Finding A Producer ▼ Multimedia Installations ▼ 8 Reviews!

Electronic Musician

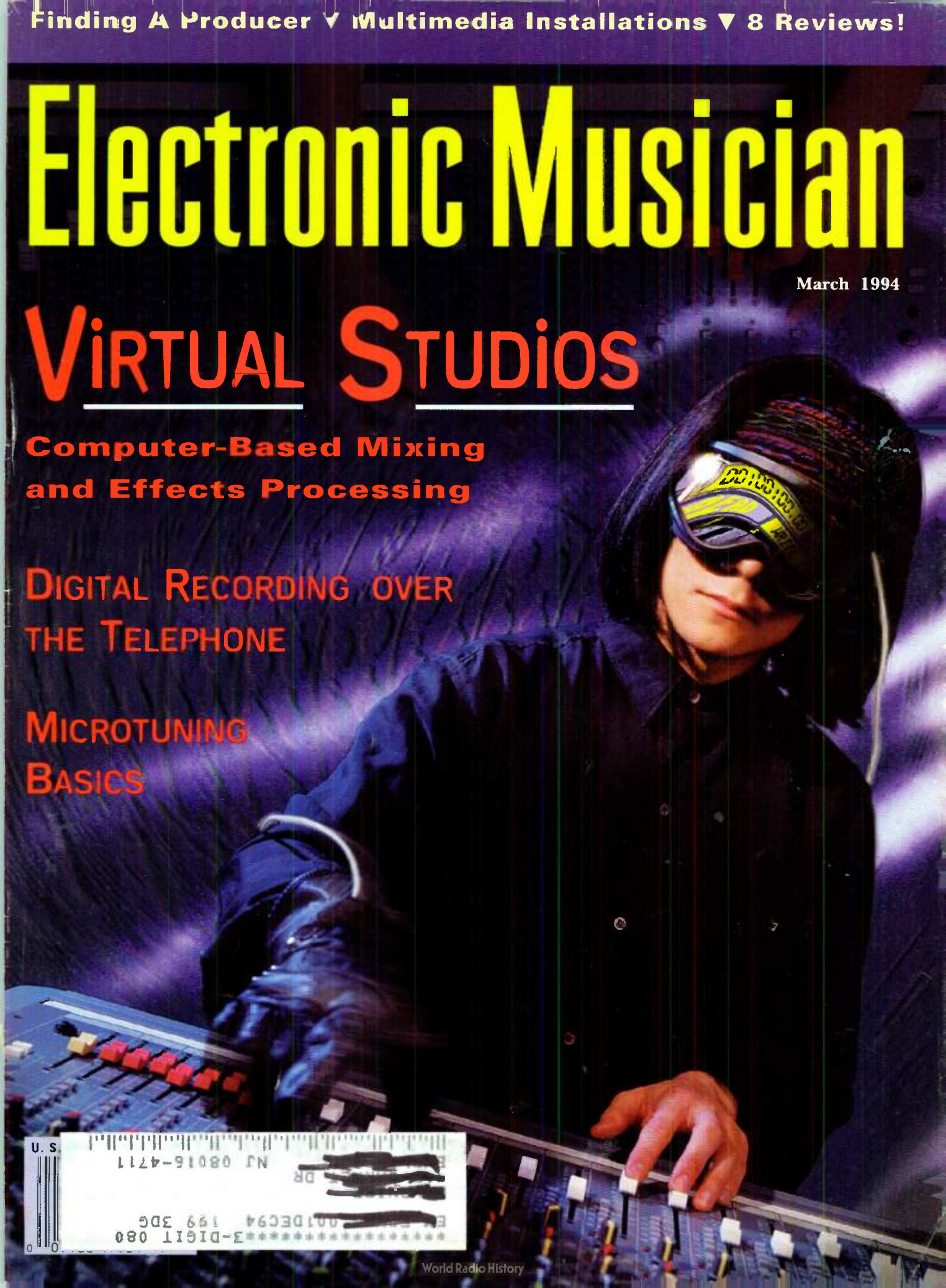
March 1994

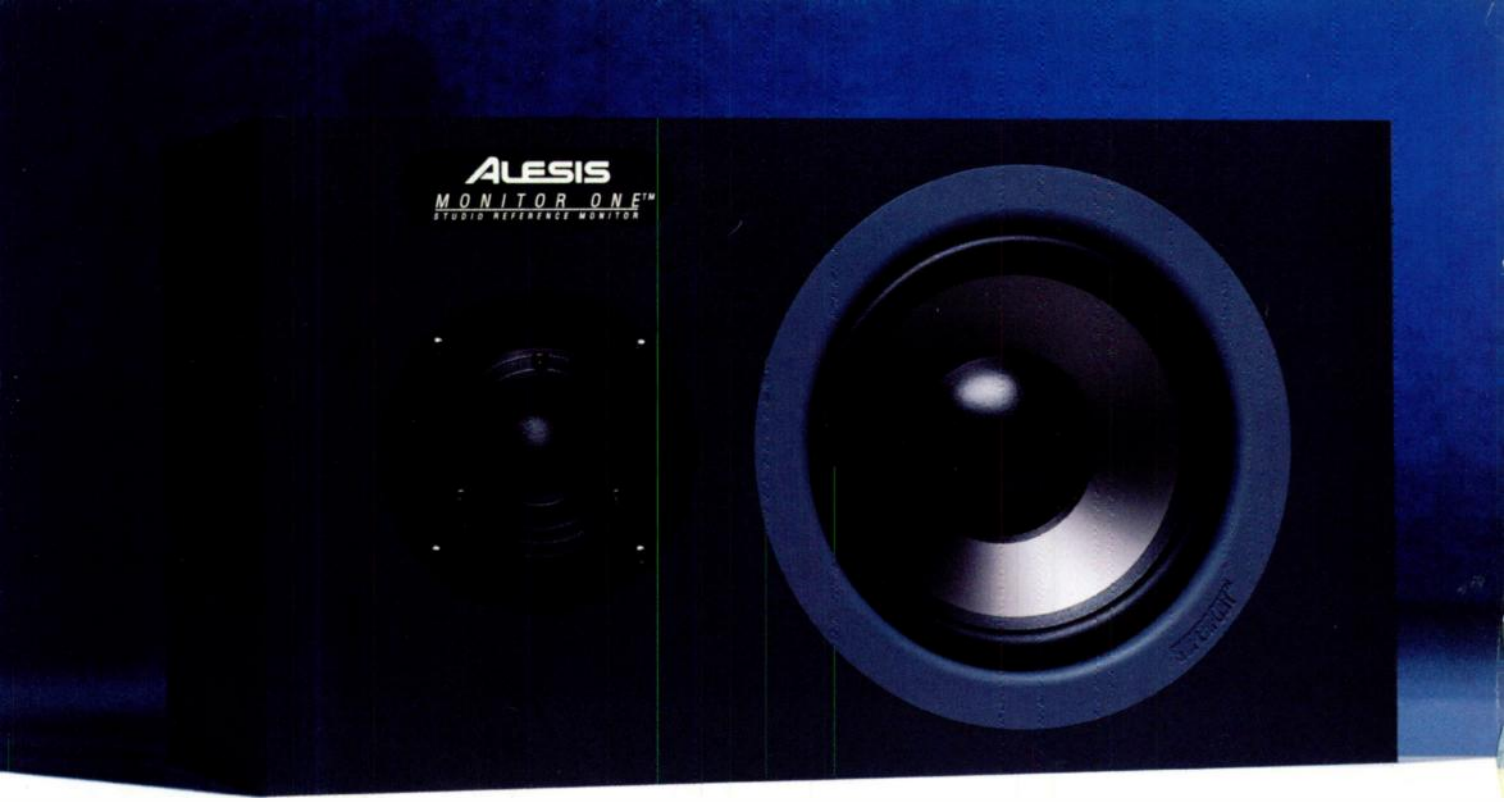
Virtual Studios

Computer-Based Mixing and Effects Processing

Digital Recording over the Telephone

Microtuning Basics



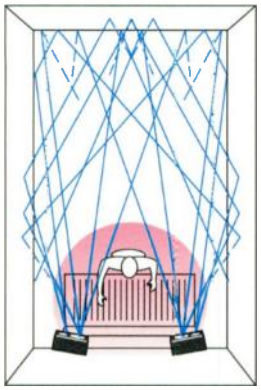


The Truth From

The truth...you can't expect to find it everywhere you look, or *listen*. But when mixing music, hearing the truth from your monitors will make the difference between success and failure. You'll get the truth from the **Alesis Monitor One™ Studio Reference Monitor**.

Room For Improvement

Fact: most real-world mixing rooms have severe acoustical defects. Typical home and project studios have parallel walls, floors and ceilings that reflect sound in every direction. These reflections can mislead you, making it impossible to create a mix that translates to other playback systems. Trying to solve the problem with acoustical treatments can cost megabucks and still might not work. But in the near field, where direct sound energy overpowers reflections, reverberant sound waves have little impact, as shown in the illustration. The Monitor One takes full advantage of this fact and is built from the ground up specifically for near field reference monitoring.



Does your living room double as your mixing suite? The pink area in the illustration shows where direct sound energy overpowers reflected waves in a typical mixing room. The Monitor One helps eliminate such complex acoustic problems by focusing direct sound energy toward the mixing position, instead of the love seat.

Working close to the sound solves the room problem but creates other problems, such as high frequency stridency and listener fatigue (typical of metal-dome and composite tweeter designs). Our proprietary soft-dome pure silk tweeter design not only solves these problems, but delivers pure, natural, incredibly accurate frequency response, even in the critical area near the crossover point (carefully chosen at 2500 Hz).

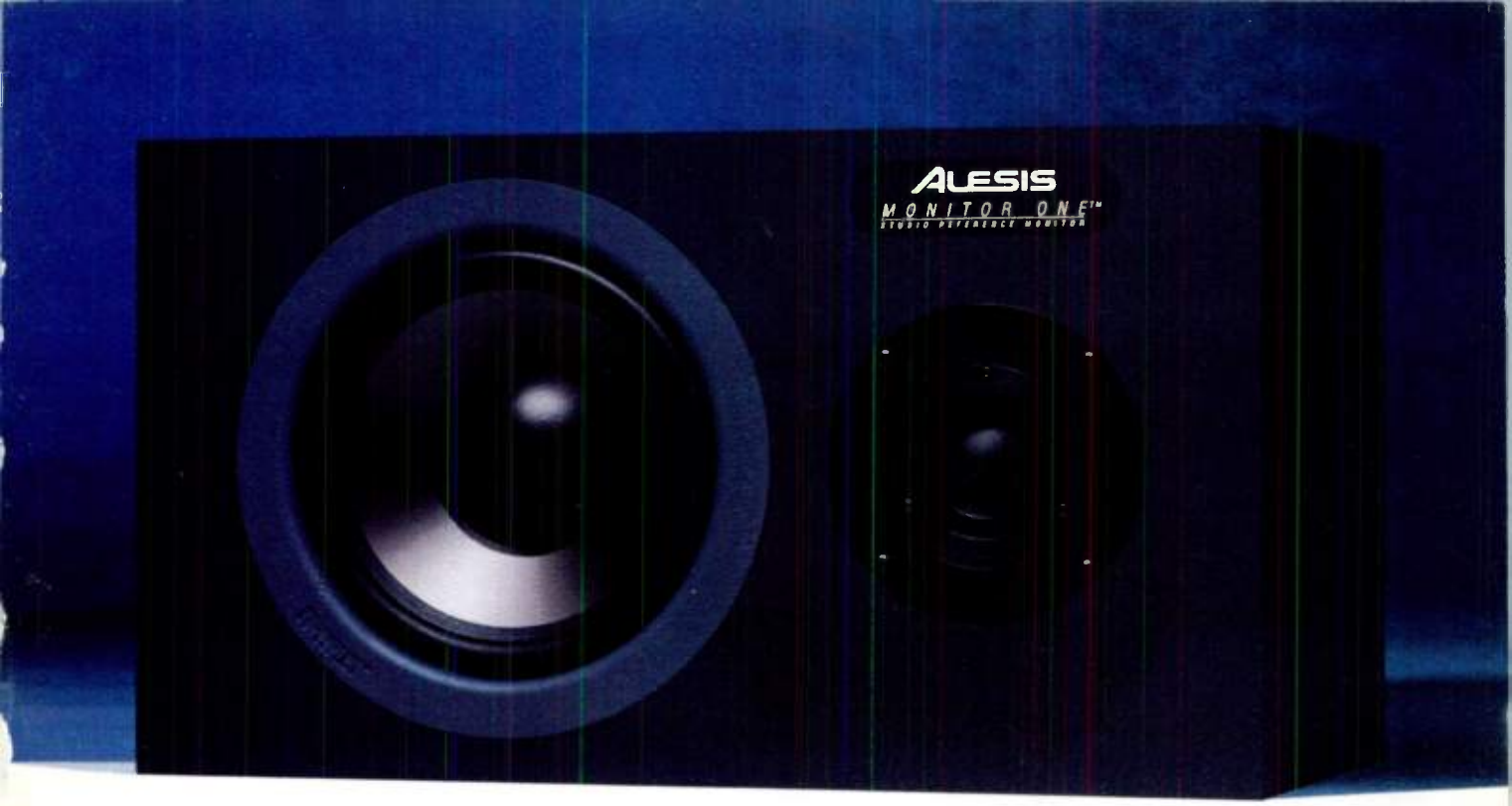
The Truth From Top To Bottom

The Monitor One gives you all the truth you want in the mids and highs, but what about the low end? You probably know that the inability to reproduce low frequencies is the most common problem with small monitors. Most of these speakers have a small vent whose effect at low frequencies is nullified by random turbulence, or they're sealed, which limits the amount of air the driver can move. Such speakers give disappointing results in their lowest octave.

The Monitor One overcomes wimpy, inaccurate bass response with our exclusive SuperPort™ speaker venting technology. The ingenious design formula of the SuperPort eliminates the choking effect of small diameter ports, typical in other speakers, enabling the Monitor One to deliver incomparable low frequency transient response in spite of its size.

Alesis SuperPort™ technology gives you the one thing that other small monitors can't: incredibly accurate bass transient response. No, the SuperPort doesn't have a blue light, but it makes the picture look cool.

The result? A fully integrated speaker *system* that has no competition in its class. You'll get mixes that sound punchier and translate better no matter what speakers are used for playback. Whether you mix for fun or for profit, you want people to hear what *you* hear in your mixes. The Monitor One's top-to-bottom design philosophy is a true breakthrough for the serious recording engineer.



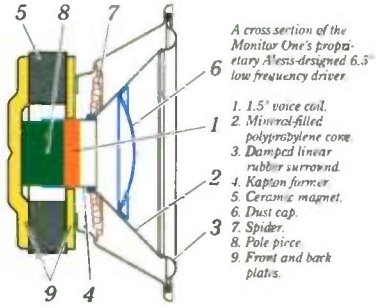
Left To Right

Power To The People

High power handling is usually reserved for the big boys. While most near field monitors average around 60 watt capability, the Monitor One handles 120 watts of continuous program and 200 watt peaks...over twice the power. Also, its 4 ohm load impedance allows most reference amplifiers (like the Alesis RA-100™) to deliver more power to the Monitor One than they can to 8 ohm speakers. That means the Monitor One provides higher output, more power handling capability, and sounds cleaner at high sound pressure levels.
If you like to mix loud, you can.

The Engine

Our proprietary 6.5" low frequency driver has a special mineral-filled polypropylene cone for stability and a 1.5" voice coil wound on a high-temperature Kapton former, ensuring your woofer's longevity.
Our highly durable 1" diameter high frequency driver is ferrofluid cooled (costly, but it's the best way to cool a tweeter), to prevent heat expansion of the voice coil which inevitably leads to loss of amplitude and high frequency response. Combined, these two specially formulated drivers deliver an incredibly accurate, unhyped frequency response from 45 Hz to 18 kHz, ±3 dB. The five-way binding posts provide solid connection, both electronic and mechanical. We even coated the Monitor One with a non-slip rubber textured laminate so when your studio starts rockin', the speakers stay put. Plus, it's fun to touch.



A cross section of the Monitor One's proprietary Alesis-designed 6.5" low frequency driver.

1. 1.5" voice coil.
2. Mineral-filled polypropylene cone.
3. Damped linear rubber surround.
4. Kapton former.
5. Ceramic magnet.
6. Dust cap.
7. Spider.
8. Pole piece.
9. Front and back plates.

The Monitor One's five-way binding posts accept even extra-large monster wire, banana plugs and spade lugs. Hookup is fast, easy and reliable.

The New Alesis Monitor One™

You don't design good speakers by trying hard. It takes years and years of experience and special talents that only a few possess. Our acoustic engineers are the best in the business. With over forty years of combined experience, they've been responsible for some of the biggest breakthroughs in loudspeaker and system design. The Monitor One could be their crowning achievement. They're the only speakers we recommend to sit on top of the Alesis Dream Studio™.

See your Authorized Alesis Dealer and pick up a pair of Monitor Ones. Left to right, top to bottom, they're the only speakers you want in *your* field.

The Monitor One is the speaker for the Alesis Dream Studio™. Need more information about the Alesis Monitoring System? Call 1-800-5-ALESIS. See your Authorized Alesis Dealer.

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NEW X3R AI² Synthesis Workstation • 340 Waveforms, 200 programs, 200 combinations, 128 General MIDI programs, plus 8 GM drum kits • 32,000 note, 16-track internal sequencer • 3.5" disk drive for storing programs, combinations, sequences, Standerd MIDI files and System Exclusive data • Dynamic Digital Multi-Effects with Real Time Control • Program and 1 Megaword PCM card slot-compatible with 03R/W card library • 32 voices with 4 polyphonic outputs

01R/W AI² Synthesis Workstation with Wave Shaping • 255 Waveforms, 200 programs and 200 combinations • 7000 note, 16-track internal sequencer • Dynamic Digital Multi-Effects with Real Time Control • Program and 1 Megaword PCM card slots• 32 voices with 4 polyphonic outputs

03R/W Single rack space module with AI² Synthesis • 255 Waveforms, 100 programs, 100 combinations and 128 General MIDI programs • Dynamic Digital Multi-Effects with Real Time Control • Program and 1 Megaword PCM card slots • 32 voices with 4 polyphonic outputs • Optional RE-1 Remote Editor

NEW 05R/W Half rack space module with AI² Synthesis • 340 Waveforms, 100 programs, 100 combinations, 128 GM programs plus 8 drum kits • Built-in MIDI interface for Macintosh® and PC compatibles • Dynamic Digital Multi-Effects with Real Time Control • 32 voices with 2 polyphonic outputs

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MARCH 1994 VOL. 10, NO. 3 - AN ACT III PUBLICATION

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REVIEWS

DEPARTMENTS

Cover: Photo Illustration by Philip Kaake.

Special thanks to Kevin Lee (model), Mary Cosola, Mark Davis, Generalmusic, and Soundcraft.

Who Are You?

EM's 1993 Reader Profile puts you under the microscope.

PEGGY SUE AMISON

The eternal puzzle for popular artists is defining their audience. Unfortunately, finding one's public is an often brutal exercise that requires juggling art, commerce, and audience expectations. Most artists drop the balls. Because of this, whenever my pop muse abandons me, I tend to envy the classic "Artist" who bows only to the whims of inspiration. These creators don't want—or need—the validation and support of the masses. Magazine editors, however, don't have the luxury of isolationism. We are beholden to our readers, because they are our life's blood. When a magazine loses reader support, it slowly fades away until there's barely enough pages to line a kitty litter box. But subservience to the reader is not a bad thing. After all, if you are committed to educating (or entertaining) the public, you should serve its needs.

Savvy magazine editors and publishers constantly monitor editorial coverage to ensure that their readers are intellectually sated. This doesn't mean that a magazine should blindly—and swiftly—follow trends. Successful magazines can either nudge their readership towards personal growth (like *Sassy*), or grow along with them (like *Rolling Stone*). On the flip side, stalwart publishing icons such as *Time*, *Vogue*, and *National Geographic* engender reader trust because they are "old friends" with strong identities.

I am passionately interested in the opinions of the **EM** reader. But getting comprehensive feedback is often difficult, especially when the magazine is shuttled off to thousands of unseen subscribers and myriad newsstands across the globe. Luckily, our yearly Reader Profile—conducted by our marketing whiz Elise Malmberg and her assistant, Diana Sergi—divulges many secrets about who you are and what you like (and don't like) about the magazine.

For example, your loyalty is impressive because subscription renewal rates are extremely healthy, and your average age has increased steadily from 36.6 years in 1991, to 37.6 years in 1992, and to 38.5 years in 1993. These figures show that we're maintaining a consistent reader base. Also, I'm extremely proud that in a male-dominated field, our female readership has increased to 9 percent this year, up from 3 percent in 1992. It also seems that we are helping you to be more successful. In 1993, an impressive 44 percent of our readers were full- or part-time professional musicians. Good work! In addition, 77 percent of you own personal studios, and 50 percent actually produced a demo tape, CD, or record.

On the push-and-nudge front, our multimedia coverage has enticed 13 percent of you to create actual multimedia projects in 1993. But the gratifying statistic is that 39 percent of our readership plans to jump into multimedia in the near future.

What do you like about **EM**? Well, product reviews are number one. From there, the features our readers enjoyed the most were computer applications, "What's New", articles on emerging technologies, product face-offs, and recording techniques and applications.

All of this data helps us decide where to take **EM** during the next few months—where to improve, how far to push the envelope, and when to leave well enough alone. In 1993, we increased page size, ad sales, and circulation. The continued enthusiasm and collaboration between our readers and editors promises to make 1994 an even brighter year for us. Thanks for your support!

Michael Molenda

Electronic Musician

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You know Proteus.® The family of MIDI sound modules from E-mu.® The superb 16-bit digital samples. The unsurpassed collection of pop/rock, orchestral, percussion and world-beat sounds. The industry's clearest, most straightforward user interface. Well, meet the new kid on the rack: Proteus FX. It's not another Proteus sound set—it's a dream-come-true for home musicians and performers held captive by a limited budget.

The idea is simple. Start with a stunning 8MB set of 16-bit, CD-quality digital samples based on the Proteus/1 Pop/Rock and Proteus/2 Orchestral sound sets and add an incredible grand piano sample. Add built-in effects processors for tailoring those sounds to meet your own musical needs. Allow for extensive programmability to customize or create entirely new sounds. Harness this incredible power with the industry's most straightforward, easy-to-use interface. Streamline the feature set—maximize functionality. And house it all in a rugged, road-worthy metal package. What you've just created is a great sounding, powerful MIDI sound module that fits into everyone's budget. What you've just created is the Proteus FX.

But don't be mistaken. If you thought we were talking about a stripped-down model with just a handful of sounds, you don't know E-mu. Only the best features merit the Proteus name. Proteus FX features 512 great preset sounds coupled with a variety of built-in digital effects for you to choose from including reverb, chorus and delays. And of course, you can count on 32-voice polyphony, 16-MIDI channel multi-timbral operation and stereo outputs to keep you at the forefront of musical capabilities whether you're composing, sequencing or performing live.

So, if you thought you were going to have to wait a long time before you could upgrade your system with a professional-quality sound module, think again. Proteus FX is here today—and it's lean and mean.

ProteusFX

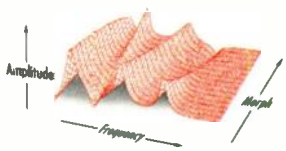
is in the Family.

The Incredible UltraProteus

If you're serious about getting great Proteus sounds and want the benefit of advanced synthesis and expandability, take a look at UltraProteus. It's every Proteus you've ever dreamed of—in a single rack-space module. 16MB of 16-bit samples based on the sound sets from Proteus/1 Pop/Rock to Proteus/2 Orchestral to Proteus/3 World. It even includes hot new drum sounds and wave forms as well as the superb Proformance® grand piano sample. You simply can't buy another MIDI instrument that has a larger variety of digital samples.

Sure, UltraProteus is packed with fantastic sounds, but it's much more than just sounds—it's what you can do with them!

Start with proprietary E-mu Z-Plane™ filter technology for the kind of expressive control you've never experienced in a MIDI instrument. (That graph to the right actually has something to do with how it works.) Add an extensive set of digital effects including reverb, chorus and flange to impart depth and ambiance to your MIDI music. Throw in a RAM/ROM card slot allowing for even more preset sounds down the road, and you have the most feature-rich, expandable sound module available anywhere.



Z-Plane Technology

While traditional synthesis technology offers a single 4-pole lowpass filter, Z-Plane technology allows you to interpolate sounds through multi-dimensional 14-pole filters in real time.

Of course, we didn't forget essentials like 32-voice polyphony, 16-MIDI channel multi-timbral operation and 6 audio outputs, but when you stand in awe of its 512 presets, you'll know this Proteus is master of the house.

UltraProteus

The Proteus FX and UltraProteus. Two new members of the esteemed Proteus family. Run down to your dealer for a formal introduction.

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LETTERS

RADIO RADIO

Alan Gary Campbell's response to Ken Lee's letter ("Letters," January 1994) is mostly correct, but far from complete. Let me add a few important thoughts to the discussion.

First, the fact that Mr. Lee's audio equipment receives radio signals of any kind is an indication that the equipment is inadequately designed or constructed. Unfortunately, most audio equipment (especially "consumer" equipment) falls into that category. Nothing except a radio receiver should receive radio signals, no matter how strong. A radio receiver should *only* receive signals to which it is tuned. (I use the term "radio" in its broadest sense, including television, cellular and other radio telephones, radar, and anything else that uses electromagnetic waves longer than light.)

However, real-world designs are not perfect. Don't let the fact that your equipment is imperfect lead you to accuse the perfectly legitimate radio operator of impropriety. Under no circumstances is the operator of a licensed radio station legally required to fix a problem of interference to non-radio equipment. You, however, can be legally required to alleviate any interference your audio equipment may cause to licensed radio services, including amateur.

Solid-state audio equipment is more susceptible to interference than vacuum-tube gear, although the older tube radios, phonographs, and Hammond electric organs were far from immune. Nonshielded plastic enclosures, direct or RC-coupled input stages, and transformerless designs are notoriously susceptible to interference. When shopping for new equipment, look for solid metal cases with mesh gaskets; finger stock or screws every quarter-inch or so on all seams; grounding wipers (not just panel bushings) on pot shafts; Faraday-shielded (screened), transformer-coupled inputs; ferrite isolators; and through-case EMI filters on power lines and outputs. The MIL-SPEC requirements for open-deck installation on communications ships is a useful *minimum* requirement for the San Fernando Valley radio-frequency environment. A field strength of 200 volts/meter can be exceeded relatively easily near some antenna installations, even at the modest power limits of amateur stations. If you are near a commercial station, expect even higher fields, and buy or build your equipment accordingly.

B. Chandler Shaw
Granada Hills, CA

CABLE CABAL

I'm pleased that EM is taking up the issue of "high-end" audio cables ("The Great Cable Debate," January 1994). I'm disappointed, however, that Scott Wilkinson's article ends up giving readers bad advice.

At the 1991 AES convention in New York, I organized a panel on speaker wire, which included a mass comparison test between a $2,400 pair of audiophile speaker cables and a $20 pair of generic professional cables. Listeners correctly identified the cables in 96 out of 212 double-blind trials, demonstrating no audible difference.

Wilkinson was wrong to say that exotic cables "probably do make a difference." Those who have tested the cables critically have shown that they don't. It is consumer fraud to claim product performance that doesn't exist. Wilkinson's advice to "try to arrange a listening test with a dealer who specializes in cable" is a recipe for being fleeced. If the salesman does his job, you will hear a difference in the showroom, and you will hear a difference when you take your $500 patch cords back to your own system. But there will be no real difference there, only a perception that has been programmed by that famous "power of suggestion." It's impossible to make this kind of judgement in an open comparison.

Dan Dugan
Dan Dugan Sound Design
San Francisco, CA

Dan—Had I known of your work in this area, I would have certainly included your comments in the article. My conclusions were based in part on an AES paper I read several years ago. In this paper, double-blind listening tests were performed on various exotic and "normal" line-level cables (even automobile jumper cables). That paper concluded there is a difference between cables. (As I recall, the jumper cables came out near the top!) Unfortunately, I was unable to find that paper as I was researching my article, even after tearing my office to shreds and repeated calls to the AES publications department. However, your comments are well taken, and I applaud your efforts to bring experimental rigor to this debate.—Scott W.

PRACTICE MAKES PERFECT

The tech stuff in your articles is great. But why did you run an article on multitimbral synths ("From The Top: Multitimbral MIDI," December 1993)? We all know how that junk works. Let's face it, nobody plays a sample except for a few good reasons. The first is the budget. If the client won't cough up the bucks, you're stuck. The second reason is scoring, arranging, and printing out the mess so "real" players can have a go at it, provided again that you have the budget. The third reason is convenience. In my case, having the crew haul a 7-foot grand around would cause a mutiny. So what do I do? I settle for a sample. But only someone who either has a tin ear or is a mediocre player and needs to "step enter" would want to bother with MIDI pianos in a studio situation.

And a final comment on your editorial "Whither MIDI?" There are very

few people in this industry—myself included—doing anything interesting. We've all heard that dumb M1 "bubbling water" patch on innumerable commercials. I used it myself a couple of years back on a water-treatment facility industrial video. In other words, we all sound alike. Just watch an evening of TV and try to pick out which synth or sampler did the work. I bet that after a day of practice you'll correctly identify every sound! What you should be practicing is your musical technique, not acquiring the latest high-tech marvel.

Shawn R. Curtis
Escondido, CA

GROUP ADVICE

Once upon a time, back when **EM** was *Polyphony*, there was an active underground of DIYers and kitbuilders. Your publication directed us towards such resources as Rodcar modular kits, SSM & Curtis ICs, and other audio specialty devices. Now, ten years later, I find myself designing and building a custom mixer, mic pre-amps, and filter-based effects. I would be most interested to learn if you or your readers know where the new generation of audio specialties are hiding.

G. Montalbano
Oakland, CA

G.—Quite a few people still build DIY projects, but the "active underground" of hardware builders is small. In Polyphony *days, the industry was in its infancy. Folks couldn't afford the gear they wanted, or had pioneering ideas, so they built their own.*

Today, reasonably priced hardware performs most required tasks. Electronic-music DIYers usually build hardware projects for grins, or to learn electronics, though sometimes they still create something wonderfully new (e.g., Charles R. Fischer's "Build the EM FingerDrum" in the March 1992 issue). PAiA Electronics, the original publisher of Polyphony/**EM** *(tel. [405] 340-6300; fax [405] 340-6378), still sells many DIY kits. Parts sources are regularly mentioned in Alan Gary Campbell's "Service Clinic" column.*

Many "new generation" DIYers design software for the same reasons Polyphony *readers built DIY projects. To learn more, check out the computer bulletin-board services.—Steve O.*

MIDI CONVERTER

Is there a MIDI instrument that can convert vocal notes into MIDI information, such as a pitch-to-MIDI converter?

Jim Cunningham
Gadsden, AL

Jim—We have published two reviews of voice-to-MIDI converters: "The Fairlight Voicetracker" (April 1987) and the "SynchroVoice MIDIVox" (July 1992). Unfortunately, neither of these products is currently available, as far as I know. The process of converting vocal notes to MIDI is extremely complicated and seldom entirely successful. As a result, we haven't written much about it. Hopefully, someone will come out with a unit that works and remains available for a while. Until then, singers will remain in the audio domain.—Scott W.

PLAYGROUND ORCHESTRA

I'm an artist interested in creating an audio/video playground on a PC platform. I would like the capa-

continued on p. 17

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128 factory presets, 128 user programs, QS Composite Synthesis™, QS Parallel Matrix Effects™ with 4 independent busses, a PCM-CIA ROM card slot, intelligent user interface, multiple independent zones, velocity, aftertouch and direct digital recording to ADAT make the QuadraSynth the most powerful keyboard you can own. The Dream Studio™ is coming together. Don't need the keys? The S4™ Sound Module is coming soon. Call 1-800-5-ALESIS. See your Authorized Alesis dealer. All trademarks are property of Alesis Corporation. ® Alesis and ADAT are registered trademarks of Alesis Corporation.

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-Mark Vail, Keyboard-

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PF85 DIGITAL PIANO
• 88 velocity-sensitive keys • AWM sound generation • Full-response stereo speakers • Automatic transposing and tuning • MSRP: $1995.00

"Coming from Yamaha—maker of some of the finest acoustic drums on the planet—we expect nothing but top-notch drum samples and the RM50 certainly delivers."
-Greg Rule, Keyboard-

RM50 RHYTHM PROGRAMMER
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"The RY30 features excellent sounds that can be extensively edited."
-Bob O'Donnell, Electronic Musician-

RY30 RHYTHM PROGRAMMER
• AWM2 16-bit samples, 96 voices • 20 songs, 100 preset patterns, 100 user patterns • 22 bit D/A for unprecedented sound quality • Dynamic filters • MSRP: $595.00

"Yamaha's RY10 rhythm programmer features the simplest and sleekest programming procedure of any drum machine on the market."
-Rich Watson, Modern Drummer-

RY10 RHYTHM PROGRAMMER
• AWM samples, 28-note poly • 250 editable drum sounds • 50 main, 50 fill-in preset patterns • 50 main & 50 fill-in user patterns • MSRP: $299.95

"...I'd have to call the TG500 (Tone Generator) the Mighty Mo of modules."
-Patrice Rushen-

TG500 TONE GENERATOR
• 64 note polyphony • AWM2 16-bit sample playback synthesizer • 16 way multi-timbre • 8 MB of ROM samples • Expandable sample RAM • MSRP: $1495.00

"They'll be talking about this one."
-Jim Presley, Yamaha-

TG300 TONE GENERATOR
• Second generation AWM2 sampled voices • 32-note polyphony • General MIDI • Built-in DSP • Mac/IBM Interface • MSRP: $TBA

TG100 TONE GENERATOR
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WX11 MIDI WIND CONTROLLER
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"The QY20's user interface is excellent, its sequencer is surprisingly flexible and the fact you can operate it anywhere is wonderful."
-Greg Rule, Keyboard-

QY20 MUSIC SEQUENCER
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And what they were after was a synthesizer whose power, versatility and expandibility are a must for any serious musician. The JD-990 provides incredibly clear acoustic sounds and analog synth textures with the most extensive synthesis controls available. And its intuitive sound manipulation capabilities allow you to create, shape, and form virtually any sound imaginable. All this because our engineers didn't let a Nobel Prize stand in the way of some really great music.

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bility to sequence, sample, edit, record, and play back audio. I'm unclear as to whether or not a soundcard can reproduce enough parts (multitimbral) for full orchestration, plus effects. What about a sound module for capabilities and quality? Is a sound card necessary?

Jeff Stoller
Laramie, WY

Jeff—You don't need a sound card. But they're convenient and extremely cost-effective, especially for beginners. Most PC sound cards have 2-track digital-audio recording and 32-voice (at most), 16-part multitimbral synthesizers. Sustaining notes and playing chords consumes polyphony, so 32 voices are not enough for "full" (e.g., symphonic or big-band) orchestrations. You'll probably have to add supplemental sound modules. The quality of sound-card synths was second-rate in the past, but they are improving greatly. Listen before you buy.

Most budget "multimedia" sound cards are meant for playing back computer games and adding dialog to business presentations. Their digital-audio quality is mediocre compared to pro audio products. However, all 16-bit cards are not created equal. For instance, Turtle Beach's MultiSound offers a decent synth and better audio than most multimedia cards. Digital Audio Labs' the CardD is a bit more expensive and has no synth, but it's sonically excellent. The genre will improve as the competition heats up. The software bundled with most cards provides basic sequencing and audio recording.

Sampling is another story, if you mean recording sounds, transposing them across the keyboard, and playing them as MIDI instruments. Turtle Beach Systems and Creative Labs expect to ship the first sound cards with this capability very soon.—Steve O.

WAITING FOR ORAM

Are you going to be doing any future articles on the progression of optical RAM technology? As it appears that it will be here in the not too distant future, I am considering waiting on making a purchase of a multithousand-dollar, music-producing computer rig until I hear how the progression of ORAM technology is coming along.

Tony Marshall
Gravity Belt Music
Memphis, TN

Tony—We will continue to cover the latest in optical RAM and other cutting-edge technologies of interest to musicians. However, I wouldn't hold my breath or my money until ORAM is available for multithousand-dollar computer systems. It will be quite some time before optical RAM and processing trickle down to that level. This technology is in its infancy; in fact, it's still a zygote. The only place you're likely to find it in the next few years is in the laboratory. Technology evolves at a fantastic rate, but we have yet to achieve lightspeed in commercial products.—Scott W.

ERROR LOG

December 1993, "Big Bang Boom," p. 61: KAT's correct address is 300 Burnett Rd., Chicopee, MA 01020.

December 1993, "DIY: Build the **EM** Tubehead," p. 25: The **EM** Phantom Powered Mic Preamp was in the April 1993 **EM.**

We welcome your feedback.

Address correspondence to "Letters," Electronic Musician, 6400 Hollis St. #12, Emeryville, CA 94608. Published letters may be edited for space and clarity.

WHAT'S NEW

By Steve Oppenheimer

▲ AKG VINTAGE TL

AKG Acoustics has introduced the Vintage TL condenser mic (model C414B/TLII; $1,499), a new version of the C414B/TL with the capsule from AKG's classic C12 tube mic. The C12 capsule was re-created from the original 1950s design, but with modern manufacturing techniques and electronics. According to AKG, the mic's transformerless output circuitry provides superior dynamic range and especially accurate low-end reproduction.

The Vintage TL is a 1-inch, dual-diaphragm, pressure-gradient mic with selectable cardioid, hypercardioid, omnidirectional, and figure-8 polar patterns. The mic has a switchable 12 dB/octave bass-cut filter (at 75 Hz or 150 Hz) and a preattenuation pad (-10 or -20 dB, switchable). AKG Acoustics; tel. (510) 351-3500; fax (510) 351-0500.

Circle #401 on Reader Service Card

▶ ROLAND S-760

Roland has combined and augmented the sampling and sound-manipulation power of its S-770 sampler and SP-700 sample-player to create the 1U rack-mount S-760 sampler ($2,595). The 24-voice, 32-part multitimbral module offers 16-bit linear sampling (at 16, 22.05, 32, 44.1, and 48 kHz), with 20-bit DACs and 24-bit internal processing. It is shipped with 2 MB of RAM in two SIMM slots, which can be expanded to 32 MB using 72-pin, Macintosh-type SIMMs. The display is a backlit LCD.

The S-760 offers eight digital, 2-band, semi-parametric equalizers, located immediately before the outputs, which can be configured as four stereo EQs or eight independent EQs. It has a SCSI port for hard-disk access, left and right line inputs, and four line outputs, which can configured as two stereo pairs. The optional OP-760-01 board ($395) one stereo S/PDIF input, two stereo S/PDIF outputs (which can be configured as four mono outs), a mouse input, and three color video outputs: digital RGB, composite video, and S-video.

The module offers a Quick Sampling feature that automatically applies default settings for Sample Naming, Loop Setting, Sample Assign for Partials, and several other parameters. From the SP-700 feature set comes Load While Play and Listen Delete, which gets rid of sample data for notes that aren't used in a sequence, freeing extra sample memory. A new Quick Load feature lets you tag Volumes, Performances, and Patches on a hard disk and just load the marked sounds. In addition to accessing the Roland S-700-series sound library, the S-760 can convert S-550, W-30, and Akai S1000/S1100 samples. A CD-ROM with 600 MB of Roland and third-party samples is included. Roland Corporation US; tel. (213) 685-5141; fax (213) 722-0911.

Circle #402 on Reader Service Card

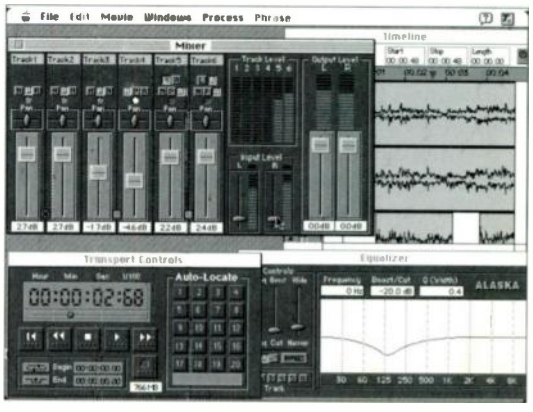
▼ ALASKA SOFTWARE DIGITRAX

Alaska Software has announced *DigiTrax* ($349), a digital-audio recorder/editor for the Macintosh Quadra 660AV, and Quadra 840AV (or a Mac with an ARTA-compatible NuBus card, such as Spectral Innovations' NuMedia card). The program uses the Mac's AT&T DSP3210 chip to provide six tracks of audio recording and playback at sampling rates of 22.05, 24, 44.1, or 48 kHz, with six bands of parametric EQ. It can also import 8-bit and 16-bit AIFF files and *QuickTime* movie soundtracks. *QuickTime* movies appear in a separate window, and audio can be synched with *QuickTime* playback for 8-bit or 16-bit soundtrack authoring.

The user interface uses familiar tape-deck and mixer analogies. All editing and recording is nondestructive with undo capabilities. Graphic waveform editing is via drag-and-drop in a timeline window, and all edits can be performed in real time "on the fly." Other features include nondestructive, automated punch-in/out; automated Loop/Rehearse mode; and track slip.

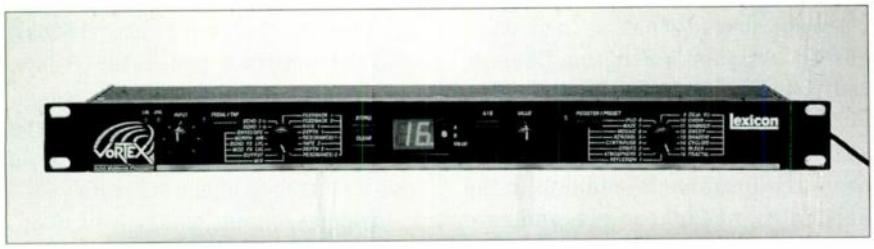
DigiTrax provides synchronous playback with any *MIDI Manager*-compatible sequencer. The software uses a proprietary plug-in module architecture, so you can add features when third-party software becomes available. Alaska Software; tel. (408) 738-3320; fax (408) 524-9699.

Circle #403 on Reader Service Card



▼ LEXICON VORTEX

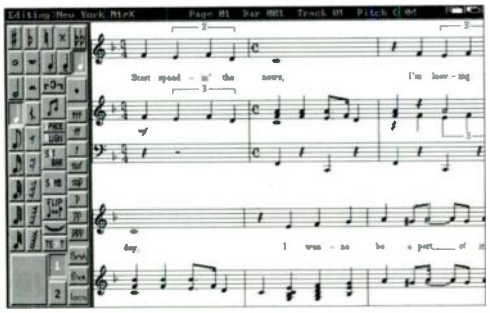
Lexicon's Vortex Audio Morphing Processor ($459) produces a variety of modulation, looping, and time-based effects. This true-stereo box can morph between two effects, i.e., it can change from one effects algorithm and set of parameters to another, continuously interpolating values between the two. The morph can occur over a programmable time period, or it can be controlled in real time with a standard expression (CV) pedal.



A dynamic envelope follower can modulate one parameter in each effect, letting you continuously alter the effect as a function of the input signal's changing amplitude. Effects can also be altered with a footpedal or LFOs. There are two independent delays. Their delay times can be globally set by tapping in a quarter-note tempo and subdividing it, if desired, into as many as 64 subdivisions (i.e., 256th notes). By using both delays, you can create polyrhythms, such as three against two. There are 32 factory presets, comprising A and B versions of sixteen unique effects. Each effect has sixteen variable parameters, including wet/dry mix, output level, modulation-effects level, echo-effects level, Morph A/B time, envelope, delay time, feedback, resonance, and modulation rate and depth. User programs can be stored in 32 nonvolatile RAM locations. The Vortex does not use MIDI. Lexicon; tel. (617) 736-0300; fax (617) 891-0340.

Circle #404 on Reader Service Card

▶ HOLLYWARE NOTATOR-X



Hollyware Entertainment has acquired MicroIllusions and released *Notator-X* ($79.95) and *Music-X* 2.0 ($199.95; upgrades $100) for the Amiga. *Notator-X* is a music-notation program that supports real-time and step-time entry. It also imports and exports Type 1 SMFs and *Music-X* files.

Each page of the score can include up to 32 tracks on eighteen staves. You can have up to five lines of lyrics, with a maximum of three different endings, in a score. The Lyrics Editor automatically aligns the lyrics under the notes, including words split over several notes.

Notator-X supports chord names (entered as text), dynamics, angled beams, ties, octave symbols, and text frames. Dynamic marks affect playback. The display is WYSIWYG, and there are three levels of zoom. The program integrates with *Music-X*, so data can be exchanged internally without saving the file.

The *Music-X* 2.0 upgrade includes *Notator-X* and adds several new modules, including DeFlam, which removes unintended grace notes that may have occurred during recording; an improved Quantizer; RexxEdit, which works with AReXX to let you create custom macros; and PrintEventList, which prints out any event list in the program. The Amiga Audio Player has also been expanded, and more than a dozen additional MIDI commands are supported. The Amiga can be used as a 4-voice multitimbral synth on any MIDI channels, and the program supports Velocity when playing Amiga samples. Hollyware Entertainment; tel. (310) 822-9200; fax (310) 390-0457.

Circle #405 on Reader Service Card

▼ STUDIO ELECTRONICS SE-1

Studio Electronics has announced the SE-1 ($1,395), a 3U rack-mount, programmable, analog, lead, and bass synth module. All 99 patch locations are in RAM. The monophonic synth offers three stabilized oscillators, each of which can produce triangle, sawtooth, and variable pulse waveforms. Pitch can be adjusted with a front-panel knob in semitones over a 5-octave range, with fine-tuning available on an edit page. Key priority can be set to trigger the low, last, or high note.

The unit includes two filters: a Moog-style 4-pole (24 dB) and Oberheim SEM-style 2-pole (12 dB). They are constructed with discrete electronics, like the originals, and do not use Curtis chips. The synth supports multiple triggering of the filter envelope.

There are four ADSR envelope generators. Two are adjusted with pots and permanently assigned to the VCF and VCA. The other two EGs are programmed in an edit page and can be assigned to VCO 2 and 3 frequency or mix level; VCO 1, 2, and 3 pulse width; VCF resonance; ring-modulation level; or noise level. The three LFOs produce triangle, square, sawtooth, reverse sawtooth, and pulse waveforms as well as sample-and-hold and can be routed to the VCOs, VCFs, and VCAs.

MIDI features include Program Change and SysEx support. Pitch Bend messages can be remapped to sweep the filter cutoff frequency and resonance. Aftertouch, Mod Wheel, and Controllers 1 and 2 can be mapped to the LFOs, VCO pulse width, VCO 2 and 3 frequency and output level, VCF cutoff frequency and resonance, ring modulator level, noise level, and EG 3 and 4 depth. Velocity can be mapped to EG depth. The SE-1 also recognizes Portamento Time, Portamento On/Off, Sustain, and Volume messages. The synth is available directly from the manufacturer. Studio Electronics; tel. (818) 776-8104; fax (818) 776-1733.

Circle #406 on Reader Service Card

▼ ALESIS QUADRASYNTH

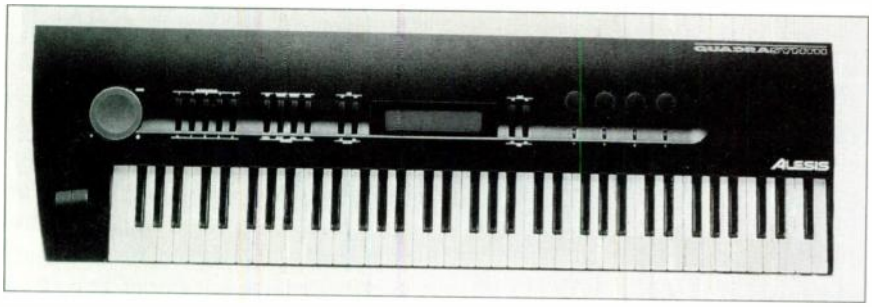
Alesis is shipping the QuadraSynth ($1,499), a 64-voice polyphonic, 16-part multitimbral, sample-playback synthesizer. The S4 ($999), a 1U rack-mount version, is expected soon. The synth has 16 MB of 16-bit, 48 kHz, ROM-based samples, and a ROM/RAM-card slot lets you add samples and Programs.

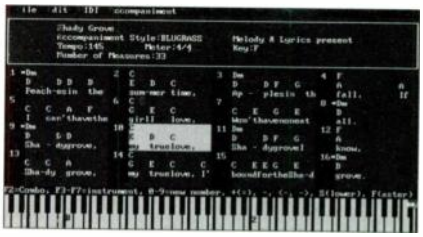
An onboard multi-effects processor can be accessed via four independent, stereo effects buses and provides up to eight simultaneous effects (three on each bus), such as pitch shifting, delay, and reverb. You can even take the output from one bus and route it to an effect on another bus. For example, the pitch-shifter and delay on bus 3 can feed the reverb on bus 1.

There are 128 factory-preset Programs and 128 user Programs. A Program can include up to four samples, each of which has three envelope generators, three LFOs, a tracking generator (which scales any modulator signal as desired), a dynamic lowpass filter, and independent matrix modulation. A Program can be routed to either of the two stereo output pairs (four output jacks). QS Mix Mode provides 100 preset and 100 user-programmable multitimbral setups in which a Program is assigned to each MIDI channel for simultaneous play. These setups can respond to the keyboard or MIDI, as the keyboard can send on up to sixteen channels at once.

The 76-key, unweighted keyboard is Aftertouch- and Velocity-sensitive, including Release Velocity. It can be divided into sixteen zones, each of which can be assigned a Program Change, MIDI channel, and Velocity curve. The pitch-bend wheel, modulation wheel, sustain pedal, and two footpedal jacks are programmable.In addition to the audio outs, headphone out, and card slot, the rear panel offers an ADAT 8-channel, optical output; ADAT 48 kHz clock-sync input; MIDI In/Out/Thru; and jacks for two footpedals and a sustain pedal. Alesis Studio Electronics; tel. (800) 5-ALESIS or (310) 558-4530; fax (310) 836-9192.

Circle #407 on Reader Service Card





▲ GRANDMASTER DO-RE-MI

Grandmaster is offering *do-re-mi* ($79.95), a musical accompaniment program for the PC (DOS). The user specifies the chords and musical Styles, and the program generates drums, bass, and up to three other accompaniment instrument tracks. Songs can be up to 512 measures long, and the Style can be changed at any measure.

Melodies, chords, and lyrics can entered into the program, or imported from *SongWright* sequencing software. The user can transpose the song and control tempo, volume, and instrumentation in real time during playback. Songs, with accompaniment tracks, can be saved as Standard MIDI Files or exported to *SongWright*.

Do-re-mi comes with 65 Styles, including Country, Bossa Nova, Gospel, Reggae, Bebop, Rock, Pop, Ballad, Salsa, Funk, Jig, and Waltz. New Styles can be defined using step-entry. The program requires an MPU-401-compatible MIDI interface and supports a mouse. SongWright; tel. (800) 877-8070 or (703) 777-7232; fax (703) 777-7503.

Circle #408 on Reader Service Card

▼ ADA MP-2

ADA is offering the MP-2 MIDI Tube Guitar Preamp ($999). The 1U rack-mount device offers ten tube configurations (called Voices), ranging from clean and bright to saturated distortion. Voices include a "brown tweed" Fender amp emulation; a highly compressed sound with articulated pick; and a smooth, full-bodied sustain. All processing is done in the analog domain. The MP-2 supports SysEx and real-time MIDI continuous control.

The preamp features a wah filter that can be triggered, swept automatically, or controlled with the new ADA Continuous Controller Pedal ($299). A compressor with programmable ratio, threshold, and gain can be set for each program or bypassed. Other effects include Stereo Chorus and Tremolo with variable rate and depth as well as sweep waveforms such as "surf."

The programmable EQ section has two separate, cascaded sections. The Bass, Mid, Treble, and Presence controls shift their center frequencies and "Q," depending on the active tube Voice. The 9-band graphic EQ is set at center frequencies selected specifically for guitar. A Noise Gate/Fader lets you program the noise-reduction threshold for each patch. An additional room EQ, set with a front-panel knob, lets you process the final output signal without altering the individual programs.

In addition to the stereo Stage outputs, there are Recording outputs that incorporate ADA's Miked Cabinet Emulation, which are provided on both ¼-inch and XLR balanced connectors. There is a mono instrument input on the front panel; an alternate input on the rear panel overrides the front-panel input. ADA Amplification; tel. (510) 532-1152; fax (510) 532-1641.

Circle #409 on Reader Service Card

continued on p. 25

The new Kurzweil MicroPiano.™ $499 of pure inspiration.

The new MicroPiano – The half-rack module features 32 Presets including Kurzweil's new Grand Piano samples. Strings, Hammond® Organ, Electric/Electronic Pianos as well as 16 superb digital multi-effects.

Musicians have always envied those who have had the legendary sounds of a *Kurzweil* at their command – especially our grand pianos, electric pianos, strings and organs. With the new $499 *MicroPiano* sound module, *you* can now add all these great sounds (and others) to your keyboard setup.

The *MicroPiano* features 32 of the most sought-after keyboard sounds with full 32-note polyphony (*64-note with two MicroPianos in the exclusive Link Mode*). In addition to keyboard sounds, Kurzweil's lush string section, played solo or layered with another sound, creates a gorgeous orchestral ambiance. Some sounds are based on the proprietary samples from the award-winning *K2000*, but many are brand new, available only in the *MicroPiano*. If you don't have a nine-foot concert grand and a great recording engineer, you need the *MicroPiano*.

Besides the acclaimed Kurzweil samples, the compact, half-rack module offers the kind of playability a keyboard player expects, with 16 superb, crystal-clear digital multi-effects, useful MIDI control capabilities and fully-functional soft, sostenuto and sustain pedal response. The user interface is straightforward, easy-to-use and includes Tuning and Transposition as well as Stereo Outputs.

At just $499 suggested retail, we've made it a lot easier for you to play a true Kurzweil. Whether you're a novice or a pro, audition one today at your authorized Kurzweil dealer.

The new *MicroPiano*.
It's Pure Kurzweil.
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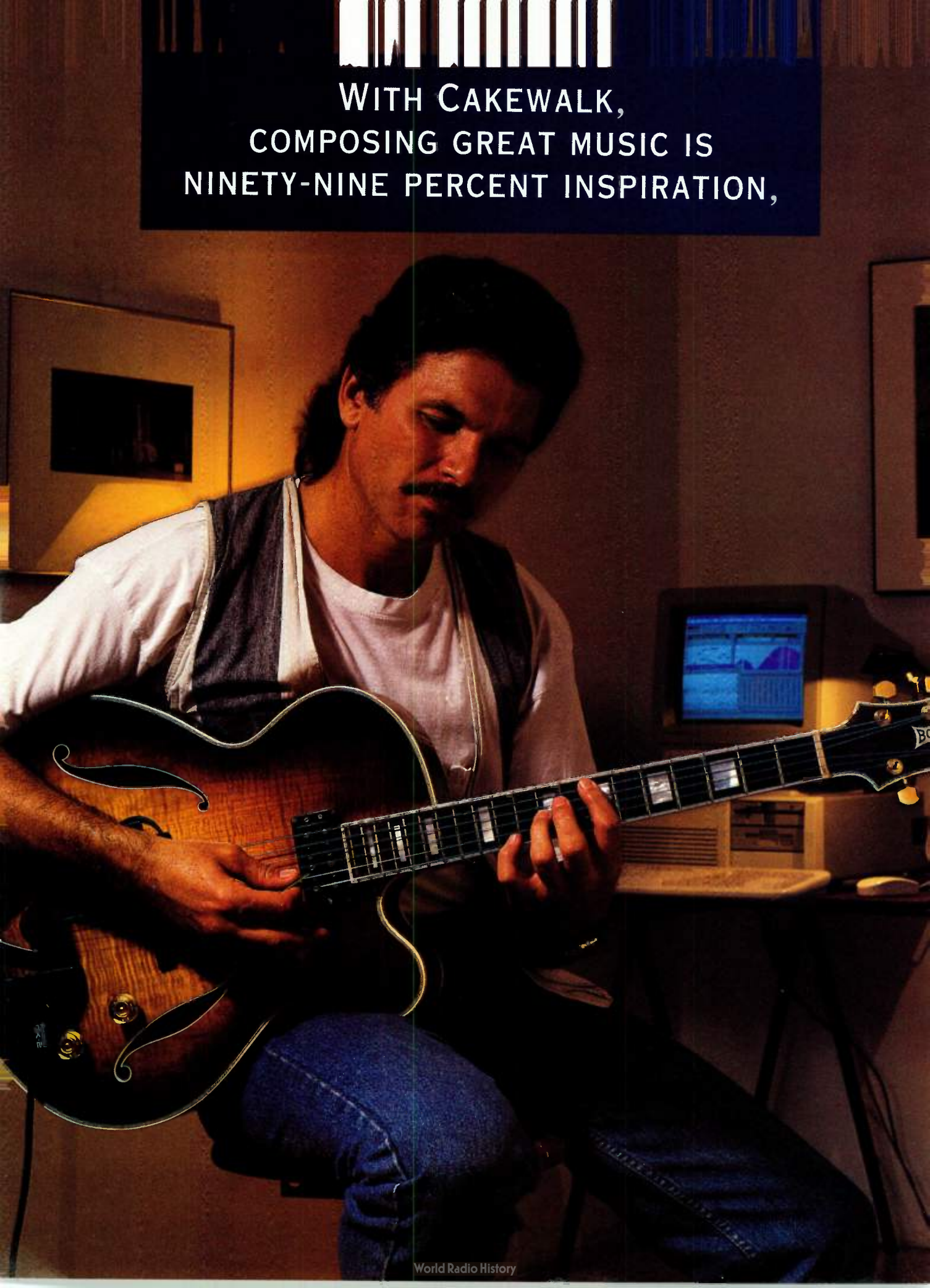


ONE PERCENT PERSPIRATION.

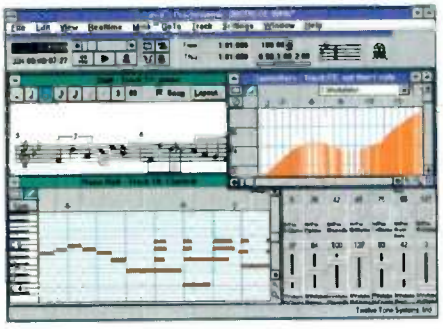
Cakewalk Professional for Windows™ 2.0 is the MIDI sequencer that's powerful enough to transform your inspirations into compositions. Yet it's no sweat to use.

MAKE A NOTATION OF THIS.

Cakewalk Professional works in concert with you every step of the way. In fact, new version 2.0 not only helps you create your compositions, it also prints them. The multi-track Staff view lets you edit and print up to 16 staves in multiple key signatures, as well as title, performance instructions, author and copyright information. It even displays and prints triplets. All in the font size you select.

YOU'LL LOVE THE VIEWS.

With Cakewalk Professional composing music is an aural and visual experience. You can use the Piano Roll view to insert, resize and move notes in a grid. The detailed Event List view lets you edit MIDI and multimedia events on multiple tracks at once. Use the Track/Measure view to assign track parameters like MIDI channels, instrument patches and key offsets, even in real-time.



Cakewalk
PROFESSIONAL
for Windows

Other extraordinary Cakewalk Professional features include a Controllers view, a variable timebase of up to 480 pulses per quarter note, a Markers view for creating text "hit points," an Event Filter and on-line help screens.

NEW WAYS TO COMPOSE YOURSELF.

Cakewalk Professional 2.0 offers other new features like:

- Play List view for live performance
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- Real-time editing
- Remote control from MIDI keyboard
- "Hot Key" macros
- Loop record
- Punch record on the fly
- Big Time display

INSPIRED YET?

If you feel inspired to find out more about Cakewalk Professional for Windows 2.0, or to learn the name of the dealer nearest you, give us a call at **800-234-1171** or **617-926-2480.** Cakewalk Professional lists for just $349. If you'd like, we'll send you a demo disk for just $5 so you can see and hear Cakewalk Professional for yourself.

Twelve Tone
SYSTEMS
P.O. Box 760, Watertown, MA 02272

System Requirements: IBM PC with 10 MHz 80286 or higher, 2 MB of RAM, mouse; Microsoft Windows 3.1. Supports any combination of up to 16 MIDI ports on devices with Multimedia Extensions drivers (including Roland MPU-401 compatibles and Music Quest MQX interfaces). Cakewalk Professional for Windows is a trademark of Twelve Tone Systems. Other products mentioned are trademarks of their respective owners.

We bet you'll *triple* your talents with

Perfect Pitch

...*just by developing your natural ear for music!*

And we'll even make you this GUARANTEE...

Try this:

CLOSE YOUR eyes and ask a friend to play a tone. Now, without peeking, *can you name it?*

No luck?

Have your friend play a chord. Listen very carefully. Can you tell which chord it is—E major...D minor...F♯ seven?

Still stumped? Don't worry! Most musicians are surprised to discover how little pitch recognition they actually possess. Yet with just a few ear-opening instructions, we bet *you* will begin to recognize tones and chords—ALL BY EAR—regardless of your current ability. *And we can prove it!*

Why YOU need Perfect Pitch

Your ear is *everything* to your music!

Why? Because music is a *hearing* art. Whether you play by ear, improvise, compose, arrange, perform, sight-read, do studio work, or just enjoy listening, all your talents are ROOTED in your command of the musical language—your ability to hear and evaluate *pitches*.

Perfect Pitch is the master key which *unlocks* your natural ear for music and enables you to:

- Copy chords *straight off the radio*
- Find desired tones *by ear*—instead of searching by hand
- Identify keys of songs *by ear alone*
- Sing any tone *directly from memory*
- Hear sheet music *mentally*—in correct pitch
- *And much more!*

Perfect Pitch *maximizes* your ear so your playing and creativity can *explode*.

Your performance *automatically* improves, your confidence gets rock solid, and every song you play takes on a whole new dimension of satisfaction.

Musicians around the globe have told us they would give *anything* to possess the power of Perfect Pitch. Fortunately, you don't have to give your right arm. Perfect Pitch is already a *natural talent* which is hidden deep inside you, crying to be let out. To uncover it, all you need is proper guidance from David L. Burge's **Perfect Pitch® Super-Course**—the #1 best-selling ear-training program today! Research at two universities and thousands of musicians —of all instruments and styles —have already proven Burge's easy method for truly awesome Perfect Pitch. These are *real* people like *you*—in over 60 different countries.

The Secret to Perfect Pitch:

Most of us were taught that only a chosen few are "born" with Perfect Pitch (like Bach or Mozart). *Not so!*

Burge will show you how every pitch has its own special sound—a *pitch color*—which your ear can learn to identify. For example, F♯ has a subtle sound which is *different* than B♭. Once your ear tunes in to these pitch colors, you *automatically* know the tones and chords that are playing.

This is Perfect Pitch. It's fun! —And *you don't even have to read music!* ...continued...

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opens your EAR to
supercharge your
PLAYING!

Perfect Pitch method proven by research at TWO leading universities!

Here's our Bet:

Order your own **Perfect Pitch® SuperCourse** and listen to the first two tapes. We bet YOU will experience the Perfect Pitch difference—*right away!*

If you don't, we lose. Simply return your Course for a *full refund—and keep the valuable bonus cassette we'll send FREE with your order.* Your bonus tape introduces **Relative Pitch**—your ear's ability to understand how all tones fit together *intelligently* to create this effect we call *music*. David compares Perfect Pitch skills with Relative Pitch abilities, and demonstrates how you are *set free* or *held back* in music by what you can or cannot hear. This 90-minute bonus tape is worth many times its $14.95 value, but it's yours FREE just for trying out the **Perfect Pitch® SuperCourse**!

SuperCourse *(we bet you will!)*, enjoy the remaining three tapes *(all included)* which give you advanced instructions.

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Research references *A study to determine the effectiveness of the David L. Burge technique for development of Perfect Pitch,* M.E. Nering (1991), The University of Calgary; *An experimental investigation of the effectiveness of training on absolute pitch in adult musicians,* Rush (1989), The Ohio State University. *You'll receive research summaries with your Perfect Pitch SuperCourse or info request!*

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PRO FILE

Crazy Crew

Béla Fleck unleashes MIDI mayhem from a banjo.

By Daniel Levitin

Three Flew Over the Cuckoo's Nest, the new album by Béla Fleck and the Flecktones, employs so many unusual instrumental textures, even a trained ear might have trouble figuring out how the sounds were derived. The Flecktones are an instrumental trio who defy stylistic pigeon-holing. Visit five different record stores, and you're likely to find them in five different sections: country, jazz, rock, bluegrass, and new age. Although the band isn't easily categorized, the instrumental prowess and compositional vision of the members have earned a loyal and growing legion of fans.

The Flecktones—banjoist Fleck, drummer Future Man, and bassist Victor Wooten—are renown for coaxing a variety of sounds from their instruments. Future Man's drum kit is actually a self-designed MIDI instrument called a *drumitar*. The drumitar looks like a guitar but sends MIDI signals to various drum modules.

To control his arsenal of wacky timbres, Fleck attaches a Roland GK-2 MIDI pickup on his banjo and connects it to a Roland GR-1 guitar synthesizer. When necessary, additional synths and sound modules are employed using the GR-1's MIDI Out. A Roland GP-16 effects box is used for signal processing.

"I like the way the Roland pickup tracks," he notes. "And because the GR-1 uses direct voltage to trigger its onboard sounds, there is no MIDI delay unless I use the synth's MIDI Out to control other modules. Also, the Hold pedal on the GR-1 allows me to play over a chord indefinitely while the pedal sustains it." This setup lets Fleck incorporate many different instruments into a composition and control all the sounds from his banjo. For example, *Vix 9*, the opening cut on *Three Flew Over the Cuckoo's Nest*, has an instrument that sounds like Chet Atkins' guitar.

"There are no guitars on the album," asserts Fleck. "That was me and the electric banjo." What about that part in the chorus that sounds like Gary Burton on vibes? "That's also me," he says. And the part on *Spunky and Clorissa* that sounds like Bruce Hornsby on piano? "Well, that *is* Bruce Hornsby," he admits. "We brought him in for a few cuts."

The Flecktones' commitment to spontaneity and improvisation impelled them to record the entire album live. This approach capitalized on the trio's artistic chemistry , but it also revealed some surprises.

Fleck recalls, "On *Vix 9*, my MIDI banjo was controlling a Roland D-50 keyboard and another synth. At one point, I hit the hold pedal, and it held the sound on the second synth but not the sound from the D-50. So there are a couple of places where there's a real dissonance happening."

"At the mixdown, we'd often have to fade the synths in and out, because they didn't always track very well to my banjo," Fleck adds. "Sometimes they would send some notes that weren't actually played! But if it was unusual, we kept it."

For the Flecktones, the search for new sounds and new ways to create them are an integral part of their musical personality. Refusal to accept traditional boundaries continues to bring them to new levels of artistic expression.

Dan Levitin *is a researcher at the Institute for Cognitive and Decision Sciences, University of Oregon. He was also a seminal producer in the San Francisco new wave scene of the 1980s.*

Béla Fleck (center) and the Flecktones.

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[1] *EM, December 1992*
[2] *Sound on Sound, October 1992*
[3] *EM, September 1992*

Digital telephone networks put

London

During the recording of his hot *Duets* album, Frank Sinatra received some very important telephone calls. But the callers were not congratulating the Chairman of the Board on his triumphant return to the recording studio, they were *phoning in their vocal performances!*

A digital telephone network called EDnet (short for Entertainment Digital Network) allowed Sinatra and producer Phil Ramone to work in a Los Angeles studio, while Tony Bennett crooned in New York, Liza Minnelli belted it out in Brazil, and Charles Aznavour sang suavely in London. In fact, none of the singers on the album tracked their duets live with Sinatra, and many of the performances were digitally recorded—in real time—over fiber-optic telephone lines.

EDnet—along with other digital telephone networks—

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has already changed the way large recording studios do business. Major film, record, and advertising producers use these networks to join a worldwide digital community of audio post-production facilities. Sessions are no longer hampered by geography. If the singer you want for your jingle lives in Atlanta, and you're working in New York,

Calling

By Michael Gore

it's not a problem. Just have the singer book a local studio that is online with a digital-audio network. From there, the engineer simply places a call to a similarly equipped facility in New York.

Once the connection is established, the session can proceed almost as if both parties are in the same studio. The producer can direct the singer, make changes, and even remix the music track being sent to the Atlanta studio right on the spot. The procedure is essentially the same as relating to an artist who is in a vocal booth,

Illustration by Jamie Hogan

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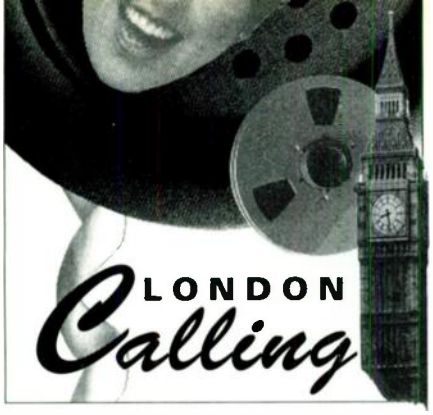

where the producer uses the console talkback mic to deliver verbal instructions, and the artist responds through the vocal mic. Of course, when "telephone tracking" you can't look through the control-room glass at the artist, although video conferencing networks may someday integrate with digital-audio networks. But the lack of visual elements doesn't diminish the fact that the audio world has literally shrunk to the size of a telephone. (For more information on local- and wide-area sound networks, see "Sound All Around" in the October 1993 **EM.**)

For example, at the Music Annex in San Francisco, Carlos Santana was recently interviewed and recorded by a producer in Los Angeles, while actor James Coburn sent his voice over the phone to another Los Angeles studio, where it was mixed into the music underscores for the new Acura ads. The studio also received music from the band Art of Noise for some advertising scores, sent over the EDnet system from London with perfect digital quality. In addition, many film companies transmit music, dialog, and sound effects to and from composers and producers across the globe.

The commercial advantages of full-bandwidth, real-time, digital-audio networks are obvious. Producers no longer have to fly artists to a particular studio, book hotel rooms, hire catering companies, or settle for less-than-amazing tracks just because the talent left town. Also, tight advertising and film deadlines tend to loosen up a bit when you can instantly "call in" your latest revision. Savvy producers and composers are even installing these systems into their home studios. (Phil Ramone did!) Currently, there are two major digital-audio networks serving the pro studio industry: EDnet and IDB.

EDNET

EDnet was originally set up under the auspices of George Lucas' staff at his Skywalker Ranch facility in Marin County to send mixes for the 1991 film *Backdraft* to the producers in Los Angeles. The system streamlined audio-post schedules by allowing speedy changes and improvements to the soundtrack.

Before digital telephone networks, mixes had to be "overnighted" (via parcel carrier) from the audio post-production facility to the film producers. If any changes were needed, the producers had to specify them over the phone to the music editor, and the shipping

MA BELL GOES DIGITAL

Integrated Services Digital Network (ISDN) is the public telephone service of the near future, and it is finally coming online in the United States. ISDN service has been available for years in Europe, Japan, Australia, and many other countries. ISDN basic-rate service divides a standard telephone line into three digital channels capable of simultaneous voice and data transmission.

The three channels, also known as 2B+D, include two "bearer" (the "B" in 2B) channels capable of transmitting 64 kilobits per second (Kbps), and a D channel that runs 16 Kbps. To make an ISDN call, both caller and recipient must have the service. (The Regional Bell Operating Companies estimate that 50 percent of all U.S. phone lines will be ISDN-capable by the end of this year.)

So why are ISDN lines such a big deal for the audio industry? Well, modems don't really cut it for sending digital-audio files, because the files are huge and take forever to download and upload. For calls of equal duration, however, an ISDN line can deliver up to fifteen times the amount of data that a "fast" modem (at 14.4 Kbps) can handle over a standard phone line.

ISDN is the cheapest, most flexible way for an individual or small business to use a digital audio network. Installation fees vary between $150 to $400, although Pacific Bell in California is aggressively pushing the system with bargain rates.

At press time, the installation fee was only $70. Call Pac Bell's automated toll-free number ([800] 995-0346, California only) for more information on availability. Monthly charges are higher than standard phone services—typical rates are $27 in Los Angeles, $38 in New York City, and $95 in Portland—and usage fees (dollars per time unit) are roughly twice the cost of a standard call.

What isn't cheap is the hardware and software required to take advantage of the digital networks. You'll need an NT-1 network terminator—for cleaning up transmissions and protecting against electrical disasters—and either a Mac/PC ISDN card (for sending/receiving digitized audio files such as *Sound Designer II* files), or a terminal adapter (the digital version of a modem) and a high-bandwidth audio codec (coder/decoder). A codec takes the incoming audio waveform and "codes" it into a bitstream that fits into the relatively narrow bandwidth of the phone line. The device "decodes" the bitstream at the other end to reconstruct the original waveform, all in real time. (At the bit rate of ISDN, a slight delay of approximately 1/3 of a second is introduced into the audio being received.)

The price tag for the codec system alone is about $9,000. The Mac/PC ISDN card system (if you already have a computer with digital audio play/record capability), while not real time, is much cheaper at approximately $2,000.

However, user's groups are forming, and prices for hardware, software, and network bandwidth should start falling soon. As systems become more affordable, more musicians, producers, and record companies can exploit the exciting new ways ISDN offers for making and marketing music.—*Dave Immer.*

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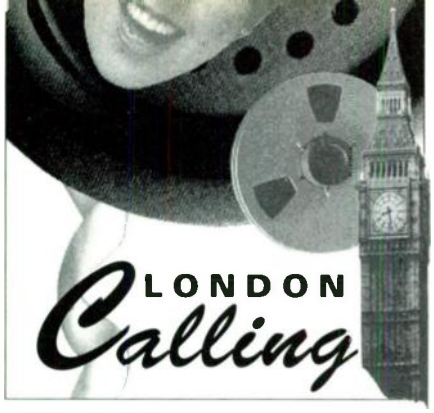

process was repeated. Unfortunately, at least two days of critical production time was lost whenever the mixes were packed off for review. EDnet allowed Lucas' sound editors and mixers to play digital mixes for the producers, who auditioned the tracks synchronized to picture in a Los Angeles studio. Then, the producers could request changes, and even hear the new version as it was being mixed. Voila! A creative team spread out in different geographic areas could work as if the artists, engineers, and producers were together in the same studio.

EDnet offers two different systems. The top-end system uses "T-1" fiber-optic phone lines and Dolby's AC-2 data compression algorithm to provide a complete, 4-track digital audio system. T-1 phone lines are among the fastest available, running up to 1.5 megabits per second. The audio specs on the T-1 system, which Phil Ramone used for the Sinatra album, are quite impressive: bandwidth is 20 Hz to 20 kHz, distortion is less than 0.02 percent, signal-to-noise ratio is 93 dB, and crosstalk is better than 70 dB.

EDnet's other system is called the Digital Patch. This network uses the Musicam compression algorithm developed by Corporate Computer Systems (CCS). The Digital Patch uses standard ISDN phone lines (see sidebar, "Ma Bell Goes Digital" on p. 33) and posts a signal-to-noise ratio of 85

DIGITAL NETWORKS

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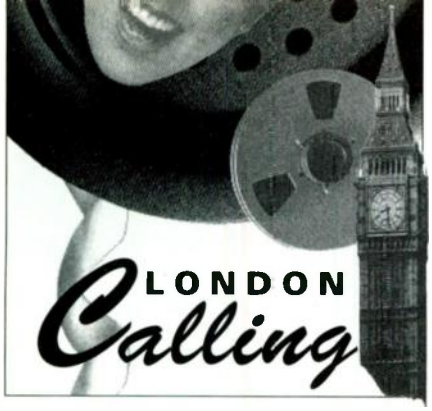

dB. Frequency response is 20 Hz to 20 kHz for mono or stereo transmission.

EDnet's charges are based on where you call and your studio's relative location to the nearest phone company hook-up. Monthly fees range between $75 and $2,000, while "usage" charges stretch from $75 per hour (for the cheapest domestic calls) up to $900 per hour (for multiple-channel international calls).

IDB

The other major option is the IDB system with its easy-to-use 3D2 unit. IDB uses the "aptX" algorithm to allow CD-quality transmission over ISDN phone lines. The 3D2 box includes AES/EBU inputs and outputs, as well as analog I/O. You can transfer digital *and* analog signals and even do digital sample-rate conversion with the unit. The IDB system offers dual, discrete stereo channels–you can send and receive signals from two studios at once (provided each studio has a 3D2 box)–with timecode. Users can also select multiple bandwidths of 7.5 kHz, 15 kHz, and 20 kHz. The system's digital ports provide a signal-to-noise ratio of 90 dB, while the analog ports deliver a signal-to-noise ratio of 82 dB. In addition, the system does not use analog compression or expansion, and there is no phase shift in the stereo signal.

A 3D2 system costs $500 per month (which includes the 3D2 box and the terminal to connect to ISDN lines), and IDB does *not* charge "usage" fees. The only additional charge is what you pay your local telephone company for using the ISDN lines.

"An IDB system takes about 45 days to install once an order is received," says Bob Landers, IDB's developer/consultant. "Charges are month-to-month, so a studio or artist doesn't have to worry about long equipment leases."

Currently, more than 80 studios worldwide have installed either IDB's 3D2 system or EDnet. Neither system presently "talks" to the other, although it makes sense that someday you should be able to send on one system and receive on another.

Many of the singers on Frank Sinatra's *Duets* album were recorded from studios all over the world using the EDnet digital-audio network. Old Blue Eyes and producer Phil Ramone stayed in Los Angeles, while artists such as Carly Simon, Gloria Estefan, and Tony Bennett phoned in their vocal contributions.

SYSTEM DELAYS

Of course, every cutting-edge technology logs a few minor technical hitches. All digital networks have a slight transmission/translation delay running from 30 milliseconds to a maximum of 300 milliseconds. Under normal usage, however these delays usually present no problems and are a vast improvement over the 650 millisecond delays of older satellite-based systems (not to mention the fact that transmitting audio via satellite often costs more than $80 an hour).

To beat the delay, simply send a basic monitor mix and your time code to the "remote" studio, so the engineer can record the data onto a multitrack recorder. Then, the remote studio plays your basic mix to the musicians, who perform to the tracks just like they would if they were recording at *your* studio. The remote studio sends the live music back to you over the digital network system, along with the prerecorded time code. At your studio, you simply lock your multitrack to the remote studio's time code, and you're back in perfect sync. Now, you can record the live performance from the remote studio as if the musicians were standing in front of you. You can direct the session over the network—asking for changes, critiquing performances, etc.—and work just as if you were there. Obviously, if you're just feeding complete tracks to another studio or playing mixes for your producer across the country, you don't need to be synchronized, and the time delay is not a problem.

OFFLINE

Digital telephone systems let artists and producers enjoy the "cocooning" trend of the 1990s. You don't have to become a rootless gypsy, traveling from city to city and studio to studio, to make your mark on the industry. And you don't have to deconstruct your studio or haul around heavy equipment racks everytime you score a lucrative outside gig. You can keep your entire system hooked up at your own project studio and send your work anywhere over EDnet or IDB. You can even send your completed album over the phone lines to be mastered.

▼

Tight deadlines loosen up a bit when you can instantly "call in" revisions.

Unfortunately, digital-audio networks aren't for everybody right now. They are costly to set up, because you must have ISDN or T-1 phone lines installed and the appropriate digital equipment from the network you've chosen. But if you can do more album, commercial, or film work by having the ability to track anywhere in the world, the costs might be worth it. For those doing commercial production, a digital phone system is becoming essential.

Michael Gore *is owner and chief technician of Bay Area Studio Engineering in San Francisco.*

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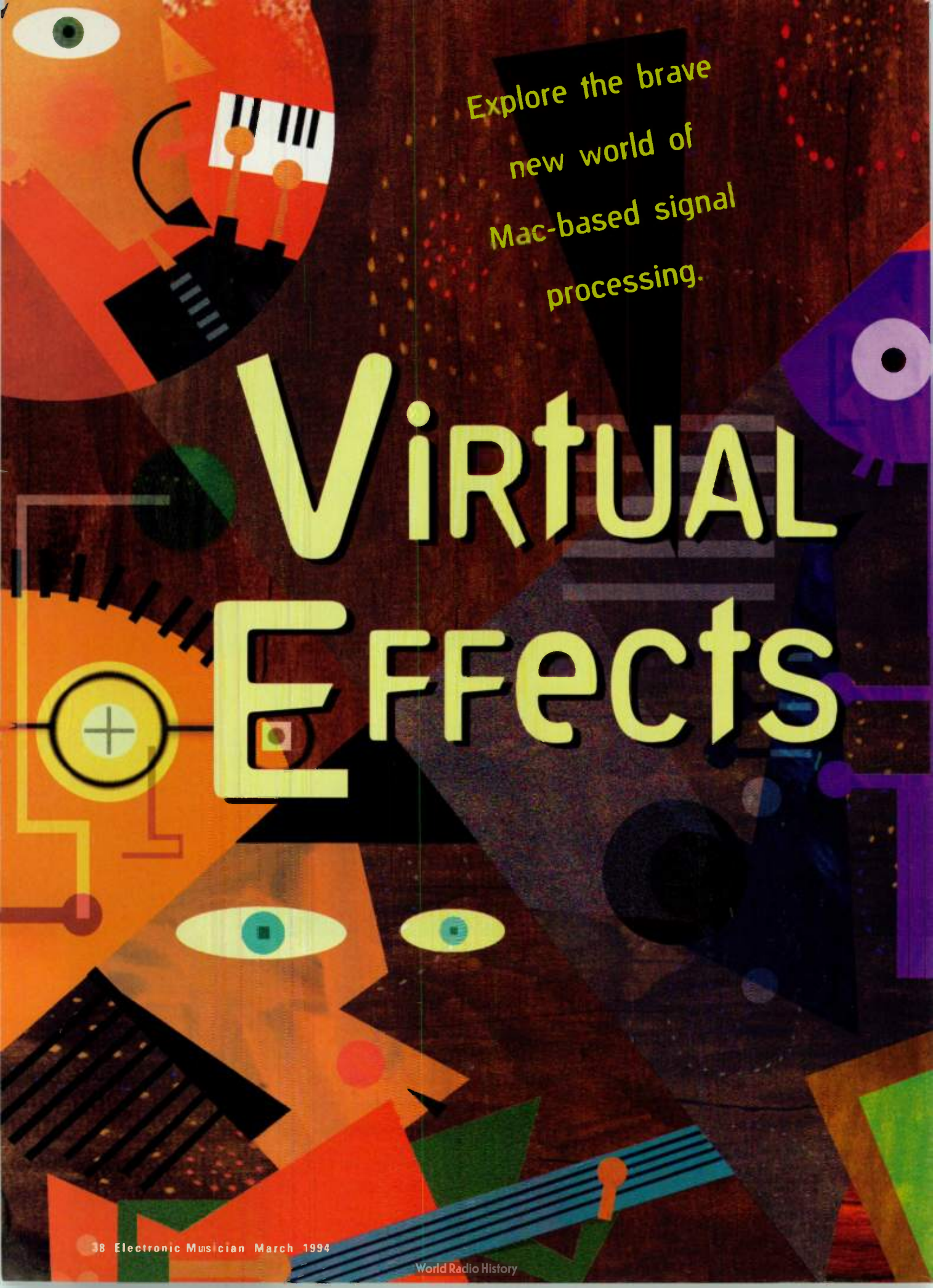

When the Apple Macintosh was introduced just over ten years ago, the only software available was a simple word processor and paint program. Today, Mac software catalogs look like phone books. Among the myriad programs are several that perform various types of digital signal processing (DSP) on disk-based audio files and real-time signals.

With the appropriate software and hardware, the Mac can perform familiar effects, such as reverb, delay, EQ, and compression. Specialized applications offer sample looping and real-time interactive processing. And for the adventurous, signal-processing languages provide access to the fundamental building blocks of digital-audio signal processing.

All of these programs work with the same hardware, and most can exchange sound files. However, in most cases, just one signal-processing task can occur at a time, so don't throw out your rack of outboard gear yet.

By David (Rudy) Trubitt

Illustration by Gordon Studer

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To understand these developments, you should be familiar with the basic concepts of digital-audio and hard-disk recording. Several **EM** articles can help get you up to speed; I especially recommend "Going Tapeless: Hard-Disk Recording and Editing" and "The Legend of Digital Audio" (October 1990), "From The Top: Hard-Disk Recording" (December 1991), and "The Digital Puzzle" (May 1993). Back issues are available from Mix Bookshelf; tel. (800) 233-9604 or (510) 653-3307.

THE HARDWARE

It's difficult to elicit multiple simultaneous effects from a computer, because effects processing requires a lot of CPU power. Multi-effects units can do it because they are optimized and dedicated to the task. The Motorola 680X0 microprocessors in all Macs can do DSP, but not in real time; for instance, equalizing a 3-minute sound file could take 30 minutes. Floating-point math coprocessors (such as the Motorola 68881 found in many high-end Macs) help, but they still aren't fast enough for processing CD-quality audio in real time.

Fortunately, specialized DSP chips can process digital audio while playing it back, making the whole process more interactive. Digidesign's line of NuBus audio cards (which are powered by Motorola DSP56000 chips) are supported by almost all Mac signal-processing programs. This nearly ubiquitous third-party support for Digidesign gear is a boon to users; we can take advantage of many different software tools with a single hardware investment.

Most programs work with any Digidesign card, but a few require more DSP power than some cards provide. In ascending order of processing speed, the Digidesign line-up includes the original Sound Accelerator (for Sound Tools) and Audiomedia cards, the newer Audiomedia II, the Sound Accelerator II (for Sound Tools II), and the Pro Tools card.

With an Audiomedia or Sound Tools system, you also get a copy of *Sound Designer II*, which provides the ability to record, edit, and play digital audio, as well as many basic signal-processing tools. The products described shortly are designed to improve upon *Sound Designer II*'s features, or address areas that *SD II* doesn't.

WAYS TO WORK

There are three basic categories of signal-processing programs. Some work offline with sound files on disk, some read files from disk and allow "knob-twiddling" while previewing the results, and some skip the disk entirely, passing audio in and out of the Mac like a stand-alone rack unit. In some cases, you can use your Mac for other tasks during processing.

With programs that offer offline disk-file processing, you simply load a file, set some parameters, start the processing, and relax while your computer crunches away. Depending on the size of the audio file, speed of your Mac, and complexity of the processing algorithm, the wait could be seconds, minutes, or hours. In some cases, the original file is modified with the processed results; in others, the results are stored in a new copy of the file.

The next level of responsiveness includes programs that let you hear the results of processing while you adjust various parameters. Several programs offer a graphic front end and other sophisticated features.

Both of these techniques owe their success to two widely supported digital-audio file formats: Digidesign's *Sound Designer II* format and the Audio Interchange File Format (AIFF). These formats make it possible to move a sound file through many different programs, using the unique features of each one in succession. In my sound-effects work, it's common for one sound to be processed through three or more programs.

However, beware of subtle compatibility problems when moving files between programs. Audio data moves smoothly between applications, but other elements, such as multiple loop markers or *Sound Designer II* Region information, are another story. Some programs ignore this information, failing

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Waves
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fax (310) 315-1913

Zola Technologies
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Suite 201
Atlanta, GA 30328
tel. (404) 843-2972
fax (404) 843-0116

VIRTUAL EFFECTS

to update changes, or worst of all, silently deleting the information. Be sure to keep a copy of the original file around in case you have to manually re-create the data.

In addition, some programs can play sounds while reading them from disk, while others must read files into RAM before playback, which greatly reduces the maximum playback length of the sound file. (Sample-editing programs typically fall into the latter category.)

The *Sound Designer II* and AIFF formats are used to move sounds around, because programs can't exchange audio via the Mac clipboard. This isn't so bad when you're transferring entire disk files, but it's awkward when you just need to process a portion of an audio file.

PUTTING IN A PLUG

For those who edit with Sound Tools or Pro Tools, Digidesign has created a framework that lets third-party developers "plug in" their own DSP modules. According to Digidesign, over 30 companies have signed up to produce a variety of Plug-Ins, including parametric equalization, sophisticated dynamics processing, and more. You must use the "parent" application to access Plug-Ins; they can't be run on their own, although this may change in the future. Digidesign offers two distinct types of Plug-Ins: *Sound Designer II* and TDM.

The type that has found the most immediate third-party support is the *Sound Designer II* Plug-In, which works within the *Sound Designer II* application, regardless of which hardware you use. Examples include the Waves *Q10* equalizer software and Digidesign's *DINR* noise reduction (discussed later). To use a *Sound Designer II* Plug-In, you select a piece of audio, open the Plug-In's processing window, and adjust the processor's controls while previewing the results. When you're happy, a mouse click modifies the selected sound and writes the processed audio back to the original disk file. The architecture does not currently support playlist volume changes, fade-ins, or fade-outs during playback, so you must process your sound files to disk before using these elements in a playlist.

However, *SD II* Plug-Ins provide a much smoother way to move audio between DSP processing programs than exchanging disk files between separate applications. Operationally, it's like using external processing, except that, in effect, you "route" the audio playback through one software signal processor.

ON THE TDM BUS

Another new development on the horizon is Digidesign's Time-Domain Multiplexing (TDM) system, a 256-channel digital-audio bus that connects multiple Digidesign cards and TDM-compatible products from other manufacturers within a single Mac. Every TDM system includes at least one DSP Farm, a NuBus card with multiple DSP chips that provide the processing resources for the system. The DSP Farm is analogous to a bank of rack-mounted, programmable DSP processors.

A TDM Plug-In has its own user interface that is displayed in a separate window within another application. The application must be compatible with the Digidesign Audio Engine (DAE). The Plug-In is independent of the parent application, although it cannot run by itself, and it looks, feels, and sounds the same regardless of which parent application you use. TDM Plug-Ins always run in real time, reading the input data from the TDM bus and writing the output back to the TDM bus.

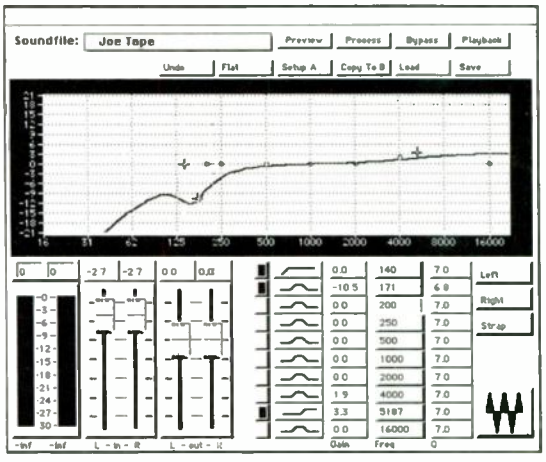

FIG. 1: Waves' *Q10* parametric EQ *Sound Designer II* Plug-In combines detailed EQ with a sophisticated graphic interface.

There are two common types of TDM Plug-Ins, although others are possible. The most common is a DSP algorithm running on one or more DSP chips in one or more DSP Farm cards. However, the Plug-Ins can also be hardware-based, as with the Lexicon NuVerb card (described later). The user does not see the difference between the two types, controlling either Plug-In through its interface window.

Unlike *SD II* Plug-Ins, you can operate many TDM Plug-Ins simultaneously. Although they do not batch-process data or write processed data back to the hard disk, the applications they run within can provide these functions.

A number of manufacturers are developing TDM-compatible hardware products, including Lexicon and Kurzweil. Expect to see plenty of software, as well. Digidesign expects that many DSP algorithms will be written as both *SD II* and TDM Plug-Ins to serve a variety of users. However, because *Sound Designer II* already exists and TDM is not yet shipping, *SD II* versions will appear first.

At present, it appears that TDM will run only on Pro Tools systems, not Sound Tools II, as initially stated. Although this is at the high end of the spectrum, the configurable DSP systems found in high-end digital audio workstations are far pricier. TDM is a development worth watching, so stay tuned.

COMMERCIAL SOFTWARE

Where there were once only a few pioneering programs, a wealth of new Macintosh signal-processing software is starting to appear. Some are free-standing applications, some are Plug-Ins, and one or two are special cases that don't quite fit either category.

Digidesign *DINR*. Not surprisingly, the first available *Sound Designer II* Plug-In tool comes from Digidesign itself. *Digidesign's Intelligent Noise Reduction* (*DINR*, $995) is designed to combat two common forms of noise: hiss (from tape, an air conditioner, etc.) and AC hum (e.g., from single-coil pickups). Digidesign also expects to release a TDM version.

Ideally (but not necessarily), the recording includes a brief segment of broadband noise without music. *DINR* "learns" the characteristics of the hiss and intelligently removes it from the sound file, with a user-definable

VIRTUAL EFFECTS

amount of noise reduction.

In hum-busting mode, *DINR* provides tunable comb filters, which consist of a series of harmonically related notches. Hums and buzzes often contain harmonics related to the 60 Hz AC frequency, so comb filtering is much more efficient than using individual notch filters.

Waves *Q10*. *Q10* ($400, distributed by Rockwell Digital) is the first third-party *SD II* Plug-In module. *Q10* offers ten simultaneous bands of fully parametric, stereo EQ (6-band stereo on the original Sound Accelerator card). *Q10* lets you see and edit the frequency-response curve of multiple overlapping filters. Waves is also developing a free-standing "shell" that will allow their Plug-Ins to be used for pass-through processing on a Digidesign card.

I've found *Q10* to be quite a problem-solver. In one example, I had to edit a solo guitar on DAT. The recording was made with a pair of mics, one of which was out of phase with the other. The resulting lack of bottom led the session engineer to unnecessarily boost the low end. After inverting one channel using *Sound Designer II*, *Q10*'s different types of filters let me combine a smooth low-end roll-off with an overlapping notch filter to recontour the bottom end, while nudging up the top end (see **Fig. 1**). The results were passed through a compressor, and the project was complete.

Lexicon NuVerb. The Lexicon NuVerb ($1,795; $495 for TDM daughterboard) is the first available TDM Plug-In, a hardware and software effects processor that runs on its own NuBus card. NuVerb is designed for pass-through operation, using AES/EBU digital I/O. If you have a Pro-Tools/TDM system, NuVerb will fit in seamlessly. If you don't, the product works fine as a stand-alone processor with digital I/O.

NuVerb can operate as a stereo or dual-mono processor, or as two cascaded processors. Effects include a variety of reverb/delay and compressor/expander algorithms, and the system offers PONS (Psychoacoustically Optimized Noise Shaping) for improved 20-bit to 16-bit sample conversion.

NuVerb provides a clear, easy-to-navigate graphical interface. When editing, three different levels of detail can be displayed and adjusted. These include overall audio routing, effects algorithm details, and the inner tweaks of the primary effects process. As a result, it's easy to understand and edit a patch. Five sliders are displayed, even when you're not editing. These can be mapped to your favorite effects parameters (room size, predelay time, etc.) and changed, via mouse or MIDI, in real time.

Effects automation is one important application of computer-based signal processing, and NuVerb is the most sophisticated example to date. The system can lock to time code while recording and playing back all changes made by mouse or MIDI. In a List window, individual events can be edited or deleted. The automation list also includes the program data for each effects patch used. This makes the list completely portable; take it to another NuVerb-equipped Mac, and it will play back exactly the same way, regardless of differences between the NuVerbs' program libraries.

Jupiter Systems *Infinity*. *Infinity* ($249; reviewed in the November 1993 **EM**) is a stand-alone application that uses a Digidesign DSP card to accelerate number-crunching. Designed expressly for sample looping, it does a great job; if you loop samples, you need it. The program can take the changing spectral content of a sound and distribute it evenly across the entire loop length.

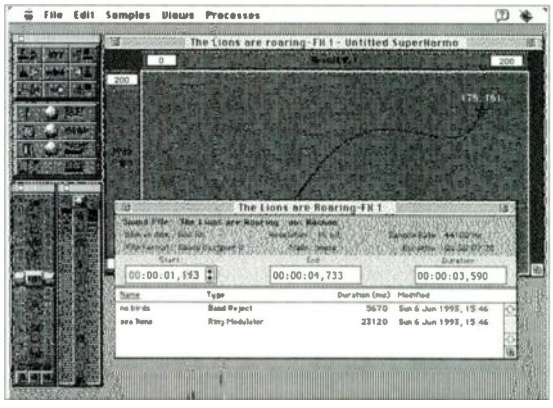

FIG. 2: *Hyperprism* lets you "gesture" with the mouse to control the processing in real time.

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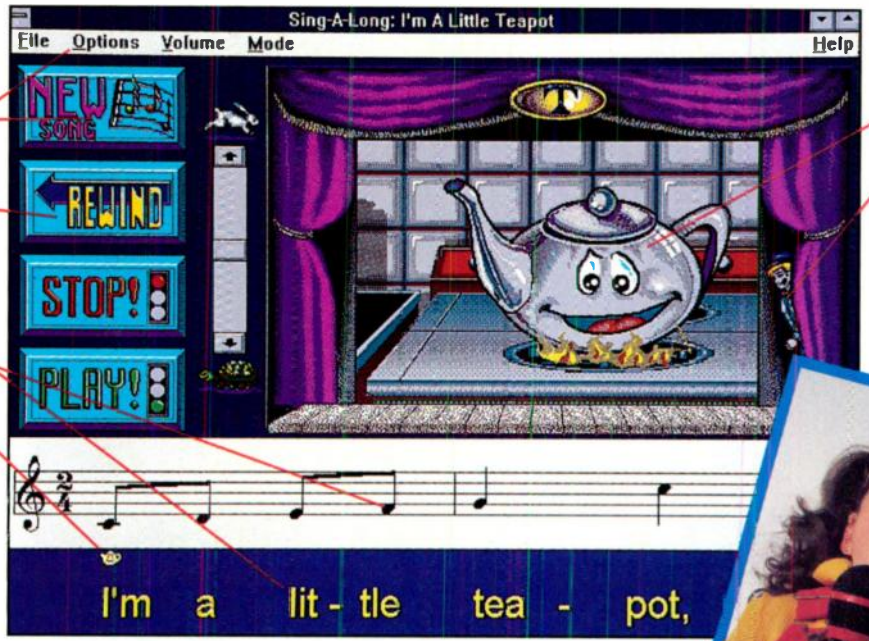

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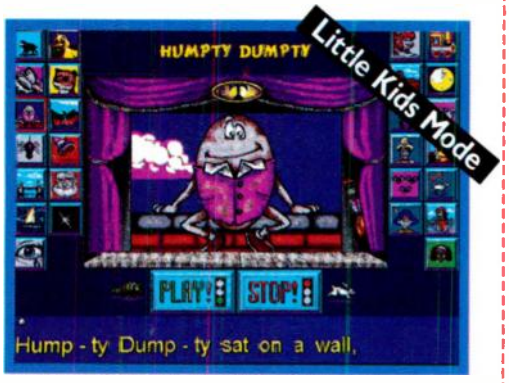

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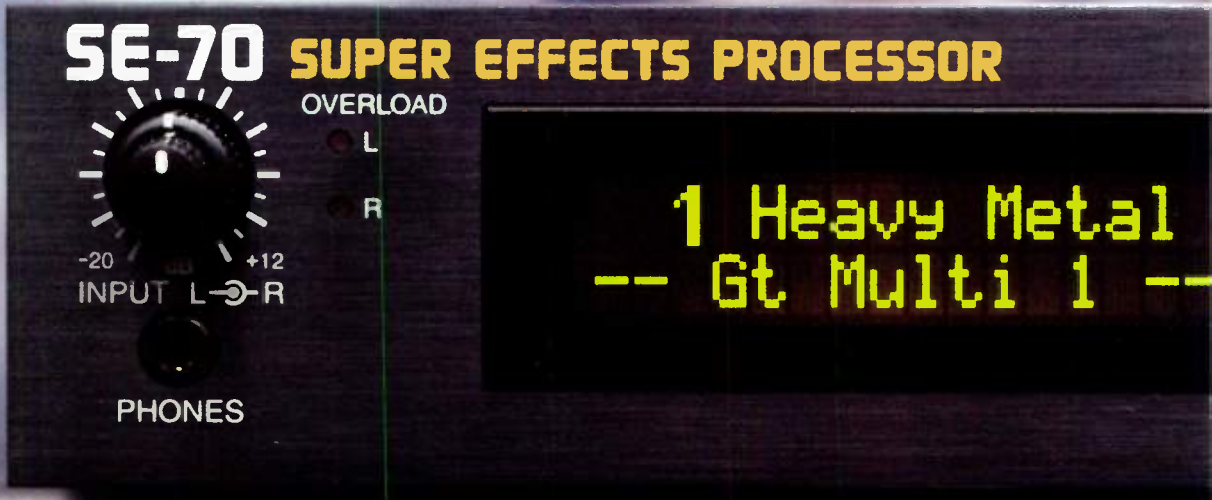

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Max Simultaneous Effects	16	12	3	4	10	Limited by Memory	9
Guitar Pre Amp	Analog	Digital	n/a	Digital	Analog	n/a	Digital/Analog
Independent Effects per Input	Yes	Yes	No	Yes	No	Yes	No
Delay Taps	20	16	8	8	4	4	4
Pitch Shift	12 part	8 part	4 part	3 part	n/a	6 part	4 part
Hum Cancel	Yes	No	No	No	No	No	No
Vacoder	21 Band	Yes	No	No	No	No	No
Guitar/Bass Synth	Yes	No	No	No	No	No	No
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In one case, I was working with a smooth, ambient bed that had some intermittent clicking sounds. I tried cutting them out, but the results were distracting. *Infinity* was able to "smear" the clicks into the background ambience. The result was a brighter ambience, as the clicks' spectra were still present, but the annoying transients were completely eliminated.

Arboretum Systems Hyperprism. *Hyperprism* ($495) is a stand-alone application that offers a unique interactive approach to signal processing. The program processes *Sound Designer II* or AIFF disk files, or pass-through audio signals in real time with one of its numerous effects, which include time and pitch shifting, ring modulation, vibrato, and Doppler shifting.

What sets *Hyperprism* apart is its user interface. Instead of adjusting onscreen sliders and buttons, *Hyperprism* lets you "gesture" with the mouse to control the processing. Drawing a curve in the program's Blue Window simultaneously modulates two parameters of a single algorithm (see **Fig. 2**), such as time stretching in the horizontal direction and pitch shifting in the vertical.

The shape and rate of your mouse gestures are recorded as you listen and react to the processed sound. Each mouse-drawn curve can be stored and replayed, using a minimum of disk space. You can make multiple passes, stacking several algorithms in a *Hyperprism* file, which is independent of, but tied to, the unprocessed audio file.

If you like the results of a particular curve, the processed sound can be stored in a new *Sound Designer II* or AIFF file. You can then open that file and process it again through a different effect.

Hyperprism places heavy demands on your Mac; a IIci or better is required. Any Digidesign card can be used, but only at 44.1 and 48 kHz sampling rates. The program ties up your Mac during processing, although the company has successfully recorded processed sounds in real time into *Studio Vision* with a

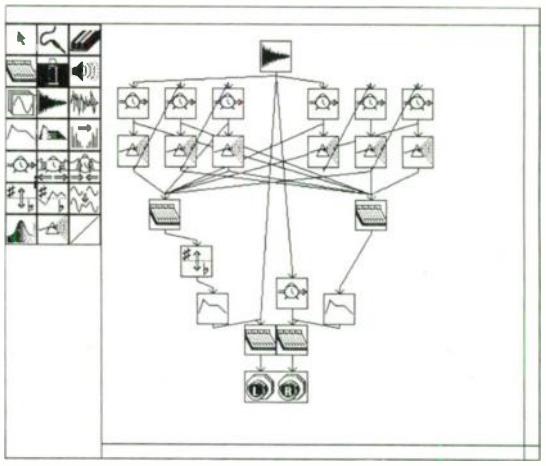

FIG. 3: The latest version of Digidesign's *Turbosynth* includes support for stereo sound files. New DSP modules include diffusors, shown here in a complex reverb algorithm.

Virtual Effects

second Digidesign card.

Digidesign *Turbosynth*. Some may think of Digidesign's *Turbosynth* ($349; reviewed in the November 1988 **EM**) strictly as a synthesis tool. However, its signal-processing capabilities have been bolstered by the latest release, *Turbosynth SC* (reviewed in January 1994), which also supports stereo sound files. For applications ideas, see "Turbosynth Tips" in the August 1989 issue.

Turbosynth uses graphic building blocks and virtual patch cords to provide pitch shifting and time stretching, diffusion (which can be used to make reverbs; see **Fig. 3**), and wave-shaping. (The latter can provide compression; try a drum sound with an S-shaped transfer curve). The new version's example disks are packed with creative uses of these tools.

I've often struggled to do something in *Sound Designer II*, only to realize it's a piece of cake for *Turbosynth*. The program plays sounds from RAM, so you can't usually process complete songs. But as a sound-design and sample-editing package, it provides a unique and deep approach to audio manipulation.

Steinberg/Jones *Time Bandit*. Steinberg/Jones *Time Bandit* ($499) is a stand-alone application with a simple purpose: providing high-quality time compression/expansion and pitch shifting. *Time Bandit* only processes audio disk files in Digidesign's *Sound Designer II* format (the next version will support AIFF files), and the program creates a new audio file every time you execute a time or pitch stretch.

The amount of time stretching can be calculated automatically if you supply the new length or tempo. Alternatively, you can directly specify a percentage change. In Pitch Shift mode, single notes can be transposed and chords can be constructed using an on-screen piano keyboard to define the musical relationships for the pitches *Time Bandit* generates.

Time Bandit doesn't require a Digidesign card, although it can use one for playback. For processing, it uses the Mac's CPU, but not the floating-point coprocessor. As a result, it runs a bit slowly, but the results are excellent.

Zola Technologies *DSP Designer*. It appears that software will be the DIY projects of the 1990s. Those interested in DSP programming should know about Zola Technologies' *DSP Designer* ($995), an environment for developing DSP algorithms. The program isn't an application, but a set of tools that runs within Apple's *Macintosh Programmer's Workshop* (*MPW*, bundled with *DSP Designer*), a multiwindow program-development environment.

I recently had a project requiring many individual sound files. They all needed to be filtered, but I wasn't sure what cutoff frequency and filter slope would sound best. So I designed a variety of filters (*DSP Designer* makes this easy) with different cutoff frequencies and varying slopes (see **Fig. 4**). Using *MPW's* scripting capabilities, I was able to batch-process a dozen different sound files through each of my custom filters, producing scores of processed files for comparison. It took a while to run, but I didn't have to be there pushing a mouse around.

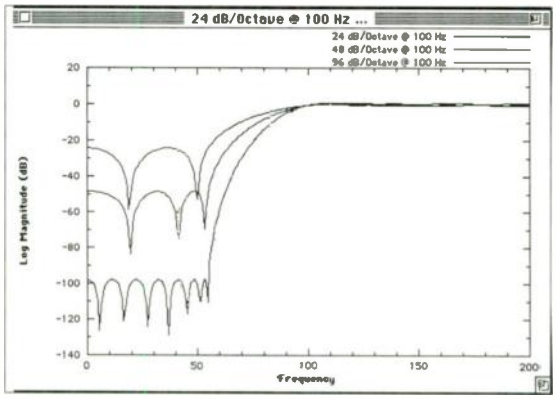

FIG. 4: Zola Technologies' *DSP Designer* lets you create your own DSP algorithms. Shown here are three different high-pass filters.

Although the full *DSP Designer/MPW* environment may be overkill for most, Zola is working on a Digidesign-compatible Plug-In that will support Zola's "Z" DSP programming language for real-time experiments. When this is released, Mac sound designers will have an extremely flexible, customizable tool at their disposal.

SHAREWARE

There are two shareware DSP programs that no one should be without: *Reverb*

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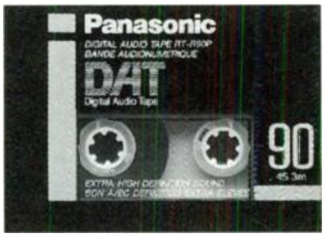

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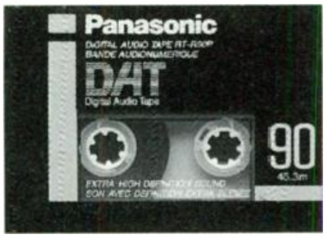

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VIRTUAL EFFECTS

and *SoundHack*. Both are stand-alone applications.

SoundHack, written by Tom Erbe and available from Frog Peak Music, is an indispensable tool for anyone working with Mac digital audio. The program operates strictly on disk files and does not require a Digidesign card to run, although it works only on Macs with floating-point processing. It's not quick, but the results are top-notch. The program also provides another valuable service: It can read and write files in a slew of Mac and non-Mac audio-file formats beyond AIFF and *Sound Designer II*, including NeXT, Sun, and Zola's *DSP Designer*.

Add to this 3-D binaural filtering, phase vocoding, sound-file convolution, ring modulation, amplitude analysis, and gain change, and you can't go wrong. *SoundHack* can be downloaded over the Internet using anonymous FTP from mills.edu.

Reverb, written by Bill Gardner, turns a Digidesign card into a stand-alone effects unit. True stereo reverbs, delays, flangers, and other useful effects can be created using a text-based DSP language. Numerous examples are included, so you can use *Reverb* without programming. The current version (5.2) even allows MIDI control of multiple effect parameters in real time.

Reverb runs in pass-through or disk-file processing modes. In pass-through mode, you can run *Reverb* and still use your Mac for other tasks, such as sequencing. Users can write their own algorithms using *Reverb*'s well-documented programming language. The program can be downloaded over the Internet by anonymous FTP from cecelia.media.mit.edu.

FUTURE DIRECTIONS

At this point, most programs have their own market niche. However, that will soon change; developers are working on products with overlapping applications. The first example of this trend will be in the field of dynamics processing. Both Jupiter Systems (*Infinity*) and Waves (*Q10*) are working on Plug-Ins to do just that. Initially implemented as *SD II* Plug-Ins, they will probably be offered as TDM Plug-Ins, too.

Jupiter's *Multiband Dynamics Tool* will provide interactive, real-time dynamics control in up to five independent spectral bands. *MDT* will use a graphic interface to edit the "transfer curves" that define the relationship between input and output levels. The program can be used to perform compression, limiting, expanding, gating, de-essing, noise reduction, spectral enhancement, and dynamic EQ. Compression will include "soft-knee," or tube-like, characteristics. The ability to set different parameter values for separate frequency bands should be useful for controlling program material that would normally cause compression artifacts such as "pumping."

Waves' dynamics-processing Plug-In will be divided into compressor and limiter modules. The compressor will offer controls similar to stand-alone units, with the addition of a program-dependent release envelope. A transfer curve will depict system response, complete with a sliding cursor showing the instantaneous input level to help set the threshold. The limiter is designed to function as an easy-to-use brick-wall limiter with the added advantage of a 64-sample look-ahead algorithm. This lets it begin limiting before the peak threshold is crossed, which is said to improve overall performance.

IN THE END

There are situations in which a knob-laden rack of gear makes more sense; it's still quicker to have two hands turning knobs than navigating through multiple windows with a mouse. Hopefully, more signal-processing automation and physical-knob control surfaces for software will become available soon.

Still, a wealth of tools is available today. Software that duplicates traditional functions often does so with greater precision and repeatability. And in many cases, software provides processing simply unavailable with traditional outboard gear.

Although there will probably always be a place for dedicated, hardware-based signal processing, an endlessly reconfigurable, software-based approach is clearly the direction in which the industry is moving. Mac users are poised to use these new concepts today.

David (Rudy) Trubitt *thanks the many people who provided background material for this article.*

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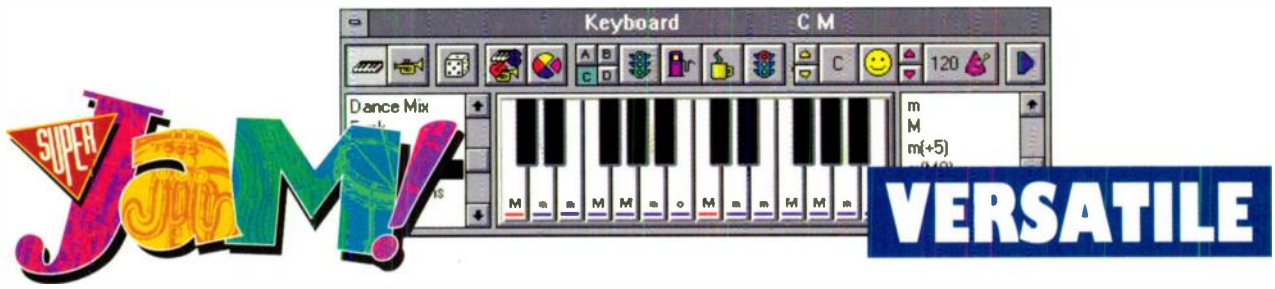

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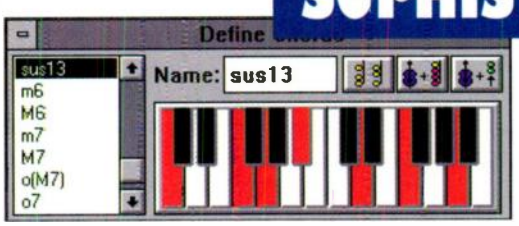

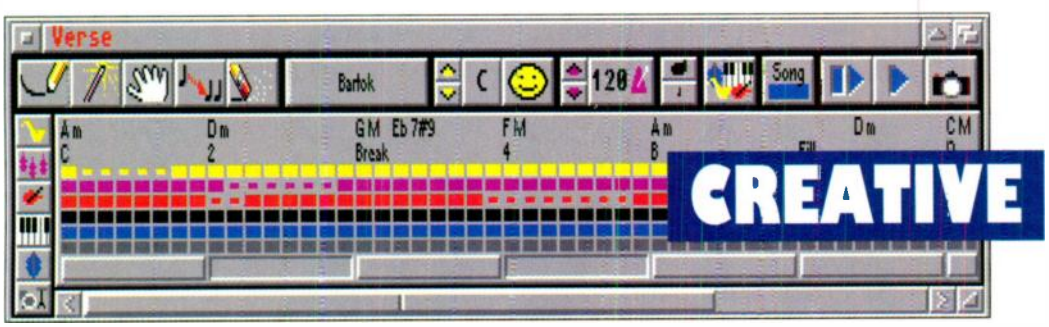

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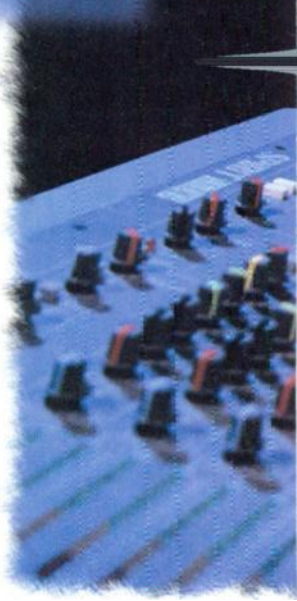
VIRTUAL MIXING

Like most home studios, mine includes a few synthesizers, microphones, and effects processors, in addition to a multitrack tape deck, stereo mastering deck, mixer, power amp, speakers, and computer. All these components work well together, each doing its job with aplomb. However, I've recently started to suspect that something strange is going on in the studio. I don't want to sound paranoid, but I think the computer is out to get the other gear.

Slowly, but surely, the computer has been taking over more of the tasks in the studio. At first, it seemed innocent enough. Hundreds of "virtual" sequencer tracks free up the multitrack to record acoustic sounds. Editor/librarians help organize a growing collection of sounds for various synths. But these developments didn't threaten the other equipment, they *enhanced* their functions.

Then, hard-disk recorders were introduced, complete with random access, nondestructive editing, and seamless integration with MIDI sequencers. Two tracks became four, then eight. Where will it stop? Is tape a thing of the past? At least the mixer and signal processors are immune from the computer's takeover bid.

By Scott Wilkinson



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Or are they? As computers become more powerful, even these traditional studio stalwarts are being swallowed up by the digital onslaught. Signal processors are now implemented entirely within the computer and integrated with other computerized musical functions (see "Virtual Effects" on p. 38). And what of the venerable mixer? Is there no escape from the computer's clutches? Apparently not, and perhaps it's just as well.

MIXING IT UP

Implementing a mixer entirely within a computer has several advantages. For one thing, many people are intimidated by the vast expanse of buttons, knobs, faders, and meters found on conventional mixers. The controls of a computer-based mixer can be displayed on the screen in any configuration, from simple to complex. In addition, different sections of the mixer—EQ, aux sends, panning, etc.—can be displayed in greater detail.

Signal routing in computer-based mixers is highly configurable. Typically, the computer is connected to an external rack-mounted box that includes the audio inputs and outputs. Multiple I/O boxes can often be chained together to provide as many inputs and outputs as you want, depending on the computer power at your disposal. In addition, the outputs can sometimes be configured as direct outs, subgroups, master outs, or aux sends.

Some computer-based mixers also offer digital signal processing (DSP). EQ is the most common processing function, and many systems include several bands for each input channel. Reverb, delay, and other forms of DSP are also common.

These mixers are normally operated by manipulating onscreen controls with a mouse or other X/Y controller. This might seem to be a significant limitation. How can you manipulate several controls at once with only one mouse? The answer is simple: In most cases, you can "link" several controls on the screen. As you manipulate one, the others also move.

Even so, many people want a physical control surface under their fingers. No problem; simply use a MIDI fader box. Most computer-based mixers include MIDI-control capabilities, and some even send MIDI messages to control external MIDI devices, particularly MIDI-controllable effects processors.

Although many conventional mixers can be automated to one degree or another, few come close to the automation potential of a computer. Most computer-based mixers include a sequencer that can record the movements of all controls. This sequence can be edited and played back for full automation.

One of the most significant advantages of computer-based mixers is the ease with which they can be upgraded. If the manufacturer of a conventional mixer adds new features, you must buy a whole new board. However, computer-based mixers can be upgraded with a software update at significantly lower expense.

Live-sound work is among the most appropriate applications of computer-based mixers because of the changing needs of different venues, performers, and events. Portability, configurability, and ease of setup are strong advantages for house mixing, monitoring, and onstage submixing. Commercial recording studios can supplement their conventional mixers with a computer-based mixer, particularly in a MIDI room. Project and home studios can exploit their computers to the fullest extent and enjoy the benefits of easy, inexpensive upgrades. Post-production facilities are finding this level of automation and integration critical in the inevitable last-minute panic to get a soundtrack out the door.

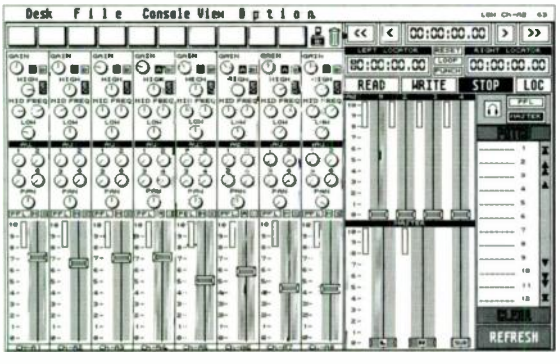

FIG. 1: The Global page of Generalmusic Sound Engineer displays the controls for any eight input channels, all outputs, and SMPTE time. Although this screen includes four aux sends, there will be eight in the U.S. version.

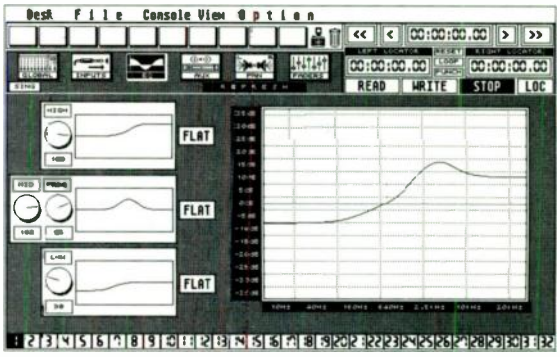

FIG. 2: The Sound Engineer EQ page displays a graph of each EQ band and a composite graph of the total effect for each of 32 channels.

SOUND ENGINEER

The Generalmusic Sound Engineer is already available in Europe using the Atari Mega ST and Falcon030. The company is working on a *Windows*-based version for the U.S. market. Customers will receive both versions of the software when it ships in this country.

The Sound Engineer includes a 5U rack-mount I/O box and a separate 1U rack-mount power supply. Currently, the I/O box connects to the computer via MIDI, although the U.S. version should also include a serial connection. The box can accommodate up to eight 4-channel input cards for a total of 32 balanced, ¼-inch TRS inputs. In the U.S. version, each input channel will also include a direct out that can be configured as a second input, switchable with the primary input. Other outputs will include a stereo master and eight aux sends that can be configured as subgroups. There are no separate aux returns, so you must use input channels to return outboard effects.

An optional DSP board will provide four independent effects processors like those found in Generalmusic's S2

and S3 keyboard workstations (reviewed in the November 1992 **EM**). You can assign any of the aux sends to these processors, which return their signals via internal buses.

The software includes six screens, or "pages." The primary screen is the Global page (see **Fig. 1**), which displays an overall view of the mixer controls. This includes eight input channels (you can select any eight inputs from those available), each with a gain control, 3-band EQ, eight aux sends, pan pot, and fader, in addition to mute, solo, and prefader listen (PFL) buttons. The Global page also includes eight master aux sends, left and right master output level faders, and a SMPTE time display.

If you want more control over a particular function, you can double-click on any control or use a pull-down menu to call up different pages. These pages include Input Gain, EQ, Aux Send, Pan, and Fader. Each page provides more detailed information and control of the selected function on all 32 channels. For example, the EQ page includes a graphic representation of each band, as well as total effect of all three bands (see **Fig. 2**).

Controls can be linked on all pages. Alternatively, you can use a MIDI fader box to control several channels at once. Either way, all control manipulations can be recorded in the Sound Engineer's sequencer, which records MIDI messages in 1 MB of onboard RAM. This sequencer is not designed to record note messages, but it can be used to control MIDI lighting systems from the Sound Engineer's MIDI Out port. The software provides event-list editing. You can also store up to 128 "snapshots" of all control settings.

Once the automated mix is recorded, you can save it to a floppy disk in the unit's internal drive and replay it from disk without requiring the computer. The unit can sync to SMPTE while replaying control moves and changing from one snapshot to another. Not

only that, you can integrate the system with other music software, passing information back and forth between them.

The Sound Engineer has already attracted some heavyweight attention. Guns 'n' Roses and Emerson, Lake, and Palmer have expressed an interest for live shows, and Herbie Hancock is beta-testing the system in his home studio. Look for U.S. sales to start sometime in the first half of 1994.

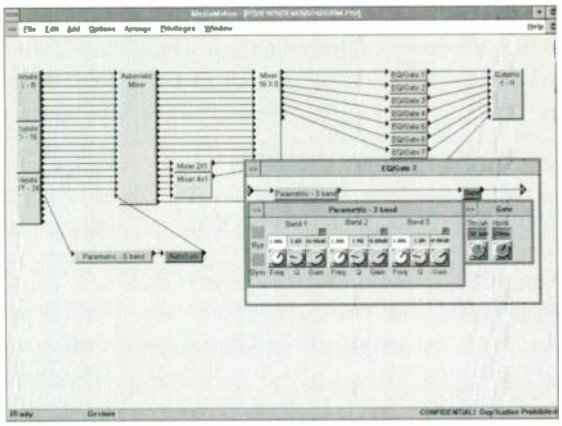

FIG. 4: Each MediaMation module has its own control surface that can be displayed and manipulated.

MEDIAMATION

Peavey Electronics began producing digital effects processors about ten years ago. In fact, they participated in the development of the Motorola DSP56000. As a result, they have steered clear of application-specific integrated circuits (ASICs), which lock you into a particular architecture, in favor of programmable general-purpose DSPs that can be upgraded with software.

Their DPM synthesizers include several 56000s to handle everything from signal generation and modulation to mixing and effects. So it seems only natural that they would extend this concept to a computer-based sound system. The result is MediaMation.

MediaMation is a sound-system construction set for 80486 *Windows* computers. You can assemble any configuration of inputs, outputs, controls, effects, and other modules on the screen and connect them via mouse with "patch cords" (see **Fig. 3**). Once a system is designed, you can call up the control surface for each module (see **Fig. 4**). In essence, Peavey has put the entire sound system into the computer, with the exception of sound sources, power amps, and speakers.

To implement the system, one or more MediaMatrix cards are installed in the computer. Each card has four 56000s, which do the required number crunching. These cards integrate seamlessly, and their combined processing power is applied as needed to any specific system.

The cards connect to 1U rack-mount "breakout boxes," which house sixteen balanced, XLR analog inputs and/or outputs and 18-bit ADCs and/or DACs. Three configurations will be available initially: sixteen inputs, sixteen outputs, and eight of each. Multiple breakout boxes can be connected to provide up to 256 inputs and outputs. The largest system that Peavey has designed so far includes ten MediaMatrix cards and 164 inputs.

The beauty of this approach is the ease with which systems can be designed and implemented. In addition, new software modules can be added at any time. The current module menu includes input, output, meter, mixer, crossover, delay, distribution amp, dynamics processor, filter, and a wide variety of EQs, including parametric, graphic, and shelving. You can also use some of the outputs to send signals to outboard gear.

The initial release, which is scheduled for the end of the first quarter of 1994,

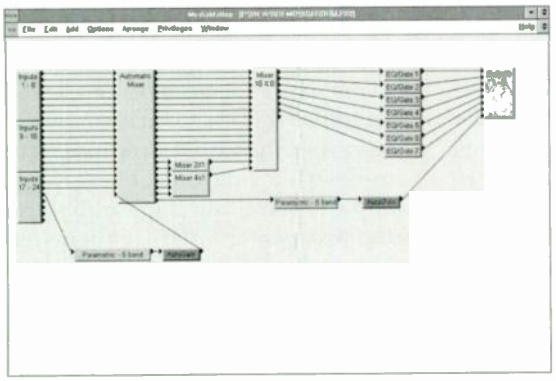

FIG. 3: In Peavey's MediaMation, modules are connected on the screen with "patch cords."

will be aimed at sound contractors and live applications. The system is perfectly capable of addressing the needs of recording studios as well, but some of the studio-specific software modules aren't written yet.

Peavey realizes that many engineers won't be comfortable running a sound system with a mouse, so they intend to develop a hardware control surface for the MediaMation system. It will also be possible to use a MIDI fader box such as the Peavey PC-1600, although MIDI has not yet been implemented in the system.

According to Hartley Peavey, founder and president of the company, "This, or something like it, is the future of the sound-installation market. There will always be hardware, rack-mount stuff, and so on. But the more sophisticated the system, the better this looks in terms of cost and implementation. Every time you patch black boxes together, you have the potential for ground loops, level mismatching, and cable and connector problems, not to mention the cost of the labor to hook it all up. You could probably implement a very sophisticated MediaMation system for under $10,000. This isn't trivial, but it's a tiny fraction of what it would cost to implement a similar system in hardware."

VOYAGER SOUND SYSTEM

Among the most unusual computer-based mixers is a patented system from Voyager Sound. Currently, they have a prototype "proof of concept" running on an Atari Mega ST, but they intend to offer the system on several platforms when it's released about a year from now.

Instead of the traditional onscreen controls and readouts, the software depicts a mix as icons in a soundfield (see **Fig. 5**). Each icon represents a signal. For example, you might have a piano, trumpet, and guitar on the screen, each representing an instrument in the mix. The center of the soundfield, called the *origin*, represents the listener's position. As you move an icon away from the origin, the level of that signal decreases; as you move the icon toward the origin, the level increases. Similarly, if you move the icon to the right or left, the pan position of the signal changes accordingly.

The hardware interface is an analog audio matrix with a voltage-controlled amplifier (VCA) at every cross point. The system translates the image on the screen to control the VCAs. It can operate in two quadrants for stereo, or four quadrants for surround-sound applications. Ultimately, it will support six primary outputs in a mix. Voyager plans to offer 96 inputs by 32 outputs, allowing several simultaneous and independent mixes. They intend to offer matrix modules to expand the system as needs and budget require. Each module is expected to include a completely reconfigurable 16 × 8 matrix.

You can link icons to move together in one of several ways. For example, you can retain the pan position of the signals by locking the angle of the icons, which restricts their motion to the radial direction. All icon movements can be recorded and played back locked to SMPTE for automation.

The software also sends MIDI messages in response to onscreen movements. This lets the system control external mixers and effects processors along with the matrix signals. For example, as you fade a signal, you might also bring up the reverb level in an external processor to simulate a sound source moving away from the listener. One of hallmarks of this system is the ability to integrate many different parameter changes into a single onscreen movement.

The system is designed to be intuitive, simple, and flexible. According to Douglas DeVitt, one of the designers, "We wanted to consolidate a lot of the functionality of a console. Even with computer-based 'glass consoles,' you still have lots of little numbers and controls on the screen. We give engineers whatever level of visual complexity they want. In addition, different parameters can be indicated with color, size, and/or position of each icon on the screen."

The Voyager system is particularly well suited for film and video surround-sound mixing. "Normally, there is a post-production bottleneck, because audio is one of the last things to get done," says DeVitt. "Surround-sound mixes are usually built in stages, or premixes. Our system lets engineers create complicated surround-sound mixes with one pass. We will also offer a retrofit system that can be integrated into an existing studio. This provides surround-sound mixing without having to go out and buy a mixer structured for that purpose."

FINAL MIX

Clearly, we are entering a brave new world in which more and more music-production tasks are being delegated to the computer. Far from being an ominous trend, this is a giant step toward integrating the entire studio or live venue with a single user interface. Computer-based mixing, audio and video processing, MIDI sequencing, lighting control, and other functions promise to take us well into the twenty-first century. Of course, the capabilities of current systems will be dwarfed by tomorrow's technology, but for now, we have some incredible power at our fingertips.

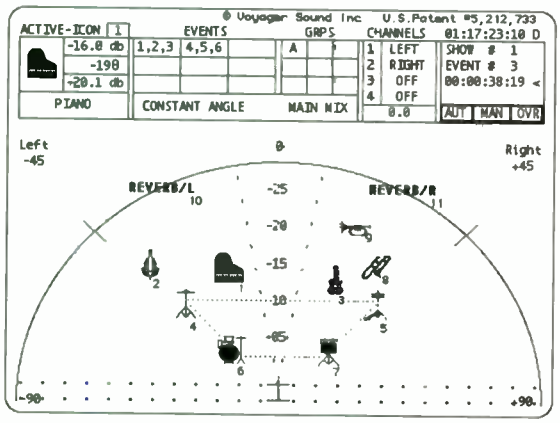

FIG. 5: The Voyager Sound system represents a mix as a set of icons in a stereo soundfield around a central listener. As you move each icon, the level and pan position of that signal changes accordingly. In this example, several elements of the drum set are linked; if you move one of them, they all move toward or away from the center. This changes the levels without changing the pan position. As you move the Reverb icons, the system sends MIDI messages to an outboard effects processor.

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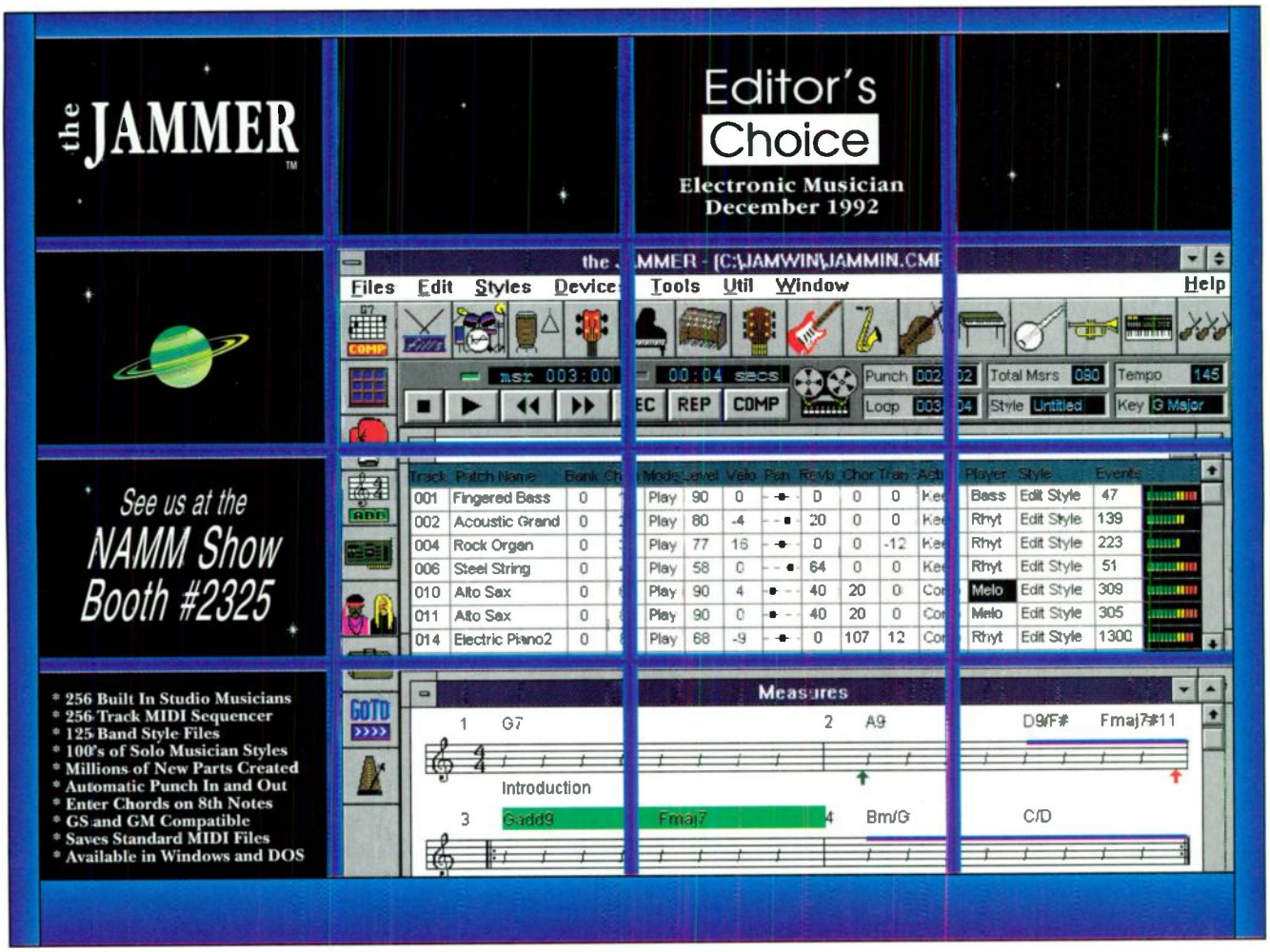

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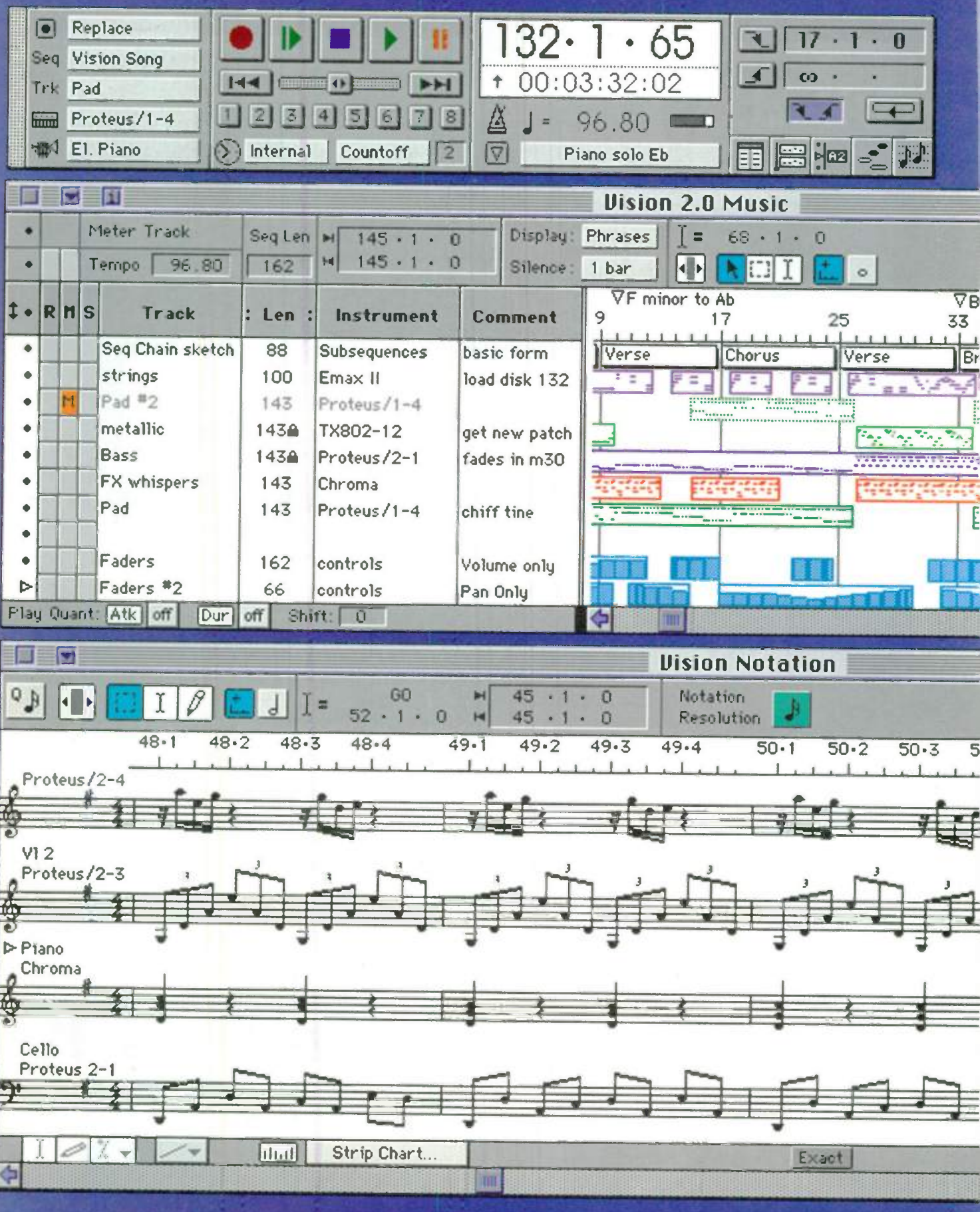

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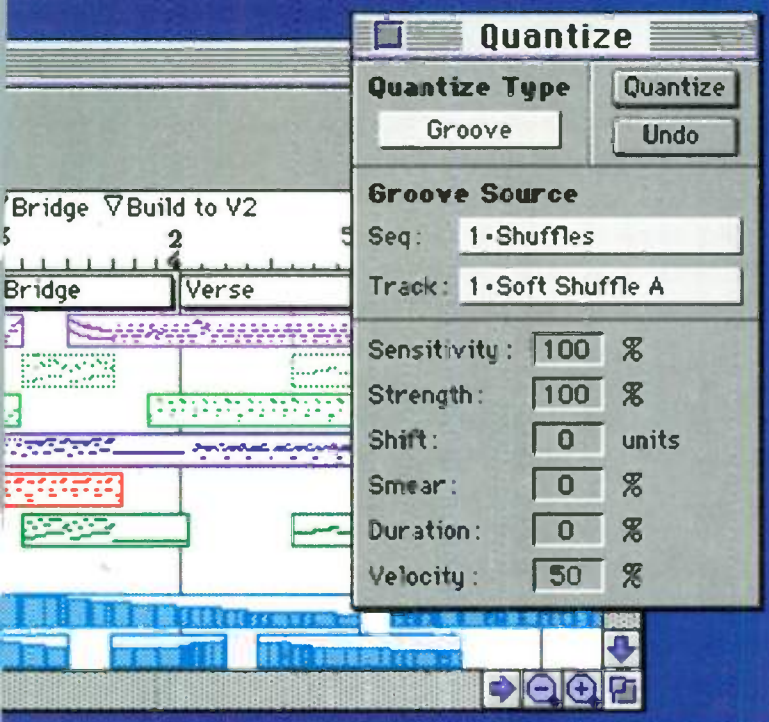

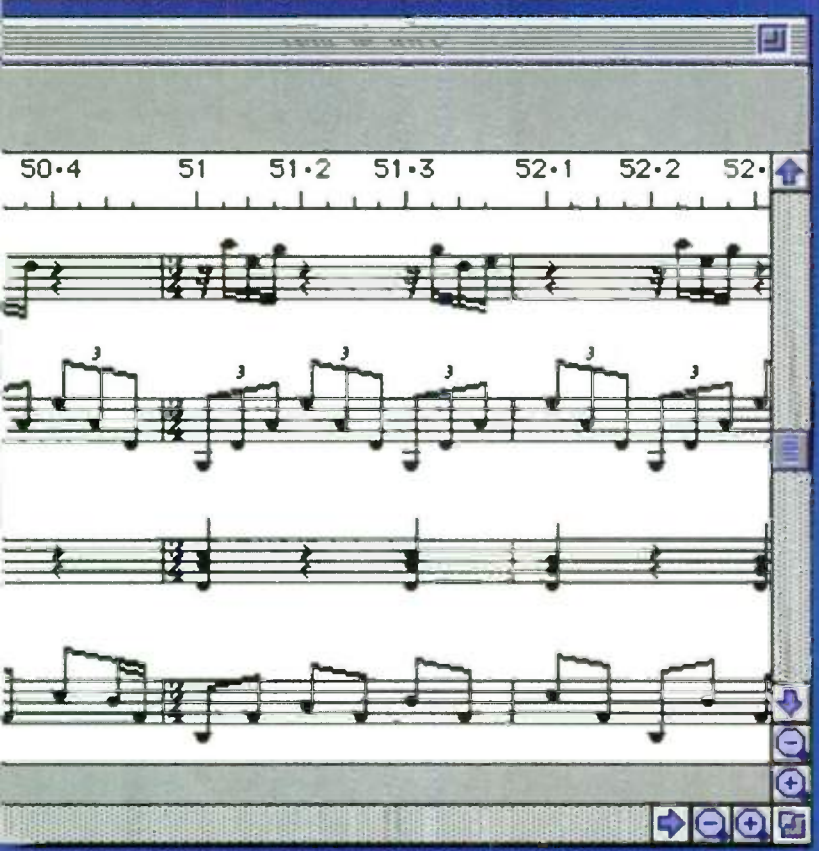

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DO ✦ IT YOURSELF

Build the EM FatMan

Gird your grids for a big one; this analog bass synth is sure to shake your booty!

By Jules Ryckebush, John Simonton, and Kent Clark

Remember when synthesizers cost a thousand bucks and only played one note at a time, but the sounds were just too cool? Whether you're playing 1970s progressive rock, or today's rap, rave, and techno, that fat, analog sound is a must. If you've been yearning for that twin-oscillator/sweeping-filter sound, and your digital sample player isn't cutting it, you should build the EM FatMan.

The FatMan is a monophonic, analog sound module. It features two voltage-controlled oscillators (VCOs); a voltage-controlled, lowpass filter (VCF); a voltage-controlled amplifier (VCA); and associated envelope generators (EGs). An 8031 microcontroller "brain" accepts incoming MIDI messages and converts pitch, Velocity, and Pitch Bend information into control voltages (CVs), which are sent to genuine analog circuitry via real knobs. The FatMan is optimized for bass sounds, and thanks to MIDI and 1990s technology, it can be assembled for about $150.

A word of caution: This is a big project. If you've never built a DIY device, this probably isn't a good first project. However, if you've already built a few things, this isn't much different; there's just more of it.

OVERVIEW

If you've worked with analog synths, you will immediately recognize the architecture of the FatMan (see **Fig. 1**). The design is updated with a MIDI-to-CV front end instead of a keyboard. In addition, the Velocity of incoming Note On messages is applied to the VCF frequency, which is not typically available on vintage synths.

Like most analog synths, the FatMan works on the principle of subtractive synthesis. In this technique, a harmonically rich waveform from the VCOs (in this case, a sawtooth or ramp waveform) is modified by the VCF to either attenuate or emphasize the fundamental and/or overtones. If the filter is set wide open, the sound is bright and brassy. If many overtones are attenuated, the sound is mellow.

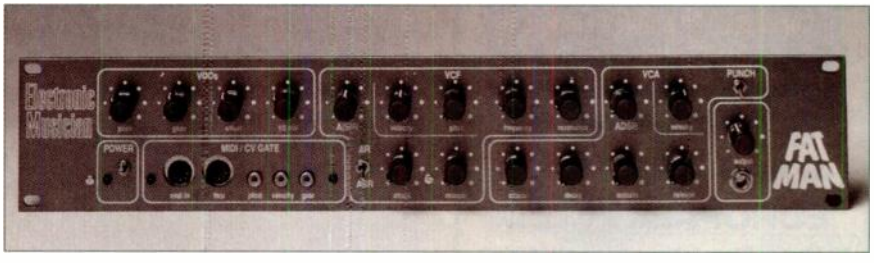
EGs are triggered when a note is played. The EGs control the VCF and VCA to produce the attack, sustain, and release portions of the sound. For example, if the VCA EG has a fast attack time, no sustain, and a moderate release time, the sound is percussion-like. Slower attacks, followed by a moderate sustain level, produce a wind-instrument feel.

DIGITAL DETAILS

The FatMan's brain is our old friend, the 8031 microcontroller (IC1; see **Fig. 2**). Firmware for the system is burned into a 2764 EPROM (IC3), which is attached to the microcontroller's address and data lines with a 74HC373 octal latch (IC2). An 8-switch DIP (S2) connects to five of the microcontroller's input port lines. Four switches in this DIP are used to select the MIDI channel, and the fifth is used for tuning.

The 8031 includes an onboard serial transceiver that is easily configured to speak MIDI, making it a natural choice for this kind of project. The receive (RXD) line of the microcontroller receives MIDI data from the mandatory opto-isolator (IC6), which isolates the ground of the MIDI transmitter plugged into J1 from the FatMan's ground. The output of the opto-isolator is buffered by a pair of inverter stages (IC7:A and B), which drive the MIDI Thru port. A third inverter stage (IC7:C) drives an LED (D2) to indicate MIDI activity at the input.

A DAC08 8-bit DAC (IC5) makes the transition from the digital domain to the world of control voltages. Its data



PETER DIGGS

The EM FatMan bass synth produces the classic, warm, fat, analog sound. Eighteen control knobs hearken back to the good old days.

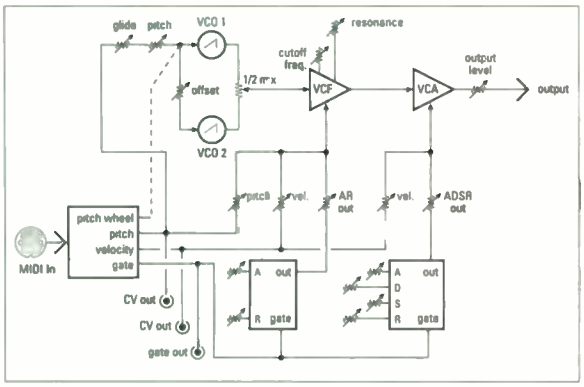


FIG. 1: Block diagram of the FatMan. Incoming MIDI data is converted into pitch CV, Velocity CV, and gate data, which are used to control the VCOs, VCF, VCA, A(S)R EG, and ADSR EG. Pitch Bend (wheel) data is added to the pitch CV. The pitch CV, Velocity CV, and gate signals are also available on phono jacks to send to an external analog synth.

input lines are glued to the microcontroller's data lines with another octal latch (IC4), and its analog current output is converted to a voltage by an op amp (IC10:B). The calibration control (R13) is used during tuning.

A string of resistors and trim pots (R17 through R26) at the output of IC10:B form a voltage divider with taps that provide four voltages related by factors of two. The dual 1/4 analog multiplexer (IC9) acts as an octave-range switcher to select one of these taps under the control of two of the microcontroller's output lines (T0 and T1).

The single output of the DAC and octave-range switcher is split into pitch and Velocity CVs. The sample-and-hold circuits are built with op amps IC12:A and B, CMOS switches IC11:A and B, and capacitors C7 and C8. The system firmware outputs pitch CV values to the DAC and range switcher, after which it turns on IC11:A to charge capacitor C7 to that voltage. IC11:A is then turned off to isolate the voltage on C7. The processor repeats these actions for the Velocity CV, turning on the second CMOS switch (IC11:B) to charge capacitor C8. The voltages on the capacitors are read out by their corresponding op amp buffers (IC12:A and B).

ANALOG DETAILS

The analog section of the circuit is shown in **Fig. 3.** The FatMan implements portamento, or glide, by charging a capacitor (C12) through a variable resistor (R32). IC10:A buffers the voltage on the capacitor and drives the Master Pitch control (R34), which is used to transpose both oscillators over slightly more than an octave range.

The two VCOs are identical except for the Offset control (R40), which allows the pitch of VCO 1 to be raised and lowered by an octave relative to VCO 2. Because they're identical, let's look at VCO 1. The pitch CV drives a voltage-to-current converter consisting of IC10:C, transistors Q3 and Q4, and the associated resistors. The current output of this circuit, from the collectors of the transistors, charges capacitor C14 and produces a linear voltage ramp that is read out by the buffer amp IC10:D.

IC16 is a 555 timer that senses when the voltage ramp at the output of the buffer exceeds a threshold, at which point an internal transistor is turned on to short out the capacitor and quickly discharge it. When the capacitor discharges to a lower threshold, the transistor is turned off, and the capacitor charges again and repeats the cycle.

This relatively slow charging and quick discharging produces a ramp (sawtooth) waveform. In the interest of simplicity, this is the only available oscillator waveform in the FatMan. A ramp waveform is one of the most useful, having both even and odd harmonics.

The VCF processes the output of VCO 1, VCO 2, or a mix of the two, as determined by the Mix control (R56). The VCF design is a state-variable, low-pass filter, with resonance (adjustable with R114) at the corner frequency. The filter is built around IC17, an LM13600 dual operational, transconductance amplifier (OTA), with filter capacitors C20 and C21.

The gain of the OTAs is set by two control currents, which are produced by the voltage-to-current converter consisting of IC13:D, Q8, Q9, and associated resistors. Four separate voltages—default voltage, Velocity CV, pitch CV, and filter EG—are summed to set the corner frequency of the filter. The static voltage that sets the default frequency is adjusted with R74, Velocity CV is adjusted with R69, pitch EG is adjusted with R71, and the depth of the filter's EG is adjusted with R115. The Velocity and pitch CV can be used to make the sound brighter as the volume and pitch increase.

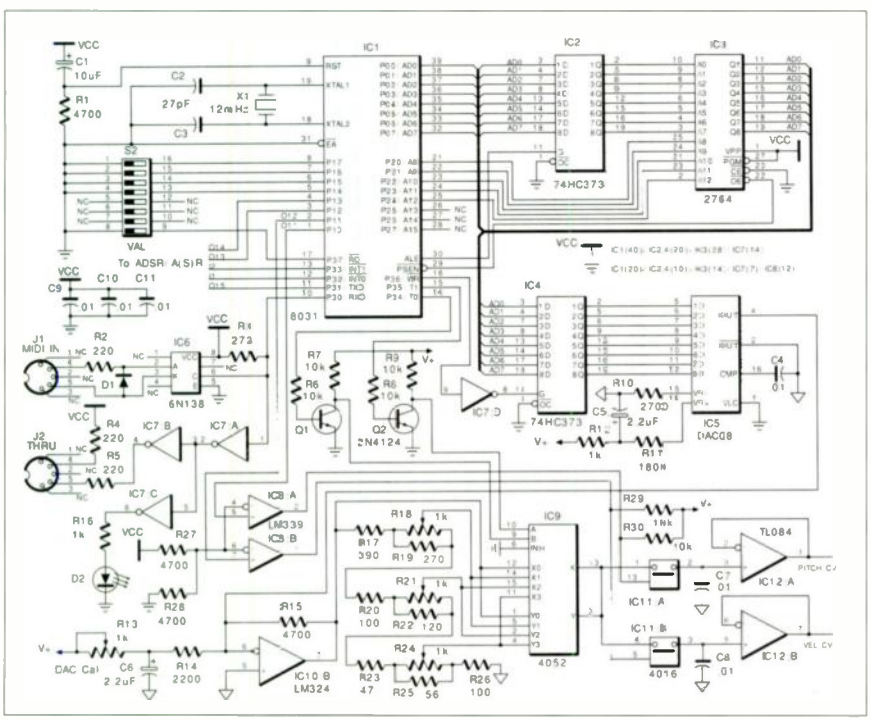


FIG. 2: The digital portion of the schematic is centered on an 8031 microcontroller (IC1).

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The filter's EG works by charging C22 through R83 and R84 for the attack portion of the envelope and discharging it through R81 and R82 for the release portion. Charging and discharging currents are steered by diodes D3 and D4, as transistor Q7 is switched on and off by the transmit (TXD) line of the microcontroller. Voltage on the capacitor is buffered by IC12:C. A comparator (IC8:C) monitors this voltage and switches a line back to the microcontroller (INT1) when the peak voltage is reached, so the firmware can switch from attack to release. When the Sustain switch (S3) is closed, it prevents this "peak reached" signal from getting back to the microcontroller, so the release portion isn't activated until the key that started the envelope is released. This switches the EG from a nonsustaining AR type to an attack/sustain/release (ASR) type.

The FatMan's VCA uses one OTA from IC18. IC13:C and transistor Q12 are the main components of the voltage-to-current converter for this element. This is similar to all other voltage-to-current converters except for the addition of D9 and C24, which compensate this circuit when the control voltages sum to zero. (This is the

PAIA KITS

Complete kits for this project are available from PAiA Electronics, Inc., 3200 Teakwood Lane, Edmond, OK 73013; tel. (405) 340-6300; fax (405) 340-6378.

Complete kit of parts (less rack panel), circuit board, and programmed EPROM (9308k): $149.

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Please add $4 to each order for shipping. For a free copy of the circuit-board artwork, wiring diagrams, and additional material mentioned in the article, send a large SASE with $0.52 in postage (or three International Reply Coupons for overseas readers) to the address above.

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only element in which there will be a zero control voltage.) The control voltages include Velocity CV and the VCA envelope generator.

The attack/decay/sustain/release (ADSR) EG dedicated to the VCA is similar to the filter's A(S)R. Under the control of a pair of microcontroller output lines (P12, P13), capacitor C19 charges and discharges through steering diodes (D6, D7, D8) at rates set by R92, R94, and R96. The Sustain control (R90) sets the voltage level to which the decay portion of the envelope falls. IC12:D buffers the voltage on the capacitor, and comparator IC8:D signals the processor when the peak of the attack is reached.

It is interesting to note that the Minimoog, widely regarded as one of the punchiest synths ever made, has an interesting "flaw" in its EGs. During the transition between attack and decay, they hang up for about 20 ms. This subliminal sustain interval, which most synths lack, adds punch to sounds with fast attack and decay times. When the Punch switch (S4) is closed, the combination of C34 and R98 adds a slight delay (about 20 ms) between the moment the ADSR reaches its attack peak and the moment this information reaches the microcontroller. When S4 is open, the ADSR behaves in the normal, "correct" way.

FIRMWARE

The FatMan firmware recognizes MIDI Note On and Note Off messages and identifies note number and Velocity values, which it then converts to the data required to drive the DAC and octave-range switching. The resulting CVs are exponential, rather than linear, as they are in most vintage synths. During the heyday of analog synthesizers, there were elegant and easy-to-use VCO and VCF chips with exponential response, but none of these are presently in production. Consequently, the FatMan includes VCOs and a VCF built from discrete components. To ensure a high degree of stability, these elements respond linearly to CVs that double for each octave.

The FatMan produces these exponential voltages by using the DAC to generate only one octave's worth of voltage and then using the octave-range switching network to transpose this voltage to the proper range. Upon receiving a Note On message, the firmware

checks to see if the note number is within the 4-octave range of the FatMan (note numbers 24-72) and ignores any notes outside of this range. Notes within the proper range are fetched from a lookup table in PROM, which yields the DAC value and octave-range switching values needed to produce the proper voltage. The Velocity values from Note On messages are handled in much the same way, except that the range of values (0 to 127) is first scaled to range from 24 to 72 before output values are fetched from the table in ROM.

The firmware is also responsible for turning the proper sample-and-hold on and off at the proper time to produce pitch and Velocity CVs. It also manages the A(S)R and ADSR EGs, turning on their attack when a note is played and managing decay, sustain, and release as appropriate for the status of the envelope and any Note Off messages that are received.

The other MIDI message supported by the FatMan firmware is Pitch Bend. If complexity were not a concern, it would be possible to add the sample-and-holds and associated switching circuitry necessary to produce a Pitch Bend CV. But complexity is a concern, so the firmware uses Pitch Bend data to modulate the pitch CV data before it gets to the DAC. This is possible because only twelve of the 255 possible values in the DAC are used for pitch, so the unused values are available for modulation. The musical range of the FatMan's Pitch Bend is ±2 semitones. The number of DAC steps available for modulating low notes in each octave is small, so there is noticeable "zippering" in response to Pitch Bend unless a little portamento is added.

CONSTRUCTION

Even if you plan to "roll your own" FatMan from scratch, you should send for the free information package (see sidebar "PAiA Kits"). This package includes full-size foil patterns for the circuit board, detailed wiring diagrams, and dimensioned panel drawings, as well as details about tuning and applications that are too extensive to include here.

Commercial circuit boards for the FatMan are available, but wirewrap on perfboard is an acceptable alternative as long as you follow the normal rules. These rules include keeping leads as short as possible and being very careful about the orientation of polarized parts (ICs, electrolytic capacitors, transistors, and so on).

In tech heaven, every ground returns to one point, but this is often unrealistic and quickly reaches a point of diminishing returns in any event. The FatMan combines digital and analog circuitry on a single board; if you're not careful about grounds, the result will be noise. In particular, notice that there is a digital ground and an analog ground, each designated by its own symbol in the schematics. These two grounding systems must not interact until they return to the same point on the component board. This point should be the place where the wall-mount transformer's leads join the board.

Take your time and use the correct tools. If this is your first project, find someone who is more experienced to help you. I like to mount the resistors and capacitors first, followed by the IC chips. Be careful; some of these chips are static-sensitive. Take your time and constantly check your work as you go. The extra effort at this stage pays off in less frustration later.

If you're a hard-core DIYer, you'll want to burn your own EPROM, even though they're available from PAiA (see sidebar, "PAiA Kits"). The source and object files for the FatMan firmware are posted on the **EM** SIG on the PAN bulletin-board service.

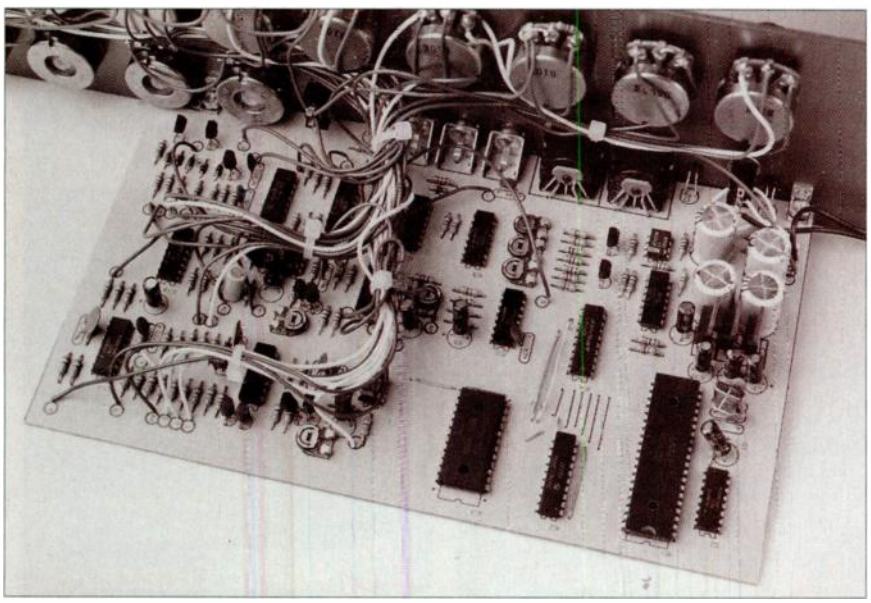
TESTING AND TUNING

When you finish building the FatMan, put it aside for awhile before plugging it in. Come back after a rest and double-check the wiring, part polarity, values, etc. Be critical of your soldering, and resolder or remelt any joints that aren't bright and shiny. Remove any solder bridges between conductors by holding the board upside down and flowing the excess solder onto the clean, hot tip of a soldering iron.

When everything appears correct, plug the unit in and turn the power switch on. If the power LED (D12) doesn't come on, turn the unit off immediately and find out why. It might be a dead wall outlet, a bad solder joint, or a polarized part mounted backwards. Once the power light comes on, let the unit idle for a few minutes while you finger-test for any parts that might be getting overly warm.

If all seems okay, connect a MIDI controller to the MIDI In jack and send different notes while you check to make sure the activity LED (D2) lights as data comes in. Set the FatMan's receive channel on the DIP switch (S2) to match the controller's transmit channel. The gate LED (D13) should remain lit as long as a key is down.

By now, you should hear some kind of sound, so it's time to tune the FatMan. You should be able to do it by ear, or with a tuned instrument as a reference. The iterative tuning procedure is too lengthy to cover in detail here, but it's part of the free informa-



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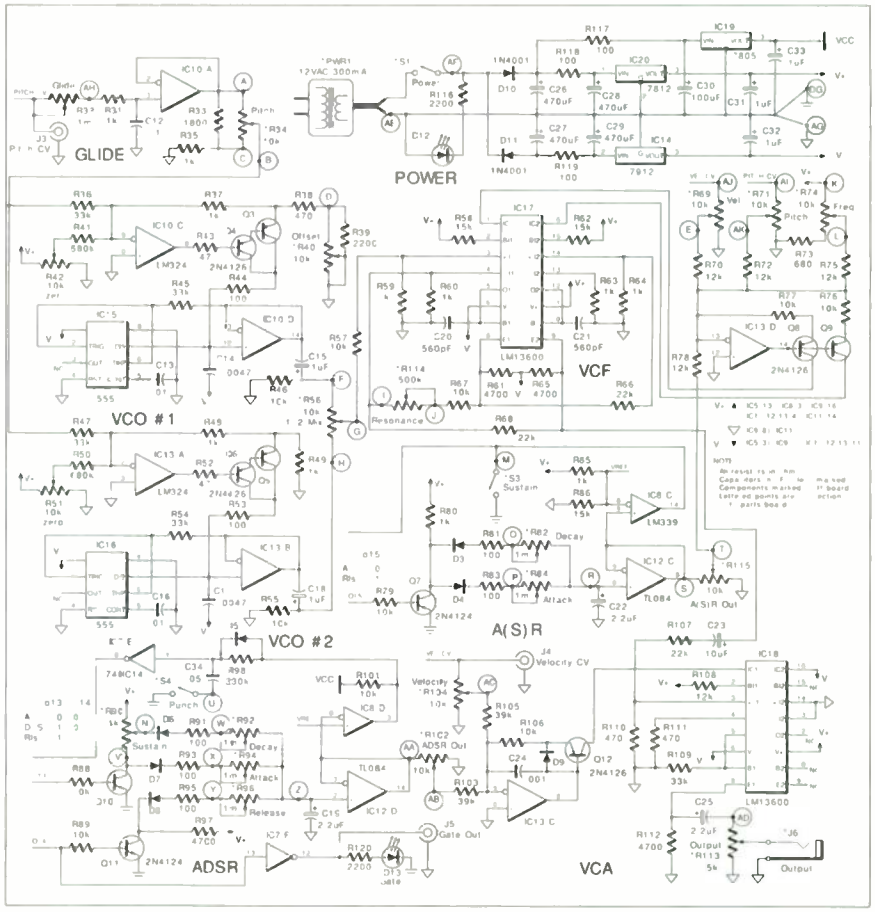

FIG. 3: The analog portion of the schematic includes the VCOs, VCF, VCA, A(S)R VCF EG, ADSR VCA EG, portamento (glide) control, and power supply.

tion package. In general terms, switch 8 of the DIP switch (S2) is toggled back and forth, causing the firmware to output two Cs an octave apart, while the Calibrate control of the DAC (R13) and the Zero trimmers on the VCOs (R42, R51) are adjusted for the proper interval. Once these trimmers are properly set, the trimmers in the octave-range switching circuit (R18, R21, R24) are set for the proper pitch.

USING THE FATMAN

Experiment with different amounts of the control voltages. That's what knobs are for; you get instant feedback about what a particular parameter does to the sound. For bass sounds, start with short attack times, full sustain, and short release for the VCA. Changing the attack and release times on the VCF gives you a wide range of funk sounds. Experiment with different amounts of filter resonance, too.

For the ultimate rap sound, set the resonance to maximum, play the lowest octave to which the FatMan can respond, and manually tune the filter with the Frequency control (R74). Set it low enough to pass only the fundamental frequency. You should be shaking the walls by now. Close the Sustain switch on the A(S)R, set the Sustain control on the ADSR at maximum, and set the other ADSR controls to their minimum levels. Mix this in with your kick drum, and you're ready to go.

The FatMan is a blend of the past and present. It is basically a retro design using modern components. Although it may lack some of the normal features that almost every modern synthesizer has, such as patch storage, polyphony, and self-tuning, the FatMan does have that wonderfully warm, fat, analog sound that is so hard to come by these days. If you've been searching through pawn shops and garage sales for a vintage synthesizer, your quest is over.

In this collaborative project, **Kent Clark** *did the digital design and firmware,* **John Simonton** *designed the FatMan VCOs and EGs, and* **Jules Ryckebusch** *designed the VCF and VCA.*

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Microtuning

By Scott Wilkinson

Use your synth's alternate-tuning capability to achieve "perfect pitch."

Anyone who works with synthesizers knows there is an infinite number of pitches between two notes separated by an octave. All you have to do is move your pitch wheel.

It seems strange, then, that Western music has evolved to use only twelve pitches. These twelve pitches—which are repeated in each octave—are the basic foundation of everything from high-art music (what most people mistakenly call "classical") to pop music. And guess what? Except for octaves, none of the intervals and chords played with these pitches are precisely in tune! We normally don't notice that our music is minutely out of tune, because we have become accustomed to these twelve pitches over the last 200 years.

To play intervals and chords that *are* in tune, the precise pitches of many notes must be shifted slightly from their normal frequencies. *Microtuning* is the term used to describe these tiny frequency adjustments. Trained singers, wind-instrument players, and fretless stringed-instrument players constantly perform these shifts to produce intervals that are as in-tune as possible. On the other hand, keyboards, fretted strings, and mallet percussion instruments can play only fixed frequencies and therefore are never perfectly in tune.

Why did Western music settle on a set of notes that are always out of tune? How can electronic musicians overcome the tyranny of this limited palette of pitches? To answer these questions, we must understand the nature of musical intervals and what it means to be in tune. (If you are unfamiliar with the basics of sound and acoustics, see "From The Top: Making Waves" in the January 1992 **EM**.)

TUNING INTERVALS

All notes are defined by their pitch, which corresponds directly to their fundamental frequency. Intervals consist of two notes sounding simultaneously or sequentially, while chords consist of several simultaneous intervals. The relationship between these notes is often expressed as the ratio of their frequencies. In the interval of an octave, for example, the frequency of the higher note is exactly twice the frequency of the lower note. The ratio of the two frequencies is 2:1.

Intervals with ratios of two whole numbers are called *pure* intervals. The common pure intervals include the octave (2:1), perfect fifth (3:2), perfect fourth (4:3), major third (5:4), and major second (9:8). Of course, there are many other intervals, but some of them can be one ratio or another depending on the tuning system (more on this in a moment). For example, the ratio of a minor second is 16:15 in one tuning system and 17:16 in another system.

Other tuning systems—including the one used in all of Western music today—use intervals that cannot be expressed as ratios of two whole numbers. Such intervals are called *impure*, and their ratios are called *irrational*. These intervals are difficult to represent with ratios, so a different interval-measuring system was developed.

The octave was divided into 1,200 equal intervals called *cents*, which lets us measure pure and impure intervals in the same way. For example, the pure major third is approximately 386 cents, while the impure major third used in Western music is exactly 400 cents. As a result, modern major thirds are sharp with respect to the pure variety.

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Circle of Fifths in their studies (see **Fig. 1**). This graphic includes all twelve notes in the standard Western tuning system in a sequence of perfect fifths. In this tuning system, the circle closes on itself, because B# is just a different name for C. These are called *enharmonic equivalents*. However, if you use pure perfect fifths in this exercise, the final B# is 23.46 cents higher than the starting C (discounting octaves). Under these conditions, the Circle of Fifths becomes a Spiral of Fifths.

This discrepancy is known as the *Pythagorean comma*, named after the ancient Greek scholar Pythagorus, who did a lot of fundamental research into musical intervals. Because most tuning

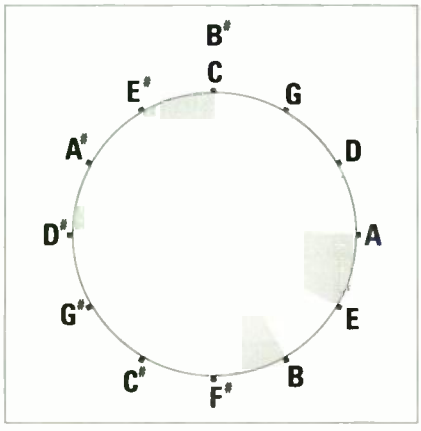

FIG. 1: The Circle of Fifths becomes a spiral if you use pure perfect fifths. The final B# is 23.46 cents higher than the starting C (discounting octaves).

systems are octave-based (i.e., they include a set of pitches that repeat in each octave), the Pythagorean comma must be placed somewhere in the scale to preserve the pure octave. Exactly how this is done is the art of creating a tuning system.

TUNING SYSTEMS

To construct a tuning with nothing but pure intervals, you must specify each interval individually. This process is generally called *just intonation* (see **Fig. 2**). Each interval with the root sounds perfectly in tune. However, like most scales other than the common Western tuning, the notes in just intonation are not equally spaced. As a result, you can only play in the key defined by the root note and a few closely related keys. In just intonation with a root of C, for example, the major third from C to E is 386 cents, but the major third from B to D#

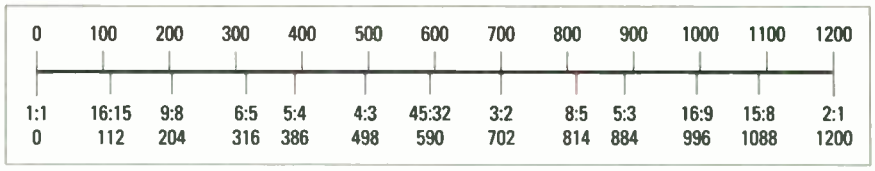

FIG. 2: In just intonation, each interval with the root of the scale is pure. The scale above the line is the familiar 12-tone equal temperament.

is 428 cents (42 cents sharp with respect to the pure third). So if you play in the key of C everything sounds fine, but modulating to the key of B sounds terrible.

One of the earliest tunings that can play in different keys is called *meantone temperament* (see **Fig. 3**). The word "temperament" refers to the fact that some or all of the intervals are tempered, or adjusted, from their pure forms to allow performances in different keys. In meantone temperament, all the perfect fifths are shortened slightly to accommodate the comma. However, they are not shortened by the same amount, so some keys sound distinctly better than others.

By the beginning of the 18th century, Western music was becoming more complicated and modulating into increasingly distant keys. Many musicians and theorists devised various temperaments to allow modulation into any key. Among the most successful of these pioneers was Andreas Werckmeister (see **Fig. 4**), whose temperaments were used by Bach and others. The notes were still not equally spaced in the scale, so each key had a distinct character. In fact, Bach wrote *The Well-Tempered Clavier* to demonstrate the character of each key in a temperament.

During the same period in history, other musicians experimented with *equal temperament*, in which the twelve notes were equally spaced within the octave. This "equality" is achieved by shortening each perfect fifth in the Spiral of Fifths by about 2 cents, making each one exactly 700 cents. The interval between consecutive notes in the scale is exactly 100 cents, which collapses the Spiral into the Circle of Fifths.

With this compromise, you can play in any key with equal ease. Each key sounds identical, with no change in character from one to the next. Unfortunately, they also sound equally out of tune. Compared to their pure forms, perfect fifths are 2 cents narrow, major thirds are 14 cents wide, and minor thirds are 16 cents narrow. The other intervals are similarly out of tune with their pure forms.

There are other scales of equal steps that come closer to producing pure intervals. Some musicians divide the octave into 19, 31, or 53 equal steps, which include many almost-pure intervals. Wendy Carlos has taken a slightly different approach. She has assembled a series of equal steps that don't repeat in each octave. Her *alpha* scale (see **Fig. 5**) includes steps of 78 cents each. This tuning produces very pure thirds, fourths, fifths, and minor sevenths, although there is no pure octave.

As Western musicians were converging on 12-tone equal temperament, the rest of the world was using many different tunings, some of which survive to this day. The musics of Indonesia, India, Asia, and the Middle East sound exotic and foreign because they are based on different intervals than Western music. For example, Indonesian music primarily uses one of two scales: *Slendro* and *Pelog* (see **Fig. 6**).

TUNING SYNTHS

One of the main reasons to adopt 12-tone equal temperament is the historical tendency toward music played on a keyboard that modulates into widely diverse keys. With early tunings that are highly key-dependent, you must retune any keyboard instrument each time you

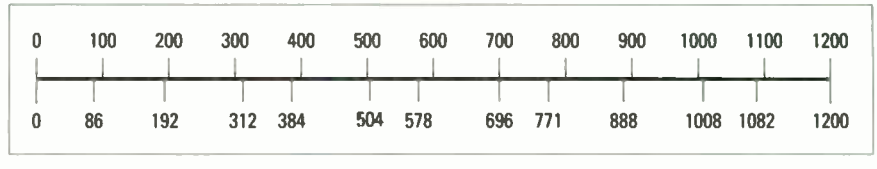

FIG. 3: Meantone temperament is one of the first attempts to create a 12-tone tuning that could modulate into different keys. It was not entirely successful.

play in a different key. As you might imagine, this is not something you'd want to do in the middle of a piece of music. Equal temperament eliminates this requirement, so it found favor among Western musicians.

Of course, retuning digital synthesizers is very easy. All it takes is the appropriate software to recalibrate the oscillators to produce any set of frequencies you desire. The first widely available synth to offer this capability was the Yamaha DX7II. Since then, most keyboard manufacturers have included the ability to use tunings other than equal temperament.

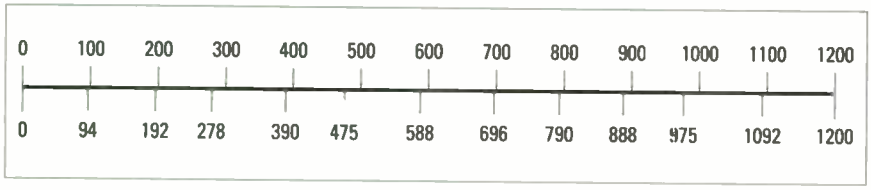

FIG. 4: Andreas Werckmeister created many temperaments, including this one, which is now called Werckmeister III.

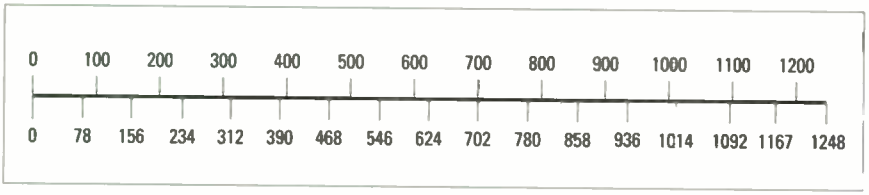

FIG. 5: Wendy Carlos' alpha tuning uses equal steps of 78 cents. This tuning produces perfect fifths and fourths, major and minor thirds, and minor sevenths that are very close to pure in any key.

Most of these instruments—which include models from E-mu, Korg, and Kurzweil—can retune only the twelve notes in an octave, and these tunings are repeated in all octaves. For key-dependent tunings, you can usually specify the desired root note. In a few instruments, you can retune each note in the entire MIDI range independently. This capability lets you construct larger tunings, such as 53-tone equal temperament or the Indian 22-note scale from which ragas are derived.

Synths with alternate tunings can't usually share their tuning data with dissimilar instruments or retune on the fly, so the MIDI Tuning Standard (MTS) was developed by Robert Rich and Carter Scholz and added to the MIDI specification. This standard includes two major parts: bulk dumps and single-note retuning. The standard outlines the messages by which an instrument can be retuned during a performance. The specified resolution is 0.0061 cent, which is fine enough for most researchers and musicians. Unfortunately, no synths currently incorporate MTS.

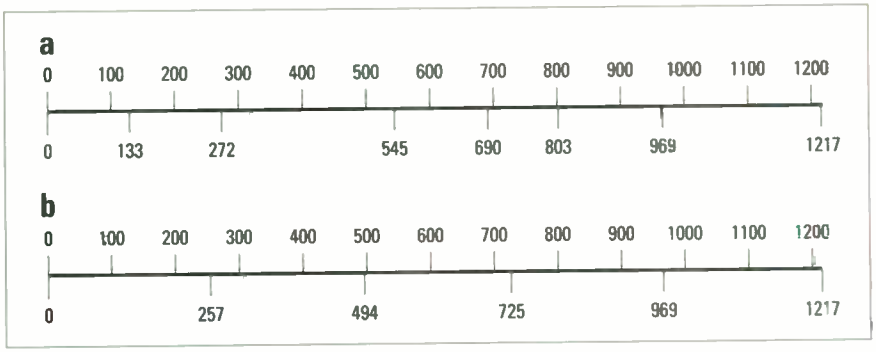

FIG. 6: Indonesian music uses two main scales: Pelog (a) and Slendro (b). These tunings probably arise from the harmonics of the gong and struck-bar instruments used to play them.

USING TUNINGS

There are many ways to use alternate tunings, particularly with synths. Early and ethnic music can be played with greater authenticity, and you can achieve better consonance in all forms of music—particularly if you don't modulate into widely divergent keys. Even if you do modulate, you can often change tunings at the same time. For example, you might create two programs with the same sound and different tunings, such as just intonation in the keys of C and B. You can retain the sound and change the tuning by sending a Program Change to the instrument.

▼

Intervals with ratios of two whole numbers are called pure intervals.

Another important application of microtuning is education. If you're a music teacher, you can impart a greater sense of historical perspective to your students by playing music from different periods and locations with appropriate tunings. For example, try playing a sequence with equal temperament followed by the same sequence in just intonation. The difference is startling. You can also explore the world of sound and acoustics with greater ease and precision.

Using alternate tunings has never been easier, thanks to modern music technology. Hopefully, manufacturers will continue to offer this capability in their instruments and include support for MTS. MTS will bring microtuning into the MIDI fold and provide musicians with even greater resources for composition and experimentation. After all, if we don't push the musical envelope, who will?

EM *technical editor* **Scott Wilkinson** *is the author of* Tuning In: Microtonality in Electronic Music, *published by Hal Leonard Books and available from Mix Bookshelf.*

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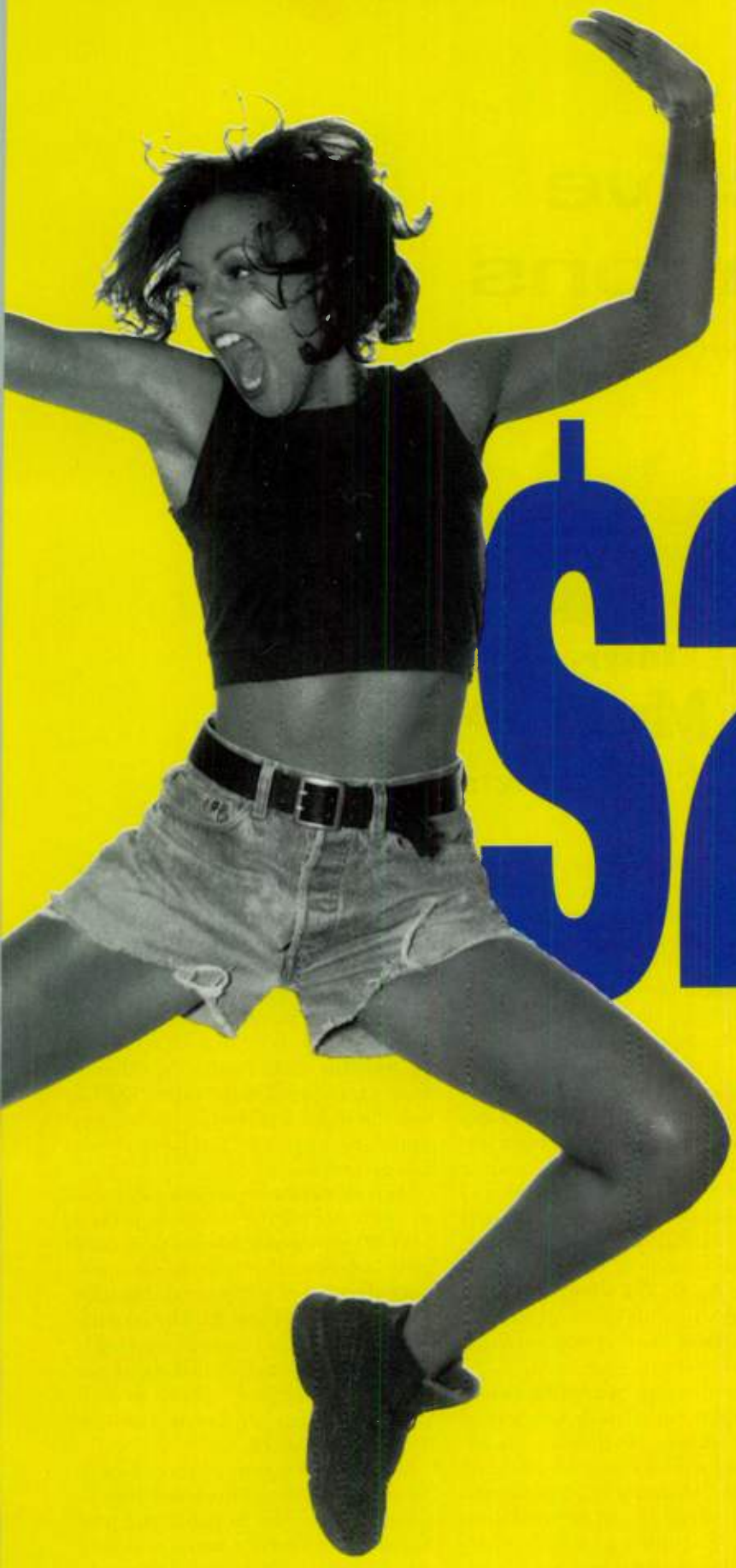

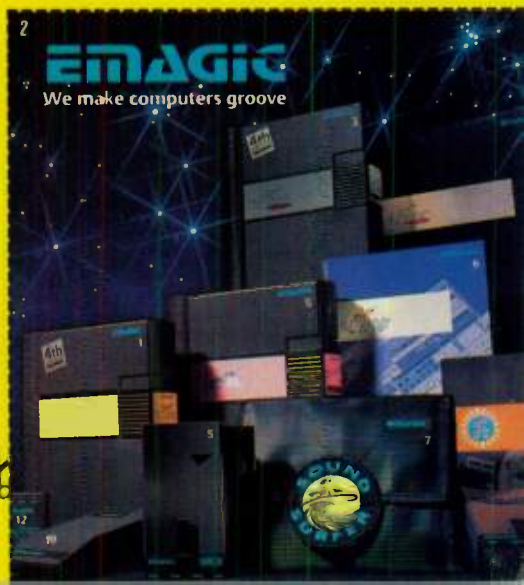

Interactive Installations

By Robert Kendall

Multimedia PCs offer a unique twist on musical performance art.

Mention the word "multimedia," and most people think of games, encyclopedias, business presentations, and educational programs; pure artistic expression rarely comes to mind. Yet this technology can offer an effective venue for serious musical performance, providing a high-tech substitute for the concert stage.

I'm among the musicians who have departed from more traditional concert settings and ventured into an entirely new kind of public venue: the multimedia installation. Similar to the kiosks popping up in museums, malls, and stores with increasing frequency, these installations use a multimedia PC to present a self-contained, interactive, audio-visual performance.

For the past three years, my MIDI compositions have been "performed" at a wide variety of sites as part of an interactive multimedia installation consisting of an IBM-compatible PC, a Roland SC-55 Sound Canvas, and a pair of powered speakers. With the aid of multimedia-authoring software, I put a little bit of everything into the mix—graphics, animation, text, and music—to create what I call SoftPoetry.

POETRY IN MOTION

To integrate the various elements of multimedia successfully, you must draw on existing traditions for combining artistic media and presenting them to an audience. I try to reshape these traditions in ways that wouldn't be possible without the computer.

Poetry is my point of departure. I write a text and set it to music, much like a traditional songwriter. The difference is that, instead of being sung, the text appears a few words or lines at a time on the PC monitor. Instead of being enhanced by vocal nuances, the words are enhanced by different fonts, colors, backgrounds, and graphic effects (see **Fig. 1**). The words move and change in sync with the music, so the resulting verbal/musical flow has much the same effect as a song.

I render the words of a SoftPoem into their graphic form using a variety of graphics editors. My multimedia authoring software (*Animation Works Interactive* and *Visual BASIC*) handles the animation elements and the transitions from one graphics screen to another. Then I create the music with a sequencer and export it as a series of Standard MIDI Files that can be played by the multimedia software. Synchronizing the music with the visuals requires the same sort of painstaking work as synchronizing a film score.

The wild card in the multimedia deck is the interactive element. This is what truly sets the medium apart from its predecessors. It is also what distinguishes the multimedia experience from a traditional music video: The listener becomes a performer, helping to shape the course of the music, text, and graphics.

My early SoftPoetry occasionally pauses and waits for the viewer to press a key to begin the next section or make a menu selection that branches the production down one of several alternate routes (see **Figs. 2** and **3**). The installation on which I'm currently working is much more interactive, making extensive use of branching options so each viewer can essentially create a unique version of the piece.

Interactive music poses more logistical problems than interactive text or graphics. It's easy to pause the production to wait for a menu selection that directs the flow of text and graphics in one direction or another. But what do you do with the music during

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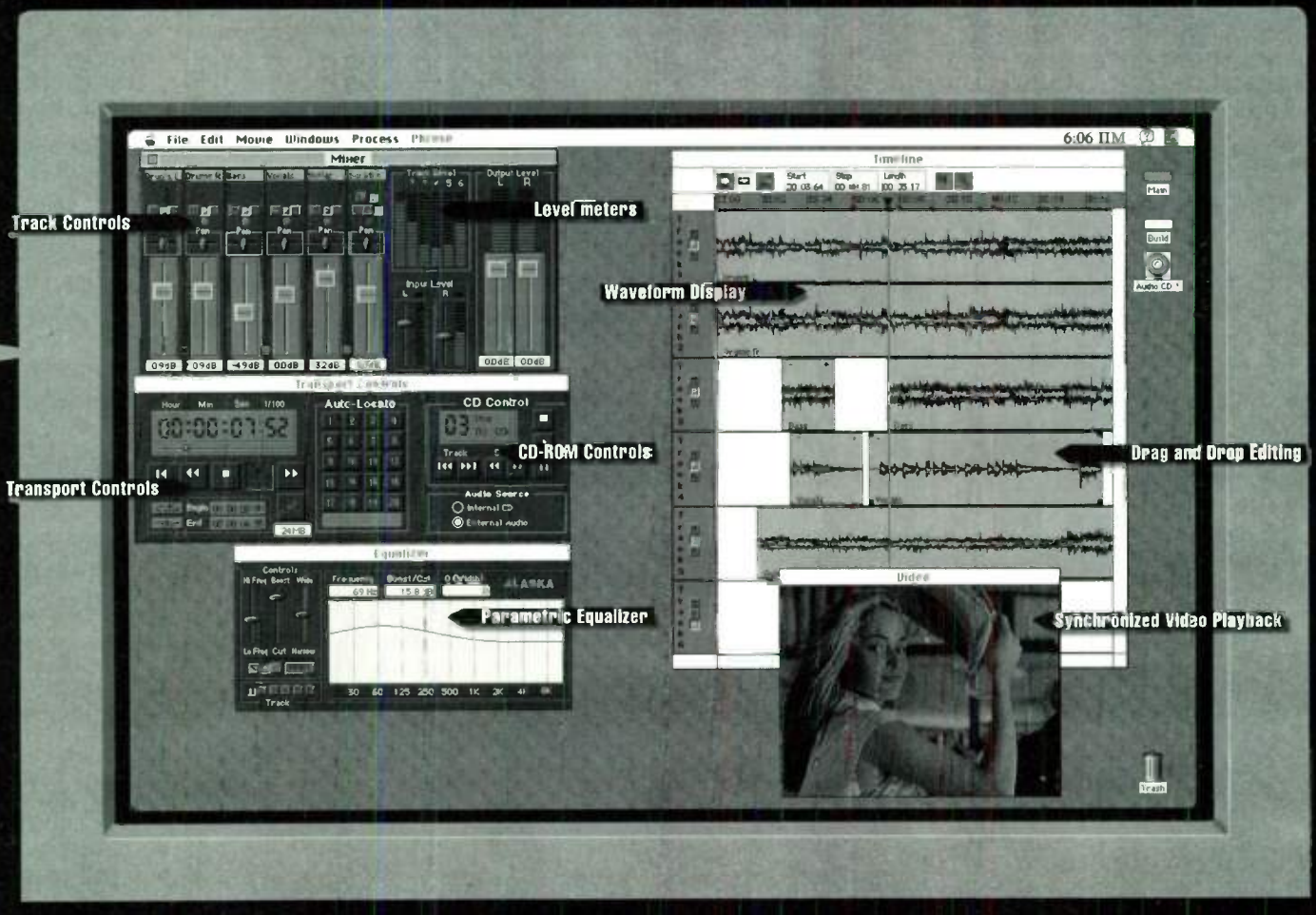

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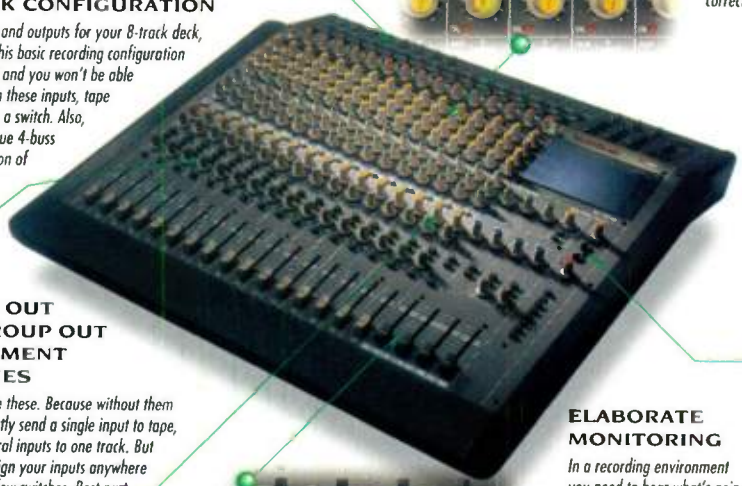

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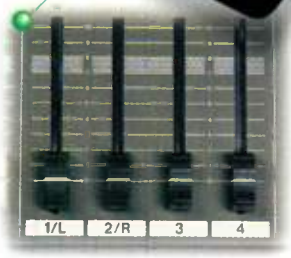

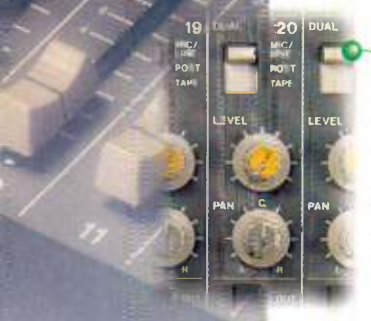

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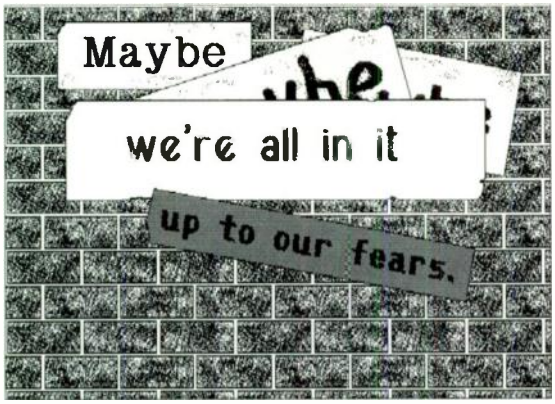

FIG. 1: In this screen, text is pasted onto the image of a brick wall a few words at a time to the accompaniment of a brass fanfare.

this pause? Working with conventional multimedia software and Standard MIDI Files provides only two options: The music also pauses, or it loops until a menu choice abruptly truncates it. Extensive interactivity poses the danger of breaking up the flow of the music unless it's carefully handled.

I would love to work with a more fluidly interactive type of music. For example, "intelligent" musical threads would play continuously while a viewer peruses a menu, then branch seamlessly to follow different musical variants whenever a menu option is selected. Unfortunately, today's multimedia software is nowhere near this level of sophistication.

A NEW WAY OF SEEING

One of the most appealing aspects of multimedia is that it offers a way around the visual problem of electronic music in live performance. Sequencers are great in the studio, but compositions that rely heavily or exclusively on a sequencer pose problems for live concerts. After all, who wants to sit and stare at a pair of speakers, or at best, someone occasionally tapping a PC keyboard?

Why not use the computer to help solve the very problem it has created? Synchronizing computer-based graphics, animation, or video to the music gives an audience something interesting to watch, as well as adding a new dimension to the music. Incorporating music into a multimedia PC installation takes this approach a step further. The relationship between the music and the visual elements may remain essentially the same as in a concert with a video backdrop, but the relationship to the listener changes dramatically. The large, passive audience is replaced by individuals who can interact with the artist's creation. The experience is more like looking at a painting or browsing through a book than attending a concert.

Just as multimedia breaks down the traditional boundaries between the arts, it also breaks down traditional audience divisions. As a hybrid of several art forms, it can give a composer entree to a wide variety of venues that would otherwise be inaccessible. My own work combines music, literature, and visual art. As a piece of visual art, a SoftPoetry installation has been included in an art show. As an electronic book, it has made appearances at a large book fair, a national poetry festival, and a Barnes & Noble bookstore. As an interesting technological achievement, it found its way into the Franklin Institute Science Museum in Philadelphia.

GETTING STARTED

How do musicians get started in multimedia? The first ingredient is another medium or two to complement the music. For those with interdisciplinary skills, this can be a uniquely satisfying way to address the different facets of an artistic personality. Others find it a rich opportunity for the stimulating

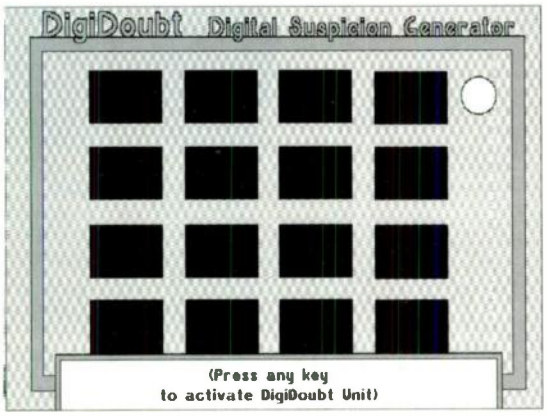

Fig. 2: Pressing a key turns on the machine depicted here, which emits an electronic-sounding melody in time to words that flash in the black windows.

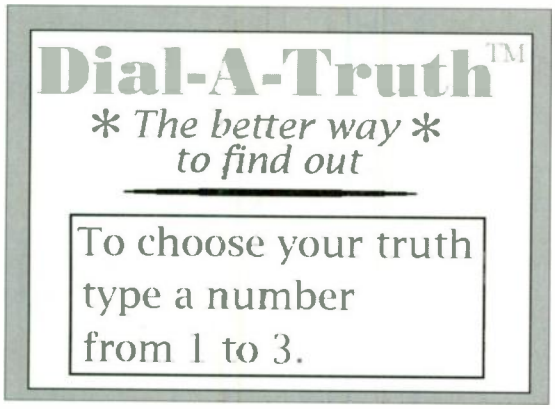

Fig. 3: The SoftPoem pauses at this screen to let the viewer choose an option.

give and take that can come from collaborating with artists in other disciplines.

The next task is choosing and mastering a multimedia authoring system or finding a collaborator to handle the software aspects for you. There is a wide variety of software to choose from for both the Mac and IBM-compatible platforms, most of it designed for creating business presentations or computer-based training applications. The best low-end packages let you quickly put together a multimedia production, but they may severely limit your flexibility. The more powerful packages can be more difficult to master, but they offer a wider range of possibilities, especially if you want to maintain close synchronization between music and graphics.

It's important to consider the logistics of setting up the hardware for an installation. Sometimes, the sponsor of an exhibit will provide a computer or arrange for rental, but when you install your work on the new machine, you may run into unforeseen incompatibilities when it's too late to do anything about them. Shortly after I started out, I began using my own PC for my installations. Unfortunately, the same PC also doubled as my home-office machine, which presented other problems.

If you want to present your work regularly, it's well worth investing in a computer that will be dedicated to your multimedia installations; I did this as soon as my finances allowed. Now I can leave the machine at a gallery for several weeks without having to worry about disrupting my other computer work or putting my personal data in peril.

With an interactive display, it's important to consider the interface you present to the viewer, especially if the installation is to be left relatively unattended in a public area. The input device should be intuitive enough not to intimidate someone who has never used a computer before. The procedures for using the menus and other input options should be self-evident. The system should also be impervious to pranksters who might try to crash it. Mice and trackballs are easily damaged and can confuse neophytes. I recently saw someone pick up a mouse attached to a computer in a museum and earnestly click it at the screen like a TV remote control. I've learned from experience that keyboards can also be confusing, and most multimedia packages won't let you lock out all the keys that

could potentially disrupt your display. The ideal option is a touch screen or touch monitor, which lets the viewer merely touch the screen to select an option. It's very intuitive and virtually immune from tampering.

A NEW ART FORM

Breaking into multimedia can require a large investment of time and effort, especially in the beginning. But it has some terrific payoffs. My own efforts have given me refreshing new perspectives on many aspects of my art. I've also found that my unusual use of a computer creates a surprisingly strong attraction for audiences and the press.

A multimedia installation can spin off some satisfying byproducts, as well. A videotape version of some of my work was shown on cable TV and at a video festival. My work has also been published on floppy disk by Floppyback Publishing International (PO Box 2084, Hoboken, NJ 07030; tel. [201] 963-3012), although in a version without music. Eventually, I hope to convert the MIDI files to digital audio and publish the whole production on CD-ROM, so the music can be played on any computer without loss of sound quality.

▼

Interactive music poses more logistical problems than interactive text or graphics.

Eventually, interactive multimedia will become recognized as an art form in its own right. When that happens, the sorts of installations I create may well become commonplace, and CD-ROMs may become as prevalent for disseminating music as audio CDs are today.

Robert Kendall *is a composer, multimedia artist, and widely published poet. Multimedia is consuming more and more of his time, at the expense of eating and sleeping.*

Hiring a Producer

By Michael Molenda

A good artist/producer relationship can energize your tracks and *your career.*

The producer's view across the SSL 4048 G Plus console at Masters Studios in Switzerland. Good producers create an environment where the artists can do their best work.

I've always considered music production an exercise of imputation and invisibility. If a project is successful, the producer's role fades to nothingness against the undeniable brilliance of the artist. However, if a record bombs, it's *always* the fault of an insensitive producer who snuffed the creative fire from a developing genius. (The imminent genius then goes into therapy for ten years due to his or her mangled masterwork.) Ouch! No wonder that if you were to look up the word *producer* in a music glossary, the first definition is "expensive scapegoat."

It's often difficult to understand why anyone would want to be a producer, much less hire one to oversee a musical project. However, history has proven that when a passionate and committed artist is matched with an empathetic producer, the world is treated to the likes of the Beatles and George Martin, or Michael Jackson and Quincy Jones.

At best, a good producer can help you more fully interpret your artistry and harness your creativity into succinct musical statements. He or she may also have the commercial savvy to guide you toward a hit record. But even if the relationship doesn't produce an artistic epiphany or a smash hit, the presence of an objective critic can force you to respect and hone your craft. That's not exactly a small gift.

Unfortunately, because some artists believe they surrender total creative control when they hire a producer, the process of finding a suitable collaborator can be stressful. Much of this discomfort revolves around less-than-accurate preconceptions of the producer's role in music making.

THE PRODUCER MYTH

Phil Spector is a legend. His "wall of sound" productions in the 1960s redefined rock 'n' roll and popularized the joyous cacophony that still influences current artists such as Pearl Jam and Nirvana. He also exercised dictatorial control over his sessions, kidnapped master tapes (to work without the interference of artists or record companies), and once fired a gun in the air to end a creative dispute with John Lennon. Producers have paid for Spector's brilliance and bizarre behavior ever since.

The assumption of many musicians is that producers are musical despots who view artists as merely the clay for their sonic sculpturing. Some producers *do* fit this description, and there's a surefire way to avoid falling into their clutches: Don't hire them! Most producers, however, are sensitive and caring collaborators who don't deserve your apprehensions or paranoia. Good producers are like film directors. They simply draw the best performances from talented artists and ensure that the project maintains some level of conceptual cohesiveness.

Many producers also help with administrative functions, so that the artist can focus exclusively on creative matters. They will book the recording studio; hire the engineer and any necessary session musicians; develop and maintain a tracking schedule; administer the recording budget; and oversee mastering and duplication. But a producer's main responsibility is as vague as it is simple: To make a good recording.

PRODUCER'S PEROGATIVES

How a producer "makes a good recording" can take many directions. I've simplified the process by defining three main production methods. These defi-

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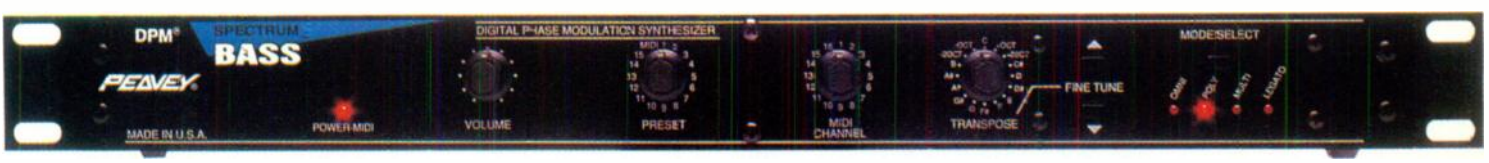

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nitions are offered to provide a global understanding of the producer's craft and are far from comprehensive. In addition, many producers combine elements of all three methods.

Producers often choose their production methodology based on their view of your current artistic sophistication, the strength of your material, and your overall personality. It's imperative that musicians also take some responsibility for forming the artist/producer relationship. Use the following definitions to decide how *you* want to work. And be honest about how much—or how little—production assistance you need.

Documentation. Alternative music recordist Steve Albini (Nirvana, P.J. Harvey, and others) hates being called a producer. Albini believes that you should stay out of a band's way; simply record the musicians live, documenting their creativity in its purest form. For some artists, this approach can be quite liberating. So why hire such a producer, if they only capture what you've already got?

Even documentary recordings need an outside ear to evaluate the quality and intensity of the tracks. Artists shouldn't have to worry about how they sound; they should be free to concentrate on delivering an evocative performance. And if you still don't think that a "documentation" producer is earning his or her paycheck, keep in mind that it's not an easy task identifying the minute nuances that make one performance better than another. Try it sometime.

Music editing. Some artists need a little more help to realize their creative potential. A producer may decide to "edit" their work, much like a copy editor proofs a literary manuscript. For example, if the song lyrics are inconsistent, the producer may request revisions (or attempt to personally rewrite problem lines). If there's a lot of "fat" in the musical arrangement, the producer will suggest deleting sections that seem superfluous or overly repetitive.

In addition, the producer monitors the performance to ensure that the

Patrice Rushen, who produced Sheena Easton's recent album of torch standards, believes "part of the art of production is reading creative needs and balancing how much to push the artist to get the best they can give."

artist isn't over-reaching his or her ability. Many vocalists, for instance, insist on singing in keys that are beyond a comfortable vocal range. A good producer makes sure that whatever remains on tape (or hard disk) is the best representation of the artist's talent.

The Svengali approach. Sometimes an artist may have personal charisma and an interesting "sound" but limited facility for musical communication. In these instances, a producer may write the songs (or find suitable freelance songwriters), form a support band for the artist, and choose a musical direction. This method is more prevalent in pop music and is often vilified by critics (especially in the wake of the Milli Vanilli debacle).

Criticism aside, this approach is more widespread than fans may realize. Vocalists such as Joe Cocker, Mariah Carey, Michael Bolton, and Whitney Houston seldom write their own material and are certainly counseled on musical direction and delivery by their respective producers. I don't believe the more "hands-on" approach of these producers diminishes the talent of their clients. I wouldn't want to be cheated from enjoying Cocker's tortured rasp just because he isn't a brilliant songwriter. If you've got great chops, but your musical direction and songwriting is unfocused, this production method may help you define your career.

Prolific artist/producer Bill Nelson produces scores of amazing tracks from his spartan home studio in England. A resourceful producer shouldn't need sophisticated gear to enhance creativity.

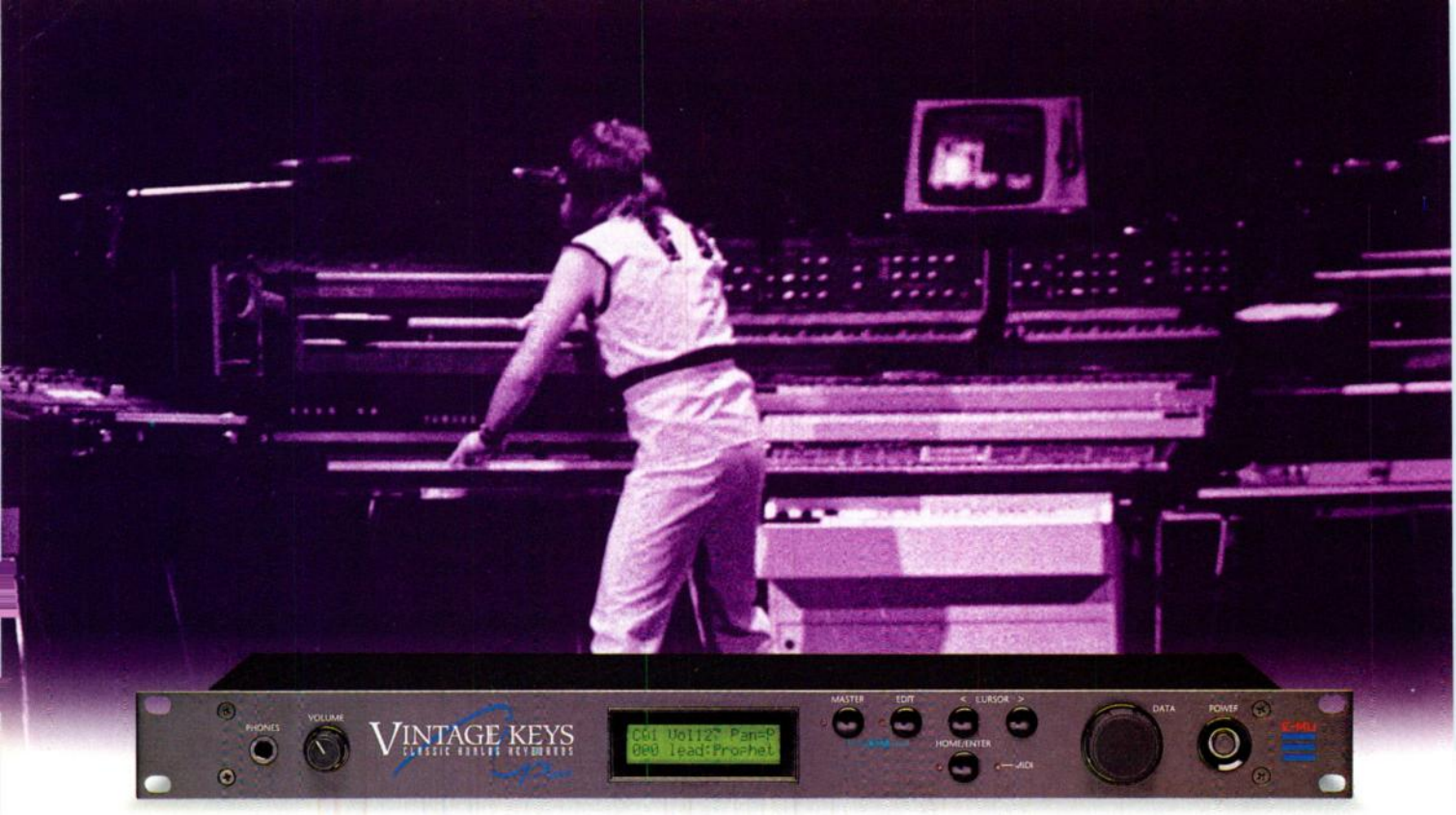
AUDITION TIME

Now that you have a basic idea about how producers work, how do you find the person that's right for your project? It's unfair to judge producers by specific projects, because they often transcend stylistic genres. A producer may work with rap artists, rock bands, and new age instrumentalists, making great records with each. Of course, there's also the tenet that unless you're immersed in a musical style, you can't do it justice. Are we confused, yet?

It is difficult to audition a producer based solely on his or her demo reel. I don't think that because someone specializes in rap music, they would automatically be a bad match for a pop band. Sometimes the cross-pollination of musical styles produces interesting and wonderful results. Because of this, I usually use the demo reel as a preliminary measure of professional competence. Forget the musical style for a moment. Does the song sound professional? Would it stand up to what you hear on the radio and MTV? Did the producer allow obvious mistakes or poor performances to stand? Is the song well arranged? How creatively did the producer deal with the sonic spectrum and subject matter? Do you like what you hear?

If the demo reel shows the producer to be competent, then you can get down to the nitty-gritty. Schedule a meeting to discuss your artistic goals. Talk about artists that you respect and records that you love. Don't forget to voice your career goals: Is the project designed to acquire a major-label recording contract, or do you have other plans? How much of a recording budget is available should also be discussed. The more the producer knows about you and your music, the better. Remember, you're forging a creative alliance; make sure both parties know what they're getting into.

After all is said and done, ask yourself if you trust this person. Do you believe that he or she has the chops to take your artistic vision to a higher level? Are you comfortable with this person making brutal assessments and criticisms of your work? If you answer "no"



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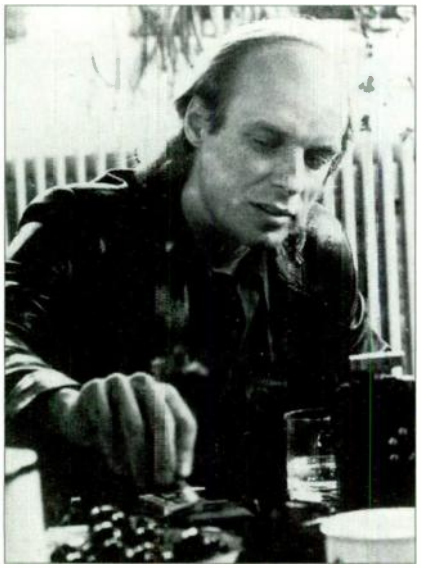

Brian Eno (U2, James, David Bowie, and others) is famous for his "happy accidents" and ambient sonic environments.

to any of these questions, don't hire the producer in question. If you're uncomfortable now, you'll *really* be in ulcerville halfway through the recording sessions.

PAY SCALES

Most producers ask for a cash advance against sales royalties. However, unless you already have a major-label contract, this arrangement is pretty ridiculous. (You can't offer a producer sales royalties if there's nothing to sell.) Most midlevel producers charge an hourly or project rate for their services. In the San Francisco Bay Area, up-and-coming producers usually charge between $100 to $1,000 per song, depending on how much they contribute to the project. Hourly rates vary between $10 and $75.

They may also ask for a percentage of *your* record-company advance, if the demo they produce gets you a deal. This figure is typically three to five percent of the gross advance payment. In all cases, be sure to get the particulars in writing. A lawyer might be unnecessary, unless you're going for the big deal, but a typed agreement letter is essential.

A production agreement doesn't have to be a scary thing. It's simply a tangible document that spells out the responsibilities of a creative collaboration. Specify what the producer is doing (producing two songs, remixing one track, and so on), and how much they are getting paid for their services. If downstream percentages are promised, put them in writing. For example, state that the producer will receive 2.5 percent of the gross record-company advance should the producer's work be responsible for sealing the record deal. And if you *do* get nervous about these contractual matters, see a lawyer before you sign anything.

FINAL FADE

I once had a production client look me in the eye and say, "I don't know why we need a producer. We wrote the songs and played all the instruments. What does a producer do?" This was after I had produced two demos with my partner, Neal Brighton, that *finally* helped win the client's band a major-label contract after many unsuccessful attempts with other producers. We had picked the four most commercial songs from the band's repertoire, helped solidify a musical direction, decided to feature the background and harmony vocals of the female bassist, and had painstakingly created an environment where the inexperienced band could flourish in the recording studio. But no, we didn't write their songs or play their parts for them.

Production is kind of weird that way. If a producer is sensitive to the artist's musical needs and ego, the process can go so smoothly that it seems effortless or unnecessary. Nothing is farther from the truth.

Assuming that a producer's contributions are diminished because he or she didn't perform or write the songs is like saying some film directors have little to do with their movies, simply because they don't act in them. Music production, like filmmaking, is a collaboration. Both parties in the relationship are indispensable. Don't forget that most successful creative partnerships are built upon a firm foundation of mutual respect. In short, don't sweat over finding the perfect producer, then trash the relationship just because your ego needs to take sole credit for a shared artistic vision.

EM *editor* **Michael Molenda** *co-produced* The Infinite Summer of Love *for Taxim Records in Europe.*

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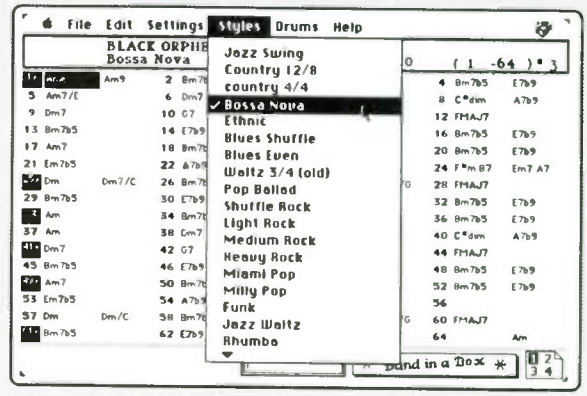

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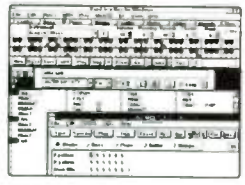

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PC Magazine Jan. 15, 1991 – Technical Excellence Awards

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Band-in-a-Box Prices

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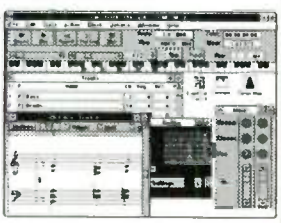

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Questions & Answers

By Alan Gary Campbell

Kindly Uncle Alan offers advice on cleaning, refurbishing, and shipping your gear.

Q. All my owner's manuals describe what not to clean equipment with, but after your DX7 has been on a club gig, and you try to "wipe gently with a clean, damp cloth," the layer of gunk on the front panel just laughs at you. What can you use?

Q. Is it okay to use Armor-All on amps, cases, and items that have a vinyl covering?

A. The cautions in owner's manuals are well founded. Almost any cleaner or solvent is a hazard to the components and finishes used on electronic music gear. A clean, damp cloth is still the best bet. Of course, deposits of club crud on panels are resistant to such gentle cleaning, and there is one exception to the "no solvents" rule: For front panels and case components of finished metal (or with overlays), a weak solution (50%) of isopropyl alcohol, applied via a soft, clean cloth can be used. However, you should first test this in a small, inconspicuous area of the panel. Immediately follow the cleaning with a thorough rinse/wipe using a second cloth dampened with water.

Effective cleaning of front panels that feature numerous protruding potentiometers, switches, and LEDs requires disassembly of the unit and removal of the panel PC boards. An attempt to clean around the protruding parts will yield poor results and can leak liquid into the unit. Disassembly of a complex musical instrument is advisable only for do-it-yourselfers with considerable experience and skill. Professional cleaning is often a good investment. A qualified technician can dismount the panel boards safely and quickly. Once free of protuberances, a panel overlay can be properly cleaned and often made to look like new.

Armor-All, STP, Formula 2001, and even Lemon Pledge (the nonaerosol type, particularly useful on panel overlays) can be used to clean and renew vinyl coverings. Again, test on an inconspicuous area. These products are best applied by spraying on the applicator cloth, not on the work, to control application density and overspray. Caution: Overspray on floors can cause a dangerously slick surface film. Put down newspaper or a drop cloth before spraying, and clean up any overspray immediately.

Q. I've become interested in vintage synths and would like to know if it is possible to repair or refurbish the wood components of the cases. Are these removable, and where could one obtain replacements?

A. Some case components are comparatively easy to remove (such as the lower case of a Minimoog and the end bells on a Polaris), although some are glued tenaciously in place (e.g., case components of the Prophet 5 and Moog Source). Those that are easily removed are good candidates for refinishing. A Minimoog lower case with a bad blemish returned from a trip to the cabinetmaker's shop with a finish that looked like new.

The quality of the end result depends upon the ability and care of the craftsperson who performs the work. Start with shops that specialize in pianos or fine furniture. Consider that disassembly of the instrument may require the assistance of a qualified technician.

Skilled cabinetmakers and refinishers can help with difficult-to-disassemble, glued wood components. You should definitely take heed if they advise against a do-it-yourself job; it is easy to damage glued pieces during attempted disassembly. In addition, a

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cabinetmaker can often manufacture a close replacement for a damaged case component and even match the type of wood and finish.

Q. Where can I get service for Moog Minimoog and Memorymoog synths and ARP/Rhodes Chroma and Polaris synths?

A. EM readers retain a lively interest in vintage gear, as evidenced by the volume of "dino mail" I receive. The instruments most frequently inquired about are the Minimoog, Memorymoog, Chroma, and Polaris. Fred McNiff, former senior technician with Moog Music, and later with EJE Research (the company, now defunct, that bought Moog's assets), operates a part-time service shop specializing in the Minimoog and Memorymoog. Contact Fred McNiff, Ames Rd., Cassadaga, NY 14718; tel. (716) 962-2172.

Peter Miller, owner/operator of service center CAE Sound, is a respected technician in the San Francisco Bay area who is adept with the Chroma and Polaris. Contact Peter Miller, CAE Sound, 285 N. Amphlett Blvd., San Mateo, CA 94401; tel. (415) 348-2737.

Rhodes Chroma

Q. What can I pack my keyboard in to ship it for service? One of my friends said that styrofoam peanuts generate dangerous static. Is this true? I don't have the original shipping carton. Is it possible to buy one?

A. Ordinary styrofoam peanuts generate static electricity when they rub against one another and against surrounding materials. This can cause a significant static charge to accrue, but it will not necessarily discharge into the instrument. If it does, it might scramble RAM-based program data (especially in older, hybrid gear), but it is unlikely to damage electronic components. Most gear is, by design, protected from moderate static discharges, which can come from everyday sources as easily as from packing materials.

Special packing materials have been developed to protect equipment from static discharge. These are colored pink—pink plastic bags, pink bubble pack, pink styrofoam peanuts, etc.—to distinguish them from static-producing materials.

Static-safe pink peanuts can be purchased from shipping and mailroom suppliers, but they are expensive: over two dollars per cubic foot. (Surprisingly, regular styrofoam peanuts cost only a little less.) Music and electronics stores often discard these materials in quantity, since accessories come bulk-

packed in them, and you can find a gold mine of packing materials in the discard pile. But ask first, before you carry them away.

Be sure to wrap the equipment with plastic to protect it from dust and debris. Use static-safe materials, when available. If you are in a pinch, two plastic trash bags will cover a keyboard instrument. Place one over each end and tape in the middle. Allow several inches of peanuts, packed firmly, on each side of the equipment.

Use a clean, sturdy box (a slightly oversize box intended for similar equipment is ideal) that is in good condition. Generally, a shipping carton should be used no more than twice, then discarded. Use only good quality, poly packing tape—never duct tape or masking tape—and seal all the seams. Do not depend on old tape previously applied to the carton. The addition of fiber-reinforced strapping tape around the girth of the carton is usually unnecessary. Remove or paint out any extraneous labels, and don't forget to include backup shipping-address information inside. United Parcel Service offices offer a helpful pamphlet, *Package with Care*, that details packing procedures.

Nevertheless, a factory shipping carton, designed for the gear in question, is best. Some manufacturers sell replacement shipping cartons for recent gear, subject to availability. These are often special-order items that can only be obtained through a dealer or service center, and they aren't cheap: A replacement shipping carton recently set a customer back $30.

Q. Is there a replacement for the self-adhesive plastic strips that Roland uses to secure the keys on the D-70 and other keyboards? The factory doesn't sell them.

A. Roland has begun to stock the plastic strips, though the replacement strips come in shorter lengths and without the adhesive material. The clear plastic strips used in the D-50, D-20, D-10, JX-10, and similar SK-3-type keyboards come in 8-, 12-, and 13-note lengths (Roland part numbers 22135417, 22135416, and 22135415, respectively).

The black plastic strips used in the Roland D-70, U-20, D-5, JD-800, and similar SK-7-type keyboards come in 12- and 13-note lengths (part numbers 22135435 and 22135436, respectively). Of course, you need to obtain enough strips to do the job, though if only a section of keys is to be removed, it is possible to cut the original strip at an adjacent point and preserve the adhesive along part of the span.

Double-sided adhesive tape (part number 17049898) is used to affix the replacement strips in place, but is not included with the strips and should be ordered concurrently. (This is the same tape that is used to secure Roland panel buttons, as discussed in the November 1993 "Service Clinic" with regard to the JV-30.) Note that these items are normally available only to service centers. It is inadvisable to use glue or silicone sealer to reattach an old strip, as both adhesive types react with the plastic and make subsequent service problematic.

EM *contributing editor* **Alan Gary Campbell** *is owner of Musitech, a consulting firm specializing in electronic music product design, service, and modification.*

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Reviews

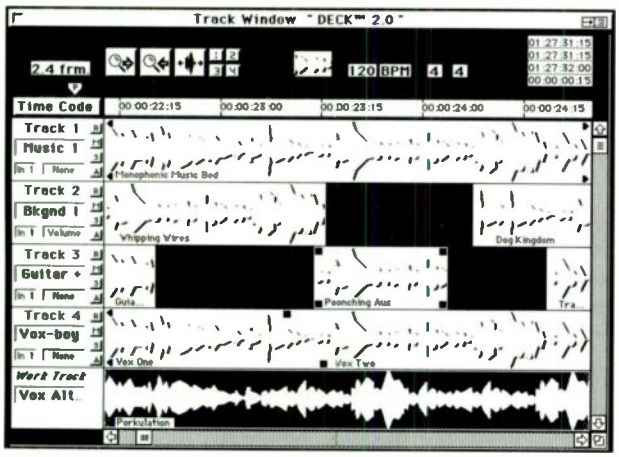
OSC Deck 2.0 (Mac)

By Charles Clouser

Hard-disk recording with a friendly face.

Computer-based random-access recording seems all the rage now, and with good reason. The ability to record, cut, copy, paste, and process audio tracks within an on-screen graphic environment makes it possible to edit and assemble songs with a precision only dreamed of a few years ago.

Most of the professional-level, Macintosh-based, audio-recording programs (e.g., those by Opcode, Emagic, Mark of the Unicorn, and Steinberg) integrate MIDI sequencing, with the MIDI and audio tracks available in a single window. If you are a MIDI-dependent recordist with a yen for sophisticated sequencing features, this is a preferable approach. But if you are mainly interested in audio tracks, and your MIDI needs are more modest, you may find it simpler to deal with a less-complex sequencer and focus on the audio side. This appears to be the driving philosophy behind OSC's *Deck* 2.0.



OSC's *Deck* 2.0 provides solid hard-disk recording with a familiar "tape-deck" interface but does not offer effects processing. It integrates with the company's *Metro* sequencer, which is displayed in a separate screen.

OSC first developed *Deck* (reviewed in the December 1990 **EM**) for Digidesign, which marketed it as the first professional-quality, 4-track, digital-audio recording program for Digidesign's Audiomedia and Sound Tools hardware. The program offered a Portastudio-like user interface, real-time audio layering (adding to existing data on the same track), offline track-bouncing, 2-band EQ, simple delay and chorus effects, and snapshot mixer automation. It could also import and play type 0 and 1 Standard MIDI Files (SMFs) in sync with audio.

The program did not read Song Position Pointer messages or provide any form of continuous sync, however. For instance, if you wanted to use it with a tape machine, you triggered *Deck*'s tracks and prayed they would stay together with the tape tracks. In addition, screen redraws were painfully slow, and it was easy to clip the audio when using EQ, as the level control was post-EQ.

Later, *ProDeck* was developed for Digidesign's first Pro Tools package (reviewed in the April 1992 **EM**). Among other things, it added real-time automation and continuous resync. But the program's MIDI features were heavily criticized, and crashes were frequent. Eventually, the developers at OSC decided to offer a major rewrite of *Deck* and market it themselves.

ENTER DECK 2.0

Deck 2.0 provides 4-track hard-disk recording on any Macintosh equipped with Digidesign's Audiomedia I/II, Sound Tools II, or Pro Tools NuBus cards; Spectral Innovations' NuMedia card; or Raster Ops' MediaTime card. The program can also use the DSP chip in the Mac Quadra 660AV and 840AV, giving you hard-disk recording without additional DSP hardware.

The user interface still looks a lot like Digidesign's Pro Tools software, and you can think of *Deck* 2.0 as a "mini Pro Tools" environment. It provides greatly increased functionality for owners of 2-channel Digidesign systems and an alternate work environment with significant enhancements and a few tradeoffs for users of 4-channel Pro Tools systems. A major new feature is the ability to play *QuickTime* movies in

sync with audio tracks, making *Deck* 2.0 an excellent audio tool for multimedia producers.

Deck 2.0 supports *OMS* (Opcode's *Open Music System;* see the March 1992 and November 1993 "Computer Musician" columns). Although *Deck* 2.0's MIDI capabilities are limited to receiving MIDI Time Code and Control Change messages from external MIDI faders, it accomplishes all this with no fumbling through setup dialogs. Tell it you're using *OMS,* and everything works. MIDI setup works just as easily if you're not using *OMS:* A simple dialog box lets you set the program to work with your interface and choose the time-code source. I wish it were always this easy.

BASIC LAYOUT

Deck 2.0 operates like most hard-disk recording programs. You record, automate, and mix in a window that looks and operates like a mixer; select, move, and edit audio regions in a window with a multitrack graphic waveform display; and control playback, looping, and autolocation with a "transport" that looks like its tape-based counterpart.

The Mixer window (see **Fig. 1**) shows four channels, one for each recording/playback channel. In addition to the four active tracks, you can create Work tracks, where audio regions and entire playlists (complete, edited tracks) can be stashed for later use. These Work tracks can be displayed and edited in the Track window, but only the top four tracks in the Track window are represented by channels in the mixer. This approach reduces screen clutter and the confusion that often results from trying to get many virtual tracks to play simultaneously.

Each channel strip in the mixer has a volume fader; pan slider; and solo, mute, and record-enable buttons. Pop-up boxes let you select the channel's hardware inputs and outputs, control automated recording and playback, and choose which playlist will be played on that channel. The bright, easy-to-read, simulated LED meters show prefader playback level or input level when the channel is record-enabled.

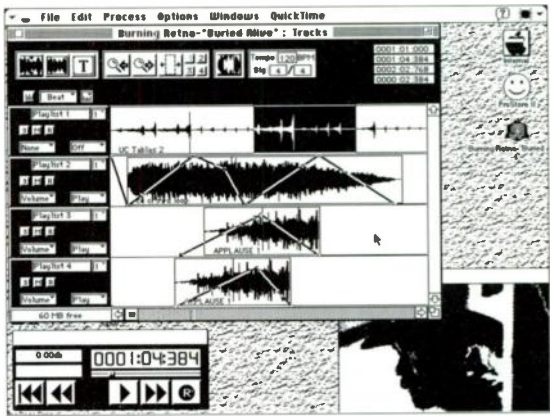


FIG. 2: A typical screen from a *Deck* 2.0 session, with a *QuickTime* movie in its own moveable window. In the Track window, a region of track 1 has been selected, and the volume graph is displaying automation data for tracks 2, 3, and 4. The Transport has been shrunk to its smallest size for quicker redraws.

THE TRACKS WINDOW

Deck 2.0's Track window (see **Fig. 2**) displays audio waveforms for each of the four actual playback tracks, as well as any Work tracks. Its deceptively simple layout only has two cursor modes: selector and hand.

The selector is used to select, separate, copy, and paste regions of audio by clicking and dragging across the waveform display. Various modifier key (i.e., option, control, command, and shift) combinations let you copy and move regions, aided by the Shuffle and Slip options. With Shuffle, if you cut or move an audio region, the two regions that surrounded it snap together, filling the empty space. With Slip, the surrounding regions remain where they are, leaving a gap where the removed region was.

The hand cursor lets you select entire, even multiple, regions and resize and move them using modifier-key combinations. I appreciate this type of design, as it consolidates a variety of related tools and tasks into two basic functions. However, you will get lost if you don't learn the modifier-key combinations.

The timeline across the top of the window can be set to display bars and beats, SMPTE time, seconds, or samples. The numbers displayed in the transport's counter and everywhere else in the program (for example, the Region Info dialog) are displayed in the same form.

A button turns off the Snap-to-Grid function, and a pop-up sets the grid resolution, which is displayed in time units that correspond to the units selected for the timeline. For example, if the timeline shows bars and beats, the grid resolution can be quarter notes or sixteenth notes; if the timeline is showing SMPTE, the selections include seconds and frames. Other buttons let you turn off waveform drawing (making audio regions appear as hollow blocks) and the display of region names, which can speed things up a bit. You can also shrink the tracks so that many more fit on the screen.

Powerful navigation tools are available, including a Zoom-to-Fit function that fills the screen with the currently selected region. Four View Memories store snapshots of where you are and how far you're zoomed in, as well as the range of audio you've selected. Combined with the selection tools in the Options menu, which let you jump to the beginning or end of a region and numerically specify a range to be selected, you can quickly zoom in for precise editing, zoom out to move and select regions, and then zoom right

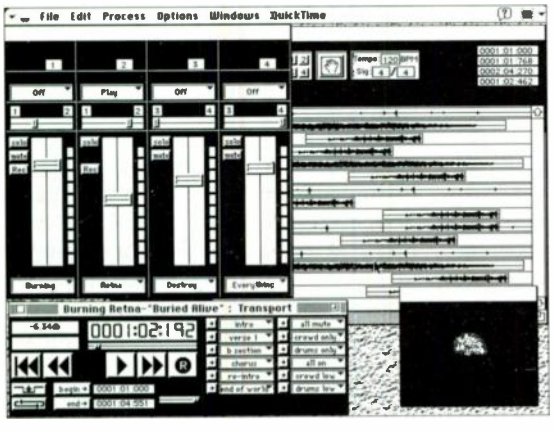


FIG. 1: *Deck* 2.0's Mixer window displays four channels, one for each playback track. The Transport window is shown at its largest size, displaying the mixer State and autolocate pop-ups, which have been renamed for easy identification. The *QuickTime* movie window is shown at a smaller (and faster) size, and in the background you can see the shrunken tracks in the Track window.

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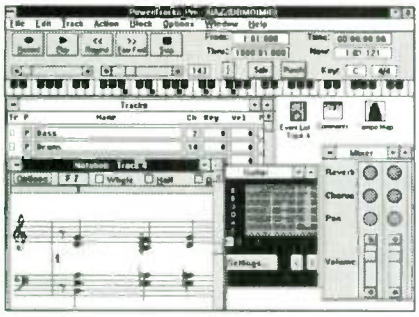

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PowerTracks for DOS - DOS 3.3 or higher, 640K, XT/286/386 or better. MIDI interface (Roland MPU401, Music Quest MQX series, SoundBlaster MIDI and FM sounds, Midiator, Roland SC7, Yamaha TG100) or Adlib/SoundBlaster compatible sound card.

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back in to the same resolution you were at before.

Deck 2.0's simplified layout and consolidated tools let you work faster once you learn them, but some operations are not as obvious as on other systems. Even so, I heartily approve of reducing the number of tools and giving each tool more options.

EDITING

Destructive editing commands such as Normalize, Invert, and Reverse are at your fingertips. With a single click, you can launch the sound-editing program of your choice (usually *Sound Designer II*), with the currently selected region already highlighted and ready for editing. You'll need *Sound Designer II*, or something like it, if you want digital EQ, because *Deck* 2.0 doesn't have any,

OSC METRO

Metro is a capable, 99-track sequencer that can run in sync with *Deck* 2.0 using a interapplication timing architecture developed by OSC. This timing architecture goes *OMS* 1.2 one better, as it allows two programs to sync to each other without an external timecode source. (*OMS* 2.0 will have this capability.) The $225 program is an updated version of Dr. T's *Beyond* (reviewed in the October 1990 EM) with some enhancements.

What makes *Metro* unique and desirable for *Deck* 2.0 owners is the high level of integration between the two programs. With a single command, you can sync one program to the other. Launching, opening documents, saving, and quitting in one program can perform the corresponding operation in the other program, even while it is in the background.

Deck 2.0 can also inherit its base tempo from the open file in *Metro*, so that the bar and beat numbers shown in *Deck* 2.0 correspond to what's happening in *Metro*. (The current version of *Deck* 2.0 does not support tempo or meter changes, but version 2.1 will automatically import entire tempo/meter maps from *Metro*.)

In theory, running *Deck* 2.0 and *Metro* at the same time gives you much of the functionality of *Studio Vision, Digital Performer, Notator Logic Audio, or Cubase Audio*, in which you have full-featured sequencing and audio-editing capabilities under one roof. However, *Metro* is a less-powerful program than these recently updated powerhouses. In addition, it's a hassle to switch back and forth between two programs running at once (although you can safely switch while playing). But the two work quite well together, with the added bonus of *QuickTime* movie playback.

Aside from its integration with *Deck* 2.0, there is a lot to like in *Metro*. The program supports pattern-based and linear tracks simultaneously, with graphic editing of notes, controllers, and sequence chains. *OMS* is fully supported, and *Metro* can automatically create instrument definitions that correspond to your current *OMS* studio setup.

Metro also integrates with both Mark of the Unicorn's *Unisyn* and Opcode's *Galaxy*, which is a big plus. Imported Standard MIDI Files work flawlessly, but you will have to assign playback instruments for each track, which merely reflects the fact that *Metro* isn't set up for General MIDI.

The piano-roll graphic-editing environment lets you view multiple tracks in the same window (see Fig. A), and you can use the mouse to draw streams of Control Change messages. There is a Song Overview mode (similar to Mark of the Unicorn's *Performer*) that represents the amount of MIDI data in each track by using different colors, and you can enter markers simply by clicking on the time line across the top of the Overview. I especially like the sequence-chaining function: Simply drag individual sequences into the editing window of a track in the master sequence, where they appear as rectangular blocks that can be moved, duplicated, lengthened, or shortened.

Metro's Selection Filter lets you select a measure's worth of notes and use the notes themselves as a kind of selection grid, allowing you to globally select events based on how close in time they are to the grid. This is a bit more flexible than Opcode *Vision*'s Select with Metrical Placement function, letting you do things, such as select only snare fills and not the back beats, for quantizing, Velocity scaling, and so on.

Things I don't like: The screen designs are a bit clunky, with sporadic use of color and little bits of wasted space here and there, and there aren't nearly as many modifier-key combinations as there are in *Deck* 2.0. In addition, *Metro* lacks many advanced professional features, such as true Groove Quantize and support for standard music notation.

Metro is an older program that has been brought into the modern-day arena against prettier, more powerful, and more expensive competitors, and it is in need of a facelift. Still, it is a strong, fast, stable performer that runs on anything from a Mac Plus on up and gives you many of the most important sequencer features at a bargain price.

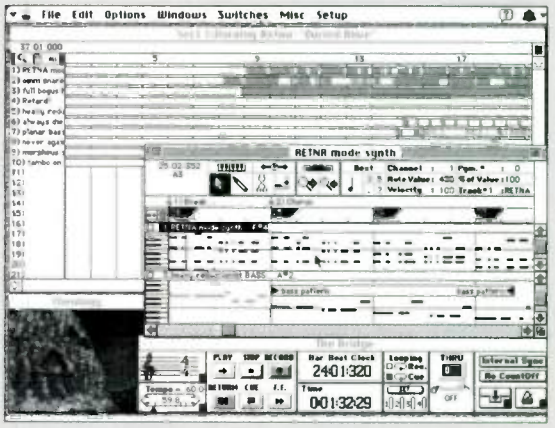

FIG. A: *Metro*'s Song Overview window (active), with an open Track window underneath. In the bottom half of the Track window, a rectangular block represents a subsequence inside a master sequence. At the lower left is a *QuickTime* movie from the current *Deck* 2.0 session, running in the background.

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ALESIS STUDIO ELECTRONICS

nor does it have a Change Gain function. However, *Deck* 2.0's architecture will support plug-in DSP functions, similar to (but incompatible with) Pro Tools' *Sound Designer II* Plug-In software (described in "Virtual Effects" on p. 38). Hopefully, third-party developers will take advantage of this architecture to develop equalizers and other goodies.

Deck 2.0 lets you crossfade any two adjoining regions by selecting from seven fade shapes and entering fade-in and fade-out times. These crossfades are created constructively, meaning that new audio files containing the crossfaded data are created on hard disk and inserted into the playlist. The original data is not altered, and crossfades can be changed or deleted.

AUTOMATION

The automation features are simple, giving you full control with an absolute minimum of buttons. *Deck* 2.0 lets you automate track levels and panning by recording real-time movements of the onscreen faders, or by using snapshot-style automation. The latter lets you store an unlimited number of named mixer States that can be recalled at any point, with an adjustable transition time between States. During the transition, *Deck* crossfades between parameter valves.

Storing and recalling mixer States is done in the Transport window, which has pop-ups that provide instant access to any six States. Recalling a State only enters data into tracks that are set up to record automation. It's easy to record automation data by mapping external MIDI controllers to the onscreen mixer faders.

All recorded data can be displayed in the form of an envelope-style graph superimposed over the audio waveform. This graph has breakpoints that can be easily dragged around, added, and removed. An Automation Thin command reduces the number of breakpoints that result from recording live fader moves.

Deck 2.0 lets you select, copy, and move regions of automation data graphically and quickly draw or edit any fades that aren't quite right. You can even select and move regions of automation data independently from the audio regions "underneath." However, since the automation data is associated with a particular mixer channel, you can't move automation data into Work tracks or store alternate takes of automation. This was a problem in a couple of real-world cases. For example, I wanted to A/B alternate versions of both the audio and automation data in a project. Using Work tracks, I could easily A/B the audio data, but because I couldn't stash an automation track in a Work track, I had to re-create the automation events manually. According to OSC, this has been corrected in version 2.1.

QUICKTIME AND SYNC

Perhaps you've heard about systems from Avid, SSL, and Digidesign that can play back digitized video in sync with digitized audio from a hard drive, eliminating the need to slave to a video deck. *Deck* 2.0 has this capability, and it works well.

First, import a *QuickTime* movie at any frame rate. You can ignore the movie's built-in audio track, leave it in the movie for playback via the Mac's built-in audio chip, or import it into a track in *Deck* 2.0. It's great that you can import the movie's audio; with *Deck*'s ability to save final mixes as *QuickTime* files, the program becomes a serious editing tool for *QuickTime* authors.

An imported movie appears at its original size in its own window. When you select a region in the waveform display, the movie cues to the first frame of the region. This lets you position bits of dialog and sound effects at a desired point in time, without looking at SMPTE numbers or fiddling with the scrub knob on a video deck.

I wanted the movie to automatically follow the actual mouse position so it would scrub as you dragged to select a region, but this is not implemented yet. According to OSC, an upgrade that includes this feature is coming soon.

Music editors and sound designers working in film and video will love having random-access video playback, provided they have the hardware to make it cruise. On a stock Mac IIci, you'll be looking at some pretty jerky images. But things move at acceptable speeds if you use a Quadra 660AV, 840AV, or a Quadra equipped with video acceleration for faster redraws and SCSI acceleration that provides asynchronous transfers via SCSI and *SCSI Manager* 4.3. You must still digitize your video and create a *QuickTime* movie out of it using a separate video-capture program (if you have the video hardware or an AV Mac), or you can have it done at a service bureau.

WHAT ABOUT THE FUTURE?

OSC is a fast-moving company, and new features are appearing rapidly. Especially noteworthy is a $125 plug-in that provides eight virtual tracks of playback on 4-channel Pro Tools systems. Another major upgrade is the AV version of *Deck* 2.0, which plays six channels of audio and a *QuickTime* movie on a stock Quadra 660AV and eight channels on an 840AV using the internal AT&T DSP3210 chip. This version (2.1) should be shipping by the time you read this. It will cost $399, but if you buy the current version before 2.1 ships, the upgrade is free.

The program also works with Spectral Innovations' DSP3210-based NuMedia card, which can be installed in any NuBus-equipped Mac. Most professional users will want Digidesign cards to take advantage of their extra audio ins and outs and processing power, but many multimedia producers and semi-pro musicians will do just fine with the AT&T chip's capabilities.

New features you can expect to see include a Bin/Region window that provides an onscreen bin in which you can dump imported regions for temporary storage. *Deck* 1.0 supported SMFs, but version 2.0 doesn't. In version 2.1, a new MIDI window allows simple playback of Standard MIDI Files from within *Deck* 2.0 without using *Metro* (OSC's full-featured sequencing program; see sidebar).

THE BOTTOM LINE

Certainly there are things *Deck* 2.0 doesn't do that would be nice to have. It doesn't make use of the unused inputs and outputs on a Pro Tools system as effects buses. In addition, the MIDI features are mediocre; for instance, it does not support MIDI Machine Control. And, as noted earlier, there is no digital EQ, which is a step backward from the original program. In general, you should still plan on

Product Summary

PRODUCT:
Deck 2.01
PRICE:
$299
SYSTEM REQUIREMENTS:
Mac II or better with 4 MB RAM; System 7.0 or later; Digidesign Audiomedia, Sound Tools, or Pro Tools card, Spectral Innovations NuMedia card, or Raster Ops MediaTime card (not required with Quadra 660AV or 840AV)
MANUFACTURER:
OSC
480 Potrero
San Francisco, CA 94110
tel. (415) 252-0460
fax (415) 252-0560

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	●●●◖
EASE OF USE	●●●●◖
DOCUMENTATION	●●●●◖
VALUE	●●●●

using *Sound Designer II* for waveform editing.

OSC's sequencing/digital audio package relies on *Deck* 2.0's integration with *Metro*, a respectable, though limited, sequencer that comes up simultaneously in a separate window (see sidebar). If hard-disk recording is your top priority, but you want a moderate level of integration with a sequencer, this is an excellent package. If complete integration is not critical, you can use *Deck* 2.0 with a pro-level, *OMS*-compatible sequencer such as *Notator Logic* or *Vision*. However, if you want both advanced sequencing and tight integration—especially if you prefer to edit sequences and digital audio on a single screen—you should pass on OSC's software and opt for one of the better-integrated, high-powered digital-audio/sequencing programs from Opcode, MOTU, Steinberg, or Emagic.

Deck 2.0 has all the major features required for digital-audio recording. Given that, the biggest selling points are its tape-deck analogy, which provides a friendly, familiar feel, and its equally friendly price. The ability to integrate *QuickTime* playback with multitrack audio editing is a big plus to multimedia authors, which speaks well for the program's future. If easy-to-use hard-disk recording is crucial to your work, and you have the required hardware, *Deck* 2.0 is a great buy.

Charles Clouser *has programmed funky beats for Tom Jones and Trent Reznor.*

Circle #437 on Reader Service Card

Fostex Model 380S Multitracker

By Allan Metts

Pro sound in a cassette ministudio.

Cassette ministudios are seldom taken seriously by professionals. Viewed as "musical scratch pads," musicians often use them for fleshing out a composition, or recording a rough demo. Those interested in professional recording usually look to modular digital multitracks, or open-reel analog decks. But Fostex's new 380S Multitracker may change everything.

The 4-track 380S is loaded with features that give the ministudio owner a fair chance at recording professional-quality masters. For starters, you get Dolby S noise reduction, which obliterates the annoying hiss of the cassette medium. The mixer offers eight channels and twelve channel inputs (four channels are stereo).

Particularly valuable is the 3-band EQ with sweepable mids. A submix feature lets you return four tape tracks *and* four line-level (or virtual) tracks on the same channels. When you add the two aux returns, this facility allows you to return up to eighteen signals during mixdown.

You also get two tape speeds (1⅞ and 3¾), with a ±10% pitch-adjustment control. The manufacturer claims a frequency response of 40 Hz to 18 kHz at high speed and 40 Hz to 12 kHz at low speed. When using the high speed, a C90 cassette offers approximately 22 minutes of recording time.

SIGNAL SURVEY

The 380S can record on all four tape tracks simultaneously, which is a boon for live recording. The 8-channel mixer section offers abundant signal-routing options, although only the first four channels are full-featured. The full-featured channels have a practical EQ section, offering 15 dB of boost/cut at 10 kHz (high) and 80 Hz (low) and a sweepable mid band that delivers 15 dB of boost/cut between 200 Hz and 6 kHz. The two post-fader, mono aux sends on these channels can do double-duty processing line input or tape tracks (more on this later).

While channels 1 through 4 can double as mic or line inputs, only channels 1 and 2 offer XLR connections and insert points (on ¼-inch TRS jacks). The remaining four channels are configured as stereo pairs—inputs 5/6, 7/8, and so on—and accept only line-level signals.

To maximize the signal-routing options of the 380S, Fostex developed a submix section that allows you to return tape and input signals simultaneously. This in-line monitoring feature lets you return four tape tracks *and* twelve line signals (as well as two aux

signals) during mixdown. The submix also can be routed to the aux sends. Basically, much of the routing flexibility of professional consoles is zapped into a ministudio.

Record Track switches enable either direct recording (channel 1 is routed to track 1, channel 2 to track 2, and so on), or L/R bus assignment. If you're not bouncing four instrument or vocal tracks to a mono track—an operation that necessitates routing the four tracks to one side of the L/R bus—direct assignment bypasses additional electronics and allows cleaner recording. The flexibility to record using either signal routing method is a big plus. There are direct outs from all four tape tracks, so you patch the recorder into a larger and more capable mixer for mixdown. Sync in and out jacks are provided for striping time code on track 4.

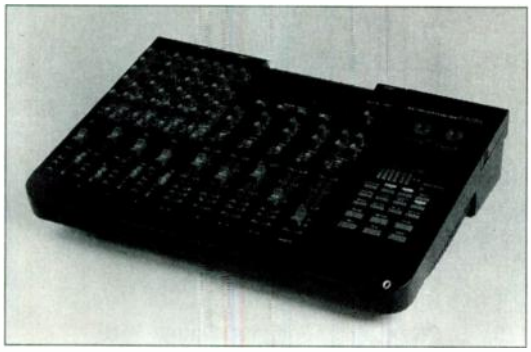
On the master section, two headphone jacks are served by one common level control. Headphone mixes can be fed from a monitor mix, the stereo bus, or a combination of both. The two stereo aux returns have level controls only; there are no pan pots. If you want anything except an even L/R mix, you had better hope your signal processor allows you to internally adjust its stereo output. A single master fader controls the stereo mix level.

CONSTRUCTION

The 380S is housed in lightweight plastic, and I do mean *lightweight*. I recommend packing the 380S carefully when going mobile. Unfortunately, the 380S is not rack-mountable, so it won't fit into a standard rack case for transport.

Although the knobs and faders all work fine, they are a bit wobbly for my taste. In addition, there was occasionally grinding and rattling in the transport on my review unit. (Fostex said that the review unit had been through a trade show and probably needed readjustment.)

Ergonomically, I was somewhat unhappy about the twelve input jacks—along with the two headphone jacks and the "punch-in" footswitch jack—being placed on the front panel. The arrangement allows quick and easy connection of sound modules and microphones, but it also means that the patch cords droop in front of me and over my other gear. I would have pre-



With Dolby S noise reduction, four mono and four stereo channels, and the ability to return four tape and four virtual tracks simultaneously, the Fostex 380S Multitracker may be the first pro-quality ministudio.

ferred back-panel connections.

The 380S also seemed quite susceptible to interference from my computer and monitor. I couldn't start recording until I rearranged the offending noisemakers.

ROLLING TAPE

For safety, the Record button is "fenced off" with raised plastic buffers, which is a nice touch. You must push Record and Play to actually start recording. If you press only the Record button, the 380S switches the enabled track(s) from tape to input monitor, so you can audition parts without committing them to tape. This feature saves wear and tear on the record head.

The 380S allows you to specify two locate points *and* punch-in and punch-out points. Separate buttons are dedicated to access zero return, locate point 1, and locate point 2. The 380S can automatically begin play at any of these locations and can loop repeatedly between the two locate points. Once I programmed the proper locations, one button press sent the 380S to the beginning of my song, where it started playing. Then, I punched in a new part on the bridge, the 380S automatically punched out for me, and the song played to its end. I also set up a continuous loop between the first verse and the song's finale, so I could audition more instrumental parts. It was quite impressive.

The Fostex 380S also "transcribes" your locate and punch points if you accidentally reset the tape counter to zero during recording. Even though you've reshuffled the tape counter, the 380S automatically adjusts your programmed location points to the new numerical locations. You can continue using your location points as if nothing happened. A Recall button shuttles the numerical LED display between current tape location, location point 1, location point 2, and punch in/out locations. The transport controls are well labeled and lightning fast. I couldn't confuse the 380S by changing locate points in mid-rewind or switching into punch-in mode while the tape was playing.

The standard punch-in options are offered: programmed auto punch, footswitch punch, or manual activation of the Record/Play buttons. A Rehearsal mode lets you practice your punch until it's perfect, without actually recording on tape. If you've ever butchered a punch and erased something you wanted to keep, you'll appreciate the rehearsal function.

I tested the punch-in and punch-out gaps by punching in a continuous tone on top of another. A slight overlap between the old and new signals was evident at punch in, with a short gap of silence at punch out. From a practical standpoint, however, these gaps should not be a problem, as most punch-ins occur between musical phrases.

Metering is handled by six 7-segment LED meters, one for each of the four tracks and two for the stereo master. The display also offers LED icons for the transport status (Play, Stop, Rewind, etc.), shows which of the two tape speeds is selected, and indicates any Auto functions currently operational.

Dolby S can only be activated at the faster tape speed. The 380S defaults to the fast speed with Dolby S activated when the unit is turned on. However, if you switch to the slower speed to monitor a conventional cassette, then switch back to the fast speed for recording, you must reactivate Dolby S manually. You'd better keep alert if you tend to switch tape speeds back and forth. Of course, for maintaining the deck's extremely high audio quality, it's essential to use the high speed.

I used the 380S on a sequenced project and used the dedicated sync input/output for SMPTE time code. Striping time code was flawless, and I never had any trouble locking my sequencer to the 380S. There was only a tiny amount of SMPTE bleed and crosstalk onto adjacent tracks. During recording, I had ample headroom and heard only a slight amount of distortion when I pegged the input-level meters. The EQ proved to be very musical, and I was able to clean up a muddy piano sound with the sweepable midrange controls. Overall, recording with the 380S was a good experience.

CONCLUSION

The 380S sounds fantastic! I recorded a passage from Alan Parsons' *Silence and I* CD and had a difficult time finding any difference between the sound quality of the original CD and the 380S recording. The unit's Dolby S noise reduction eliminates tape hiss, even during soft dynamic sections. It was hard to believe the tracks I recorded were on a cassette. The 380S allows the home recordist to make professional-sounding master tapes.

The manual does a good job of helping users get the most from the deck. Fostex wrote the manual for beginning multitrackers, and it's full of tips, tutorials, illustrations, and definitions of recording terms and concepts. Even seasoned multitrack veterans might learn something.

I would give the Fostex 380S a good, hard look when shopping for a ministudio. If you're looking for rugged portability, however, the lightweight construction of the 380S might be a concern. Also, the unit is susceptible to electromagnetic inference, which is problematic if you can't get the deck away from your computer and video gear. However if you're looking for a

Product Summary

PRODUCT:
Model 380S Multitracker

PRICE:
$995

MANUFACTURER:
Fostex Corporation of America
15431 Blackburn Ave.
Norwalk, CA 90650
tel. (310) 921-1112
fax (310) 802-1964

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ◖
EASE OF USE	● ● ●
AUDIO QUALITY	● ● ● ● ◖
VALUE	● ● ● ●

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Mike Pinder likes to keep his Mellotron mellow.

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Songwriter, vocalist, and keyboardist Michael Pinder, formerly with the Moody Blues, is famous for his pioneering use of the Mellotron. The hauntingly beautiful sounds of this instrument became the trademark of the group's early works.

Mike is back in the studio, and has just released a new CD called *"Off the Shelf."*[1] Mike's new CD *"has a jazzier, more sophisticated flavor than his music with the Moodies, while retaining...'that heavenly atmosphere.'"*[2]

When it came time to digitize his recordings for final mastering, Mike trusted only one system. *"...at the end of the chain I mix directly to an IBM clone computer running The CardD™, by Digital Audio Labs... It's fabulous, for a thousand dollars, and it has incredible editing and the A-to-D and D-to-A converters are the best I ever heard. I do all of my mastering there."*[2]

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The Professional editor for Windows™ soundfiles.

[1] Mike's CD is available exclusively through Higher & Higher, P.O. Box 829, Geneva, FL 32732. Send SASE for information.

[2] From Higher & Higher, an independent fan magazine focusing on the Moody Blues, Winter/Spring 1994

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ministudio with amazing sound quality and flexible signal-routing, the Fostex Model 380S Multitracker may be the best game in town.

Allan Metts *is an Atlanta-based MIDI consultant, musician, and electrical engineer. He thought of a really cool name for a band, but he's not telling anyone what it is.*

Circle #438 on Reader Service Card

Cakewalk Professional for Windows 2.0

By Bob Lindstrom

The graphical interface is just the icing on the cake.

Windows-based sequencers are clearly the future for owners of IBM PC-compatibles. That's a daunting prospect to those of us who have often found them sluggish, complex, and mouse-bound where DOS-based sequencers are fast and effective.

Last year, *Cakewalk Professional for Windows* 1.0 hit the scene like a meat-and-potatoes session player. Although it could reliably handle just about everything you threw at it, it didn't set the world on fire. I wasn't persuaded to give up my ugly—but fast—multitrack DOS sequencers.

With *Cakewalk Professional for Windows* 2.0, I surrender my last remnants of skepticism. With a rich selection of features, views, tools, and customizing options, *Cakewalk Pro* 2.0 provides a graphical workplace that keeps pace with your creative drive. With its intelligently designed user interface, you'll be laying down tracks, not shoving your mouse around in frustration.

GOURMET INGREDIENTS

Cakewalk Pro 2.0 fully exploits the multiwindow, graphic-interface potential of Microsoft *Windows*. The program uses an array of windows (called "Views") to display MIDI data. These include shaded measure blocks and track info in the Track/Measure View, standard score notation in the Staff View, multitrack event listings in the Event List View, pitch/duration bars and a Velocity graph in the Piano Roll View, and a similar click-and-draw display in the Controller View.

By opening multiple View windows, you can edit, play, and record in several environments simultaneously. Shift a pitch in the Event List View and the note is automatically updated in the Piano Roll View. Cut-and-paste or click-and-drag measures in the Track/Measure View, and the changes are reflected in the notation in the Staff View. Version 2.0 gives you many ways to explore and edit your MIDI data.

There are 256 tracks for merge or overwrite recording, step recording, loop recording, multitrack recording, and real-time punch-in/out. With resolutions of up to 480 ppqn, you can be sure that what you play is what you get.

As you'd expect from a "professional" sequencer, *Cakewalk Pro for Windows* 2.0 incorporates features such as rhythmic quantize and humanize, data transposition and transformation, and Velocity scaling. These editing goodies are enhanced by the excellent Event Filter. Available throughout the program, this dialog box permits you to select groups of MIDI events by pitch, data type, duration, velocity, or location, then apply changes exclusively to the selected events.

The program synchronizes to all SMPTE/MTC formats. A Big Time option displays a huge SMPTE readout that can be seen anywhere in a studio. You can also insert time-locked markers and time-locked MIDI events into a file. (With time-locked events, no matter how you change the tempo or stretch the music's duration, the event remains locked to its assigned SMPTE time.) Commands such as Fit to Time let you massage musical events into perfect sync with film or video. The program also boasts full *Windows* multimedia support, with the ability to trigger Media Control Interface (MCI) events and assign individual tracks to sixteen separate MIDI interface ports.

Film and video composers will also benefit from the ability to insert single WAV-format samples into a MIDI sequence. There are two ways to add samples: WAV samples load into RAM, while MCI events play directly from hard disk. Both methods are excellent for special effects, or to integrate a Foley track into your score. I even had success using a WAV sample as a digital track and integrating it with MIDI sequences.

Other features include context-sensitive, online help; a System Exclusive librarian for as many as 256 SysEx banks of a length limited only by available RAM; and the Cakewalk Application Language (CAL), a built-in programming language that lets you create your own algorithmic and editing tools. CAL is a powerful addition to the program, but it's underdocumented in the manual, though the online help is somewhat more detailed. The handful of sample programs only hint at CAL's versatility.

Cakewalk Pro 2.0 is packed with so many well-designed, smoothly functioning features, there isn't enough room to mention them all. Simply put, it's a professional powerhouse.

IMPROVED RECIPE

Over 50 new and updated features make version 2.0 more accessible, more capable, and smoother in form and function than its predecessor.

Version 2.0 presents a more attractive face than version 1.0, because View windows stay closed until you open them. When you launch version 1.0, a gaggle of eight icons load across the bottom of the screen. Version 2.0 opens a single Track/Measure view. As

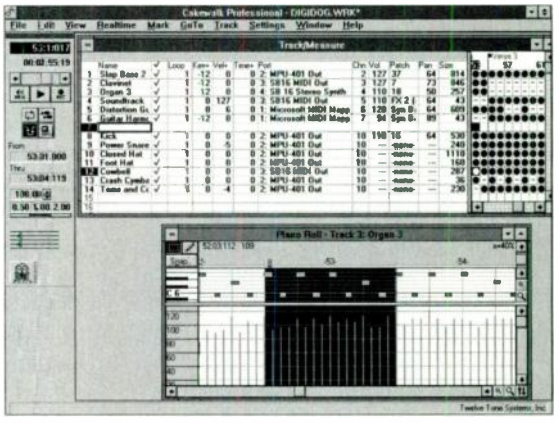

FIG. 1: The Track/Measure View is the program's central work area, with its editable displays of basic track configuration information. Dots in the Measure side of the window (right) indicate the presence of MIDI events. The standard Piano Roll View shows note pitch and duration, as well as Velocity.

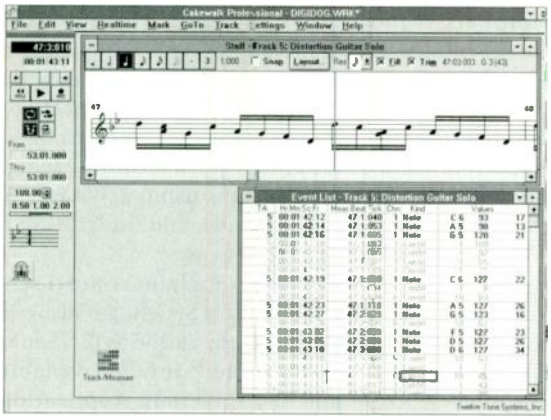

FIG. 2: The Staff View generally provides clear notation, but offers an inconvenient editing environment. The List View facilitates detailed changes down to the individual MIDI event. At the left of the screen, the Control Bar is shown in its optional vertical format, with the Looping and Overwrite icons enabled.

a result, the program loads faster and guzzles less resource memory. For convenience, a new View pulldown menu lets you swiftly add additional Views. If you still want all those Views from the get-go, you can customize your startup to include or omit the Views of your choice. You can choose screen colors, control bar position and appearance (horizontal or vertical layout), and determine the initial window layout.

The multiple window Views are great, especially if you have a 17-inch or larger monitor running at 800 × 600 pixels or higher resolution. To keep you from getting lost in a maze of Views, all Views are updated to the active cursor location in the Track/Measure View. Select a measure there and all Views jump to that location. As a nice interface detail, you can scroll freely through the Event List, Staff, or Piano Roll Views without affecting the current location of other Views. Then, to bring everything back into sync, a mouse-click in any View restores all *Windows* to the same score location.

Real-time options have also been increased in 2.0. During playback, you can use a keystroke to activate recording at any time and replace or merge the new data with existing track data. Although the first release of version 2.0 eliminated the ability to automate a punch-in/out range, Twelve Tone restored it in version 2.01, available free to registered owners. You can also define a MIDI hot-key combination that will activate Record on the fly.

Version 2.0's Loop Recording lets you repeat a defined section while you overlay new versions of the section. The most recent take then repeats until replaced with a new one, or you can layer multiple takes, keeping or discarding the most recent one. You can change tracks or move to any View at any time during Loop Recording, then continue to record and edit MIDI events.

When the performance doesn't match the inspiration, you can now undo recording without enduring 1.0's irritating "Keep take?" prompt. During Loop Recording, "Reject Loop Take" performs the same service. I still prefer a nondestructive, multitake Loop Recording that automatically jumps to the next available track. Although 2.0 doesn't offer it, it's a relatively simple matter to implement multitrack looping using CAL's Macro Recorder.

The Staff View of version 1.0 was welcome, but the lack of printing was frustrating. The good news is that version 2.0 includes multitrack printing in the Event List View and part and score printing in the Staff View. Although the output quality won't exactly compete with *Finale*, you can print with reasonable quality, and it's darn convenient when you need it.

In the Print Preview, output may be configured for nine standard engraver's sizes of 5-line staves, including Commercial or Public; Regular, Common, or Ordinary; and Cadenza. Because the Print configuration options are limited, you get whatever the program gives you in terms of measures per staff and staves per page. However, you can fine-tune output appearance by experimenting with different Staff View duration resolutions and output sizes.

Sometimes the program uses space intelligently and places a few measures on a staff, and sometimes it places just one measure along with a lot of empty space.

A warning: The *Windows* printer driver you're using is critically important to *Cakewalk*'s Print Preview and output. Outdated or defective drivers will create strange and unusual behavior that is not *Cakewalk*'s fault. In my case, the Print Preview initially reversed the Landscape and Portrait views. When one of those page configurations was selected in my Print Setup, Print Preview formatted the screen for the opposite one. Yet it printed the correct Print Setup choice.

The culprit turned out to be an old print driver for my aging Panasonic printer. I updated the driver and, sadly, the problem remained. However, when I selected my HP laser-printer driver or used an Epson driver to run the Panasonic in emulation mode, all was well. Twelve Tone recommends getting the latest *Windows* printer drivers directly from Microsoft. You can do so through the Microsoft library on CompuServe (GO MSL), or by connecting to Microsoft's BBS at (206) 936-6735.

In the Tracks/Measures View (see **Fig. 1**), the Key+ command allows you to record parts in C, then transpose them to whatever key the instrument supports. The correct transposition is automatically reflected in the Staff View and in print-outs.

Interestingly, the Staff View (see **Fig. 2**) has the ability to beam rests, that is, to place a beamed stem over rests when they occur within a group of beamed notes. The favorable argument is that this makes the music easier to read. As

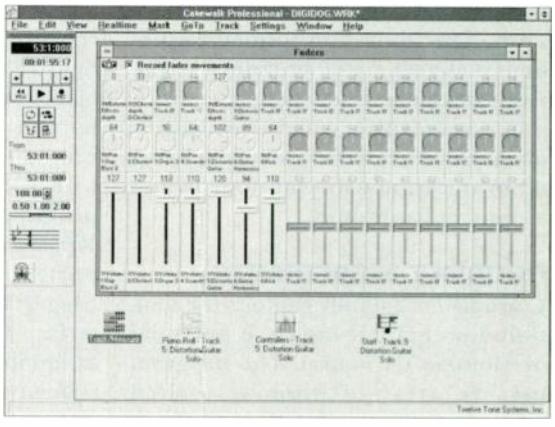

FIG. 3: *Cakewalk Pro* 2.0's Faders screen includes 48 knobs and sliders to mix and pan scores and record controller events in real time. The minimized Views at the bottom of the screen make navigating through the program quick and easy.

a classically trained, paper composer, I think it's stupid and confusing. Sorry. The good news is that the program makes it an option.

Version 2.0 adds triplets to the Staff display, but not "exotic" groupings of five, seven, nine, or more notes. Also missing is a zoom-in/out option, similar to the one in Print Preview. Without it, you must scroll all over the Staff View to see more than a few staves at a time.

For automating an entire musical performance, a new Play List accepts up to 128 songs for consecutive play. To pace your show, you can program pauses between songs of variable lengths, or use a "Wait for Keypress" option that lets you start the next number at the press of a computer key or the OK button. *Cakewalk*'s Key Binding feature lets you remap the OK button (or any other command or CAL routine) to a key on your MIDI instrument for convenient onstage control.

Among other additions to 2.0, the Fader screen (see **Fig. 3**) now includes 48 knobs and sliders for real-time mixing or recording of controller messages. You can drag-and-drop tracks in the Tracks/Measure view. When you click the right-hand mouse button, an expanded Feature menu appears at your cursor, with more view and editing options than in 1.0. Instead of a single

Product Summary

PRODUCT:
Cakewalk Professional for Windows 2.0

PRICE:
$349

SYSTEM REQUIREMENTS:
PC-compatible (10 MHz 80286 or better) with 2 MB of RAM; mouse; Microsoft *Windows* 3.1; *Windows*-compatible MIDI interface

MANUFACTURER:
Twelve Tone Systems
PO Box 760
Watertown, MA 02272
tel. (800) 234-1171
or (617) 926-2480
fax (617) 924-6657

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ●
EASE OF USE	● ● ● ●
DOCUMENTATION	● ● ● ●
VALUE	● ● ● ●

startup configuration, you can now create a library of startup templates. Hot keys can be defined and saved for computer or MIDI keyboard to trigger commands or CAL routines.

On the editing front, Velocity Scale can adjust Velocity to smoothly move from a beginning to an end value, or scale a section by a percentage. Fit To Time lets you specify a tempo change to make the fit, or a shift of event times that leaves the tempo unaltered. And when you're doing time-sensitive work, the program will now show SMPTE time-code values, rather than Measure:Beat:Tick displays. Oddly, that preference cannot be saved permanently but works only on the current session.

There are yet more additions to version 2.0. For example, you can save files in type 0 or type 1 Standard MIDI File format and connect CAL scripts to *Windows*' Dynamic Link Libraries. All the new goodies are spelled out in an appendix in the 284-page, spiral-bound manual.

I WANT MORE

MIDI musicians are so predictable and so hard to please. The improvement of an existing product suggests more possible improvements. I started building a version 3.0 wish list soon after I began enjoying the extras in version 2.0.

Let's start with the manual. On the subject of keyboard commands and equivalents, it can be a little vague. A thorough, context-sensitive listing of all hot keys and all key/mouse command combinations should be added. Without such a list, I had to hunt through the manual to find the existence of some key commands.

Click-and-drag editing is a real timesaver when used with an Event Filter that copies only selected events. However, when I wanted to copy controller events to a new location, I was forced to Blend the data because Replacing the controller data also erased the existing note events. For maximum editing flexibility, Twelve Tone recommends placing controller messages on separate tracks assigned to the same MIDI channel as the corresponding Note Event tracks.

The Staff View is great for paper composers to assess their creation in notation. However, aside from changing note pitch, it's a clumsy environment for editing. Adding notes or trying to change note duration is quite clumsy. A little improvement in note-handling would make Staff View a much more useful tool.

THE ICING

With version 2.0, *Cakewalk Professional for Windows* has matured into a do-everything virtuoso that capably moves between several MIDI recording and editing environments. The program hops easily from multitrack sequencing to notation editing and printing. Whether you're a keyboard improviser or a paper-bound arranger, *Cakewalk Pro for Windows* 2.0 is powerfully prepared to help you do it your way.

That's not to say that the program takes first place in every feature category. Like most jacks-of-all-trades, *Cakewalk Pro for Windows* is more skillful at some tasks than others. For example, its newly acquired notation printing is good, but it can't rival dedicated music publishing software, and Twelve Tone doesn't claim that it does. It's there for the convenience of being able to work in conventional notation.

Similarly, as powerful as *Cakewalk Pro for Windows* 2.0's quantizing features are, particularly when teamed with the search-and-select power of its Event Filter, you'll find hipper quantizing goodies in the Groove menus of Steinberg/Jones's *Cubase for Windows*, not to mention *Cubase*'s excellent algorithmic editing features.

Still, 2.0 goes far to address the majority of your note-manipulation needs. And with the power of CAL, including the new Macro Recorder, you'll be able to create many options to suit your own needs, or add them by incorporating CAL routines developed by other users.

In short, this latest version of *Cakewalk* may lack a few of the ingredients found here and there in other MIDI software, but you'll have a hard time finding another *Windows* sequencer that so deliciously fills the needs of the daily grind professional, as well as the serious amateur. For most PC-based musicians, *Cakewalk Professional for Windows* 2.0 provides a gourmet, multicourse meal.

Bob Lindstrom *is a freelance writer, composer, and conductor who owns one of just about every major type of computer available.*

Circle #439 on Reader Service Card

Lexicon JamMan

By David (Rudy) Trubitt

Lexicon's new delay doubles as a MIDI-savvy, real-time looper.

I refuse to carry a calculator onstage! If I'm going to figure out the Perfect Delay Loop, it has to be done simply and musically. Unfortunately, most effects boxes make creating tightly synchronized echoes an exercise in frustration. Even in the relative comfort of the recording studio, it's tedious to work out musical delay times in milliseconds.

Yet adding a long delay in tempo with the music creates all sorts of interesting harmonic and rhythmic juxtapositions, especially with a sampling delay that lets you loop infinitely while adding more layers. The trick is finding and maintaining the correct delay time during a live performance.

It sure would be nice to have a sampling delay with a footswitch for tapping in tempos. Tap tempo isn't a new idea, but it's not common in effects processors. Even if you had tap tempo in musical durations, would you depend on luck to keep your echoes in sync with your drum machine or sequencer? I thought not. So while we're dreaming, the delay loop should sync to and send MIDI Clock messages.

Happily, Lexicon's engineers have been dreaming along the same lines. The company's unique JamMan effects processor is designed with live performance in mind.

JamMan isn't a multi-effects unit; it only produces time delays, which it uses for echo, sampling, and looping. While tap-tempo echo is a great feature, looping is where JamMan really shines. With this box, you can create a set of grooves for a whole song, complete with a synchronized drum-machine accompaniment, without taking your hands from your axe.

THE PACKAGE

JamMan comes in a single-rackspace package with an external, 9 VAC power supply. Two audio inputs and outputs

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NEW PRODUCTS!

Lexicon's JamMan sampling delay lets you create multiple sampled loops and sync external devices to them using MIDI Clock. You can tap in tempos from a footswitch or front-panel button, and delay times are calculated in terms of musical durations, rather than milliseconds.

are provided, although JamMan is a mono-only device; the second input and output are for passing through a dry stereo signal. Stereo processing would be cool, but for $459, that's extending the dream a bit too far. MIDI In and Out (but not Thru) connectors complete the back panel.

Front-panel audio controls include input level (with a signal-present/clip LED), wet/dry mix, and output level. A data-entry knob adjusts parameters, while a 16-position switch selects Echo mode, Sampling mode, or any of fourteen Loop-mode variations.

JamMan's important real-time controls are accessible via external footswitches. A dual footswitch controls the Reset/Bypass features (discussed later) and the Tap feature, which lets you set the tempo and engage recording. This footswitch comes with the unit. An optional, second dual footswitch provides remote Select and Function controls. You can use any dual, normally-open, momentary footswitch that terminates in a ¼-inch, tip-ring-sleeve plug.

The unit samples at 31.25 kHz, with 16-bit resolution, so the frequency response of the delayed signal tops out around 15 kHz. For many applications (such as electric guitar), this isn't a concern, but keep it in mind.

Aside from the clip LED, visual feedback is provided by a 2-digit LED and a blinking tempo light. The meager display means some operations are obscure. For instance, changing the MIDI receive channel requires an unintuitive procedure in which you hold a button while powering up, then run through several more steps. The biggest problem here is that there's no power switch, so you have to unplug the wall-wart, or switch it at the power strip. This routine must be repeated each time the unit is turned on, because there is no battery backup for user configuration. Depending on the flexibility of the rest of your MIDI rig, this could become a hassle.

The display can show plus or minus signs and a decimal point, which are used to indicate different functions. The functions might be easier to remember if they had labeled, dedicated LEDs. Of course, big

LCD alphanumeric displays cost money, and JamMan is not an expensive device.

ECHOES

Tap-tempo echo is set by tapping a front-panel button, or a footswitch, at the desired speed. You don't even have to tap if you're mixing a MIDI sequence, as JamMan can use MIDI Program Change messages to set delay times.

Having set the basic tempo, you can control all important delay settings via MIDI or footswitches. Delay time can be cut by half, a third, or a quarter to create smaller increments and triplets. Regeneration/feedback level can be changed from a single delay to infinite repeat, or the delay can be bypassed entirely.

Whether playing live or recording in a studio, the speed and convenience of having a front-panel Tap Tempo button is obvious. Instead of painfully scrolling delay-time increment/decrement buttons, just tap twice, and you're done. Every delay unit should have this feature.

GOING LOOPY

The stock unit can sample and play eight seconds of monaural audio. Forward or backward playback can be triggered manually, with a footswitch, or using an audio input-level threshold trigger. You can expand the JamMan's memory to 32 seconds of total delay time, using PC-type ZIP RAM. The 4-chip upgrade is easy to install, but be sure you have a robust, small-head, Phillips screwdriver, as the case's screws are small and tight, and you don't want

Product Summary

PRODUCT:
JamMan
PRICE:
$459
MANUFACTURER:
Lexicon, Inc.
100 Beaver St.
Waltham, MA 02154
tel. (617) 736-0300
fax (617) 891-0340

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ◖
EASE OF USE	● ● ●
AUDIO QUALITY	● ● ● ●
VALUE	● ● ● ●

to strip them.

Simple sampling is useful enough, but JamMan's most exciting and unique feature allows it to be used as a real-time looping accompanist. Play a phrase up to 24 quarter notes long, in any time-signature. Tap once at the downbeat of the phrase and again at the end. Immediately, JamMan starts looping your part, in tempo. While it repeats, you can solo or record new layers to the repeating loop.

The best part is that JamMan *sends* MIDI Clock messages based on the tempo you tap. This means you can trigger a drum machine or sequencer in real time and have it play along in tempo. Of course JamMan isn't playing rhythm patterns; you program those into the drum machine or sequencer's memory.

Fourteen of the sixteen positions on the Mode switch select specific Loop

▼

Lexicon described their MIDI design goal as "plug-and-play."

modes. Seven of these settings define the number of quarter-notes each loop contains (from three to 24, referenced to MIDI Clock) in Punch-in Loop mode. In Punch-in mode, loop-related commands (change loops, enter record, etc.) are acted upon immediately. The other seven positions set the number of quarter notes per loop in Phrased Loop mode, where commands are executed at the loop's end. For example, in Punch-in Loop mode, selecting Replace lets you immediately record over whatever is playing, while in Phrase Loop, Replace puts you into Record when the current loop finishes. Note that any time you change positions on the 16-position Mode switch, all loops are cleared, and there is no way to store samples or loops.

Theoretically, up to eight different Phrases (chord changes or song sections) can be recorded and played back in any order. Practically speaking, using more than two short loops exceeds the unit's eight seconds of memory, so for serious looping, you

need the optional RAM expansion. You also can use Program Changes to automatically fade loops, with preset short, medium, and long fade times. The fade-out is somewhat analogous to changing the regeneration on a standard DDL, in that the actual duration of the fade varies with loop length.

JamMan's multiphrase Looping must be seen in action to be fully appreciated. Under footswitch control, you can improvise multipart, multisection songs without ever taking your hands off your instrument. With the memory upgrade, a complete song's worth of patterns can be created.

As I worked with the device, I made a pleasant discovery. Chorusing has become so commonplace, it's easy to forget that the original purpose was to simulate the sound of two instruments playing in unison. JamMan lets you layer parts in unison by recording a loop and playing along. For many applications, this beats a chorusing device that just provides a modulated time delay of one signal.

MIDI CONTROL

Lexicon described their MIDI design goal as "plug-and-play," and they've hit that mark. JamMan accepts Program Changes 1 to 20 (but not momentary or Continuous Controller messages) to control many of its functions. In Echo mode, you can use Program Changes to MIDI-control the tempo and delay-time subdivisions (divide by 2, 3, or 4). One of the most important features is that in Loop mode, you can trigger any of the eight loops via specific Program Changes. Program Changes also can toggle the Record and Mute features. (The latter stops loop playback and MIDI Clock output.)

I highly recommend using a MIDI foot-controller for hands-free operation. But accessing twenty Program Changes requires a Bank change on most foot controllers, a dance I could do without. It's too bad momentary and Continuous Controller messages weren't used instead of, or in addition to, Program Changes. On many MIDI foot controllers, these messages can be assigned to user-configurable buttons, letting you group your most-often used controls together for convenience. Continuous Controllers also make more sense for parameters such as feedback level; I would much rather

ramp up a CV pedal than step repeatedly on a button.

Overall, JamMan's MIDI implementation is disappointing, considering the extensive MIDI capabilities on most other Lexicon products. However, its limitations don't really get in the way of the unit's most important live-performance operations. Besides, relatively few people exploit the power of complete MIDI implementations. Also, JamMan's minimal display and lack of user-configuration memory would make a more complex MIDI implementation rather difficult.

▼

JamMan's most exciting feature allows it to be used as a real-time looping accompanist.

NOT INSANE

For a dedicated delay device, the JamMan offers plenty of possibilities. The combination of tap tempo and sampling with multiple looping and MIDI Clock send/receive allows complex rhythmic effects you'd have a hard time achieving with any other device. Equally important, using it won't drive you loony.

I've always been impressed with the sonic clarity of Lexicon gear, and the JamMan's audio quality lives up to expectations. You can use it live or in the studio, with no qualms. JamMan is a great scratchpad, too. Tapping your foot, playing some changes, triggering a drum machine—this is the quickest way I've found for instant sketching of patterns and grooves.

Lexicon has delivered an effects processor with unique, *musical* capabilities available nowhere else. Despite a couple of complaints, I can happily recommend JamMan as an excellent creative tool for live performance, songwriting, and mixing. ❁

Circle #440 on Reader Service Card

KRK Model 6000

By Larry the O

Dynamite loudspeakers in a compact package.

Recording studios once built their reputations on big, loud monitor speakers, but today the little guys rule. Small, close-field monitors are standard in control rooms all over the world, and independent engineers often carry their favorite monitors from studio to studio.

KRK got its start during the "bigger is better" days of the 1980s with founder Keith Klawitter's designs for large studio monitors. The company followed the market, however, and now produces close-field designs, including the Model 9000 and Model 7000 (reviewed in the July 1993 **EM**). Recently, KRK unveiled an even smaller monitor, the Model 6000.

"Diminutive" is an appropriate word for the 6000s. They are the most portable speakers I have ever used, a significant consideration for freelance engineers who like bringing their own reference monitors on the job. At approximately twelve pounds with a 13 × 9

KRK's Model 6000 displays excellent imaging and a smooth frequency response that goes lower than most monitors in this price range.

× 10-inch footprint, the Model 6000 is exceptionally small and lightweight, even in the arena of small monitors. It costs a third less than the Model 7000 and, at $649 a pair, is certainly within reach of budget-conscious home recordists in search of quality monitors.

The Model 6000 shares a number of attributes with its older sibling, including its medite construction (finely ground wood particles suspended in resin) and two-way driver system. The new monitor uses a 6-inch polyglass woofer—the Model 7000 has a 7-inch, Kevlar woofer—and a 1.5-inch, Kevlar, inverted-dome tweeter.

The system uses a 2.4 kHz crossover and is wired with 14-gauge wire to prevent low-frequency loss. The rated frequency response is 62 Hz to 15 kHz (±3 dB), with a sensitivity of 89 dB (1W at 1 meter). It can handle up to 75 watts of juice into 8 ohms and delivers up to 106 dB SPL, which in most close-field situations is enough volume to make you resemble the happy couch potato with his hair flying behind him in those Maxell ads.

SOUND JUDGMENT

I put the 6000s to use on several disparate projects. One involved tracking and mixing an album of Celtic harp, vocals, and other traditional instruments. In contrast, I also mixed a remake of the 1960's rock tune "White Bird," with electric guitar, bass, drums, vibes, electric violin, and a vocalist with an extraordinary range.

Not surprisingly, the Model 6000 sounds similar to the Model 7000. In my review of the 7000, I noted the clarity of its imaging, a quality retained by the 6000. The "White Bird" mix, with its numerous layers of instruments, allowed the 6000s to demonstrate their ability to clearly reproduce front-to-back imaging. I often use a combination of relative level, high-frequency rolloff, and direct-to-reverberant ratio to place instruments "in front of" or "behind" other instruments in a mix. Small monitors often lose the instruments that are not as far forward. The 6000s did an admirable job of maintaining audibility for these sources.

The frequency response of the 6000 is quite smooth, with no noticeable "bumps." The Celtic harp, a lap harp that is much different from concert harps, would have quickly revealed problems in this area. Low-frequency response is always the limitation of small monitors; that's just a matter of physics. The Model 7000, with its larger woofer, has more extended low-end response than the Model 6000, but the 6000's low end is more than satisfying. The frequency response of the Model 6000 is lower than most monitors in its class, and the rolloff is extremely graceful. The low end does not simply drop off, but is smoothly tapered.

I work with a wide variety of music and was pleased to find that the Model 6000 has the punch for rock, yet has sufficient delicacy for acoustic instruments. Most important for a close-field monitor, the 6000's sound is well balanced at low, and even barely audible, volumes. (I always check mixes for balance at extremely low levels.) The balance did not change radically for louder playback.

FEEDBACK

I can't say that I have any real complaints about the Model 6000. As with the 7000, the high end lacks the absolute clarity one gets by spending thousands of dollars for a monitor. That aside, it is at least as smooth and clear as anything else in its class.

However, one discovery left me feeling a bit foolish. I took the 6000s to a studio that had bare wires for speaker connections, instead of dual banana connectors. I was puzzled and dismayed when, unscrewing the posts on the 6000's dual bananas, I found no holes for bare wires. Later examination revealed that these holes do exist, but only on the underside of the banana connectors. Silly me.

With the right price, the right size, and balanced and accurate sound, the Model 6000 represents the state of the art in close-field monitoring. If your control room is larger than the typical home studio, you may want to consider the extended low-frequency response and greater power-handling of the Model 7000, or the even more upscale Model 9000. But if you have a small room and an equally small budget (or plan to carry your monitors around with you), the KRK Model 6000 is an ideal choice.

Larry the O *performs with 11:11 and Ascot Jacket and edits sound at Wave Group Sound for the ABC cartoon* Things That Go Bump in the Night.

Circle #441 on Reader Service Card

Product Summary

PRODUCT:
Model 6000 loudspeaker system
PRICE:
$649
MANUFACTURER:
KRK Monitoring Systems
16462 Gothard St., Unit D
Huntington Beach, CA 92647
tel. (714) 841-1600
fax (714) 375-6496

EM METERS	RATING PRODUCTS FROM 1 TO 5
SOUND QUALITY	● ● ● ●
VALUE	● ● ● ● ◖

Neumann TLM 193 Condenser Mic

By Michael Molenda

A royal mic lineage for a commoner's purse.

The timeless quality of Neumann microphones has made them the Ferraris of the recording studio; unfortunately, they have been just as unaffordable. Classic models such as the U87 and U67 cost many thousands of dollars. That's why the only Neumanns you see in the typical home or project studio are usually in framed photos of legendary recording sessions. But Neumann's affordable TLM 193 breaks the legendary mic line out of dreamland.

At a retail price of $1,295, the TLM 193 is still an expensive prize, but street prices put it within reach of the committed recordist. Neumann made this price breakthrough by stripping the mic to its basics. You get one polar pattern—cardioid—and no low-frequency rolloff or input-level pad switches.

Fortunately, Neumann's basics are pretty lush. So what you *do* get is a large-diaphragm, 48V phantom-powered, condenser capsule with a near-silent (10 dB equivalent noise,

A-weighted), transformerless, solid-state preamp. The standard XLR connector has gold-plated pins. Frequency response is rated by the manufacturer at 20 Hz to 20 kHz, and the dynamic range is 130 dB. The TLM 193 stands up to a maximum SPL of 140 dB, which means just about anything except cannon and jet turbines can be miked safely.

STUDIO TEST

Of course, the classic use for the Neumann sound is recording vocals. I used the TLM 193 to record Naomi Ruth Eisenberg performing a remake of her song "Slow Motion Ocean" for *The Infinite Summer of Love* compilation (Taxim Records, Germany). Eisenberg wanted to play acoustic guitar and sing at the same time, which made getting a clean vocal track difficult. The adjustable stand adapter for the TLM 193—the preferable, optional suspension mount was not available for this test—allowed me to position the mic horizontally towards Eisenberg's mouth, and the cardioid pattern proved tight enough to minimize sound leakage from the acoustic guitar.

But even with a little acoustic jangle sneaking into the mic, the TLM 193 reproduced Eisenberg's vocals precisely. I listened to her sing in the vocal booth, then listened to her flat (no EQ) through the mic/mixer/monitor combination and discerned only minimal coloration from the mic. Although I'm used to the high-end crispness of AKG C414 mics, the smooth response of the TLM 193 is a boon for digital tracking, where sizzles and sibilance are often uncomfortably accentuated. (You can always tweak the EQ during mixdown

Product Summary

PRODUCT:
TLM 193 condenser mic
PRICE:
$1,295
MANUFACTURER:
Neumann USA
6 Vista Dr.
PO Box 987
Old Lyme, CT 06371
tel. (203) 434-5220
fax (203) 434-3148

EM METERS	RATING PRODUCTS FROM 1 TO 5
AUDIO QUALITY	● ● ● ● ◖
VALUE	● ● ● ●

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MARCH 1994

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507	526	545	564	583	602	622	641
508	527	546	565	584	603	623	642
509	528	547	566	585	604	624	643
510	529	548	567	586	605	625	644
511	530	549	568	587	607	626	645
512	531	550	569	588	608	627	646
513	532	551	570	589	609	628	647
514	533	552	571	590	610	629	648
515	534	553	572	591	611	630	649
516	535	554	573	592	612	631	650
517	536	555	574	593	613	632	651
518	537	556	575	594	614	633	652
519	538	557	576	595	615	634	653
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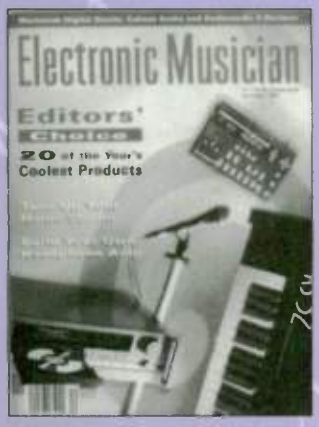

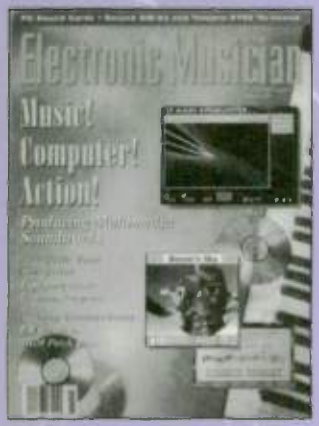

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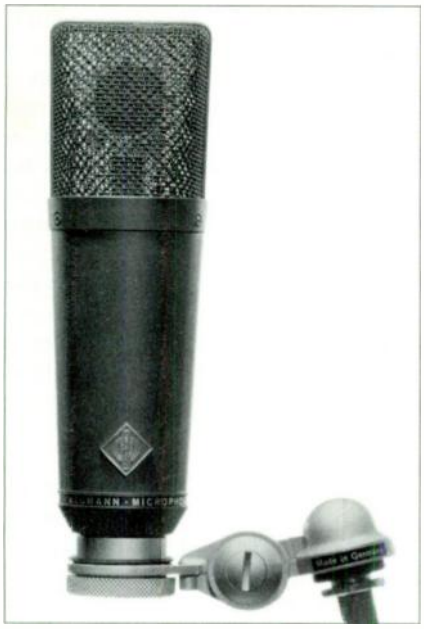


Neumann's affordable TLM 193 large-diaphragm condenser mic bestows the classic Neumann vocal sound on budget-bound home recordists.

if you want more bite on the vocal track.)

I was also impressed by how the TLM 193 tackled a rowdy vocalist. Eisenberg has a vast dynamic range and likes to bounce around while she sings. I didn't want to "tame" the performance with compression, because extreme dynamics are an integral part of her style. Luckily, the TLM 193 handled the situation with aplomb, even when Eisenberg let loose several vocal explosions that pinned the level meters into the red. The mic did not distort. And the TLM 193's articulation is such that it clearly reproduced Eisenberg's sensuous rasp when she dropped the volume to a purr.

When Eisenberg unexpectedly leaned right into the mic (which happened quite frequently), the proximity effect didn't compromise sonic quality. Little pops and plosives were diminished by slightly cutting 100 Hz during mixdown. In addition, low-end rumble from room acoustics was minimal. She bumped into the mic stand once, but the noise was not catastrophic. In fact, I left the collision in the final mix as a nod to the "casual" performance style of the flower-power rockers of the mid-1960s.

I also used the TLM 193 to record a flute track and was wowed at how delicately the mic reproduced the instrument's breathy melodicism. The recorded tracks sounded almost exactly the way the flute sounded in the room. Such accuracy is important when auditioning mic positions. You can get a truer picture of the audio spectrum and jettison the knee-jerk habit of tweaking the console EQ to get the right sound.

Like most large-diaphragm condensers, the TLM 193 sounded great as an ambient mic. I recorded room sounds by placing the mic approximately ten to fifteen feet in front of drum kits, guitar amps, and acoustic guitars. Each time, the TLM 193 returned an extremely organic picture of the instrument in its acoustic environment. Again, the lack of coloration allowed me to play with the close-miked and ambient sounds to produce a pleasing "dry" timbre with a natural room decay.

CONCLUSION

I tried to trip up the TLM 193, and I couldn't do it. I put it in a vocal booth with a dynamically wild singer. It didn't flinch. The mic accurately reproduced every stylistic nuance and didn't distort when the singer fired off rebel yells and vocal crescendos. I put the mic in rooms with fiendishly loud drummers and guitar amps, and it didn't care. It simply recorded the cacophony as clearly as if the room acoustics could be magically routed to tape *sans* microphone. There's no doubt about it: The TLM 193 is a brilliant microphone. It's not cheap, but ask yourself this question: If you could buy a Ferrari for half-price, would you do it? I don't need to tell you *my* answer. (Hop in!) ●

Circle #442 on Reader Service Card

Peavey Autograph II

By Peter Freeman

MIDI control and memory make this graphic EQ a prize.

Sound engineers are trained in a sophisticated dance, reaching far corners of their small world, pulling and pushing faders, twiddling knobs, flipping switches, and even chasing mice. Unless you have a second engineer on hand, you soon come to appreciate the fine arts of remote control and automation. And if you have ever fine-tuned the P.A. in a difficult room, only to begin anew the next time you return, a programmable, MIDI-controllable EQ is very enticing.

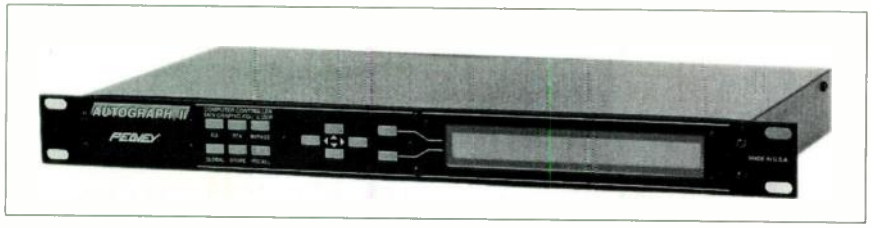
Peavey has long succored recordists and live-sound people on a working stiff's budget. The 1U rack-mount Autograph II is the company's EQ automation solution for the average working musician/engineer. The mono, ⅓-octave, 28-band, graphic EQ offers user-programmable memory, MIDI automation, and real-time spectrum analysis. A subsonic filter attenuates frequencies below 40 Hz, which reduces boominess in P.A. systems. The device even has balanced XLR and unbalanced ¼-inch input and output jacks, although the inputs are combined into a single, dual-function jack, so only one can be used at a time. Although the Autograph II isn't the only programmable EQ available, it is noteworthy because it combines all these functions, smooth performance, and good sonic quality at a reasonable price.

PROGRAMMING FUNCTIONS

Working with the Autograph II is simple. Six front-panel keys access the basic modes: EQ, RTA (real-time analyzer), Bypass, Global, Store, and Recall. There are four directional cursor keys and two Execute keys, which are "soft" buttons for the top and bottom lines of the 40-character × 2-line, backlit LCD display. Up to 128 user-defined and named EQ curves can be stored, with independent level settings, in nonvolatile RAM.

The EQ key displays the current EQ curve on the LCD; bar-graph indicators show the levels of the 28 bands. The horizontal cursor keys navigate from one band to the next, while the vertical keys control the amount of cut or boost (±12 dB, in 1 dB increments). As with many synthesizers, an edit buffer retains the most recently edited curve.

The Autograph II can A/B two curves for immediate comparison and even lets you add two EQ curves to create a new curve. This is useful for situations where one might, for example, want



Peavey's Autograph II provides 28 bands of graphic EQ with program memory. Its real-time MIDI control is a boon to personal and project studios, while a real-time analyzer, low-frequency rolloff, and pink-noise generator make it a flexible sound-reinforcement tool.

to add characteristics of a preexisting curve to the one currently being edited. According to Peavey's rep, this is intended for live applications; for instance, you could combine prepared EQs for a full room and an empty room to come up with a "half-full" room EQ. It seems an odd approach, but a sound-reinforcement engineer might find it handier than I did.

REAL-TIME ANALYZER

The Autograph's real-time analyzer (RTA) and program memory combine to make it an excellent room EQ for touring bands. The unit includes an onboard pink-noise generator, which is patched through the sound system. A room mic is routed to the RTA's microphone input. (The unit is optimized for Peavey's PVR-1 reference mic, but you can use any mic with a relatively flat response.) The real-time analyzer compares the pink noise reaching the room mic with the original pink noise generated by the Autograph II.

You can sample the room ambience at several different locations in the room, and the Autograph will automatically develop an average response curve. Of course, some rooms are acoustical nightmares, with odd sections that have unique sound-reinforcement needs. In such cases, a single, average response curve (on any type of equalizer) could prove a total disaster. But an Autograph II with a custom curve for each of several time-delayed, remote speaker stacks could be a gig-saver.

In addition, you can set target curves, which represent the system frequency response you feel best optimizes the music. You get three general-purpose factory target curves for different-size rooms, but as you're sure to want custom curves to match the band's various musical styles, Peavey provided memory for three user target curves. For example, you could create one curve for hard-hitting rock songs, with a gut-wrenching bass response, and a less radical curve for mellow country ballads. You can perform a real-time analysis on each target curve, and the Autograph II will automatically adjust the system's frequency response accordingly.

The RTA section includes a Feedback Finder, which helps locate the exact frequencies of any feedback in a room. This works by creating feedback in the sound system and feeding a room microphone into the Autograph II. The display immediately jumps to the band nearest to the feedback frequency, facilitating immediate boost or cut.

In another nod toward live-sound applications, Peavey put a security lock in the Autograph II that can limit access to the unit's functions from the front panel, MIDI, or both. (This is one of the few new features added to the original Autograph.) Access is gained by entering a user-selected, 4-digit code. Club engineers and performers will find this invaluable for protecting carefully programmed EQ curves from inebriated instant experts.

If you're in a band and play a regular club or circuit, you'll appreciate being able to save your hard-earned settings for future visits. This is especially convenient for equalizing stage monitors, as the stage acoustics in a venue are generally more consistent from night to night than the main room acoustics, which vary according to the crowd.

MIDI FEATURES

The Autograph II's individual EQ bands and overall gain can be controlled with MIDI Continuous Controller commands, and the unit can dump and load its program memories via SysEx. It can also send out controller messages in response to front-panel keystrokes, allowing two or more equalizers or Automates (a companion single-rack, "guts-only" slave version of the Autograph) to work together.

These messages can also be sent to a sequencer for automated, real-time EQ changes, which is how I used the unit most. Any MIDI fader box becomes a remote controller. You have time to plan subtle timbral changes and repairs at mixdown, so EQ automation can be especially effective then. Changing EQ programs from a computer sequencer worked quite smoothly, as did changing individual band settings.

CONCLUSIONS

I tested the Autograph II with a variety of different instrument sources, from keyboards to basses, drums, and vocals. The unit sounded fine in nearly all situations, except those requiring extreme boost or cut. In these instances, the somewhat "electronic" character of the unit's filters became apparent, particularly on electric bass and vocals. Transitions when changing EQ curves were quiet, with no annoying pops or clicks.

The Autograph II performed well and proved handy in a number of musical situations. I used it mostly as an inexpensive, automated graphic EQ in my project studio. Although it would not be my first choice as a main EQ for lead vocals, I especially liked it as a secondary EQ during mixes.

Alone, or coupled with one or more Automates, the Autograph II is a good choice for sound reinforcement. I found the unit's lack of a power switch and "wall-wart" power supply irritating, but I give it high marks for roadwor-

Product Summary

PRODUCT:
Autograph II programmable graphic EQ
PRICE:
$499
MANUFACTURER:
Peavey Electronics
711 A St.
Meridian, MS 39302-2898
tel. (601) 483-5365
fax (601) 484-4278

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ◖
EASE OF USE	● ● ●
AUDIO QUALITY	● ● ●
VALUE	● ● ●

thiness. It is solid and reliable. The RTA features and target curves make it particularly valuable as part of a P.A. system.

Finally, you can really benefit from the Peavey Autograph II if you sequence instrumental parts for live performance and, like most live acts, have a modest budget. A couple of these gadgets offer a degree of continuous timbral control that could outperform a crack engineer with a trained octopus—hands down.

Peter Freeman *is a freelance bassist/synthesist and composer living in New York City. He has worked with such artists as John Cale, Jon Hassell, Chris Spedding, L. Shankar, Sussan Deihim, and Richard Horowitz.*

Circle #443 on Reader Service Card

Dr. T's Omega II (Atari)

By David Snow

Compositional power without the compromising price.

Despite the recent appearance of the Falcon030, the last few years have been rough on Atari users, given the preeminence of PCs and Macs and a concomitant dwindling of software support. However, Dr. T's is supporting Atari's attempted revival with the release of *Omega II,* a suite of programs that can operate either as stand-alone applications, or as an integrated system under Dr. T's *Multi Program Environment* (*MPE*).

In the original *KCS Omega,* Dr. T's bundled the venerable *Keyboard Controlled Sequencer* (*KCS;* reviewed in the September 1988 and February 1992 **EM**) and *TIGER* graphic editor (reviewed in December 1989) with a new *Song Editor* and a transcription utility called *QuickScore.* The package was part of the company's bid to keep pace with a trend toward integrated sequencing, real-time editing, and notation tools. *Omega II* takes the concept further with the introduction of a graphic *Mixer* module and refinements to *KCS,*

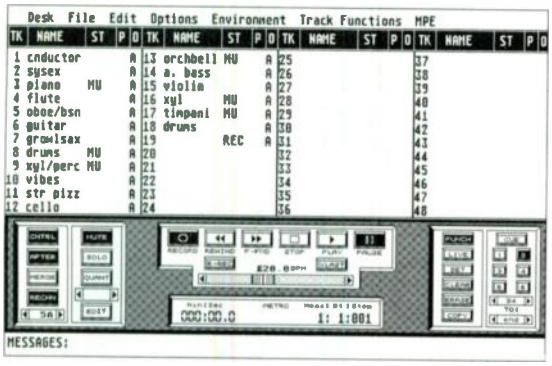


FIG. 1: The Record/Play screen of *KCS'* Track Mode displays each track's name, mute/solo status, and output port assignment.

TIGER, and the *Song Editor*.

Omega II is not copy-protected, runs under all versions of TOS in ST high and medium resolution (I recommend high res), and works with both hard-disk and floppy-only systems. It supports multiple MIDI output ports using Dr. T's Phantom and C-Lab's Export (except with the Falcon030) and imports and exports Standard MIDI Files (format 0 in Open Mode and format 1 in Track Mode).

TRACK RECORD

KCS is powerful enough to suffice as a composing environment by itself, offering two independent modes of operation. Track Mode is a familiar, multitrack tape-recorder emulation. Open Mode is a more complex and flexible system.

The Track Mode Record/Play screen (see **Fig. 1**) displays a Track List of up to 48 tracks in the upper part of the screen and a Control Panel at the bottom. Recording can begin either after a count-in, or upon playing the first note. You can use a computer-generated click or MIDI output as a metronome. Pitch Bend, Aftertouch, and MIDI Continuous Controllers can be selectively filtered from the program's input, and messages from a master keyboard can be rechannelized to accommodate external sound modules. *KCS* can record System Exclusive messages of up to 5,000 bytes in length.

You can set six independent loops; regrettably, you can't set loop points in midmeasure. In addition to punch in/out, the program has a Mute New Tracks feature that allows you to repeatedly record over a looping section; each take is saved in its own track and muted at the end of each loop. A versatile Live Edit feature lets you modify a previously recorded track in real time by selectively deleting notes, substituting notes from another track, or changing Velocity values. Another handy real-time edit lets you shift a track forward or backward in time by increments of one, three, or twelve steps.

As useful as these features are, real-time editing is not the sequencer's forte. Detailed track editing is done in the Track Mode Event List (see **Fig. 2**), where *KCS* reveals its ancient pedigree. Unfortunately, switching from the Record/Play screen to the Event List automatically halts playback.

Editing options are fairly comprehensive and reversible. Tracks can be modified by cutting and pasting, typing in new data, and exercising menu options that increase, decrease, scale, invert, clip, time-reverse, and rechannelize data. Rhythms can be compressed and expanded by fixed ratios, or "scrunched" with a new option that creates rhythmic acceleration and deceleration without changing tempo. Only "hard" quantization is available in *KCS*, although a new feature lets you maintain the time relationship between quantized Note Ons and associated controller gestures.

With controller chasing, you can start playing a composition at any point, and the designated controllers will be updated to their most current values at that point of the piece. A well-implemented Chase setup allows you to designate up to 64 different MIDI controllers, including Program Changes, Pitch Bend, and aftertouch.

Step-time recording is supported in Track and Open Modes. Notes are entered from a MIDI keyboard, and time and duration values are set with the computer. Velocities can be entered either from the computer or via MIDI. Timing resolution is adjustable from 1 to 384 steps per beat. Record quantization can be set to any arbitrary value.

The sequencer locks to MIDI Time Code, or to SMPTE via Dr. T's Phantom synchronizer. (The Phantom does not work with the Falcon030, however.) *KCS* also supports MIDI Machine Control for remote operation of a suitably equipped tape deck, but I was not able to test it.

HITTING THE OPEN MODE

The obvious advantage of Track Mode is that it lets you manipulate individual tracks; the corollary disadvantage is that there is no way to modify all tracks as an aggregate. This can be accomplished in Open Mode, which also supplies other important features. An Open Mode sequence is a multichannel list of MIDI events. Multiple tracks can be merged into an Open Mode sequence and edited in an Event List, then reconverted to multitrack format, if desired.

Open Mode allows up to 126 sequences (the maximum *KCS* can hold in memory) to be played consecutively, or simultaneously, in any order. The tempo is global, however. You can even record a new sequence on the fly while other sequences are playing.

The unique power of Open Mode is predicated upon the use of Control Events, playback instructions that can be inserted into a sequence's Event List. Control Events direct the playback of other sequences via Start, Stop, Loop, Mute, Unmute, Transpose Pitch, and Transpose Velocity commands.

A simple application of Open Mode is to create sequences for the different parts of a song (intro, verse, chorus, bridge, etc.) and play them consecutively under the direction of a Control Sequence consisting entirely of Control Events. To make matters more interesting, a group of additional Control Events introduce randomization and "flow control" (looping, branching, conditional execution) into the

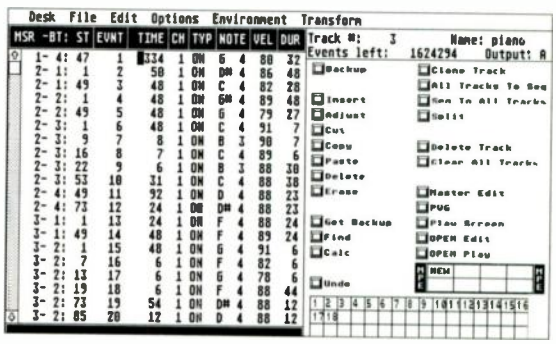


FIG. 2: The Event List is the principal editing environment for *KCS'* Track Mode.

playback process. This is where *KCS* stands apart.

WEIRD AND WONDERFUL

Two versions of *KCS* are included in *Omega*. *KCS* Level II contains all the features of plain-vanilla *KCS* 5.0, plus the Programmable Variations Generator (PVG) and the Master Editor, which are accessed through Track and Open Mode Event List screens. Level II requires more memory, so use the smaller version if you are short on RAM.

The Programmable Variations Generator is a set of logical editing tools that modify and generate track and sequence data. Most PVG operations can be applied to any or all of a note's parameters, which can be modified by fixed or randomly variable amounts and rearranged. Probability weights associated with each edit determine the degree of randomness involved.

This level of programmability allows edits as simple as fixed-value pitch transposition, or as complex as repeated pitch remapping with simultaneous Velocity-value rotation and duration-value swapping (which you can't do with any other program I know of). Because a particular operation might involve pages of numerical parameter setting without graphic aids or interactivity, using the PVG is not exactly an exercise in intuitive music-making, but it is powerful.

The Master Editor is an additional

Product Summary

PRODUCT:
Omega II
PRICE:
$199
SYSTEM REQUIREMENTS:
Atari ST, Mega, TT, or Falcon030 with 1 MB of RAM (2.5 MB recommended); any TOS
MANUFACTURER:
Dr. T's Music Software
124 Crescent Rd.
Needham, MA 02194
tel. (800) 989-6434
or (617) 455-1454
fax (617) 455-1460

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ●
EASE OF USE	● ● ●
SOUND QUALITY	● ● ● ◖
VALUE	● ● ● ● ◖

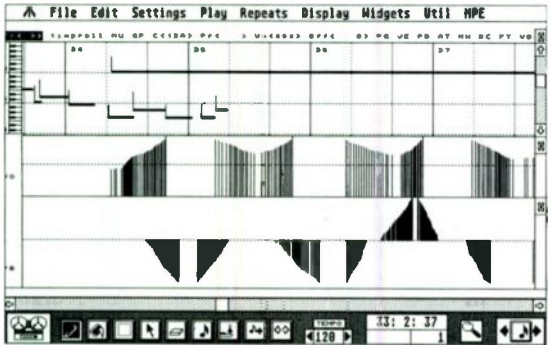


FIG. 3: *TIGER* lets you display notes and controllers separately for graphic editing. Here, a sampled timpani roll (top) is modulated by MIDI Volume (middle) and Pitch Bend (bottom).

set of utilities that process track and sequence data. You might want to familiarize yourself with them before attempting to tackle the PVG, because they are easier to apply. The Master Editor offers six editing pages: Blend (substitute data from a reference sequence into a target sequence), Chords (sort, adjust, and rechannelize chord notes), Controllers (split, erase, and thin controller data), Tempo Changes (change tempos by ratio and convert accelerandos/decelerandos into absolute tempos), Track Utilities (insert and delete space into Track Mode tracks), and Pitch Map (substitute designated pitches, Velocities, and channels with specified values).

ENVIRONMENTAL ISSUES

The *Multi Program Environment* (*MPE*) is Dr. T's proprietary program-switching system that allows up to eight programs ("modules") to share memory and data with *KCS*. A minimum of 2.5 megabytes of RAM is required in order to load Level II *KCS*, *TIGER*, the *Song Editor*, and the *Mixer*. Computers with only 1 MB of RAM can accommodate one *MPE* module at a time, but you can unload a module and install a new one at any time. You can also instruct *KCS* to auto-load modules upon bootup. I have experienced occasional system crashes while switching from one module to another, but in the absence of a truly universal Atari multitasking system, *MPE* is about as efficient a working environment as you'll find.

QuickScore, which only runs under *MPE*, transcribes Track Mode sequences into music notation. Transcriptions are derived exclusively from track data, so you need to create a customized version of your sequence edited specifically for notation, particularly with regard to quantization, note durations, and instrument ranges.

Once the sequence is tweaked, *QuickScore* allows each notated track to be further customized by clef, key signature, stem direction, beaming, and transposition. You can quantize the displayed rhythm of a track without modifying the original sequence, but *QuickScore*'s built-in quantization is limited to duplet values ranging from quarter notes to 64th notes. The program can extract parts.

QuickScore is extremely limited. It will only transcribe the first sixteen tracks of a Track Mode sequence. Screen redraws can be slow, and the program does not transcribe text, dynamics, or articulation markings. It incorrectly places a time signature on every score system, yet won't display meter changes within a sequence—you get the picture. *QuickScore* is a nice bonus, but users who require serious notation tools are strongly advised to look elsewhere.

TIGER, TIGER, BURNING BRIGHT

Running *The Interactive Graphic EditoR* (*TIGER*) under *MPE* endows *KCS* with real-time graphic editing of tracks and sequences. The program's only screen (see **Fig. 3**) is primarily composed of one to three Track windows that display data in piano-roll format. Notes are symbolized as horizontal bars whose length indicates duration. A vertical stem at the start of each bar indicates Note-On Velocity. Each Track window can also have one or more subwindows attached to it that display controller data.

All parameters can be edited while the sequence is playing. A Mouse Position Indicator displays the cursor's horizontal position as a time parameter (either measures:beats:steps, minutes:seconds, or SMPTE). The vertical position is a pitch, controller value, or tempo value, depending on the type of window or subwindow the mouse is placed over. Nine Tool Buttons near the bottom of the screen determine the function of the mouse.

The horizontal time scale of the screen display can be adjusted from a few beats to the entire length of the sequence by clicking on the Zoom icon. A horizontal scroll bar below the Track window lets you jump directly to any location in the sequence. An Information Line above each Track window reveals its track number, mute status, channel, initial Program Change number, and initial Volume value, all of which can be modified. An Offset control moves the track forward or backward in time by single steps.

Controller buttons above each Track window open up subwindows that display controller data. On the left edge of each Track window is a keyboard that indicates the window's pitch range or, in the case of a drum track, a list of drum names.

TIGER reserves the first track of any sequence for tempos and time signatures. New meters can be inserted anywhere in a sequence simply by clicking in track 1's Time Signature subwindow. Like controller data, tempo changes are graphically drawn in their own subwindow, making it easy to program accelerandos and decelerandos in real time.

IN THE BELLY OF THE BEAST

Any number of notes in a single track can be selected for editing individually, in a contiguous group, or in discontiguous groups. Menu options permit you to select notes according to specified pitch, Velocity, duration, or time. Once selected, notes can be repositioned in pitch or time using the mouse

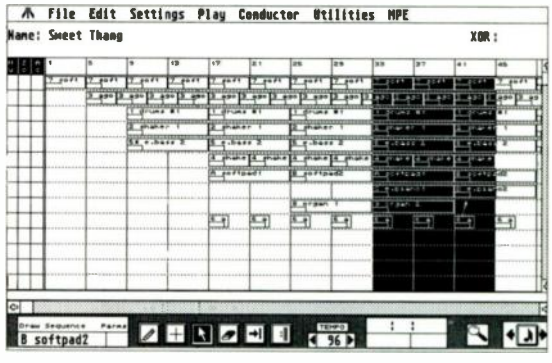


FIG. 4: The *Song Editor* can be used to graphically construct multitrack compositions. Each track shown here is composed of consecutive Open Mode sequences.

or computer keyboard, or quantized, mangled, and massaged with menu options. Selected notes can also be cut or copied to a buffer, with several paste options available. Thankfully, all edits are reversible.

TIGER also offers interesting recording and edit functions via MIDI. The contents of the cut/copy buffer can be pasted into a track, in real time, under MIDI control. Pasted pitches are automatically transposed to a note played on a MIDI master controller, and pasted Velocity values can be shifted to correspond with the played Velocity. The MIDI Note Edit option allows you to replace the pitch and Velocity data of a track via MIDI without affecting its rhythm.

▼

In the absence of a truly universal Atari multitasking system, *MPE* is about as efficient a working environment as you'll find.

If you've ever attempted Event List editing of MIDI controller data, you'll appreciate the graphic approach. You can open subwindows for any type of controller and display several subwindows simultaneously. Data can be edited and drawn with the mouse, or modified by key and menu options. Especially handy is an Interpolation feature that draws linear data ramps between two or three points. *TIGER* also lets you manipulate Note-On Velocities and Program Changes in subwindows in the same way as you edit controller data.

As a convenient option, MIDI Program Changes can be displayed by patch name, as well as number. To do that, however, you must provide *TIGER* with the names of the patches stored in your synths, a tedious task if done manually. Unfortunately, a utility program supplied with *TIGER* that was supposed

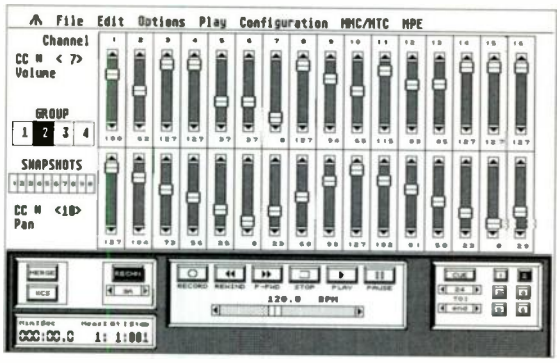


FIG. 5: The *Mixer* allows you to inject MIDI controller data into tracks and sequences. Faders can be configured in groups, and fader settings can be stored as snapshots for instant recall.

to automatically extract this information from librarian files did not work as advertised on the Falcon030.

The program offers numerous block-edit functions that are not available in *KCS*. There are options for quantization with "swing" and for quantization to a reference sequence. Partial quantization options provide a handy tool for correcting notes that are way off the mark, while leaving small "human-sounding" inaccuracies intact.

Other block-edit operations modify pitch, Velocity, durations, and controllers in a fashion similar to *KCS*, but they can be performed in real time. A Compare feature lets you toggle between two different edits without stopping playback, and edit-parameters can also be stored as presets for instant recall.

Rounding out *TIGER*'s editing arsenal are note remapping, replacement, and randomization operations that selectively substitute notes within a track. *TIGER* also includes a cryptic function called "Fill," which features a nasty dialog box brimming with edit fields and buttons that will have you scurrying for the manual. The Fill function is a pattern generator with quantizing and randomizing elements, using single notes, extended phrases, or whole sequences as the pattern source. Like the Programmable Variations Generator, it's one of those black holes you can spend years exploring if you're sufficiently dedicated.

ALL FOR A SONG

The *Song Editor* is a graphic environment for arranging Open Mode sequences. Sequences are displayed on-screen as rectangular bars (Sections) set against a horizontal time grid. Sections can be added to and removed from the display, shifted in time, and modified in pitch transposition, Velocity level, and duration. Each Section can be instructed to repeat itself a set number of times, or to randomly skip playing a certain percentage of the time. Up to 62 independent lines of consecutive Sections can play simultaneously, each with its own mute and solo settings. Most edits can be performed while the song is playing and are immediately reversible.

The *Song Editor* can be applied in several ways. If you create Open Mode sequences that are sections of a larger musical work, you can string them into a complete piece, then painlessly rearrange them without altering the sequence data itself. Another approach is to create Open Mode sequences of individual instruments (see **Fig. 4**) and layer them in the *Song Editor* as a multitrack composition. A composition assembled in the *Song Editor* can be converted into an Open Mode sequence for playback within yet another song, or for additional Editing within Open or Track Mode.

The *Song Editor* is also suitable for live performance. You can construct an unlimited playlist of songs that can be triggered in response to Program Change or Song Select messages transmitted by a remote MIDI device.

MIX MASTER

The *Mixer* (see **Fig. 5**) is an *MPE*-only module that records and edits MIDI controller messages in Track and Open Mode. Its most obvious use is to generate MIDI Volume and Pan messages, but it can be programmed to transmit any type of Continuous Controller and can be configured to automate hardware mixers that respond to MIDI controller data.

For MIDI mixing, the program's 32 graphic faders are configured as two separate, 16-fader banks, each either transmitting one continuous controller on sixteen MIDI channels, or sixteen different controllers on a single channel. For automating MIDI-controllable mixers, the faders can be configured as a single bank transmitting consecu-

tively numbered Continuous Controllers on a single channel.

The *Mixer* stores six independent setups, each consisting of a selected fader-bank configuration with its associated MIDI channel, Continuous Controller, and output port assignments. Each setup also stores four fader group assignments. The relationship of fader movements within a group can be linear or proportional, and faders can be designated to crossfade. Each setup also stores ten fader-position Snapshots for recall.

The graphic faders aren't large, but they are responsive and easy to mouse-jockey. A programmable MIDI Thinning option limits the density of data each fader spews in order to prevent overloading the MIDI datastream. In Track Mode, controllers can be recorded either on a separate track or automatically merged with existing tracks. The faders automatically follow recorded controller moves during playback, but you can grab a fader at any time and re-record its data.

FINAL THOUGHTS

Choosing a sequencer is like buying a house: You had better be comfortable with it, because you're going to spend a lot of time living there. Although *KCS* itself feels a bit old-fashioned, within *MPE* it does its job; *Omega II* can handle any compositional task you throw at it.

This suite of programs is deep, and *Omega II* is overkill for beginners. But the learning curve for the main features is not steep, and those who are willing to work at it will be amply rewarded. The documentation is comprehensive and easy to grasp (albeit with a few errors), and you can learn and use only whatever parts you need. Some composers will opt to work exclusively within the familiar confines of *KCS, TIGER,* and *Song Editor,* while others will devote themselves to the arcane mysteries of the PVG and Control Sequences. It's to *Omega*'s credit that it can accommodate a range of musical and work styles.

Composer/MIDI soloist **David Snow** *was voted* Musician *magazine's "Best Unsigned Band" by judges Don Was, Bootsy Collins, Chrissie Hynde, and John Hiatt.*

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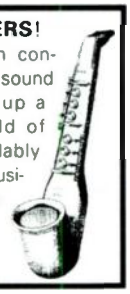

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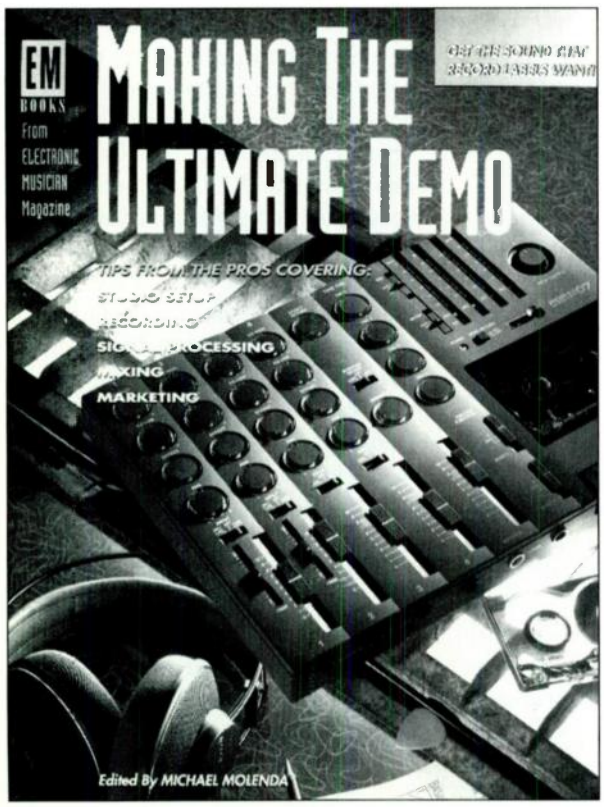

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TECH PAGE

PowerPC

Personal computers climb the evolutionary ladder.

By Scott Wilkinson

In the decade since the Apple Macintosh was first introduced, it has evolved from an underpowered "concept" computer to a mighty multimedia machine. Similarly, the IBM PC and clones have grown from humble beginnings to their reigning glory through five generations of central processing units (CPUs).

According to most industry pundits, the performance of Motorola's 680X0 and Intel's 80X86 families has reached a plateau. As a result, both companies have been working feverishly to produce a new generation of faster, more powerful chips for personal computers. Intel is banking on its Pentium processor, which is fully compatible with existing 80X86 software. However, IBM is hedging its bets by teaming up with former rivals Apple and Motorola in a joint venture that has spawned a new breed of microprocessor: the PowerPC.

The PowerPC is a reduced instruction-set computer (RISC) processor, as opposed to the 680X0, 80X86, and Pentium, which are complex instruction-set computer (CISC) processors. At first, this may seem to be a drawback. Why would you want to reduce the instruction set of a processor?

To begin with, a reduced set of instructions is easier and faster to implement. In addition, the PowerPC uses instructions that are uniform in size, unlike most CISC processors. Simplified memory addressing also speeds things up, and there are many registers onboard to minimize data transfers between the processor and external memory.

The first PowerPC processor is the MPC601. It employs a 64-bit external data bus and 32-bit address bus, which provides direct access to 4 GB of physical memory. An integral memory management unit (MMU) handles 52-bit virtual addresses, allowing up to 4 terabytes of virtual memory.

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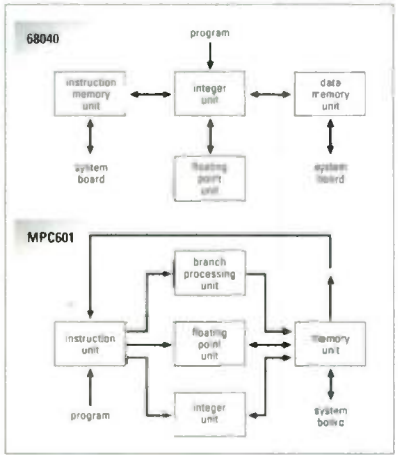

FIG. 1: The 68040 architecture (top) includes two execution units and separate data and instruction memory units, which pass information serially from one to the other, sometimes resulting in a bottleneck. The MPC601 architecture (bottom) includes three parallel execution units and a single memory unit that can process information simultaneously and independently.

The MPC601 is more efficient than the 68040 (see **Fig. 1**). Its instruction unit holds eight instructions, sending up to three instructions per clock cycle to three parallel execution units. The branch-processing unit looks ahead and decides which set of calculations to execute before they're required, thus reducing the overhead of performing unneeded calculations. The floating-point unit (FPU) operates independently from the integer unit, making it much faster than 680X0 FPUs. All three execution units can operate simultaneously, processing instructions in any order. The results are assembled in the correct order after processing, so an idle execution unit can park its result in a register and work on something else while another unit finishes its instruction.

In addition, the MPC601 has a large onboard cache (32 KB) to hold frequently used instructions and data, reducing the delays associated with getting them from system memory. When the processor transfers information to and from system memory, the 64-bit data bus accommodates twice as much data per clock cycle as the 68040, which has a 32-bit data bus.

Many applications will benefit from the PowerPC, including real-time processing, interactive collaboration, and A/V functions. All of these applications will be of critical importance to electronic musicians in the years to come, making the PowerPC a formidable new species in the web of computer life.

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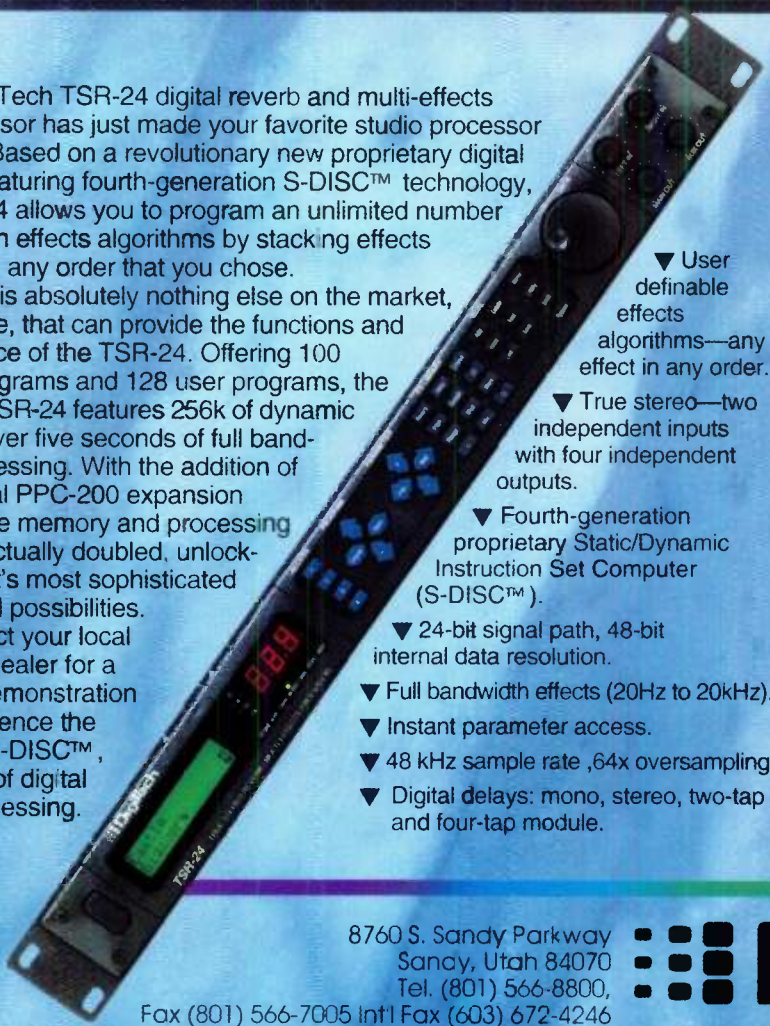

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True synchronization is now affordable for every studio, from project to professional. Get the best for your digital system. Connect with the digital timepiece.

Motu Audio

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