundFile View, defining the regions you want to keep, then adding regions to the MultiTrack View window. In the MultiTrack View, you assemble material on 32 virtual tracks, create volume and pan settings using any of several methods, then apply internal or third-party effects. Overall, the process is straightforward, and *SAWPro* has numerous options that make the job easy.

You can define a region in several ways; for example, by marking its beginning and end with keyboard shortcuts (B and E, respectively), pressing Shift-N to name it, then adding it to the Regions View window. You can also click the left and right mouse buttons simultaneously to access a dialog box where you name and add the region, or you can simply hold down the Shift key and click once on the region with the mouse to automatically add it to the list. Using this last method, you can then move directly to the MultiTrack View window and insert the region with a single click. This type of flexibility allows you to accomplish tasks in the way that suits you best.

Once your regions are in the MultiTrack View window, it's easy to manipulate a single region or multiple regions simultaneously. Here again you'll find lots of shortcuts, such as using the End key to select all regions to the right of the cursor or using a single keyboard command to realign all tracks into their original order. And speaking of aligning, you can autoalign the start times of regions on different tracks with yet another simple command.

In addition to assembling the regions in your project, you use the MultiTrack View to control pan and volume. Though settings are created using a fader (as opposed to drawing directly on the screen), you can actually move volume and pan data around independent of the audio it affects. You could even create a complex pan curve, copy it, and use it elsewhere in your mix.

Attention to detail is apparent throughout the program, such as in the ability to adjust the resolution of the volume and pan changes you make or modify the increments used by faders. Though there's no dedicated mixer, you can open or close faders for all tracks with a single key-click

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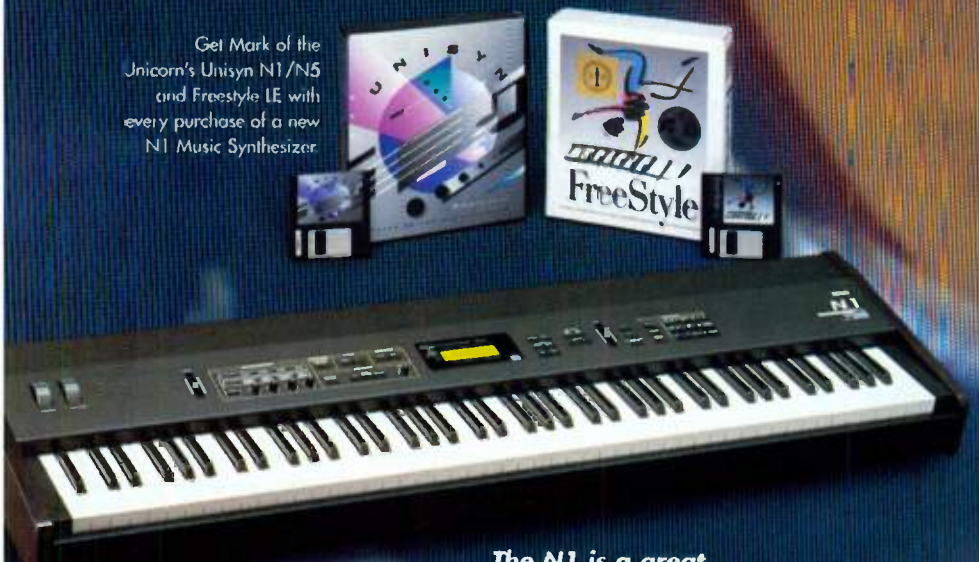

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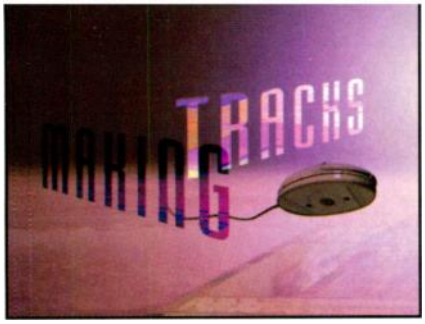

combination. Unfortunately, once all the faders are onscreen, there's no way to adjust their placement automatically. (They appear stacked on top of one another.) There's also no dedicated global fader, although you can achieve the same effect by setting the levels on *SAWPro*'s Output tracks, to which all tracks in the mix are routed.

Vegas Pro. In *Vegas Pro* you assemble a mix primarily by moving Events with your mouse in the Track View window. Though you won't find an abundance of tools for positioning Events, such as nudging them one sample to the left or right, it's easy to make very precise edits nonetheless. For example, it's no trouble to create a crossfade that begins on the sixth sample from the beginning of a file or build a fade-in over a ten-sample range.

Speaking of crossfades, *Vegas Pro* has an Automatic Crossfade mode that builds a crossfade any time two Events overlap. Once the crossfade is created, you can choose from among nine different fade types. *Vegas Pro* also offers several Paste functions that make assembling a project easier. Once you've copied data to the Clipboard, you can paste it repeatedly using either the End to End option, which lines up the successive segments with no gap, or the Even Spacing command, which lets you specify a recurring gap between instances of the pasted data. You can then use a keyboard shortcut to jump directly to the start point of each successive segment.

Individual Events in a track can be looped, normalized, muted, and locked in position. If the Loop switch is enabled, dragging the end point of that Event causes it to play repeatedly throughout the duration of the new region you create. (You can also shorten the length of an Event the same way.) Otherwise, dragging simply adds silence over the area that extends beyond the Event's original length.

Vegas Pro offers playlist-style editing via its Edit Details window (see **Fig. 15**). This area resembles a spreadsheet and displays information about your project, such as Event start and end times. You can edit nearly every field in this window and save the worksheet to disk. The program also offers an Edit Undo history list, which allows you to return to any random point in your work session. And rest assured that you'll have plenty of tracks to work with; in fact, you're limited only by the computing resources you are able to put to the task.

When all is said and done, you have two options for creating your final mix. One option allows you to mix down a multitrack project to a new stereo track, which is what you would use for burning a CD. (You can also simply save all tracks in a project as a new WAV file.) The second option allows you to preview your mix using a number of different compression options as well as various sample rates and bit depths before writing the final file. Choose MP3 format, for example, and you're presented with a screenful of settings to determine the exact configuration you want. When you click on OK, the program "renders" your project into an MP3 file and begins to play it back using your system's default MP3 player.

FIG. 13: The Mixer screen in *Samplitude 2496* is not only very slick, but very functional. Real-time adjustment is possible, even on multiple tracks simultaneously.

WaveLab. *WaveLab*'s Wave screen offers editing options as robust as any in this group. In fact, the editor has all of the many features *WaveLab* 2.0 has, along with a number of enhancements. Many of the most common editing commands are available in a context-sensitive menu accessible with the right mouse button. Not only will you find the standard Cut, Copy, and Paste functions in this menu, but there are some handy selection options as well. For example, you can define a range that extends from the current cursor position to the beginning or end of a file, or from the cursor to the beginning or end of the current window display. Similar options for tweaking a range once you've defined it are also available.

The program gives you several choices for pasting data into a file, including overwriting existing data or adding the pasted data to the beginning or end of the file automatically. You can also mix in the pasted data, but you won't find any options to change the proportion of source and destination (the default is 50/50). And if you happen to forget which data you most recently cut or copied, you can view and play (and clear, if necessary) the contents of the Clipboard.

Because clips in the Audio Montage window are simply pointers to actual audio on your hard drive, you can easily manipulate them to play more or less of the file they reference. You can also stretch audio data to fit a specific length of time, which can be useful if you're trying to match the durations of two clips on different tracks. To do this, just position your cursor at the point on the timeline where the longer clip ends. Then highlight the shorter clip and choose the Time-Stretch to Cursor option. A dialog box appears that lets you configure the stretching parameters to your liking.

Playlist-style editing is accomplished in the Clip List, where you can edit a clip's start and end times, adjust its volume, and audition it. You can also drag a highlighted range from a file in the Wave window and drop it onto a blank area of the workspace to create a new file. As with several of the other programs, there is no fixed limit to the number of tracks you can work with.

Drawing volume and pan curves directly on clips in the Audio Montage window is a handy way to work with your data, and the crossfade options are as versatile as any we've seen. (No fewer than 17 pages in the manual are devoted to fades and crossfades in the Audio Montage alone!) Different types of fades can be used for the beginning and end of a crossfade, and each individual clip can have its own default fade

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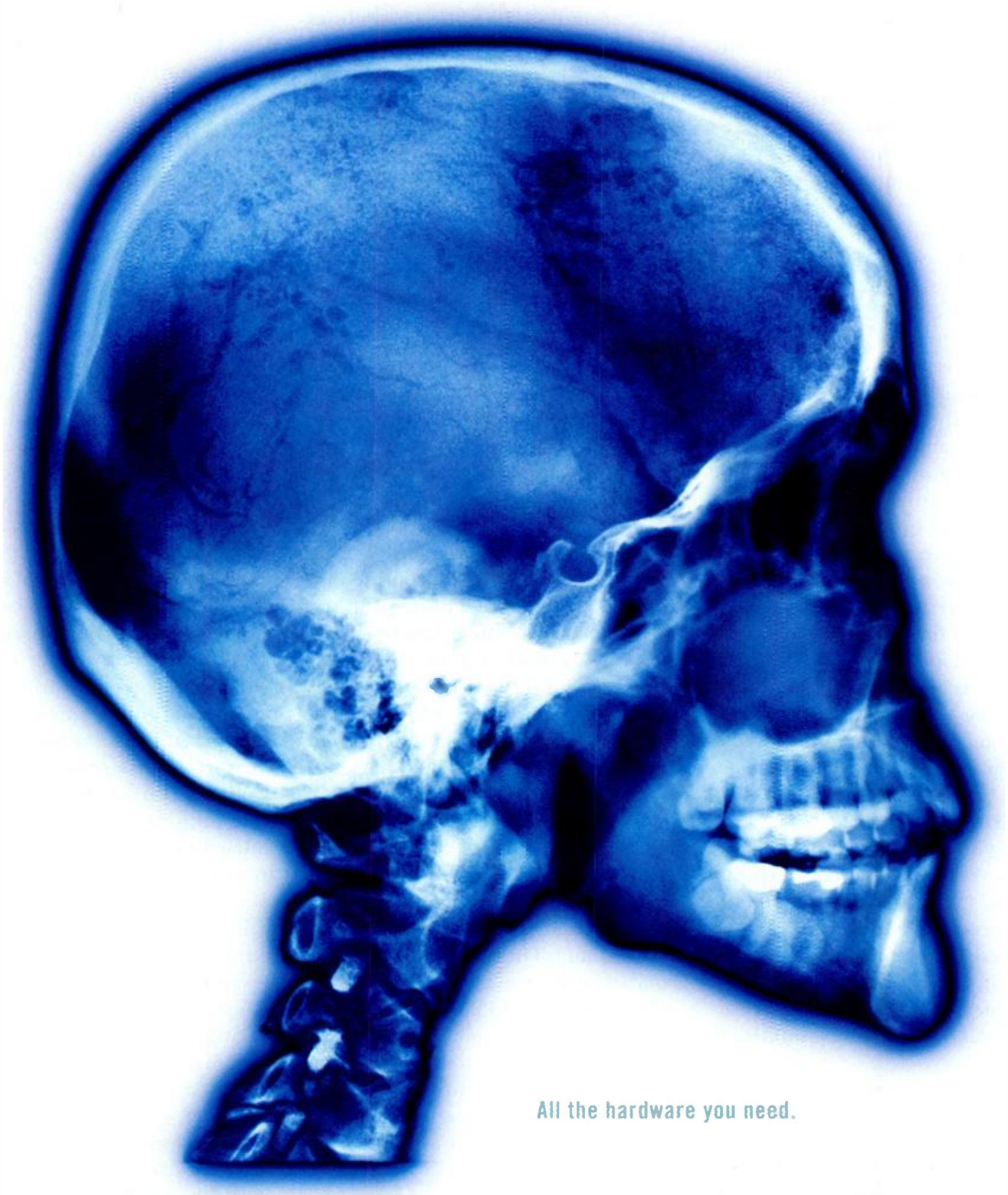

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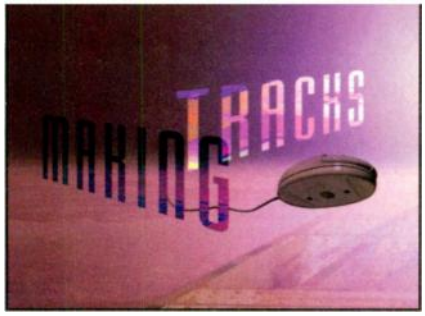

type. (There are numerous rules that govern what happens when clips with different default fade types overlap.) You can create custom fades directly on the screen and save them as presets, in addition to the program's numerous preset common fade curves.

You can use a keystroke-plus-mouse-click combination to alter the volume on all the clips on a track simultaneously, but we would prefer the option of faders on each track or a global mixer with strips for each track. If one of these features is added to future versions, it will vastly improve *WaveLab*'s mixing capabilities.

Once you've adjusted the volume and pan settings for all your data, you can mix down an entire Audio Montage using the Apply function in the Master Section. Here you choose whether to mix all clips in the project, only selected clips, or just a finite range of time. The new file can be saved to disk or just created in a Temp directory and immediately reopened in the Wave window. This last option is especially useful for bouncing tracks while in the middle of a session.

HAVING AN EFFECT

Whether your plans include making minor tweaks to your data or performing massive spectral surgery, you'll find plenty of processing and effects options among these editors. In addition to the traditional delays, reverbs, and EQs, we were pleased to see more esoteric functions such as the convolution effect in *Cool Edit Pro* and *Samplitude*, and the vocoder in *Cool Edit Pro*. You'll also find many types of mastering tools among the group—several programs sport multiband compressors, for example—and with universal support for DirectX plug-ins, plus VST support in *WaveLab* and *SAWPro*, the possibilities for adding third-party effects via plug-ins are nearly infinite.

Cool Edit Pro. *Cool Edit Pro* offers several dozen high-quality internal effects that are useful for both traditional mastering purposes and more exotic manipulations (see **Fig. 16**). Most of these "transforms" are applied in the Edit View screen, though two, Vocoder and Envelope Follower, are available only in the Multitrack area. The majority of the effects are destructive, but most can be previewed before you apply them. There are numerous good-sounding presets to get you started, and we detected little if any latency when changing settings, even as a file played back.

Among the more interesting features is a Clip Restoration tool, which can do wonders to damaged audio, and an excellent noise-reduction routine that comes complete with a noise-print option. The reverb effect has been significantly enhanced in the latest version of the software and now rivals many dedicated reverb plug-ins costing hundreds of dollars. We also liked the time-stretching function, which is as good as any we've heard, and *Cool Edit Pro* is one of few programs that offers time-varying time stretching, which means the beginning of a file can be stretched to 200 percent its length while the end is set to 50 percent of the original. (The actual values range from 10 percent to 400 percent.)

Quartz Audio Pro 32. *Quartz Audio Pro 32* includes ten internal real-time effects, and its well-designed interface for building effects chains makes it easy to apply the effects. Each effect has an extensive set of parameters as well as a Mute and Compare button. Moving controls while audio was playing produced no noticeable delay, at least on a PII/400. (The effects can be applied pre- or postfader.) Unlike the parameters found elsewhere in the program, you can enter values by typing text directly into the effects-control fields.

Overall, the real-time effects are of very high quality, but another type of processing seems to be a particular favorite of the developer: there are no fewer than three different ways that you can apply time-stretching to your data. In addition to accessing the time-stretch controls directly from the Edit menu and applying effects in the Edit Elements screen, you can simply drag the end of a clip of data in the Mixing Grid and extend it to any point you want. The program automatically computes the stretch factor for the audio to fit the region you've defined.

Though *Quartz Audio Pro 32* supports DirectX plug-ins, it failed to recognize more than half of the plug-ins I had registered on my system. That's mainly because it can use only plug-ins that employ both stereo-in and stereo-out audio streams. Yet even some plug-ins that met this requirement did not appear in the DirectX list. The developer is currently looking into this problem.

Samplitude 2496. *Samplitude* has so many high-quality internal effects that you may never need to look outside the program for third-party plug-ins. In addition to a number of excellent traditional effects, such as reverb, delay, echo, and parametric and graphic EQ, you'll find a multiband compressor, a noise-reduction routine, a declipper, and a dehisser. More esoteric options include the Convolver, which applies the impulse response of an acoustic space (or any audio file) to a file. You also get a filter designer with a vast number of parameters for fixing many types of audio problems. A Resample/time-stretching feature is also provided. At the Very High quality setting, the results are excellent, though it's too bad that the stretching tops off at 200 percent.

DirectX support is also available. In fact, you can even assign a plug-in to an individual Object on a track. Equally cool is the ability to use *Samplitude* as a real-time effects box, without writing any audio to disk. When you activate Live mode, audio is routed through the program, and all of the effects and playback parameters you've set in the mixer (including the real-time reverb) are applied. If you have a multichannel sound card, you could even route different audio channels to different tracks and apply several distinct effects

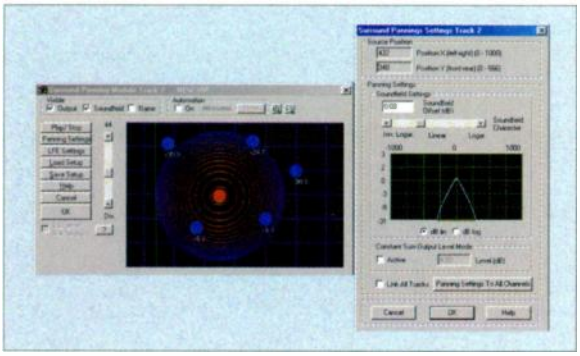

FIG. 14: Musicians will appreciate the dedicated surround-mixing screen found in *Samplitude 2496*.

simultaneously. Each channel can be sent out discretely, or you can mix the whole thing to stereo, even using automation functions to pan or adjust volume faders as the audio passes through. It's truly excellent.

Of course, a plethora of choices can also cause some confusion, so follow carefully: some of *Samplitude*'s effects, such as the Room Simulator, FFT filter, and Resample/time stretching, are always applied destructively, though you can easily create a backup copy of your data by enabling that option in an effect's parameter window. Other effects, such as those enabled in the mixer, are always nondestructive. DirectX plug-ins, on the other hand, can be applied destructively *or* configured to operate only during playback, depending on where you apply them. Quite a few choices!

SAWPro. *SAWPro* provides a modest but high-quality set of internal effects. Included in the group are a graphic EQ, dynamics processors, and an echo/delay module. Reverse Phase and Reverse Audio also appear in the effects list, and a center-channel eliminator is available as well. Fortunately, *SAWPro* supports DirectX and VST plug-ins, which opens the door to many other options. You can also purchase additional plug-ins, such as IQS *Reverberator,* direct from the manufacturer, but at around $100 per optional plug-in, this can get a bit pricey.

All of the included effects can be previewed in real time, though you might need to modify your PreLoad Buffer settings to compensate for any latency when you adjust effects parameters during playback. You can't add, switch, or remove an effect once audio has started to roll, but of course, a Bypass option is available when you're playing back, and you can toggle a Post Fader button on or off in real time as well. Though *SAWPro* doesn't have the plug-in manager that some of the other programs have, you can easily determine which plug-ins load at startup by modifying one of the program's configuration files.

Vegas Pro. *Vegas Pro* doesn't have as wide a range of built-in effects as the other multitrack programs do. In fact, there are just a few basic "utility" effects included, no doubt because Sonic Foundry has made provisions for you to link directly to an external audio editor. And since DirectX plug-ins are supported, you have easy access to any plug-ins in that format that you've already installed.

The included effects are a 4-band parametric EQ, a compressor, a noise gate (automatically added to every track), and a dithering utility. All can be applied globally or track by track. They may not be very fancy, but they are all fully functional and offer enough adjustability to get by. You can also normalize an Event using the command for that purpose found in the Switches menu accessible via the right mouse button. And in a nod to *Vegas Pro*'s sibling *Acid,* there's a pitch-change feature that offers a two-octave range in either direction (though not, unfortunately, in real time).

In spite of its limited number of built-in effects, *Vegas Pro* does offer several useful ways to employ whatever outside effects you may have. Among other goodies, the program offers a flexible approach to building effects chains. For

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example, open the Plug-In Chooser and drag the plug-ins into position at the bottom of the screen (see **Fig. 17**). Then rearrange the different effects by dragging them to new locations or by using the dedicated buttons to shift the selected plug-in left or right. Close the Plug-In Chooser window and the entire chain appears in the FX window in the Docking area, where each effect can be tweaked and tuned to taste. (Effects chains can be saved and reused across projects.) This quick and intuitive working method helps you get the most out of the plug-in resources that you have available.

WaveLab. What *WaveLab* is missing in the areas of mixing, it makes up for in the effects and processing categories. *WaveLab* has a large number of built-in effects, some for real-time processing and others for use "offline," and it provides creative ways to apply them. For starters, you can process files in the Wave window with either real-time DirectX or VST plug-ins using the Master Section. (*WaveLab*'s 14 internal real-time effects are also available from this screen.) In the Master Section, you'll find slots for assigning up to six effects in series and accessing their editing screens. The program also provides an Output Level Block that allows you to adjust master-volume faders and to monitor output levels. It includes buttons that control dithering and noise-shaping as well.

You can also process files in the Wave window using the included non-real-time effects. In this group you'll find options for time-stretching, pitch correction, normalization, reversing a file, harmonization, chorusing, EQ, and more. These processes are quite effective, and in some cases, truly unusual. The Chorus effect, for example, makes up to 100 slightly detuned copies of a file or selected range and mixes them together. You can specify the maximum variation in pitch from the original and set a "dispersion" curve that determines how the pitch variation is distributed among the copies. Both the real-time and offline effects can be run in Batch mode, but *WaveLab*'s batch-processing feature is so vast that we'll have to save it for another review.

You can also route multitrack audio in the Audio Montage window through the Master Section, but there are many other options for working with clip data. For example, you can assign up to ten VST effects to an individual clip in the Audio Montage and specify the duration of the "tail" you want added at the end of a processed clip. (Using a tail ensures that time-based effects such as reverbs and delays are not cut off if they continue beyond the total length of the original clip.) You can also copy and paste an effect, complete with its settings, from one clip to another.

You can apply VST effects in the Audio Montage as inserts or in a modified "send" mode that lets you adjust the mix of wet and dry signal. Effects envelopes allow you to vary the amount of processing that is applied over time, and you can even apply envelopes that you've created for other purposes onto the effects. And when you've found just the right settings for an effect, why not just use it on live audio? Like *Samplitude, WaveLab* provides a Live Mode feature for that purpose.

PICTURE PERFECT

As more musicians move into the realm of multimedia, working directly with a video file while composing or mixing music has become a major advantage. We found that support for video is growing, but is still by no means universal. On the other hand, playing back your mix in sync with an external video device (or even a sequencer running on the same computer) has become quite common.

In this section, we'll take a look at how these programs handle video files and time code and how well they address the needs of multimedia audio developers and soundtrack producers.

Cool Edit Pro. *Cool Edit Pro* does not support QuickTime or AVI movies, so you can't synchronize your sessions to onscreen video clips. The program does, however, support all popular frame rates of SMPTE time code (in the form of MIDI Time Code), which allows you to sync an audio file or session to a video work print. *Cool Edit Pro*'s Play List lets you assemble up to 64 Cue List entries and trigger them individually, but unfortunately you can't sync the Play List to incoming time code.

Quartz Audio Pro 32. *Quartz Audio Pro 32* supports AVI files and synchronizes the picture to the Project audio for simultaneous playback. (The picture appears in its own resizable window.) You can also extract the soundtrack from an AVI file and add it to the current Project or insert your stereo mix into an AVI file. We did experience some difficulty controlling AVI files that were loaded via *Quartz Audio Pro 32*'s MCI command, however. Once a file started to play, the transport controls froze and there was simply no way to stop the file from playing through to the end.

Quartz Audio Pro 32 supports SMPTE time code (MIDI Time Code), so you can slave your multitrack mix to a video work print. The program can send or receive frame rates of 24, 25, and 30 (drop and nondrop) fps. It can also send MIDI Clock and Song Position Pointer signals for use with a sequencer. *Quartz Audio Pro 32* does not offer a synchronized playlist option, although it can trigger individual tracks from a CD through the use of MCI commands.

Samplitude 2496. *Samplitude* supports AVI and QuickTime movies, so you can link video clips to VIPs and scrub the video and picture together. The picture appears in a resizable window; a separate dialog box lets you extract or

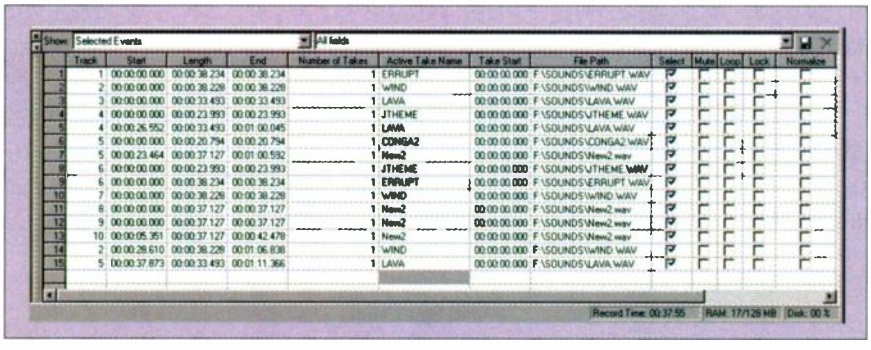

FIG. 15: Like the Event list in a sequencer, the Edit Details window in *Vegas Pro* shows many parameters of the Events in your project.

replace the soundtrack (not yet available for QuickTime). You can also view a movie's individual frames lined up in miniature along the top of the VIP window, which comes in handy if you're trying to locate a specific edit point in the video clip. *Samplitude* can also link to other media files, including MIDI and WAV files.

Samplitude supports SMPTE (MTC) in 24, 25, and 30 (drop and nondrop) frame rates as well as MIDI Clock, and it can serve as either the master or the slave. (Full chase-lock sync is supported when using the SEK'D ARC series audio cards.) Its synchronization capabilities enable you to sync a VIP to a video workprint or use *Samplitude* as a sync source for a sequencer. *Samplitude* does not offer a synchronized playlist option, but you can play CDs from within the program, trigger individual tracks, extract CD audio, and import the extracted audio into a VIP.

SAWPro. *SAWPro* does not support AVI or QuickTime video, so you can't import a video clip into a session and sync it to the multitrack mix. (IQS offers a 32-bit *AVI Viewer* plug-in for $100 that provides a professional set of features for working with video clips.) SMPTE and MIDI Time Code are well supported in *SAWPro*, so you can work with other programs and external equipment. The program can serve as the master or slave in a setup, and it reads and writes all SMPTE frame rates. Surprisingly, it does not have a large SMPTE readout display as most other multitrack programs do.

SAWPro also lets you play regions and trigger playback from markers through the use of MIDI trigger notes. A dialog box offers ten octaves of MIDI notes from which to choose.

Vegas Pro. *Vegas Pro* supports AVI, QuickTime, and MPEG files, which makes it well suited to a variety of multimedia projects. Adding a video clip to a session involves simply dragging the video file into the Track View window and depositing it in the Video Ruler area. The movie then appears spread out across the top of the window as a series of individual frames. It also appears in the Video Preview window if it's open.

If the video file includes a soundtrack, the audio portion of the file is automatically assigned to its own track above the other waveforms. Dragging the video left or right in the Video Ruler drags the audio as well; the two tracks remain locked unless you separate them. You can add the soundtrack to your mix, or you can easily delete the original audio and replace it with the current project. The final result can then be previewed or rendered as an AVI file for stand-alone playback.

Vegas can also work with external hardware through its support for MIDI Time Code (at all frame rates). The program can slave to incoming time code, and it can generate MIDI Time Code as well as MIDI Clock messages. (It doesn't support MIDI Clock input, however.) The Track View's already large elapsed-time display can be enlarged even more, which makes it very easy to read from across the room.

WaveLab. *WaveLab* does not support AVI, QuickTime, or other video formats, so you can't create multimedia soundtracks while viewing an onscreen video clip. The program does, however, support SMPTE time code (MIDI Time

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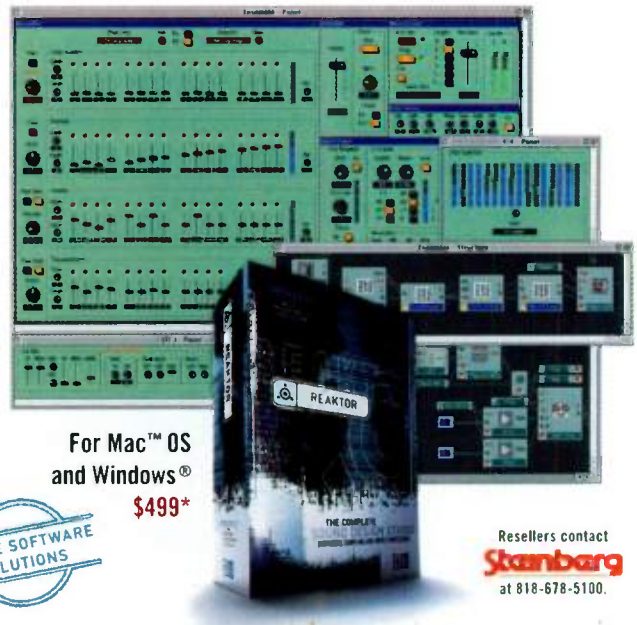

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Code), which lets you synchronize playback from the Wave and Audio Montage windows with external video decks, tape recorders, and MIDI sequencers.

When synching to time code, *WaveLab* can act only as the slave device; it does not generate time code for output. A large, resizable Monitor window shows the incoming time code; it's quite easy to see from a distance.

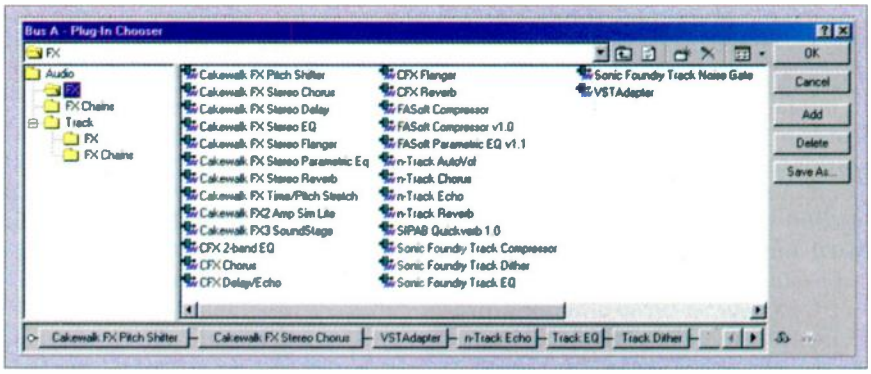

FIG. 17: Though the program doesn't offer a wide range of internal effects, building an effects chain in *Vegas Pro* is a quick and easy task.

BOOK REPORT

Getting help when you need it most is a major concern when you're learning a new piece of software. We evaluated the types, organization, and quality of the supporting documentation that these programs offer, and were amazed at the differences among them. Printed manuals, for example, range from the slimmest of "getting started" booklets to massive, 600-page printed tomes. Sure, you'll find more thorough documentation in some of the PDF files that are offered on disc, and those are great for randomly searching out a specific topic. But we still prefer having hard copies on hand for browsing when the computer is turned off or busy with other tasks.

We also appreciated the tutorials that we encountered, whether in the form of AVI files on disc or in the printed manuals. (*Cool Edit Pro* deserves a nod for its extensive video tutorials.) We further discovered that some manufacturers offer additional tips and tricks at their Web sites, so it might be worth checking them out if you're stuck with a question.

Cool Edit Pro. *Cool Edit Pro*'s documentation is exemplary. The 236-page manual is well organized, clearly written, and informative. In addition to explaining the program's features, the user manual includes several short essays on topics such as time code, digital audio, filters, and MIDI. It also includes FAQs and miscellaneous notes on various subjects. (To get the manual you must send in your registration card or make a request by phone.)

In addition, *Cool Edit Pro*'s CD-ROM includes a PDF version of the manual and extensive self-running video tutorials that demonstrate all aspects of the program. Once you're in the program, an excellent online help file provides concise descriptions of tools and features, and pop-up labels identify buttons and icons throughout the interface. Syntrillium's Web site offers additional FAQs and other helpful information.

Quartz Audio Pro 32. *Quartz Audio Pro 32* comes with little in the way of printed documentation. A 20-page training manual introduces you to the program, but we were unable to run the only tutorial because an essential file was missing from the CD-ROM. The full documentation comes on the disc as a 61-page PDF user manual and a 112-page PDF reference manual.

The program also includes extensive online help with links to related topics. In most cases, the online help will get you through most situations nicely. The American distributor's Web site (www.tracertek.com) offers some FAQs, tips, and other helpful information.

Samplitude 2496. *Samplitude*'s documentation consists of a 324-page, spiral-bound user manual that details the program's extensive feature set. A separate Version 5.3 Addendum provides another 45 pages of explanation of new features, with much space devoted to the redesigned 5.1-capable Mixer window and related topics.

The *Samplitude* CD also supplies a PDF version of the documentation and a helpful video demo showing how to use various elements of the program. Other CD goodies include several VIP demos, tutorials, and additional software. Within the program itself, you'll find a good online help menu with an excellent context-sensitive help option and a search function. The SEK'D Web site offers FAQs and access to a newsgroup.

SAWPro. *SAWPro* comes with a 286-page spiral-bound user manual that describes the program's features in detail but lacks tutorials to help you get started. Online help with a search function is also available, as is a PDF version of the user manual. Although the user interface is relatively clear, we were a bit disappointed that pop-up labels weren't provided to help identify (and maybe even explain) some of the more cryptic buttons.

IQS markets tutorial CDs, seminars, and even telephone training, and the company maintains an active Web site with useful information, chat rooms, newsgroups, and an online magazine.

Vegas Pro. *Vegas Pro* comes with a

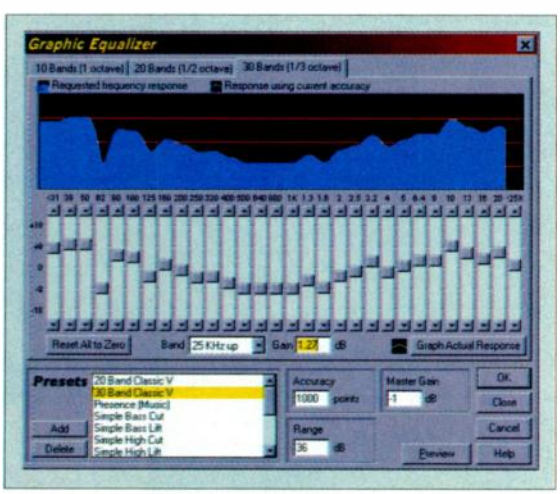

FIG. 16: *Cool Edit Pro* offers a generous assortment of high-quality effects for mastering and sound designing. The Graphic Equalizer window, for example, can have as many as 30 bands along with its visual display.

For manufacturer information, please see Contact Sheet, p. 195.

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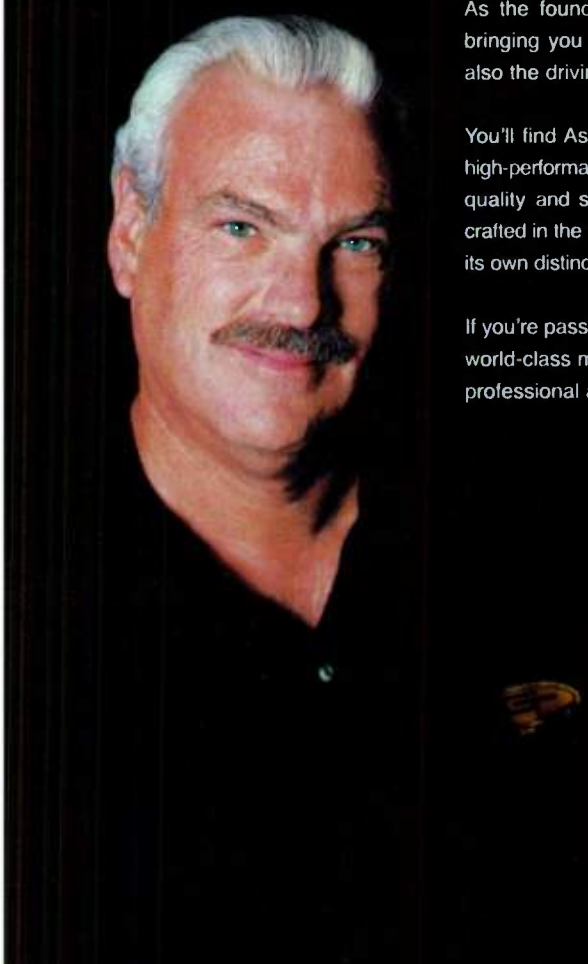
A Passion for Sound



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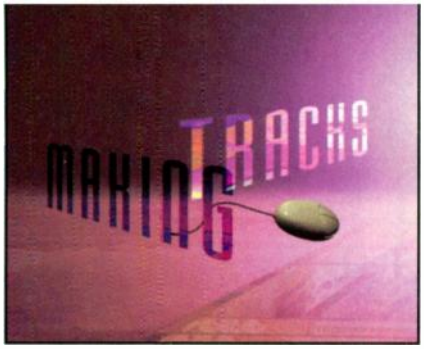
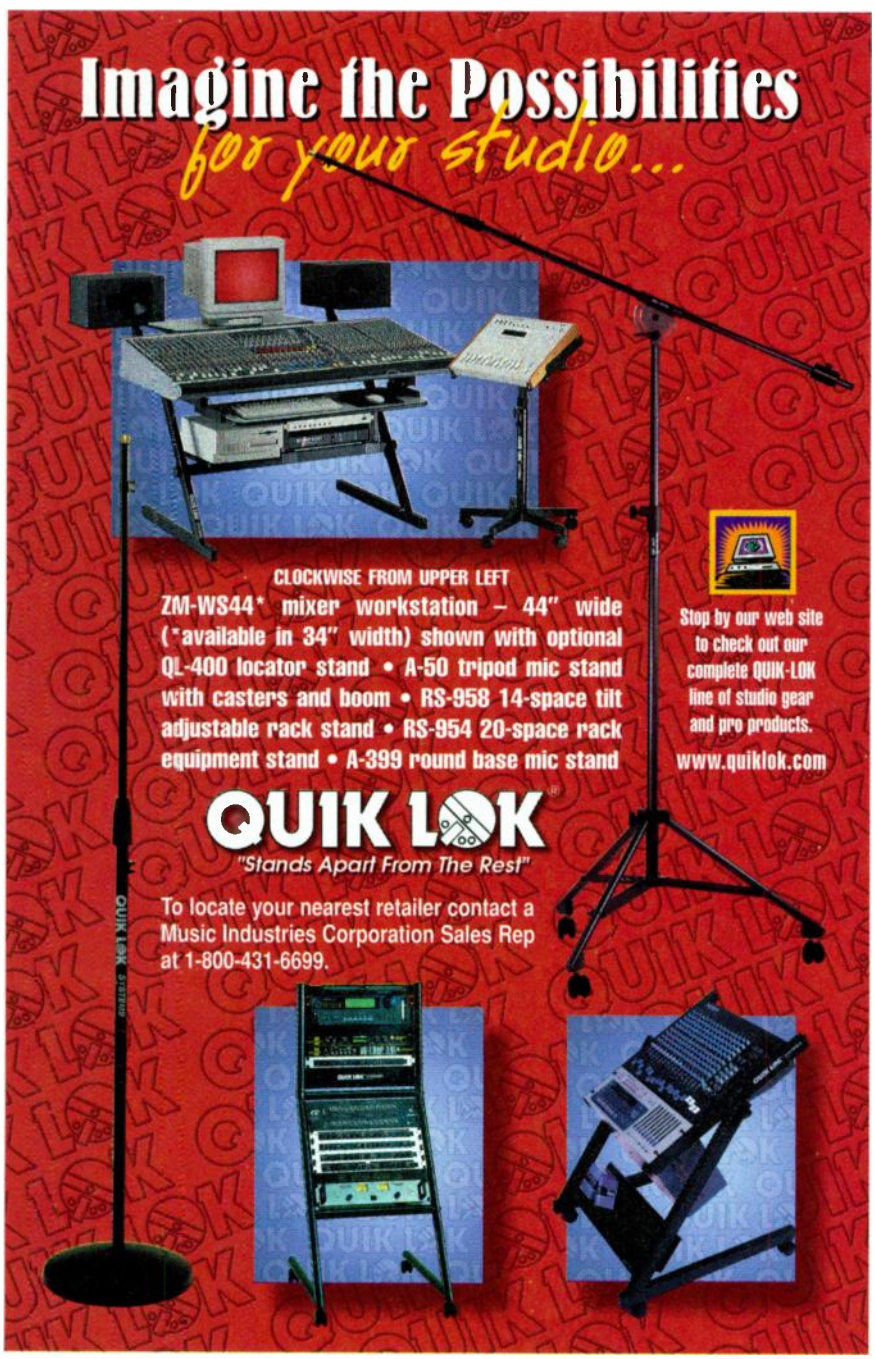


164-page user manual that introduces the program and highlights the main features. It's easy to read and well illustrated, but it's far too sketchy for more advanced users. Much of the program is not covered in detail, which forces you to search for information elsewhere. A complete reference guide to the program's features would come in handy. The user manual does, however, include an excellent tutorial that gets you started with several of the program's primary tools. The online help (with a search feature) is satisfactory, but not in any way outstanding. Handy pop-up labels appear for many of the buttons and other onscreen controls.

The *Vegas Pro* CD-ROM includes a PDF version of the user manual along with some example projects, product demos, and tutorial files. The Sonic Foundry Web site provides product news, a *Vegas Pro* forum, and user-directed demos that introduce the program.

WaveLab. Of all the programs in this group, *WaveLab* takes top honors for offering the most extensive printed documentation. The 650-page manual is comprehensive, well written, and well illustrated. The Getting Started tutorial does a good job of introducing several of the basic tools and editing procedures for the Wave window. A few more tutorials for other aspects of the program would be helpful, though.

The online help, which is comparable to that in most of the other programs, includes a search function. The CD does not include a PDF version of the documentation.

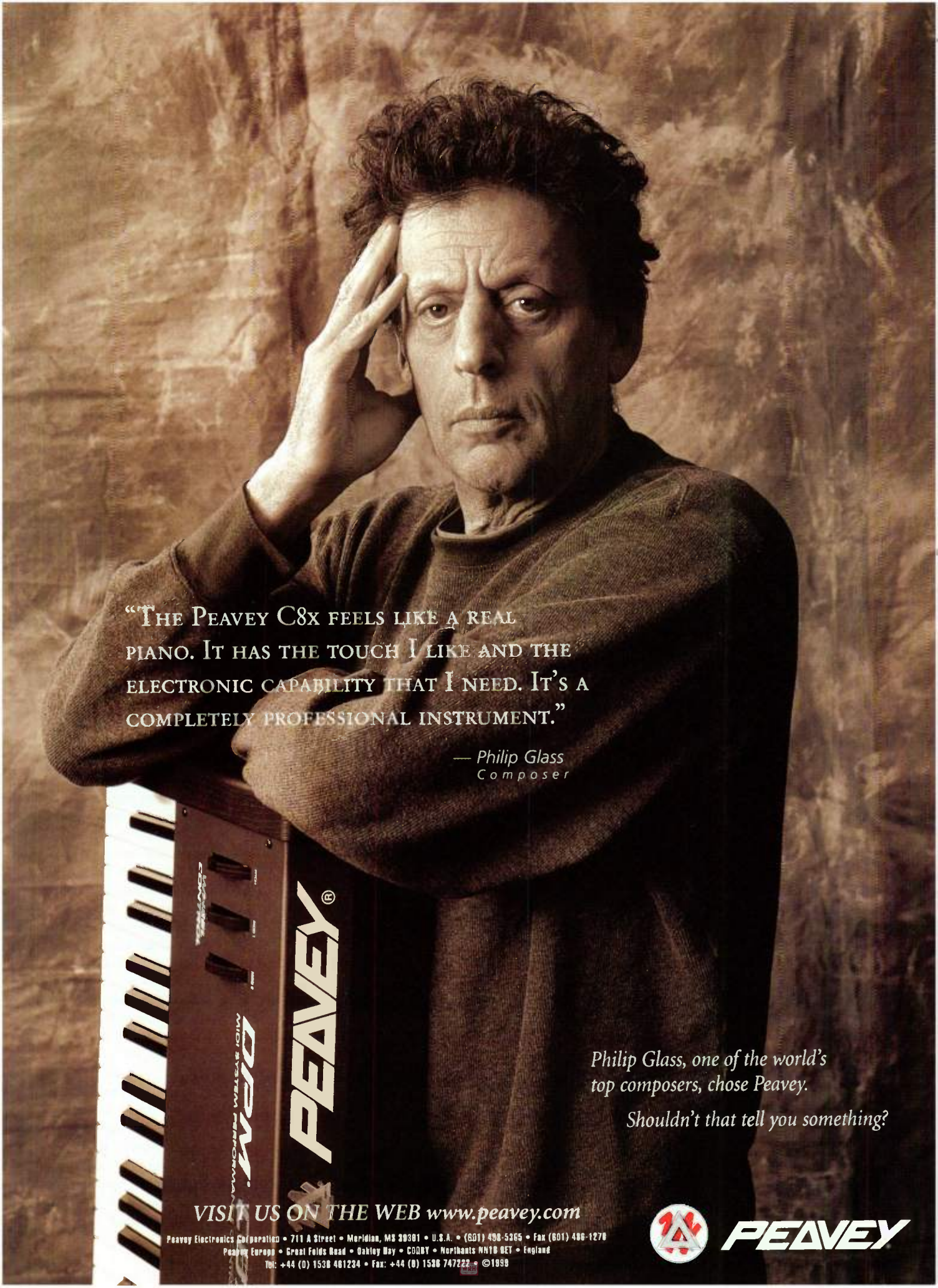


ODDS AND ENDS

Though we've covered the features that we think will be of greatest interest to our readers, there are additional aspects of each program that deserve mention. Here, we'll discuss some of the distinctive features of these editors, and add a few points that can help you get an even better feel for what they have to offer.

Cool Edit Pro. *Cool Edit Pro* has a number of tools that move well beyond the traditional editing features mentioned previously. Among these is its Scripting feature, which, like a macro, allows you to record and play back long series of keystrokes. You can use scripts to generate material from scratch: for example, you could have *Cool Edit Pro* generate several basic waveforms and save them to your hard drive. Or you can use scripts to manipulate all or part of an existing file. You can also run a script on a group of files—which could be useful, for example, if you needed to convert the sample rate or bit depth of many files. A number of scripts are provided as models, and because they are saved as text files, you can easily edit the examples or your own script files.

Cool Edit Pro also has several features that make finding loop points particularly easy. The Find Beat feature identifies two successive amplitude peaks and highlights the region between them. Then, as the audio in the region plays repeatedly, you can extend or shorten the range until the loop's end point is precisely where you want it. And once you have a loop region defined, *Cool Edit Pro* can search out the next zero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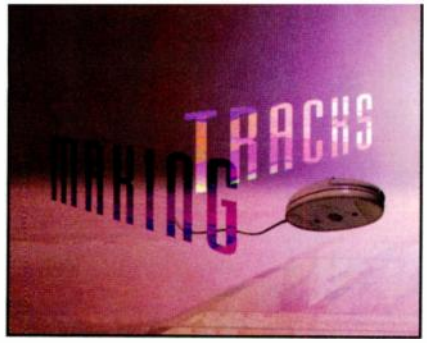


crossing automatically to ensure that your loop repeats without a glitch.

Quartz Audio Pro 32. Though *Quartz Audio Pro 32* doesn't have the sheer number of features that some of the other editors have, for the most part it's easy to use, and its main work areas are well integrated. Unfortunately, several problems cropped up during the review period, and it was not an easy matter to get a reply from either the domestic distributor or the French manufacturer.

Granted, one of the problems we encountered, a program crash when we attempted to use a third-party plug-in, turned out to be something that plagued one other program as well. But other problems, such as the AVI file playback issue and the failure to identify supported DirectX plug-ins, were simply not accounted for.

Still, there is a simple logic to *Quartz Audio Pro 32* that is appealing, and the quality of its effects and the convenience of its editing options should make it a player in the audio world, assuming the manufacturer smooths out a few rough edges.

Samplitude 2496. Two features that set *Samplitude* apart from the others are its support for MIDI and CD burning. (*WaveLab* is the only other program that supports CD burning directly.) Not only can you trigger MIDI files to play back at various points, but you can load, record, edit, and even create new MIDI files inside the program. You can also use the Control Panel feature to map external MIDI data to *Samplitude* functions. This allows you to use external MIDI control surfaces such as the Peavey PC 1600x or a sequencer running on the same computer to scroll, scrub, zoom, or adjust mixer settings.

Though none of the MIDI features will be unfamiliar to users of any modern sequencer, having them integrated into an audio editor this powerful is a major bonus and makes *Samplitude* one of the most multifaceted programs you'll find.

The same can be said for the CD-burning options. You'll find all the features of a professional CD-creation program, including editing subcode, adjusting track gaps, and placing pause markers. You can even perform volume and pan adjustments live while burning, and there's no need to waste drive space creating an image file, because *Samplitude* calculates all real-time processing adjustments including mixing on the fly (assuming your system can handle it). A large number of ATAPI and SCSI drives are supported, and in the package you should find everything you need to get your music onto disc.

SAWPro. *SAWPro* is very much a what-you-see-is-what-you-get program, and you won't find dozens of features buried beneath the surface. Instead, the richness and depth of the program can be attributed to the vast number of editing shortcuts and options the program provides. *SAWPro* feels quite compact and is clearly well integrated; it's easy to move data from one area to another or perform similar functions in different sections of the program.

We wish that some of the "extras," such as CD burning, AVI support, and the highly touted *Reverberator,* were built in. A program of this cost should include these types of features, in our opinion. On the other hand, IQS's long-standing policy of free upgrades is to be applauded, and the company has been active in publishing free information on how to optimize a PC for audio. That's a resource that all Windows users will appreciate.

Vegas Pro. *Vegas Pro* may just be the first major professional PC audio application designed from the ground up with multimedia and the Internet in mind. Its clean and intuitive layout, which clearly owes its heritage to *Acid,* should make it very appealing to multimedia producers and Web-site developers who work with a range of projects headed in many different directions.

Vegas Pro also provides the capabilities that a professional musician needs for live recording and mixing, although in that scenario, you'd really need a companion stereo audio editor or a large batch of DirectX plug-ins to fill some of the program's editing and processing gaps. But that's a very common scenario today, and if you already own a stereo editor and plug-ins, why pay for redundant features? *Vegas Pro* is clearly a model that's different from the other programs in this group, and many people working with multitrack audio

may decide that it makes a lot of sense.

WaveLab. *WaveLab* has more extras than nearly any other program in the roundup. Not only does it have extensive CD-burning features, fully the equal of any professional program on the market, but you can communicate directly with a hardware sampler via MIDI (SDS) or SMDI if you have the proper hardware. The Crossfade Looper tool is a great help in creating perfect loops, and the Tone Equalizer minimizes amplitude changes in a loop to provide more options for setting loop points.

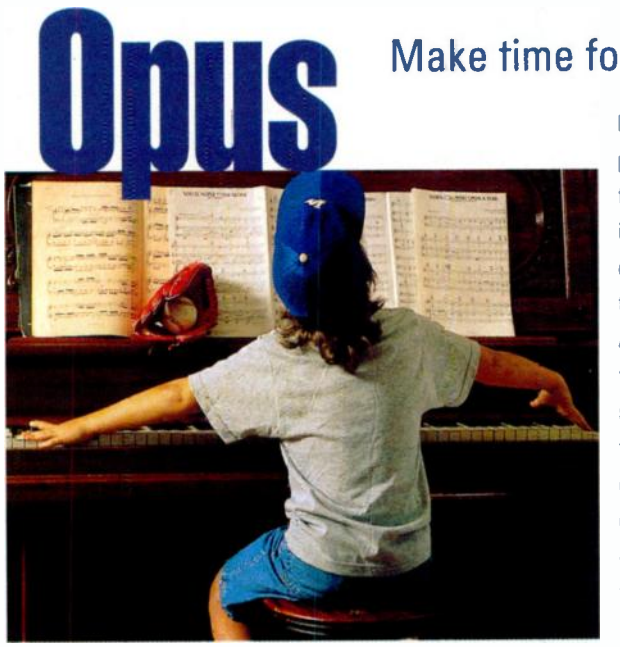
WaveLab's Database feature is also an excellent add-in and offers a way to manage different types of audio files on your system or on CD-ROMs that you keep around your studio. You can set up numerous conditions for searching, such as "all 16-bit mono WAV files smaller than 1.5 MB," and create categories for the files that the Database locates.

WaveLab also has some of the best customization options around. For example, the Plug-In Manager allows you to determine which plug-ins are loaded when you run the program, and includes a feature for grouping plug-ins by category. You can also create keystroke shortcuts for loading a plug-in and opening its edit screen. And we haven't mentioned it earlier, but *WaveLab* 3.0 still has the best looking 3-D analysis plot (FFT) on the market today.

WRAP IT UP

As you can see (those of you who've hung in this far!), these programs are very versatile, surprisingly powerful, and, in some cases, elegantly designed. And in spite of the depth of their feature sets, many of their operations are straightforward and for the most part intuitive. Whether you're looking to record your band directly to your PC, produce multimedia soundtracks, or create audio for the Internet, one of these multitrack workhorses should do the job. To learn a bit more and to get some hands-on experience, check out the demos on the manufacturers' Web sites. It's time to find out if there's a virtual multitrack in your future!

Associate editors **Dennis Miller** *and* **David Rubin** *live more than 4,000 miles apart, but through the wonders of modern telecommunications, they were able to compare notes and compile this article in record time.*



Out of the Bottle

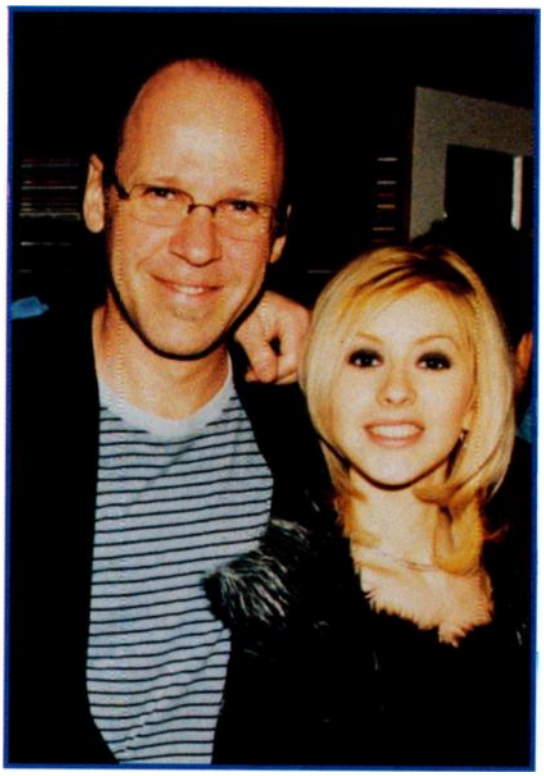
After Berklee, Frank played in a variety of Top 40 bands in the Boston area. On one momentous occasion, the bass player in one of his bands brought in an ARP Odyssey, and Frank's career was changed forever. "He put it in front of me and said, 'Here, play this,'" Frank remembers. "I had no idea how to use it. I played some standard like 'Misty' or something, and it sounded horrible. Still, I was hooked, and the next day I bought one. That was my first synthesizer."

LEARNING THE SYNTH ROPES

In 1979, Frank moved to Manhattan with nothing but the keyboards he'd accumulated. His first job was backing Frank Sinatra imitators at weddings with his ARP Odyssey and Fender Rhodes.

Frank soon developed an interest in Oberheim synths. As more gigs brought in more money, he expanded his keyboard collection to include an Oberheim X-A, DSX sequencer, and DMX drum machine, which he linked to his very first Minimoog.

"That setup was my 'thing,'" remembers Frank of his rig. "I used a Minimoog for the bass, and with the Oberheim DSX and DMX, I could have two different parts with four voices each. So I started programming with those. The DSX was a lot like a MIDI sequencer, except that there was no Velocity sensitivity and you had to start at the beginning each time you recorded something. When I got my DSX, I decided that I was going to figure out how to do everything that you could possibly do with this drum machine and sequencer. I was determined to use it to do something different from what other people had done. I wasn't just out to have a hit record. It was an intellectual challenge for me, as though I was still in school."



David Frank with Christina Aguilera. Frank tracked and mixed Aguilera's hit "Genie in a Bottle" at his Topanga Canyon home studio.

Frank's innovative approach to music-making bore fruit in the synthesizer-fueled '80s, when he hit the big time as one half of the System, a radical new funk band. Their cross-format hit, "Don't Disturb This Groove," vaulted Frank and singer Mic Murphy to the top of the charts in 1987.

Like many great inventions, the System was born of necessity and serendipitous timing. Frank recalls the events that led to his fortuitous pairing with Murphy: "One day I got a call from Lou Bolognese, who owned a 24-track studio in Long Island. He wanted me to do a session as a favor, and he offered me some studio time in return. I thought I'd just do some demos and sample commercials with the time, but Lou said, 'Why don't you do a song? You know, a dance song, a 12-inch. Just get a singer, you can do it!'"

Frank programmed a song in a few weeks, but he still needed a singer. Why not ask the girl upstairs? he thought. "The girl upstairs was Madonna," Frank explains. "This was in 1981, before she had a record deal. We were in a pickup band together, and she was the singer. We rehearsed in the same building, called the Music Building, on 37th Street and 8th Avenue. I was actually paid to write with her. I made $30 for four hours of work," he laughs.

Frank had only the title for the song, "Crimes of Passion." He brought in the future mogul to write some words and a melody. Then fate intervened. "We were all set to do it. But the night before we were going to cut the song, Madonna called me and asked if Steve Bray, her drummer, could be in on the session as coproducer. "I love Steve, but I knew he would want to put guitars on the track. I had visualized it as a synth-only song, which was still a bit of a novelty at that time."

The conflict meant that Madonna was out. "I called up Mic Murphy, a singer I knew," Frank continues. "He wrote a new melody for the song and changed the words to 'In Times of Passion.' We recorded and mixed all of it in one day. He took it to a friend of his, who cut an acetate, a 12-inch, and we got a

PAUL MYERS

Frank keeps his turntable within arm's reach of his workstation so he can quickly grab samples from vinyl.

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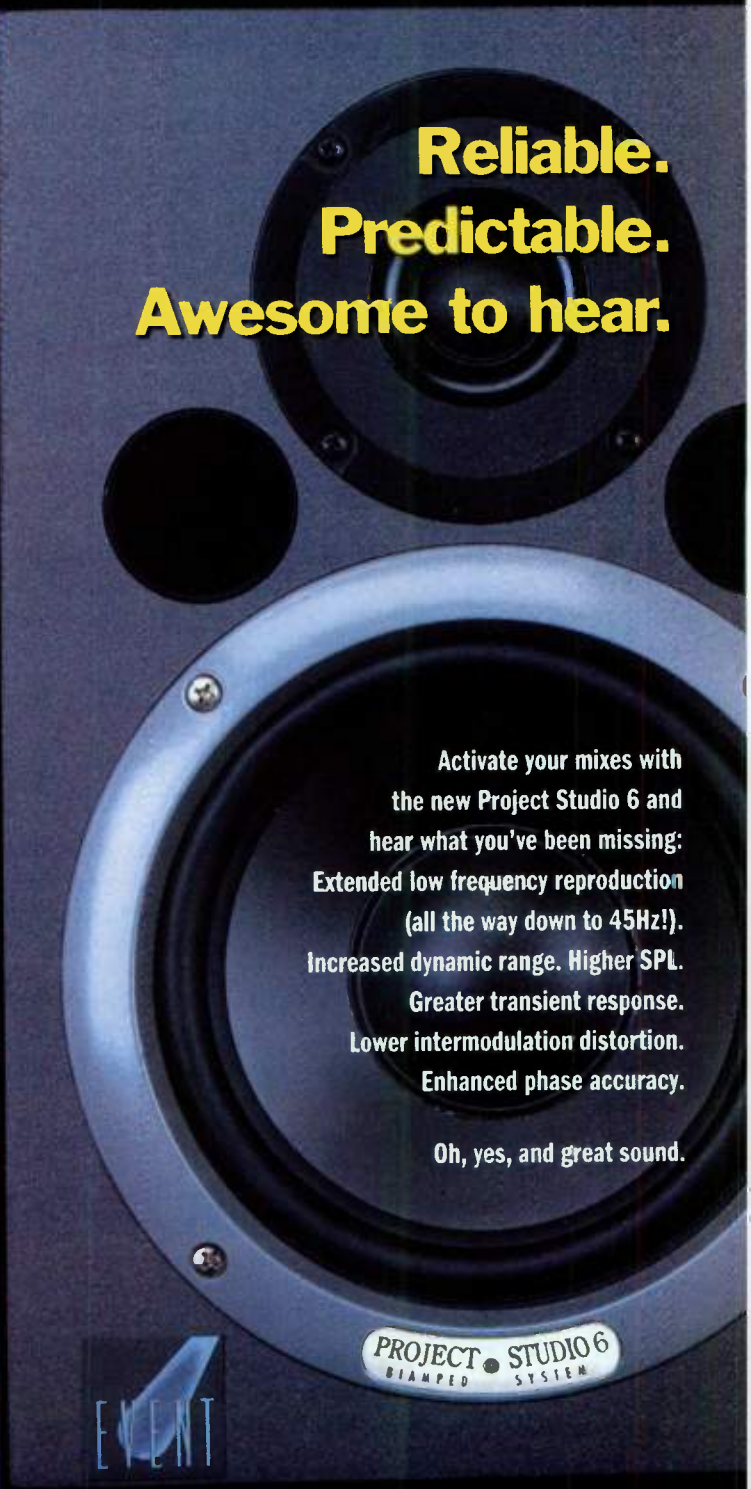

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Out of the Bottle

record deal with Atlantic the next day."

Within a month, the System, as the two had hastily dubbed themselves, had a hit song. Not long after, their label (Atlantic Records' Mirage imprint) wanted another, and gave the duo a budget of $35,000. "We thought that might be the last amount of money we ever got, so we decided to keep most of it for ourselves and make the record as cheaply as possible. We kept $10,000 each, so we could only spend $15,000 on the album. Of course, we were doing it all by ourselves, so we could get away with that amount." One of the best-known songs from those sessions is 1982's "You Are in My System," a song that would become a hit for both the System and, later, singer Robert Palmer. Suddenly, Frank was in demand.

LIFE IN THE CANYON

Fast-forward to 1992, when Frank moved from New York to the very different world of Los Angeles. He found a house in Topanga Canyon and converted the garage into a project studio, adding a separate entrance and doubling the walls to soundproof it. He spent a considerable amount of time learning to use Digidesign's Pro Tools and Emagic's *Logic Audio*. Thus Frank's home studio, Canyon Reverb, was born.

Frank actively sought out cowriters who could get him a better shot at radio airplay. He met writer Steve Kipner through their mutual publisher, EMI Music Publishing, and began writing with him. Kipner already had a great track record, with hits such as Olivia Newton-John's "Let's Get Physical" and Chicago's "Hard Habit to Break." It helped that Frank and Kipner were neighbors. Their first attempt didn't become a hit, but they were confident that they were on the right track. "Then one morning," Frank recalls, "I had an idea for a song, and I called Steve and asked him to come over. We wrote 'The Hardest Thing,' which has become 98 Degrees' biggest hit. That was satisfying because I got to use some of my piano ideas. 'The Hardest Thing' is a piano-based song, more so than 'Genie.'"

PAUL MYERS

Frank won a gold record for producing Chaka Khan's 1984 smash single, "I Feel for You."

A WISH COME TRUE

Aguilera's "Genie in a Bottle" is arguably the most successful project studio recording ever made. Frank recollects the song's creation: "I knew Christina's A&R person, Ron Fair," says Frank. "He had called me a couple of times about Christina. As an instrumentalist first and foremost, I want to work with great singers. Luckily, Christina is a really, really great singer."

Frank is justifiably proud of Aguilera's self-titled record, which he coproduced with Kipner. "I'm most proud of the way every little sound can be heard absolutely clearly, down to the last detail. That has a lot to do with being patient and spending a lot of time listening to a track. And you have to be true to your instincts. Sometimes when you're working on a drum track, you think, 'No one really wants to listen to this skittering kick drum. All people want to hear is the kick and snare going *boom thwack boom boom thwack!*' But you can get more creative than that with the keyboards and drum programming, and people will appreciate it."

PAUL MYERS

With his Minimoog and Pro Tools/24 gear, Frank brings together the best in state-of-the-art and vintage equipment.

David Frank tracks typically are born first thing in the morning or very late at night, when, Frank says, his mind is clearer and more receptive to ideas. "Those are the times when I start programming. With 'Genie,' I had an idea on tape that I really liked, but that needed one other part. Steve, Pam, and I were going to finish the song together, but the night before we were to meet, I woke up thinking, 'My god, the track isn't anywhere near ready!' So at two o'clock in the morning, I went into my studio and began working.

"I had an idea for a chordal pattern, so I used the Nord Rack. I arrived at a kind of wah-wah sound, basically by twirling the knob controls and recording the results straight into the sequencer. I also found the high-frequency, cymbal-type sound using the Nord. I got it by turning up the FM knob until the two oscillators were interacting. The zap sound with a little rumble underneath it came from a Yamaha EX5. You'll

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also hear a very high-frequency sound going over the whole thing. I don't go in thinking about the frequencies; I just listen to them as the track is being built."

Frank used the matrix editor within *Logic Audio* to create the song's signature 32nd-note kick drum, a beat similar to one Frank used on the first System album. His E-mu Planet Phatt synth module's reverse hi-hat also contributed to the song's intriguing rhythm pattern. "That sounded good," remembers Frank, "but it was late on the beat, so I advanced the track to make it fit.

"We ended up mixing everything on an SSL 9000 at Pacifique Studios [in North Hollywood, California]," reveals Frank. "At the time we tracked everything, I was still using an analog Soundcraft Spirit board. We put everything to analog tape and did a mix. But after a week or so we weren't really happy with the mix. We had gotten really used to hearing the vocals coming directly out of Pro Tools. There's a certain edge that you get with digital that you don't with analog. We couldn't get the snare and kick sounds we wanted with the analog tape; analog warmed it up too much. So we just mixed directly from Pro Tools. I brought my whole Pro Tools rig and all my gear to Pacifique.

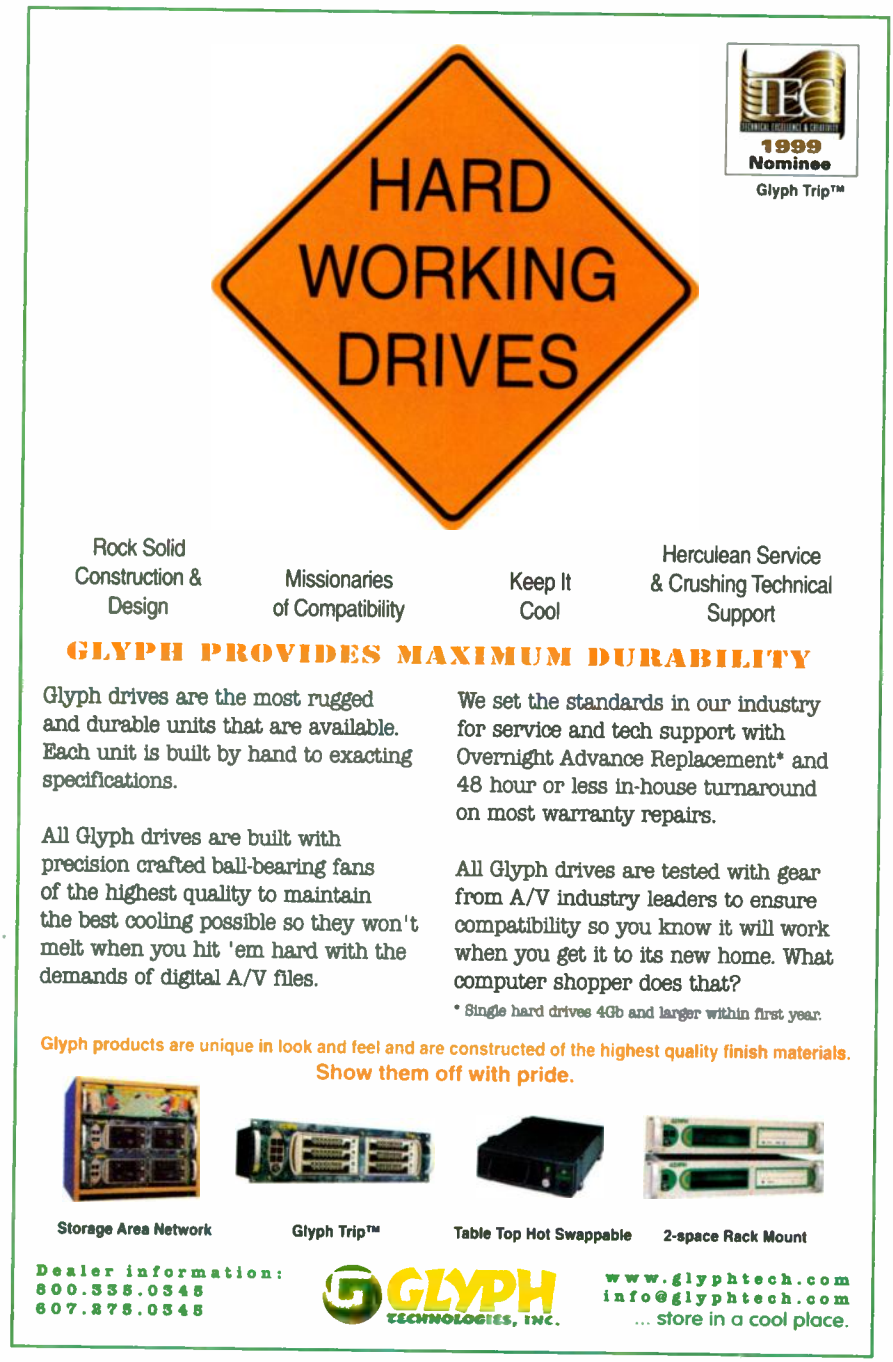
"For now," Frank says, "I'll go to other studios to mix. People who run really great mix studios usually have collected gear for many years, so it's to our advantage to go to them."

FRANK ADVICE

Frank doesn't try to guess where technology will lead home recordists. Nor does he feel that gear is the secret to a hit recording. "There will always be a lot of insomniac musicians waking up in the middle of the night with an idea that they need to get out. If you have a limited amount of gear, don't worry about it. Even if you have the worst instrument, if you know its ins and outs, you can still make fantastic music. 'Genie in a Bottle' was the biggest record in the world, and yet the whole thing was recorded in my home studio using an old Soundcraft Spirit board that was made nine years ago," says Frank. "The music comes from inside you."

"As an instrumentalist first and foremost, I want to work with great singers."
—David Frank

Paul Myers *is a Toronto-born guitarist, singer/songwriter, producer, and freelance journalist. He frequently gets behind the word processor to ramble on about music and related topics.*



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The Electronic Century

Part III:

Computers and Analog Synthesizers

The recorder, which became commercially available around 1950, made possible a musical revolution because it allowed composers to record sounds and arrange them into any order. Throughout the 1950s and 1960s, advances in technology led many composers to realize there were sonic possibilities beyond magnetically recorded sounds. For these composers, the goal was to compose sound itself, and computers and analog synthesizers provided the means to do so.

The beginnings of electronic synthesis.

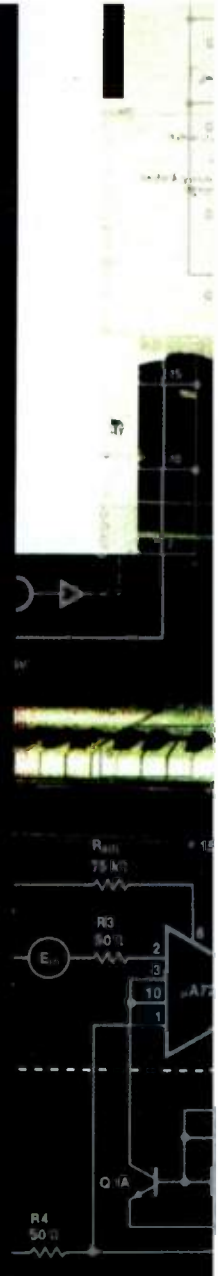
By Joel Chadabe

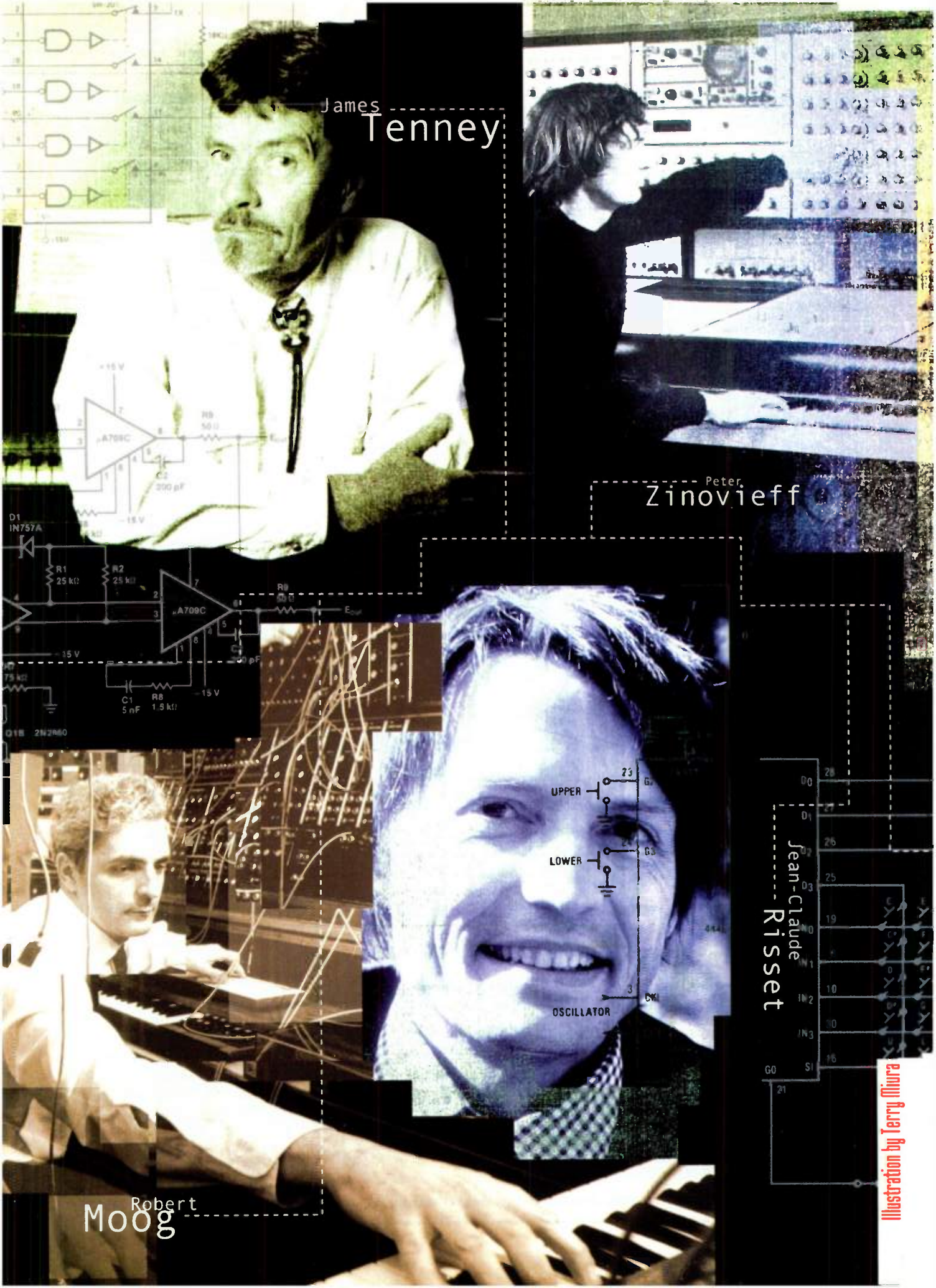
MUSIC FROM COMPUTERS

The first computer-generated sound was heard in 1957 at Bell Telephone Laboratories in Murray Hill, New Jersey. Max Mathews had finished writing Music I, the first program to generate sounds with a computer, and used it to play a 17-second composition by a colleague, Newman Guttman. Although the piece didn't win any music awards, it was the first computer music composition and marked the birth of digital sound synthesis.

John Pierce, head of the department in which Mathews worked, was interested in the possibilities of sound synthesis. With Pierce supporting his work, Mathews and his collaborators made continued improvements to the Music I program over the next several years, resulting in a series of programs that came to be known as the Music-N series: Music II (1958), Music III (1960), Music IV (1962), and the last in the series, Music V (1968).

Music V was modular and hierarchical in its structure. The software simulated oscillators, mixers, amplifiers, and other audio modules; each module was referred to as a *unit generator.* The software oscillators functioned by reading waveforms from numerical tables and outputting streams of numbers that represented those waveforms. Numerical outputs from two software oscillators, for example, could then be added together in a 2-input software mixer. The output from the mixer could in turn be scaled in a software amplifier by multiplying it by a fixed number—increasing its amplitude if the multiplier was more than 1 and decreasing its amplitude if the multiplier was less than 1. In the Music V language, a particular combination of unit generators was called an *instrument,* a sound was called a *note,* and a sequence of notes was called a *score.*

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Tenney
Peter
Zinovieff
Jean-Claude
Risset
Robert
Moog
UPPER
LOWER
OSCILLATOR
Illustration by Terry Miura

Computers and Analog Synthesizers

become the Center for Computer Research in Music and Acoustics (CCRMA), a major center for computer music research. Chowning later went on to develop frequency modulation (FM) as a method for generating sound. His approach to FM, in fact, was licensed by Yamaha in 1974 and was the basis of sound production in many Yamaha synthesizers through the 1980s.

Chowning's early compositions *Sabelithe* (1971) and *Turenas* (1972) both simulated sounds moving in space. In *Stria* (1977), Chowning used the Golden Section to determine the spectra of the sounds. The results were otherworldly—magical, strange, icy, and unlike anything that one could imagine coming from an acoustic instrument.

WAITING FOR A SOUND

James Tenney, Jean-Claude Risset, and John Chowning were among the first composers to work with computers in the 1960s. Many others followed in the 1970s and 1980s, including Charles Dodge, Barry Vercoe, Jonathan Harvey, Larry Austin, Denis Smalley, and Paul Lansky. Yet compared with composers working with the interactive computer systems of today, these pioneers had a job that was far from easy.

They required technical knowledge, perseverance, patience, and the ability to deal with a lot of frustration. The time frame between specifying a musical idea at the computer and hearing the results, for example, was often measured in days or weeks. A composer would accumulate a Music V creation on a digital tape second by second, day by day. When the composition was finished, the digital tape was normally taken to a particular department at Bell Labs, where it was converted into analog signals and recorded onto an audiotape. This process could take up to two weeks to complete.

A serious problem with this way of working was that composers were not able to hear a work as they created it. Many musicians of the time, including those who were attracted to electronics, did not want to deal with the long turnaround times necessary for generating computer music. Another significant problem was that composers and musicians had to know computer programming.

BIRTH OF THE SYNTHESIZER

Analog synthesizers provided a solution. They made possible a new world of sound without the need for programming skills. Synthesizers were also designed for performance and provided an immediacy of response resembling the performance capabilities of traditional musical instruments. Even though synthesizers were based on new technologies, many musicians found them attractive because they had familiar forms and features.

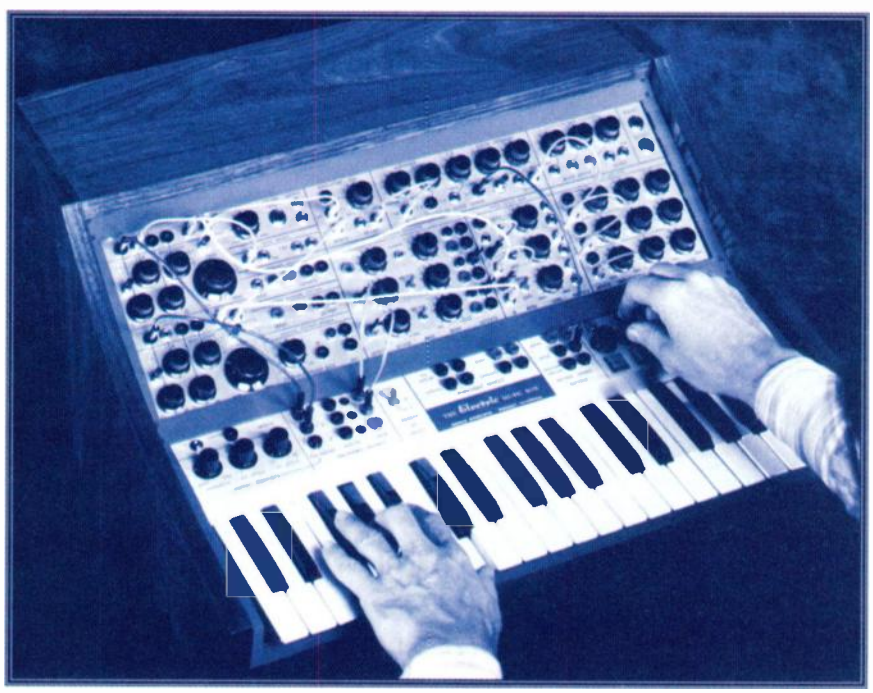
In 1964 three men independently invented analog synthesizers: Robert Moog in Trumansburg, New York; Paul Ketoff in Rome; and Donald Buchla in San Francisco.

That year Robert Moog invited composer Herb Deutsch to visit his studio in Trumansburg. Moog had met Deutsch the year before, heard his music, and decided to follow the composer's suggestion and build electronic music modules. By the time Deutsch arrived for the visit, Moog had created prototypes of two voltage-controlled oscillators. Deutsch played with the devices for a few days; Moog found Deutsch's experiments so musically interesting that he subsequently built a voltage-controlled filter.

Then, by a stroke of luck, Moog was invited that September to the AES Convention in New York City, where he presented a paper called "Electronic Music Modules" and sold his first synthesizer modules to choreographer Alwin Nikolais. By the end of the convention, Moog had entered the synthesizer business (see **Fig. 2**).

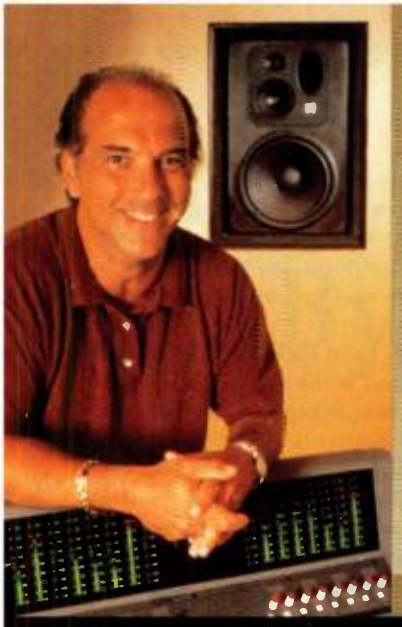
Also in 1964, Paul Ketoff, a sound engineer for RCA Italiana in Rome, approached William O. Smith, who headed the electronic music studio at the city's American Academy, with a proposal to build a small performable synthesizer for the academy's studio. Smith consulted with Otto Luening, John Eaton, and other composers who were in residence at the academy at the time. Smith accepted Ketoff's proposal, and Ketoff delivered his Synket (for *Syn*thesizer *Ket*off) synthesizer in early 1965.

Meanwhile, Donald Buchla had begun working with Morton Subotnick and Ramon Sender at the San Francisco Tape Music Center. After designing and building a waveform generator controlled by optical sensors, Buchla



COURTESY ELECTRONIC MUSIC FOUNDATION

FIG. 3: Donald Buchla playing the Electric Music Box in the early 1970s.



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Los Angeles

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Computers and Analog Synthesizers

controlled independently by a knob. Each stage is then played in sequence, one after the other, using an oscillator to control the timing. The Moog sequencer, for example, had 24 stages configured in 3 rows of 8.

Sometimes sequencers were used to automate aspects of a performance. But it was far more common to use a keyboard controller to play an analog synthesizer. Voltages generated by the keyboard controlled the frequencies of the oscillators and filters. Every time a key was pressed, the keyboard triggered an envelope generator that normally controlled the filter and amplifier.

EARLY SYNTHESIZER WORKS

The specific design of each synth—the type of keyboard it used, for example—optimized it for a particular musical and performance approach.

The Moog synthesizer was the most traditional of the three early synths because its keyboard resembled a traditional piano keyboard in size and

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FIG. 4: Peter Zinovieff, about 1971, playing the Synthi 100 in his London studio.

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operation. The keys were approximately the same size as those on a piano, and the case was made of wood. As if to verify the traditional functionality of the Moog keyboard, Wendy Carlos used a Moog synthesizer to record *Switched-On Bach* (1968).

The Synket was a bit less traditional than the Moog and much more compact and portable. Its keyboard was smaller than that of a normal piano, and each key could be wiggled sideways to bend the pitch. Pianist and composer John Eaton immediately saw its potential and began using the Synket as a performance instrument. In 1965 Eaton composed *Songs for RPB,* for soprano, piano, and Synket. In April of that year, in what was possibly the first public performance using a synthesizer, Eaton accompanied soprano Michiko Hirayama in a concert at the American Academy in Rome. This author had the particular distinction of turning pages at that concert.

The Buchla modular system was the least traditional of the three synthesizers. Its keyboard was made up of a series of fixed-position capacitance-sensitive metal strips, each of which generated a voltage when touched. Morton Subotnick, who had played a role in the Buchla synth's design, used it extensively.

In 1966 Subotnick relocated to New York City, where Nonesuch Records commissioned him to create a series of works specifically for release as recordings. He had brought a Buchla synthesizer with him and used it to compose *Silver Apples of the Moon,* the first of the series, in 1967. *The Wild Bull* and *Touch* followed in 1968 and 1969, respectively.

Subotnick's approach to composing music was unconventional in that he did not play his creations using a keyboard but instead automated most of the detail with the sequencers. In these compositions, Subotnick functioned more as a conductor, "cueing" the sequencers from moment to moment, turning them on or off, changing connections, and pushing buttons.

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TOWARD MAJOR SUCCESS

Because it had been commissioned specifically to appear on recordings sold by a commercial record company, Subotnick's work crossed the line from art music to commercial music. In fact, much of the synthesizer-created music of the day became popular. Wendy Carlos's *Switched-On Bach* became the hit of 1969 and one of the best-selling classical music recordings ever.

After hearing Chris Swanson, Robert Moog, and others perform a jazz concert in 1969 at the Museum of Modern Art in New York City, Keith Emerson bought a small Moog modular system and used it for the hit song "Lucky Man" on the album *Emerson, Lake, and Palmer*. Eric Siday also used a Moog synthesizer to compose a theme for CBS.

Demand from musicians, in what was clearly a growing market, led to a large number of companies being formed and new products being developed. Peter Zinovieff (see **Fig. 4**) formed EMS Ltd. in London, for example, and with David Cockerell and Tristram Cary produced the VCS-3, among other synthesizers and devices. Robert Moog, Bill Hemsath, and others developed the portable Minimoog, the first commercially successful synthesizer. Alan R. Pearlman formed ARP Instruments near Boston and produced the modular Model 2500, followed by the integrated and portable Model 2600. Tom Oberheim founded Oberheim Electronics and designed the Four Voice, the first polyphonic synthesizer on the market. Dave Smith formed Sequential Circuits and developed the Prophet-5, an analog synthesizer with digital controls.

Many other companies and products came and went. The '70s saw the market for electronic musical instruments expand, accompanied by the feeling that they would have a profound impact on the way musicians thought of sound and music. It was a very exciting time.

Joel Chadabe, *composer and author of* Electric Sound, *is president of the Electronic Music Foundation. He can be reached at chadabe@emf.org.*

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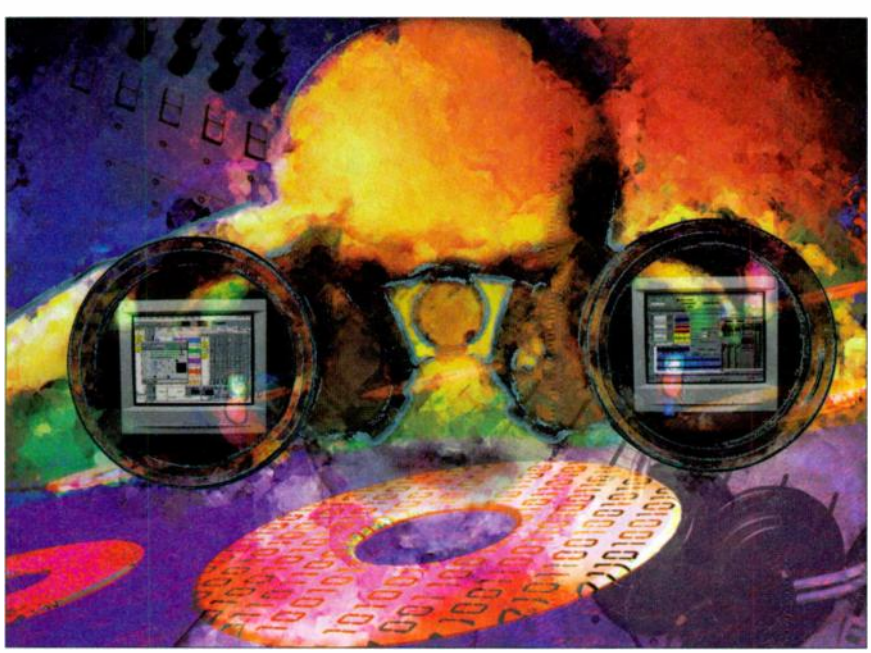
DESKTOP MUSICIAN

Double Vision

Improve your computer's outlook with a second video monitor.

By Brian Smithers

Have you worn out your Alt and Tab keys switching between your sequencer and editor/librarian? Have you saved dozens of screen sets in your favorite DAW program and memorized the hot keys to get from one to the other? Do you catch yourself wondering whether your kid's teeth will eventually straighten out by themselves, so you can buy a 21-inch monitor and finally see your Mixer, Track, and Controller views all at the same time? Well, my friend, what you need is a second monitor!



STEVE RAMIREZ

These days, both Macs and PCs support multiple video cards, enabling you to expand your desktop relatively easily and inexpensively. Adding a second 15-inch monitor and video card to your computer costs less than upgrading to a 21-inch monitor, and you actually end up with more total screen area. You'll also find that the total footprint of the two monitors is only slightly larger than that of the bigger monitor. For those of you whose minds aren't already reeling from the possibilities, let's first look at the advantages of a dual-monitor setup and then explore adding a second monitor to your system.

SIZE MATTERS

If you've ever programmed a synthesizer or sequencer from a two-line LCD, you'll find it hard to believe that you could ever complain about the limitations of a 17-inch computer monitor. (Next you'll be calling your 486 "too slow"!) Nevertheless, you must admit that when you launch your favorite software synthesizer or sampler along with your sequencer, you only have two options: run the programs full-screen and switch between them or try to squeeze them both onto your desktop.

As **Fig. 1** shows, the "squeezing" approach is a losing proposition for a couple of reasons. First, if you set your display resolution to fit both programs comfortably, everything

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FIG. 1: Trying to squeeze two applications onto a single monitor is an exercise in futility. You can't do any serious work in either application's allotted space without scrolling around the screen. Switching between two full-screen applications is only marginally better.

onscreen will probably be too small to read or manipulate. Second, most programs are designed to fit a standard display, so tiling the applications horizontally or vertically often distorts the user interface.

I constantly switch between my sequencer and my notation program, because I often compose in my sequencer and then import the resulting MIDI file into my score writer. If the translation isn't quite right, I have to edit the score by looking at the original sequence to see what I had intended and then switch back to the score to make corrections. It definitely helps to have each program on its own screen, so I can simply glance back and forth.

Displaying each application on a separate monitor is clearly a superior solution. **Fig. 2** shows the same two programs as **Fig. 1**, but this time each is on its own screen. Everything necessary is now visible and within easy reach, unless of course you also want to see the sound card's mixer applet. Never fear—theoretically you can drive up to nine separate monitors on a Windows 98 machine, and your Mac will run out of PCI slots long before the operating system chokes from too many displays.

As you might have discovered, sometimes even a single program is too much for a lone monitor. In a typical digital audio sequencer, for example, once you have more than 12 tracks in your mixer view, the dreaded scrollbar appears. It's hard enough to mix with a mouse—now you have to scroll to reach all the faders.

A dual-display setup allows the user to stretch a single application across a greatly expanded desktop (see **Fig. 3**). This comes in handy for viewing longer tracks, squeezing more mixer channels onscreen, and displaying more subwindows, such as event lists, video displays, and piano-roll views. Although dual-monitor support is built into the operating system, stretching a program across multiple displays requires the cooperation of the application. According to Apple, any well-written Mac application will automatically spread itself across multiple displays, and the software makers with whom I spoke all claimed to offer support for multiple monitors on both platforms. Still, it's not a bad idea to check the Web sites of your favorite programs' manufacturers to see if there are known problems.

THE RIGHT STUFF

So what exactly do you need to expand your desktop studio's view? Well, if you have your platform's latest operating system, you're halfway there. Mac OS has supported multiple displays since the introduction of the Mac II in 1989. Microsoft finally added multiple-monitor support with Windows 98. There are some aftermarket multiple-monitor solutions for earlier Windows versions, but I'll focus here on OS-level support.

Naturally, you'll need a second video card and a PCI slot in which to put it. For both Mac and Windows users, finding slots can be a challenge. A Mac G3 or G4 user with an audio interface and a SCSI accelerator can put the second video card in that last PCI slot, but no room is left for additional system expansion. You could attach a PCI expansion chassis to your computer, but that adds significant cost. If your PC has an AGP slot, you can add an AGP video card and keep your PCI slots available for other hardware.

PC users have a file in their Windows directory called Display.txt that allows you to set up your system for multiple monitors. The file lists cards and chip sets (and sometimes specific driver versions) that are known to work in a multiple-monitor configuration, and provides step-by-step instructions for installing and configuring two or more video cards. It also includes troubleshooting advice and points out that new video cards released after the file was written may support multidisplay setups. In fact, most of the video cards at my local computer superstore were newer cards not listed in the file. As

FIG. 2: A second display monitor allows each program to have its own space. The Seer Systems *SurReal* window has gone from being too cramped to having more than enough room.

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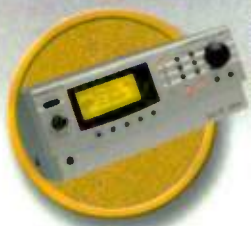

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FIG. 3: A sophisticated digital audio sequencer such as *Cubase VST* can easily fill two monitors. If you move the Mixer view and the various other *VST* views to the right, you can devote the left screen to the Arrange window.

always, you should check the manufacturer's Web site for the most current information on compatibility issues.

Under Windows, one monitor is considered the primary display, and that's where the Windows startup logo, among other things, appears. Unfortunately, most PCs offer no system-level method for designating which card handles the primary display. Should the BIOS choose the wrong card for your primary display, simply change the order of the cards in the PCI slots. Once you've installed the second video card and the system has recognized it, all you have to do is right-click on your desktop, select Properties and then Settings, and check the box labeled "Extend my Windows desktop onto this monitor" (see **Fig. 4**). You can also get to the Display Properties window through the Control Panel folder.

The setup procedure for a Mac is virtually identical. Turn the computer

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off, install the second card, plug in the monitor, and power up again. The system should recognize the new display automatically. Open the Monitors & Sound control panel, click on the Arrange button, and drag the monitor icons into the arrangement you want (see **Fig. 5**).

DEJA VIEW

Under both platforms, the two monitors can theoretically have different resolutions, but some Windows users warn against it. Give it a try if you like; you'll probably have no trouble as long as you don't go below 256 colors. Should your system balk at the second monitor, try setting both monitors to the same resolution and see whether that helps. If you're really picky about your display, consider using matched monitors so that their refresh rates are the same.

The other potential snag in setting up a dual-monitor system under either platform is PCI bandwidth. Some video cards don't play nicely with other PCI devices. For those cards, the top priority is getting video information through the pipeline at all costs. This can wreak havoc on PCI audio interfaces, and a dual-monitor system will only make matters worse. Before you take the leap and add that second video card, check with the manufacturer of your audio hardware to see what issues, if any, the company has had with video cards.

You can also find one-card solutions for Macs and PCs. These cards not only save you slots and resources, but also provide additional features for

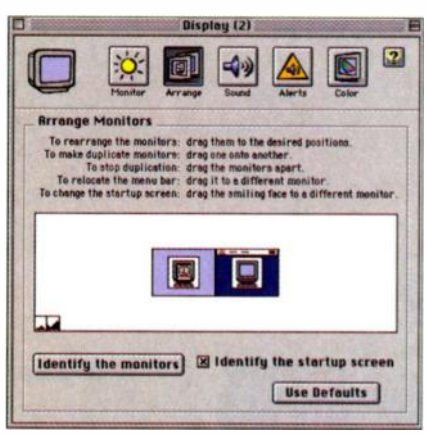

FIG. 5: The Monitors & Sound control panel lets you tell your Mac how you want your displays arranged. Simply click on the Arrange button and drag the monitor icons into position.

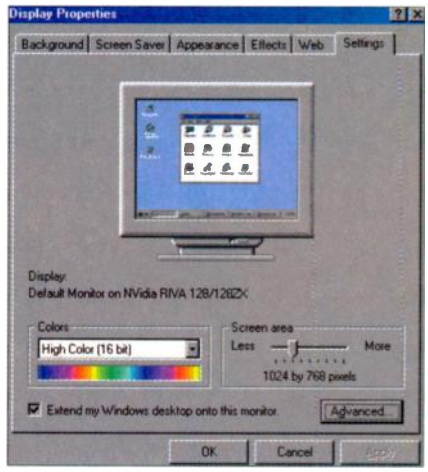

FIG. 4: Setting up an expanded desktop is child's play under Windows 98. By clicking in the "Extend my Windows desktop onto this monitor" checkbox, you double your work area.

configuring your expanded desktop. (For PC users they may also offer support for Windows 95 and NT.) At $179, the G400 from Matrox is a relatively inexpensive Windows card. Its DualHead technology lets you manage four display modes and eight combinations of display types, including analog flat panels. The card even allows you to use an NTSC/PAL television monitor for your secondary display. For $200 to $700 more, you can have an Appian Graphics card, which supports two or four monitors and features a sophisticated application called *HydraVision*. *HydraVision* lets you specify items such as which monitor displays which program and where dialog boxes pop up.

With multiple-monitor support standard in both major operating systems and dirt-cheap 15- and 17-inch monitors readily available, adding a second (or third) display has become a fairly inexpensive way to make your virtual workplace more productive. Just be sure to look before you leap; compatibility hasn't become a nonissue quite yet. Once you've gotten used to long track views, side-by-side full-screen displays, and 24-channel mixers without scroll bars, you'll wonder how you ever got by with just one monitor. Enjoy the view.

Brian Smithers *wonders whether applying this technology to clocks would result in more hours in a day. Share your thoughts with him through his Web site, members.aol.com/notebooks1.*

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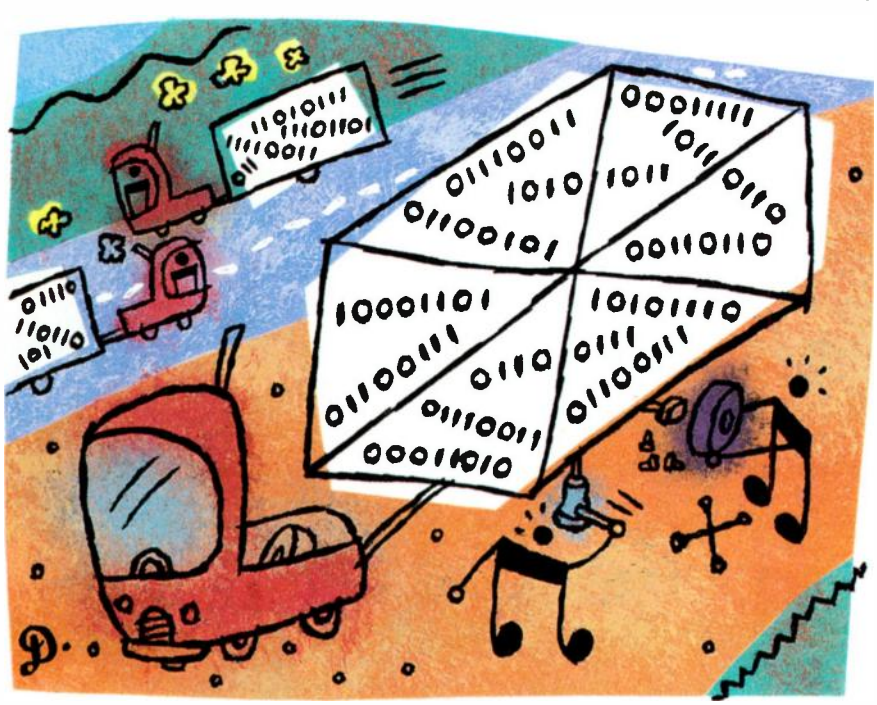
Spare Interchange

Knowing your digital audio ins and outs can spare you headaches.

By Jeff Baust

Digital audio devices are in home and project studios everywhere these days, and connecting them requires an understanding of the various communication protocols and interface formats that send and receive digital audio signals. These protocols and interfaces include AES/EBU, S/PDIF, ADAT Optical, and TDIF, among others. It's important to understand the features and capabilities of these formats in order to make connections correctly and avoid the problems that can crop up if you don't.



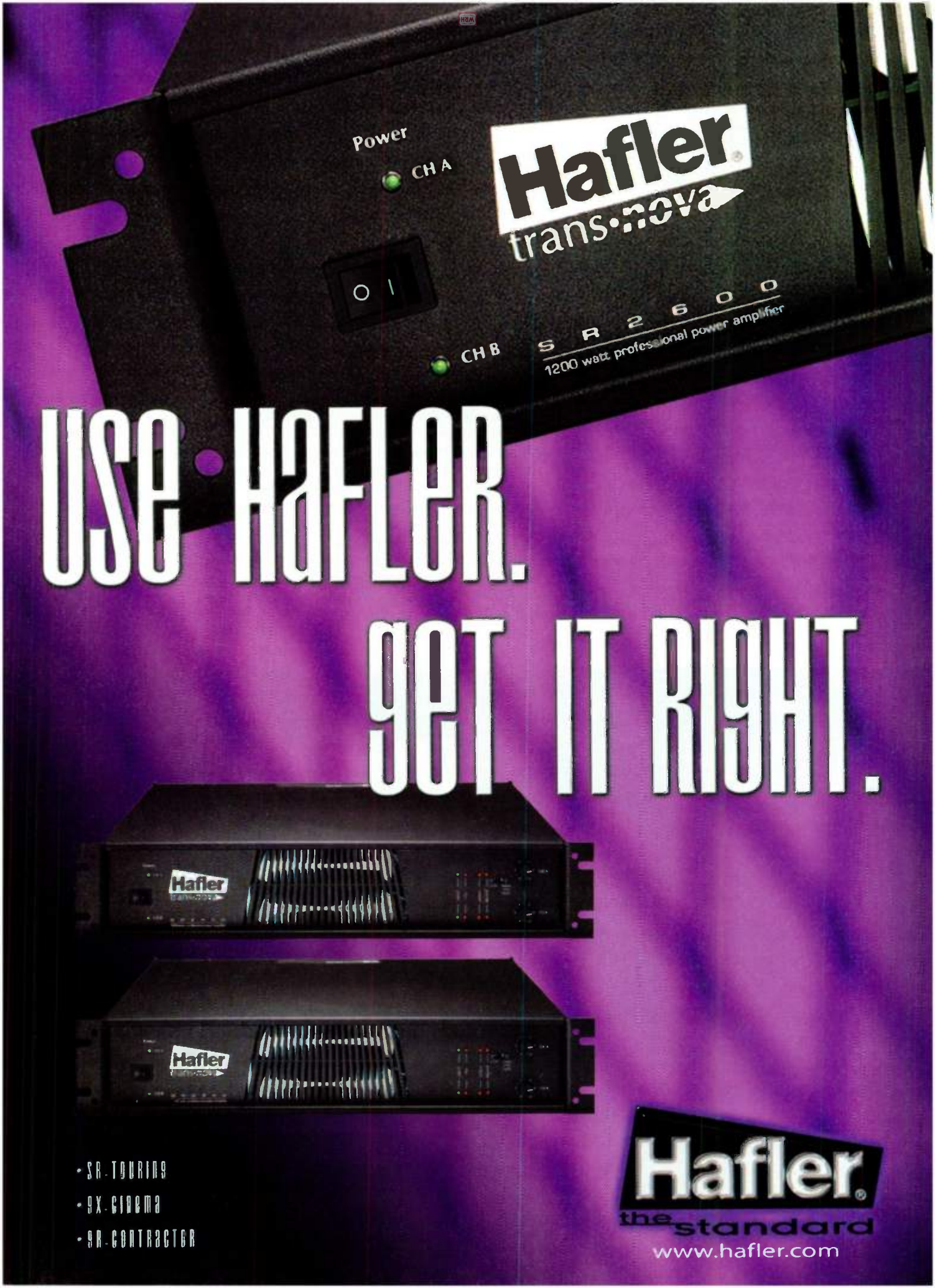
JACK DESROCHER

WORD CLOCK

To transmit digital audio, both the sending and receiving devices have to agree on the rate at which the data will be sent. To achieve this, all digital connections incorporate a clocking signal—called *word clock*—which provides a common timing reference. Word clock also defines the number of individual samples (words) sent per second. Word-clock signals are either carried on a separate cable from the digital audio data cable or embedded in the digital audio data itself.

If word clock is embedded in the audio data, the transmitting device will become the clock master, and you should configure the device to use its internal clock as a timing reference. Then configure the receiving device as a slave to the transmitter's clock signal by setting its clock parameter to "external." You can then daisy-chain and synchronize additional devices to the transmitter's clock signal within the digital audio data stream (see **Fig. 1**).

Word clock can also be sent by a master-clock source on a separate cable. This clock signal can be sent by one of the devices in the system or a dedicated device whose sole function is to generate stable word clock. Such a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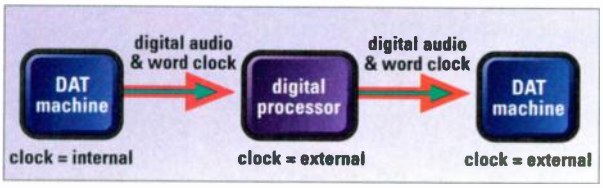

FIG. 1: If word clock is carried on the same cable as the digital audio data, designate the transmitter as the clock source by setting its clock to "internal." To sync other devices in the chain to this signal, set their clocks to "external."

device normally includes the connectors necessary for hooking up all your digital gear (see **Fig. 2**). A dedicated master clock is more common in complex professional systems.

AES/EBU

One of the most common digital audio interfaces is called AES/EBU, developed by the Audio Engineering Society and the European Broadcast Union in 1985. The AES/EBU format transmits two channels of digital audio serially (one bit at a time) over a single cable at resolutions of up to 24 bits per sample. It is not restricted to any particular sampling rates, although typical rates include 32, 44.1, and 48 kHz.

Along with the bits allotted for audio information, eight extra bits are used to carry *subcode* information: the sampling rate, error correction, and other information about the digital audio signal. However, not all AES/EBU devices use all of these subcode bits.

The standard means for transmitting an AES/EBU signal is a balanced, 110-ohm cable that is terminated with XLR connectors (see **Fig. 3**). Balanced XLR cables can transmit signals over distances of up to 100 meters without interference, at a level typically between 3 and 10 volts. But not all AES/EBU cables are XLR; you might encounter an AES/EBU device that uses balanced ¼-inch connectors or even a 75-ohm unbalanced video cable terminated with BNC connectors (those "push and turn" connectors you find on TV sets, VCRs, and cable boxes).

It's important to use the proper cables when connecting AES/EBU devices. Analog XLR cables, such as microphone cables, aren't right for the job. These have variable impedance ratings (typically 30 to 90 ohms) and can cause the digital data to be "reflected" back when it reaches the receiving end. This can result in timing errors (jitter), data corruption, and signal dropout. In addition, you should avoid passively splitting a digital signal.

The AES/EBU format is *self-clocking:* word clock is embedded in the digital audio stream. As a result, a single cable carries two channels of audio plus word clock. However, master-clocking AES/EBU devices is also possible and even recommended in larger, more complex systems. In this case, the master-clock signal is typically carried on a 75-ohm coaxial cable with BNC connectors (see **Fig. 3**). Keep in mind that not all AES/EBU devices have these BNC connectors, and some don't work with a word-clock signal other than the one in the incoming digital audio signal, so you might not be able to configure your own gear this way.

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S/PDIF

The Sony/Philips Digital Interface Format (S/PDIF), which is very similar to AES/EBU, can handle various sampling rates and resolutions of up to 24 bits, and also includes 8 subcode bits. However, the data in the subcode bits is somewhat different from the data AES/EBU subcode bits carry. The most notable difference is that some of the subcode bits are used by the Serial Copy Management System (SCMS), a copy-protection scheme that prevents multigeneration copying via S/PDIF. AES/EBU's corresponding subcode bits carry entirely different data.

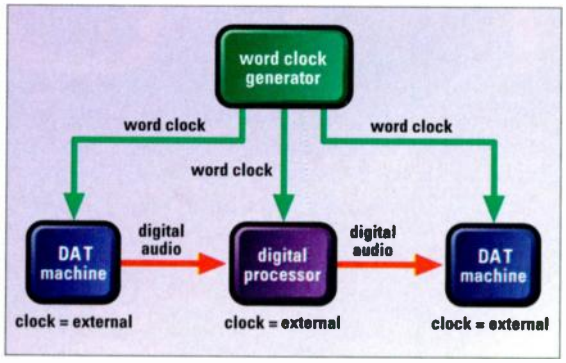

FIG. 2: In this system, a master clock sends word clock over a separate cable to all devices.

The S/PDIF interface typically uses unbalanced, 75-ohm coaxial cable terminated with RCA-style connectors. A video-dubbing cable terminated with RCA connectors is fine for making transfers, but an analog-audio cable is not. The S/PDIF signal's amplitude is about 0.5 volts—much lower than the AES/EBU signal's.

S/PDIF is also often implemented in an optical format called Toslink, which uses a small fiber-optic cable made of plastic or glass. Such optical interfaces avoid the problems associated with electrical connections, such as cable capacitance and grounding issues.

As with AES/EBU, S/PDIF word clock is carried in the digital audio bitstream. However, S/PDIF devices don't typically come with separate BNC word-clock connectors, so they can't be configured for a master-clock system.

AES/EBU and S/PDIF use similar data formats, so you might think that getting the two interfaces to work together is a simple matter of using an XLR-to-RCA adapter—but this isn't the case. The signal levels are very different (about 5 volts for AES/EBU and 0.5 volts for S/PDIF); the subcode bits contain different data; and mismatching a balanced, 110-ohm interface with an unbalanced, 75-ohm interface can corrupt the data. It is therefore a bad idea to make direct connections between AES/EBU and S/PDIF equipment. Instead, you should use some kind of dedicated format-converting device.

ADAT OPTICAL

The Alesis ADAT 8-track digital tape recorder comes equipped with a proprietary digital-connection format designed to carry eight channels of digital audio on a single fiber-optic cable (see **Fig. 4**). This format is known as ADAT Optical (sometimes called Lightpipe). You can also find the ADAT Optical interface on digital mixers, computer interfaces, synths, and effects devices.

Each channel can accommodate digital audio at sampling rates of 44.1 or 48 kHz with up to 24 bits of resolution, plus 64 bits for subcode information. However, ADAT Optical devices might be able to transmit only 20 bits of digital audio resolution. For example, all of Alesis's current recorders have a resolution of 20 bits or less. If you own a device with an ADAT Optical interface, you should check with the manufacturer to see whether the interface sends all 24 bits of digital audio.

The fiber-optic cables used for ADAT Optical are the same as those used for Toslink, but the data format and transmission rate are completely different. Therefore, you can't plug one directly into the other and expect results. Typically, ADAT Optical cables work well at lengths of up to 10 or

FIG. 3: The Apogee PSX-100 includes AES/EBU connectors (3-pin XLR) and word-clock BNC connectors (labeled WC In and WC Out).

FIG. 4: As you might expect, the Alesis ADAT XT20 includes ADAT Optical connectors.

15 meters, and they can run even longer with glass cables.

The ADAT Optical format uses an embedded clock signal that does the same job as standard word clock. The timing signal is also transmitted on a separate 9-pin sync cable that carries additional transport-control information. Some devices equipped with the ADAT Optical interface require both connections to work properly, whereas others require only the optical cable to be connected.

TDIF

Tascam's DA-88 family of 8-track digital tape recorders has its own proprietary digital audio interface called Tascam Digital Interface Format (TDIF). Unlike the other interfaces I've discussed here, this is a bidirectional interface: a single cable carries eight channels of data in both directions. TDIF cables are multiwire, unbalanced cables terminated with 25-pin D-sub connectors, and their recommended length limit is 5 meters. This interface is implemented on Tascam recorders in the DA-88 line, Tascam digital mixers and peripherals, and third-party products such as interface cards for digital mixers and computers.

As with most digital-interface formats, TDIF supports multiple sampling rates and resolutions of up to 24 bits. It is intended to operate as a master-clocked system with a separate 75-ohm cable terminated with BNC connectors that carries standard word clock. However, each pair of channels within the TDIF interface also carries a clock signal called Left-Right Clock (LRCK). This signal runs at the same rate as standard word clock and defines the odd and even channels within the pair. As a result, LRCK can often be used instead of an external word-clock signal if the TDIF device supports it.

Other digital audio interfaces are out there, but the ones I've covered here are the current crop of widely used formats. They all have similarities, so a basic understanding of these formats and how they handle the issues common to all digital interfaces will help you use your digital equipment effectively and make good digital interconnections.

Jeff Baust *is a professor of music technology at the Berklee College of Music.*

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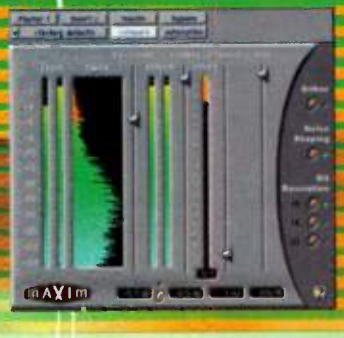

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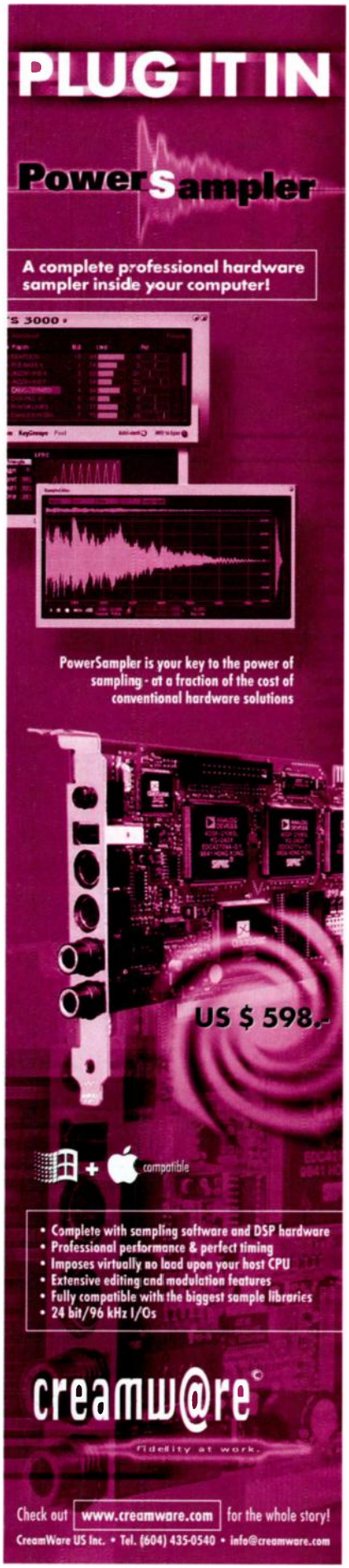

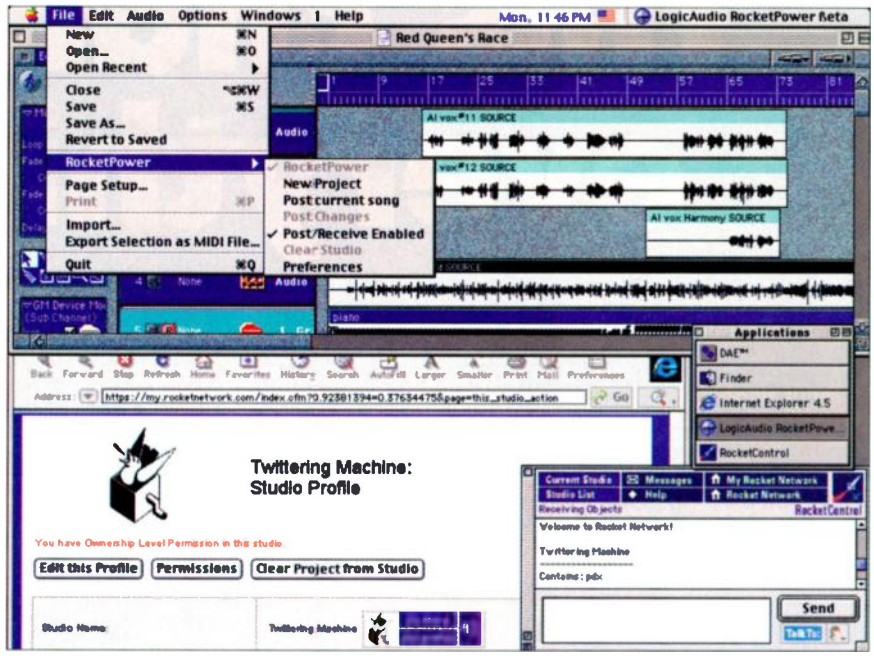

FIG. 3: The Twittering Machine virtual studio page shows that "pdx" (Peter Drescher) is logged on. Notice the RocketPower item in *Logic Audio*'s File menu.

wasn't overjoyed at the prospect of learning a new digital audio sequencer—especially a beta version—but with a little help from Rocket Network's Andy Russell, I was able to get up and running without too much trouble.

After that, I registered as a new user at Rocket Network's Web site (www.rocketnetwork.com) and downloaded the latest version of *RocketControl*. This application is the glue that holds the whole system together. It provides a gateway for sending and receiving digital audio data to and from the Rocket Network servers, controls log-on and chat functions, and launches the required Web pages.

This is where I first ran into problems, as the dynamic HTML pages that display the available online studios would not load in Netscape *Navigator* 4.5. At first we suspected that my system did not have enough RAM (the site recommends 128 MB and I had only 88 MB). I then installed additional memory, but to no avail. Installing the latest version of Microsoft's *Internet Explorer* and making it the default browser, however, solved my problem.

I'm no stranger to using beta software, so I wasn't too surprised that simultaneously opening the sequencer, the Digidesign Audio Engine, the browser, and *RocketControl* caused my whole system to collapse occasionally. Excellent tech support from Rocket Network's Kriss de Jong (aka TekNoSan) helped me work through the bugs, and things stabilized after a while.

CREATING A SESSION

My plan was to set up a virtual studio on the server, create a new project, record the conga player from the Rocket Network offices, and track the vocalist from Henshall's home studio. To simulate a situation in which the participants are on different continents, we tried to communicate using only the online chat functions. In addition, none of the musicians had heard the song prior to the session. It was a grand experiment, and I was both thrilled and skeptical.

I fired up the RocketPower version of *Logic Audio*, which looks and acts just like the regular version 4.0 except that it includes a new RocketPower item under the File menu (see **Fig. 3**). I selected that option to launch the *RocketControl* client software, which asked for my user ID and password. *RocketControl* then started the Web browser, logged on to the Rocket Network system, and took me directly to a Web page that displayed the studios I had access to, my bookmarks, and other relevant information. There we created a new virtual studio called Twittering Machine.

For the purposes of this article, Rocket Network provided me with a virtual studio. Normally, I would have to

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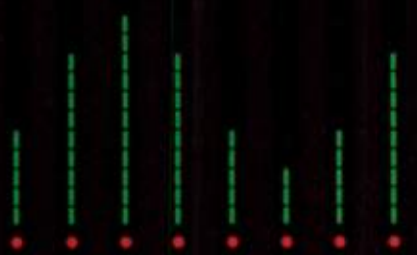

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go to a third-party source such as HarmonyCentral.com, Steinberg, or Emagic to lease studio space of my own. These companies buy large blocks of studios from Rocket Network and rent them out to individuals. I'd pay a yearly fee for a certain amount of bandwidth and storage, the same way I pay an Internet service provider to host my site.

As the studio owner, I control who has access to my studio and which users may contribute audio to a session. I can also enter profile information that lets other users know which instruments I play, what music I work with, and what hats I wear (composer, producer, and so on).

To begin the session, I selected New Project from the RocketPower menu and uploaded my piano and bass MIDI tracks to the Rocket Network server so that the conga player and vocalist would have something to listen to while recording. Because the amount of MIDI data was so small, the transfer was practically instantaneous. However, I had no way of knowing how the tracks would play on the other users' sound modules, so I recorded the audio output of my Roland SoundCanvas and posted the resulting two-minute AIFF file.

Because everyone involved with this session had fast Internet connections, we decided to use the Standard compression mode and upload the full 16-bit, 44 kHz AIFF source files when we were done. A buggy implementation of the QDesign codec in my beta version of *Logic Audio* caused the compression step to take a very long time, but this problem has since been corrected.

SYSTEM RECOMMENDATIONS

Many applications have to work together to make recording on the Rocket Network system possible. System requirements depend on your digital audio sequencer and Web browser as well as the *RocketControl* application.

If you're running Windows 98 or Windows NT 4.0, Rocket Network recommends using a Pentium/300 with 128 MB of RAM and 20 MB of hard disk space. You'll also need access to the Internet and either Microsoft's *Internet Explorer* 4.0 or Netscape *Communicator* 4.0 (or later).

Macintosh users need at least a PowerPC 604e/200 running Mac OS 8.1; Rocket Network recommends a G3. You'll also need 128 MB of RAM, 20 MB of hard disk space, Internet access, and either *Internet Explorer* 4.5 or *Communicator* 4.0 (or later).

AUSPICIOUS BEGINNINGS

Michaelle Goerlitz of the band Wild Mango arrived at Rocket Network headquarters just as my audio files finished posting. An excellent player, she was able to lay down an impressive conga track in just a few takes (see **Fig. 4**). Andy Russell compressed and posted the track, and it soon arrived on my computer.

I had something of an epiphany when I pushed Play and heard Goerlitz's track for the first time. Although I had found the online demo only somewhat interesting aesthetically, producing an actual song over the Internet turned out to be an extraordinarily compelling experience.

Through *RocketControl*'s chat functions, I asked Goerlitz to take a solo after the *coro* of the tune. Soon, my audio disk started chugging away, and five tracks of smoking conga solos showed up in my session. At this point, I was ecstatic.

BEING THERE

For me, there's a big difference between tracking a rhythm part like the congas and tracking vocals. To get just the right feeling, I like to coach a vocalist while I'm working. Here, I had to communicate entirely via the chat window, which proved difficult—especially when the other studio's computer crashed. For most of the session I really missed being there, and sometimes I even felt a little left out of the loop on my own project.

On a technical level, too, the vocal session didn't go as smoothly as the conga session, again due to problems in the prerelease software. Earlier, I had given the lyrics to vocalist Al Owens of Motion Music and uploaded a MIDI flute line of the intended melody as a guide track. When Owens arrived at Henshall's home studio, Henshall logged on and told me he was getting set up to record.

Under "normal" recording circumstances, I would have taken this time to go over the song with the vocalist, explain what I was looking for, and make suggestions. As it was, all I could do was sit and wait until the chat window said, "OK, we're going to record now." Once the first vocal take posted, I listened to it a few times and made some critiques, requests, and suggestions using the chat window. I was still waiting for a reply when I got the message "OK, we just did three more takes!" Apparently they had received my directions and acted on them without actually telling me they were doing

FIG. 4: Michaelle Goerlitz lays down a conga part while Andy Russell mans the computers at the Rocket Network studio.

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so, which I found kind of confusing.

Then we hit a patch of technical difficulties. Henshall had to reboot a couple of times, the compression took forever, and then *all* the audio data (not just the vocal tracks Henshall had recorded) got compressed and uploaded—twice! The result was that I didn't get to hear the subsequent takes or the harmony parts for almost two hours. At that point, the vocalist had already gone home. Fortunately, Owens is an excellent singer and I was quite happy with his tracks, but the overall experience was a little disconcerting.

I went into this project knowing that bugs were still being ironed out, so I wasn't surprised that the sessions weren't technically flawless. These troubles aside, I came away feeling that Rocket Network's system has great potential.

FUTURE REVS

Rocket Network has big plans for the future. The company is creating a new browser interface and redesigning the *RocketControl* user interface to make navigating the system easier. Users will be able to customize their studio's Web page to a greater degree. A new Bounce to Web feature will let any user with a Web browser hear a project's current mix without installing sequencing software. Rocket Network is working up a database of registered musicians that will be searchable by a broad range of criteria and able to generate contracts and arrange for payment through an escrow service; online catalogs of sound effects and production music will allow producers to quickly audition and purchase audio for commercial spots; and QuickTime video capabilities will speed the production of TV and film scores.

Professional recording facilities such as Tomandandy, the Berklee College of Music, and Serafine Studios are already lining up to rent Internet studio suites for internal projects. Third-party developers like Euphonix, Digidesign, and G-Vox are building RocketPower into their products, and more developers are coming on board every day.

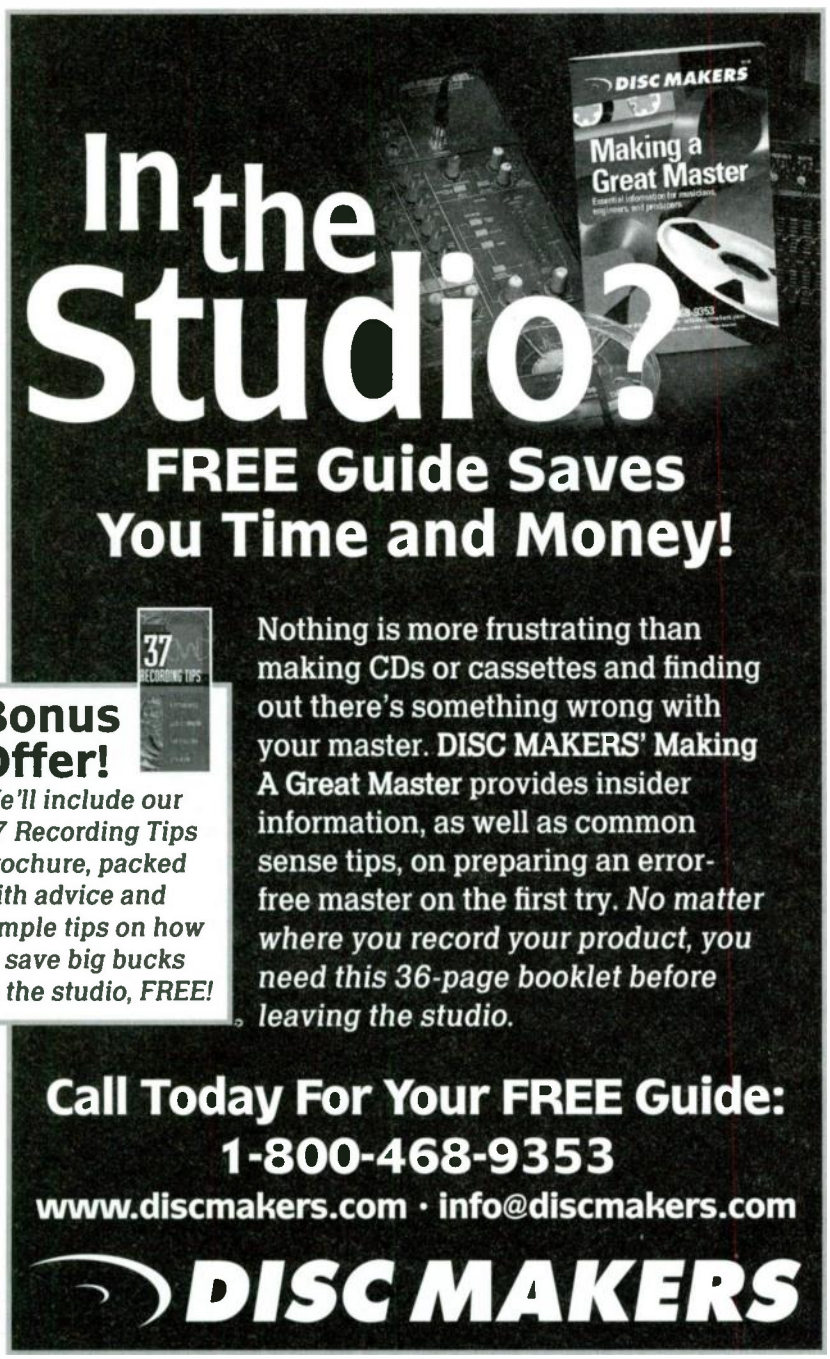
ONE GIANT LEAP

The ability to collaborate quickly and cost-effectively with an international pool of musicians is certainly a compelling reason to look into this new technology. For me, the biggest drawback to recording online is that I'm not in the room with the musicians during the session. On the other hand, the idea of working online with musicians I would never otherwise have the opportunity to meet is pretty exciting.

I did have some technical problems, but those stemmed from the beta version of the digital audio sequencer I was using, and those bugs will have been corrected by the time you read this. Nevertheless, you will have to meet some hefty hardware and ISP requirements to use the system. (Don't try this with a 14.4 kbps modem, folks.)

Like everything that involves the Internet, the Rocket Network system is a work in progress that will continue to evolve as each new development partner signs on and adds features. Still, it's clear that the Internet recording studio is an idea whose time has come.

Peter Drescher *is a composer and the owner of Twittering Machine, a project studio in San Francisco. You can hear the final mix of the song described in this article at www.twittering.com/EM/rocket.html.*



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Compiled by Mike Levine

Welcome to "Operation Help," the column dedicated to helping you get more out of your gear. This month we offer advice from Emagic on setting up groove templates in *Logic Audio*, from GT Electronics on omnidirectional miking, and from Sonic Foundry on getting more from *Acid* software. We also get tips from an electronics expert on minimizing the effect of radio frequency interference on audio gear.

In Emagic's *Logic Audio*, groove templates can be made from sequence data or extracted from an audio track.

FROM THE MANUFACTURERS

Setting up Groove Templates in Emagic's *Logic Audio*

In addition to extremely stable timing, Emagic's *Logic Audio Platinum* and *Logic Audio Gold* feature some of the most extensive and musical groove functions available on the market today. The real-time, nondestructive nature of the program is extremely effective for creating, editing, and auditioning MIDI groove templates that you've generated, imported, or extracted from digital audio. You can create MIDI groove templates in *Logic Audio* in one of the following ways:

1. Select any existing MIDI sequence that you wish to use as a MIDI groove template. Select Make Groove Template (Options → Groove Template → Make Groove Template).

2. Record or step enter one bar of 16th notes. Modify the positions, Velocities, and note lengths until you have the groove or feel you want, then select Make Groove Template.

3. Import a *Cubase* DNA groove.

4. Within *Logic Audio*'s integrated stereo Sample Editor, extract the groove from any digital audio region using the Digital Factory's Audio-to-MIDI Groove Template feature.

Most sequencers' groove templates contain only note-position information, which determines the rhythm and feel of the sequence. In *Logic Audio*, the templates also contain Velocity (accents)

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and note-length (articulation) data. This is crucial to the accurate reproduction of a groove.

Logic Audio's extended sequence parameters (Options → Arrange) offer extensive parameters for quantizing MIDI sequences nondestructively. After you have quantized a sequence with a groove template, you can edit the following extended parameters in real time while you listen:

1. Q-Strength. This adjusts the percentage of quantization that the selected MIDI sequence will receive. The default setting is 100 percent. Lowering the percentage will move the notes in the sequence farther from the groove template's note-position grid, thus "loosening" the feel. Zero-percent Q-Strength will remove all quantization.

2. Q-Veloc. This adjusts the amount of the groove template's Velocity envelope that is imposed on the selected MIDI sequence. When Q-Veloc is at 0 percent (the default setting), the notes in the sequence will play back at their original Velocities. At 100 percent, the selected sequence will have exactly the same Velocity envelope as the groove template.

3. Q-Length. This adjusts the amount of the groove template's note-length information that the selected MIDI sequence will contain. At the default setting of 0 percent, note lengths in the selected sequence will remain the same. When you increase Q-Length to 100 percent, the selected sequence will have note-length information matching that of the groove template.

All these edits affect only playback and are totally nondestructive. You can massage the settings in real time and the results are immediately audible. This is a primary strength of *Logic Audio*'s real-time functionality. It's a very musical but often overlooked feature.

Here's the kicker: once you've added a groove template to one or more MIDI sequences, you can edit that groove template in real time with the Matrix, Event, Score, or Transform Editor. Any edits you make will affect (in real time) all the sequences using that groove template. This feature is called the Living Groove Connection.

Here are some power tips:

1. Name your sequence before using the Make Groove Template function. The groove template is then added to the bottom of the quantize selection list in the MIDI Playback Parameter and Extended Sequence Parameter windows.

2. Copy your groove templates for variation.

3. In your Autoload's Arrange window, store groove templates in a folder named Grooves.

4. Investigate and learn how to use the Digital Factory's Audio-to-MIDI Groove Template function.—*Clint Ward, Emagic*

Omnidirectional Miking Tips from GT Electronics

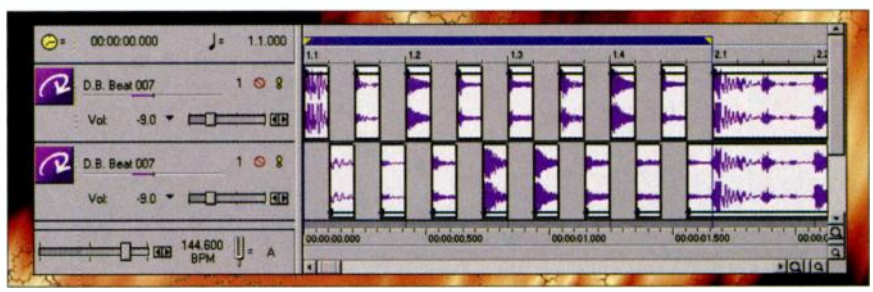
An omnidirectional microphone picks up equal sound energy from all directions. The polar pattern is, in theory, a perfect circle, although in practical application this is difficult to achieve. Because of this polar pattern, the signal includes both the direct source and the reverberant sound reflecting off the surfaces in the room. You must choose your mic placement carefully to achieve the right blend.

The closer the microphone is to the source, the more distinct and present the sound will be. The farther it is from the source, the more diffuse and less clear (but more spacious) the sound. The distance at which direct sound and ambient reflections are equal is called *critical distance*. Be aware of critical distance when you're deciding on mic placement. With an omni microphone, follow the three-to-one rule. For example, if the room is ten square feet, the mic should be within three feet of the source.

Omni microphones are a frequent choice for stereo-miking or room-ambience applications, but they are often overlooked as instrument mics. The new GT Electronics AM30 and AM40 microphones have midsize (¾-inch) diaphragms with interchangeable capsule designs, allowing you to easily change from the supplied cardioid capsule to a supercardioid or omnidirectional capsule. Here are a few omni capsule secrets to help you get the most out of your new (or existing) omnidirectional microphone in a close-miking application:

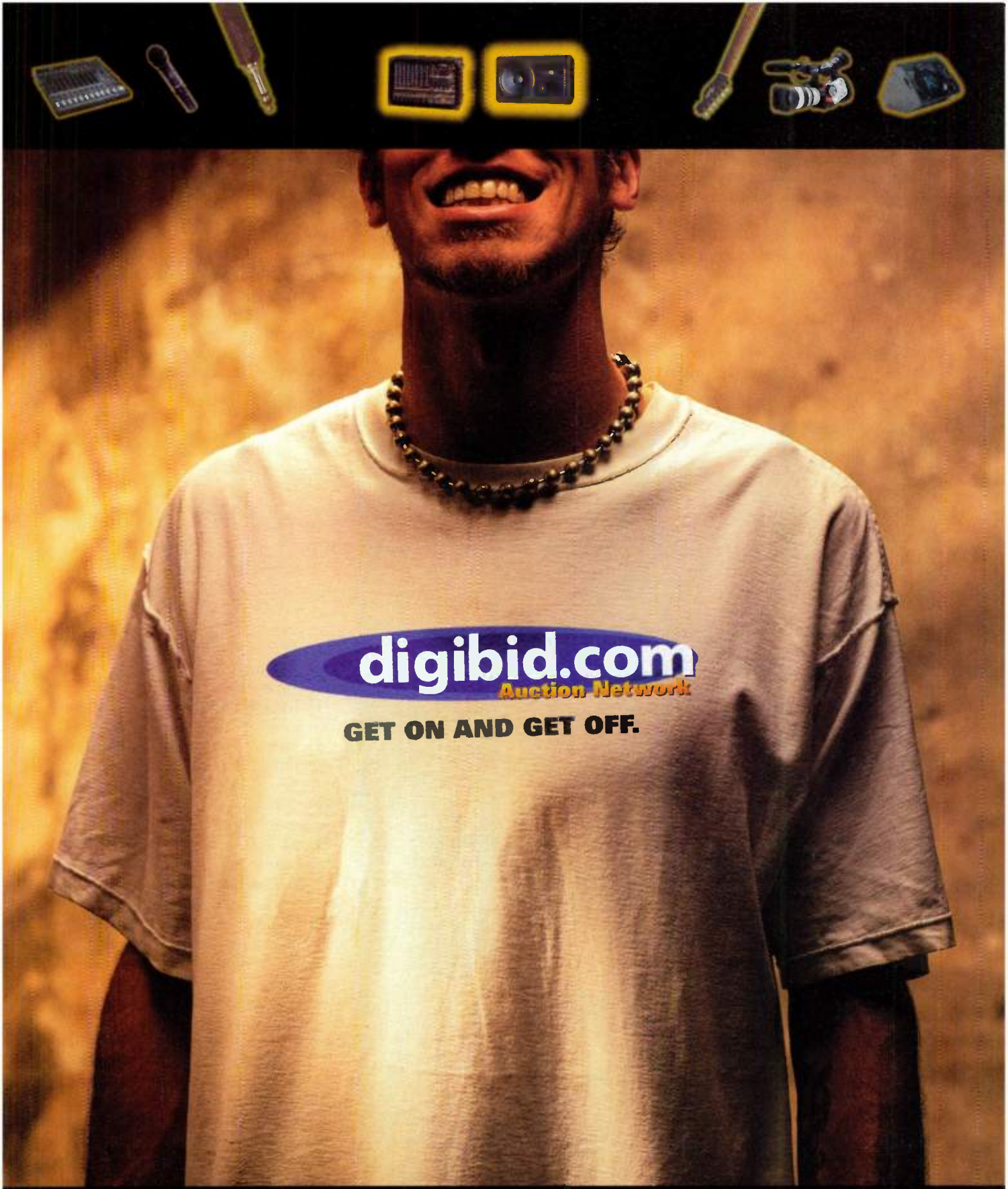
1. Omni microphones typically exhibit a smoother, more linear response than other types of capsules.

2. Unlike directional microphones, omni microphones are immune to the *proximity effect*, the increase in a mic's



In Sonic Foundry's *Acid* software, you can set up a track for ping-pong panning, a technique that bounces the audio rapidly between the left and right sides.

For manufacturer information, please see Contact Sheet, p. 195.



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low-frequency sensitivity when it's placed very close to an instrument.

3. Omni mics commonly have higher outputs (4–6 dB) and better signal-to-noise ratios than mics with other patterns.

4. Because of their gradient pressure sensitivity, omni mics are not as susceptible to wind noise, which makes them a good outdoor miking solution.

With these unique properties, an omni microphone can be an outstanding choice, yielding exceptional (and sometimes surprising) results as a close-instrument mic. On acoustic guitar and other stringed instruments, the absence of the proximity effect and the mic's linear response allow for close miking without the "boominess" you often get when miking near the sound hole with a cardioid or other directional pattern. Saxophone tones can also benefit from an omni pickup; try miking closely with an omni mic if your brass tracks are honky, nasal, or pinched-sounding.

Of course, omnidirectional mics have their own set of placement and dynamic considerations. Here are several things you should keep in mind:

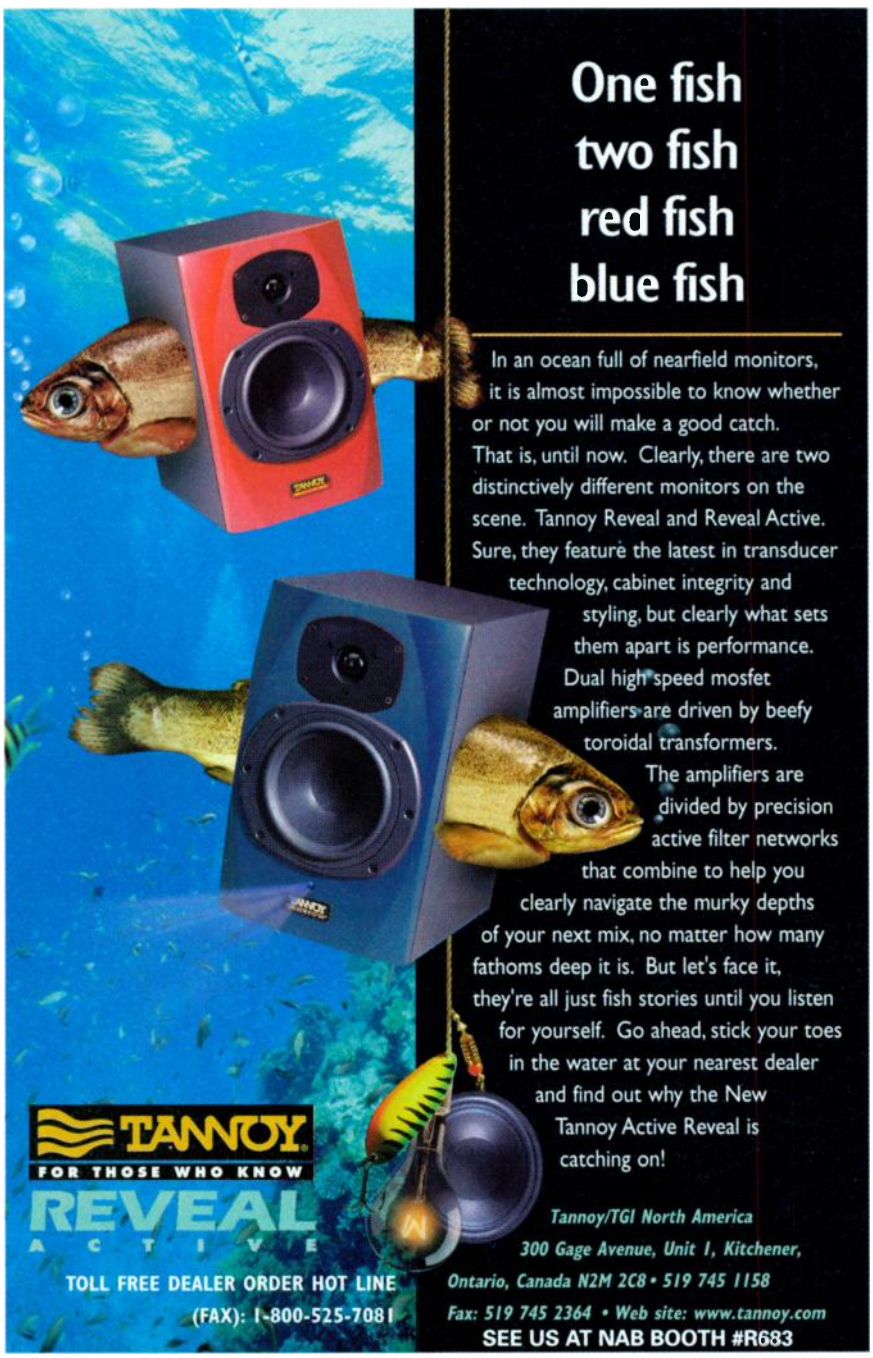
1. Omni mics are more responsive to low frequencies.

2. Because they pick up sound from all directions, omni mics are more likely to register the rumble from air conditioners and heaters.

3. When you use omni mics outdoors, close placement is necessary to prevent picking up too much ambient noise.

4. To avoid excessive bleed, be careful when placing omni mics relative to other instruments.

With these tips, and some practice, you can make the most of your omni mics.—*Randy Neiman, GT Electronics (a division of Alesis)*



Getting More out of *Acid*

If you own a PC and are into loop-based music production, you probably use one of Sonic Foundry's *Acid* software products. Following are six quick tips to help you get even more out of *Acid*. Except where otherwise specified, these tips apply to all titles in the *Acid* software family.

1. *Acid*-izing one-shots. *Acid* assumes that most WAV files are 4-beat loops. That can be annoying if you want to work with an existing library of one-shot WAV files, such as individual drum samples. A freeware utility called *Acidizer* (www.xaviersjoint.com/acidizer.htm) will make WAV files recognizable as one-shots to *Acid*.

2. Easy tool swapping. You can quickly cycle through the *Acid* tools. Press D to cycle forward, and Shift+D to cycle backward.

3. Slip 'n' split. For an easy variation on a track, try splitting an event (S is the keyboard shortcut for the Split function) and then holding down Control and Shift while dragging within either of the newly split segments. The event stays where it was, but the audio data "slips" backward or forward, resulting in a quick shuffle or syncopated fill.

4. Dragging drumrolls. Add a volume envelope (volume envelopes are not supported in *AcidXpress*) to the event you're editing, pick out a drumbeat, and split just to the left of it. Select the Draw tool, then hold down Control while dragging and dropping copies of the beat, thus creating a drumroll. For a more even-sounding roll, snap to 16th or 32nd notes. You can add a

TECHNICAL SUPPORT

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crescendo to the roll by increasing the volume envelope slightly for each new event.

5. Painting plaid. The Paint tool works like Bugs Bunny's can of plaid paint—no matter how sloppily you paint in the events, the loops always line up with the grid. The Paint tool also affords easy access to the Erase tool (via the right-hand mouse button), which behaves in the same way. If you deselect Enable Snap To (F8), you can splotch together elaborate cut-up variations on a loop while keeping the original rhythm intact.

6. Ping-pong panning. Paint in a long event and add a pan envelope to it (*AcidXpress* does not support pan envelopes). Duplicate the track, then pan one track completely to the left and the other to the right. Next, use the Erase tool to chop out alternating bits of the audio, giving it a rapid-fire stereo movement.

Also try bouncing between two different FX envelopes (only *Acid Music* 2.0 and *Acid Pro* 2.0 support FX envelopes), or changing the pitch of the duplicated track using the track header's Pitch Shift shortcut menu.—*Frank Shotwell, Sonic Foundry*

QUESTIONS FROM READERS

RF Predicament

Q: I live near a 100 kW FM radio station broadcasting on 92.3 MHz. Many appliances in my house pick up interference from the station, but particularly bothersome is the radio frequency (RF) interference that my telephones and musical equipment pick up. For example, my music system receives the radio signals in the line between the amplifier and speaker. I have tried a number of tricks, including shortening the cable, wrapping it around toroids, creating loops and kinks in it, rerouting it, using heavy-gauge Monster cable, and (per the recommendation of the station's chief engineer) inserting a 47 pF capacitor across the volume control to ground. Some of these tricks help, but nothing snuffs out the interference altogether. Is there a way to design and install a low-pass filter that will effectively eliminate the broadcast interference while not significantly affecting my sound quality?

Steve Poteet
via e-mail

A: To answer your question, we consulted Peter Miller of CAE Sound in San Mateo, California. Miller is an electronics expert who has designed and repaired gear for the Grateful Dead and other major acts.

According to Miller, installing low-pass filters and other modifications might help, but it's probably not a cost-effective solution. "It would be cheaper to replace your gear," he says, "or even move to another location." He further points out that living in such close proximity to heavy amounts of RF could pose a health risk.

If you're planning to stay in your present location, however, Miller has some suggestions on how to deal with the problem. "Basically we're looking at a couple of techniques to combat RF energy. Put all of your gear in a steel equipment rack. Get a rack that has front and rear doors so that you completely isolate your equipment from the radio noise."

It's also very important, he says, to be sure that your equipment is properly grounded. Making the switch to balanced gear would help a great deal, as well. "Consumer hi-fi equipment and low-end, unbalanced audio equipment is much more susceptible to this kind of problem," explains Miller. "If you really want to beat that RF interference, you'll have to jump into the professional, balanced world with as much of your equipment as possible."

Miller recalls a friend of his who lived near a radio tower and had a similar problem. "It seemed that his speaker wire was picking up radio noise. He even went so far as to put the speaker wire inside steel electrical conduit to shield it."

Finally, Miller suggests that you find out whether the radio station's transmissions are exceeding the legal limits. "One question that remains unanswered," he says, "is whether the transmitter's field strength is acceptable to the Federal Communications Commission."—*Mike Levine*

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DIGIDESIGN

DIGI 001 (MAC)

An all-in-one Pro Tools system for under a grand.

By Gino Robair

Digidesign's Pro Tools remains one of the most popular digital audio workstations on the market. Unfortunately, most personal-studio owners don't have the $5,999 (or more) that it takes to get started with a Pro Tools TDM system with its DSP-based processing power.

And the competition has been catching up. A number of other companies have released DAWs and digital audio sequencers that cost well under $1,000, work with third-party hardware, and support real-time plug-in formats such as VST or DirectX. Although Digidesign has made some attempts to cater to this market with less-expensive packages such as ToolBox, these systems don't include support for real-time plug-ins or feature MIDI sequencing capability.

Enter Digi 001, the long-anticipated personal-studio-priced digital audio sequencer from Digidesign. Digi 001 includes a hardware interface (see Fig. 1) and PCI card, and it runs *Pro Tools LE*, a host-based "lite" version of *Pro Tools* version 5.0. *LE* features a MIDI sequencer and 24-bit audio capability, just like the TDM version of *Pro Tools* 5.0, and also introduces a new plug-in format called Real Time AudioSuite. Ever since I'd heard rumor of this feature-enhanced, lower-priced system, I couldn't wait to take it for a spin. Since I'm familiar with the power of the higher-end TDM systems, I was especially curious to see how robust Digi 001 would be and what kind of demands it would place on my computer.

PACKAGE DEAL

Digi 001 is designed to be a studio in a box (sans amplifier and speakers, of course). Along with the PCI card,

FIG. 1: The Digi 001 hardware interface features a pair of built-in microphone preamps, 48V phantom power, and a –26 dB pad. The Neutrik combo jacks can also accept ¼-inch plugs with line- or instrument-level signals.

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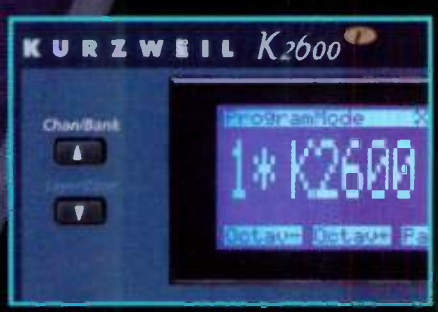

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FIG. 2: The rear panel features MIDI In and Out, RCA S/PDIF I/O, six balanced TRS inputs, two Main and two Monitor outputs on balanced TRS jacks at +4 dBV, and six unbalanced outputs at –10 dBu.

hardware interface, and *Pro Tools LE* software, the package includes an optical cable and a cable to connect the PCI card to the interface. Digidesign intended Digi 001 to be a plug-and-play product, and indeed it is—if you meet the minimum RAM and OS requirements.

For starters, if you're used to running your digital audio sequencer with 64 MB of RAM, you'll need to double that amount to run this program. Although Digi 001's minimum requirement is 128 MB of RAM, Digidesign recommends that you have at least 192 MB, and if you want to take full advantage of the system by running 24 audio tracks, numerous MIDI tracks, and plug-ins galore, you will need even more. Needless to say, this isn't your typical "lite" version of an application.

ON THE FACE OF IT

The Digi 001 hardware interface is designed for use with or without a mixer, and sports a nice complement of I/O options. The unit is 1U, beginning at 13.5 inches wide without the rack ears attached, and is powered by your computer via a 6-foot multipin cable that attaches from the rear panel to the PCI card. A front-panel light indicates that the interface is on. While the cable is long enough to let me easily reach the interface when it's in the rack, I wish there were a power button on the unit so I could shut it off when I'm using my computer for nonmusical chores.

The Digi 001 interface can handle most I/O needs. The front panel has two mic/line inputs with convenient Neutrik combo (XLR and ¼-inch) jacks that accept mic-, instrument-, and line-level signals. These inputs, channels 1 and 2, feature mic preamps (a first for Digidesign), a –26 dB pad for line-level signals, and separate gain controls. A single front-panel switch adds phantom power to both inputs at the same time. A software-selectable highpass filter (shelving at 60 Hz) on channels 1 and 2 removes low-end artifacts while recording. The front panel also has a volume control for the Monitor outputs, a headphone jack with a dedicated gain control, and a Monitor Mode switch.

The remaining six analog inputs, channels 3 through 8, are on the rear panel (see **Fig. 2**). Inputs 3 and 4, also called the Monitor Inputs, are used in conjunction with the Monitor mode. When the front-panel Monitor Mode switch is on, signals sent to Monitor Inputs 3 and 4 will go to Main Outputs 1 and 2, respectively, so you can use the interface as a simple mixer even if the unit is disconnected from your computer.

The mic preamps compare favorably to the ones built into my studio mixer, and the tracks I recorded through the interface sounded great. The A/D/A converters are all 24 bit, and you can run a session in 16- or 24-bit resolution at either 44.1 or 48 kHz. A dither plug-in comes standard and allows you to select a bit resolution of 16, 18, or 20.

I'll admit that a couple of things about Digi 001 immediately stuck in my craw when I first started recording. To begin with, the hardware interface has no level meters. While you can watch the meters in the Mix or Edit windows as you manually adjust the gain level for channels 1 and 2, gain adjustments for inputs 3 through 8 must be done with the software, and the necessary dialog box is two click levels away from the surface of the program. The program also doesn't allow you to hear the results as you change levels. You need to execute a change before you can see and hear the results.

Also on the rear panel are ten analog outputs: two Monitor Outputs and two Main Outputs on balanced ¼-inch TRS jacks operating at +4 dBV, and six additional outputs on unbalanced ¼-inch jacks operating at –10 dBu. In Stereo Mix Output mode, the outputs are grouped into pairs, allowing for stereo panning. In Direct Output mode, audio can be sent to each output individually, which is useful if you're going to route each output through an analog mixer, or use the outputs for sends and returns. Other rear-panel connections include MIDI In and Out, a footswitch jack, a 9-pin serial connector, and S/PDIF I/O on RCA jacks.

The Digi 001 system also includes

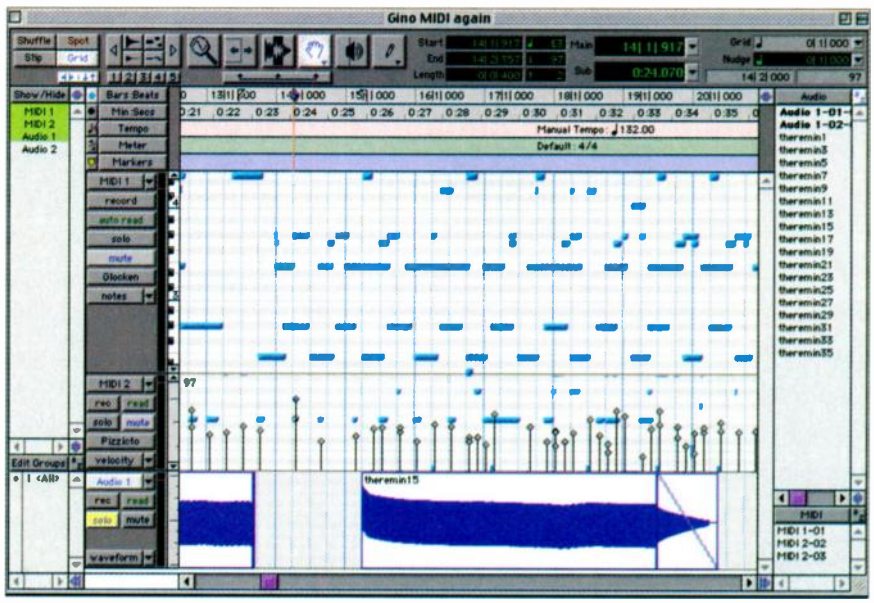
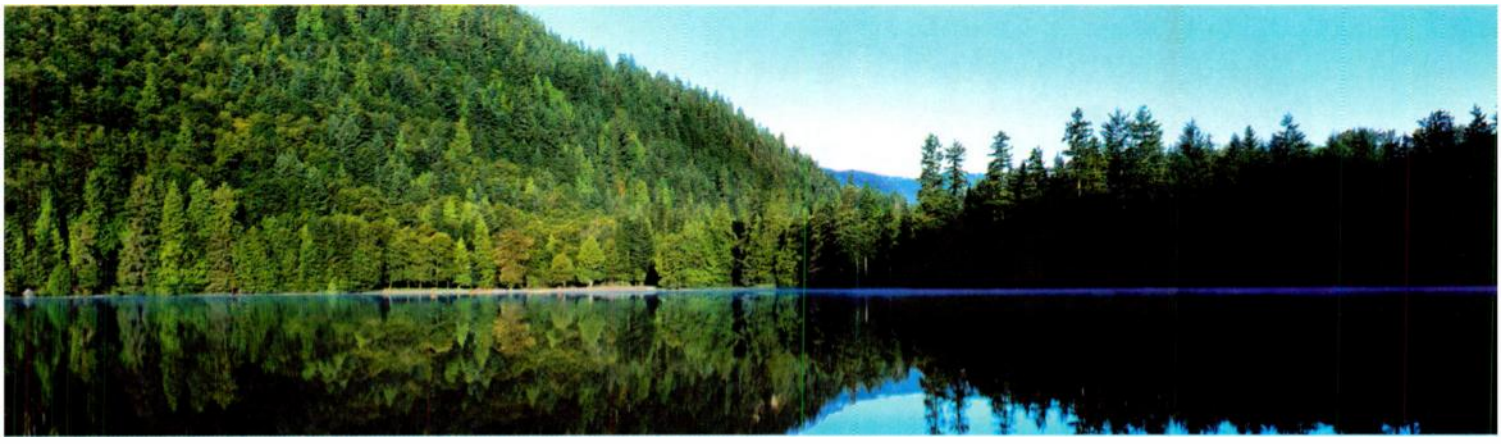


FIG. 3: This view of the *Pro Tools LE* Edit window shows the vertical keyboard to the left of the MIDI 1 track. The MIDI 2 track shows the Velocity stalks for each MIDI note in that track. The grid appears in the background.

For manufacturer information, please see Contact Sheet, p. 195.

From a land of forests & fables



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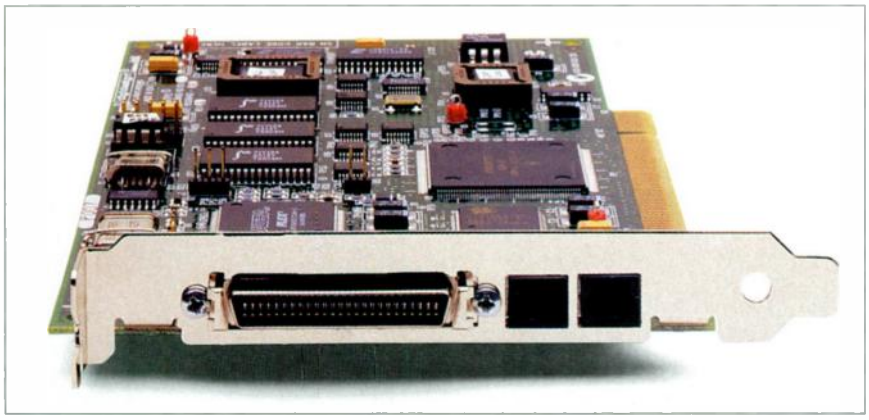

The Digi 001 PCI card includes a multipin connector that attaches to and powers the hardware interface, as well as optical digital I/O that's switchable between 8-channel ADAT Lightpipe and 2-channel S/PDIF.

optical I/O on the PCI card. In software, you can select whether the optical connections send and receive 8-channel ADAT or 2-channel S/PDIF information. Digi 001 gives you the option of using S/PDIF Mirroring, which sends the same signals that are routed to outputs 1 and 2 to the selected S/PDIF output simultaneously. When S/PDIF Mirroring is disabled, the S/PDIF outputs can be routed independently, so you can use them for sends and returns.

I didn't like having the optical I/O on the PCI card, however, for several reasons. First, it's difficult to access, unless you connect the cables to the card when you install it and leave them connected until you need them. Second, the distance from the bottom of my computer tower to almost any position in my rack is greater than the length of the optical cable supplied with the Digi 001 system—you'll need to invest in a pair of long cables if you plan to use the optical input and output at the same time. Lastly, there's no ADAT sync in the Digi 001 system, although I didn't encounter any problems when I recorded to and from Digi 001 with an ADAT.

These inconveniences aside, Digi 001 allows you to use up to 18 inputs or outputs simultaneously, which isn't bad, considering the size of the interface.

As would be expected, *Pro Tools LE* imports Sound Designer II files. You can also open AIFF, WAV, SND, and QuickTime files using the Convert and Import Audio command. *Pro Tools LE* can also export these file types, as well as RealAudio G2 and MP3. To export MP3 files, you'll need to buy an optional encoder ($19.95) directly from Digidesign's Web site, although *Pro Tools LE* comes with a 30-day demo version.

I should also mention that you can change the color of the Digi 001 faceplate to match the color of your computer (unless you're running a beige G3, as I am). Faceplates are available from Digidesign for an extra $29.95.

RESPECT YOUR HOST

Pro Tools LE is a host-based DSP/plug-in engine that runs *Pro Tools* 5.0 software under the hood. For the most part, *Pro Tools LE* looks and acts like the TDM version, with certain limitations.

The maximum number of mono audio tracks that can be played back simultaneously in *LE* is 24 (compared with a maximum of 64 in a Pro Tools/24 Mix TDM version). In addition, *LE* gives you a maximum of 16 internal mix buses (versus 32 in a TDM system), as well as five inserts and five sends per track (the same as in the TDM version). Running *Pro Tools LE* with the Digi 001 interface gives you 24-bit A/D/A conversion. If you're using an Audiomedia III card with *LE*, you'll have only 18-bit A/D/A conversion, although the card can handle 24-bit word lengths through the digital I/O.

One important thing to know is that *Pro Tools LE* sessions are interchangeable, under certain conditions, with sessions created on Pro Tools/24 Mix-plus TDM systems. *LE*-created sessions will work in TDM systems with no trouble, including automation and plug-in settings. One way to create sessions on a TDM system that will work on an *LE* system is to limit your session to 24 tracks or less and 16 buses or less. Another way is to select Pro Tools LE on Mix in the Playback Engine Setup in the TDM application before creating your session. This step still allows you to use the Mix or 24 Mix I/O, but *Pro Tools* will be run on the host processor rather than the TDM DSP cards. You'll also need to make sure you limit the track count to 24; any

FIG. 4: A Mix window view showing that the Bomb Factory's Moogerfooger Ring Modulator plug-in has been added to track 3. The MIDI-fortified transport controls are visible just below the plug-in.

DIRECTCONNECT RTAS

Digidesign has nearly completed its DirectConnect RTAS plug-in for *Pro Tools* 5.0. In conjunction with *LE*, DirectConnect will allow you to control software samplers and synthesizers via MIDI and route the output directly into an aux input of the *Pro Tools* mixer. By connecting to the mixer internally, you maintain a 24-bit word length while keeping latency at a very low level.

A number of third-party applications will work with DirectConnect RTAS when it's released, including Koblo's *Studio 9000*, BitHeadz's *Retro AS-1* and *Unity DS-1*, and Native Instruments' *Reaktor*. But keep in mind that combining CPU-intensive applications such as *Pro Tools LE* with a software synth or sampler will require a faster processor and more RAM.

additional tracks will be discarded when the session is opened in *Pro Tools LE*. This compatibility aspect is an important feature of *LE* and should be of great interest to the personal-studio owner thinking about investing in this system.

SPEED IS KING

When you launch the *Pro Tools* application, you're also launching the Digidesign Audio Engine (DAE), which acts as the driver for the system. The memory allocated to the DAE determines how certain aspects of *Pro Tools* will operate; in particular, how much RAM is allocated to the program (select the DAE icon and choose Get Info, then Memory) and the size of the playback buffer (found under the File menu in DAE). These DAE settings affect the plug-in operation and the editing and mixing strength.

The performance of a system running *LE* depends on the speed of the host processor. The faster the processor, the more power you'll get. Although the minimum CPU requirement is 604e/200 MHz, you're going to want a much faster processor if you plan on having a lot of automation and a large number of tracks, edits, or third-party plug-ins. Balancing these four CPU-intensive elements is the key to success with a host-based system, especially if you have a slower computer.

With this in mind, two of the most important settings in *LE* are the Buffer Size and the CPU Usage settings, found in the Hardware Setup dialog box. Buffer Size controls the amount of latency, or delay, you get when recording or playing through the system. The lower the setting, the lower the latency; the higher the setting, the more tracks and plug-ins you can use. CPU Usage determines how much of the host processor is reserved for the *Pro Tools* application. This will need to be adjusted if *Pro Tools* is sharing the processor with a host-based synthesizer.

For this review I used a beige G3 with a 266 MHz processor. Although I had no problem running Digidesign's excellent 24-track tutorial and demo on this machine, I found it wasn't fast enough when I tried to use multiple third-party plug-ins at once, or if I had lots of edits and automation in my projects. G3s and G4s with faster speeds will get the best results.

To get the most out of *Pro Tools LE*, you'll need to have the right balance between memory allocation and speed. Fortunately, the manuals that come with Digi 001 help you determine this, in language that is easy to understand.

Be aware that there is a small incompatibility problem between Digi 001 and the beige G3s. Digidesign is aware of the problem, which is posted on the Digi 001 Web site. The incompatibility problem results in an occasional, non-fatal error. During the month that I tested *LE*, I got the error message only three times. Not a big deal, but noticeable. Blue-and-white G3s and G4s are therefore recommended for use with Digi 001. (By the time you read this, a Windows 98 version of Digi 001 will also be available.)

MIDI IMPLEMENTATION

With version 5.0, Digidesign introduces a MIDI sequencer—a major breakthrough for *Pro Tools* and a feature many of us *Pro Tools* users have been anxiously waiting for. In the last few years, Digidesign has fallen behind its competitors, who have developed quite sophisticated digital audio sequencers that use third-party hardware I/O. Has Digidesign risen to this important challenge with Digi 001? The answer is "almost." Don't give up your full-featured sequencer just yet.

A far cry from the days when *Pro Tools* could only import and play Standard MIDI Files, Digi 001 and *LE* now allow you to record, edit, and play MIDI data much the same way you do audio

FIG. 5: The Memory Location window (shown here floating over the Digi 001 multitrack demo) gives you one-click access to any point in a session file.

THIRD-PARTY RTAS OFFERINGS

A number of Digidesign Development Partners have RTAS plug-ins available, some of which may already be familiar to TDM users. Waves' batch includes not only the familiar Q10, L1, C1, and S1, but also TrueVerb, RComp, MaxxBass, Ultra Pitch, and more.

Bomb Factory has modeled a handful of popular effects processors including Big Briar's Moogerfooger Ring Modulator and Lowpass Filter, the SansAmp PSA-1, and the Universal Audio LA-2A and 1176 compressors. Other companies currently shipping RTAS plug-ins include Arboretum, DUY, Metric Halo, McDSP, and INA-GRM. More are sure to follow.

tracks. In fact, you can edit across audio and MIDI tracks at the same time, working on entire sections of a session if you so desire. I found this to be one of the most useful aspects of the new MIDI implementation.

The new sequencer has a resolution of 960 ppqn and allows for a total of 128 MIDI tracks. With the Digi 001 interface, you get a single MIDI In and Out port, giving you a total of 16 MIDI channels at a time. With a more extensive MIDI interface, you can use up to 128 MIDI channels with *LE*.

In the Edit window, MIDI tracks are treated just like audio tracks and can be viewed as either Notes (in the familiar piano-roll style) or Regions (see **Fig. 3**). At the far left of the window is a handy vertical keyboard, which you can play by holding down the Command key and clicking on the note you want. The larger the displayed track, the more keyboard notes you will see.

You can use the Track Display option in the Edit window to select the MIDI data you want to view or automate, just as you would with an audio track. You have a choice of viewing Notes, Regions, Volume, Velocity, Pan, Pitch Bend, SysEx, or Continuous Controllers. For example, if you select Velocity in the Track Display, you'll see a vertical line for every MIDI event. These lines are referred to as Velocity Stalks, and can be raised or lowered using the editing tools. Other MIDI data, such as Pan, is similar to its audio counterpart and can be edited in a similar fashion.

The implementation of MIDI in *Pro Tools* also adds a few items to the transport control bar (see **Fig. 4**). In addition to the regular transport controls, you get a metronome button, which lets you count off a specified number of bars, and tempo and meter indicators. You can select the tempo either manually with a slider on the transport, or via the Tap Tempo feature, and you can place specific tempo events in the tempo track at the top of the Edit window.

Another useful button in the transport window is MIDI Merge. When selected, it allows you to merge new MIDI data with existing MIDI information.

For my taste, the MIDI implementation complements *Pro Tools*' audio features quite well. Like the rest of the program, the sequencer is straightforward and easy to use, which is a plus. However, I consider this sequencer to be a work in progress; sophisticated MIDI users who require a full-featured sequencer will find some significant items missing.

To begin with, there's no Event List. Musicians who are serious about tweaking MIDI data will be disappointed by this omission. (Digidesign is planning to change this in a future revision of the program.) Also, you can record only one MIDI track at a time. In addition, the program lacks a step-record mode, groove-quantization capabilities, MTC output, and simple music-notation abilities. Fortunately, you can run a third-party sequencer with *LE* if necessary.

REAL-TIME EFFECTS

Yet another significant feature of the Digi 001 system is its Real Time AudioSuite (RTAS) plug-in format. RTAS plug-ins can be added to an audio channel via any of the five available inserts, in the same way plug-ins are added in the TDM environment. The difference is, of course, that with TDM systems, the plug-in runs from a dedicated DSP chip, whereas in *LE* the plug-in runs on the host processor. The faster your computer is and the more RAM you have, the more plug-ins you can run in a session.

For the most part, the RTAS versions of a plug-in have the same features as their TDM brethren. And if you open an *LE*-created session on a TDM system, the TDM version of any RTAS plug-ins you used in the session can be substituted. As a person who enjoys using plug-ins, I couldn't wait to use RTAS.

To get you started, Digidesign throws in a set of its DigiRack RTAS plug-ins. These include two EQs (1-band and 4-band), four dynamics processors (a compressor, limiter, gate, and expander/gate), four types of delay (short, slap, medium, and long delays, both mono and stereo), and dither. One nice thing about the DigiRack plug-ins is that they don't tax your CPU, so even on slower machines you can run a large number of them simultaneously.

Things get a bit more interesting with the third-party RTAS plug-ins, however. A number of companies in Digidesign's Development Partners group have created RTAS versions of their TDM plug-ins. The result is that newer TDM plug-ins will come with both an RTAS *and* an AudioSuite (non-real-time) version, and every RTAS plug-in will include an AudioSuite version as well.

I was able to test several third-party

Pro Tools LE Specifications

Audio Tracks	24
MIDI Tracks	128
Buses	16
Sends per Track	5
Inserts per Track	5
Resolution	24-bit, 16-bit
Sequencer Tracks	128 maximum
Sequencer Resolution	960 ppqn, synched to internal or MIDI Clock source
Quantization	whole note to 64th triplet

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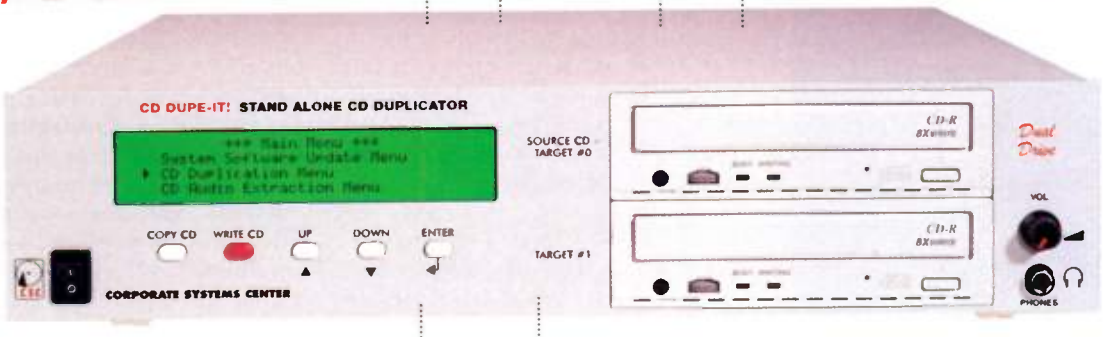

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DIGIDESIGN
Digi 001 (Mac) digital audio sequencer
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FEATURES ■■■■
EASE OF USE ■■■■■
AUDIO QUALITY ■■■■■
VALUE ■■■■
1 2 3 4 5

PROS: Session compatibility with TDM systems. Real-time plug-in format. 24-bit capability. Includes mic preamps. Excellent assortment of analog and digital I/O. MIDI sequencer. Good price.

CONS: RAM and CPU intensive. Hefty minimum requirement for RAM. No MIDI Event List. Optical I/O on PCI card. Limit of 24 mono audio tracks. No virtual tracks. Doesn't support other audio drivers or plug-in formats. Records only one MIDI track at a time. Only one level of Undo. No feet/frames ruler.

RTAS plug-ins from Waves and Bomb Factory (see the sidebar "Third-Party RTAS Offerings"). On their own, the effects worked great. Some of the plug-ins, however, are particularly CPU-intensive, and I had mixed results when I tried to use more than one at a time during a session.

Apparently, a 266 MHz G3 is no match for some of these plug-ins. I had to remind myself that I was using the host processor rather than the card-based DSP chips of a TDM system. At least there's file-based AudioSuite processing available as well as *Pro Tools*' Bounce to Disk feature, so I could create file-processed (non-real-time) versions of a track when I needed them. As a nice touch, *LE* lets you copy and paste the settings of an RTAS plug-in to the AudioSuite version. This is a handy feature, since AudioSuite file processing is generally faster than bouncing to disk.

In addition to the system's speed requirement, Digidesign suggests that in order to run multiple memory-intensive RTAS plug-ins, you allocate an extra 1 to 2 MB of RAM to the DAE application for every five plug-ins you add. You can also gain some extra processing power by moving unused plug-ins from the Plug-in folder to another folder. (You'll need to relaunch *Pro Tools* each time you do this.)

NEW TOOLS

Pro Tools 5.0 includes a host of important upgrades. (A number of new features will appeal to post-production users; these will be covered in a full review of *Pro Tools* 5.0 for TDM in an upcoming issue of **EM**.) The user interface in version 5.0 includes familiar tools and windows, as well as some classy additions.

For starters, the Smart Tool automatically selects the Trimmer, Selector, and Grabber tools as needed. It determines its selection according to the portion of a waveform you're covering. Smart Tool can be switched on or off (the button resides below the Edit tools) and doesn't affect the Zoomer, Scrubber, or Pencil tools. Edit tools can also be selected with the F5 through F10 keys, and you can engage the Smart Tool by simultaneously pressing F6 and F7 or F7 and F8 (which correspond to the appropriate tools)—just two of several very useful macros incorporated into the program.

The Pencil tool now has five preset shapes: freehand, line, triangle, square, and random. The last three are handy for drawing track automation. The square and random shapes, with their sharp corners, are ideal for automating functions that can be switched on or off, while the triangular shape works well for continuous parameters such as volume. The height of the preset waveform is adjustable as you draw. Grid Value, on the other hand, determines the width of the shape, regardless of whether you're in Grid mode.

Another significant change is in the zoom arrows. The horizontal zoom buttons affect audio and MIDI, but now there are separate vertical zoom buttons for audio and MIDI. In addition, there are five user-definable zoom presets (Digidesign refers to them as Zoom Chicklets). Anyone who has spent time with a waveform editor knows that zooming in and out can be time consuming. The ability to instantly recall specific resolutions is a great feature.

TAKE ME TO YOUR RULER

Another new aspect to the Edit window is that you can display any or all of the time-line rulers. This allows you to view audio and MIDI against bars and beats, minutes and seconds, and samples. You can view the tempo and meter bars to keep an eye on how they're mapped throughout a piece. Distressingly, a time-code ruler is absent in *LE*. If you plan on doing serious post-production, you will have to work around this by converting minutes and seconds to feet and frames.

Much of this becomes useful if you tracked to the internal metronome. When audio and MIDI tracks are synched to bars and beats, you can make use of Grid mode and view the grid across the entire Edit window. You

Digi 001 Specifications

Hardware Interface	
Analog Inputs	(2) balanced combo XLR-¼" connectors; (6) balanced ¼" TRS
Analog Outputs	(2) balanced ¼" TRS monitor outs; (2) balanced ¼" TRS main outs; (6) unbalanced ¼" outputs
Digital I/O (interface)	(1 pr.) RCA S/PDIF
Digital I/O (PCI card)	(1 pr.) ADAT Optical or S/PDIF (switchable)
Other Ports	MIDI In and Out; ¼" stereo headphone output; ¼" footswitch; 9-pin serial port
A/D/A Converters	24-bit
Sampling Rates	44.1, 48 kHz
Frequency Response	20 Hz–22 kHz (±0.5 dB @ 1 kHz)
THD+N	0.003%
Dynamic Range	98 dB
Dimensions	13.5" (W) × 1.75" (H) × 6.75" (D)
Weight	4.75 lbs.

Pro Tools LE
Minimum System Requirements
PowerPC 604e/200 (G3 or G4 recommended); 128 MB RAM (192 MB recommended); Mac OS 8.6; PCI card slot; 7,200 rpm hard drive (ATA or SCSI) with average seek time of <10 ms and support for HFS or HFS+ file system

can specify the resolution of the grid, from bar-length increments down to 64th-note triplets.

If you have an audio file that wasn't created with the internal metronome but you want to set a tempo map and use the features in Grid mode, you can analyze the file using the enhanced Identify Beat command. This command determines the tempo of the audio file based on the meter and time signature you've selected, then adds Bar/Beat markers in the tempo ruler. Once this is done, you can use Grid mode to select and work in any of a variety of quantizations.

MEMORY SERVES

Pro Tools 5.0 allows you to set 200 memory locations per session. In this application, however, memory locations are more than just one-dimensional pointers. Memory Location markers can recall specific zoom settings, track groupings, edit locations, track heights—you name it.

You can view memory location markers in the Marker window just below the Meter ruler, or with all memory location information in the floating Memory Locations window (see **Fig. 5**). Use this window to select the memory location you want to go to, as well as view the properties of a specific marker (whether it pertains to a zoom setting, track height, grouping, or something else). I found the ability to set different types of memory locations to be a valuable tool as my projects increased in size and complexity. Any position in the piece is only a single click away, whether it's an edit location zoomed down to the sample level or a specific track layout in the Edit window.

AN AFFORDABLE SOLUTION

My initial excitement about Digi 001 was somewhat dampened by the hefty RAM requirements and the fact that I couldn't run more than one or two of the cooler third-party plug-ins at once. However, on my computer I had no problems using the system. Minor complaints aside, *Pro Tools* 5.0 is a significant upgrade, and the host-based *LE* is remarkably smooth and trouble free, even on my beige G3.

A number of digital audio sequencers on the market have more sophisticated sequencing capabilities, are compatible with ASIO drivers and VST or DirectX plug-ins, and cost less than Digi 001. (Even with version 5.0 and *LE*, *Pro Tools* continues to be a closed system when it comes to PCI card and hardware I/O compatibility.) Nonetheless, when you consider that you're getting a hardware interface with lots of I/O and a pair of great-sounding mic preamps, a PCI card, and RTAS-enhanced *Pro Tools LE* for under a grand, you're getting your money's worth with Digi 001.

Gino Robair *is an associate editor at* **EM.**
Special thanks to Rod Watkins, Peter Drescher, Rudy Trubitt, and Steve Kirk.

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T-RACKS (MAC/WIN/BEOS)

A stand-alone software-mastering suite.

By Mike Collins

When I think of signal processors, such as compressors and equalizers, I picture classic models with glowing arrays of tubes, chunky Bakelite knobs, metal toggle switches, and large analog meters. Those were the kind of products I came in contact with when I started out in recording studios—too long ago to dare think about! Like many people, I'm working mostly from my home studio these days, where my chief "weapons" are *Pro Tools* and a Yamaha 02R.

When it comes time to master my projects, I could use the processors in my mixer or plug-ins from *Pro Tools,* but I find it is often better to deal with the final mastering as a completely separate stage in the production process. In a perfect world, I would bring in specialized tools for the job, such as the aforementioned classic tube devices, but vintage gear is extremely expensive.

So what's the answer? One solution is *T-Racks* from IK Multimedia, a company based in Modena, Italy. *T-Racks* is a stand-alone software package for Mac, Windows, or BeOS that emulates those high-end analog mastering tools. It includes a state-of-the-art 6-band parametric equalizer, a stereo tube compressor/leveler, and a multiband stereo limiter—all at an extremely attractive price.

Of course, you can get Pro Tools TDM plug-ins (or plug-ins in other formats) that offer most of these features, but the big difference here is that *T-Racks* gives you a dedicated environment for mastering. It boots quickly, loads a file in seconds, and lets you concentrate solely on the final stages of mastering. (For those who might be unfamiliar with mastering, it is the process of applying equalization, compression, and limiting to your mixes—balancing the volume, stereo imaging, and overall tonal qualities of each track to achieve proper continuity throughout the recorded project.)

THE USER INTERFACE

One of the striking things about *T-Racks* is the sheer simplicity of its user interface. It has only one screen, with a realistic-looking graphic depiction of a stack of analog processors replete with glowing tubes that change colors based on the number of individual components switched into the signal path. The processors provide the typical controls you'd expect to see, laid out in the usual manner.

I took a quick peek at the File and Edit menus, expecting to find software-related commands—such as loading and saving files, adjusting preferences, and so on—but I was surprised to find almost nothing there apart from Quit and Undo. It turns out that most of these items are spread around the *T-Racks* panels, disguised as input jacks, hidden under virtual LEDs, or discreetly available from a row of neatly labeled buttons referred to as the Console Strip. As a Mac programmer, I know that it would not take a lot of additional programming effort to put these commands in the menus where they belong.

More specifically, the Console Strip contains a horizontal row of seven buttons and a question-mark icon. On the far left are the Quit and Info buttons, followed by the Preferences button. Pressing Preferences opens a floating window where you can switch dithering and real-time processing on and off, set the audio-buffer length, and choose a color—gold, copper, or chrome—for the rack of virtual gear.

The next button, labeled Snap, brings up a floating window that lets you take up to eight snapshots of various processor settings. These can be recalled at any time, which is useful for comparing different settings on the fly during a song. The CPU button brings up another floating window for monitoring the degree of computer-processor activity. There's also an Undo button, which lets you go back one edit, and a Meter button, which opens another floating window with a large, high-resolution, sample-accurate peak-program meter.

Finally, the question-mark icon at the far right of the Console Strip is actually a Help button. Enable this function, and you can position the mouse over any of the controls to display appropriate explanatory text in the upper right corner of the screen.

At the bottom of the window to the right of the Console Strip is a set of transport controls with buttons for Stop, Start, Loop Playback, Return to Start, Jump to Next Marker, and Jump to Previous Marker. Loop start and end points can be set by dragging two small loop markers that appear on the timeline slider above the transport controls when loop playback is enabled. The positions of these markers are also

***T-Racks* offers an array of analog-style mastering tools in one elegantly designed application.**

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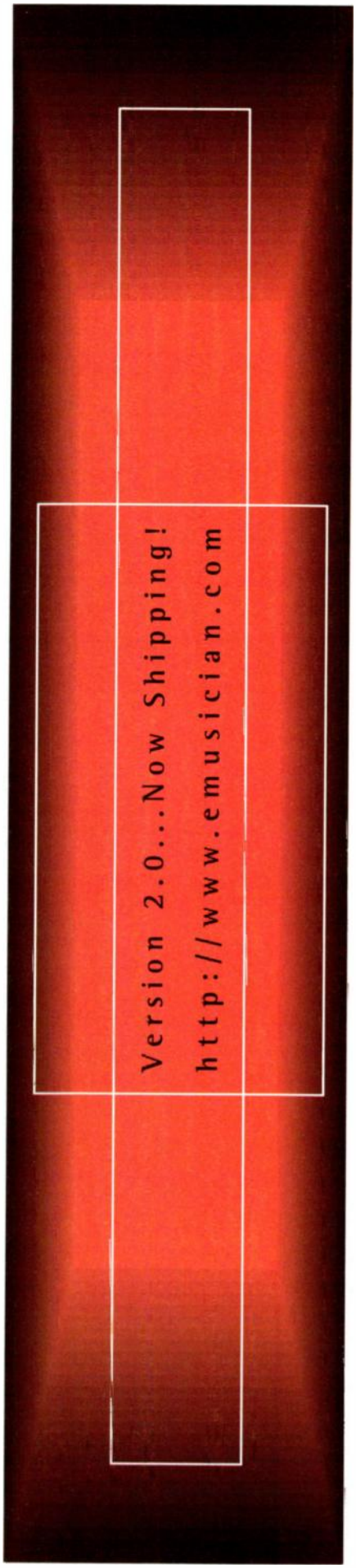

indicated in the numerical display above the timeline.

An icon resembling a small input jack, labeled Mark, is actually a button that inserts a marker in a file at the moment you click on it. These markers let you quickly jump between various points, such as verse and chorus, using the Jump Marker buttons. Alternatively, the time-line slider can be dragged to quickly place the playback start point anywhere in the file.

Above the Mark button are two similar buttons, labeled Fade-in and Fade-out. Clicking on either of these opens a small floating window that lets you set the fade time and choose a logarithmic or linear fade curve. Clicking on the input-jack icons marked Open and Process loads and saves files, respectively. I guess this is a bit like plugging in your input and patching your output to your master recorder, but in this case you are opening a file and then processing it and saving the result.

Files can be previewed before loading, and presets can be applied to the audio file while previewing. This makes *T-Racks* very fast to work with. For instance, you can compare all the songs of a project—with their appropriate mastering settings—prior to processing.

THE MASTERING PROCESSORS

Typically, you might start a mastering project by applying some equalization. The *T-Racks* equalizer has six filters that were specially developed for mastering: Low Cut, Low (shelf), Low Mid (peak), High (shelf), High Mid (peak), and High Cut. A set of on/off buttons and frequency controls for these filters is accompanied by gain controls for the shelving and peaking filters (±15 dB) and two toggle switches that select low or high Q for the two peaking filters.

A small numerical display shows the gain in decibels or the frequency in hertz or kilohertz of the currently selected knob, and it's easy to check how these filters are altering the frequency response by looking at the oscilloscope-type display to the right of the EQ section. A Patch switch lets you place the equalizer section either before or after the compressor in the audio chain.

The compressor, called Tube-Comp, can be used to make a mix sound louder, more cohesive, and more punchy. The usual Attack and Release knobs are available, and a Stereo Enhancement control affects the stereo width of the mix. This is not a conventional "threshold and ratio" compressor; it's very much a "soft knee" unit with a "no threshold" characteristic. Raising the input level increases the compression and vice versa. There isn't a particular level at which the compression begins; the Gain Reduction VU shows compression even at very low levels. This works like an old tube compressor, providing gentle compression that's ideal for mastering.

If you want to bring up the level of your mix even higher, *T-Racks*' multiband limiter can be used to tame peaks that occur in three different frequency ranges. The simplicity of the limiter's controls hides its complexity—which I reckon is a good thing. As the Input Drive control is turned up, it limits

T-Racks
Minimum System Requirements
Mac: 604e/120 or 603e/180 (233 MHz recommended); 32 MB RAM; System 7.5
PC: Pentium/200 MMX (Pentium II/266 recommended); 32 MB RAM (64 MB recommended); Windows 95/98/2000/NT 4.0
BeOS: Pentium/200 MMX (Pentium II/266 recommended); 32 MB RAM (64 MB recommended); BeOS 4.0

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T-Racks (Mac/Win/BeOS) mastering software
$299

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

PROS: Convincing, noise-free emulations of analog mastering processors. Easy-to-use, single-screen interface. Low price.
CONS: Does not support Digidesign's Pro Tools hardware directly (only via the Apple Sound Manager, which can be inconvenient). No plug-in support. No MIDI control.

For manufacturer information, please see Contact Sheet, p. 195.

more peaks and increases the level of the program material. An "analog" VU shows the amount of gain reduction in decibels. Limiting is applied within three frequency bands, but they cannot be controlled independently. Consequently, the meter displays an average of all three.

As you might expect, the Release Time knob controls the time it takes the limiter to return to unity gain after peak limiting, but the Overload control is a bit less conventional in its operation. As this control is turned up, the limiter lets progressively more of the peaks through, which are then clipped in an analog-like fashion as would happen with a classic tube device—a neat touch.

THE OUTPUT STAGE

The Output section of *T-Racks* can be used to tweak the program material even more. To the right of the Output control knob, there's a three-stage (–3 dB, –1 dB, and 0 dB), stereo, LED-style level meter. Above it is another virtual LED, labeled Sat (for saturation), which indicates when clipping occurs. An associated toggle switch is provided for choosing between hard (digital) or soft (analog) clipping. If you don't want clipping, the Output control must be kept at a suitably low level. There's also a Bypass switch that allows for easy A/B comparisons between the processed and unprocessed audio. If the original mix has L/R level-calibration problems, the Balance control can be used to correct them.

Above the output controls is the Preset display, which shows the name of the currently selected preset. Click on the preset name and hold it, and a pop-up menu opens with the factory presets, such as Brickwall Master, Gentle Master, Flat EQ + Hard Compression, Low & High Boost + Compression, and so forth. The menu also lets you save and load user presets.

Once all the desired processing has been determined, the results can be written to disk by clicking on the Process button. If Realtime Processing has been enabled in the Preferences menu, you will hear the new file playing as it is being written to disk, and further adjustments, such as recalling snapshots, can be made in real time. If no additional tweaks are needed, disabling Realtime Processing allows the file to be saved more quickly.

IN ACTION

I tested *T-Racks* on a Power Mac 9500 with a 300 MHz G3 upgrade, 192 MB of RAM, and Pro Tools 24 Mix audio hardware via Sound Manager. I started with a fairly dry recording of an acoustic Gibson L5 guitar solo. The track had been recorded flat using an AKG C12 VR microphone that emphasized some of the higher frequencies. While the track was still in Pro Tools, I had applied EQ to remove some of the boominess and presence boost, and I also added some gentle compression with the Waves *Renaissance Compressor*.

Then I opened the file in *T-Racks* and chose Gentle Master 1 from the excellent selection of presets. I found that it replaced some of the highs and lows that had been lost as a result of my previous equalizing. It also made the overall sound a lot punchier without emphasizing any boomy or scratchy frequencies—just what I was looking for.

To see just how versatile *T-Racks* was, I checked out an Alanis Morissette soundalike mix, which was packed full of acoustic and electric guitar parts, bass, kit drums, drum loops, synth sounds, and so forth. This time, I decided not to bother with the presets and just go for it by tweaking the knobs myself. The bottom end was a little heavy, so I started out using the EQ section to reduce some of the lower frequencies. The oscilloscope display really came in handy here, adding visual feedback to what my ears were hearing. I ended up just cutting a fairly narrow range of frequencies around 150 Hz by a little more than 1 dB. I used the Low Mid filter to get the effect I was looking for, rather than rolling off the low frequencies with the Low filter as I had first intended.

Then I decided that the bass and drums weren't sounding raunchy enough. This was a job for the compressor section. I used fairly fast attack and release settings (32 milliseconds and 320 milliseconds, respectively) and pushed up the input drive until the track really started to rock.

Not surprisingly, I found manipulating onscreen controls with a mouse to be more difficult than turning real knobs on an actual processor. Of course, that's always going to be a problem with software emulations of hardware products (mixers are a prime example). This problem would be largely eliminated if the software responded to MIDI Control Change messages from a MIDI controller box. However, it should be noted that sweeping through the frequencies with the EQ controls while the mix played back sounded just as smooth as the best hardware I have used.

THE LAST WORD

T-Racks is a very straightforward yet powerful package of software mastering tools that does what it claims simply and effectively. I particularly like the user interface design, and I am quite impressed with the sonic results, which compared favorably to plug-ins costing many times more.

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

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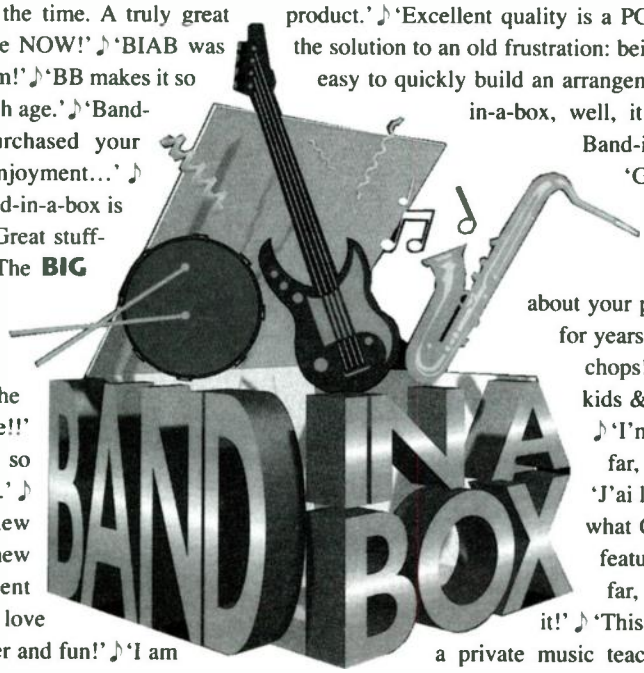

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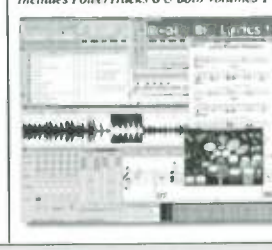

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YAMAHA

S80

A weighted-action synth that a real keyboard player can love.

By Julian Colbeck

The S80 is a weighty instrument in every sense of the word. This serious synth offers an expandable palette of tone colors, initially based on Yamaha's AWM2 technology; full onboard sound programming with visually satisfying editing software; and a wealth of controller capabilities that are beautifully thought out. Kin to Yamaha's dance-oriented CS6x/6R, the S80 uses the same sound engine as the CS but is oriented toward pianists, offering more piano sounds, a weighted action, and a more conservative look. On the other hand, the S80 lacks the CS's sample-loading Phrase Clip feature—not to mention its techno attitude.

The S80 is all about control. With its 88-note weighted keyboard action, this is not an instrument for one-finger sample-stabbers. It's a grown-up's synthesizer, meant for someone who can actually play—preferably piano—and who won't be intimidated by weight under the fingers. It's also a synth for someone who can afford a roadie—or at the very least a decent flight case.

OUTER LIMITS

As noted earlier, there's nothing radical about the synth's appearance (see **Fig. 1**). The S80 is big and black, with a smallish (40 by 2–character) backlit display. A pod of buttons to the right of the display accesses the modes of operation: Voice for single patches and Performance for multitimbral patches, plus Utility, Card, Edit, and Job. Flanked by sundry inc/dec, exit and enter, yes/no, and play/stop buttons, it's all perfectly plain and simple to see and operate.

Farther to the right comes a larger pod of buttons that access the sound-memory banks and items therein. These are labeled Piano, Organ, Strings, and so on—labels that always concern the pro player because they scream *preset!* But fear not. The ROM sounds here are of a higher standard than most of us will ever program in a lifetime, and there's plenty of space for user patches.

Beneath the screen are seven rotary knobs: two gray, click-stopped Page and Data controls and five assignable knobs for real-time entry and control over the on-screen parameters. Just to the left are four assignable sliders and a master volume slider, and way over on the top left-hand side of the control panel are a center-detented pitch wheel and a mod wheel. The position of the wheels is perhaps a bit uncomfortable, but to have placed them more conventionally to the left of the keyboard would add several inches onto an already lengthy animal.

At the rear (see **Fig. 2**), you'll find just the main L/R outputs and two individual audio outs, a configuration that I feel is a little mean for this substantial sound generator. (However, the S80 accepts Yamaha's new mLAN card, which gives you eight channels of digital I/O via IEEE 1394, or FireWire.) But you'll find plenty of control-device inputs—breath, footswitch, sustain, volume—a To Host computer terminal, and an A/D input with gain control, the benefits of which I'll deal with later. You also get, of course, the standard MIDI ports, as well as a card slot for SmartMedia removable storage.

Yamaha's construction quality does not need my endorsement. Everything is as professional and sturdy as one could ever hope for. At just under 53 pounds, this is no lightweight synth, but it's less than half the weight of a Fender Rhodes. Its fully weighted 88-note keyboard is as good as you're going to find today and indeed is sold by Yamaha to other manufacturers for their piano-action instruments.

FIG. 1: Yamaha designed the S80 synth with pianistic sensibilities in mind: with the 88-key weighted action, the pianos respond very well to your playing technique. In addition, this versatile instrument provides a powerful synthesis engine, a wealth of sounds, and expansion-card slots.

SMART OR NOT SO SMART

The S80 has no disk drive. Yamaha has chosen the cost-effective SmartMedia cards for external storage and for loading of sound and sequence data.

SmartMedia is a more flexible and forward-thinking medium, with a greater storage capacity than either floppies or the card slots in most synths. Yamaha recommends using the S80's play-only sequencer with Standard MIDI Files, but I am not aware of any commercially available SMFs on SmartMedia yet.

Fortunately, you can transfer files through the computer interface using the supplied *Card Filer* software. Nevertheless, a floppy drive would have been, ahem, smarter than SmartMedia alone, in my opinion, because it's less hassle.

SOUND ORGANIZATION

The S80 organizes itself very conventionally into single-patch sounds (Voices) and multitimbral sounds (Performances).

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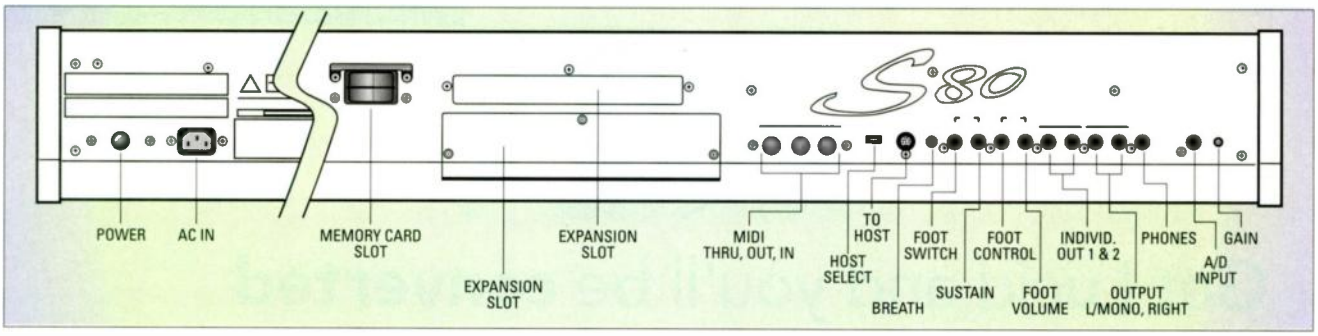

FIG. 2: The S80's anterior panel sports four audio outputs, lots of control-device, a computer interface, an A/D input with gain, a SmartMedia card slot, and the usual MIDI ports.

There are 256 "normal" (pitched) preset Voices offered in Preset 1 and Preset 2 banks, as well as room to store 128 user programs. Besides that, you get eight preset drum Voices and room to store two user drum Voices.

Maximum polyphony is 64 notes, though in this context the word "note" really should be "Element." An Element is the S80's smallest increment of sound, comprising an oscillator-pitch-filter-amplifier chain of command that processes Yamaha AWM2–sampled waveforms. This means that, as with most sample-based synths, if you use a sound containing four Elements, the polyphony will be slashed to 16 notes, which is not a lot nowadays. But most sounds use no more than two Elements; and as I'll detail later, you can increase the polyphony, as well as the number of sounds, using plug-in boards.

A Performance can consist of up to 19 Parts, a somewhat intriguing tally that can include Voices (normal or drum), A/D input Parts, or Plug-in Parts. Performances can be simple voice sandwiches or highly customized concoctions of zoned and Velocity-switched Voices, complete with internal and external controller assignments. There are 128 Performances stored in ROM; another 64 user Performances can be stored internally.

PLUG AND PLAY

Switch on and start playing the luscious Yamaha S700 Grand Piano sample in "StereoGrnd," preset 1, and you'll know you're in the presence of greatness. This is a sound you could live with comfortably for years to come. It has life, richness, tonal depth, and—unlike some of the too-smooth Korg and Roland pianos—plenty of bite and character.

At this point, the S80's screen offers you control of a 3-band "tone-control" graphic EQ and direct access to the chorus and reverb depths. These five parameters can be adjusted using the five soft knobs below (A, B, C, 1, and 2). You're not sentenced to EQ and effects control alone, though; you can set up each Voice with instant access to the parameters *you* want to control. Knobs 1 and 2 can control different parameters for each Voice, while knobs A, B, and C are global and control the same user-selected parameters for all Voices.

It's time to get cruel and really test this beast: let's hit the handy Effects Bypass button (well done, Yamaha) and hold down two low Cs an octave apart. Time ticks by . . . 10 seconds, 20 seconds. . . . The sound, at first aggressive and rasping, slowly tails off to a warm blur and finally tapers to a pinpoint. You can't fault that. No noticeable loop, no number crunching, no fall-off (or, worse, infinite sustain).

In the Piano category the S80 starts with StereoGrnd and goes on to offer a slightly more condensed, apparently close-miked grand piano; a collection of acoustic pianos ranging from dark to "slamming" edgy (for example, Elton John circa 1978); electrics like the Yamaha CP2000 electric grand; and a number of "piano-pluses," such as "oohs" and strings.

Before I get too deeply involved in a sound-by-sound analysis, let's linger on a couple of Yamaha solutions to one of today's most irksome keyboard problems: "I've so many sounds to choose from that half my time is wasted just trying to find them."

S80 solution 1 is a button marked Quick Access; by pressing it, you're dialed into what Yamaha considers the 16 "best of" sounds within that category, no matter where in memory (Preset 1, Preset 2, or Internal) the sound is actually located.

Solution 2 is Voice Category Search, with which you can search for all piano-type (PF) voices, all guitar (Gt) voices, and so on. By such means I quickly discovered that a standard S80 has more than 60 pianos resident.

Whichever means you choose, navigating around the S80 in normal day-to-day use is fast and hassle-free. You can instantly access plenty of cool parameters using the assignable sliders, knobs, and pedals. The precise nature of such control is left up to you. Want some groovy arpeggiation in the left hand of a Performance? How about serious filter tweaking on a lead synth? Delicate Velocity switching on a funk bass? It's your thing; do what you want to do.

YOU MUST HEAR THIS

AWM2 is one of the core technologies used on Yamaha's EX5 synthesizer. This sample-based synthesis architecture may not be cutting-edge, but Yamaha squeezes every scintilla of sound quality and playability from the S80's 24 MB waveform pool.

Of the single Voices, the aforementioned StereoGrnd piano is stellar, but I also loved some of the electric pianos (Bel Roadz, Erl Fusion). The Clavinets are suitably rubbery and expressive, unlike the flat and static simulations of Hohner's 1970s masterpiece found in most synths.

Brass, too, is well represented, as you'd expect from an instrument of EX5 lineage. The generically titled Medium Brass is the pick of the crop; it plays beautifully, with just the right amount of tonal embellishment under Velocity control. When I applied it to previously recorded parts, I found the sound impressively accommodating, too: parts that had been recorded using other synths simply sprang to life.

Gamelan may not be top of your wish

For manufacturer information, please see Contact Sheet, p. 195.

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KORG

Super sonic.

list, but if you're looking for exotic bell tones you'll be blown away by the S80's airy Gamelan preset. This, like so many of the natural-instrument presets, seems to exist in a totally natural environment. It's almost spooky.

But the S80 is not just about replicating real-world sounds. It is also a fierce, filter-laden monster, offering not only a dozen or so filter types—including resonant filters—but real-time knob control, too. Check out the richly vocal PhazFilter or, for one of those gentle and inspiring types, Soft Dream. Some presets include rhythmic elements; I particularly liked Rndm Gruv and ShineSeq 1. If you were a Korg Wavestation fan, you'll be catered to nicely here.

The quality of an instrument is perceived not only in its sound but also in its responsiveness when played. S80 sounds seem to have air in them, a far cry from the often fossilized-sounding world of synthesis. And it's not just a question of judicious use of reverb—it's the difference between recording a guitar through a direct box and sticking a $2,000 Neumann mic in front of your trusty Fender Twin. These sounds have life and breath, right back to the original samples. Moreover, much like myself if I may say so, they speak properly. Whether it's the preciously preserved attack portion of the sound or the subtle use of Aftertouch to induce an added characteristic, the sounds just *feel right* under the fingers.

VERY LIVE IN PERFORMANCE

S80 multisounds come in several varieties. Most obviously there are fat, layered patches for regular playing—including the obligatory brass-based orchestral scene with Velocity-accessed timpani—as well as massive string orchestras and plenty of fizz-bang synths. Performances can comprise separately zoned instruments; for instance, the S80 has another of today's obligatory patches that features jazzy piano, bass, and drums. In addition, Yamaha has most thoughtfully provided some template Performances, with sounds accessible on separate channels for multitimbral sequencing, and a demonstration Master Keyboard Performance (H16) that cracks open the door to a world of Total Control for your entire live keyboard rig.

Multisound patches always make ear-catching solo playing, although most, frankly, are useless outside the confines of a music store or your own self-indulgent noodling. The S80's multisound Performances, heavy on spectacular arpeggiator work, are top drawer. Normally, making adjustments on a multisound involves dragging yourself back into an instrument's sound-editing pages to tweak the individual components from which the multisound has been assembled. Happily the S80's use of Parts within a Performance means you can tweak with relative ease. You can, for instance, Quick Edit each layer within a Performance, including its filter, envelope, level, and effects.

THE GENERAL IDEA

The S80 is not sold as a General MIDI instrument; however, as creator of the XG superset of GM, Yamaha is obviously a GM-mindful company. Accordingly, a set of what Yamaha calls "Pseudo GM compliant" sounds is available for Internet download. This sound set can be loaded via SmartMedia card into the External memory location.

If GM is essential to your work (and its convenience is surely beyond question these days), then I'd strongly recommend purchasing the PLG100XG plug-in module. It not only gives you a full complement of 700-plus Voices in full GM/XG layout, but also adds 32 notes of polyphony and 16 multitimbral Parts.

AWM2 ON BOARD

Yamaha's AWM2 synthesis technology has been around a while, but being sample-based it is always open to updating with fresh waveforms. The S80's 24 MB of waveform ROM offers more than 500 sound bites to use as the kernel of your sound. (The waveforms are compressed, so this really is the equivalent of about 40 MB of uncompressed samples.)

A single Voice can be made from up to four Elements, each of which can use a separate waveform for its oscillator. Element oscillators can be set in terms of output, pan, pitch, and note range. They also can employ a five-stage pitch envelope and pitch scaling, which adjusts the speed of the pitch-envelope control according to where you are playing on the keyboard. Each Element can employ an insertion effect or choose Thru to bypass the effects—a very detailed and useful facility.

Is this all a little *too* detailed? Of course, 99.9 percent of S80 users will use and abuse the presets, pausing only in an emergency to tweak a tone's brightness or attack. This is absolutely fine. But I am pleased to see that Yamaha neither denies the tweakers access to the parameters nor compels them to use external editing software unless they feel so inclined. Cross-platform editing software is provided on CD-ROM, I hasten to add, but you won't need it. I must pause here to praise the S80's clearly labeled screens and well-written user manual.

Back to Sound Central. Filters play a crucial part in any synthesizer, and the S80 provides a choice of 12 basic filter types, selectable—and this is very important—*per Element*. Your choices include some blends (12 dB/octave lowpass plus highpass), a bevy of lowpass types with different slopes and extractions (24 dB/octave to 6 dB/octave, digital and analog), two strengths of highpass, and three selections of bandpass/band-reject. This is strong stuff—perfect for creating fierce Moogy sounds, slimmer and trimmer ARP-type tones, raw and gutsy basses, and intricate effects. It's interesting to play around with the digital and analog lowpass alternatives. Of course, "analog" here really means "analog-like," but these filters are certainly smoother and less sheer than the digital filters. It's great to have options.

Resonance is available throughout, as a harmonics booster for the lowpass filters and as a width adjuster on

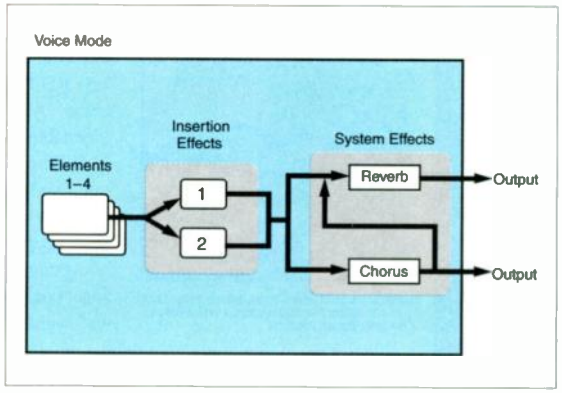

FIG. 3: Insertion effects can be applied individually to each Element, whereas system effects (reverb and chorus) are applied globally to the summed signal.

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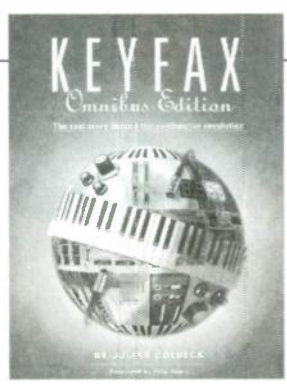

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bandpass. You also can apply multistage envelope generation and filter scaling. Sorry to harp on about it, but remember, this is all per Element.

Velocity can be tailed to Mars Pathfinder accuracy (well, perhaps there's a more complimentary analogy), and you can control the amplifier stage with a five-stage envelope generator and scaling.

The hardware-based Element LFO is a bit underpowered, with just three waveshapes (sawtooth, triangle, and square), speed and depth controls, and pitch/filter/amplifier modulation. KeySync resets the LFO cycle with each played note. Unfortunately, the LFO cannot sync to MIDI Clock. However, the S80 also has a common LFO, created in software, that can be assigned to any oscillator. It offers a wider variety of waveforms and parameters and an attack-release envelope, and it will sync to MIDI Clock.

THE DRUM PLANET

A different set of controls is available for drum Voices than for normal Voices. This makes a great deal of sense. For drums, you can set up all manner of juicy pan options (under Velocity or note-order control) and can specify which Voices employ effects, pitch, filtering, EQ, and arpeggiation.

If you've not experimented with drum arpeggios, you're in for a treat. A drum arpeggio, of course, quickly becomes a drum pattern, but one with all the quirkiness and unexpected bonuses of pitch arpeggiation in terms of polyrhythms and grooves.

THE ICING

The range and quality of effects is at a level that only Yamaha could consistently attain. The S80 has two stereo effects processors for insertion effects and two dedicated to global reverb and chorus. The insertion effects are applied at the Voice level, so all Elements within a Voice use the same insertion effect; but these effects can be bypassed by a particular Element or drum Voice. In Performance mode, insertion effects can be applied to Voice Parts or the A/D input Part. In addition, you get a second set of insert effects that are specifically devoted to the modular-synthesis Plug-in Voices.

Insertion effects include flanger, phaser, distortion, compressor, touch wah, gate, delays, karaoke (oh no!),

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amp simulators, rotary speaker, and some crazy stuff like digital turntable (adds click and rumble), digital scratch (to filter and pan a sound—brilliant), and many more. All can be tweaked with appropriate parameters.

Reverb and chorus are offered in multiple, editable variations (12 reverbs, 11 choruses) and are applied globally, after the insertion effects, to the summed signal (see **Fig. 3**). These system effects are on a bus, and you get send-level and effects-return-level controls for each Voice.

OUTSIDE IN

Earlier I mentioned the Korg Wavestation, which I believe was the first digital synth to let users process outside signals with the internal synthesis components and effects. I'm happy to report that this feature is alive and well, and the S80 has it. Cool? You bet. Plug in a mic or a guitar, and you can use any of the S80's 100 or more effects within a Performance setting. For instance, you could set your input level on the Mix Template page and start applying vinyl noise or scratch effects to your vocals.

CONTROL PATROL

Yamaha really ought to make a video about the S80's control options. In print, it's impossible to make the zillions of options seem as exciting as they actually are. You need to hear the effect of controlling the arpeggiation gate-time rate with a footpedal or employing different levels of Velocity control over specific areas of the keyboard—never mind just tweaking the filter cutoff with a panel knob. The S80 really deserves the title "control freak."

Starting with the controllers themselves, you have two wheels, four sliders, five knobs, and room for four pedals. To top it off, you can use a Yamaha breath controller with the S80—provided you don't mind looking like an overgrown baby sucking on a pacifier.

Control destinations are not limited to obvious candidates—volume and reverb level, for example—but embrace such minutiae as Element pitch-envelope depth, LFO speed, EQ, arpeggio speed, and gate time. If you're a budding Vangelis (who in the '70s used an army of pedals and controls to turn his rig into one living, breathing entity), you'll be in heaven here.

Groups of control setups can be separately saved as Control Sets. What a great idea! You can write up to six Control Sets per Voice, each superimposing a fresh collection of real-time controls over your sound. The benefit of separating control settings from a patch will be instantly obvious to anyone who has labored under hard taskmasters in a live band or studio setting and heard, "Don't change the sound, but I need an arpeggio going as well" or "Can you fade that string patch in more?" (then 20 minutes later, "No, back as you were").

THE MAGIC TOUCH

Internal sound control is one thing, but what about master-keyboard duties? Yamaha's literature is very keen for you to make the connection between the S80 and the company's seminal KX88 controller keyboard. Actually, the two have almost nothing in common except 88 notes and a decent weighted keyboard action. The KX88 is impossibly difficult to set up (unless you dream in hex) and, being a relatively early MIDI instrument, is very restricted in modern terms. The S80 offers 100 times the power at a fraction of the complexity. I particularly like its Master Keyboard button, which superimposes a set of Master Keyboard setups onto a Performance.

Yamaha acknowledges you'll probably have the odd tone module or sampler in your rig in addition to the S80. Master Keyboard mode functions as a form of external Performance memory, letting you construct complex MIDI and zone combinations over your entire keyboard rig. For each zone, you can set different

S80 Specifications

Keyboard Action	88-key weighted, Aftertouch-sensitive
Controllers	pitch-bend wheel; modulation wheel; (4) assignable sliders; (1) volume slider; (5) assignable real-time knobs; (2) data entry/page knobs; (1) A/D gain knob
Sequencer	Type 0 SMF play-only
Synthesis Engine	AWM2
Maximum Polyphony	64 notes
Multitimbral Parts	(16) voices, (1) A/D, (2) plug-in
Sample Memory	24 MB ROM (compressed)
Filters	(64) multimode, resonant
Voices (single sounds)	normal: (256) presets, (128) users, (128) externals; drum: (8) presets, (2) users, (2) externals; plug-in: (64) per plug-in board (2 boards available)
Performances	(128) user internal, (64) user external; (4) zones (master keyboard settings); (19) Parts (16, plus Plug-in 1, Plug-in 2, A/D)
Arpeggiator	(128) types; MIDI Sync, TX, RX, Velocity Rate; Gate Time Rate; Unit
Effects	(12) reverb, (23) chorus, (93) insertion effects, (24) insertion effects for plug-in boards, (4) master equalizer
Display	40 × 2–character, backlit LCD
External Storage	SmartMedia card 3.3V
Expansion Slots	Modular Synthesis Plug-in System
Audio Outputs	(2) unbalanced ¼" main L/R, (2) unbalanced ¼" individual, (1) ¼" stereo headphone
Other Ports	(1) ¼" A/D audio input; (1) To Host mini-DIN Mac/PC computer port; (2) independent sets of MIDI In, Out, Thru; (1) ¼" footpedal; (1) ¼" footswitch; (1) ¼" momentary switch; (1) breath controller
Dimensions	52.31" (L) × 16.63 (W) × 6.19" (H)
Weight	53.5 lbs.

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transpose factors, enable or disable any of the controllers, and assign Program Change and Bank Select messages. This is good, practical stuff designed by someone who has played live.

EXPANSIONIST IDEAS

"Plug-in," the great buzzword du jour as the old millennium wheezed its last, replaced its immediate predecessor, open-ended architecture. The term plug-in can be taken literally with the S80. Yamaha currently offers six plug-in expansion boards for the S80, including the PLG150VL (physical-modeling derived from the VL series), PLG150DX (FM synthesis), PLG100VH (vocal harmony processor, particularly cute when used with an A/D input vocal microphone), PLG150AN (analog modeling), PLG150PF (pianos, pianos, and more pianos), and PLG100XG (MU-series XG tone module).

The crucial thing is that you are purchasing sound generators, complete with their own CPUs—which means added polyphony as well as new sounds. The physical plug-in is a simple do-it-yourself operation, and you can load two boards at a time.

YAMAHA
S80 keyboard synthesizer
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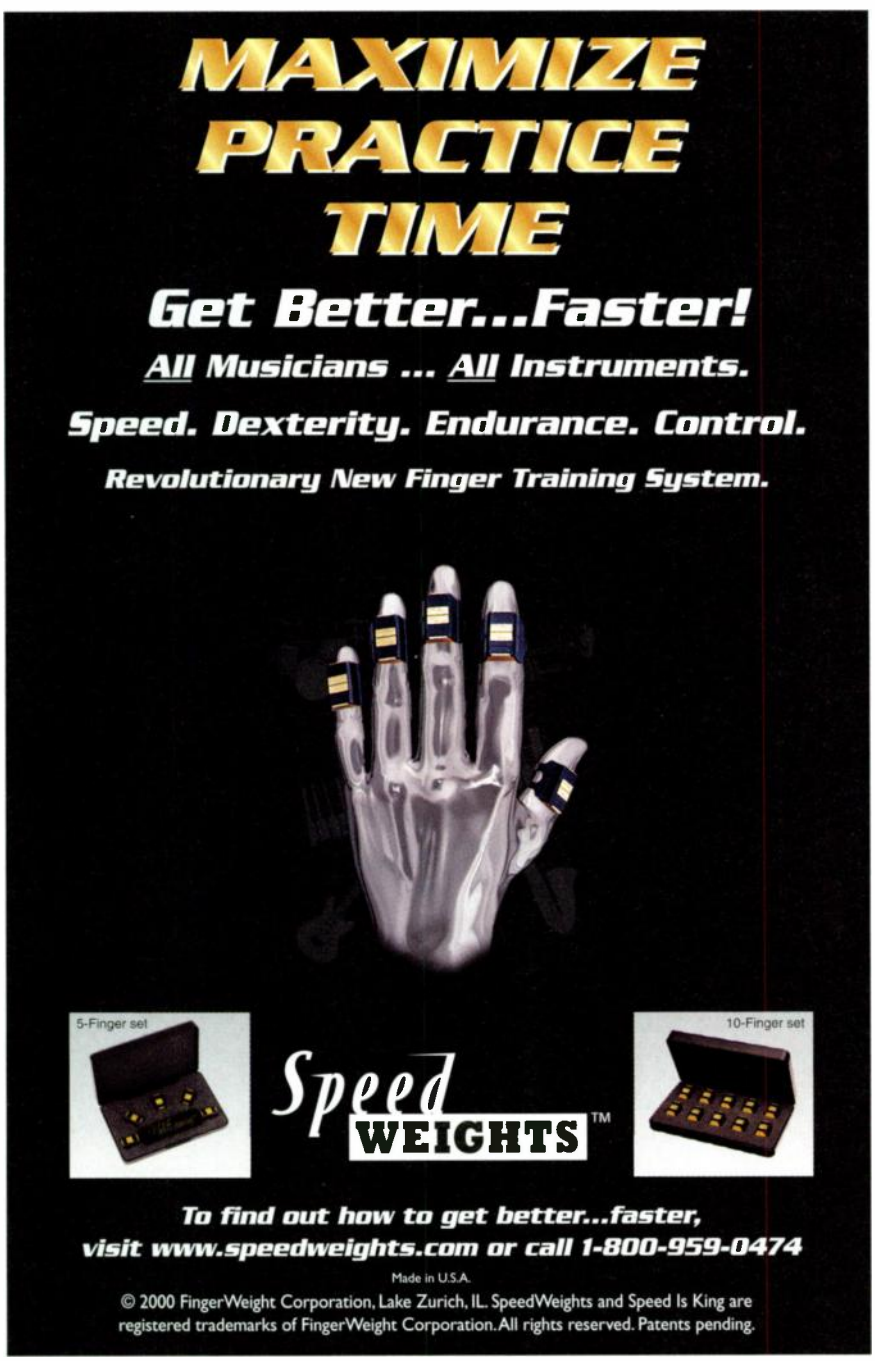
FEATURES ■■■■■
EASE OF USE ■■■■■
QUALITY OF SOUNDS ■■■■■
VALUE ■■■■■
1 2 3 4 5

PROS: A huge but still practical army of control facilities for both live and studio work. Top-notch 88-note weighted keyboard. Natural, "living" sounds. Immense add-on potential with plug-in cards. Nice arpeggiator. SmartMedia storage.
CONS: No floppy drive for sequence/sound storage. Playback-only sequencer. Just four main audio outputs.



AFFORDABLE LUXURY

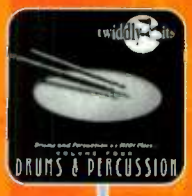
Playing the S80 makes you feel like you've *made it*. The keyboard has weight, authority, and class, and your chops will probably take a 50 percent hike as a result. The synth sounds fantastic with or without expansion boards. The effects work great on internal keyboard sounds. I could go on and on.

Yamaha is absolutely right to offer external facilities (plug-ins, A/D, bundled software for editing internal and XG sounds), and it has done so without sacrificing internal features or control. You can still edit everything without using a computer.

As a controller keyboard, the S80 occupies a very select class in both feel and function. If you're working in a complex, sample-heavy environment, you can set up control zones, effects applications, and performances that will be both what you need and what you like. Though its association with the KX88 is spurious, there's every chance the S80 will be received as well and last as long.

Julian Colbeck *has been playing keyboards since the 1960s, professionally since the 1970s, lucratively since the 1980s, but with far more enjoyment in the 1990s. He does not anticipate taking to the road at all in the 21st century.*

PLUG-iN SOME REAL DRUMMERS



In a perfect world Bill Bruford, or Gavin Harrison, or Paul Kodish descends on your studio in person to lay down some rhythm tracks. You sit sipping non-fat lattés and discussing the finer points of the material while a crew of smiling but monosyllabic assistants assemble the drums. The session is a blast: the tempos perfect, the feels peerless. You can use everything.

But then Bill/Gavin/Paul slips you an envelope. S***, the invoice: You open it with trembling fingers to read the words 'No Charge,' and you look up into Bill/Gavin/Paul's smiling eyes and waving finger as he says "But next time, man, you're gonna play on my record, OK? Deal?"

You both laugh, knowingly, as only fellow and equal artists can do. And then sushi arrives.

In an imperfect world you've just spent another lousy hundred bucks on another sample CD. It's got some loops you can use but, heck, you've heard a lot of these a zillion times on the radio. When did this come out? 1997. You curse the clerk at BigBucks Megastore.

But by lunchtime you've got a groove loaded and found a workaround to incompatibility issues between your sequencer and digital audio package. The tempos are kind of limp, which you can fudge. Still you wish you could change the sound of the snare. You wish you could program decent drums yourself. At the end of a hard day you fill in some sample clearance forms and toss a pizza into the microwave.

In a smart world you reach up for the Jewel-Case marked Twiddly•Bits Vol 8 MIDI BreakBeats and flip open the lid. You insert the disk into your PC (or Mac), open Cubase (or Cakewalk, or Performer..), and load a file. You Solo one of a dozen tracks containing exuberant 2-bar drum 'n' bass loops, and hit play. Geez! Are those sounds coming out of *my* gear? Still in shock, you loop the groove over 16 bars and snip out the final bar, substituting it for a death-defying fill currently residing on Track 14. You switch to an ambient drum kit. Yea! the groove becomes even more intoxicating, especially when you hit the gas and effortlessly take the tempo up to 155. The track already has life, energy, and your own slant on things. You wonder how many grooves are on this disk. You look. About 700. For how much? $39 bucks? Why haven't I bought any of these before? Food comes in and you don't even notice.

GET CONNECTED

Drummers we use include Gavin Harrison (Level 42, Incognito), Bill Bruford (Yes, King Crimson), Shane Meehan (Us3), Alfredo Dias Gomes, Paul Kodish (Chemical Brothers, Appollo 440), Chronic Music's The Beat Professor, Ron E. Beck, Hugo Degenhardt (Womack & Womack, Steve Hackett), Dave Spiers, Andrew Small, and T.E.T (Anthill Mob, Doug Wimbish), and Al Eaton (Queen Latifah, Ice-T). All disks are sold license-free.

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By Phil Darg

There is an episode of *Star Trek: The Next Generation* in which one of the characters walks onto the holodeck and programs his musical fantasy simply by commanding, "1950s New Orleans jazz, small combo." The computer instantly generates a holographic combo that appears and starts playing. The character then picks up his trombone and commences to jam along with the computer-generated trio.

Science fiction? Maybe not. PG Music's *Band-in-a-Box* 9.0 offers a similar experience in the here and now.

THE BIG PICTURE

Band-in-a-Box (*BIAB*) 9.0 is the latest version of software that has been in continuous development since 1989. It is a MIDI accompaniment program that automatically creates drum, bass, keyboard, and other tracks, and even generates solos. *BIAB* also applies a number of different musical styles to a song, generates lead sheets, and saves its song files as Standard MIDI Files.

PG Music has added a lot to *BIAB* since **EM** reviewed version 7.0 in the December 1997 issue. Among the many enhancements are new view displays, new styles options, limited audio-recording capability, and—most compelling of all—a Melodist feature that adds a melody to chords that the user (or the computer) generates.

BIAB uses General MIDI for playback and also offers a number of other patch maps. The program should work fine with nearly any computer sound card or tone module that has GM capabilities. The Windows and Mac versions contain essentially the same features; the MegaPak bundle includes significantly more arrangement and Soloist styles than the Pro version.

NEW VIEWS

Among the most obvious improvements in *BIAB* 9.0 are the new display windows. These include the Drum Kit, Fretboard, Big Piano, and Big Lyrics views.

The aesthetically pleasing Drum Kit view shows a screen of percussion instruments that can be triggered as the song plays (see **Fig. 1**). Serious musicians may not find this window useful, however: because the mouse and the computer keyboard are the only triggering options, it's difficult to create intricate patterns. Nevertheless, the Drum Kit could be a handy tool for those learning about different percussion instruments or for those who like to record drum fills using visual cues.

Band-in-a-Box Minimum System Requirements

Mac: 68030; 8 MB RAM; System 7.5; internal system sounds (QuickTime Musical Instruments) or external General MIDI tone module

PC: 80486/66; 8 MB RAM; Windows 95/98/NT; 16-bit sound card or external General MIDI tone module

Version 9.0 also features a Fretboard view for guitarists. This window displays the notes of any selected track in real time. Each note on the fretboard lights up as it is played. A useful learning tool for guitarists, Fretboard enables players who don't read music to follow and learn the notes of tracks they want to play. Similar to this is the new Big Piano view (see **Fig. 2**), which shows the notes being played on a large keyboard. Its main purpose is to improve playing technique and assist the user in learning selected tracks.

One of the best new windows in *BIAB* 9.0 is the Big Lyrics view. It's a major improvement over the old lyrics display, which really didn't allow any live-performance application. With Big Lyrics, a user can make the lyrics as large as desired and easily follow along with the song. Better yet, the lyrics are highlighted as the piece plays, enabling a singer to keep on track. Font, size, color, and background are all customizable. In fact, this new feature turns your computer into a stand-alone MIDI karaoke machine. Would-be Wayne Newtons can say *danke schön* to *BIAB* 9.0 and *auf Wiedersehen* to backup bands and expensive stage setups.

ONE-TRACK MIND

In the past, *BIAB* has always been exclusively a MIDI application. With version 9.0, it makes the transition to a combined MIDI/audio program, although the step is a tentative one. *BIAB* 9.0 records and processes a single track of digital audio in 16-bit, 44.1 kHz format only. This grants the user the luxury of recording real sound along with

FIG. 1: The interactive Drum Kit window displays drum notes as they are being played and can be used to trigger and record drum events.

Miroslav Vitous

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Superior professional quality in music composition is completely within your grasp with the Symphonic Orchestra Samples. This is a world-class symphony at your fingertips, with the articulation needed to create expressive orchestral pieces. The sounds in this library will inspire you to create. Sumptuous strings, beautiful wood-winds, piercing brass, all extremely realistic. Composers/producers that demand the ultimate in high quality orchestral samples should give these a serious listen. Keyboard review -- "Superbly recorded....with spectacular realism. They will never believe you did the master tape in your spare bedroom".

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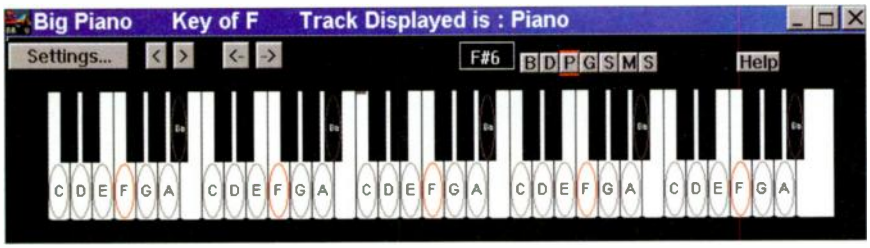

FIG. 2: *Band-in-a-Box*'s Big Piano view makes it easy to play tracks on your keyboard.

the MIDI composition. Although serious digital music producers will prefer multitrack applications with higher bit rates, those who want to record a simple vocal or solo accompaniment could be quite satisfied with *BIAB*.

The software comes with an impressive number of built-in plug-in effects that you can apply to your audio tracks, including reverb, compression, echo, chorus, and tremolo. You can also perform some minor editing on the audio track. For more extensive alterations, you'll need to export your track to an external audio editor and then import it back into *BIAB*. Also new in this version is the ability to convert a MIDI track to a stereo WAV file; the audio track can be mixed with the MIDI data if you want.

CHAINED MELODY

BIAB's most impressive new addition is the Melodist. This feature lets you automatically compose not only complete chord progressions and accompanying MIDI tracks, but also the *actual melody* of the piece. Another button even creates song titles! In short, the Melodist is an automatic song generator. But can *BIAB* really create full songs with credible melodies? Yes and no.

Choosing from a wide variety of styles, you can instantly generate an entire song with full melody and backing accompaniment. The music is fully competent—meaning that it conforms to the expectations of the style and the chord structure. There were very few sour notes in the songs I created in *BIAB*. However, just because a piece is musically correct doesn't mean that it is pleasing to the ear.

Listening to and rejecting dozens of auto-generated songs, I felt like a desktop A&R man. The true measure of a melody is its "catchiness," and creating that is still an immutably human enterprise. That said, I found that about one of every ten auto songs actually had decent melodic structure. You can also use the Melodist to generate chord progressions only, or to add a melody to chord progressions that you input.

Although the melodies created with the Melodist ranged from fair to good, all of the pieces' arrangements were stylistically impeccable. This is the real strength of *BIAB:* its MIDI AI (artificial intelligence) programming is truly awesome, and the jazz styles and harmony programs are especially impressive. In fact, you can learn a lot about the elements of a style, such as how to compose a techno bass line or a swing drum part, by analyzing the tracks the program creates. Some very sharp musical minds are behind this software, although I am not about to claim that it can completely replace human arrangers.

BIAB 9.0 also has a new Guitarist feature that generates rhythm guitar tracks to existing melody lines. This feature creates a multinote track in voicing appropriate for guitar. A user can adjust parameters such as the number and range of notes in the chords, and even the intensity of the "strum" factor. I found that this feature works fairly well in simulating real guitar voicings—provided that you are using a high-quality guitar sound for playback. You can also use the Guitarist in conjunction with the Soloist or Melodist to create an instant guitar solo or strummed-chord melody line.

MIDI CITY LIMITS

Although *BIAB*'s strength lies in its MIDI performance, the program does have some limitations. Each song created by the Melodist uses a style file that dictates the instruments to be used and the note patterns. Technically each song is different, but there are a lot of similarities among songs generated in the same style—and even among some of the melodies created in different songs.

Also, for all MIDI sequences, *Band-in-a-Box*'s ppqn (parts per quarter note) resolution is only 120, a relatively low rate. Despite this, I found *BIAB*'s tracks amazingly lifelike in terms of both Velocity and timing. (A Humanizer feature is available for those who want to liven up their tracks even more.)

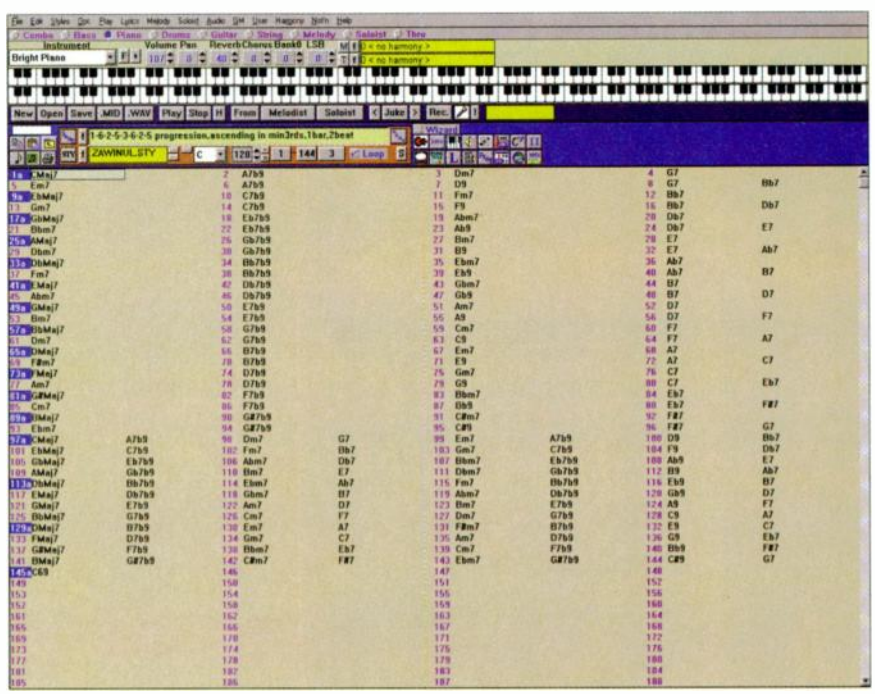

FIG. 3: The main interface of *Band-in-a-Box* is a holdover from DOS days and doesn't conform to many modern Windows display conventions.

For manufacturer information, please see Contact Sheet, p. 195.

Another limitation is that *BIAB* will generate some types of MIDI control data (Pitch Bend and Sustain Pedal), but not others (Aftertouch and Mod Wheel). Also, you can open just one song file at a time, and some settings (such as volume and tempo) offer only limited adjustment increments.

OLD WINDOWS

Although *BIAB* 9.0 is capable of some amazing feats, the application has one major drawback that must be addressed: its user interface looks old and is hard to use. The appearance reminds me of dated DOS or Windows 3.*x* applications (see **Fig. 3**). In general, the program's controls and menus are difficult to navigate and operate. Also, *BIAB* doesn't support many standard Windows keyboard shortcuts, the menu choices are long and complex, and navigating through files is tedious.

Worse, some of the menus shift off the screen; I was constantly moving the window around to read and select many of the choices. (This problem doesn't occur at high display resolutions.) Also, inputting some data is inefficient, and actions that should take only one click require two or three. Despite all this, the application runs well. I spent many hours using it, and it rarely crashed or hesitated.

PG MUSIC
Band-in-a-Box 9.0 (Mac/Win)
auto-accompaniment software
Pro version $88
MegaPak version $249

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

PROS: Instantly generates very competent MIDI accompaniment, solo, and melody tracks. Solid performance with some astounding musical style and harmony capabilities.

CONS: Clunky, old-looking user interface. Many input options are relatively difficult to activate. Includes song files that aren't up-to-date.

CLOSING BARS

Overall, I found PG Music's *Band-in-a-Box* 9.0 a solid application with lots of features for both amateur and serious musicians. Even if you are not interested in having it compose for you, *BIAB* is still a great tool for auditioning styles for MIDI compositions, and it offers endless possibilities for creating arrangements and harmonies (although I do wish the bundled song files included more up-to-date material). *BIAB* 9.0 also makes it easy to generate backing tracks for rehearsal or jamming purposes.

Considering its capabilities, *BIAB* 9.0 is well worth the price, and despite its old-fashioned look, the program has many powerful features that can create contemporary-sounding music. It definitely opens up a whole new world of tools for modern MIDI composers and solo artists.

Phil Darg *is a composer, songwriter, and producer of music for video and film. His latest project is the soundtrack for the upcoming independent film* Bob Came from Outer Space.

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C A D

VSM

This tube mic is a smooth crooner with a sound all its own.

By Erik Hawkins

The days when premium-quality, large-diaphragm condenser microphones cost a fortune are long gone. Indeed, low- and mid-priced condensers now seem to be popping out of the woodwork. Nearly every mic manufacturer on the block has a budget offering, the competition is fierce, and prices continue to plummet.

But what has all this mass-market mic-manufacturing madness really brought us? Some exceptional gear, to be sure, but a lot of mediocrity as well. I'm all for lots of choices, but with so many mics out there, it has become increasingly difficult to distinguish the really great mics from the so-so units.

With the VSM, CAD brings the luxury of owning a premium tube condenser microphone within reach of the personal-studio budget. No copycat, the VSM has a distinctive sound: clean and full-bodied with smooth, translucent highs.

Well, stand back—a guiding light may be shooting our way. CAD—a company that helped fuel the personal-studio condenser market in the mid 1980s with mics such as the Equitek E100—has introduced the VSM (formerly called the VSM 1), a large-diaphragm tube microphone that could turn out to be a benchmark for years to come. The VSM employs CAD's patented Optema capsule, which has a superthin (3-micron), 1.1-inch diaphragm and utilizes a special combination of tube and FET circuitry dubbed "servo-valve technology." Inside, a hand-selected and "burned-in" 12AX7 tube handles the input duties while a solid-state differential amp covers the output. The VSM is assembled and manufactured entirely (all the way down to the screws, I'm told) at CAD's plant in Conneaut, Ohio. Considering the VSM's quality, its $1,299 sticker price is quite reasonable.

THE LOOK AND FEEL

The VSM is not a particularly photogenic microphone, thanks to a silver-gray complexion and matte black trim that don't translate well to pictures. However, in person it's a good-looking, impressive unit. The mic is beautifully shaped and seems to me the perfect size—just big enough to look important, but not so large as to be overbearing or make the mic stand tip over.

The mic has a fixed-cardioid polar pattern but otherwise is full featured, providing both an 80 Hz highpass filter and an attenuation pad. The pad offers three settings: off, –8 dB, and –16 dB. You access both filter and pad via two small, clearly marked toggle switches located in an oval "window" on the front of the microphone.

You get a lockable custom flight case made of a sturdy black plastic. CAD includes a well-designed and effective shock-mount (matte black to match the trim on the mic), an external power supply, and a 30-foot, 7-pin cable. The VSM can pretty much live in the shock-mount because the flight case is designed to cradle the mic and mount as a single unit—very convenient for setup.

The VSM1PS power supply is housed in a small, ruggedly built metal box. The cable is high-quality Gotham with gold-plated Neutrik connectors. The power supply takes a standard IEC Type II cable and is manually switchable between 117 and 220 VAC, which is convenient for those traveling abroad. A 160 A "Slow Blow" fuse is located on the rear of the power supply.

TECH TALK

For a tube mic, the VSM is marvelously quiet. The signal-to-noise ratio is a very respectable 79 dB, ranking the mic near the top of its class. And the specs definitely support what I heard—or didn't hear, as the case may be.

The frequency response, rated at 10 Hz to 20 kHz, is also impressive. The VSM has a flat-sounding midrange, from about 200 Hz to 1.5 kHz. Below 200 Hz, the response rolls off smoothly, making for a mellow bottom end. At around 5 kHz there's a tiny presence bump, while a dip of perhaps 2 dB around 8 kHz seems to smooth out sibilance. The response rises smoothly again above 10 kHz, giving the mic a sweet clarity without it sounding contrived or overly "excited." Every VSM comes with its own frequency-response chart—helpful if you ever want to pick up a second mic for a stereo pair, as you can compare the charts to find a good match.

Bass-boosting from the proximity effect on the VSM is quite moderate (not nearly as pronounced as that on most Neumann large-diaphragm mics, for example), kicking in at about four inches away from the capsule.

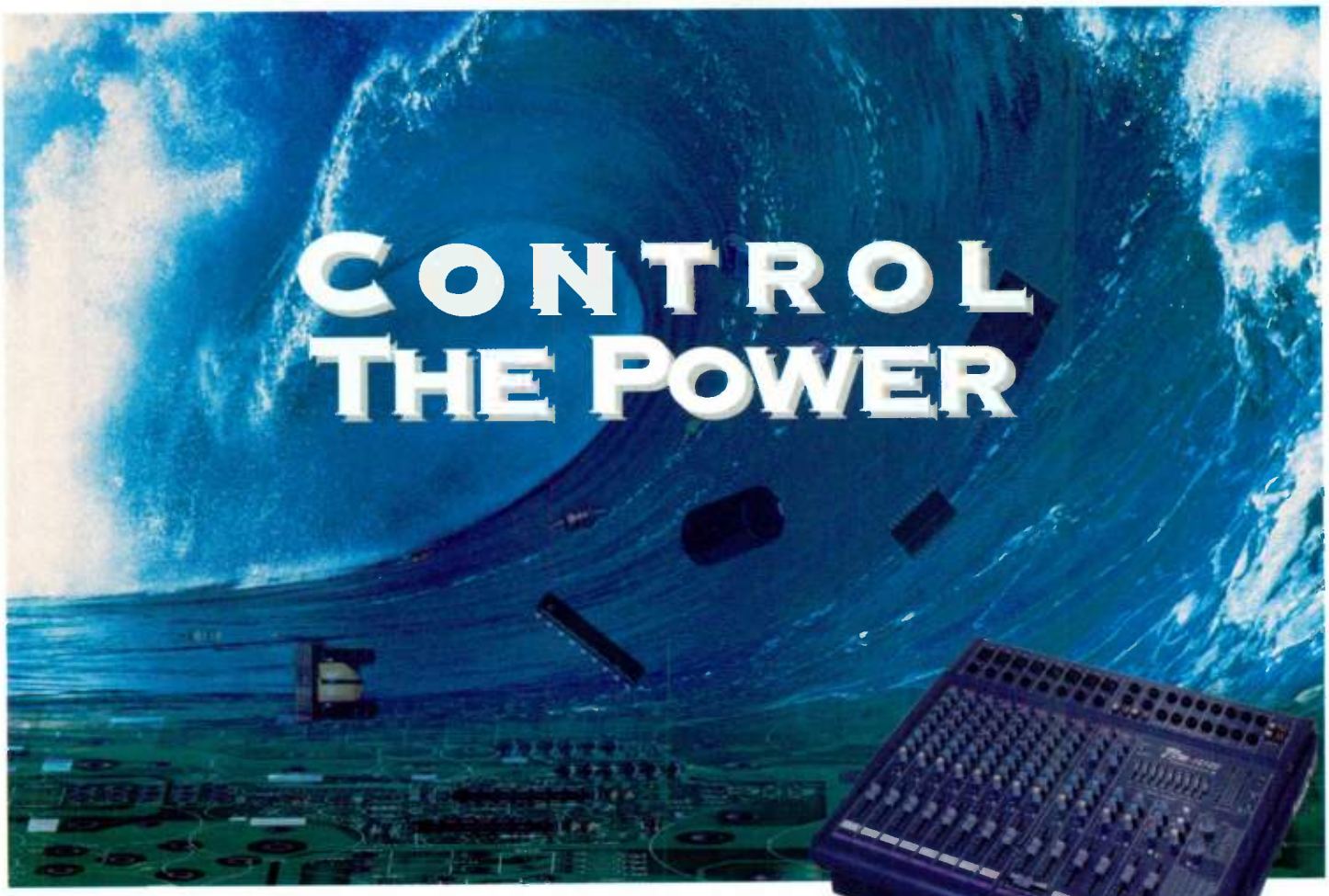
WHOLE LOTTA MIKING

I recorded with the VSM at several studios ranging from a beautifully constructed million-dollar facility to a home setup in a friend's living room. I listened to the mic (and tracks recorded with it) through a variety of monitors, including Genelec 1031s, Hafler TRM8s, and Tannoy PBM8 LMs. One constant point of reference was my trusty Sony MDR-V6 headphones.

I also compared the VSM with a number of other microphones, including a vintage Neumann U 87, a Neumann TLM 103, an AKG C 414 EB, an AKG C 12 VR, an Audio-Technica AT4050, and CAD's premium, large-diaphragm tube condenser, the VX2.

Impressively, the VSM held its own against all the microphones, including the prestigious, high-end models. It

For manufacturer information, please see Contact Sheet, p. 195.



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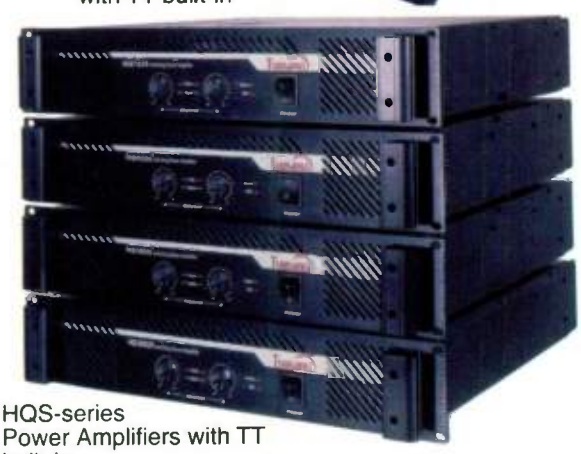

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sounded distinct from the Neumann U 87, presenting a crisper, cleaner image without sounding cold or lacking in body. The U 87, in comparison, could be described as sounding warmer and fatter but also a bit muddier.

The AKG C 12 sounded edgier and more sibilant than the VSM, with a more pronounced low-midrange tube quality. The VSM, in contrast, sounded smoother and flatter without being wimpy, even though its low mids weren't as big.

The CAD VX2 was an interesting case. This mic, which employs twin tubes and twin humbucking transformers, comes stock with a 1.25-inch capsule (the OS-125) but also works with the OS-110, the same 1.1-inch cap on the VSM. I expected the two mics to sound pretty much the same when the VX2 was fitted with the OS-110 cap. Boy, was I wrong. The VX2 had a much more heavy-handed tube quality, its dual-tube technology punching through the OS-110 capsule to create a rounder, heftier sound. In comparison, the VSM was airier, lighter, and a bit less present. The VSM sounded even less robust and up-front—its low end particularly diminutive—when compared with the VX2 fitted with the OS-125 cap.

Compared with the other three mics—the TLM 103, C 414, and AT4050—the VSM consistently captured a truer-to-life sonic image while still sounding pleasantly distinctive. In contrast, the TLM 103 sounded sibilant; the C 414, lacking in body; and the AT4050, significantly smaller. Certainly, each of these mics has characteristics that might be complementary to particular instruments in various situations; overall, though, the VSM sounded better to my ears.

As is true of all tube mics, the VSM needs to warm up in order to perform optimally. But after working with the mic extensively, I realized that it required more warm-up time than other tube mics I've used—a good 15 to 20 minutes rather than the usual 5 or 10. Before the mic has warmed up sufficiently, the sound is thinner and not as lifelike. But after 15 minutes or so, the tube stabilizes, the electronics get warm and cozy, and the VSM's true colors begin to show. Only then do you get the smoothness, full body, and translucent highs that distinguish this microphone.

BANG A GONG

This isn't the mic I'd normally grab for drums, but, for the sake of this review, I gave it a shot. First, I positioned it on a snare drum about six or seven inches from the head at a 45-degree angle with the 8 dB pad on. The sound was decent—very open, jazzy, and natural, capturing the warm tone of the wood shell nicely. The transient of the stick hit was rather laid-back, though, so I wouldn't choose this mic if I wanted an aggressive, snappy quality.

I also tried the VSM on kick drum, this time with the 16 dB pad engaged. The mic captured a clean sound with a nice image of the skin, but there wasn't enough low end for my taste. Then again, I like a really phat kick.

The VSM sounded cool as a drum overhead: the cymbals were sweet, bright, and airy; the toms cut through without sounding harsh; and the room sound was well portrayed, with a realistic sense of space. I would bet that a stereo pair of VSM overheads would sound fresh.

The VSM did an amazing job of capturing the distinctive personalities of a variety of percussion instruments. It represented the percussive swoosh of shakers, the slap and pop of congas, and the distinctive dry-husk flavor of a South American bean pod beautifully, without any harshness or biting transients. I love the way this mic's high end is rounded and smooth but doesn't sacrifice clarity. It's a very refined sound.

PICK, PLUCK, AND TWANG

The VSM is hands down one of the best mics I've heard on nylon-string acoustic guitar. Positioned about four inches out from and a bit below the sound hole, and angled slightly toward the bridge, the mic sounded fantastic, with glossy, even transients and a sensuous, warm presence. Positioning the mic was remarkably easy. With other mics, I've worked for what seemed hours trying to find that perfect placement where the mix between body and strings was just right. With the VSM, though, I nailed the spot on the first try. Incredible.

I got similar results miking a steel-string guitar. Again, the microphone was a breeze to position, and it captured a great sound: full-bodied but

CAD PROFESSIONAL MICROPHONES
VSM large-diaphragm tube condenser mic
$1,299

AUDIO QUALITY ■■■■■
VALUE ■■■■
1 2 3 4 5

PROS: Great multipurpose mic with excellent translucent sound quality. Low self-noise. Power supply included, along with high-quality 30-foot cable. Cool flight case.
CONS: Applications limited by the fixed-cardioid polar pattern.

VSM Specifications

Type	side-address, external DC polarized ("true" condenser)
Capsule	Optema OS-110 series, with 1.1", 3-micron, gold-sputtered Mylar diaphragm
Tube	12AX7 (input stage only)
Frequency Response	10 Hz–20 kHz (±3 dB)
Polar Pattern	cardioid
Dynamic Range for THD <0.5%	118 dB
Signal-to-Noise Ratio	79 dB (@ 94 dB SPL)
Self-Noise	15 dB
Maximum SPL for THD <0.5%	133 dB without pad; 149 dB with 16 dB pad
Highpass Filter	3 dB @ 80 Hz
Attenuation Pad	–8 dB, –16 dB (switchable)
Power	VSM analog power supply
Dimensions	6.84" (L) × 2.87" (W) × 2.42" (D)
Weight	1 lb.

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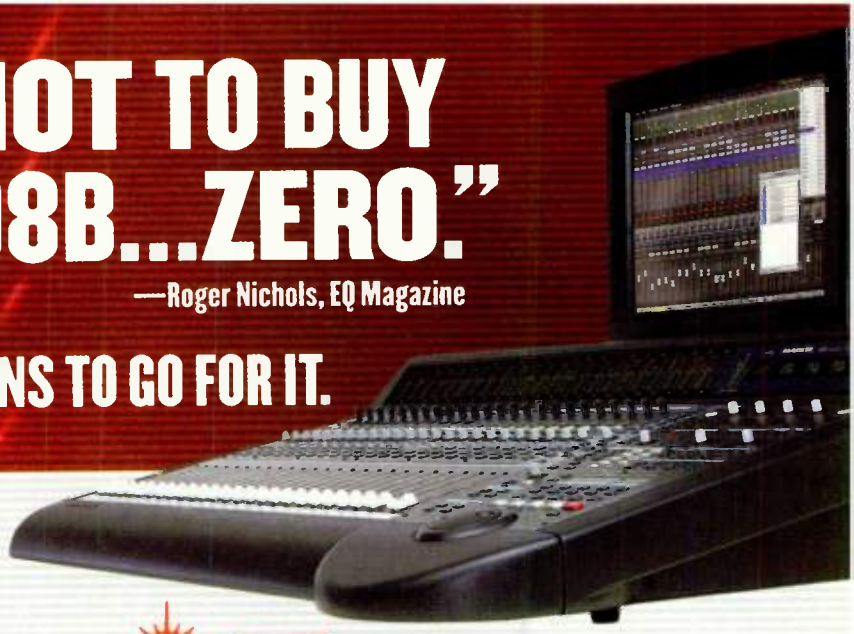

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- **Multiple Undo List** — 999 levels!
- New **Snapshot libraries**.
- Externally or internally accessible **inserts across Mains and Buses** plus **channel inserts pre and post DSP**.
- **Updated GUI** including 48-channel fader bank view screen.
- **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.

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.

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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3 1999 TEC AWARD WINNER!

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SEE US AT NAB BOOTH #M9373

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not domineering, with a translucent quality to the strings. For an edgier, more midrangy and aggressive sound, I'd probably look for a different mic—the VSM is just too polite.

On an old Fender blond combo amp, the VSM presented a very true-to-life image. On this particular track, though, we needed a more nasal, "in-your-face" quality—something to roughen up the already saccharine sound of the amp. An old, banged-up Shure SM57 proved just what the producer ordered, which just goes to show that no one mic—even one as slick as the VSM—can be all things to all tracks.

VOCAL PURRINGS

As a vocal mic, the VSM is the cat's meow. I auditioned it on several vocalists, and it always sounded solid, regardless of the singer's gender. On male vocals, the VSM tended to smooth out the voice, with only a slight bit of tube coloration in the low mids, making for a clear, unencumbered sound. The mic was most complementary to male singers with an edgy, nasal tone that needed taming. If more body was desired, it was simply a matter of moving the singer in closer to the mic to capitalize on the VSM's mellow proximity effect.

On female vocals, the VSM performed superbly, creating a round, silky, very present sound with a nice balance of air and punch. The mic was always a candidate for female lead vocals, and it proved exquisite on background vocals as well. In addition, it handled sibilance beautifully, capturing the kind of track that needs little or no de-essing at mixdown.

Naturally, despite praise from everybody who heard the mic, it didn't get picked for every vocal track. But this says more about the huge variety of human voices (not to mention the artistic license provided by a well-stocked mic cabinet) than it does about any shortcoming on the VSM's part. In general, especially given situations where a closet full of mics *isn't* available, the VSM will fit the bill for vocals most every time.

ITS OWN THING

CAD often gets pigeonholed as a maker of low-end mics best suited for grassroots, hip-hop, and home productions. Pardon the pun, but that's a bum rap. Though it's true the company's innovative designs and low prices helped spearhead the personal-studio market for microphones, CAD has also demonstrated its high-end capabilities with the VX2, a truly first-rate transducer. At $2,249, though, the VX2 is too expensive for many personal-studio budgets.

That's where the VSM comes into play. Bringing much of the VX2's technology and appeal into an affordable price range, the VSM sits poised to be a classic. This mic is distinctive both for its smooth, clean, translucent sound and for its all-around flexibility. I especially like that it doesn't try to copy the sound of classic Neumann and AKG mics. Instead, the VSM has its own sound and stands on its own merits. If you're shopping for an affordable large-diaphragm tube condenser mic, the VSM is a shoo-in.

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

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We loved *Recording* magazine's SampleTrak review so much, we had to rip it off.

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"The ST-224's internal noise is virtually nonexistent."

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DAC Crowell
Recording, September 1999

"In the end, the Zoom SampleTrak ST-224 is less like a phrase sampler and more like a little shrunken-down sampling workstation ...one that doesn't cost all that much more than those little loopers. Lots of KA-BOOM! for the buck."

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GADGET LABS

WAVE/824 (MAC/WIN)

No bells, no whistles—just eight channels of high-quality audio I/O.

By Zack Price

As a rule, musicians love products with lots of features. Sometimes, though, we end up paying for bells and whistles we don't need, even when they're standard. For instance, different multichannel digital audio cards often have similar features, such as 8-channel analog I/O, S/PDIF I/O, and MIDI capabilities. Moreover, they often carry a list price ranging from $700 to $900.

But what if all you want is a good, inexpensive way to get eight channels of 24-bit digital audio into and out of your Macintosh or Windows PC without having to pay for some of those "standard features" that you simply don't need? If this describes your situation, then Gadget Labs just might have the product for you: the Wave/824. It not only gives you what you need at a reasonable price ($499), but it also allows you to expand its features—affordably.

INSERT CARD HERE

The Wave/824 is a full-length PCI card with a 25-pin D-sub connector on its faceplate for attaching the outboard analog I/O breakout box (more on this in a moment). It also has a pair of RCA jacks for the optional S/PDIF I/O. This option ($129) comes on a small, square daughtercard that mounts on the end of the Wave/824. Installing the S/PDIF option is a two-step process. First, you attach a signal cable to the underside of the daughtercard, then you attach the daughtercard itself to the multipin header on the main card. The signal cable attaches to a connector at the other end of the main card.

Initially I wondered why this option was designed in such a manner; there seemed to be no reason to use the extra signal cable. As it turns out, Gadget Labs will be offering an ADAT I/O option that uses the same multipin header on the Wave/824. (It should be available by the time you read this.) The optical ports will be on a separate faceplate, however, making it necessary to use a signal cable to connect the faceplate and the daughtercard. Unfortunately, you must choose between the S/PDIF and ADAT options—you can't have both.

My only concern regarding the S/PDIF option is that the daughtercard adds some extra weight to the Wave/824. This is no problem if the card sits in an upright position, as it will in most desktop systems. However, when mounted sideways as in tower-type computers, the extra weight of the daughtercard bends the end of the Wave/824. If you have another long card installed below it, the two cards could easily touch each other. Just make sure the card below is not a full-length card, or simply seat the Wave/824 in the bottom slot.

Wave/824
Minimum System Requirements

Mac: PowerPC/233; Mac OS 8.1; full-length PCI slot; OMS 2.3.2; ASIO-compatible application

PC: Pentium 233 or equivalent; Windows 95/98/NT 4.0; full-length PCI slot; ASIO-compatible application

The Wave/824 has sync in and out jacks on the card itself. These let the user combine up to three Wave/824 cards in one system for 24-channel analog I/O. It also has an audio connection for a CD-ROM drive. When connected, the audio from the CD-ROM drive outputs to channels 7 and 8 on the breakout box. (Of course, you can defeat this monitoring feature when you need to use channels 7 and 8 in a multitrack recording environment.) I like this option because it means you don't need a separate multimedia card taking up space in the system if you use it only to monitor audio from your CD-ROM drive.

The Wave/824 is a full-length PCI card that connects to a breakout box with 8-channel analog I/O on ¼-inch TRS connectors. Two of the channels also have XLR connectors.

ATTACH CABLES HERE

The outboard analog I/O box is a 1U rack-mount device that connects to the card with a 2-meter, 25-pin cable. If this isn't long enough for you, a 7-meter cable is also available. A wall-wart adapter supplies power for the unit; there is no on/off switch.

Also residing on the back panel is a pair of MIDI In/Out jacks. It would be preferably if there were at least 32 channels available, but 16 seems to be standard for this type of device. Still, you do get extra sets of MIDI channels as you add more Wave/824 cards to your system.

The breakout box's front panel contains eight ¼-inch TSR jacks for analog input and eight more for analog output. You can use balanced or unbalanced plugs, provided that you set the proper level for each input and

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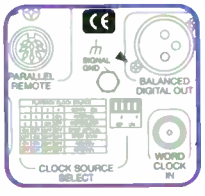

CDR850 PLUS adds a Word Clock input and balanced digital out.

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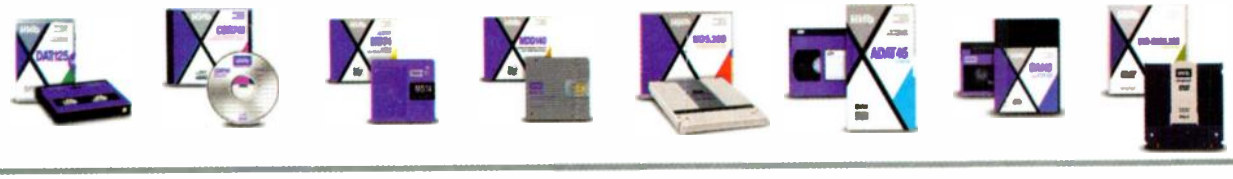

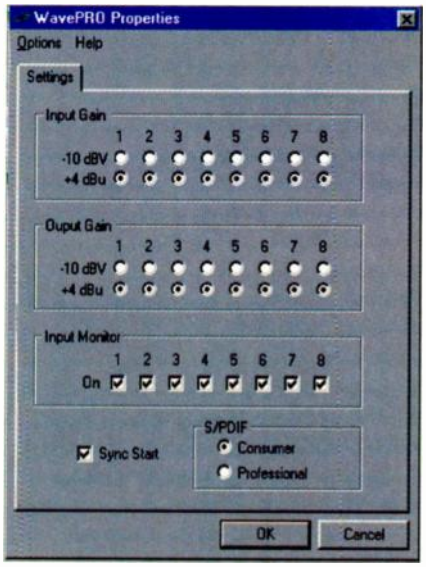

FIG. 1: The *WavePro* application controls the settings for balanced and unbalanced levels on each channel; output monitoring functions; and bit-resolution settings for use with digital audio software.

output in the software control panel. In addition, channels 1 and 2 have XLR connectors on their inputs and outputs. These connections are line level; if you want to use microphones, you will need mic preamps. Correspondingly, you should use the XLR outputs with a device designed to handle balanced signals.

It's possible to use both the XLR connectors and the ¼-inch jacks simultaneously. Even so, be careful when combining inputs into a single digital audio channel. If you don't watch your combined input levels, digital distortion can easily occur.

LOAD DRIVERS NOW

The Wave/824 can be used with both PCs and Macs. I tested it using a Pentium II/450 machine running Windows 98, second edition. The Mac software includes OMS and ASIO-2 drivers in addition to a control panel, while the Windows package includes drivers for Windows 95/98, Windows NT 4.0, and ASIO, as well as Syntrillium Software's *CoolEdit SE* digital audio program and demo versions of Gadget Labs' own *WaveZip* audio-file compression program and *WaveWarm* plug-in software.

The Wave/824 currently has no drivers for DirectSound, which is designed for use with Windows 95, or for the newer Windows Direct Media (WDM) DirectSound, which is supposed to be the new standard for Windows 98 and 2000. According to Gadget Labs, WDM DirectSound adds too much latency to be usable with professional software synthesizers. Moreover, WDM is currently incompatible with all existing 24-bit audio applications. Until Microsoft revises the specifications to make WDM more usable with professional digital audio, don't expect DirectSound or WDM drivers any time soon.

There is likewise currently no driver for the NemeSys *GigaSampler*. Discussions between the two companies are in progress, which might result in the appearance of a *GigaSampler* driver by the time you read this. I hope so, because *GigaSampler* would make an ideal companion to a good, inexpensive digital audio system like the Wave/824.

The Wave/824 card is Plug and Play compatible, so Windows 95/98 is supposed to recognize it in the system. Ostensibly, all you have to do is supply the driver disk when it's requested and installation should be automatic. Windows users know better. Initially I had a little trouble installing the drivers, but only because I'd set my BIOS to force the first two PCI slots to accept specific IRQ numbers. Once I returned the BIOS to standard settings, driver installation proceeded without a hitch, and the card worked perfectly.

▼

You can use the Wave/824 with both PCs and Macs.

FLIP THIS SWITCH

Before you begin recording with your favorite digital audio software, click on the *WavePro* control-panel icon in the system tray. A dialog box opens, displaying some important options (see **Fig. 1**). You can set each channel's level to balanced (+4 dBu) or unbalanced (–10 dBV). If you have more than one Wave/824 card in your system, you'll see a tab for selecting each one. Likewise, you can choose which ports you want to monitor the analog inputs.

If you plan to use the Wave/824 in a multitrack recording environment, activate the Sync Start box because Windows MME drivers see each pair of input and output channels as separate stereo devices. To work around this, card manufacturers must ensure that all channels record and play in sync. (Some digital audio applications also synchronize digital audio I/O from multiple cards, but if the card manufacturer writes synchronization capability into its drivers, then the software application has that much less work to do.)

Finally, go to the Options menu and select the bit resolution that corresponds to your digital audio software's capabilities. Some programs can record and play back at only 16-bit resolution. For the Wave/824 card to work properly with these programs, it has to dither the 24-bit audio input

Wave/824 Specifications

Analog Audio Outputs	(8) ¼" TSR; (2) XLR (line level); +4 dBu or –10 dBV; auto-switched via software
Analog Audio Inputs	(8) ¼" TSR; (2) XLR (line level); +4 dBu or –10 dBV; auto-switched via software
Digital Audio I/O	S/PDIF RCA on base card; functionality available on an optional daughtercard
Additional Ports	MIDI In and Out on breakout box
Sampling Rates	11.025, 16, 22.05, 24, 32, 44.1, 48 kHz
Sampling Resolution	24 bits
Oversampling	128×
Frequency Response	10 Hz–20 kHz (±0.1 dB)
Dynamic Range	105 dBA (A/D); 106 dBA (D/A)

For manufacturer information, please see Contact Sheet, p. 195.

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GADGET LABS
Wave/824 (Mac/Win)
audio interface
$499

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

PROS: Inexpensive, excellent-sounding card that's easy to use and expandable. Mac and Windows compatible.
CONS: Daughtercard option can bend the card's end so that it touches adjacent cards. No DirectSound or *GigaSampler* drivers.

down to 16-bit resolution. The Wave/824 does this for you in hardware, so you don't have to rely on software to handle it. Naturally, if you're planning to work with 24-bit digital audio, you'd simply select the 24-bit setting.

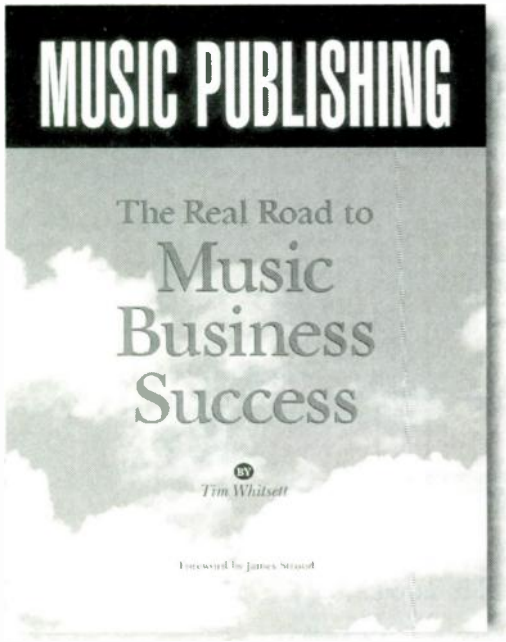
GO GADGET GO

The Wave/824 might be basic, but this is intentional. For instance, the company made S/PDIF I/O an option because it found that a very high percentage of users did not need or want to use S/PDIF in their production environment. If you think about it, this shouldn't be that surprising. Gadget Labs views the Wave/824 as sort of a hard disk version of an MDM. Its users will likely use the analog outputs for monitoring or for sending audio to an external processor. Ultimately, the tracks will likely be mixed down to stereo audio files within the program and burned onto a CD-R. Alternatively, tracks might be mixed from an analog mixer to an analog recorder or a DAT mastering deck's analog inputs. None of these scenarios necessarily requires S/PDIF.

This product needs very little improvement for its target market. Besides my misgiving that the card can bend if the optional daughtercard is attached, I also wish that Gadget Labs would write a DirectSound driver, because I use software synthesizers frequently. However, given the company's previously stated views on the matter, I can see why this might not happen in the near future. (Gadget Labs recommends using Seer Systems' *Reality* and BitHeadz's *Unity DS-1* programs because they don't rely on DirectSound.) And as a *GigaSampler* user, I'd like a driver for that as well. The computer power required to run *GigaSampler* is moderately priced, and a low-cost, high-quality multichannel audio card like the Wave/824 would be a perfect fit.

The Wave/824's low price and expandability make it a good choice for those who want to incrementally increase their computer-based digital audio system's capabilities. Best of all, the Wave/824 sounds great and performs well, so you're not sacrificing audio quality or processing performance. In other words, it's an excellent card, even if money isn't an object.

Zack Price *is a digital audio editor and Windows digital audio consultant in the Chicago area.*



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QUICK PICKS

Q UP ARTS

Latin Groove Factory, Volume 2

By Rob Shrock

Latin Groove Factory volume 2 ($79 audio CD; $299 CD-ROM in Akai, Roland, and SampleCell formats) concentrates strictly on the sounds of Brazil. As in the original *Latin Groove Factory,* these samples and loops are well recorded and are easily incorporated into music productions.

In fact, the day I received *Latin Groove Factory 2,* I used it on a dance version of "Feliz Navidad" for a Christmas album. While hunting for an interesting introduction for the song, I popped the Roland version of *LGF* 2 into my CD-ROM player and immediately found some samba loops with tempos that closely matched my track. Since the sounds in the loops are also available as individual hits, mixing and matching between the two was seamless. Twenty minutes later I had a samba intro—complete with call-and-response—that worked perfectly with the Latin-flavored dance track I had begun creating earlier in the day. I added a few more loops and individual instrument sounds into the main track, and I was finished. The results were excellent.

Q Up Arts' *Latin Groove Factory,* volume 2, delivers authentic Brazilian sounds with drums and percussion that will add sizzle to your tracks.

South American Loops

I've been fortunate enough to have had direct exposure to Brazilian music for quite some time. I toured Brazil several times with both Burt Bacharach and Dionne Warwick and worked on many of the arrangements on Warwick's *Aquarela do Brasil* CD. I've also had the pleasure of working with her Brazilian percussionist, Renato Pereira, for several years, as well as with members of Batacoto (a very popular group from Rio de Janeiro). Brazilian sounds aren't new to me, so frankly I was skeptical that a sample library of them could hold up over repeated use.

Well, *LGF* 2 does. The percussion collection contains all the popular Brazilian instruments, like *chekere, caxixi, tamborim,* samba whistle, *cuica, pandeiro, surdo,* and *repinque.* There are also *cabasa, agogo,* shaker, woodblock, cowbell, bongo, and conga multisamples to round out the collection. In addition to the individual hits, there are several indigenous loops like Baion, Bossa Nova, Partito Alto, Samba Canzao, Samba Cruz, Samba Funk, and Marcha at appropriate tempos. The loops provide the individual elements playing their specific parts as well as various combinations of instruments playing together. This allows you to vary, for instance, a *cuica* pattern by isolating the loops that have the *cuica* omitted and playing the multisampled *cuica* instrument pattern to your liking.

Get into the Groove

Besides providing great percussion sounds, *LGF* 2 features some absolutely fantastic drum kits that have that tight, Yamaha Recording Series–type punch so commonly heard on records by Djavan, Ivan Lins, Batacoto, and—well, you get the idea. The kits are good enough to use for other musical applications, of course, but the drum samples really embody the popular Brazilian sound. It's not an exhaustive collection, but it's enough to create a great Brazilian groove of your own and definitely enough to augment your collection of loops dripping with Brazilian feel.

As a supplement to the original *LGF* or as a stand-alone library, *Latin Groove Factory* 2 won't disappoint you. *Carnaval,* anyone?

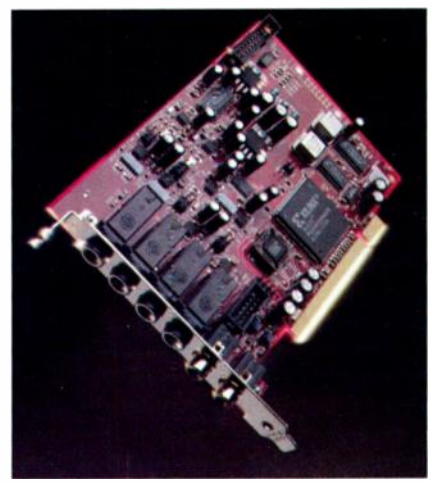
Overall EM Rating (1 through 5): 4

DIGITAL AUDIO LABS

CardDeluxe (Win)

By Erik Hawkins

Digital Audio Labs (DAL) has long had an excellent reputation for making affordable, reliable, and good-sounding audio cards for the PC, and the company's latest offering is no exception. With 24-bit, 96 kHz recording and a $595 list price, the CardDeluxe sizzles right from the get-go.



Digital Audio Labs' sweet-sounding CardDeluxe can simultaneously record and play two tracks of 24-bit, 96 kHz analog audio and two tracks of S/PDIF digital audio. Drivers are currently available for Windows only, but the company is working on Mac support.

The PCI card can record and play back up to four tracks at once—two via the analog ports and two via S/PDIF digital I/O. This is great for multitracking and surround sound. Connect the card to any external S/PDIF converter, like a DAT machine or sampler with digital I/O, and you're ready to rock.

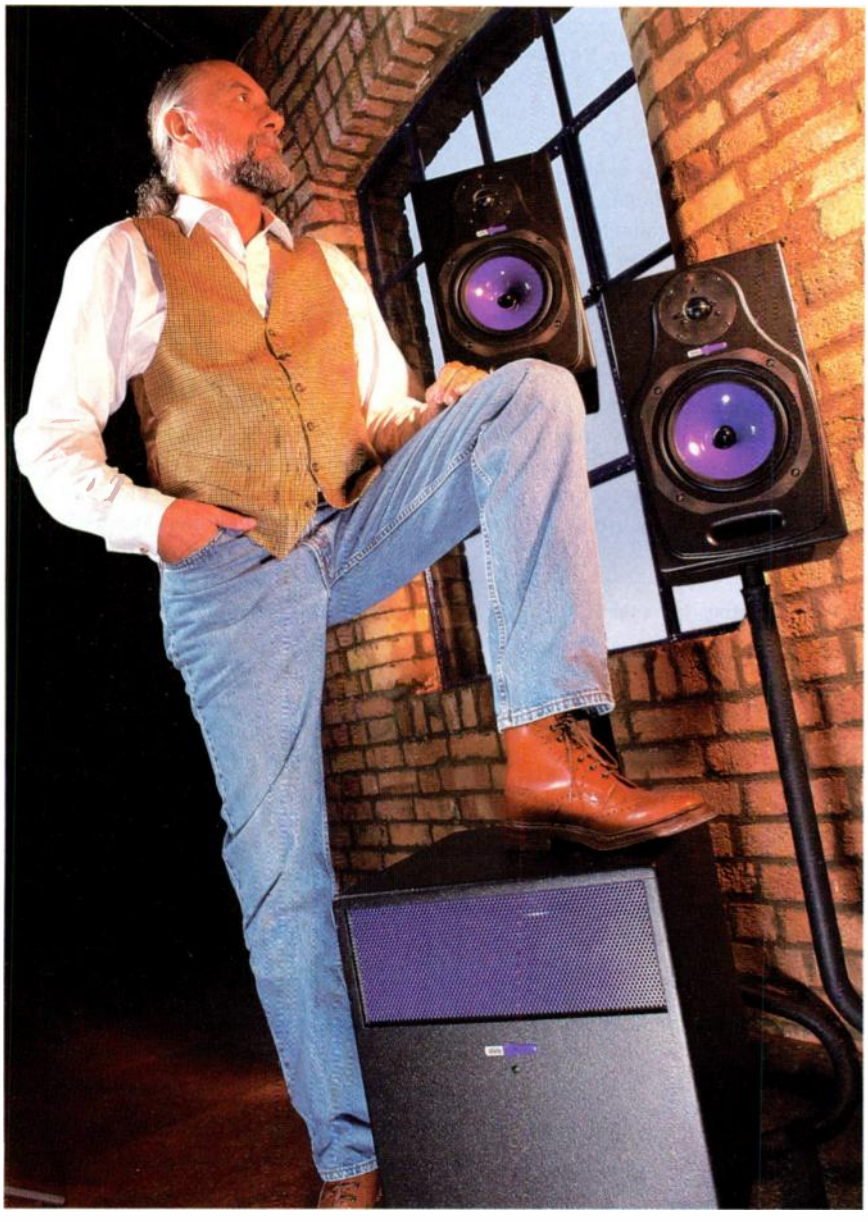
The minimum suggested system is a 166 MHz Pentium, AMD, or Cyrix processor and 32 MB of RAM running Windows 95, 98, or NT 4.0. (A Pentium II with at least 64 MB of RAM is recommended.) A DirectX driver is available, and as of this writing, an ASIO driver is in testing but should be available by the time you read this. DAL is also working on Mac drivers and hopes to release them in the third quarter of 2000. I tested the card with Steinberg's *Cubase VST 24/96* and Cakewalk's *Pro Audio* 8 on a Pentium II/400 with 160 MB of RAM.

The Port Report

The balanced, ¼-inch analog inputs and outputs also accept unbalanced plugs, and

For manufacturer information, please see Contact Sheet, p. 195.

THE RUMORS ARE ALL TRUE



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So what are you waiting for? Get your ears down to the nearest HHB dealer and check out Circle monitors today.

Above (left to right): HHB Circle 5 midfield monitor (active and passive versions available), HHB Circle 1 powered sub-woofer, HHB Circle 3 nearfield monitor (active and passive versions available).

Left: Mick Fleetwood with HHB Circle 5 active midfield monitors and Circle 1 powered sub-woofer.

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FIRST WE LISTEN

you can switch them between +4 dBu and –10 dBV operation by using a jumper. S/PDIF digital I/O is provided on RCA jacks, which are nicely gold plated for a better connection.

AES/EBU and S/PDIF optical connections are available as an upgrade directly from DAL for the very reasonable price of $50. The upgrade occupies the port slot for a PCI card but does not use the PCI slot itself, so you can still plug in a PCI card that has no ports. The upgrade attaches to the CardDeluxe by way of a ribbon cable. The AES/EBU ports are on nonstandard balanced, ¼-inch TRS jacks. According to DAL, this design was necessary to accommodate the size constraints of the computer's port slot; nonetheless, I prefer to have standard XLRs without the need for an adapter.

Deluxe Installation

The first set of drivers and firmware that I received had serious problems, ranging from random system-boot errors to sampling-rate playback anomalies. Updating the driver to version 4.05.1023 and the firmware to version 1.04.0011 fixed the problems, so I recommend that you check DAL's Web site for the latest downloads. Incidentally, the company's site is comprehensive, with lots of product descriptions, prices, and answers to commonly asked questions.

You can install and sync as many CardDeluxe cards as you have PCI slots; some users have as many as eight cards in a single system. A 20-pin ribbon cable connects the cards, and each card comes with one cable. An extension, WavSync, ensures that tracks assigned to different CardDeluxes are properly synchronized.

The CardDeluxe accommodates bit resolutions as low as 8 bits and sampling rates down to 8 kHz. Each card can have a different sampling rate and still remain synched with the other cards. With this excellent feature, there is no need to convert samples that have differing rates: you just send each sample to the card with the matching rate. For example, you can record and play back critical tracks at 24-bit, 96 kHz resolution with one CardDeluxe and save disk space by recording synths and samplers at 16-bit, 48 kHz with a second card.

My main gripe about the CardDeluxe is that it has no connection for the computer's CD player. In my opinion, this is a pretty big inconvenience because I can't pop in an audio CD and listen to it through the board's outputs. According to DAL's engineers, adding this feature would greatly diminish the board's performance, especially the signal-to-noise ratio (rated at 114 dB, full scale). I can't argue with the importance of designing for top audio quality, but I am nevertheless annoyed with my remaining options: add another sound card for the CD player, plug the headphone jack of the CD player into a mixer, or use an external CD player. Perhaps DAL could concoct a stand-alone program that would let audio from the CD player stream to the CardDeluxe's outputs.

Sweet Serenade

The CardDeluxe is a sweet-sounding piece; it makes 24-bit, 96 kHz recordings with stunning audio quality. Unlike many audio cards in its price range, its phat lows and warm highs remind me of a high-end analog tape machine—but without tape hiss. It's excellent for recording acoustic instruments and voice, capturing more detail and nuance than ever before. And because it's DirectX compatible—a feature often left out by "pro" audio cards—all your games and DirectX audio programs benefit from the CardDeluxe's fine fidelity.

Overall EM Rating (1 through 5): 4

BIG BRIAR

Moogerfooger MF-103

By Barry Cleveland

The MF-103 12-stage phaser ($399) is number three in Big Briar's Moogerfooger series of analog effects devices. Like all Big Briar products, it was designed and built under Bob Moog's supervision and is typical of his work. The MF-103 is constructed of durable yet elegant materials—including genuine wood side panels—and employs the finest analog components available.

The MF-103 is completely modular and consists of two sections: a switchable 6- or 12-stage voltage-controlled phaser and a voltage-controlled low-frequency oscillator. The phaser section has knobs for sweep and resonance: sweep moves the frequency response over a six-octave range, whereas resonance acts like an array of resonant filters. The LFO section has knobs for amount and rate, plus a rocker switch for selecting a Lo or Hi range of oscillation rates. The Amount knob varies the depth of the phaser modulation over a range of 1 to 10 (with 6 labeled "Stun" and 10 "Kill"). The Rate control varies the LFO speed over a range of 0.01 to 2.5 Hz when set on Lo, and 1 to 250 Hz when set on Hi.

Small knobs for drive and output level are situated between the two sections, as are LEDs for input-level overload, LFO rate, and bypass status. Drive acts as an input-level trim and can be pushed into distortion, creating some dramatic overdrive effects. A stompbox-style footswitch is located directly below these controls, in case you want to put your MF-103 on the floor. Actually, you could easily construct an entire pedalboard just to control the MF-103.

Power to the Pedals

When Bob Moog says the words "voltage-controlled" and "modular," he means it. Four ¼-inch TRS jacks on the rear panel allow the MF-103's amount, sweep, rate, and resonance parameters to be controlled externally using expression pedals (such as the optional Moogerfooger EP-1), MIDI-to-CV converters, or any other control-voltage source. As if that weren't enough, there are also jacks for LFO Out and Sweep In that allow the LFO to control external devices and the phaser's two sections to be accessed separately when in 12-stage mode. Finally, the Aux Output sends a signal that has the opposite frequency-response characteristics as those coming from the main output. The phase relationship between the two outputs can be used to create some fat stereo effects by panning hard right and left in a stereo mix—not too shabby for a stompbox.

The Moogerfooger MF-103 12-stage phaser from Big Briar uses high-quality components and offers an amazingly detailed and transparent sound.

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Dave Kochanski on the Rippingtons Tropez Tour

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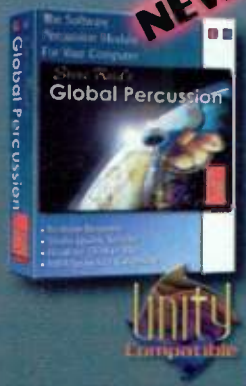

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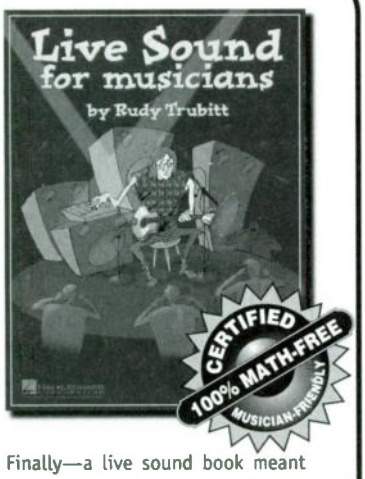

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QUICK PICKS

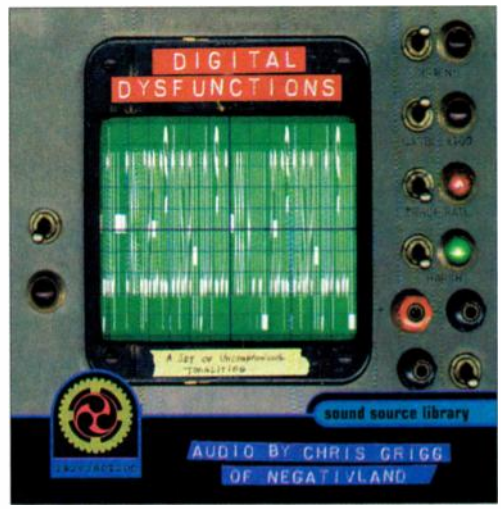
Passing Through a Phase

Besides being well constructed and having an extraordinary amount of control flexibility, the MF-103 is arguably the best-sounding phaser ever created. It has an amazingly detailed and transparent sound that's more reminiscent of a Mutron Bi-Phase than, say, an MXR stompbox (though you can get a dirtier edge by cranking up the drive).

In addition to classic phaser "whoosh" sounds, the MF-103 produces a variety of effects, ranging from subtle modulations to over-the-top ring modulator–type freakouts. One of the most impressive is what the manual refers to as a "rotating speaker simulation" but which sounds frighteningly similar to the Chorus setting on a vintage Uni-Vibe phaser.

The Moogerfooger MF-103 is not exactly inexpensive, but in this case you definitely get what you pay for. A vintage Bi-Phase or Uni-Vibe would cost twice as much and wouldn't be nearly as versatile or reliable. I suggest you sell some of your old stompboxes and get yourself an MF-103. It's a real Moogerfooger!

Overall EM Rating (1 through 5): 5



Casting aside conventional approaches, Negativland's Chris Grigg creatively applied software tools to produce a fun and useful collection of strange and unusual sounds in Rarefaction's *Digital Dysfunctions* CD-ROM.

RAREFACTION

Digital Dysfunctions (Mac/Win)

By Jeff Obee

I asked my therapist whether I was digitally dysfunctional. He told me to listen to *Digital Dysfunctions* ($149). This cross-platform CD-ROM from Rarefaction overflows with 16-bit, 44.1 kHz mono, stereo, and split-stereo AIFF files of manipulated aural snippets. It was developed by Chris Grigg of the notorious Negativland.

The disc presents hundreds of sound files in eight categories: aliases of the Top 50, Computer & Communication SFX, Kapows, Loopable SFX, Musical Loops (in bpm), Processed Media, Processed Voice, and The Uncategorizable Category. There are whirs, whooshes, bleeps, tones, squishies, squigglies, belches, and strange loops that range from basic and organic to complex and grating.

The names of the sounds are practically worth the price: I clicked on the Piggies folder in the Processed Voice category and played "Harsh Pig Inhale-g." I laughed heartily as my eardrums vibrated with this somewhat ominous processed grunt. Then I saved it as a WAV file and imported it into my Kurzweil K2000RS. After transposing it down an octave, running it through a DSP algorithm, and adding a spacious reverb, I had a fine horror-movie cue.

Going to Extremes

Grigg created intriguing sounds by applying extreme EQ and pitch shifting, less than optimum time-compression, or redundant processing through one type of effect. He also "abused" Digidesign's *DINR* noise-reduction software and sometimes employed numerous techniques at once.

Grigg used numerous older digital tools, as well; in fact, Grigg looks for anomalies in the software and deliberately processes the audio at low sampling frequencies. Although the final resolution of the sounds is 44.1 kHz, he processed most of the sounds at 22 kHz (or less) in Digidesign's *Sound Designer* II, Tom Erbe's *SoundHack,* and various video-game sound editors on Commodore 64 and Sega Genesis systems. He even used the Farallon MacRecorder 8-bit audio interface to record voice samples.

For example, Grigg made the Processed Voice files with excessive EQ and gain boosts or reductions, poor pitch shifts, and the occasional use of a Sequential Circuits delay. He captured the Processed Media sounds from radio and TV, then ran them through delays, distortion, envelope filters, and EQ. Trust me, you won't recognize them. The Kapows are largely variations

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of laserlike bursts of sound from the C64 Epyx SPL language, which Grigg designed, and the Sega GEMS system, which he helped design.

Grigg synthesized the Computers & Communication SFX (some 425 sounds) using computer-game chips and a Kurzweil K2000S sampler/synth, lots of *DINR* processing, and narrow-band, high-frequency EQ. In some cases, Grigg synthesized new sounds by consecutively copying a very short piece of sound—say, a few hundred samples—then pasting it many times in a row. This creates a new continuous tone with an unpredictable (often inharmonic) spectrum.

I was particularly enamored of the sounds in this category; they work very well for creating unusual rhythmic loops. I howled with laughter again as I played the Tech Multi Duck files and the wonderful Edited Computer Sequences.

Dysfunctional Opinions

These sounds may seem twisted at first, but they will work in a variety of settings, including video post-production, one-shot sound effects, and other creative applications. It's fun to process them even further and see what bizarre noises result.

You get a bunch of bonus goodies on the disc, too, such as Negativland sound clips, third-party demos, and *DINR* and *SoundHack* settings. Mac users also get a copy of *SoundHack* and a couple of *Control-G* utilities (available at www.control-g.com). One *Control-G* extra was especially useful: PlaySound CMM, a contextual menu extension that allows you to play compatible sound files by holding the Control key and clicking your mouse on the file. There's also PlayMovie CMM (the same idea for movie files), a font called Crash Test, and a demo of a sound-effects library database called *FXDB*.

When you grow tired of all your pristine samples, boot up this CD-ROM and explore the shadow side of audio.

Overall EM Rating (1 through 5): 4.5

OFFICIAL SOFTWARE

Official Copyright (Mac/Win)

By Michael A. Aczon

If you create works of art that need copyright protection, *Official Copyright* ($70.95) is for you. Published by Official Software, it is a one-stop shop for writers and producers of music who need to register their works with the U.S. Register of Copyrights. In fact, this program offers protection for more than just your songs. It provides you with forms for musical compositions, lyrics, and all manner of sound recordings. In addition, it includes forms for fiction and nonfiction writing; computer programs (software as well as Web sites, databases, and multimedia productions); performing-arts works, such as scripts and choreography; architectural plans and drawings; and visual artwork including photographs, drawings, and greeting cards. To say the least, it covers a lot of territory.

The system requirements are minimal: PC users need a 486 or better machine with Windows 95 or later and 16 MB of RAM. Mac users need a 68040 or Power Mac with Mac OS 7.0.1 or later and 8 MB of RAM. You also will need 15 MB of free hard disk space and a printer with 300 dpi or better resolution for generating the forms. Installation on my Power Mac 7200 was a breeze. The documentation is written clearly and doesn't require that you have a technical or legal background.

Doing Legal Copy Right

I went through the copyright-registration process using *Official Copyright* when I was producing my new CD. With completed CD, artwork, and sales materials in hand, I launched the program and was greeted with a well-laid-out main menu that made navigation simple. Selecting the Search By Form feature summons a menu that describes the four correct forms. Click each highlighted form name, and a brief description appears that helps you determine whether you have chosen the correct form for the copyright you need.

Select the PA form to register songs and underlying text; if you are the author of both, be sure to claim "song and underlying text" in the Nature of Authorship space. The TX form takes care of the song text, CD packaging text, and advertising copy. Use the VA form for the CD and advertising artwork and accompanying text—again, you need to claim both art and text under Nature of Authorship. Finally, the SR form protects your master recording. *Official Copyright* provides long and short versions of the PA, TX, and VA forms, so you get seven forms in all.

The program walks you through each form line-by-line. Go to the Forms pull-down menu, open up a form, and you again get information that tells you whether you have chosen the correct form. Filling in the form is a simple matter of typing in an answer to a question or checking a box. In addition to the interactive forms, several less-used copyright forms—such as Form CA for Corrections & Amplifications and Form CON (Continuation Sheet)—are provided as PDF files.

After completing a form, you can print it out, sign it, and refer to the schedule of fees, which was recently updated to conform to the July 1999 revision of fees by the Register of Copyrights Office. Additional instructions tell you what other materials are necessary to include with your form prior to sending it off to the Register of Copyrights.

When you save the form, it is immediately filed into the Account section of the program so you have a complete record of every copyright you file with *Official Copyright*. This is a great way for prolific writers, artists, and producers to keep track of their work. All the information is at your fingertips, which comes in handy if you correspond with anyone about a copyrighted work or revise the copyright registration in any way. For example, you might want to transfer the rights to a song to a publisher or reregister a song after making substantial changes to it.

Forms, Not Firms

Of course, complex legal questions about copyright law will still require the help of an experienced copyright lawyer. But

Official Software's *Official Copyright* walks you through the process of filling out all manner of copyright forms. Unlike most things official, it is simple and user friendly.

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QUICK PICKS

between the Index and the Reference function, *Official Copyright* can answer just about every basic question about copyright forms. If you create original works, this program is almost as important as the strings on your guitar.

Overall EM Rating (1 through 5): 5

SANYIU SAMPLES

Sounds of Silence

By Larry the O

In the hurly-burly of sample CDs for every instrument, sound effect, and noise source conceivable, there is nothing to be found for those instances when less is more. "No sound is so rich and varied as silence," says Korean master sound designer Jeok Sanyiu in the liner notes to his new sample CD, *Sounds of Silence* ($69.95). The CD makes his point, containing a wide range of pristinely recorded room tones, loops, and ambiences from the quietest places on Earth.

Sanyiu traveled everywhere—from an unoccupied suburban New Jersey tract house to the depths of the Chuscwiddn caverns in Wales, to the barren, windless spaces of Australia's desert—in gathering the finest collection of stillness recordings you have ever heard.

Walls of Silence

The room tones section contains no less than 15 different room tones, including the aforementioned suburban house (a particular favorite of mine), museum after-hours (somewhat marred by a slight air-conditioning rumble), the requisite anechoic chamber, and the unique abandoned yurt, recorded deep in the steppes of Mongolia. Each room tone is a full three minutes long. I found the bomb-shelter tone to be a bit of a disappointment, though; it lacks in the fullness that is experienced only between 18-inch concrete walls.

Exotic Ambience

The ambiences make up possibly the most brilliant portion of the entire disc. Each sample is more than six minutes in length and presents complete solutions to those needs that no other CD on the market can fill. Who else but Sanyiu could pull off the insertion of a tiny microphone into a hollow Italian peppertree seedpod? The result is like nothing you've heard before, all of it. Sanyiu spent three months north of the Arctic Circle making hydrophone recordings, producing incredible ambiences from deep snowdrifts and even within the permafrost itself. Unafraid to extend his fresh perspective to the mundane, Sanyiu includes the world's first ambient recording of the inside of a rusted beer can he found deep in an Indonesian garbage heap.

Still, given all the spectacular ambiences gathered from the world over, I was surprised and disappointed to find that no rock-pile interior ambiences anywhere on the disc.

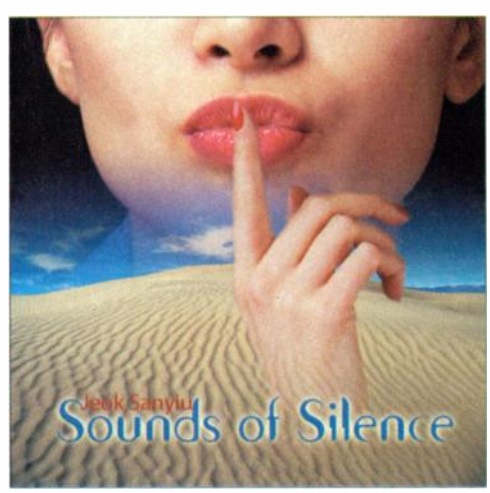
But Wait—There's More

Not content to dazzle users with exotica, Sanyiu has also provided a host of bread-and-butter utility recordings: a series of files of digital silence in varying lengths, including perfectly placed loop markers. This alone makes this disc worth the price of admission.

Anyone familiar with Sanyiu's film work will not be surprised by the beautiful fidelity of these recordings. The signal-to-noise ratio (or, perhaps more appropriately, silence-to-noise ratio) of almost every track is a testament to the quality of modern recording equipment and Sanyiu's mastery of it.

Surround Silence

In today's market, it is easy to find a steady stream of the latest, greatest drum loop or industrial noise CDs being issued every



Sound designer Jeok Sanyiu's *Sounds of Silence* captures the ambience of locations around the globe, ranging from caverns in Wales to suburban New Jersey, from an Australian desert to the far reaches of Mongolia.

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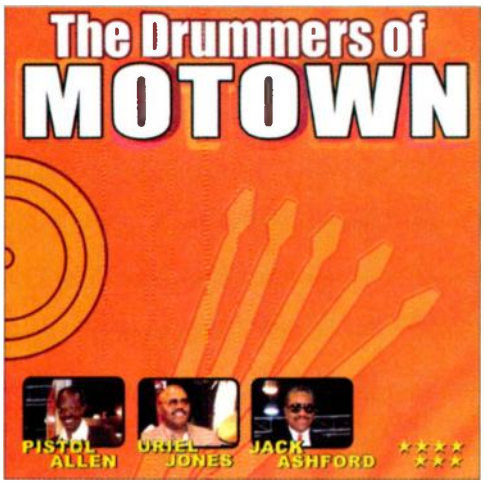
day, it seems, but one would have to search for a year to find another disc such as this. Sanyiu has also announced that there will be a volume 2 of *Sounds of Silence,* recorded and mastered entirely in 5.1 surround. I have already reserved a spot on my shelf for it.

Overall EM Rating (1 through 5): 4.5

POWERFX

The Drummers of Motown

By Dan Phillips



***The Drummers of Motown,* from PowerFX, features original players and successfully re-creates the Motown sound.**

When producer and drummer Bil Bryant heard that original Motown drummers Richard "Pistol" Allen and Uriel Jones were planning to visit town for a drum clinic, he quickly ran the idea of recording a CD of drum loops by them. The two agreed and, after lining up Motown tambourine player Jack Ashford, Bryant put together the session that became *The Drummers of Motown.*

Heard It Through the Grapevine

All three players have stellar Motown résumés, and most of the loops on the CD are modeled after their own hit tunes. So, for instance, there are two sets of loops based on "I Heard It Through the Grapevine," one in the style of the Marvin Gaye original (on which Allen played), the other modeled on Gladys Knight's take, which featured Jones on drums.

Perhaps less recognized, Ashford deserves a special call-out on *Motown.* According to Bryant, the tambourine player sat in on nearly all of the Detroit Motown sessions—yet even without that history, his playing here is critical to the groove, clearly sparking the performances of Allen and Jones.

The Motown Sound

The recording technique itself mimics the original: a single, lightning-fast five-hour session, with no overdubs and everyone playing simultaneously. Also drawing from Motown example, Bryant chooses to feature the two drummers playing as a team: one on a full kit and the second either doubling or playing an added hi-hat pattern.

Most of the loops are done three ways: close-miked, room-miked, and dual-mono (drums on one side, percussion and additional hats on the other). The room-miked and dual-mono versions brilliantly capture the feel of the original Motown recordings, while the close-miked technique means added flexibility for the loop user. Confusingly, some loops seem to use different performances for each version, instead of offering alternate mixes of a single recording—a bummer if you find a loop you like only to realize it isn't available in a particular version.

Most of the loops resonate with a warm and distinctly human beat. Winners include the Gaye-style "Grapevine," with its solid, throbbing tom rhythm, the perky drums, conga, and tambourine combo of "Can't Get Next to You," and "Psychedelic Shack," with its fast party tick. A number of great soloed conga and hi-hat loops check in as well, some featuring tambourine.

A few audio and performance glitches show up. Some loops, including several in the "My Cherie Amour" set, are marred by wavering tempos, while others have noticeable time-stretching artifacts. Tape hiss is an occasional problem, though it didn't bother me except when it appeared on the individual hits at the end of the CD.

The disc is solidly organized, with sensible sample grouping and meticulous documentation of tempo. All of the loops fall at 10 bpm increments between 80 and 130 bpm, making them easy to mix and match.

Minor flaws aside, *The Drummers of Motown* delivers well on its promise: to deliver authentic, vintage-style recordings performed by the era's originals. If you're looking to inject your recordings with a Motown drum groove, this would be a fine place to start. ●

Overall EM Rating (1 through 5): 3.5

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COMPUTER BASED DIGITAL AUDIO SYSTEMS

MOTU AUDIO Hard Disk Recording Systems

The MOTU Audio System is a PCI based bare recording solution for the Mac and PC platforms. At the heart of the system is the PCI-324 PRI 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 panels 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– • 24-bit 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 116 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 A Division of Avid Technology, Inc.

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, realtime 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 • PDLAR 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 1000 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 • Q10-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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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 -500 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

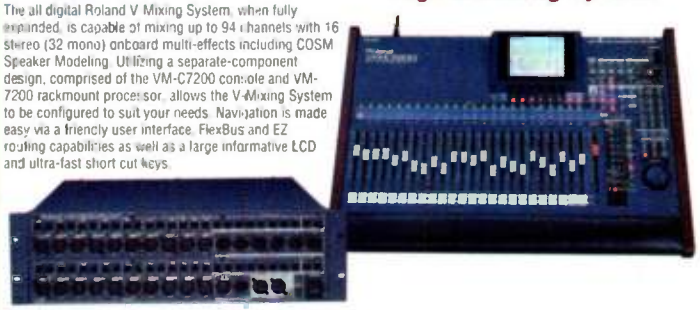
The Microboards StartREC is the first digital audio editing system combined with a multidrive CD recordable duplication system for professionals. Audio is recorded to the internal 6.2 GB IDE hard drive using analog or digital inputs. Sample rate conversion is automatic. Tracks can be edited and sequenced 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 S/PDIF 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 automatec 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 6-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 expanded 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

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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 Electronics 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-M2 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

ALL ITEMS ARE COMPLETE WITH ALL ACCESSORIES AS SUPPLIED BY MANUFACTURER

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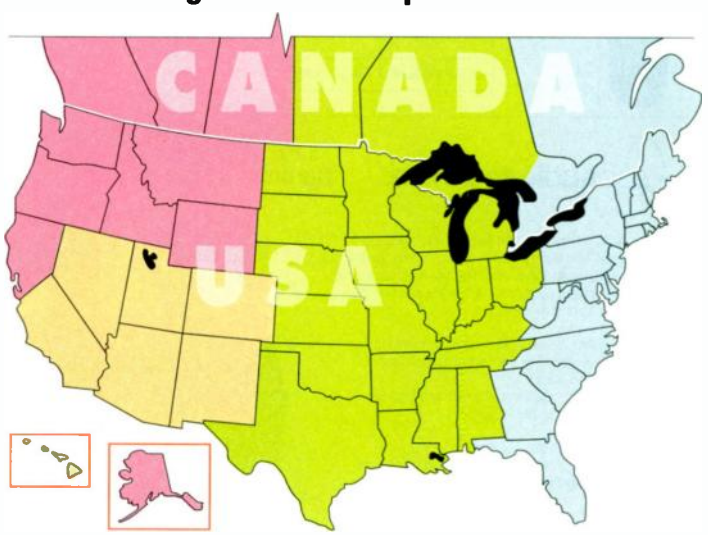

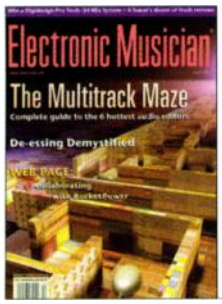

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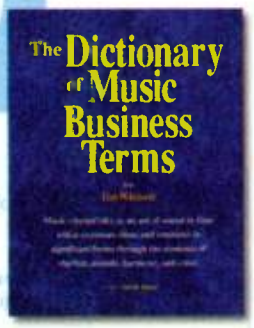

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FINAL MIX

By Larry the O

Lessons of History

It is the sad fate of also-rans to be forgotten by history. Who ran against George Washington for president? Even those who succeed still may not be remembered. Henry Ford did not invent the automobile, but does anyone remember who *did?* If I were to ask **EM** readers for the name of the first person to make sound with a computer, would any correctly respond that it was Max Mathews? OK, Max, *you* would, but who else?

It came as no surprise, then, that several industry friends of mine were dumbfounded when informed at a recent dinner that the first digital recording of audio predated Mathews's astonishing 1955 achievement by several years. Though the effort ultimately came to nothing, it is a story worth knowing, if only for the perspective it lends.

In 1951, Giancarlo Çioniou was nothing more than one of many tailors in his native city of Milan, Italy. Gaspare Çioniou, Giancarlo's French father, had met his Italian seamstress wife, Pietra, in Paris during the Roaring Twenties. Gaspare was an actor, which meant that his wife supported the family. After the couple relocated to Milan, Pietra gave birth to three sons. She taught them all to sew rather than chance their being tempted by the theater.

The boys all became tailors, sharing a custom tailoring business for nearly 26 years. Gioc (as his family called him) developed a particular fondness and talent for leather work.

One July day, Gioc was using his modified sewing machine to punch holes in a piece of leather destined to become a brass-studded vest. As he worked, he listened to a radio drama about naval battles in World War II. One of the broadcast's background effects was the sound of a telegraph sending signals in Morse code. Çioniou was surprised to realize he had unconsciously started varying the speed at which he drew the leather through the machine in accordance with the Morse code, thus altering the spacing between the holes.

It suddenly occurred to Çioniou that he was essentially storing the Morse code in the pattern of holes. History's most fascinating aspects are the least explicable: why, with no previous knowledge of or interest in sound, did Gioc Çioniou leap to the realization his tailoring goof could be turned into a method of storing sound? Çioniou himself was never able to provide an explanation, but the next 18 months found him conducting a series of experiments. He started by manually varying the speed at which he moved the leather. He then created elaborate mechanisms that changed the speed by means of a set of switches, which were triggered as the sound volume moved a stylus-type device past "threshold" reeds. A clunky optomechanical system read the hole patterns and produced a highly distorted, but recognizable, output.

Gioc's brothers were also captivated by the idea. They conducted their own tests but used the size of the holes, rather than spacing, to store information.

Eventually, the brothers developed their techniques into two different working systems. They marketed and sold several of each and, sibling rivalry aside, interesting things were unfolding—until Gioc sold a system to a man and his brothers sold one of theirs to the man's sister. When the two customers discovered that they could not listen to their recordings at the other's house, they were outraged.

Gioc and his brothers fought viciously about whose system was better, taking out vitriolic ads berating each other's system and touting their own. Before long, interest in both systems evaporated and the recordings were only bizarrely punched scraps of leather rotting in the attic. The incompatibility of their systems destroyed them both.

It is said that those who do not learn from history are doomed to repeat it, and no better example exists in our business than the story of Gioc Çioniou.

STEVE CURL

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