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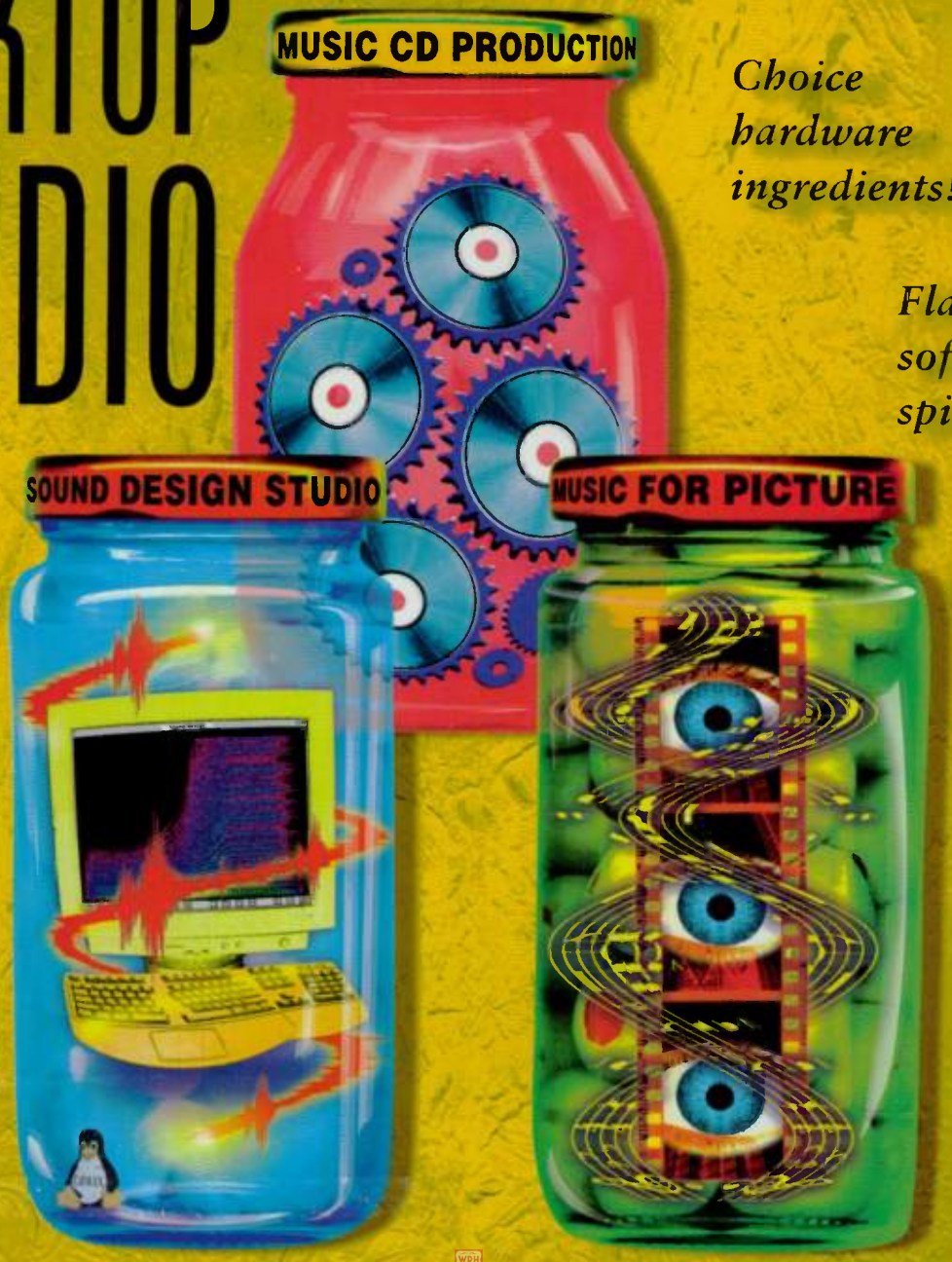

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WHY DOES THE RESPONSE OF BECAUSE IT'S

WHERE'S THE EXTRA SUBWOOFER?

Greg Mackie and his team were recently invited to present the Digital 8•Bus to Britain's top engineers and producers in the "A" rooms at two of the world's most famous recording studios. Of course we used HR824 active monitors.

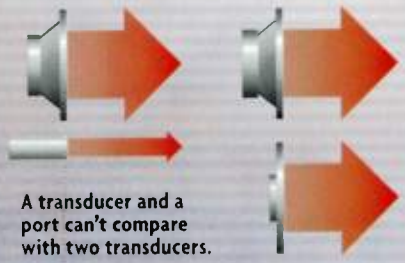
When the presentations were over, many of the veteran engineers were astonished to learn that they had been listening to 8-inch monitors instead of the studio's Big Speakers. Some even so far as to touch the house monitors' 12 and 15-inch cones while the HR824s were playing. They just couldn't believe the bass output from such a compact box.

TIGHT, RESPONSIVE BASS FLAT DOWN TO 39HZ. Reviewers and owner's warranty card responses are unanimous: The HR824 has the most accurate bass they've ever heard from an 8-inch monitor. And the **quality** is as astonishing as the quantity. Fast low frequency transients like kick drum slaps and electric bass notes have a crisp articulation that makes other monitors sound like mush.

Last fall we won the pro audio industry's coveted TEC Award for best near field monitor. Modesty prevents us from listing the impressive field of competitors but you'll probably encounter their ads in this magazine.

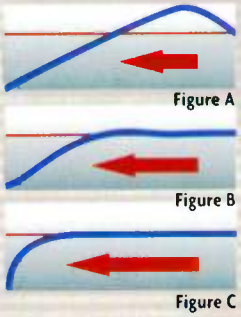
ANOTHER TRANSDUCER INSTEAD OF A PORT.

The more LF transducer cone area a speaker has, the more bass it can produce. But a huge low frequency transducer isn't an option on a compact near field monitor. To augment primary bass output, other monitors resort to using ducted ports that can convert cone movement into extra low frequency air movement. But for optimal output, a ducted port needs to have the **same area** as the low frequency transducer. In other words, an 8-inch near field monitor would need an 8-inch vent. Needless to say, you haven't seen any vents this big on our competitors' near field monitors. When vent size is reduced to maintain compact enclosure size, bass output is compromised. And, forcing a lot of energy out of a couple of small ports can create audible wheezing and whooshing.



A transducer and a port can't compare with two transducers.

Instead, the HR824 adds a large passive transducer with the cone area of another 8-inch woofer. Occupying the entire rear panel of the monitor (see photo below), this ultra-rigid honeycomb laminate piston tightly couples with the 824's active bass transducer. With a combined cone area greater than a single 12-inch woofer, you get exceptionally extended bass without port noise complaint.



Pushing out the curve: redistributing LF energy with synthesized mass.

SYNTHESIZED MASS AND OTHER STORIES.

The cool thing about an active speaker system is that you can basically rewrite laws of physics that otherwise limit passive speaker designers.

A low frequency transducer's free air response graph looks like a bell curve—it's most efficient in the mid band (Fig. A above). To flatten the curve (and extend low bass), you have to proportionally reduce higher frequency output. Acoustic designers use all sorts of tricks to do this—and usually end up with response something like Fig. B.

The most effective way to "shape" an LF transducer's output would be to increase its mass (cone weight). But for designers of traditional passive speakers, adding mass hasn't been a practical option since it would dramatically slow down the woofer's transient response.

Rear view: The HR824's electronics conceal an ultra-rigid, honeycomb composite passive transducer.

HR824 HAVE THE MOST ACCURATE BASS ANY 8-INCH ACTIVE STUDIO MONITOR? REALLY A 12-INCH MONITOR IN DISGUISE.

Because the HR824 is internally powered (active), we could precisely control parameters that normally occur outside of the loudspeaker. Greg and the engineering team were able to create an electronic "symbiotic relationship" between the low frequency transducer's voice coil and its FR Series amplifier voltage output. At mid-band frequencies, the woofer "sees" extra synthetic "electronic mass." This effectively pushes out its lower bass response without compromising its lightning-fast transient response (Fig. C).

MASSIVE POWER THAT WOULD PROBABLY POP A PASSIVE MONITOR.

Punching out crisp bass requires a lotta watts. The FR Series™ high-current bass amplifier module inside the HR824 delivers a solid 150 watts of power with peak output in excess of 250 watts (plus another 100 watts for mid and treble). That's significantly more than any other 8-inch active monitor. Moreover, the HR824's servo coupling and ultra-short signal path put that power to work far more effectively than a passive monitor and a 250-watt stereo amp could.

PART OF A TIGHTLY-INTEGRATED SYSTEM. Our servo bass system is only one contributing factor to the HR824's amazing accuracy.

Internal power amplifiers are "fed" by phase-accurate, low distortion electronic circuitry instead of a crude coil-and-capacitor passive crossover. The HR824's proprietary logarithmic wave guide not only widens treble dispersion but also smooths the midrange transition between high and low-frequency transducers. At the critical 3500Hz crossover point, the alloy HF transducer's output is acoustically the same diameter as the LF transducer's output, thanks to the wave guide's flaring design (refer to the actual HR824 photo on the other page, not our ad folks' fanciful rendering at left).

Indirectly, the HR824's LF transducer even contributes to high midrange accuracy. In many monitors, woofer cone harmonic vibrations bounce around inside the enclosure and then exit through the thin woofer cone. The result: smeared imaging and muddled details. Instead of a chintzy chunk of fluff, the HR824's enclosure is utterly packed with high-density absorbent foam. Cone vibrations go in, but they don't come back out.

DON'T SKIMP. It's amazing how many studio owners will mortgage the farm for money-is-no-object, esoteric microphones... and then monitor on cheap, passive loudspeakers. If you aren't using ACTIVE near field monitors, you're seriously compromising your creative product.

We urge you to visit your nearest Mackie Designs Dealer and seriously audition **all** of their active monitors with some demanding, bass-rich program material. Judge our claims (and those of our competitors) for yourself. We think you'll agree that the HR824 is truly the best of the best.

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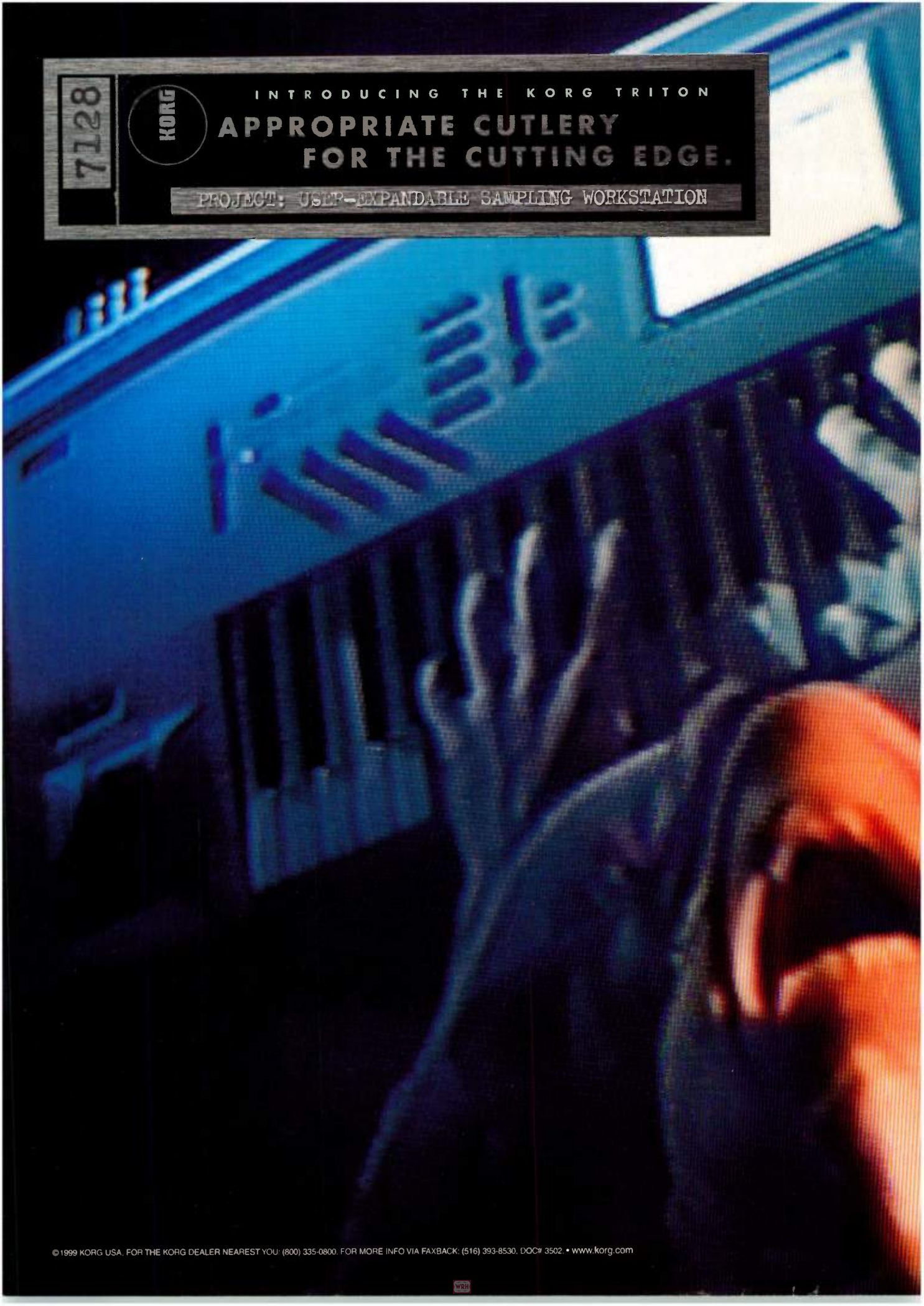

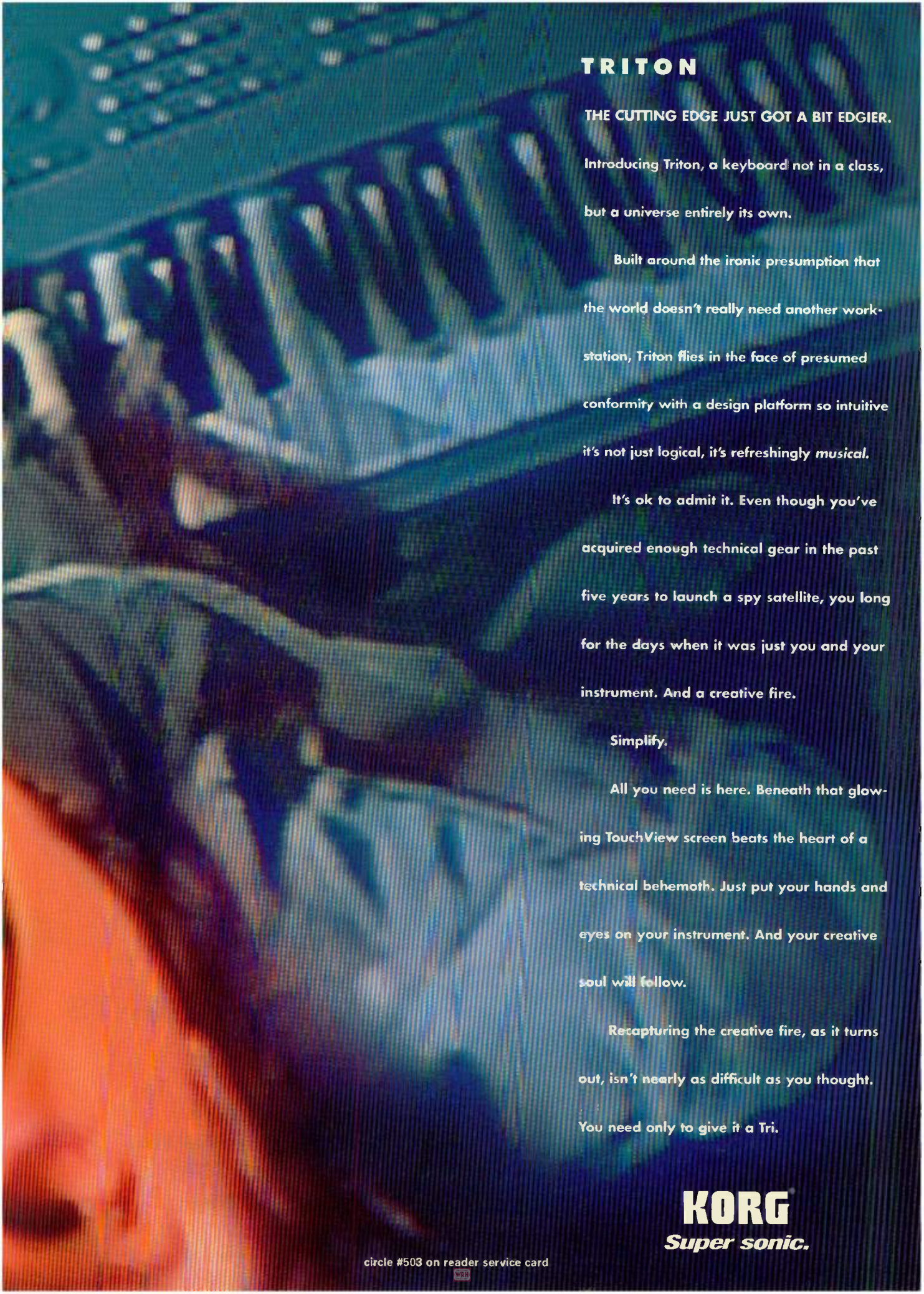

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Recapturing the creative fire, as it turns out, isn't nearly as difficult as you thought. You need only to give it a Tri.

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COLUMNS

REVIEWS

Cover: Photo illustration by Ben Fishman

Walk the Plank!


ANTHONY PIDGEON

I firmly believe that people should take responsibility for their actions and decisions and should allow other people their right to do the same—and this includes making mistakes. You can advise someone; you can even preach. But ultimately, you must allow people to make choices and to accept the responsibility for making those choices.

Taking responsibility for one's decisions also includes considering whether the decisions are morally sound. (Yes, I used the "m" word!) Of course, moral values vary greatly among cultures, and our complex, multicultural society fosters differing opinions about what is acceptable. I think we can agree, however, that theft is generally considered unacceptable behavior.

Yet thievery has become a common occurrence within the music industry. For example, the amount of pirated DSP plug-in software is so great that certain developers and distributors are reconsidering whether selling plug-ins is worthwhile. The same problem exists for other types of music software.

Some hackers even defend their piracy as striking a blow against big corporations. "We're the Jesse Jameses of the '90s," they proclaim. Hooey! I hope these people remember that Jesse James was shot in the back of the head by a supposed friend. *Sic semper banditos!*

One musician I know uses samples from music CDs in his own music and never pays royalties. He says that he'll worry about paying when he makes enough money from his music to risk getting sued by the record labels. I have heard a similar argument made for pirating commercial sample CDs: people say that they will pay once they make money using the samples. Following that logic, I can go steal a new computer and pay for it only if the cops are closing in, or when the computer helps me make more money—and only if I feel like it. I think not!

Similarly, the amount of music distributed illegally on the Web in MP3 format is amazing. That could be *your* music getting pirated. Yet some musicians are right there with the fans, taking what they want because they can.

For the most part, these pirates seem like average, reasonable folks. They could be members of your band. Maybe they're even you. We're not talking about swashbuckling buccaneers or compulsive maniacs. My guess is that few of them shoplift and most would be outraged at being compared to common pickpockets and thieves. They won't deal with the fact that in actuality they are thieves, and the products they steal are part of other people's life work.

Although the pirates are undoubtedly a small minority, they are doing tremendous damage. Aside from the moral issues, piracy hurts us all because it forces manufacturers to raise prices. Manufacturers are having to respond with collective action in the form of organizations such as Copyright Control Services (www.copyrightcontrol.com). CCS is campaigning for legal action against software pirates who break copyright laws by distributing unlicensed software. The organization is also going after audio professionals who knowingly use pirated software.

But legal action addresses only part of the problem. Each of us should examine our own actions and make sure we do not let our appetites obscure our sense of right and wrong.

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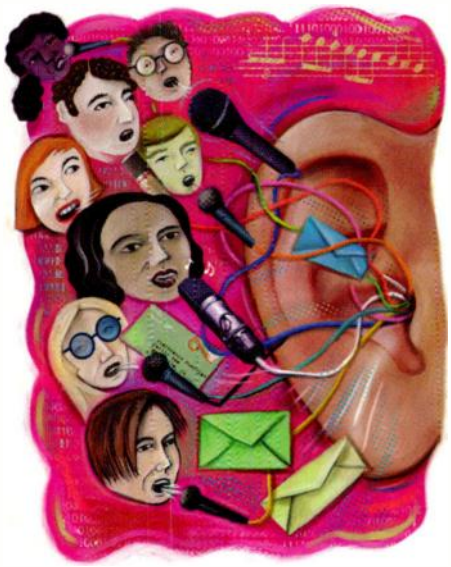

THE NEW MIDI?

I've heard from many sources that there is a new standard, called 1394mLAN, coming to replace MIDI. I've seen Yamaha's EX series advertised as "1394mLAN ready." What is this, and is it really going to replace MIDI within the next few years? Will it be compatible with current MIDI devices?

Piotr Szewczyk
Cincinnati, OH
piotr3@yahoo.com

Piotr—Actually, mLAN is Yamaha's implementation of IEEE 1394 (aka FireWire), an up-and-coming high-speed serial interface that's making inroads throughout the computer and consumer-electronics industries. However, I don't believe that it will replace MIDI any time soon. For one thing, IEEE 1394 is merely a means of getting information from one device to another very quickly; it has nothing to do with the nature of that information. Replacing MIDI would mean devising an entirely new MIDI spec with a new data format and higher bandwidth, which I don't see happening for quite a while. When this does occur, the "new MIDI" will undoubtedly use whatever interface standard seems appropriate at the time.

The IEEE 1394 interface is certainly capable of carrying MIDI data in addition to digital audio, video, and other types of data. Any current MIDI device could be connected to a 1394 bus with an appropriate "bridge" box that has MIDI ports on one side and a 1394 port on the other side. In addition, the 1394 interface could be very useful for connecting a computer to a multiport MIDI interface, because it's much faster than RS232. For more on mLAN, see "Tech Page: Fire in the Wire" in the July 1996 issue, which is available in the Article Archives section of **EM***'s Web site (www.emusician.com).—Scott W.*

MAGNETIC PERSONALITIES

I have always kept my Alesis ADATs in a separate rack and tried to keep them a good distance away from the rack containing my big Mackie power supply and my monitor amp. My thinking has been that the massive transformers in the amp and power supply would give off a significant EMF (electromagnetic field) that could have an adverse effect on the sensitive ADAT heads by magnetizing them.

Can the ADATs peacefully coexist in the same rack with big power supplies? If necessary, is there any way to magnetically shield them from each other?

Dave
rock4onthefloor@hotmail.com

David Simpao, product development director at Alesis Corporation, replies: *All Alesis products pass electromagnetic compatibility rules pertaining to interference and susceptibility. As long as the other products in your rack also comply with those rules, none of them should emit interference or be affected by it. (Check for a "CE" or "FCC" marking on the unit or in the user manual.) If that's the case, it is not necessary to magnetically shield the units from one another.*

EDITOR/LIBRARIAN DREAM

Steve O., in response to your "A Modest Proposal" ("Front Page," January 1999), I share your vision—or your frustrations, anyhow. I wholeheartedly endorse your effort to improve our corner of the industry. However, I don't think your proposal is the most practical or effective way to achieve full device-profile coverage. Even if a device-editing-profile standard could be designed (which in itself would be a Herculean effort), it wouldn't alleviate the current problems that force profile developers to limit the number of devices they support. I'm talking about unstandardized, poorly designed, buggy, and undocumented System Exclusive implementations.

Unfortunately, SysEx is still an afterthought to many MIDI manufacturers. Some don't even bother to implement it. Others attempt a SysEx implementation but disregard the basic protocol guidelines. (Michael Haydn and I cowrote these guidelines several years ago out of our mutual frustration.) Many manufacturers either don't document their System Exclusive implementation, or they document it so poorly that it becomes torture for anyone else to write an editor/librarian profile. If profile development doesn't become significantly easier, then more or less the same determined group of masochists will write more or less the same profiles; others will run away screaming, just as they do now.

There is one positive groundswell to note: a few intelligent manufacturers (including Alesis and E-mu–Ensoniq) have realized the value of constructing an editor during the product-development phase. This makes it possible to start creating the machine's sound presets earlier, using large-screen graphic sound-design tools instead of a beta version of the front-panel interface. This process also usually works out any flaws in the SysEx, which otherwise would become roadblocks for future profile developers.

To sum up, I believe your concept has merit, but it would be more productive and practical to address the underlying obstacles. I would be thrilled if you were to use your bully pulpit to encourage manufacturers to employ universal ed/lib products in their development efforts, follow the SysEx protocol guidelines, and publish their protocols coherently. If the manufacturers start to listen, devices can be supported relatively quickly and easily, without the usual quandaries and annoyances. This, I predict, will attract more profile programmers to the task.

BARBARA POLLAK

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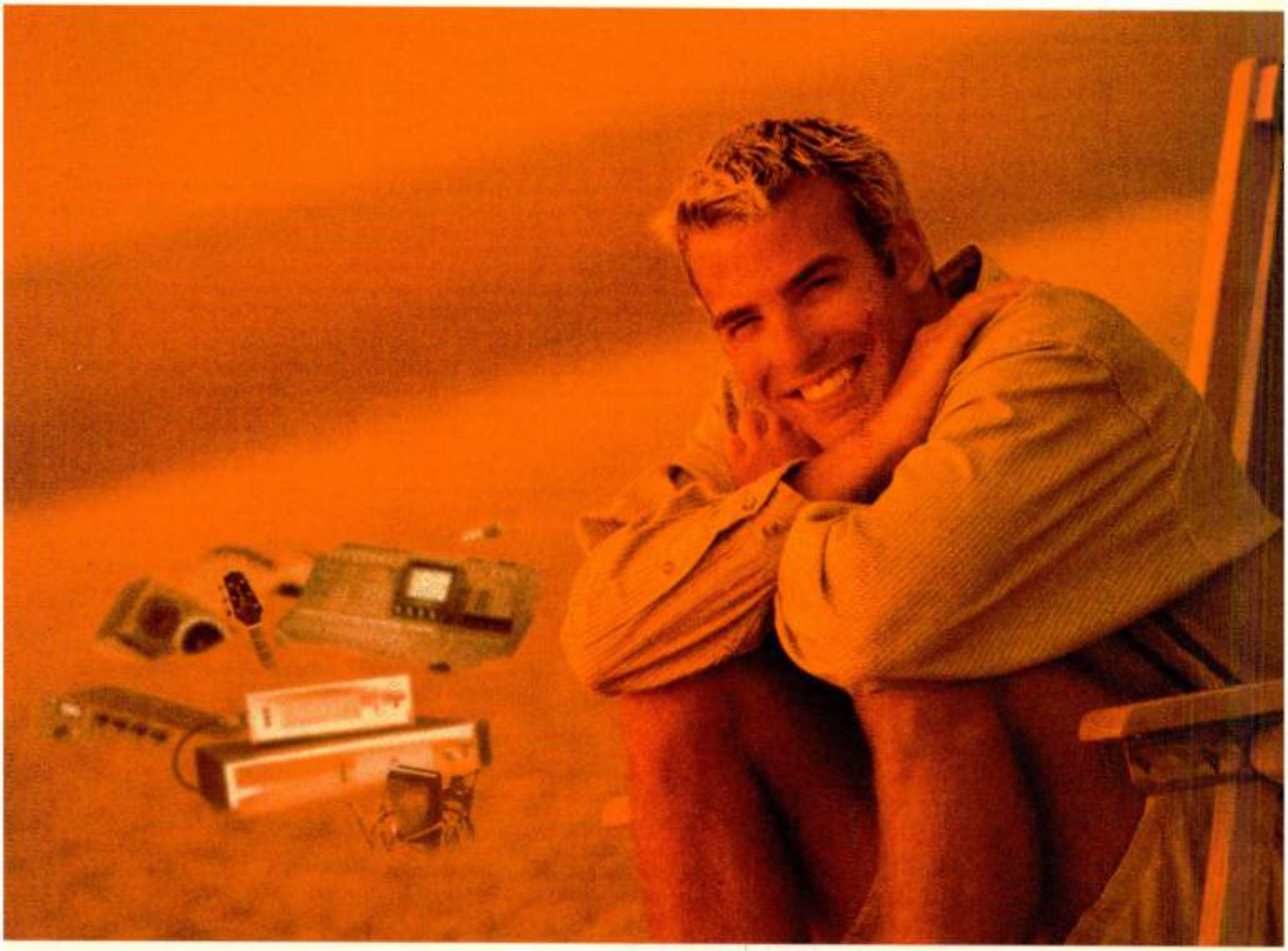

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resulting in a much greater number of device profiles, stand-alone editors, virtual control panels, and so on.

Bob Melvin
Mark of the Unicorn

Bob—Thanks for your response. I certainly agree that when companies ignore existing guidelines, it makes supporting (and for that matter, using) their products more difficult for everyone.

Part of my point is that if software support for editing hardware promotes ease of use, and if that can translate into better hardware sales, it would be advantageous for the hardware manufacturers—not necessarily the software developers—to supply the basic profiles. (Software developers could still sell their own profiles directly to the public or under contract to the hardware companies, of course.) This doesn't really make the hardware companies into computer-software developers, because all they basically would supply in a profile is their SysEx and other MIDI control messages, a map that links the MIDI data to the names and attributes of specific product features, and perhaps some product-specific handshaking code. The ed/lib or sequencer would interpret that profile to create the editor user interface, and of course, the ed/lib would supply the librarian features.

The onus for getting the SysEx documentation right would be on the hardware companies because they would create the profiles. If their products don't implement SysEx at all, then the only software-editable features would be those that can be addressed with the MIDI messages that the products do support, such as NRPNs, Control Changes, and System Common messages. Obviously, you can't use software to edit parameters that cannot be addressed with MIDI.

If enough companies get behind this proposal, it might put competitive pressure on the others to do a proper MIDI implementation and develop profiles for future products. But the first order of business is to begin an industrywide dialog aimed at agreeing on the basic concept of a universal editing architecture and deciding to create a profile standard. Software and hardware developers would all have to be deeply involved in that. Part of that dialog could include veteran developers such as yourself making it clear to the hardware manufacturers where the problems lie.—Steve O.

DIY WITH BATTERIES

I've read the article "Build the **EM** Distortion Box" by Peter Miller (January 1999) and am interested in giving it a try. Can this device be constructed to run on battery power? I would like it to be portable for connection to a portable recorder. The power supply is 12V, so can the components be supplied by 9V or 18V (2 × 9V)? Would changing the power supply affect the operation or calibration of the current regulator section?

Garry
was@gpfn.sk.ca

Author Peter Miller responds: *Yes, you can run this project on battery power. Two 9V batteries in series, for a total of 18V, will work just fine. I cannot predict how long the batteries will last.*

Figure A *shows how you can construct the battery connection. This illustration fits into the diagram shown in Figure 2 on page 84 of the original article.*

ODD TUPLETEER

When I'm not working at Big Briar, Inc., I'm a composer. I love odd meters, and 5-lets, 7-lets, 11-lets, etc., and I like to write parts I can't play! (Yes, I'm a Zappa fan.) I thought I'd ask you folks the same question that I've been asking everyone else: do you know of a MIDI sequencer for PC that supports entry of "odd tuplets" (not in real-time record mode; preferably in staff view)? Coda *Finale* is the only program I've seen that does what I need: it allows you to specify subdivisions, such as seven 16ths in the space of one quarter note. But *Finale* is designed for notation and lacks the MIDI features of other sequencers.

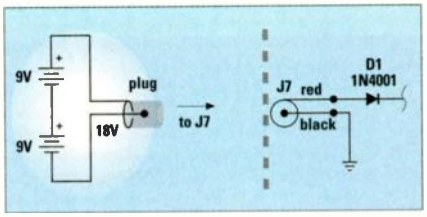


FIG. A: This diagram shows the placement of two 9-volt battery connectors in the overall schematic of the EM distortion box.

I've also looked at Steinberg *Cubase*, but it doesn't seem to support tuplets other than triplets. I've used Cakewalk *Pro Audio*, which doesn't support them either. (In *Pro Audio*, you can change the time base to a value divisible by five to get 5-lets, but if you try to edit pitches in staff view, they snap back to 16ths.)

Any suggestions?

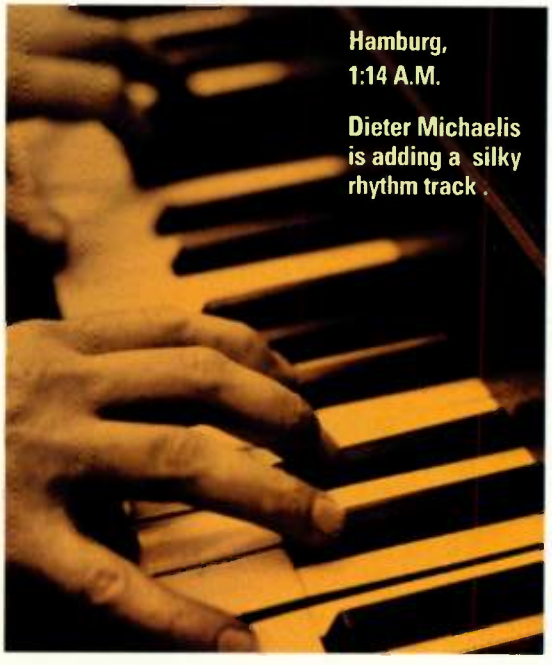
Tom
tdudley@mycroftx.com

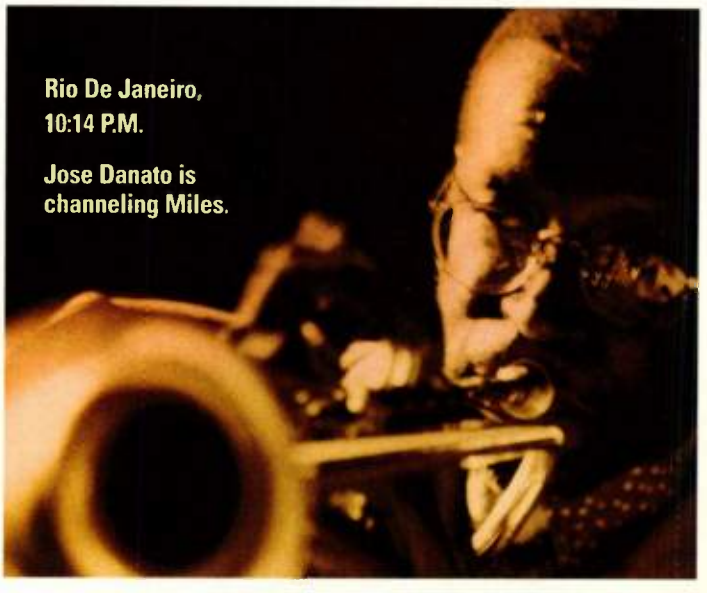
Tom—What you're attempting to do is trivial in most standard notation programs but can be difficult, or even impossible, with some sequencers. Fortunately, several sequencers provide the feature that you want.

You may have missed it, but Steinberg's Cubase *does support tuplets. Just select the notes that you want, then go to the Score/Staff Functions/Build N-tuplets menu and you'll find the functions that you'll need for whatever "tuple" value you desire. Once you set the tuplet, you'll see your changes reflected in the Score Edit window.*

The procedure for tuplets is similar in Emagic's Logic Audio: *Simply go to the Score window, work your way down to the N-Tuplets symbols, then choose the numerator and denominator—for example, 5:4—for the tuplet you need. There are several display and print options, and you'll even find some shortcuts that make entering tuplets a breeze.*

These two programs, which are both cross-platform, offer the best integrated scoring features of any sequencer that I'm aware of. No doubt you'll find most of the options





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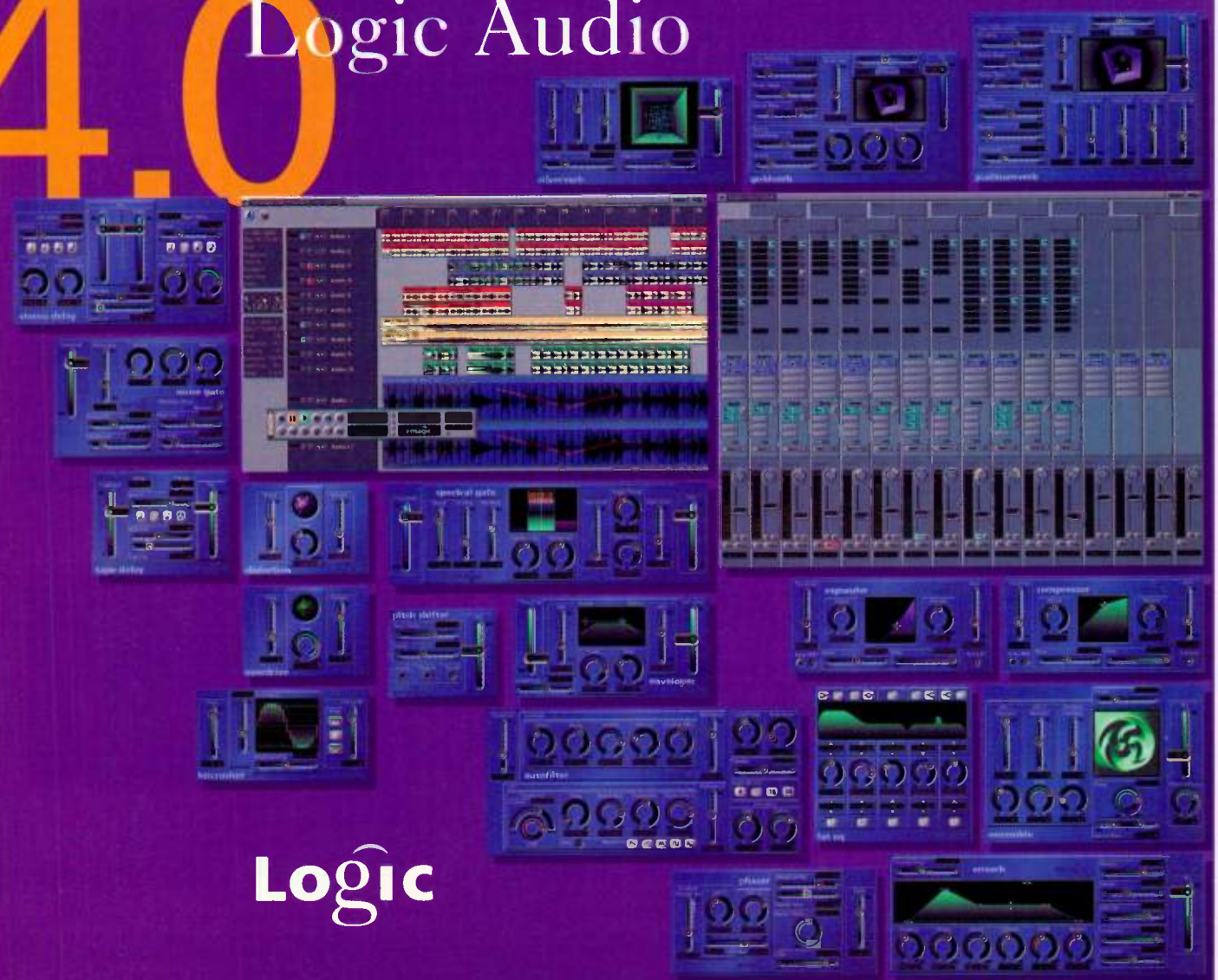

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you want if you stick with either of these two.—Dennis Miller

ERROR LOG

April 1999, "Digital Pipelines," pp. 42–62: How mortifying! We accidentally omitted Frontier Design's entire line of ADAT Lightpipe–equipped products, including the WaveCenter audio card, Tango and Zulu modular A/D/A converter boxes, Dakota audio card, and Montana expansion card for Dakota. Fortunately, details on these products are available on Frontier Design's Web site at www.frontierdesign.com.

We also missed CreamWare's Lightpipe-equipped products, including the Pulsar, SCOPE, and A8 and A16 A/D/A converters. For more information on them, see the CreamWare site at www.creamware.com.

Finally, Yamaha recently announced the optional dual-Lightpipe (16-channel) AX16AT PCI card for its DSP Factory. You can obtain information about this card at www.yamaha.com/cgi-win/webcgi.exe/DsplyModel/?gCRA00001AX16AT.

April 1999, "Digital Pipelines," p. 50: In the table "Putting It All Together," the Mark of the Unicorn (MOTU) 2408 can be expanded, so its audio I/O configuration should be listed as up to 72 (optional) Lightpipe channels, up to 72 (optional) TDIF channels, and up to 12 (optional) S/PDIF channels.

In the same table, the audio I/O configuration for the Soundscape SSHDR-1 with SS8IO-1 is 10-in, 12-out analog; 2-in, 4-out AES/EBU or S/PDIF (selectable); 8-channel TDIF; and optional 8-channel Lightpipe. On p. 56, in the first paragraph, the first sentence should also have reflected this digital I/O configuration.

April 1999, "Digital Pipelines," p. 54: S/PDIF I/O for the Tascam IF-88AE was omitted in the table "Converters Compared." That unit offers two channels of S/PDIF.

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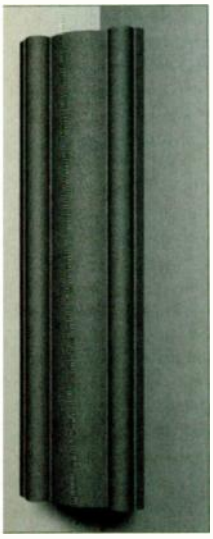
WHAT'S NEW

By the EM Staff

RPG DIFFUSOR PROCORNER

Personal-studio owners often find that cramped recording spaces present uneven frequency absorption and an increased likelihood of standing waves. The ProCorner from RPG Diffusor Systems is designed to provide low-frequency absorption in the corners of your live room. The unit measures 48 inches tall by 12 inches wide, extending 9½ inches along the wall from the corner. It ships in a box of four and is available in two materials: Polyflex ($235), which is a Class B/C, polyester/urethane material, and Melaflex ($431.83), made of Class A, nonfibrous, fire-resistant melamine foam. The Polyflex version is available in purple, blue, and charcoal gray, and the Melaflex version comes in your choice of natural white, white fleck, or gray fleck.



RPG lists the ProCorner's noise reduction coefficient rating as 1.0, with a uniform absorption across the audible spectrum, except for a slightly higher absorption from 125 to 400 Hz. The shipping cost is included in the retail price. RPG Diffusor Systems; tel. (301) 249-0044; fax (301) 249-3912; e-mail info@rpginc.com; Web www.rpginc.com.

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FUTURERETRO 777

True to its name, FutureRetro combines old-style analog synthesis and CV-based modulation with the modern conveniences of MIDI in the new 777 monophonic synthesizer ($777). In addition to reproducing the sound-creation capabilities of Roland's classic TB-303 bass synthesizer, the 777 includes a 256-pattern onboard sequencer with complete MIDI control.

Audio source, FM, and filter options on the 777 come in sevens. The seven source choices are two oscillators, two square-wave suboscillators, a noise generator, an external audio signal, and a filter. Among the seven FM controls are portamento time, waveform modulation, and envelope decay. The filter section has a highpass filter with gain control and a lowpass filter with controls for gain, slope (switchable 3- or 7-pole), resonance amount, resonance maximum, cutoff, and an accent parameter.

Filter-modulation parameters include CV type and amount, waveform type and amount, and envelope decay and amount. You can control the amplifier with a gate or envelope generator. The amp also provides bass boost and normal and phase-type overdrive distortion.

The built-in step sequencer offers real-time editing of pattern information in 16 memory banks (called Songs), each with a 16-pattern 3,580-measure capacity. The sequencer lets you copy and paste of patterns, transpose by ±36 steps, set tempos up to 250 bpm, and place up to 16 loop points per pattern. SysEx dumps are supported for loading and saving songs, and the unit can sync to internal or external MIDI Clock.

In addition to the ¼-inch audio output, ¼-inch filter input, and MIDI In and Out ports, the 777 has ¼-inch inputs and outputs for control voltage, accent, and gate. FutureRetro Synthesizers; tel. (785) 827-9578; e-mail futurer@midusa.net; Web www.futureretro.com.

Circle #402 on Reader Service Card

ROLAND DS-90

Roland's new DS-90 powered near-field monitors ($595 each) offer analog and digital inputs with 24-bit D/A conversion. These biamped speakers will work with any system, but they are specially designed to implement the new COSM speaker-modeling effects that now come with the company's VS- and VM-series digital mixers.

The DS-90 has two sets of S/PDIF inputs, on optical and coax jacks, as well as balanced XLR and balanced ¼-inch TRS analog inputs. Each speaker has a 6.5-inch polypropylene woofer powered by a 60-watt amplifier, and a 1-inch soft-dome tweeter driven by a 30-watt amp, with a fourth-order active crossover at 2.6 kHz. Each cabinet has separate high- and low-range trim controls on its back, along with a level knob, power switch, and switches to select analog/digital input, coaxial/optical digital input, and left/right speaker assignment. Roland Corporation U.S.; tel. (323) 685-5141; fax (323) 721-4875; Web www.rolandus.com.

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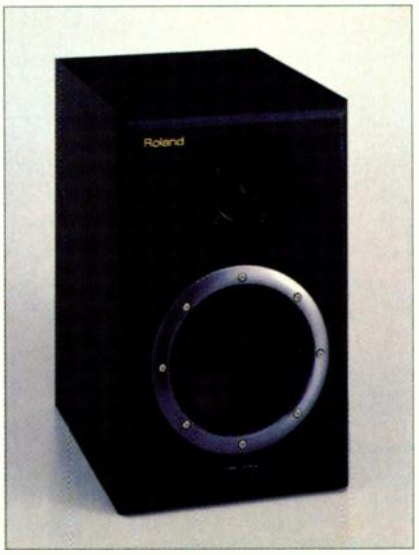
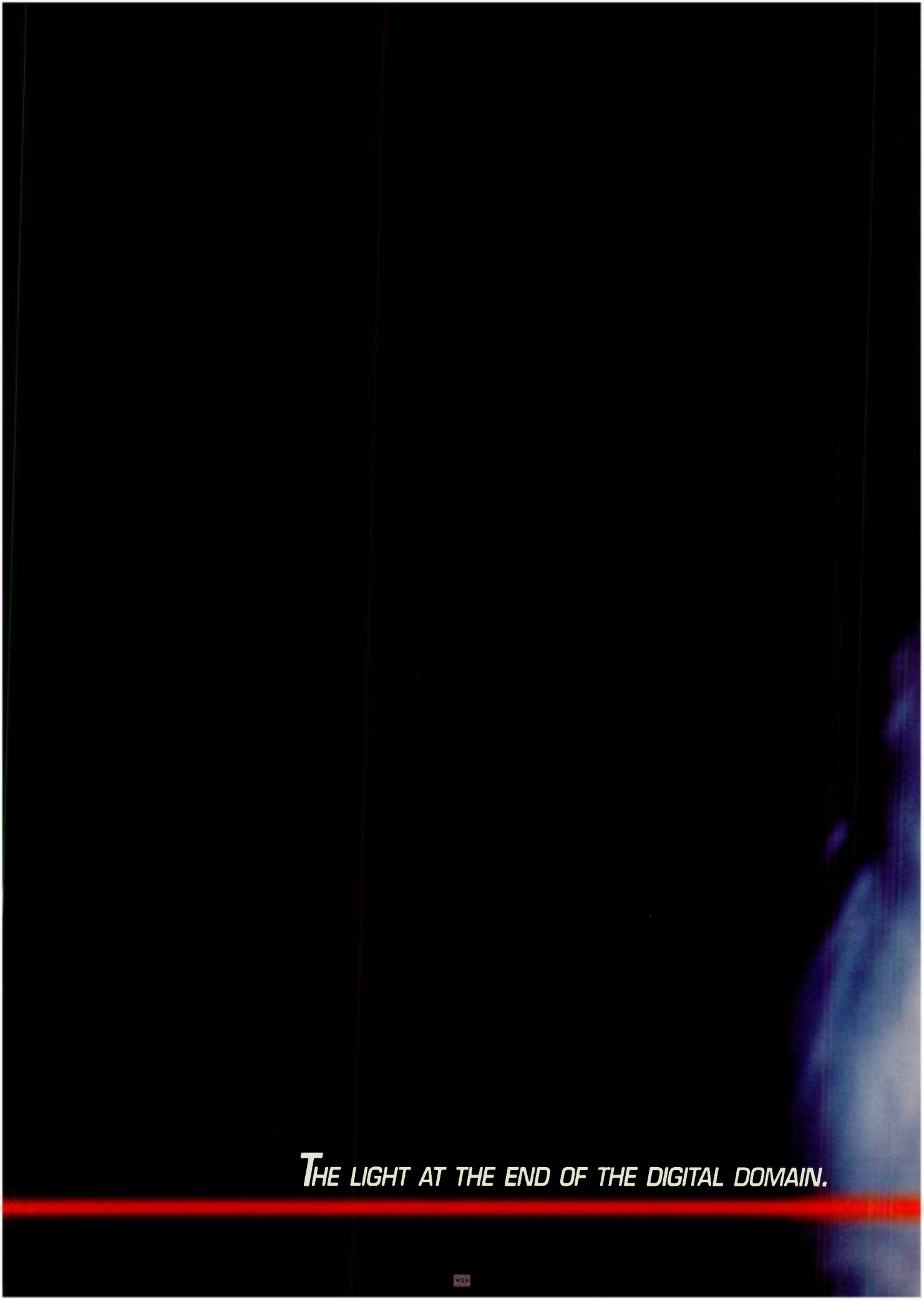
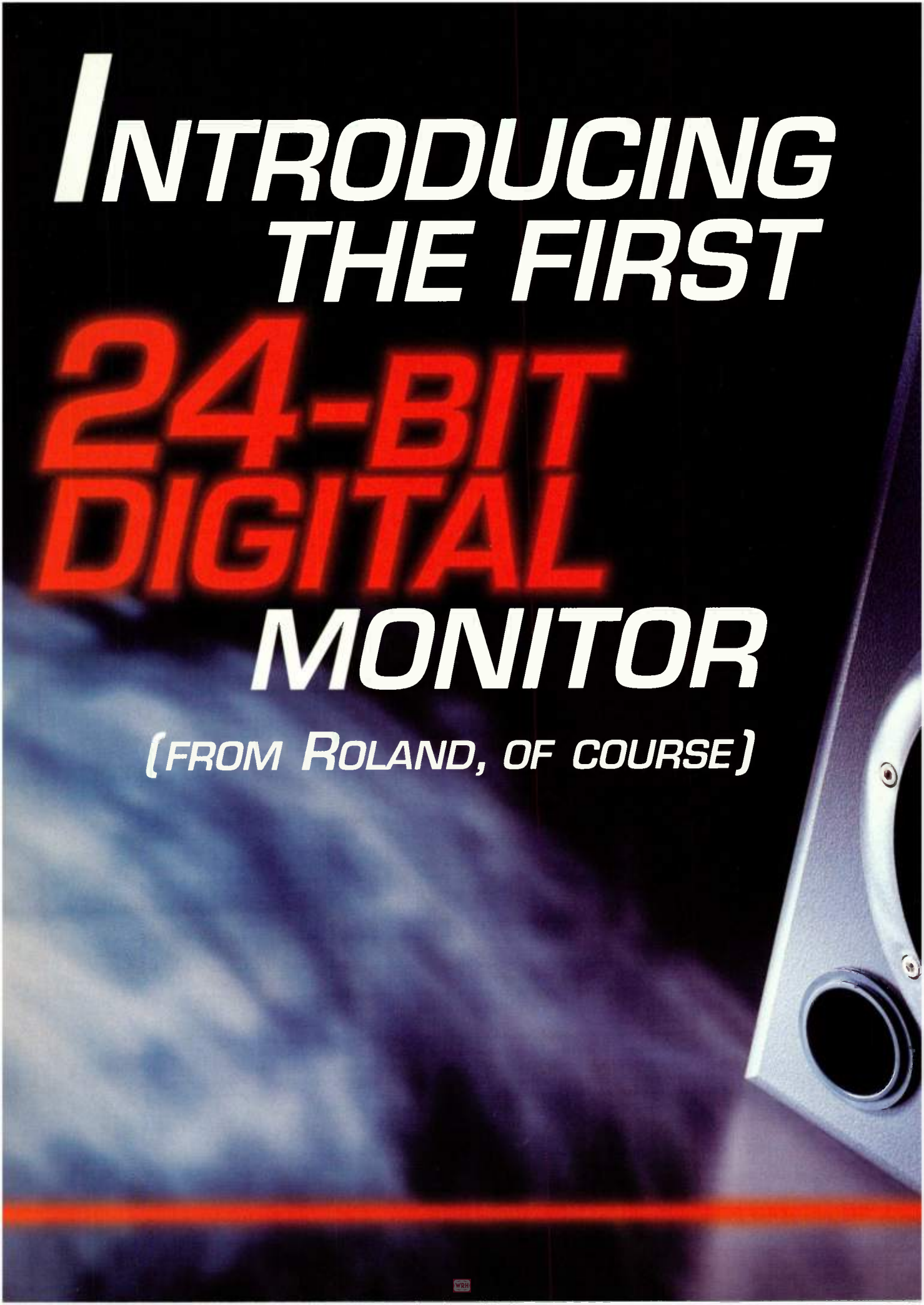



THE LIGHT AT THE END OF THE DIGITAL DOMAIN.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PERFORMANCE TOOLS ▲ ▲ ▲ ▲

▲ ALLEN & HEATH

The two latest mixers from Allen & Heath are the DL1000 ($1,395) and DP1000 ($1,595), both part of the company's new Icon series of live-sound-oriented digital mixers. The mixers have six mono and two stereo channels and a 20-bit A/D/A converter. The DP1000 differs from the DL1000 only in that it contains a stereo power amp providing 300W (into 4Ω) per channel. The consoles allow you to save song, set, and venue settings for later real-time recall.

All input channels on these mixers have balanced ¼-inch TRS and balanced XLR connectors. Each channel has a 100 mm fader, a mute button, and dedicated knobs for level and gain. Four-band EQ, with parametric mids, can be applied to each channel using the backlit LCD and its associated rotary controls. Noise gating and compression is available on every channel, and the mixers have two built-in effects processors that offer more than 80 presets.

The Icon mixers provide ¼-inch TRS jacks for left and right channel outs, two aux sends, and A/B amp outputs, as well as L/R unbalanced RCA recording outs and a ¼-inch stereo headphone out. The A and B amp outputs can be individually configured with a 10-band EQ, which can be saved in the venue memory.

The DL1000 and DP1000 each have a 20 Hz to 20 kHz frequency response (+0/-1 dB), and their THD is rated at less than 0.008%. Allen & Heath offers optional rack ears for the units. Allen & Heath; tel. (801) 568-7660; fax (801) 568-7662; e-mail customer@dbxpro.com; Web www.allen-heath.com.

Circle #407 on Reader Service Card

▼ PEAVEY

Peavey's new Vocal 100 stereo hybrid vocal processor ($339.99) puts vocalists' sound control in their own hands. Singers can use this unit in live or studio situations to control output level as well as six different digital effects. With separate control of the two output channels, you can send a wet signal through the P.A. and a dry signal to the monitors to avoid feedback.

The Vocal 100 has an analog preamp with input-level control and a low-cut switch set at 75 Hz. The unit includes a compressor with adjustable

threshold, ratio, and gain. Balanced XLR and high-impedance ¼-inch mic inputs are available, and left and right outputs are on ¼-inch jacks. Also provided are an auxiliary input and a headphone out. Switches for stereo/mono output (global) and compressor on/off (per preset) are on the back of the box.

The effects section offers six effects: distortion/exciter, pitch shift, chorus/flanger/phaser, delay, reverb, and EQ, each with various controllable parameters. There are 20 effects presets and 20 user-definable locations; these are arranged in banks of two, and a footswitch allows you to quickly select between presets A and B in each bank. Three additional footswitches trigger bank select up and down, and bypass. Peavey Electronics Corp.; tel. (800) 821-2279 or (601) 483-5365; fax (601) 486-1278; e-mail peavey@peavey.com; Web www.peavey.com.

Circle #408 on Reader Service Card

▼ QUICK CORD SYSTEMS

Setting up P.A. systems or synth rigs can get old quickly. This is especially true in low-light conditions or under time pressure. Quick Cord Systems are designed to alleviate many of these problems by providing rack-mount chassis with internal, self-retracting reels.

The chassis is available as a 2U rack-space box ($119.95) that can hold 4 cable reels, or as a 5U ($164.95) box with 14 reels. A reel mounts inside the chassis so that one end of a cable extends out of the rear panel. You can use this to make a semipermanent connection to a mixer or synth module, avoiding wear and tear on connectors. The other cable end can be extended out of the front of the box and locked into place. A slight tug on the line causes the cable to retract to its initial position.

The cables come in seven standard forms, ranging in price from $61.95 to $79.95 each: female XLR, ¼-inch to ¼-inch instrument cable, ¼-inch to 90-degree ¼-inch, ¼-inch to ¼-inch speaker cable, ¼-inch to banana-plug speaker cable, male AC power cord, and female AC cord. Other cords can be special ordered. Quick Cord Systems; tel. (408) 778-1046; fax (408) 778-1046; e-mail leatherj@garlic.com; Web www.quickcord.com.

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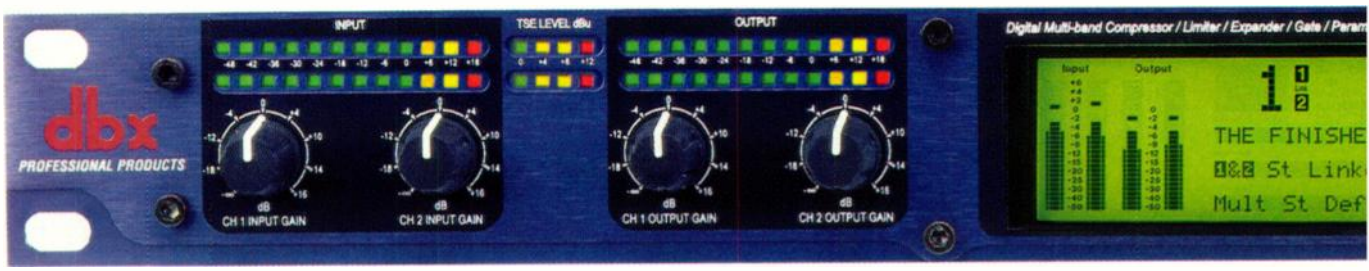

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SOUND ADVICE ▲ ▲ ▲ ▲

▲ SAMPLEHEADS

Sampleheads has expanded its sound library by harnessing the sounds of jazz-fusion mallet percussionist Dave Samuels in *Dave Samuels: Marimba and Vibes* ($99.95 audio CD and WAV/AIFF format CD-ROM; $149.95 CD-ROM). The disc has 16 audio tracks (or 49 patches in E-mu EOS format) that feature chromatic samples of marimba and vibraphone representing several playing techniques and a range of dynamics. The disc has mallet scrapes; rolls; two sets of "vibe riffs"; and sustained notes and muted notes played soft, medium, and hard. Each instrument sample on the EOS-format disc is stored in sizes of 8, 16, 32, and 64 MB.

Samuels played a Yamaha YM5000 5-octave marimba and a Yamaha YV3710 3½-octave vibraphone using a variety of mallets. Sampleheads recorded the samples using a Digidesign Pro Tools/24 system, BIAS *Peak*, and various Waves TDM plug-ins.

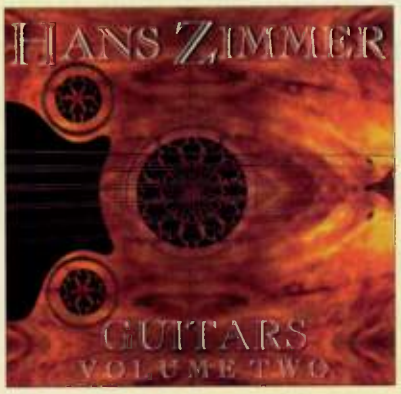
The CD-ROM version is shipping in native formats for Akai S1000, E-mu EOS, NemeSys GigaSampler, Roland S-700, and SampleCell, as well as WAV/AIFF format. A SoundFont-format CD-ROM is expected to ship by this summer. Sampleheads; tel. (800) 807-6056 or (212) 262-3488; fax (212) 262-2009; e-mail info@sampleheads.com; Web www.sampleheads.com.

Circle #412 on Reader Service Card

▼ SPECTRASONICS

A multifaceted guitar-sample library from Spectrasonics, *Hans Zimmer Guitars*, vol. 2, is available as an audio CD ($99) or as a CD-ROM ($299) in Akai S1000, Roland S700, Kurzweil K2000/K2500, and SampleCell formats. *Hans Zimmer Guitars* is a collection of rare and vintage acoustic and electric instruments.

Volume 2 provides many samples that feature Velocity switching, up and down slides, and vibrato whose depth increases as the MIDI Velocity increases. Some of the acoustic instruments sampled include a Guild A-500, 1909 Gibson A2 mandolin; South American instruments such as the four-stringed cuatro, the high-pitched cavaquinho, the



charango, and a nylon-stringed flamenco guitar. Also in the collection are samples of the Middle Eastern oud, saz, and cumbus, originally created for the Disney movie *Prince of Egypt*. This section also includes samples of the yayli tambur, an unusual Turkish instrument with a neck almost three feet long and three sets of doubled strings.

Electric instruments, such as a 1947 lap steel, an electric baritone guitar (with and without tremolo), and a Coral electric sitar, round out the disc. Ilio Entertainments (distributor); tel. (800) 747-4546 or (818) 707-7222; fax (818) 707-8552; e-mail ilioinfo@ilio.com; Web www.ilio.com.

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▼ DAUSENKUNZ

If you're looking for some really different sounds, why not look to the dark ages? We're not talking about the age of analog synths; with *Early Patches* (CD-ROM; $60) from Germany's Dausenkunz you can have the sounds of medieval and renaissance Europe. This collection comprises many wind, stringed, and percussion instruments, including such rarities as shawm, psaltery, Bohemian bagpipe, and Turkish drums, as well as the more familiar recorder, lute, glockenspiel, and kettle drum. The instruments were played and recorded by producer Andreas Sumerauer, who also built many of them himself.

The sounds on *Early Patches* are in Creative Labs' SoundFont format. Other formats include Terratec's TTS format and Dream .94b. The percussion instruments are also provided as WAV files. Other formats, such as Akai S1000 and Turtle Beach Pinnacle, will be added to future releases.

The melody-instrument SoundFonts are presented in looped multisamples, recorded at intervals of a minor third or less. Some unlooped patches of stringed instruments are also included.

Early Patches gives you musicological information on each instrument, with pictures and descriptions. Dausenkunz Produktionen; tel. 49-5336-948-387; e-mail ansum@online.de; Web www.dausenkunz.de.

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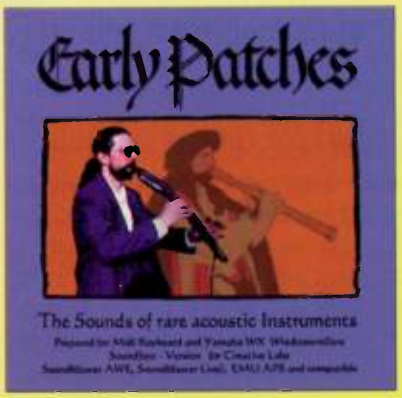

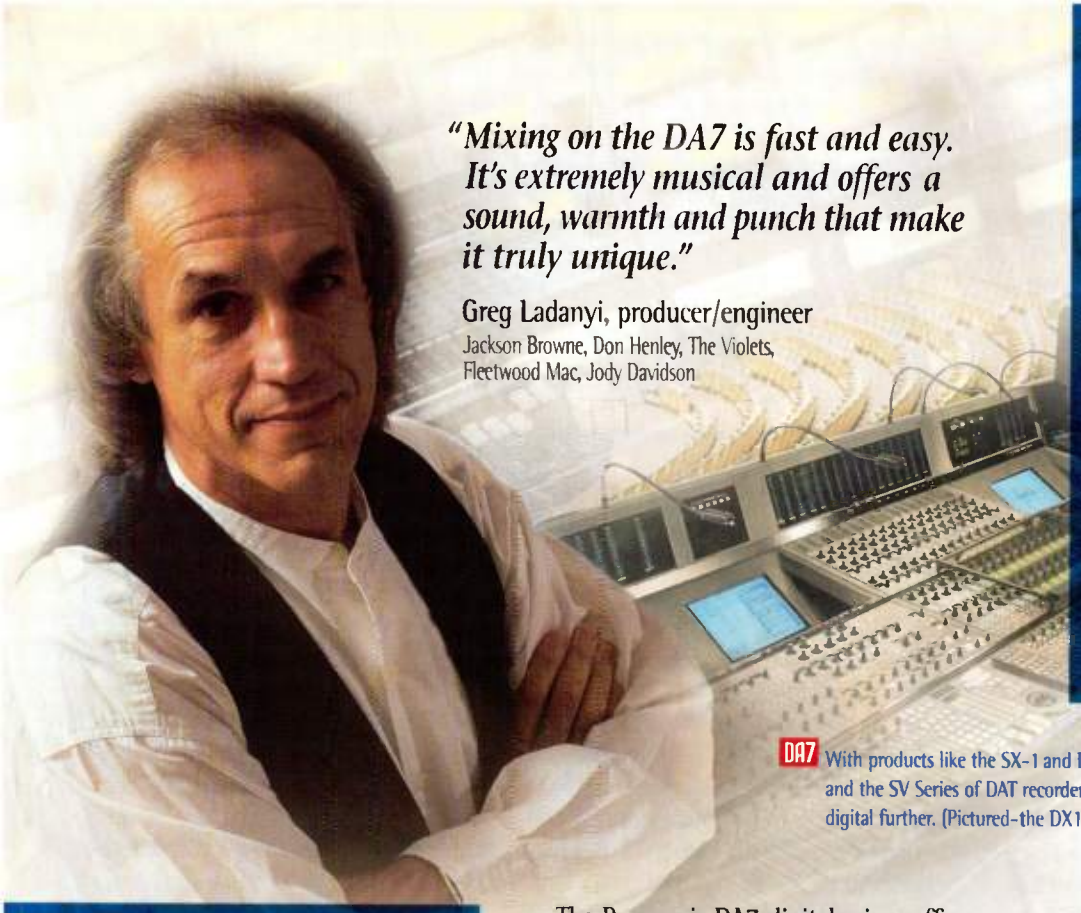

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▶ KORG TRITON

Korg's Triton-series keyboards are the company's next generation of synth workstations. The new instruments are available in three versions: the 61-key Triton ($2,700), the 76-key Triton pro ($3,200) and 88-key weighted-action Triton proX ($3,800).

The Triton uses Korg's new Hyper Integrated (HI) synthesis system, which has a PCM-playback engine that can combine ROM samples, user sampling, and PCM expansion boards. The new synth supports GM level 2 and ships with 32 MB of 48 kHz PCM waveforms. It has more than 1,300 sounds, divided into two groups—768 Programs and 25 drum kits—which include real and synthetic instrument sounds. The 512 Combinations contain up to eight Programs plus two polyphonic arpeggiators. The Triton has two wave-expansion slots, each of which can accept a 16 MB expansion board, for a total of 64 MB of wave ROM.

An onboard 16-bit linear, 48 kHz sampler with 16 MB of sample memory (expandable to 64 MB) lets you record audio or import samples in AIFF, WAV, Akai S1000/S3000, and Korg Trinity formats. Input for the sampler is on two ¼-inch balanced connectors, and Triton offers onboard visual editing of sample data. A SCSI interface can be added for working with various types of media. There are two stereo master outputs and four individual outputs, all of which are on ¼-inch connectors.

You also can add a 6-voice EXB-MOSS expansion board ($550), which uses the same 6-voice physical-modeling synthesis engine found in the Korg Z1 and Trinity V3. Unlike the optional expansion board for the V3, the new board has been redesigned to be user-installable, and it is up to 6-part multitimbral.

The Triton has two master effects processors, with a selection of 89 possible algorithms, plus a stereo, 3-band master EQ. In addition, up to five stereo insertion effects can be applied simultaneously, which can use any of 102 algorithms. The insertion effects can be applied to any of the synth's four independent, ¼-inch outputs. Any of these effects can also be applied to a signal fed through the audio inputs in real time.

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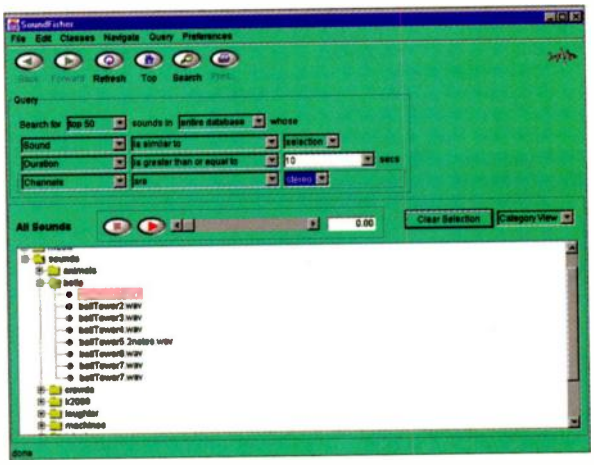
SoundFisher (Mac/Win; $995), from Muscle Fish, is not your ordinary audio-file database manager. This program features a "sounds-like" search function that can compare waveform characteristics and find audio files on your network that sound similar to any file you specify.



You can add any WAV, AIFF, SDII, or AU file to the *SoundFisher* database. The program then quickly analyzes and classifies the file's audio content. It simultaneously records data such as sample rate and resolution, channel configuration, file format, and file name. Any or all of these attributes can be included in a search query, along with user-defined keywords, comments, and other editable text fields. *SoundFisher* will catalog files on all associated drives, CD-ROMs, and even the Web.

The program lists the results of your search, and you can immediately audition each file. When adding sounds to the database that aren't stored on your local drive, you can create a "thumbnail" that you can quickly audition before you retrieve the complete file. Three browsers are available: a hierarchical browser, showing folders and subfolders; a list browser, sortable by any field; and an unusual multidimensional feature browser, in which you can assign various audio attributes (such as average pitch or amplitude) to the axes of a grid and see which files are mapped closest together.

In addition to the search functions, *SoundFisher* can perform batch-conversion processes, such as converting between file formats, adjusting files' sample rates, and more. Many other signal-processing and batch-processing features are planned for future releases.

SoundFisher requires either a Pentium 90 or faster PC with Windows 95/98/NT 4.0 and 40 MB RAM or a Power Mac with Mac OS 7.6.1 or later and 32 MB RAM. Muscle Fish; tel. (510) 486-0141; fax (510) 486-0868; e-mail inquiries@musclefish.com; Web www.musclefish.com. ●

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Illustration by Nathan Ota

Shake, Rattle, and Roll Tape

Sampling hand and mallet percussion instruments can knock you for a loop.

By Jim Miller

In previous **EM** articles, I have written about sampling everything from solo strings to screaming guitars. This time, I'll discuss hand percussion (which includes practically anything that is struck, slapped, shaken, or beaten to produce a percussive sound or rhythm), as well as mallet instruments (the marimba, xylophone, vibraphone, and glockenspiel, among others). Let's begin with the basics: congas, bongos, and any other headed drum that is struck in some way by the hands.

The conga family comprises three different-size drums, each with a distinct voice: the tumba has the lowest pitch, the conga the middle pitch, and the quinto the highest. Ideally, all three should be represented in your final conga samples; if you have to cut corners, though, go for two adjacent voices (say, the conga and quinto).

When sampling any instrument, you must first decide whether to record in mono or stereo. My advice—as long as your sampler can handle it—is to record all source material in stereo. (For information about recording stereo samples, see "Polishing Your Image" in the January 1997 **EM**.) RAM prices have plummeted in recent years, so there's no real reason to produce mono samples just to save sampler memory.

If your goal is realism, mono just won't provide the authenticity that you need—we have two ears, after all. The only time that mono samples will suffice is when you are capturing a mono instrument (say, electric bass guitar) or an instrument that is typically mixed way in the background.

Stereo recordings, however, by providing both amplitude and time cues, allow the brain to determine where sounds are coming from in a three-dimensional space. These cues, as well as increased ambience, make for a more natural and ultimately better-sounding sample. Moreover, as long as the stereo sample is free of phase anomalies, it can usually be converted to a mono sample simply by panning the two channels to the same spot in the stereo spectrum.

Mic Selection

Another important consideration when sampling percussion is what types of microphones you have at your disposal. Although dynamic mics can produce great results in some applications, you are generally better off using quality condenser mics. That's because condensers are more sensitive and typically have a more extended frequency response than dynamics. For stereo recording, you will need either two of the same mic (a matched pair is best) or a dedicated stereo mic, such as the Crown SASS-P or AKG C 426 B.

Even with two different mic models, all is not lost: you can still produce good samples as long as the mics are sonically similar. After all, hand percussion is unlikely to be the most forward instrument in a mix, so the samples will be under less scrutiny than, say, piano samples would be.

As for polar patterns, I normally use a cardioid pattern to record samples. However, an omni or even figure-8 pattern also produces excellent results, especially when close-miking.

Wet or Dry

After you settle on which microphones and miking technique to use, you must decide where to record. Obviously, the acoustics of the recording space will affect the audio quality of the final sample; how much they affect it is determined largely by how much room sound you introduce into the recording. This amount, in turn, is decided by several factors, including which mic (or mics)

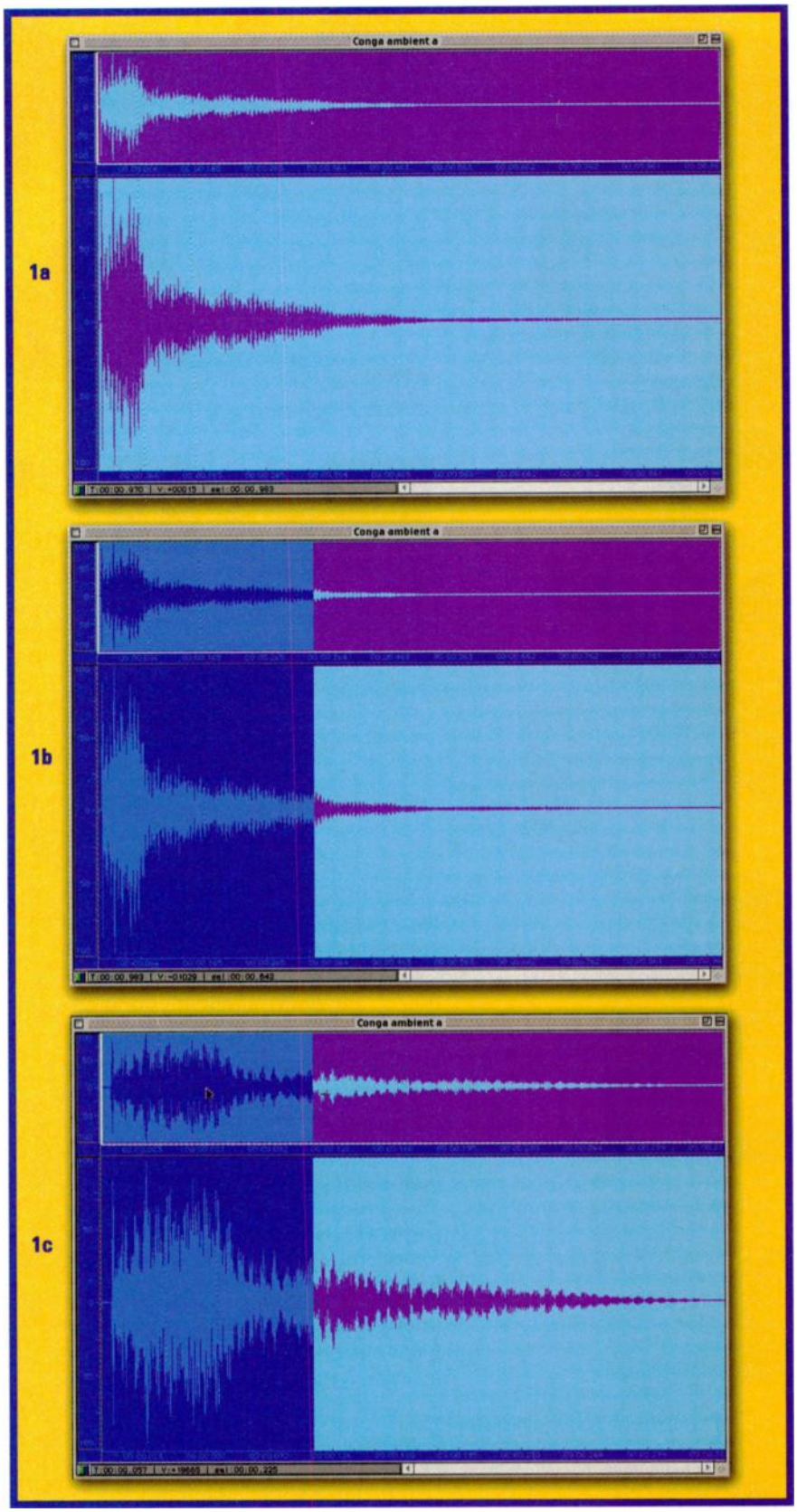

FIG. 1: The top waveform (1a), depicted in BIAS *Peak*, shows a conga recorded in a large, live room. The long decay indicates room ambience or reverberation. To eliminate most of the ambience from the sample, highlight the reverb sound, then delete it (1b). Next, to produce a tidier, even drier conga hit, fade out on the last half of the sample (1c). You may need to experiment to determine how much of the sample to fade.

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you record with, the microphone polar patterns, and where you position the mics in relation to the instrument. In general, the more room ambience you want on your sample, the more important the sound of the room.

But wait a minute; since when do we want room sound on samples? After all, most sampling experts recommend that drum samples be recorded dry, so as to allow more processing options for the end user. Admittedly, one problem with sampling an instrument with real room ambience is that when you use the sample in a mix, you could end up with an instrument that sounds as though it is in a different acoustical space than the other instruments. So sometimes it's best to keep your samples dry, especially if you intend to use an effects processor later to add artificial ambience to the overall mix.

FIG. 2: To create stereo samples of percussion, I first make a "map" of where the instruments will be positioned on the soundstage. Then, rather than move the mics around, I move the musicians, placing them at the spots I have chosen for their particular instruments.

Nevertheless, I generally prefer to capture some real room ambience so that my samples sound more natural. Sure, you can add effects such as digital ambience and reverb during mixdown, but no artificial effect can duplicate all the factors that create the specific sonic signature that comes with a real physical space. (On top of that, the end user gets an extra bonus, because having some reverb on a drum or percussion sample can free up an effects unit for a different instrument—depending on the mix, of course.)

Keep in mind, too, that if you capture too much room sound when recording a sample, it's easy enough to "dry up" the sample after the fact by shortening the envelope in your sampler. Moreover,

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with sample-editing software, you can snip off the ambient tail of the overly wet sample and then use a fade-out to smooth the sample to silence (see **Figs. 1a, 1b,** and **1c**).

Room Boom

If a studio is not available, and you're shooting for a relatively dry sound, a medium-sized, plushly appointed living room is a good place to work, particularly if it's open to other areas of the house (a dining room, for example). The carpet, curtains, and sofas will help absorb unwanted reflections, while adjacent rooms will reduce the risk of standing waves and other unnatural resonance peaks that are common in small, square, closed-off rooms.

A sizable living room with hardwood floors, on the other hand, can provide a nicely spacious room sound. My own living room is large (about 16 by 20 feet), has a vaulted ceiling (which makes for a more open sound), and is connected to both a kitchen and a sitting room. I've created some very nice ambient percussion samples there.

If I want more "boom," I move to our two-and-a-half car garage. I've discovered that, in the garage, I can alter the amount of reverb captured in the sample simply by opening or closing the garage door. With the door closed, the sound has more surfaces to bounce around on, which creates a more reverberant sound and a definite slap; with the door open, the sound is free to travel out on one end, which reduces the reverberation.

I usually position the stereo mic pair between three and six feet from the instruments. To find the sweet spot, move around the space and listen closely while the percussionist plays. Wherever the instrument sounds best to your ears will most likely be the prime place to put the mics. Listen with quality headphones or monitors, too, if possible, to confirm your open-ear impressions.

If I'm going for an even bigger reverb, I'll rent a hall (a small church does nicely) and position the mics farther back from the instrument to capture more of the room sound. About eight to ten feet back is usually sufficient; more than that, and you tend to lose the attack transients.

Imaginary Stage

Now you have your mics set up in the environment of your choice, and the percussionist is ready to slap, shake, and rattle. Where should the individual percussion instruments be positioned in the stereo field?

This is an important consideration. After all, if the stage were filled with percussionists, they would not all be standing in the same spot. Rather, you might put a tambourine player on the far left, a shekere player on the far right, a cowbell left of center, and the congallero right of center. Occupying center stage, of course, would be the conventional drum kit (kick, snare, toms, and so on).

For most sample-recording sessions, though, only one musician plays at a time. Obviously, if the performer stands in the middle of the stage to play each percussion instrument, you'll end up with a stereo recording in which each instrument is "panned" dead center. This will not only sound unrealistic, but it will also handicap you when mixing down a project because you'll be unable to spread out the percussion parts.

When I recorded the samples for Sweetwater Sound's *Total Stereo Session Drums* CD-ROM, I decided immediately that I would spread the percussion "ensemble" fully across the stereo field, so as to create the most realistic sounds possible. For this approach, mapping out a dummy ensemble helps to determine the position of each percussion instrument (see **Fig. 2**). That way, I create a sonic "stage" on which my samples will play. (The end user, of course, can switch an instrument from right to left by either reversing the panning or switching the L/R audio cables on the sampler.) If, however, you're creating mono samples, none of this is an issue, because a mono sample can readily be panned to any position in the stereo field.

Troubleshooting

Once you've mapped out your soundstage, have the percussionist play in a normal manner and record a minute

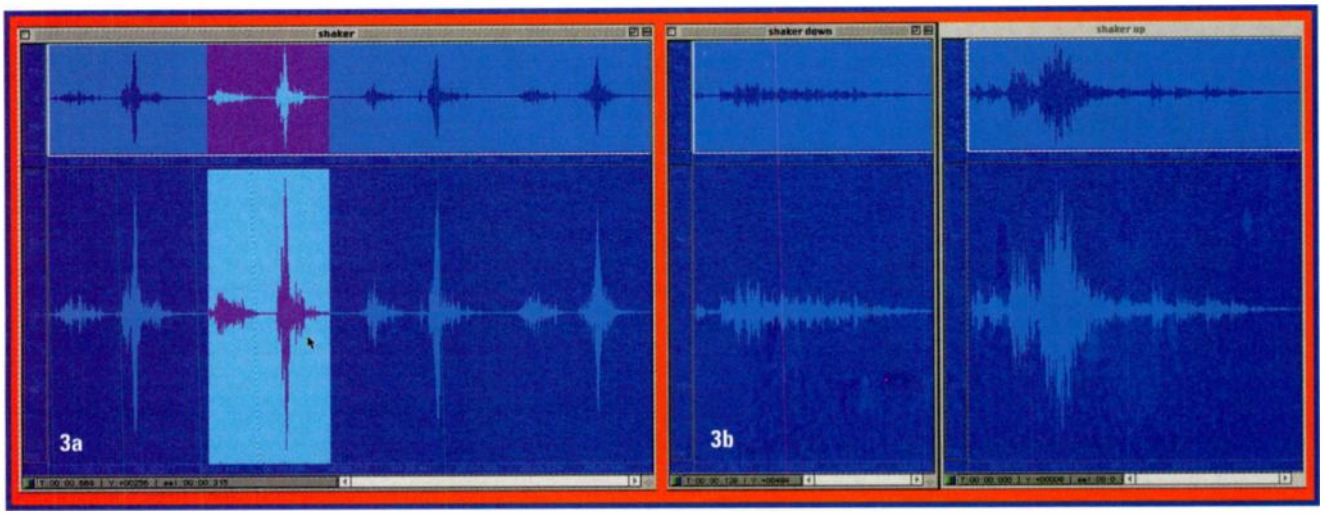

FIG. 3: The waveform in Figure 3a shows a shaker playing a steady, rhythmic pattern. I chose the best-sounding up and down strokes, cut them from the main sample, and pasted them into two new files. I deleted the unwanted part of the sample from my two shaker files (3b), leaving just the down (left) and up (right) sounds. In the sampler, I will map them to adjacent keys so I can play a natural-sounding pattern.


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or two of the performance. Then, using headphones or monitors, listen to the recording to make sure that it has no clipping or phase problems.

Most hand drums are capable of putting out hot transients that are too quick to register fully on DAT meters but can cause distortion nonetheless. (This is not so much of a problem on analog tape recorders, because they can better handle transient signals bounding high into the red. In fact, analog clipping might even result in a desirable, compressed quality.) Digital distortion on transient peaks can be hard to hear, so if you even suspect that the attacks have some grittiness, try to locate the source of the problem and fix it. The distortion could be happening at the mic capsule, for example, in which case you would want to engage attenuation pads on the mics or move the mics back from the source.

Moving the mics back, however, could result in more room sound than you want, so a better solution might be to aim the mics upward a few degrees, so that the signal isn't hitting the diaphragms head-on. Done just right, this approach will avoid the distortion without compromising the overall sound quality. Of course, if the distortion is happening in the mic preamp or on the recording medium, reduce the gain until the levels are manageable.

To check for phase problems, set both pan pots to dead center or engage a sum-to-mono switch. Phase problems can cancel or intensify certain frequencies, resulting in anything from a nasal sound quality to weak bass. If this happens, reposition the mics (see "Recording Musician: Avoiding Phase Cancellation" in the July 1997 **EM**).

Rolling, Rolling

Now you're ready to start recording. Hit the Record button and have the musician play as many different sounds and articulations as possible.

Don't stop there, however. Why? Because often, when the player is trying to produce particular sounds one at a time, the musicality can get lost. Therefore, ask the percussionist to think of a song with a slow tempo and to "sing" along silently while she plays. This trick helps keep the musicality intact, often yielding articulations and dynamics that aren't present in isolated hits.

Other Worlds

After you've recorded a full set of conga and bongo samples, it's time to expand your percussion palette. With instruments from around the world so readily available these days, there's a wealth of hand drums to choose from—indeed, the real challenge might be figuring out which drums *not* to sample.

Basing your selection on the availability of good players is an easy way to narrow down which drums to sample. Most techniques for playing hand drums have deep-seated traditions and require years of study to master. A set of East Indian tabla samples, for example, will be of little use unless the musician playing them is highly accomplished. (The same holds true when sampling mridangam, bata, dumbek, ashiko, boba, djembé, bodhran, pandeiro, and others.)

Fine Accents

After you have sampled a range of hand drums, it's time to record some percussive "accent" instruments, such as tambourines, claves, shakers, and the like. You can probably leave the mics right where they are. However, some percussion instruments record better when positioned a bit farther back from the mics. You can get a very nasty "splatter," for example, from a tambourine if it's too close to the mic. When recording tambourines, I normally have the player take a few steps back and raise the instrument into the air.

Other instruments that need more distance from the mics are mark trees and bell trees. In fact, the most difficult time that I have ever had recording an instrument—aside from an Uilleann pipe (a kind of bagpipe)—was with a mark tree. A mark tree is a piece of wood on which metal (usually brass) chimes that vary in size from top to bottom are suspended. The instrument is played by sweeping the hand or a stick across the chimes in an ascending, descending, or random pattern. Capturing the mark tree's lovely ringing sound without getting some weird digital artifacts is difficult. Good mic placement is the key here; you must be extra careful to avoid clipping, so don't get too close or point the mics directly at the instrument, and try tilting the mics up or down slightly. Be sure to record plenty of takes of this instrument.

Zils (finger cymbals) and small triangles can also be tough to capture cleanly because they have so much high-frequency energy. Obtaining good samples of these instruments requires that you use a superior mic. You also have to be careful where you point it: if the mic is aimed directly at the instrument, you can get some nasty digital artifacts. In some cases, switching in a -10 dB pad may be necessary, because the transients can be too hot for the mic. In fact, I usually switch in the pad when sampling this type of instrument unless the mic is backed off quite a bit.

You also might need to filter the output of the mics. When two finger cymbals come together or certain heavy triangles are struck, you can get a lot of low frequencies. They can sound pretty distracting, even if they're accurate; you really want to hear only the upper frequencies. Therefore, I recommend using a highpass filter to cut the bass below 75 or 150 Hz.

FIG. 4: To emphasize the attack of a mallet instrument, position the mic pair above the bars, pointed down (red circles). For a mellower, more resonant, less percussive tone, pull the mics back from the instrument and position them lower, aiming up toward the resonators (blue circle).

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Shakers are fairly easy to record but are hard to play in a way that yields a usable sample. My advice is to go for individual shakes first, followed by some rhythmic patterns that you can cut up later to build your sample. Keep in mind, too, that a shaker has an up and a down sound (or a front and a back, depending on the playing style). One way to represent both sounds is to cut your sample in half and place the two parts on adjacent notes (see **Fig. 3**) so the end user can play the shaker rhythmically. (The same holds true for maracas, cabasa, guiro, and any other percussion instrument played with a back-and-forth motion.) Again, I recommend using a highpass filter to keep out unwanted bass frequencies when recording these instruments.

Other common hand-percussion instruments include claves, woodblocks, cowbells, and agogo bells; somewhat less common are shekere, caixixi, cuica, vibraslap, flexatone, ratchet, and rainstick. Of course, almost anything can be hit or shaken to produce a percussive tone, so the supply of instruments is virtually inexhaustible. I've sampled percussion for 15 years, and I still come across instruments that I have never recorded before.

Mallet Instruments

Now that you have sampled a variety of hand percussion, you're ready to move on to percussion instruments tuned to a chromatic scale. (A piano is technically a percussion instrument, but in this article we will focus on mallets.) Mallet instruments comprise a relatively small group that includes marimba, xylophone, vibraphone, and glockenspiel. Of course, there are many other mallet instruments, but these four are the ones most commonly used in Western music. Usually, these instruments are played with rubber, plastic, wood, or metal beaters, and the note bars are made of either rosewood (marimba and xylophone) or metal (vibraphone and glockenspiel).

Fortunately, none of these instruments is particularly difficult to record. In fact, in my experience, mallets are some of the simplest instruments to sample. Even my earliest attempts, done more than a decade ago with inferior mics, still sound great.

Once more, I recommend stereo recording with the mics positioned about three to eight feet away, depending upon the size of the room and how much ambience you want to introduce into the samples. Mic placement for mallet instruments is a matter of taste, and almost any stereo configuration will achieve excellent results. However, you can emphasize different qualities of the sound depending on where you place the mics.

If you want lots of percussive bite, for example, put the mics closer to the instrument, positioned slightly above the bars and angled down. This placement will emphasize the attack. If you want a more mellow, resonant sound, pull the mics back a bit and position them between the floor and the top of the instrument, aiming up toward the resonators (see **Fig. 4**). Most importantly, trust your ears; they're the most sensitive equipment you own.

Most condenser mics will do a good job, provided you don't put them too close to the instrument. Overloading a condenser mic on the attack transient is easy to do with mallets, particularly when the instrument is being played with heavy beaters. To complicate matters, distinguishing a clip from mallet noise can be difficult, so the distortion may not be apparent while you're recording. (As mentioned previously, most DAT meters aren't fast enough to register such short, hot transients.)

You can avoid such clipping by having the musician play the hardest hits on various notes, both low and high. Then, listen critically to the recording through quality headphones or monitors. If you suspect any clipping, determine where it's coming from and take appropriate steps to alleviate it. There's nothing worse than transferring your data after a long recording session, only to hear distortion on the transient peaks.

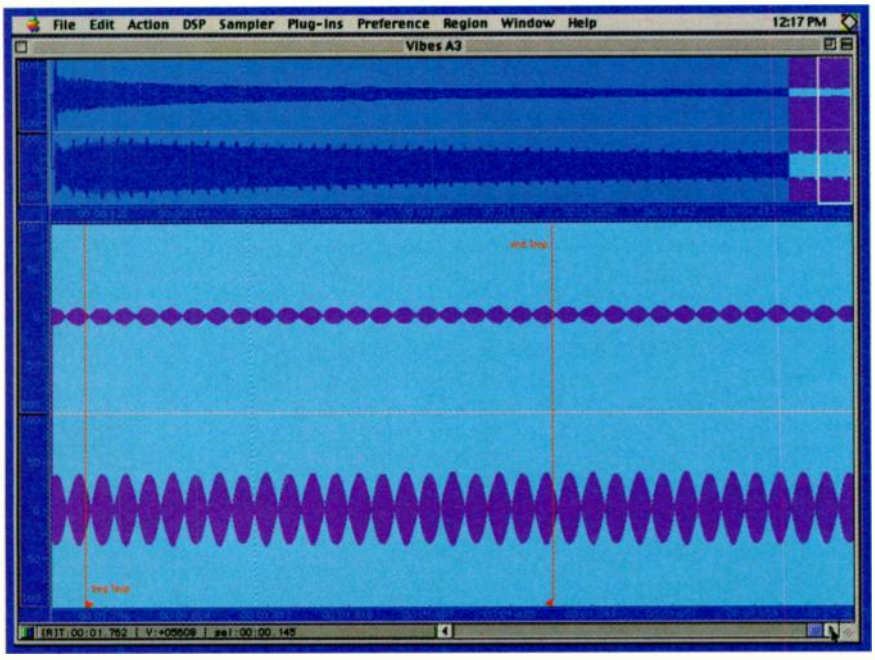


FIG. 5: This waveform of the low A on a vibraphone has been looped at just under two seconds. To prevent subharmonic buzz or rumble, I looped more than a single cycle.

Wood That It Were

The marimba, the lowest pitched of the four mallet instruments discussed here, is tuned a full octave below the xylophone. Both marimba and xylophone have tubular metal or plastic resonators suspended beneath each note. The xylophone's sharps and flats are placed on a slightly higher level than the naturals, while the marimba's are not. The reason is that the marimba is often played using four beaters (two in each hand), and the notes must be on the same level to allow the player to strike a four-note chord in keys that require sharps or flats.

The choice of beater contributes considerably to the tone of both marimba

and xylophone. The softer the beater, the warmer and richer the tone. Harder mallets are typically used to cut through dense arrangements in which other instruments are also playing (as in a modern symphony orchestra). To cover your bases, therefore, record at least one pass each of soft and hard beaters.

Testing Your Metal

The vibraphone is about the same size and shape as the xylophone but is tuned the same as the marimba. Like the marimba, the vibraphone's sharps and flats are at the same level as its naturals. (Originally, vibraphones had steel bars; versions with metal-alloy bars were called vibraharps. Today, all such instruments are called vibraphones.)

Although both vibraphone and glockenspiel have metal bars, vibes have distinctive "vibrating" tubular resonators suspended beneath each note. A long axle passing along the top of each row of resonators bears small, circular, metal or plastic fans (one for each resonator) that rotate together to give the instrument its vibrato effect.

The question of whether to sample with the vibrato effect has less to do with aesthetics than with how much noise is generated by the electric motor that drives the fans. The vibraphone I recently sampled had such a noisy motor that it was impossible to record with the vibrato. Some newer instruments, though, are much quieter.

When recording vibes, make sure you have a microphone that can accurately handle the high-frequency information and wealth of upper harmonics. I've had great success using AKG C 414B/ULSes and Audio-Technica AT4050s, both large-diaphragm condensers. However, any condenser that's smooth out to 20 kHz or above should do the job.

Our final mallet instrument is the glockenspiel, which is available in orchestral and marching-band models. (The latter is known as the bell lyra or lyre glockenspiel.) The orchestral glockenspiel is typically built into a wooden case; the lyre glock sits on a metal frame and is open on both sides.

The glockenspiel's lowest note is the G an octave and a half above the piano's middle C (though some custom-made instruments include extra notes that go down to the C above middle C). The glock is usually played with hard plastic or brass beaters to produce the bright, penetrating sound that is so readily identifiable in certain classical scores. As with the vibes, choose a mic with extended high-frequency capabilities—glocks produce more high harmonics than any acoustic instrument I can think of.

Fly the Loop

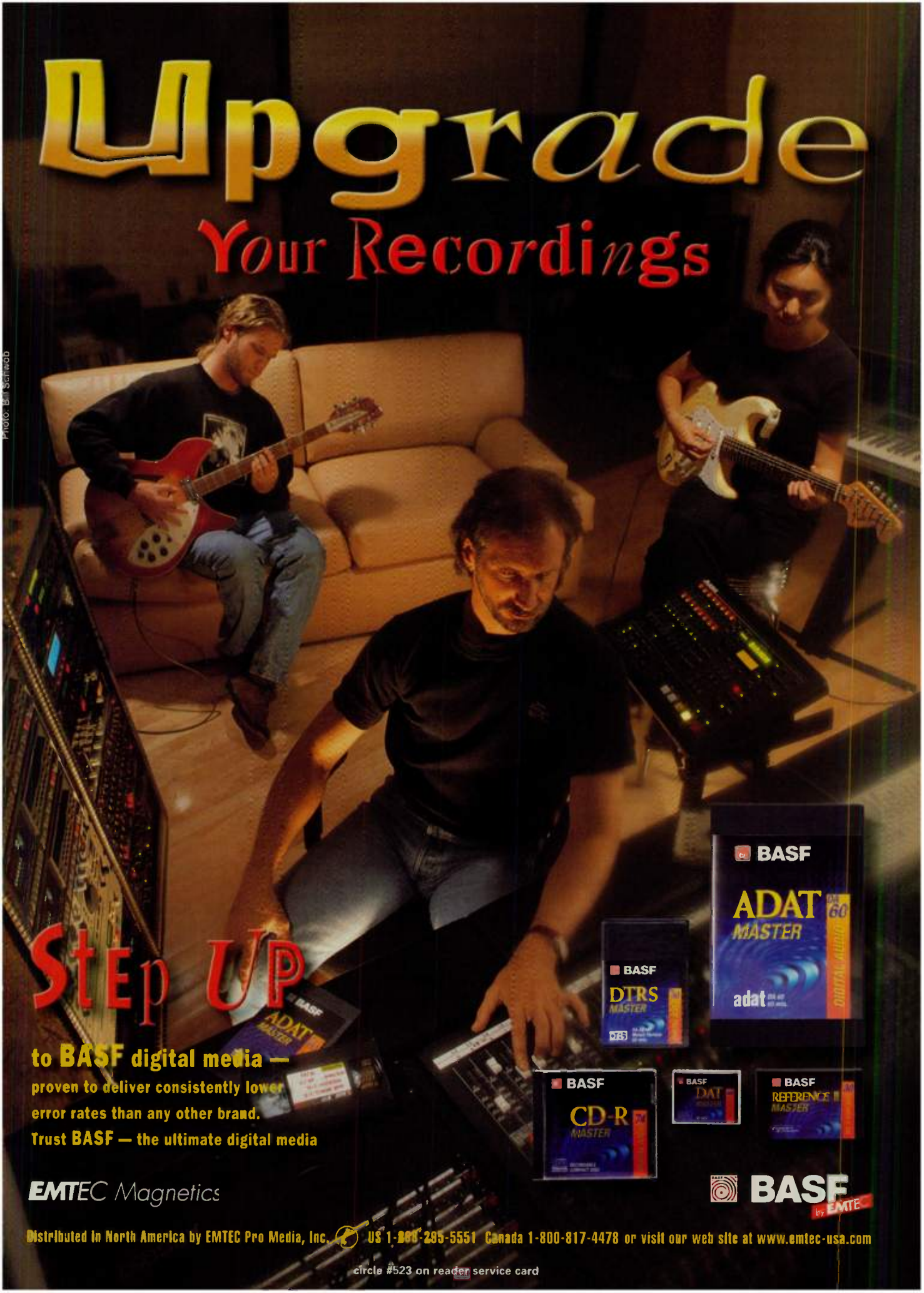
In the case of marimba and xylophone, I favor letting the note decay to silence rather than looping it—especially now that RAM is cheap and abundant. Except for notes in the marimba's lowest octave, marimba and xylophone notes rarely ring out for more than a second, so it makes little sense to struggle with finding a perfect loop in such a quick-decaying sound. I don't loop low marimba notes nowadays, but the sound does quickly become a sine wave, so it can be looped at about 1.5 to 2 seconds.

Vibes and glocks are another matter, as both produce long-sustaining notes. Fortunately, the notes quickly become sine waves (see **Fig. 5**), which makes looping a breeze. Sometimes, however, looping on a single cycle may produce a noticeable suboctave "undertone" that can sound awful. Work-arounds include looping a larger segment of the sample (say, three or four cycles), changing the loop point, or simply sampling a different note and not worrying about it (which is usually my choice).

Ready to Hit

When you're finished with your stereo percussion and mallet samples, you'll have a personal library of natural, musical sounds that can do wonders to spice up your mixes, no matter what the style. Moreover, if your focus is electronica or some other modern form of music, you may be surprised by how nicely these traditional sounds work in the context of "postmodern" music production. So go out there and create some magic of your own. You'll find that the work is worth every ounce of effort.

Jim Miller *is a frequent contributor to* **EM** *and a freelance sound designer whose samples have appeared in sample libraries and instruments from Alesis, Roland, Kurzweil, Korg, Peavey, and Sweetwater Sound.*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THE COMPLETE DESKTOP STUDIO

Periodically, we at **EM** examine just how much of the production process can be accomplished on a computer, and each time we revisit the subject, we find we're closer to a practical, all-desktop studio. These days, you can compose, arrange, track, edit, synthesize, process, mix, and master complete projects—all with a computer system, a few peripherals, and some software. It's true that thorny issues remain, such as incompatibility between software programs or between software and audio hardware. You must plan carefully, and you might have to put up with some hassles. For the most part, however, the all-desktop studio is virtually here.

For this article, we decided to specify which products we would use to create practical desktop studios for Mac and Windows systems, accounting for compatibility issues and other practical considerations. We soon realized, though, that the way we designed our systems depended on our production goals. For example, the combinations of tools needed to design sounds differ from those needed to create music for multimedia or film, or to produce music CDs. Some of the tools we chose can be used for all of these applications, but they might be used for different reasons and in different ways.

We decided that three types of applications accounted for most work done in personal studios, so we divided this article into three sections: sound-design studios, music-for-picture studios, and music-CD production studios. For each type of studio, we've defined basic and advanced systems.

Both the basic and the advanced studios are equipped to handle professional work; the conceptual difference between the two levels is based on the type of work being done. For instance, the basic music-for-picture studio is designed to produce multimedia, whereas the advanced version handles film and video scoring. The basic sound-design studio gets you started in the pro world, but the advanced studio enables you to take almost any sound-design gig. The basic music-CD production studio lets you produce your own music, and the advanced studio equips you to handle outside clients.

With all of the studios in this article, we wanted to do as much production work on the computer as possible; there were times, however, when we had to use external hardware. In some cases, such as with mics, speakers, preamps, and MIDI controllers, we chose not to specify products because this ground has been covered often in **EM.** Occasionally, though, we selected particular outboard hardware when it was essential to the unique purpose of the studio. We also stuck to fundamental production-oriented computer products; for instance, we didn't include notation and algorithmic-composition software.

Finally, this article was written by four of our editors and was assembled and edited by a fifth (yours truly). Each author has strong opinions, a different way of organizing and explaining ideas, a distinct writing style, and a unique way of allocating the "play money" that I dealt out. Rather than make the article homogeneous, I decided to let these differences shine through because it's my hope that you'll learn as much from the authors' differences as you will from their similarities.

—Steve O.

THE EM STAFF DESIGNS 12 COMPUTER-BASED STUDIOS.

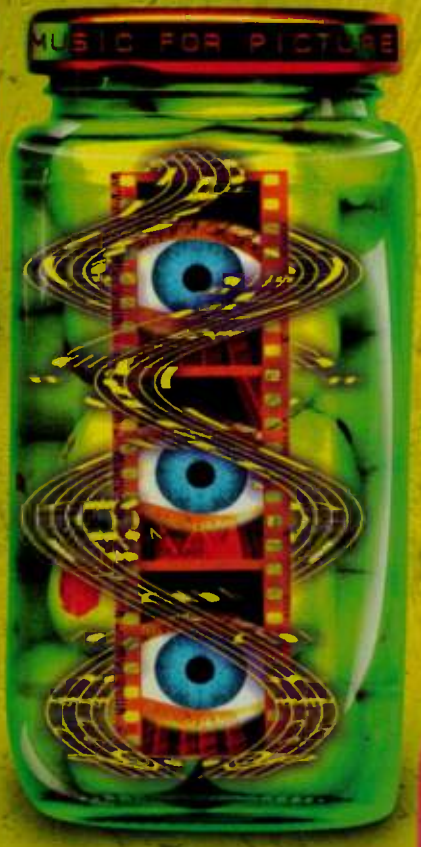

ILLUSTRATION BY BEN FISHMAN

THE SOUND-DESIGN STUDIO

BY DENNIS MILLER

SO YOU want to be a sound designer and create sounds for games or theatrical productions, or maybe even produce a sample CD-ROM for sale? Sound design is a burgeoning business, and it doesn't take much to get into the game. I'll describe some of the tools you'll need to build a basic sound-design studio, and I'll provide some details on a more advanced setup. We'll look at the Macintosh and Windows platforms.

Sound design means many things to many people, but in nearly all cases (except perhaps creating instruments for use in music production), your job is to construct unique and interesting sounds to enhance some other type of medium. Often, you'll have to generate a sound from scratch, in which case a good knowledge of synthesis and some efficient synthesis tools will help you reach your goal. On the other hand, sometimes you can start with a preexisting sound and modify it until it suits your requirements. For this approach, you'll want a good recording device, some sound-effects CDs, and a large number of sound-processing tools. Fortunately, you have plenty of options.

Let's say, for example, that you were called upon to create sound effects for an alien-invasion game. Given that you can't sample all the sounds you'd need (unless, of course, you live in Roswell, New Mexico), you'd have to find creative ways to come up with sounds that would be convincing to the producer of the project. You need to consider which tools would be useful to have on hand and what approaches you could take to reach your goals.

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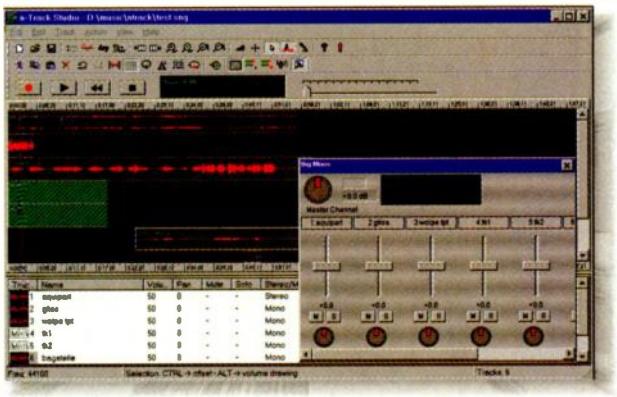
STUDIO BASICS

Unlike some tasks that you're likely to perform in a home studio, sound design is not inherently a real-time endeavor. That means you don't need the fastest computer or hottest new controller to get your work done. Therefore, I won't discuss specific CPU speeds or minimum RAM requirements; I will simply assume that you have a functioning computer. Nor will I cover particular sequencers, mics, or studio monitors. For our purposes, you could use virtually any sequencer, or even no sequencer at all. Remember, you are creating sounds, not music. As for monitors and mics, there are many good options, and **EM** has already published numerous articles and reviews on those subjects.

Instead, I'll deal with the tools you should add to your system in order to begin accepting sound-design jobs. For the basic, entry-level Mac and Windows studios, I'll fix the budget at approximately $2,000. That's all you'll need to build a well-equipped setup suitable for many types of projects.

Of course, if you're expecting to get calls from major clients, such as top television, movie, or game producers, you'll need a lot more than the basics. Therefore, I'll discuss numerous additional resources that you'll need for setting up an advanced Mac or Windows studio. Using these options, you will have enough gear to tackle even the most demanding assignments. (For a synopsis of recommended products, see the table "Sound-Design Studio Summary" on page 60.)



F.A. Soft's *n-Track Studio* offers Windows users multiple tracks of audio and MIDI file playback from a single screen. (MIDI data is shown in green.) The program supports DirectX plug-ins and can export audio in MP3 format.

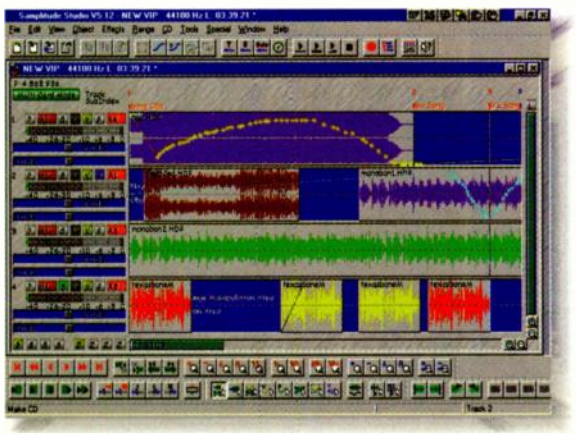
CAPTURING THE ELUSIVE SAMPLE

Regardless of your budget, having a good recording device is a must; it will allow you to bring home material that can serve as the basis for many of your sounds. For example, to recreate that perfect spaceship-engine effect, you might want to spend some time at a construction site, recording various engine and machine noises. You can probably survive with nothing more than a cassette recorder, a decent mic, and some sound-processing software to clean up and tweak your samples. In fact, before I got my first DAT machine, I did numerous jobs using a Marantz professional portable cassette recorder that is no longer in production. (Newer models are still available.)

Today, you are better off buying a MiniDisc recorder than a cassette deck, if you're just starting out. Most MiniDisc players have digital inputs—typically optical, for connecting to consumer-model CD players or DATs—which give them added connectivity in your studio. (Of course, a digital *output* would be more suitable for the job at hand.) For just a few hundred dollars, you can get a top-of-the-line MiniDisc recorder such as the Sony MZ-R55 ($350). The MZ-R55 gives you more than two hours of record time, and at less than eight ounces, it's light enough to carry for long stretches. (Remember, Area 51 is a long way from the nearest highway.)

A good portable DAT deck will provide the best-quality source material, but you should expect to pay double or many times the price of a MiniDisc recorder. The Tascam DA-P1 portable DAT recorder is my top choice for the advanced studio, though it's not inexpensive at $2,060. The DA-P1 has balanced and unbalanced analog I/O and S/PDIF ins and outs, and it's SCMS-free. It's also a rugged unit and a real workhorse. If the price tag is too high for you, then I suggest the Sony TCD-D8 ($899) as a second choice; I've used one for several years. But keep in mind that the Sony model requires an optional connector for many standard I/O functions, and that will add to the cost.

With your portable recorder in hand, your next purchase should be a good pair of microphones. I'd start with a pair of cardioid condensers and later expand the mic collection to include a broad variety of mics from different manufacturers and with an assortment of polar patterns (perhaps omni, M-S, PZM, and multipattern). There are advantages to using ribbon and dynamic mics, as well as condensers, and you might want both tube and solid-state mics. A shotgun mic can be handy for some kinds of field recording. You'll need to pick up a phantom-power supply for some condenser mics, and if you plan to record acoustic sounds directly to a computer in the studio, you'll need a mic preamp.



SEK'D's *Samplitude Studio* multitrack audio editor has many invaluable sound-designing features. Its CD-burning capability is an added bonus for musicians who need to deliver their work on a reliable medium.

SOUND-EFFECTS LIBRARIES

If you can't capture the right sound out in the field, you might find good raw material among the hundreds of sample CDs on the market. Libraries range from collections of exotic, non-Western instruments, such as Spectrasonics' *Heart of Africa,* volume 1 ($129

For manufacturer information, please see Contact Sheet, p. 179.

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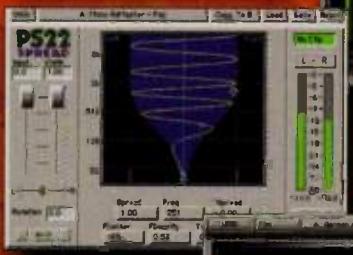
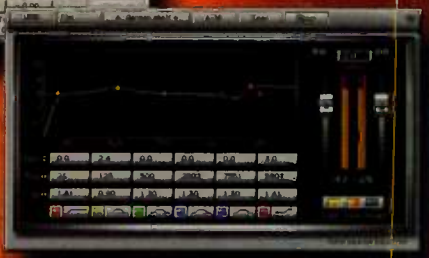


PS22



Renaissance EQ

Pro-FX is for TDM. Native versions in Q4 '99. Only TDM II contains PS22.

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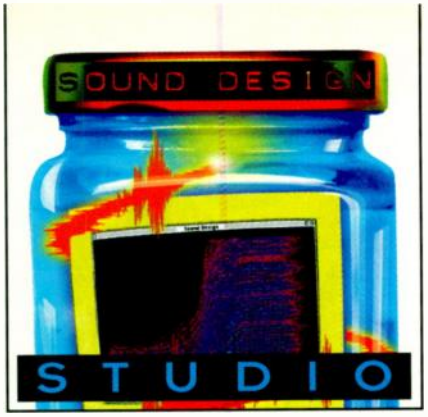


for the two-CD audio set), to high-quality orchestral collections, such as the renowned Miroslav Vitous *Symphonic Orchestra* library ($3.899 for five CDs, which are also available separately). Another type of collection, generic sound effects, is particularly useful for the sound designer. In fact, in many cases, a good sound-effects CD might be the only one you need to get the job done.

The advanced sound-design studios, both Mac and Windows, should include the Hollywood Edge *Premiere Edition* ($895 for the 20-disc set), which I've used for a number of projects. Hollywood Edge also produces one of my favorite special-effects collections, the five-CD *Cartoon Trax* library ($395). It has more *boinks* and *splats* than you'll ever need, but the short, sharp attacks in many of these samples can be grafted onto longer, sustaining sounds to make some very unusual effects.

Our basic studios will be limited to just a few CDs at first, so I'll opt for the four-CD Hollywood Edge *Edge Edition* ($295), which has a wide range of high-quality material. I'll also add a copy of Rarefaction's *Poke in the Ear III* ($149) to both the basic and advanced studios. This is the latest volume from folks who gave new meaning to the word *twisted*. These CDs will get you off to a good start, and once you land a few paychecks, you can look into adding more discs to your collection.

Another way to get good, quality sound effects is to download them from the Internet. Several companies offer this type of service; Sound Dogs (www.sounddogs.com), which has a huge library of material available, is a good place to start. Once you have a password, you can search by category or enter a keyword to limit your search. You can then preview the sounds in AU format before making your purchase. (Sound Dogs' site has no support for RealAudio at this point, but MP3 will be available soon.) Prices are based on the format you select, from just under $1 for 8-bit, 11 kHz quality to several dollars for CD quality. If you choose the direct-download option, you'll immediately get an e-mail message with the URL where you'll find your purchased sounds. Alternatively, you can have Sound Dogs burn your selections onto a CD, in any of the standard audio file formats, and mail it to you.

AUDIO EDITORS

Even with good samples in hand, there's always a need to tweak and twist your sounds. One of the best places to begin the search for processing tools is on your desktop. You can find a good collection of tools in most audio editors (see "Shaping Better Waveforms" in the March 1999 issue of **EM** for a roundup of stereo audio editors), and you might be surprised at the audio-processing capabilities of your digital audio sequencer. There are also a number of dedicated processing applications, some of which run as plug-ins.

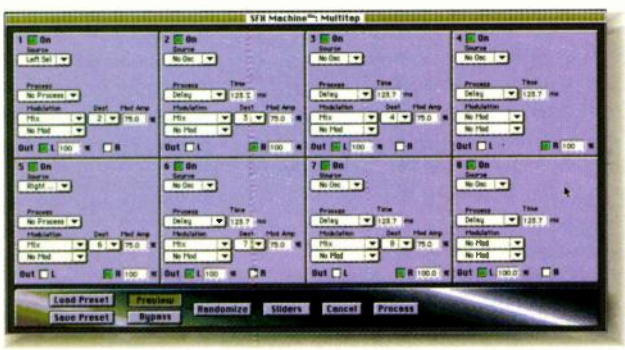
Most audio editors offer sound-manipulation tools that go well beyond cut, copy, and paste. You might opt for a stereo editor initially and then add a multitrack program later for more flexibility.

Our entry-level studios won't include a top professional editor, because you need to save your resources for other purchases. Therefore, my choice for the basic Mac studio is MicroMat's inexpensive *SoundMaker* ($30) 2-track editor. *SoundMaker* has a huge number of unusual sound-processing tools; the Robotize and Doppler effects are especially suitable for that alien game. The program also supports proprietary plug-ins, which adds considerably to its value.

For the advanced Mac studio, I suggest the *Peak* 2-track audio editor ($499) from BIAS, recently upgraded to version 2.0 (although I'm basing this choice mostly on *Peak* 1.6 because we haven't finished testing the new version). The program's Convolution feature has great potential for the sound designer. (*Convolution* is a process that applies the sonic characteristics of one sound to another; see "Square One: Convolution Number Nine" on p. 118 for an in-depth discussion.) *Peak* also includes a number of batch-processing features, and version 2 supports Premiere, AudioSuite, and TDM plug-ins.

For some kinds of sound-design work, our advanced Mac studio will need a professional multitrack editor. Here I choose Digidesign's *Pro Tools PowerMix* ($795). *PowerMix* is identical to the software that comes with a full-blown Pro Tools 24/MIX system, except that it uses the Apple Sound Manager and the Mac's onboard I/O instead of Digidesign's high-end hardware. The software is deep, it has good file-management tools, and it lets you create a variety of custom fades. *PowerMix* supports AudioSuite plug-ins, which means you can use some of the same plug-ins you use with *Peak*. *Pro Tools* is the de facto standard for pro multitrack recording; if you get gigs designing sounds for film or TV, for example, you will probably be expected to know this program. Finally, if you start with *PowerMix*, you can upgrade to a full-blown Pro Tools 24/MIX system later, if the gigs justify it.

On the Windows side, you'll get a lot of work done for a bargain-basement price with Syntrillium's *Cool Edit 96* 2-track audio editor ($50), which has one of the most unusual effects you'll find anywhere. Syntrillium claims that by applying interaural time delays to a stereo sample, the Brainwave Synchronizer feature produces a state of serenity in listeners. I used the process in a Sound Health project, and the producer seemed happy with the results. The effect works only with headphones, but it might be just what your project needs. Of course, *Cool Edit 96* has numerous other effects, and in nearly all cases, the user-definable parameters are quite extensive.



***SFX Machine*, from BIAS, includes hundreds of presets for manipulating sounds. You can also build effects using the Editor screen or have the program generate them for you automatically.**

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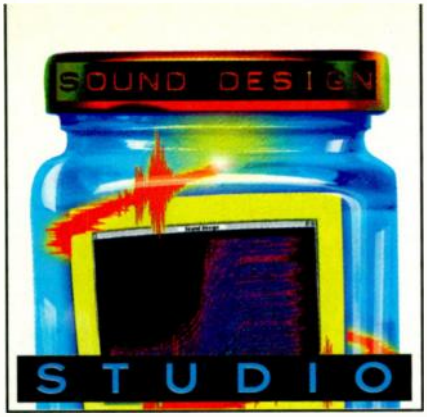
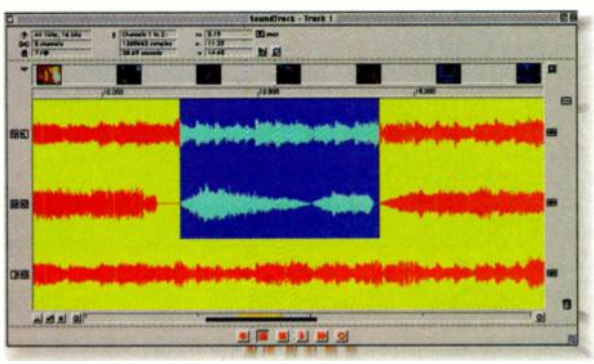


For multitrack projects, you can't pass up the deal F.A. Soft offers on its *n-Track Studio* shareware, so I'm adding it to the basic Windows studio. For only $35, you'll get as many audio tracks as the computer hardware can handle, DirectX support, and integrated MIDI playback. The program's effects, though not extensive, sound very good, and the ability to view data in waveform mode and as a text-based tracklist is a handy option. You'll also have no trouble preparing files for the Internet, because a WAV-to-MP3 encoder is built into the editor.

For a more advanced Windows-based studio, Sonic Foundry's *Sound Forge* 4.5 2-track editor ($499) has a massive feature set that offers traditional as well as outrageous options. You can perform unusual sound-altering feats with functions like the Gapper/Snipper and Pitch Bend, and you can use the Playlist feature to create pseudogranular effects if you splice and dice numerous short chunks of audio. In addition, you get batch-conversion features that can be very useful when doing some types of sound design.

On the other hand, for advanced work you'll probably opt for a multitrack audio editor, and you'll find great features in SEK'D's *Samplitude Studio* ($399). *Samplitude* has numerous functions that are optional in other programs, such as the ability to burn CDs directly from within the program. Its Live Input mode allows you to pass a stereo audio signal "through" the program without having to record the sound to disk. This turns *Samplitude* into a giant real-time effects processor. You also get a versatile filter designer, multiband compressor, and convolution effects, all of which offer great resources for fine-tuning your sounds. The ability to upgrade to SEK'D's *Samplitude 2496* is another reason to make *Samplitude* your editor of choice in a high-end Windows studio.



MicroMat's *SoundMaker* offers an extraordinary variety of processing tools, a proprietary plug-in format, and numerous QuickTime features, including easy audio-offset adjustments and video scrubbing—all for an amazingly low price.

DSP PLUG-IN EFFECTS

Now that you're set with your audio-editing software, it's time to look into the numerous plug-ins that will enhance your resources. Alex Yermakov's *SoundFront FX/SM* ($15) is a choice plug-in for the basic Mac studio. It will operate under our basic Mac audio editor, *SoundMaker*, and its incredibly low price gives you lots of headroom for purchasing other handy tools.

I recommend one of my favorite plug-in effects programs for the advanced Mac studio: BIAS's *SFX Machine* ($299). This Premiere-format plug-in is a tweaker's delight and includes more than 300 preset effects, as well as a complete tool kit for building your own. You can use the presets to generate a massive range of sonic material, or you can employ the Edit screen's eight stereo modules to create extremely complex modulation routings. There's even a random effects generator that can quickly build entirely new effects automatically.

Arboretum's *Hyperprism* effects plug-ins ($349 for the basic version), for both the Mac and Windows, is another powerful set of effects that extends well beyond your simple reverb and delay. *Hyperprism*'s famous "blue screen" interface allows you to preview real-time changes to multiple effects parameters simultaneously. In addition to a great-sounding pitch shifter and numerous spatial effects, the program offers dozens of other features for fine-tuning or totally altering your sounds. The best way to run *Hyperprism* is using the included *HyperEngine* host program, available for the Mac only, which adds even more functions to the plug-in set. I recommend that you buy both *Hyperprism* and *SFX Machine* for the advanced Mac studio, to be sure that you'll always have the right tool for the job. The advanced Windows system will also have *Hyperprism* on hand.

In addition to *Hyperprism*, let's include Opcode's *fusion:Vocode* ($149) in the advanced Windows and Mac setups. *Fusion:Vocode* takes an unusual approach to crossing two sounds, and it has an intuitive interface. You can use its onboard synthesis capabilities to generate source waveforms, and its real-time preview makes fine-tuning parameters an easy affair. On the Mac side, you can use the Premiere version with *Peak*.

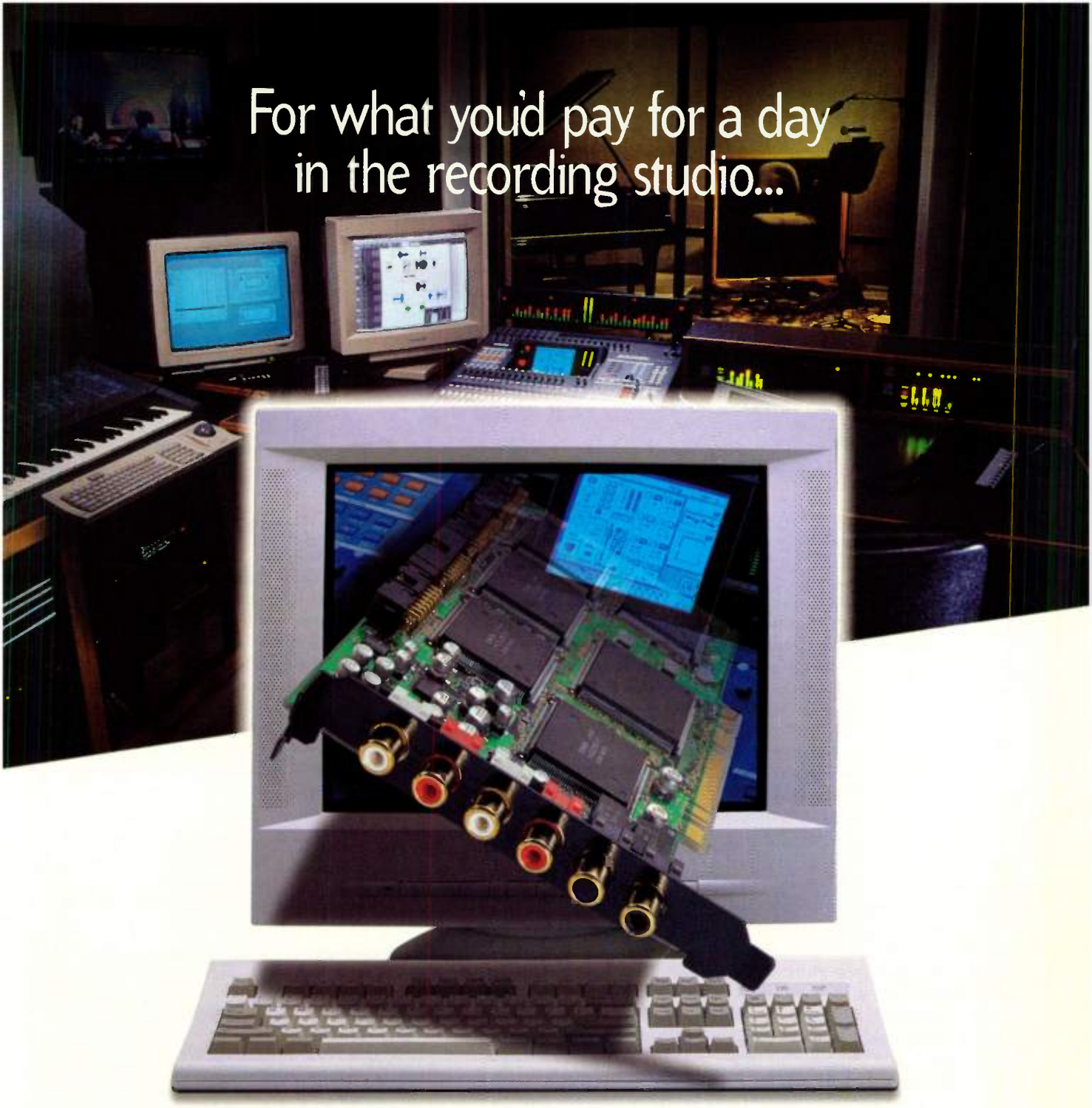
On the Windows platform, the DirectX format is nearly universal. This ensures that the DirectX software you buy will work with nearly all of the most common audio applications, including digital audio sequencers. My favorite DirectX plug-in for sound design is Sonic Foundry's *Acoustic Mirror* ($249). Though the software is intended primarily to apply different room ambiences to your material—which it does exceptionally well—it can also be used to convolve two sound files. I've spent hours crossing different types of material and have created some of my most interesting and unique sounds almost by accident. *Acoustic Mirror* is a bit of a splurge for a low-budget system, but nonetheless I'm going to include it on the must-have list for both the high- and low-end Windows studios because it has so much potential.

MAC STAND-ALONE PROCESSORS

Some digital audio processing software runs as independent, stand-alone applications. The Mac has a clear edge over Windows in this area, but powerful programs exist on both platforms.

Sadly, one of the oldest and best-known Mac programs is no longer being developed, though it is still available. Digidesign's *Turbosynth SC* ($349), surely the granddaddy of user-friendly, modular sound-design software, is still available from the company, but it is not guaranteed to work with newer Mac models. It's too bad *Turbosynth* won't be updated for the next generation of sound designers. I'm not going to formally include it in our Mac studios,

For manufacturer information, please see Contact Sheet, p. 179.



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DSP FACTORY

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YAMAHA

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These companies have announced support for DSP Factory in their Windows® products. Macintosh software coming soon.

Visit our Web site @ www.yamaha.co.jp/product/proaudio or call us at 800-937-7171 ext. 683 • ©1999 Yamaha Corporation • Yamaha, DSP and DS2416 are registered trademarks of Yamaha Corporation. *Not all software supports all of DS2416's features.

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but I do recommend it as one of the most unique and versatile music programs ever made.

There are many sound-processing tools on the Mac, and I'd need to write a separate article just to mention them all. But one valuable tool that should be included in a Mac studio of any level is Prosoniq's *sonicWorx Artist* ($199). *Artist* is a stand-alone application that offers 60 processing algorithms and some of the most unusual presets you're likely to find. The interface is not very intuitive, but the developer is addressing that in a new version scheduled for release later this year. The quality and scope of the effects you can create are amazing, though, so don't pass this one by.

No Mac-based sound designer should be without Tom Erbe's excellent *SoundHack* (available for $30 as shareware) and Kelly Fitz's *Lemur* (free). Both programs analyze existing files and allow you to perform mind-boggling alterations before resynthesizing them. *SoundHack* excels at esoteric processing functions, such as its Spectral Extractor and Phase Vocoder. There are also several convolution and morphing options. *Lemur* is similar in function and works by tracking frequency and amplitude components of a sound independently. You can manipulate the analysis data in numerous ways before resynthesizing. The best part about these programsis that fully functional copies are readily available for download. Both of the programs belong in our basic and advanced Mac studios.

U&I Software's *MetaSynth* ($299), a truly unique sound-design application, also belongs in both Mac studios. There is simply no end to the interesting, arresting, and provocative sounds you can make with it. If you haven't seen *MetaSynth* in action, it's a tough program to describe. What would "painting with sound" do for you? Or how about "scoring with pictures"? These are just two ways to conceptualize *MetaSynth*'s approach to making music, and you'll simply have to trust me on this one. (If you aren't the trusting kind, see the review in the August 1998 **EM**.) Still need proof of my sincerity? I bought my first Mac just so I could run this program!

Finally, *MSP* ($295) from Cycling '74 has some of the most advanced sound-design and processing functions you'll find anywhere, and it would definitely be an asset to the advanced Mac-based studio. If you own Opcode's *Max*, you can create your own *MSP* patches as well as edit existing ones, but even without *Max*, you can use the numerous example patches, as well as others that you can find on the Internet. *MSP* offers a huge number of processing algorithms, and the excellent tutorial makes it easy to get a handle on how they function. (*MSP* patches can also be used inside *Cubase VST* via the *Pluggo* utility from Cycling '74.) If you like to tweak audio in real time, you'll appreciate the tremendous power *MSP* has to offer.

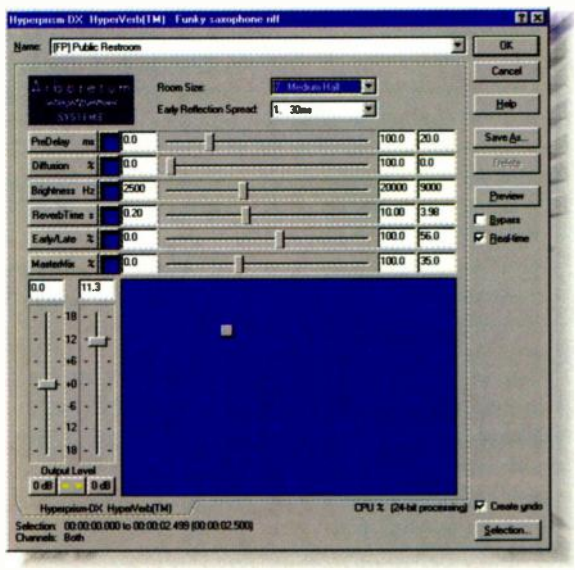
If you don't mind using software that is a bit rough around the edges, consider joining IRCAM's Sound Design forum ($298), which gives you access to very advanced Power Mac–based tools. The French research center offers an annual membership to the forum and supplies you with a CD full of software that is under continuous development. Of the three main programs, my favorite is *Modalys*, which uses physical modeling to design "virtual instruments." Both of the other major programs, *AudioSculpt* and *Diphone*, provide exotic ways to modify the spectrum of a sound. The IRCAM CD also includes contributions from members, and a very active newsgroup is available to answer many support questions.

WINDOWS STAND-ALONE PROCESSORS

A number of Windows programs are available to help you build custom sounds using a modular approach. Rather than working primarily in real time—as software synthesizers such as Seer Systems' *Reality* and Native Instruments' *Generator* do—these programs "compile" the sounds that you design into WAV files on your hard drive. All of the programs I mention below use a graphic interface to build sounds, and each requires a split second to half a minute or more to generate the WAV files you design.

My favorite Windows sound-design software is *Virtual Waves* ($199) from Synoptic. This professional application offers numerous sound-generating and processing tools that can be "wired" together to form complex synthesis patches. You can pick from a wide range of synthesis techniques, including such advanced methods as formant-wave function synthesis and physical modeling, and even use MIDI data extracted from a file to control a number of the processing parameters. *Virtual Waves*' Sound Assistant, a wizard-style feature, will even automate the process of sound design for you. Simply tell the Assistant what category of sound you want, and the design will appear on the screen instantly. You can then edit the design and, of course, save it to disk for future use. Add *Virtual Waves* to either the basic or advanced Windows studio, and you'll turn to it often.

Although not included in our recommended list, some other options in the same category are Rave Technologies' *Audio Architect* ($149) and *WaveCraft* from Last Unicorn (free). These Windows programs work much like *Virtual Waves*, but *Audio Architect* offers significantly more real-time features (though not nearly as many synthesis



Arboretum *Hyperprism*'s blue screen provides access to multiple effects parameters simultaneously. Using the *HyperEngine* host program on the Mac, you can draw control data or use the mouse in real time.

options). *WaveCraft* was a fully commercial application before its developer released it to the public, and its many synthesis tools can be used to serve up some strange and unusual sounds. Also take a look at Jim Bumgardner's *Syd*, which has excellent physical-modeling modules and can read or write a Csound score file. (More on Csound in a moment.) *Syd* is a free program and runs on both Mac and Windows.

A final option for the Windows studios is a newcomer from Sounds Logical. The company's *WaveWarp* ($595) modular effects processor is a huge tool kit of functions that you'll use to create or manipulate sound files. The numerous effects, which include delays, filters, reverbs, and spectral enhancers, are of exceptionally high quality, and unlike the programs mentioned earlier, *WaveWarp* works in real time.

SOUND CODES

If you're willing to step outside the familiar interfaces that most programs offer, you'll find some amazing territory to explore in the world of sound-programming languages. The public-domain synthesis programming language Csound, written by Barry Vercoe of MIT, is an excellent choice for synthesizing and processing sounds and is available for nearly all modern computer platforms. Csound is a powerful tool for building sounds from scratch, and you'll find hundreds of examples online that you can use as starting points. Csound requires two source files: an "orchestra," in which you design the sounds you want using the hundreds of algorithms, or "unit generators," that the language offers; and a "score," in which you specify how and when the sounds are to be played. You can build your sounds using plain text editors, or with any number of graphic "helper" applications that make the task more intuitive.

In addition to synthesizing new sounds, you can use Csound to manipulate preexisting audio files. For example, using the "soundin" and "diskin" functions, you can load sound files from

SOUND-DESIGN STUDIO SUMMARY

PRODUCT	Mac Basic Studio	Mac Advanced Studio	Windows Basic Studio	Windows Advanced Studio
Alex Yermakov *SoundFront FX/SM* DSP plug-in	$15			
Arboretum *Hyperprism* DSP plug-in		$349		$349
BIAS *Peak* 2-track audio editor		$499		
BIAS *SFX Machine* DSP plug-in		$299		
BitHeadz *Unity DS-1* software sampler	$449	$449		
CDP System audio-processing software				$541
Cycling '74 *MSP* audio-processing software		$295		
Digidesign *Pro Tools PowerMix* multitrack audio editor		$795		
Emagic Audiowerk2 audio card		$299		
E-mu *Module Mania* 5-CD SoundFont sample library			$99	
F.A. Soft *n-Track Studio* multitrack audio editor			$35	
James McCartney SuperCollider 2 waveform compiler		$250		
Kelly Fitz *Lemur* audio-processing software	free	free		
Hollywood Edge *Cartoon Trax* sample-CD library (5-CD set)		$395		$395
Hollywood Edge *Edge Edition* sample-CD library (4-CD set)	$295		$295	
Hollywood Edge *Premiere Edition* sample-CD library (20-CD set)		$895		$895
MicroMat *SoundMaker* 2-track audio editor	$30			
Opcode *fusion:Vocode* DSP plug-in		$149		$149
Prosoniq *sonicWorx Artist* effects-processing software	$199	$199		
Rarefaction *Poke in the Ear III* sample CD	$149	$149	$149	$149
Seer Systems *Reality* software synthesizer			$495	$495
SEK'D *Samplitude Studio* multitrack audio editor				$399
Sonic Foundry *Acoustic Mirror* DSP plug-in			$249	$249
Sonic Foundry *Sound Forge* 2-track audio editor				$499
Sony MZ-R55 MiniDisc recorder	$350		$350	
Symbolic Sound Kyma System sound-design workstation		$3,300		$3,300
Synoptic *Virtual Waves* sound-design software			$199	$199
Syntrillium *Cool Edit 96* 2-track audio editor			$50	
Tascam DA-P1 portable DAT recorder		$2,060		$2,060
Tom Erbe *SoundHack* audio-processing software	$30	$30		
U&I Software *MetaSynth* sound-design/composition software	$299	$299		
TOTAL	**$1,816**	**$10,711**	**$1,921**	**$9,679**

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- Word Clock In/Out
- Tone & Silence Generator
- ADAT® Optional
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disk into the program's function tables. Then using an oscillator, for example, you can read the tables and employ the sounds in any of your designs. Csound is not for the fainthearted, but it's a free resource, so why not take the plunge? Watch for an authoritative new text, edited by Dr. Richard Boulanger, that will help you get the most out of this powerful language.

Another excellent choice for coding sound is James McCartney's SuperCollider 2 ($250) for the Macintosh. Like Csound, SuperCollider is a waveform compiler; it creates audio files on your drive based on the specifications you determine in your source files. SuperCollider is less "C-like" in its syntax but has numerous hooks for sending sound parameters in real time—for instance, from a MIDI controller, onscreen slider, or external audio source. The numerous included examples are ready to run, and by making even minor modifications to those files, you can generate dozens of new sounds.

Finally, for advanced sound design, Windows users should take advantage of the CDP (Composition, Development, Performing) system (about $541, payable in British pounds), a library of several hundred processing algorithms that fall into two main categories. First is a set of routines that are intended to transform data extracted by phase-vocoder analysis of preexisting sound files. You can perform a dizzying array of transformations on the analysis data before you resynthesize it: for example, morphing two analysis files or stretching a sound's spectrum like the bellows of an accordion.

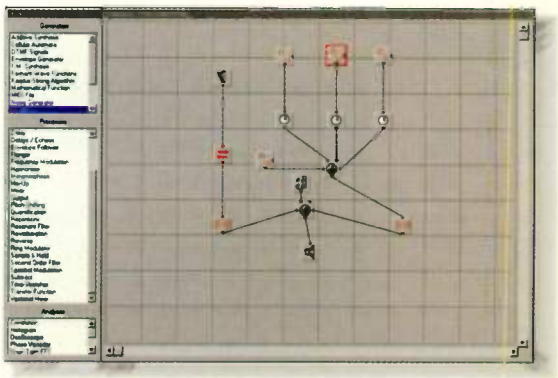
The second set of processes runs directly on audio files. Here you chop, grind, twist, blend, or mutilate your data, all by entering a few parameter values on the command line. The range of processes is amazing, and the documentation and tutorials are superb. CDP will go into our advanced Windows studio, and it's guaranteed to get a real workout.

SOFTWARE SAMPLERS

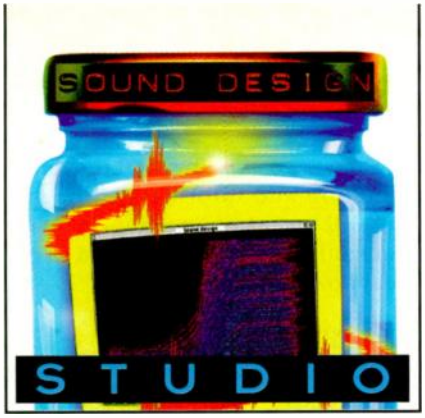
Sound designers often need to deliver original music to clients, so sampling capabilities are essential to both basic and advanced studios. Good hardware- and software-based sampling options exist right inside the computer, so that's where we're going to have a look.

In the software-sampler category, we can use BitHeadz's new, cross-platform *Unity DS-1* ($449), which works well either as a stand-alone module that you can play from a MIDI controller or as a companion to a sequencer that is running on the same computer. The numerous filters, effects, and modulation routings will be especially useful for designing custom sounds, and you can incorporate samples and map them automatically in several formats, including SoundFont 2.0, Akai S1000, and SampleCell II. *Unity DS-1* is especially suitable for Mac studios because it works particularly well with Steinberg's ReWire technology and Mark of the Unicorn's MAS audio format. Because the program is RAM-based, you'll want some extra RAM to get the most out of it.

Both of the Windows studios will have a copy of Seer Systems' *Reality* ($495), which doubles as a powerful synth engine and sampler. Though it doesn't have the range of sampling features that *Unity* has, it can load, map, and trigger up to four sound files from disk at once. And with all the synthesis methods available in *Reality*, we'll be able to create an enormous number of interesting and



Synoptic's *Virtual Waves* offers dozens of sound-processing modules you wire together to create complex synth networks. The Windows program also provides a number of modern synthesis tools.



unique sounds suitable for many different projects. No doubt you'll surprise more than a few clients when you deliver sounds combining FM, AM, subtractive, and modal synthesis with physical modeling and samples.

Keep a close eye on the newest release from Native Instruments, which is called *Transformator* ($298). This modular software sampler runs on both Mac and Windows and offers some of the most interesting DSP effects available today. From everything I've seen, *Transformator* should be a worthy companion to Native Instruments' *Generator*, the 1999 **EM** Editors' Choice winner for best software synth. The two programs are available separately and will also be combined into a single application called *Reaktor* ($469).

AUDIO I/O

For the basic Mac system, you can stick with the computer's built-in audio I/O. The software I've chosen supports it, and given that you can deliver your final product as WAV or AIFF files, you don't need more high-end outputs. You will need some type of small outboard mixer to provide separate monitor and headphone outputs. Any clean mixer can do that job, though, so I won't specify a particular product. (I will note, however, that Midiman makes several small, simple, inexpensive line mixers that would fit the bill nicely.)

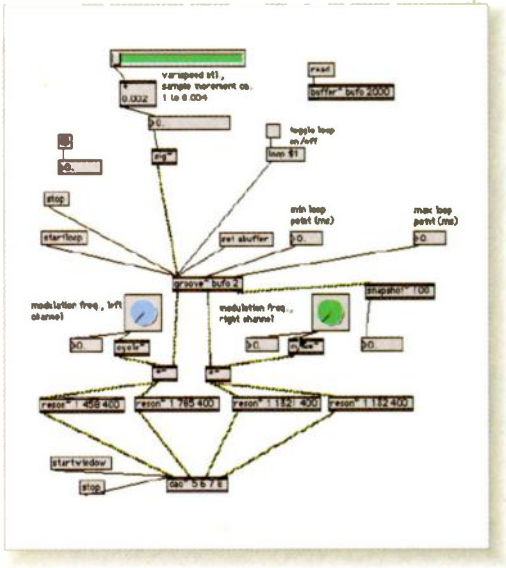
For the advanced Mac system, you would do well to have digital inputs in order to bring your DAT field recordings into the computer in pristine condition. Digital outputs are less critical if you are going to deliver computer files, but they're nice to have. Fortunately, you can probably easily afford Emagic's new Audiowerk2 card ($299), which is based on the Audiowerk8 technology. The new card has two analog ins, two analog outs, and stereo S/PDIF I/O. The Audiowerk2 analog ports are far better than the Mac's onboard audio ports, and the S/PDIF outputs can carry a separate signal from the analog outs, so you get 2-channel recording and 4-channel playback.

Bundled with the Audiowerk2 is Emagic's *WaveBurner* CD-R software, *MicroLogic AV* digital audio sequencer, and *ZAP* lossless audio file compressor, which will be handy for archiving your files. As you may recall, I wasn't going to specify a digital audio sequencer, but because Emagic has been nice enough to give you a good one, you might as well use it.

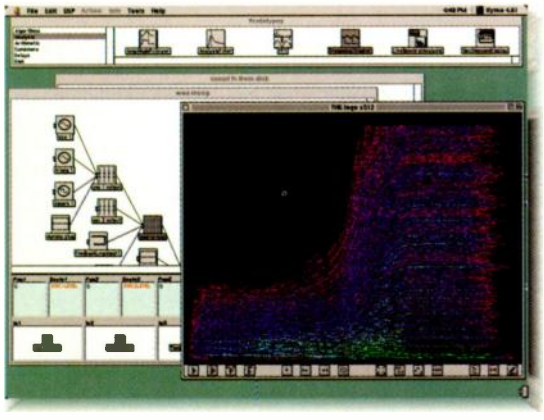
For the basic Windows studio, stick with the sound card currently in your computer, and if that happens to be a SoundBlaster or an E-mu product, take advantage of the support for SoundFonts that it probably offers. You can find numerous SoundFont banks on the Internet for little or no money, but I suggest you spring for all five of the *Module Mania* CDs from E-mu ($99 for the Penta-Pack; $30 per CD), which will give you a huge number of sounds.

If you're planning to upgrade anyway, maybe because you have a sound card that is not up to par, several new cards offer extensive sampling capabilities. I like the E-mu APS system ($699), which supports up to 32 MB of sampling RAM and provides S/PDIF digital I/O as well as four analog inputs and two analog outputs. The APS ships with the *Vienna SoundFont Studio* 2.2 editor, which is the program you'll use to build keymaps and multisamples from your source material. This new version is more intuitive than previous ones and makes creating samples less of a chore. You'll also get hundreds of megabytes of SoundFonts to use right out of the box. By the way, E-mu plans to release its Mac APS driver by the time you read this, and assuming it works as promised, it would make a nice enhancement to your basic Mac system. However, we'll assume that your stock sound card is sufficient for now.

Other sound cards also have sampling capabilities, but before you buy anything, be sure to look at the software you'll be using to edit your samples. Some cards, such as the TerraTec EWS64 and Voyetra's Pinnacle Studio, offer full-blown editing options, but others have very limited capabilities. Suffice it to say that an onboard sampler is not of much use if the tools it provides aren't intuitive.



Cycling '74 *MSP* is a set of extensions for Opcode's *Max* that allow you to develop your own audio-processing programs. In this example patch, the playback rate can be altered using the slider at the top, and ring modulation occurs as the signal is multiplied by two sine waves (labeled 'cycle ~').



The Kyma System from Symbolic Sound is a hardware-accelerated sound-design workstation. The cross-platform system provides nearly unlimited resources for synthesizing and processing audio and has a powerful spectrum editor (right).

MOTHER OF ALL SOUND DESIGN

I've covered everything you'll need for a basic system, but there's one more major item for both Mac and Windows advanced setups: the Kyma System from Symbolic Sound ($3,300 for base unit). Now in its fifth generation, the Kyma System is a massively powerful "black box" full of Motorola

For manufacturer information, please see Contact Sheet, p. 179.

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MIDI Interfaces:

MIDIport 32™
2 IN 2 OUT 32 MIDI Channels

MIDIport 64™
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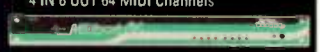

MIDIport 128™
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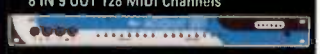

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* The Universal Serial Bus is a new high-speed standard on Mac and Windows for easily connecting devices: no IRQs, no DMAs, no I/O addresses. yeah!

56309 DSP chips that you program using an intuitive graphic interface. The system has just had a significant upgrade and a substantial drop in price. Equally important, Kyma now includes four I/O channels as standard and is easier than ever to use.

You can do just about anything with Kyma. Start with true stereo effects processing; add in a multimegabyte, disk-based sampler; stir in every synthesis method known to humanity; season with spectacular spectral-processing tools that should give you a good 20 percent of the picture. Extensive new tutorials will help get you up and running quickly, and an active newsgroup is also available to answer any technical questions you might have. Kyma will give any sound designer an edge, so plan on using it in your advanced studio for many types of applications.

FINAL DECAY

I hope that the ideas and suggestions here will assist your entry into the sound-design world. Keep in mind that no matter how many tools you have on hand, you'll still need to master many basic skills.

Most important, familiarize yourself thoroughly with synthesis techniques and, of course, sound-processing methodology. The more you know about methods such as FM, subtractive, and granular synthesis, and processes such as convolution and phase vocoding, the better you will be able to accomplish specific goals. Sound designers are fortunate to have such a massive array of hardware and software tools available, but it's up to you to learn how to use them.

Watch for future articles on sound design in **EM**. We want to help you make the most of all the great tools you'll have on hand.

Associate Editor **Dennis Miller** *still lives in the suburbs of Boston. He wishes to thank Ron MacLeod of Rarefaction and BIAS for his help with this article.*

Let the "critics" tell you how easy the Spirit Digital 328 mixer is to use...

Spirit's Digital 328 represents a new way of thinking in digital console design—it bridges the gap between analog ease-of-use and digital sound quality and features.

George Petersen of* Mix *says: "There are more than a dozen entries in the 'low cost' category of digital consoles, but in terms of pricing, performance and fast, logical interface, the Digital 328 clearly sets itself apart from the pack."

Take a few moments to read what he and other "critics" say about the Digital 328. Then, go to *www.spiritbysoundcraft.com* on the web for more information. If you're in the market for an *affordable* digital console, you need look no further.

On 328's user interface:

"The 328 is a real console interface that immediately feels as close to your comfortable old analog board as you could want... the consideration that has gone into every single button, knob and interconnect is striking." – Recording

"I liked the user interface a lot, and given that the most-requested features and digital interfaces are all included, the price is excellent." – Electronic Musician

"I like this board. It has a logical interface and enough knobs for fast operation (as such it could be ideal in a live performance or broadcast situation) while its audio performance is clean enough for any recording application." – Mix

On 328's E-Strip:

"The invention of the E-Strip is a stroke of genius, [giving] instant access to all controls at once on the selected channel." – Audio Media

"The 328 is fast and intuitive, thanks in large part to its 'E-Strip' interface. There are no subroutines or hidden pages; anyone familiar with an analog console can sit down at a 328 and be working in a matter of minutes." – Mix

"With Spirit's clever E-Strip design, this digital desk has the feel of an analogue." – The Mix (UK)

On 328's equalization:

"...To my ears, this is one of the most musical sounding digital EQs I've ever heard." – Recording

"[One] of the best features of the desk: carefully tailored to provide control ranges similar to those on a top-notch analogue console, it is (dare I say) very musical." – Audio Media

On 328's effects:

"A strong selling point for this unit is the pair of built-in stereo Lexicon effects... Having quality effects in the digital domain makes for clean sounds." – Electronic Musician

On 328's automation:

"The automation is straightforward to set up and works well." – Audio Media

"Between the user setups, snapshots and dynamic automation, the 328 remembers everything except the line-input trims and 100Hz rolloff switches. It's easy to get used to this way of working." – Electronic Musician

On 328's connectability:

"Clearly, the Digital 328 provides a multitude of configuration options suitable for project studios, post-production facilities, radio stations and even live applications." – Electronic Musician

"The 328 interfaces to practically anything digital." – Recording

On 328's unbeatable value:

"All in all, the British have indeed landed with a winner. The more you use this board, the more you will discover its depth and power. With one of these consoles, you could start a musical revolution of your own." – Electronic Musician

"This mixer packs a mighty punch for $5,000 [suggested list price]. It sounds excellent, does an excellent job of untangling all the various digital formats in use, and has an excellent interface. A bold step forward in digital console design." – Recording

"I like this desk! There's nothing better out there right now than the 328." – The Mix (UK)

On 328's mic preamps:

"The mic preamps have plenty of headroom... I was surprised at the clarity of the most subtle nuances of the percussion, including the last hint of sound from the bell trees and chimes." – Electronic Musician

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THE MUSIC FOR PICTURE STUDIO

BY DAVID RUBIN

NOW THAT personal computers have thoroughly invaded the world of film scoring, the process of adding music to picture has undergone a technological sea change. By combining a computer and a video player with time code, composers can now add music to picture in real time. This has opened up many creative possibilities and new opportunities for otherwise disenfranchised musicians. Even composers who prefer to write away from the picture now have the option to try out musical cues against picture before making a commitment to a particular cue. Indeed, the use of synth/sampler mock-ups of scores has become widespread as a form of "insurance" for all involved in the project to guarantee that everything works musically and dramatically before spending big bucks on an expensive studio recording session.

Even so, low-budget features, educational films, industrial videos, TV commercials, and other audio-visual formats are often served well by scores that are created and recorded entirely on a desktop music system. In fact, the frenzied pace of today's TV and movie post-production schedules often relies on the speed and flexibility of desktop systems to get the work done on time and under budget.

What do you need to get started scoring to picture? That depends on what kind of "picture" you have in mind; the audio-visual universe has expanded a lot in the past couple of decades. Aside from films and TV, media such as computer games, Web sites, and desktop multimedia offer new points of entry into the picture-scoring field.

HIGH AND LOW

To simplify the process of assembling a good desktop scoring system, I've divided the arena into two categories: the more basic system will be designed for multimedia music production, and the higher-end system will focus on film/video scoring. In each category, I'll assemble a cost-effective, computer-based system for Mac and for Windows that will enable you to produce high-quality music with the option of future expandability. (For a list of recommended products, see the table "Music-for-Picture Studio Summary" on page 80.)

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To heighten the challenge, these are to be true desktop systems: as many of the core components as possible will be computer hardware and software, avoiding unnecessary external hardware devices such as mixers, sound modules, and effects units. This approach will simplify various aspects of studio design and help you keep costs down. Of course, if you already have external hardware devices, you can add them to any of the systems described here as long as you get an audio interface with the appropriate inputs and outputs.

For our purposes, a film-scoring system is one that can deliver quality, 16-bit, 44.1 kHz (or better) digital audio in one or more tape formats, such as DAT, ADAT, or DA-88. SMPTE time-code support is essential. Such a system can handle almost any music-for-picture job, including fully synchronized film or video scoring.

The less expensive multimedia system may lack extensive synchronization capabilities, but it lets you try your hand at scoring to picture by working in the field of desktop multimedia. Instead of tape, these soundtracks are typically delivered as audio files (or MIDI files), so the ability to read and write a variety of file formats is important, as is the ability to suitably compress, edit, and process the audio. Let's begin by looking at basic, entry-level desktop multimedia systems for Mac and for Windows.

GETTING STARTED

Unless you have connections in the film industry, a good way to gain experience combining music with picture is by creating soundtracks for multimedia. Apple's QuickTime architecture supports a wide array of file formats, such as digital audio and MIDI, as well as several audio compression schemes. You simply import a QuickTime movie onto your hard drive and add a soundtrack to it, or replace an existing soundtrack with one of your own. If you have a video-capture card, you can create your own movies and score them with your own desktop workstation.

QuickTime movies can be cross-platform compatible and are often used as elements within multimedia authoring programs, such as Macromedia's *Director,* or as design elements to enhance Web sites. Game developers can also use QuickTime movies at places where the flow of action allows for proper playback. In addition, countless CD-ROMs and Enhanced CDs rely on QuickTime to add a multimedia component to the rest of the content.

Although there are more than 26 million QuickTime users running Windows, Microsoft's AVI format is still the preferred digital video format for many Windows users. Both QuickTime 3 and Adobe *Premiere* 5.1 support AVI.

Speaking of *Premiere,* if you're interested in exploring QuickTime-based multimedia in depth, consider purchasing Adobe *Premiere* 5.1 ($895), a powerful, yet largely intuitive, multimedia authoring program for Mac and Windows. (For more on *Premiere*'s audio capabilities, see "Desktop Musician: World Premiere" in the July 1997 **EM.**)

But you don't need *Premiere* simply to add soundtracks to QuickTime. Most mid- to high-level sequencers and audio editors now support QuickTime (or AVI for Windows) and allow you to view movies frame by frame and position your music at specific places. That means you can often create, edit, and align a soundtrack in a single program. Which program you use depends on the nature of the soundtrack and of the particular project.

For that reason, a well-designed multimedia workstation must include an audio editor and an audio/MIDI sequencer for music production. It should also include a large palette of musical and nonmusical sounds. To avoid using external gear as much as possible, these sounds will be supplied by a software synth and sampler in our system. Of course, you'll need an input device for creating your music, and a MIDI keyboard is a logical choice. That, in turn, necessitates a MIDI interface, which completes the essential elements in a desktop studio. Now let's look at some specific setups.

THE MULTIMEDIA STUDIO

A good desktop music-production studio should be centered on a solid and versatile audio/MIDI sequencer. Because multimedia is still predominantly a 16-bit, 44.1 kHz (or lower) medium, you don't need to have high-resolution (24-bit, 96 kHz) audio capability, although leaving the door open with upgrade options is a good strategy.

The Mac is especially well positioned as a platform for multimedia music production because of its onboard 16-bit stereo audio hardware and robust QuickTime authoring capabilities. I'll take advantage of the Mac's native audio to keep costs manageable in this entry-level system. You can always add a multichannel, high-resolution audio card later.

On the Windows side of the aisle, there are hordes of sound cards to

You can scrub through a video clip frame by frame in Steinberg *Cubase VST*'s dedicated QuickTime window. As you drag the scrollbar slider, the Song Position Pointer line moves with you to show where you are in the sequence.

The biggest thing in samplers wouldn't even fit on this page

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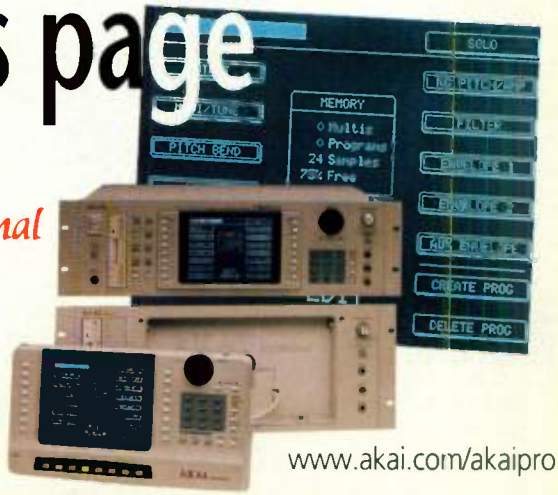

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choose from, and CD-quality (or better) output is now commonplace. For our system, I'm choosing Creative Labs' Sound Blaster Live ($200); it's relatively inexpensive and widely compatible. Moreover, Sound Blaster Live's S/PDIF I/O and support for E-mu's SoundFonts and Microsoft's DirectSound makes it highly compatible with the BitHeadz products that I'll be covering shortly.

THE SEQUENCER

Choosing a sequencer is difficult; personal tastes and work-style preferences tend to muddy the picture. In general, however, you'll need a user-friendly sequencer with a well-designed interface, plenty of editing tools, good audio mixing and processing capabilities, and above all, excellent QuickTime or AVI support. High-end programs cost too much for this budget system; low-end programs typically lack the necessary tools for professional-quality work. That leaves a handful of midlevel sequencers in the under-$400 range.

Two other characteristics further narrow the field: plug-in support (for extensibility and versatility) and effective audio/video scrubbing (to help pinpoint cues and transitions). Emagic's *MicroLogic AV* ($99) supports QuickTime (or AVI for Windows) nicely, but the program provides only 16 audio tracks and doesn't support plug-ins. Emagic's *Logic Audio Silver* ($299) is a better choice, with its VST plug-in support, but it offers only 24 audio tracks, which might still be too limiting for some projects.

Cakewalk's *Metro* for the Mac ($249) also works with QuickTime, and it supports VST and Premiere plug-ins. But *Metro*'s scrubbing tool is awkward to

RECOMMENDED MINIMUM SYSTEMS

Multimedia Music Studio
Power Mac G3/233 MHz CPU running Mac OS 8.x or Pentium/200 MHz CPU running Windows 95 or 98; 64 MB RAM; dedicated 4 GB SCSI hard drive with minimum 12 ms access time

Film/Video Scoring Studio
Power Mac G3/300 MHz CPU running Mac OS 8.x or Pentium II/300 MHz CPU running Windows 95 or 98; 128 MB RAM; dedicated 4 GB SCSI hard drive with minimum 12 ms access time

Hear what the experts have to say about the E-MU Audio Production Studio.

- "The E-MU® APS is essentially a complete system based around a 64-voice sampler.... It sounds excellent..."

  – Sound on Sound, December 1998

- "The E-MU APS is one of the most effective ways of optimizing your PC for desktop music and recording.... It's also one of the most cost-effective."

  – Computer Music (UK), January 1999

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  – Editors' Choice Award Winner, Electronics Musician, January 1999

- "Listening to the E-MU APS MIDI/SoundFont® demo tracks provided the most stunning audio experience in the shootout – great samples, clean output, and quality effects...."

  – EQ Magazine, September 1998

- "The great thing about this card is it sounds like you're playing a real instrument.... I would have no problem recommending the APS to anyone who wants to dive in to digital home recording, sequencing, sampling, or other music production on a PC."

  – Mix Magazine, February 1999

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  – Keyboard, April 1999

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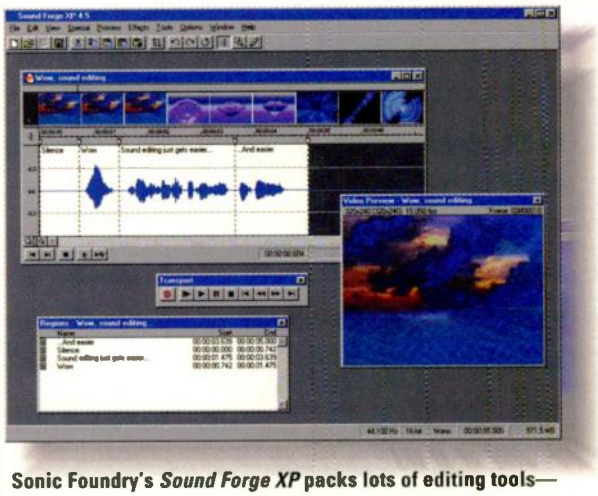
use and not as well integrated as similar tools in competing products—a major drawback. Cakewalk *Professional* 8 for Windows ($269) provides excellent AVI and QuickTime support and works with DirectX plug-ins, but it has only eight audio tracks. Steinberg's *Cubasis AV* ($99) lacks plug-in support and also offers merely eight tracks of audio.

In spite of its higher cost, therefore, I've settled on Steinberg's *Cubase VST* ($399) as the best all-around choice for our Mac and Windows budget music-for-picture studios. *Cubase VST* has a vast number of editing windows, and its 64 audio tracks and support for VST plug-ins make it powerful enough for any job. Moreover, *Cubase VST* has an impressive mixer section with four inserts and eight effects sends per channel, and the program comes with several high-quality effects to get you started. That saves you money on an external reverb unit and other external processors.

Cubase provides an excellent environment for working with QuickTime or AVI movies. You can import a movie without its original soundtrack, or you can import the soundtrack and have it appear in the Tracks window, so you can build on it with more tracks. A separate MovieTracks window (Mac version only) lets you audition a movie and adjust the audio offset, panning, and volume with sliders.

The dedicated QuickTime window provides a scrollbar and playback controls (Mac only), and you can also play the video using *Cubase VST*'s transport controls. To scan through the video frame by frame, grab the QuickTime scrollbar slider (or the *Cubase* transport slider in the Windows version) and drag left or right. In the Tracks window, the Song Position Pointer line moves along with you in real time (live scrolling) as the transport's location display provides a readout of elapsed time.

Let's say you want to add a harp glissando to an important transition in the video. The first step is to record and edit the harp part; you can record the part as you watch the movie, or you can record without the picture. Next, scrub through the video using the scrollbar until you find the frame where you want the gliss to begin. The Song Position Pointer line will appear at the corresponding place in the sequence. Simply drag the harp part to the line and that's it. Adding sound effects and clips of dialog is just as easy. When you're finished creating your soundtrack, you can mix it, process it, and lay it back to the AVI or QuickTime video, thereby producing a finished digital video file.



Sonic Foundry's *Sound Forge XP* packs lots of editing tools—along with support for AVI and RealNetworks G2—into an easy-to-use program.

THE AUDIO EDITOR

Sometimes, of course, audio tracks need close-up editing, so a well-equipped desktop studio also needs a good audio-editing program. Although *Cubase* can handle most editing tasks, a dedicated audio editor is sometimes essential. Most high-end editing programs support QuickTime on the Mac or AVI in Windows, which is a nice feature to have. In this case, however, we're trying to save money, so we'll let *Cubase VST* handle the QuickTime or AVI chores and choose an inexpensive editor to serve as an adjunct to the sequencer.

At less than $100, BIAS *Peak LE* 2.0 ($99) stands out as a particularly good buy. The program gives you the same well-designed user interface as *Peak* 2.0 and has many of the same editing capabilities. What's more, *Peak LE* supports Premiere plug-ins, which further broadens your plug-in options for processing audio files.

Peak LE lets you zoom in on a recording and view the waveform at the sample level. A Pencil tool enables you to smooth over clicks and mismatched loop points by redrawing the waveform. The program provides unlimited undo

BitHeadz's *Unity DS-1* is an excellent cross-platform software sampler. Its ability to connect to other Mac programs makes it especially suitable for use on that platform.

For manufacturer information, please see Contact Sheet, p. 179.

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and sophisticated scrubbing features. You can create playlists in *Peak LE* (although without the crossfade and DSP options found in the higher-end version of *Peak*) and export them to Adaptec *Toast*, which is bundled with the program, so you can burn CD-Rs. That adds versatility to our system, as do *Peak LE*'s abilities to import and export a wide variety of file formats and to encode MP3, Shockwave, and RealAudio 5.0 files.

For Mac users, *Peak LE*'s lack of QuickTime support is adequately covered by *Cubase VST*, but if you want to work with QuickTime from within your audio-editing program, consider MicroMat's *SoundMaker* ($30). It handles QuickTime in an intuitive manner, with video scrubbing and easy audio-offset adjustments. In *SoundMaker*, you can view individual movie frames above the waveform display, and you can import, view, and edit multiple audio tracks simultaneously. This program is hard to beat for the price. However, *SoundMaker* sacrifices sample-level waveform editing, audio scrubbing, playlist editing, and, perhaps most importantly, support for third-party plug-in formats.

On the Windows side, Sonic Foundry's *Sound Forge XP* 4.5 ($50) gives you a lot of flexibility for a bargain price. It supports AVI files and several audio formats, including RealNetworks' G2 format. *Sound Forge XP* comes with lots of built-in effects, and you can expand its processing options by adding dedicated ExpressX plug-ins. The program includes unlimited undo capability and plenty of editing tools for most tasks.

Together, *Cubase VST* and *Peak LE* make a powerful yet cost-effective team, and they complement each other well. The same is true of *Cubase VST* and *Sound Forge XP*. In fact, you can set up *Cubase VST* to export audio files to either audio editor when you select the Launch External Wave Editor command in the Audio Functions menu. You can then make the necessary changes in the audio editor and shoot the file back to *Cubase VST*.

These programs also share another trait: they offer upgrades to more advanced versions (*Cubase VST/24*, *Peak* 2.0, and *Sound Forge* 4.5). One other option worth noting for Mac users is BIAS's *Deck* ($399) multitrack digital audio recording program. It comes bundled with *Peak LE;* although it's not a sequencer, it can import and play MIDI files along with audio files, and it supports QuickTime.

THE INSTRUMENTS

Now that we have the heart of our desktop system, let's assemble some musical colors to paint our scores. As mentioned earlier, I'll eschew the usual options of external sound modules and samplers in favor of internal solutions.

Software synths and samplers have been grabbing a lot of attention lately. The latency issue has been diminishing, and new products offer exciting potential. Two recent cross-platform programs from BitHeadz, *Unity DS-1* ($449) and *Retro AS-1* ($259), have made quite a splash. *Unity* is a software sampler that can import Sound Designer I and II, AIFF, CD audio, and WAV files; read DLS and SoundFont 2.0 formats; and read SampleCell I and II and Akai S1000 and S3000 discs with proper mapping of multisamples. That gives you access to an enormous library of sample CDs, in addition to hundreds of sounds (250 MB including a GM set) that come with the program. *Unity* outputs 24-bit, 96 kHz sound (depending on your hardware, of course) with up to 64-note polyphony and 16-channel multitimbral capability. It has a full MIDI implementation and is extensively programmable.

Moreover, the Mac version can output its files directly to disk in 8-, 16-, and 24-bit format. Currently, the Windows version supports only 8- and 16-bit audio up to 48 kHz, but support for 24-bit, 96 kHz audio is in the works and should be available soon.

For the Mac system, we'll use some of the money we saved by not buying a sound card to expand our *Unity* instrument library. (The Sound Blaster Live adds lots of new sounds to the Windows system, so it seems only fair.) I'll choose E-mu's new *Module Mania* library ($99). It comes on five cross-platform CD-ROMs and consists of the sound sets, in SoundFont format, of E-mu's most popular sound modules: Proteus/1, Proteus/2, Proteus/3, Vintage Keys, and Planet Phatt.

Retro AS-1 rounds out our instrument set nicely by adding the sounds of analog synthesizers from days gone by. *Retro* outputs 16-bit, 44.1 kHz stereo sound (96 kHz on the Mac), with up to 32-note polyphony; it reads and writes AIFF and WAV formats. With *Retro* you can create a wide array of sounds from scratch, and the program includes about 1,000 classic sounds to get you started. *Retro* and *Unity* pack an irresistible one-two punch and provide a solid foundation for building an open-ended palette of instrument sounds. Be aware that these programs can chew up a lot of CPU cycles; your computer will bog down if you try to run them simultaneously with other CPU-intensive programs, such as a digital audio sequencer with plug-ins.

Windows users also have two powerful options for expanding their sonic palettes: Seer Systems' *Reality* ($495) and NemeSys Music Technology's *GigaSampler* ($795). Unlike the RAM-based *Unity*, *GigaSampler* reads its samples directly from the hard disk, so you can have truly gigantic samples. *Reality* includes sample-playback capability, but the program really shines when it comes to synthesis: it offers several types with extensive control over parameters. If you have some extra room in your budget, it's worth exploring these exciting programs.

MOTU's cross-platform MIDI Timepiece AV offers 8-In, 8-Out, 128-channel MIDI capability along with a full complement of audio/video sync options. Its support for SMPTE time code, blackburst, and word clock make it ideal as the cornerstone of our film-scoring studio.

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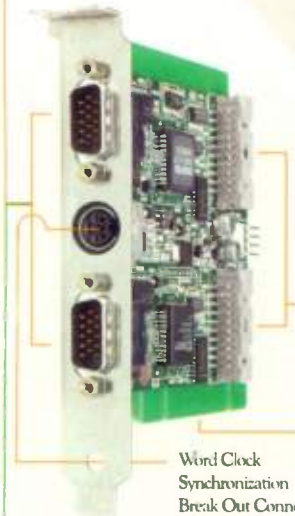

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THE INTERFACE

To complete this desktop puzzle, you need a MIDI interface so that your MIDI keyboard can send messages to the computer. Because there are no external sound modules in our system at this time, an inexpensive, 1-In/1-Out unit can work fine. In the long run, however, you'll be much better off with a midlevel, multiport, multichannel interface.

One of my favorites in the under-$300 price range is Mark of the Unicorn's Micro Express ($295). This 4-In/6-Out interface supports up to 96 MIDI channels and can merge, filter, and rechannelize MIDI data. It also supports SMPTE time code and converts clicks to MIDI. That's a lot of power in a half-rackspace unit, and it provides an opportunity for easy expandability as your desktop studio grows (especially as you add external gear). In fact, because *Cubase VST* and the Micro Express both support SMPTE time code, your studio can easily evolve into an intermediate-level studio so that you can try out video scoring and time-code-related applications as well as desktop multimedia and game scoring.

That completes the core of our Mac and Windows systems for multimedia music production. As you might expect, however, there are always a few more things to consider.

ADDITIONS AND EXTRAS

Most computers—especially Windows PCs—come with a set of desktop speakers, and some multimedia monitors house small speakers next to the video display. In some cases, these desktop speakers work fine for mixing and editing music for games and multimedia. After all, most end users will likely be listening to your work on similar speakers. But many computer speakers provide such poor audio quality that they may adversely affect your mixing decisions and ruin the final soundtracks.

It pays to invest in a decent pair of modestly priced, self-powered, magnetically shielded reference monitors. They'll give a clearer picture of your musical output. You have lots of choices here, but I won't make any specific recommendations in this article; **EM** has covered this subject many times before.

Don't throw away those cheap desktop speakers, though. You can use them to verify that your final mix will sound balanced on any system. Listening to your music on a variety of setups is always a good practice because you never know where the music will be playing next. Along those same lines, I always keep a set of high-quality headphones close at hand for carefully scrutinizing my music. Headphones make excellent diagnostic tools—and they let you work at night without disturbing your neighbors.

As I mentioned earlier, most multimedia soundtracks end up as audio files of some sort, even though you may be asked to submit your music in another format. An inexpensive DAT machine, therefore, makes a good investment. Mastering to DAT is easier and less expensive than keeping all of your music on removable hard-disk cartridges. And DATs are easy to mail across the country. Be sure to choose a DAT recorder with S/PDIF ins and outs so that you can digitally transfer your masters to and from the computer for further editing if needed. (For the Mac system, you'll need to purchase a sound card with digital I/O to stay in the digital domain when transferring audio files to DAT.)

The other obvious extra that you'll want is a MIDI input device, and that means a MIDI keyboard controller for most people. Preferences in keyboard action vary widely based on musical style and playing technique, so no single make or model will satisfy everyone. A number of suitable keyboard controllers are on the market, however, so you shouldn't have trouble finding one that suits your needs.

THE FILM-SCORING STUDIO

Several important characteristics distinguish our professional-level, desktop film-scoring studio from the entry-level multimedia system. First and foremost, an advanced system must offer extensive synchronization capabilities, which include full support for SMPTE time code (all frame rates), video blackburst, and digital word clock. Because an advanced system must interface with outside film, video, and audio-recording facilities, it must also be compatible with more kinds of external gear than the desktop multimedia studio has to accommodate. In addition, it must offer better-than-CD-quality multichannel audio so that you can tackle the most demanding jobs.

BIAS *Peak* 2.0's well-designed user interface, SMPTE time code support, playlist editing capabilities, and powerful editing tools make it a natural for our desktop film-scoring studio.

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We've got a solution for you.

USB is the new wave in MIDI and MIDIMAN, the leader in MIDI interfaces, has created it's newest MIDI product the USB MIDISPORT™ 2x2. The cross platform MIDISPORT™ is a 2 in / 2 out USB MIDI interface with true Plug-n-Play for PCs or Macs and requires no external power supply. For more information or to get your hands on a MIDISPORT see your local dealer or call MIDIMAN at (800) 969-6434.

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WRH

Pro-level desktop systems range in price from a few thousand dollars to tens of thousands or—if you add high-end external hardware—even hundreds of thousands of dollars. For our purposes, I'll assemble a modestly priced desktop system that provides high-quality audio and supplies all the essential tools without permanently destroying your credit rating.

FROM HERE TO THERE

Although the process of scoring films varies from place to place and from job to job, it typically involves several common steps. After principal photography is complete and the film goes through several edits, a final edited version is transferred to video. Theoretically, this "locked" work print is to remain unchanged so that the composer has a reference for matching the music to picture. (In reality, however, things always seem to change.)

Ideally, the work print includes most of the dialog and a few temporary sound effects as references so you can avoid unpleasant collisions in the soundtrack. The tape will also include SMPTE time code (in the form of Longitudinal Time Code, or LTC) on one of the audio tracks. The work print should also include a time-code window onscreen so you can watch the SMPTE numbers flash by as the video plays. (For a thorough introduction to the topic of synchronization, see "That Synching Feeling" in the October 1996 issue of **EM**.)

Larger studios often use ¾-inch videotape for work prints, because ¾-inch decks are rugged, offer greater control over tape shuttling, and often provide a dedicated address track for time code. However, ½-inch (VHS) decks are common for midlevel desktop studios and are frequently used for independent, low-budget productions, even though they're a bit more trouble to work with.

Once a work print with a time-code window is available, the composer, director, and music editor (if there is one) get together for what is called a *spotting session*. They view the movie scene by scene and determine where the music should start and stop and how the music should sound. Notes taken at this session form the *cue sheet*, which the composer uses as a reference. The cue sheet shows SMPTE times, fragments of dialog, and descriptions for each musical cue. At this point, the composer retires to the dungeon and desperately tries to kickstart the creative process.

PICKIN' THE PIECES

As with our multimedia system, I'll rely on the *Unity DS-1* and *Retro AS-1* software sampler and synth from BitHeadz as the primary sources for instrumental sounds. That keeps the core system inside the computer and—for now, anyway—avoids the need for an external mixing board.

Your audio-editing programs must be top-notch so that you are prepared to handle any music, dialog, or sound-effects editing jobs that might come your way. Therefore, we'll step up from *Peak LE* to *Peak* 2.0 ($499) on the Mac and from *Sound Forge XP* to *Sound Forge* 4.5 ($499) for Windows. These programs offer lots of powerful editing tools—especially for close-up editing—and support for a wide range of file formats and plug-ins (Premiere, AudioSuite, and TDM in *Peak* and DirectX in *Sound Forge*). *Peak* 2.0 also has a QuickTime movie window (which the *LE* version lacks), and it lets you burn CDs directly from its playlist. It can record up to 32-bit files, if your hardware can support that resolution.

Perhaps most important, however, is that both programs offer sophisticated playlists that can be synched to incoming time code. That enables you to create a list of music cues, sections of dialog, or sound effects, for example, and have them trigger at specific SMPTE times—a highly useful post-production tool.

MUSIC-FOR-PICTURE STUDIO SUMMARY

PRODUCT	Mac Multimedia Music Studio	Mac Film/Video Scoring Studio	Windows Multimedia Music Studio	Windows Film/Video Scoring Studio
BIAS *Peak* 2-track audio editor		$499		
BIAS *Peak LE* 2-track audio editor	$99			
BitHeadz *Retro AS-1* software synthesizer	$259	$259	$259	$259
BitHeadz *Unity DS-1* software sampler	$449	$449	$449	$449
Creative Labs Sound Blaster Live sound card			$200	
E-mu *Module Mania* 5-CD SoundFont sample library	$99	$99		
MOTU 2408 hard-disk recording system		$995		$995
MOTU *Digital Performer* digital audio sequencer		$395*		
MOTU Micro Express MIDI interface	$295		$295	
MOTU MIDI Timepiece AV MIDI interface/synchronizer		$595		$595
Sonic Foundry *Sound Forge* 2-track audio editor				$499
Sonic Foundry *Sound Forge XP* 2-track audio editor			$50	
Steinberg *Cubase VST* digital audio sequencer	$399		$399	
Steinberg *Cubase VST/24* digital audio sequencer				$799
TOTAL	**$1,600**	**$3,291**	**$1,652**	**$3,596**

* Upgrade from *AudioDesk*, which is bundled with the MOTU 2408.

For manufacturer information, please see Contact Sheet, p. 179.

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N5EX

MUSIC SYNTHESIZER

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ARPEGGIATOR
DYNAMIC STEREO EFFECTS

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INCREDIBLE REALTIME CONTROL

Whether you're gigging, recording, or just having fun, the N5EX's four front panel knobs provide real-time control of up to 16 sound parameters, including Attack/Release Time, Filter Cutoff and Effect Modulation. And with 32 memory locations in which to save favorite Performance settings, you can call back split, layer, arpeggiator and knob settings with the touch of a button.

FEATURES GALORE...

The N5EX is loaded with everything you'd expect—like 64-note polyphony and 32-part multi-timbrality. And some very cool stuff you wouldn't—like polyphonic portamento and a MIDI-syncable arpeggiator.

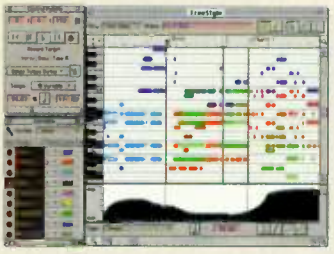
MORE MODELS TO CHOOSE FROM.

All the fabulous features of the N5EX come standard in the N1, a weighted-action, 88-key marvel that marries real piano feel and response to N™ level performance. And the N1R squeezes all that power and utility into a single rack space module.

DISCLAIMER: SHARP DUDS AND A GROOVY ATTITUDE HAVE NOT BEEN PROVEN TO ENHANCE KEYBOARD PERFORMANCE. BUT YOU GOTTA ADMIT THEY LOOK PRETTY BITCHIN'.

MIDI-PHILES LOVE THE N5EX

The new N5EX fully supports General MIDI and includes GS & XG sound maps. That means it can speak the language of all commercially available



GM, XG, OR GS—THE N5EX PLAYS 'EM ALL BACK. PLUS, BOTH THE N5EX AND N1 COME BUNDLED WITH MARK OF THE UNICORN'S *FREESTYLE LE* SEQUENCING AND EDITOR/LIBRARIAN SOFTWARE—A $500 VALUE!

MIDI file information. It also comes with a built-in computer interface that's both PC and MAC compatible.

SURFERS WELCOME...CHECK OUT WWW.KORG.COM

For more information on the N5EX and the rest of Korg's outstanding line of music products, make it a point to drop in at Korg's home on the cyber-range.

*Producer/Remixer Doug Beck's remix credits include Salt-n-Pepa, The Rolling Stones and Shania Twain.

KORG
Super sonic.

THE SEQUENCER

With the sound sources and audio editors in place, it's time to confront the difficult task of choosing a high-end audio/MIDI sequencer. Emagic's *Logic Audio Platinum* ($799) is attracting a growing number of pro-level users, as is Cakewalk *Pro Audio* 8.0 ($429) for Windows. For our Mac system, however, I prefer MOTU's *Digital Performer* 2.5 ($795). *Digital Performer* integrates extremely well with the other components in our particular system.

BitHeadz and MOTU have been working together closely in several areas, and their programs communicate with each other quite well. For example, *Unity* and *Retro* appear in FreeMIDI just like other sound modules, and inside *Digital Performer*, you can select their numerous patches by name from pop-up palettes, which eliminates a lot of hassle. What's more, MOTU will soon be offering a free version 2.6 upgrade, which will allow you to route *Unity*'s outputs directly into *Digital Performer*'s mixer for full audio integration. You can then mix *Unity*'s outputs with *Digital Performer*'s other audio tracks and apply any of *Performer*'s plug-in effects to any or all of the audio tracks.

For the Windows studio, I'll stick with *Cubase VST*, but I'll step up to *Cubase VST/24*. It lets you record as many as 96 tracks of 24-bit, 96 kHz audio if the need should arise. The program's full-featured music notation section lets you replace bar numbers with SMPTE times. You also get an impressive internal resolution of 15,360 ppqn (for more accuracy when positioning and editing audio segments) and a mighty powerful mixer with lots of good effects.

THE INTERFACE

For a MIDI interface, I'll step up from the Micro Express to the MIDI Timepiece AV ($595). MOTU's top-of-the-line, networkable interface gives you eight MIDI Ins, eight Outs, and 128 channels. It supports all the essential sync options, including SMPTE time code (all frame rates with variable freewheeling), MTC, video blackburst, word clock, Digidesign Superclock, and ADAT sync. The MTP AV also has a front-panel LCD window, which shows incoming time code and other useful information.

The cross-platform MTP AV can be hooked up to a Mac or a Windows PC, or to both at the same time; a USB version is due out soon. The MIDI Timepiece AV adds another element of integration by allowing you to select sound modules and other sound sources by name from pop-up palettes within *Digital Performer*. As your studio expands, this will become increasingly important.

THE AUDIO HARDWARE

Choosing a hard-disk recording system is another difficult task. The computer-music world is awash in excellent multichannel audio cards and digital-audio recording setups. In the film, TV, commercial, and recording industries, Digidesign's Pro Tools systems have become standards due to their powerful

Pure Power...Pure Sound!

"A best buy"... "The Carvin DCM1500 – with its detailed top end, punchy low end ... sounds great."
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"Carvin gives the end user a roadworthy, high-powered amplifier (DCM2000) at a price that is almost too good to be true. Little wonder, then, that these amps have been showing up in quite a few local bands' rigs."
© Pro Audio Review, March 1998 – Roger Williams III: Systems Engineer

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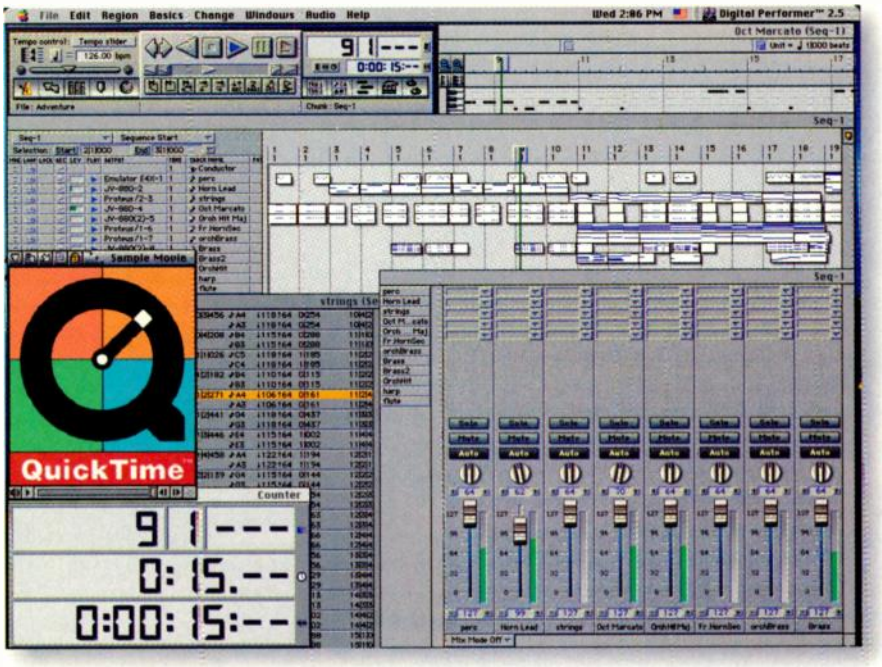
feature set (enhanced by TDM plug-ins), high-quality audio output, and well-established user base. But Pro Tools systems are not for the financially delicate. A complete Pro Tools/24 system (with necessary I/O and SMPTE support), for example, will set you back more than $9,000. That puts it off-limits for a "modestly" priced pro-level studio like the one I'm constructing here.

In spite of a long and deserving list of nominees from other companies, such as Korg, E-mu–Ensoniq, Event, Lucid, Frontier, Sonorus, Creamware, and others, I'm choosing MOTU's cross-platform 2408 hard-disk recording system ($995) for our desktop studio. The 2408's great bang for the buck and exceptional level of connectivity with the outside world make it hard to beat.

This PCI-card and rack-mount–I/O combo has eight analog ins and outs with 20-bit converters, 24 channels of ADAT optical I/O, 24 channels of TDIF I/O, and two channels of S/PDIF in and four channels out. That means you can connect three Alesis ADATs, three Tascam DA-88s, a DAT recorder, and eight analog devices simultaneously. The 2408 also offers ADAT sync input and word-clock in and out. Moreover, the 2408 can transfer files to and from Pro Tools systems, and with all those digital I/O ports, you can upgrade to 24-bit audio by adding a 24-bit A/D converter, such as Apogee's AD-8000. That helps you sidestep future obsolescence.

Most important, however, the 2408 works seamlessly with *Digital Performer* to create a true workstation environment. In fact, MOTU offers a special upgrade from *AudioDesk*, which comes with the 2408 system, to *Digital Performer* 2.5 for just $395. This makes our Mac system an especially good buy. On the Windows side, MOTU offers ASIO drivers written specifically for *Cubase VST*. The 2408 also supports *Logic Audio Platinum*, Opcode *Vision DSP*, Cakewalk *Pro Audio*, *Sound Forge*, and other popular software.



MOTU's *Digital Performer* 2.5 integrates well with *Unity DS-1*, *Retro AS-1*, the MIDI Timepiece AV, and the 2408 audio interface. The program's sophisticated editing features, high-quality audio effects, and sample-accurate sync capability make it well suited for our advanced studio.

One possible fly in the ointment for Windows users should soon be resolved. Although the 2408 supports ASIO, it doesn't support Microsoft's DirectSound, which allows multiclient audio output. Consequently, you can't play back audio from *Cubase* while playing audio from *Unity* or *Retro*. You can save the *Unity* or *Retro* files in WAV format and import them into *Cubase*, but that's a hassle. (The yet-to-be-released ASIO 2.0 support should resolve this problem.) BitHeadz, however, is about to release a new ReWire software link that will enable BitHeadz audio to show up in the *Cubase VST* mixer channels. You'll then be able to use *VST*'s EQ and effects on the BitHeadz instruments. That should solve the problem nicely, and it will probably be available by the time you read this.

The MIDI Timepiece AV and the 2408 make a solid combination that can handle most film/video scoring tasks. In a typical scenario, the MTP AV receives time code from the video work print and converts it to MIDI Time Code to drive the sequencer, which is operating in External Sync mode. The MTP AV also converts the SMPTE time code into word-clock output to keep the 2408 in sync. All MIDI and digital audio tracks then follow the picture with nearly instantaneous lockup.

THE LIST GOES ON

Our film-scoring studio includes the basic elements for creating and editing music for film and video, but there are other components that you'll have to consider. As with the multimedia studio, you'll need a MIDI keyboard. Also, if you are recording singers and acoustic instruments, you'll need at least one pair of good mics.

Aside from a video recorder (¾-inch or VHS), you'll also need a DAT recorder for stereo masters. Many film composers also have at least one Alesis ADAT or Tascam DA-88 for mastering. With eight tracks, you can include separate but synchronized stereo mixes for dialog, sound effects, and music on the same master tape. You can also provide alternate, multichannel music mixes in case something changes at the dubbing session. (For instance, if the brass section interferes with the sound effects, you could pull down the brass without changing the woodwinds.)

Finally, if your system expands too much (especially with external sound modules and samplers), you'll have to add a mixing board to the setup. Given the nature of this studio, a digital mixer would seem to be in order, but that, my friends, is another story.

Associate Editor **David Rubin** *lives and works in the suburbs of Los Angeles.*

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THE MUSIC-CD PRODUCTION STUDIO

BY GINO ROBAIR AND JEFF CASEY

BEFORE we specify the components of our basic and advanced studios for music-CD production, it's important to define what separates the two types. After some debate, we decided that what distinguishes the basic studio from the advanced is that the first equips you to work primarily on your own projects, whereas the second equips you to accept outside clients.

Because you'll be using a basic studio to work on your own projects, you can tailor it to meet your specific needs. For example, if you want to lay down mainly dance-music grooves, you won't need to purchase elaborate audio-recording equipment. Or if you're in a garage band and want simply to record a demo CD, choosing a full-featured recording environment and an easy-to-use MIDI setup should be enough.

On the other hand, advanced studios are designed to handle just about every project imaginable. Most personal "project" studios have to be able to interface with other studios, and if you can't connect, you won't attract clients. This doesn't mean that your studio must be able to accept analog 2-inch tapes, but you do need more than just a self-contained computer setup.

We've chosen flexible systems that provide a wealth of recording, processing, editing, and mixing functions; decent MIDI capabilities; and support for popular plug-in formats. In addition, we determined that the advanced systems should have hardware control surfaces, if for no other reason than that some clients get scared by computers and want to touch a mixing console. (For an itemized list of recommended products, see the table "Music-CD Production Studio Summary" on page 96.)

As you'll see, we diverged from each other at several points, including our basic system choices. But we sincerely hope that our differing views will be as instructive as our common positions.

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EV Eliminator

BY GINO ROBAIR

I WANT a basic music-production system that can do it all—record, edit, sequence, and score. My wish list includes a digital audio sequencer, digital audio card, a software synthesizer and sampler, a couple of MIDI control surfaces for good measure, and professional scoring capabilities. Because my wish list is rather long, I'll go through it one step at a time.

THE HEART OF THE STUDIO

A number of companies have quality digital audio sequencers with notation capabilities. They're all competitively priced at well under a grand, so the choice is a tough one. But if you're going to produce it all, Emagic's *Logic Audio Gold* ($499) is my pick for the digital audio sequencer. It comes fully loaded with features, yet with a price tag under $500, it enables you to channel extra money toward other items on the list.

Although *Logic Audio Gold* is the most difficult to master of the leading digital audio sequencer programs, the payoff is great once you've conquered it. And you will always have room to grow because of the program's great depth.

The Keyfax Phat.Boy is handy whenever you need hands-on control of software functions. It's especially useful for controlling the XG sound-card synth and BitHeadz' *Retro AS-1* software synth.

Logic Audio Gold is a fully integrated software system that gives you up to 48 tracks of 16-bit audio, eight effects buses, MIDI sequencing, and a full-featured music notation editor. The program is compatible with audio interfaces from most manufacturers, so you should have no problem upgrading your audio hardware in the future. In addition, when you want to move to 24-bit audio and increase the number of digital audio tracks to 96, you can step up to *Logic Audio Platinum* through Emagic's upgrade program.

Using Emagic *Logic Audio*'s Environment window, you can configure your physical studio by connecting virtual representations of the devices. You can also create templates of these configurations for similar projects down the road.

You can customize the program's user interface to a high degree. One way to do this is to use the Environment feature, which allows you to define the flow of audio and MIDI data. With this feature, you can configure the various elements of your physical studio by connecting their virtual representations. This allows you to create templates of the configurations used for specific projects. By delving deeper into *Logic Audio Gold*, you can use the Environment to do more interesting things with the flow of MIDI data by connecting virtual objects. Preset Environments will help you get started.

Logic Audio Gold comes bundled with the *Sound Diver* librarian program, *WaveBurner* for burning Red Book–compliant CD-Rs, and BIAS *Peak LE* for editing stereo audio files. Combined with *Gold*'s recording, editing, mixing, sequencing, and scoring features, these tools give you the beginnings of a powerful workstation, and you're on your way to creating a professional-quality CD master. Furthermore, *Logic Audio* version 4.0 should be available by the time this article goes to press. Among other things, the program includes 31 new plug-ins.

AUDIO I/O

You'll need an audio card, so I'm choosing Emagic's Audiowerk2 ($299), a 2-channel version of the company's Audiowerk8 that supports up to 24 tracks with *Logic Audio Gold*. (For details on this new card, see the Sound-Design Studio, p. 64.)

MicroLogic AV, *WaveBurner*, and *ZAP* (Emagic's audio-file compression program) come bundled with Audiowerk2, making the package a powerful system in itself. You won't need *MicroLogic AV*, of course, because you have *Logic Audio*.

SOFTWARE SYNTHS

The logical choice for a Mac software synth and sample player comes from BitHeadz. The company's *Retro AS-1* analog-synth emulation software ($259) and *Unity DS-1* sampler ($449) are good companions for *Logic Audio Gold* because they can work directly in the *Logic Audio* environment without using OMS.

Retro AS-1 gives you three oscillators and two filters per voice, as well as two insert and two global effects. It is 16-part multitimbral and 32-note polyphonic, with envelopes and LFOs limited only by the processing power of your computer. A collection of presets is included, giving you an immediate palette of vintage sounds. *Retro AS-1* version 1.2 has improved effects, supports ASIO, and links easily to the Keyfax Phat.Boy MIDI controller (which I'll discuss shortly).

Unity DS-1 is a stereo software sampler that requires no additional hardware. It supports a number of common sound-file formats, including SDII, WAVE, AIFF, SampleCell, Akai 1000, and SoundFont 2.0. *Unity DS-1* can also record audio and includes an editor for sculpting digitized audio into the perfect sample.

The downside to these programs is that they are CPU intensive, and you'll have difficulty running them simultaneously with the digital audio sequencer. You can circumvent that

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—Electronic Musician

"Those who've used Cakewalk (Pro Audio) for years will appreciate the new tools and features and will wonder how they got along without them."

—Maximum PC

"This product deserves its status as an industry standard, and is highly recommended."

—The Tapeless Studio

"Suddenly, features that were the sole purview of companies like SADIE and Sonic Solutions have become standard issue for Cakewalk."

—AudioMedia

"Incredible price/performance ratio."

—Game Developer

"The addition of non-destructive gain and pan envelopes, non-destructive MIDI effects, flexible mixer console and 24-bit/96 kHz sampling rate make Cakewalk Pro Audio a bona fide production powerhouse."

—Pro Audio Review Magazine

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problem by recording some of the sounds into audio tracks when you meet your processing limits. This solution takes care of the other drawback to this setup: because of the nature of ASIO drivers on the Mac, you are able to run only one application at a time per audio card. A simple way to get around this limitation is to use Sound Manager as the *Retro* or *Unity* driver, plug the Mac audio outputs into the Audiowerk2 inputs, and record the sound. If *Logic Audio* supported the ReWire software link (as *Cubase VST* and *Digital Performer* do), this wouldn't be an issue. However, these are problems I can live with for the time being.

SEIZING CONTROL

A mouse is not the ideal hardware interface to use when you're editing on the computer. Therefore, I'm going to add two MIDI control surfaces: one with knobs and one with sliders and buttons. The Keyfax Phat.Boy ($250) gives you 13 knobs to grab. As mentioned earlier, it interfaces well with *Retro AS-1* but can also be mapped anywhere else a knob is appropriate in the system. (The mapping assignments in the Phat.Boy are fixed, but they can be remapped and routed within *Logic Audio.*)

You'll also need a simple but handy fader box, and the Peavey PC 1600x ($400) fits the bill. It enables you to mix your audio with real faders, punch tracks in and out with real buttons, and tweak a few knobs to control the software synth or MIDI-controllable effects plug-ins.

You now have a complete system that will provide many years of productivity, with potential for easy expansion and upgrading.

MAKING WELCOME ADVANCES

Everything I have chosen for the basic Mac studio could be incorporated into the advanced studio; however, the advanced system is designed to do more, and better. Remember, the purpose behind an advanced studio is to be able to accept CD-production projects from a variety of clients as well as to produce your own projects.

The centerpiece of the advanced system that I've chosen is Digidesign's Pro Tools digital audio workstation. Pro Tools gives you that edge to handle any sort of project that a client may bring. There is a wide range of software products that interface beautifully with Pro Tools, from sequencers and software synths to extremely powerful plug-ins.

The current state of the art is Pro Tools/24 MIX ($7,995), which provides all of the DSP needed for 16 channels of 24-bit TDM-based recording, mixing, and editing on one PCI card. By using a little less real-time processing, you can mix up to 64 tracks of audio with one card. This is particularly good news for Mac users who have only three PCI slots.

To take full advantage of the 24-bit processing from beginning to end, I have selected Digidesign's 888/24 I/O audio interface ($3,695) for eight balanced XLR ins and outs with 24-bit A/D and D/A converters, eight channels of AES/EBU digital I/O, and two channels of S/PDIF I/O. If you need more I/O, you can connect as many as nine 888/24s together for 72 channels of discrete I/O (though you'll need more computer muscle for that).

You'll also need a digital audio sequencer. To match the depth of the Pro Tools system (as well as to take advantage of the easy upgrade from our basic Mac studio), I've picked Emagic's *Logic Audio Platinum* ($799), which has all the features of *Logic Audio Gold* but fully integrates with TDM systems.

I'm not going to use a software synth or sampler with the advanced system because none of the current crop support the Digidesign Audio Engine, which is required to address the Pro Tools hardware. You could add another audio card for this purpose, but you're better off buying Digidesign's SampleCell II Plus PCI card ($1,295).

Long available on the Macintosh and recently released for Windows NT as well, SampleCell II Plus is a complete sample-playback/synthesis card that offers 32-note polyphony, eight outputs, and a powerful editing environment. All the number crunching takes place on the SampleCell card, which comes with 32 MB of RAM, so your CPU only has to run the editing application. Hundreds of megabytes of samples are bundled with the system. I'll also buy the optional TDM module ($395), so that the SampleCell II's editing environment can run as a TDM plug-in and the sounds can be triggered from within Pro Tools.

PLETHORA OF PLUG-INS

Now that we're in the land of TDM, we can choose from any of the fine, real-time plug-ins from TC Electronic, Focusrite, Waves, Lexicon, Apogee, and Line 6, among others. Depending on your immediate budget and needs, you can assemble enough reverbs, compressors, EQs, and other effects to cover traditional signal-processing chores without using outboard devices.

The first set of TDM plug-ins you should get is the Waves TDM Bundle ($1,000), which is a good choice for basic mixing and mastering situations. Part of the Waves package, *Q10 Para-Graphic Equalizer,* handles EQ chores and provides two to ten bands of mono or stereo EQ per channel. *TrueVerb* is a fine-sounding reverb with plenty of parameters. You also get *C1 Compressor/Gate,* a frequency-sensitive dynamics processor for compression, expansion, and gating; *L1 Ultramaximizer* for maximizing volume when mastering CDs; *S1 Stereo Imager* for adjusting the stereo image of a mix; and *PAZ Psychoacoustic Analyzer* for real-time audio analysis.

INTERFACE ACE

If you don't have good, reliable sync, you aren't ready to bring in clients. You'll also need a MIDI interface to hook up your Mackie Human User Interface (HUI)—which I'll discuss shortly—and any other external MIDI devices you may have. Here, I've chosen to invest in

In addition to offering 16 easily programmable sliders, 16 buttons, a data wheel, and two control-voltage inputs, the Peavey PC 1600x MIDI controller can send any MIDI message in user-programmble hex strings.

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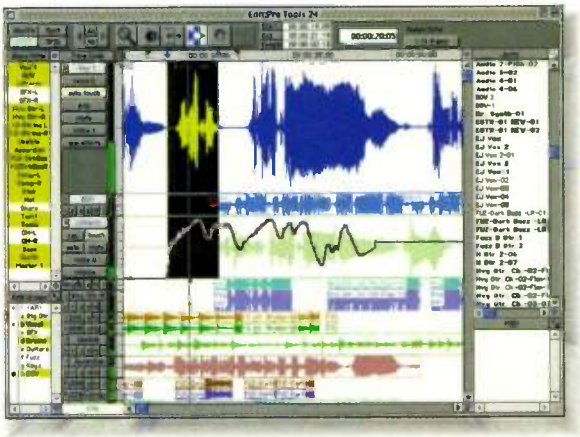
a MOTU MIDI Timepiece AV MIDI interface/synchronizer ($595), which combines an 8×8 MIDI interface with a synchronizer that can handle word clock, MTC, ADAT sync, Superclock, and SMPTE.

Although you might not need it yet, you would be wise to invest in a Digidesign ADAT Bridge ($1,245) sometime in the future, especially if you add an ADAT to your system. With the ADAT Bridge, you get 16 channels of Lightpipe digital I/O.

THE HUMAN INTERFACE

If you're willing to spend some more money on your advanced system, buying a better control surface would be a wise investment. The Mackie HUI ($3,499) is a fully automated controller tailored for use with Pro Tools. It features motorized faders, assignable V-Pot rotary controls, level meters, dedicated plug-in controls, tape transport buttons, eight assignable channel strips and buttons, two mic preamps, and a jog wheel.

Every function of Pro Tools is immediately within reach on the HUI. Because Pro Tools mixing is fully automated, you can get by with HUI's eight faders. If you need to expand, you can add another HUI, or, if you need to save money, add a Peavey PC 1600x or two.



If you want to use the same multitrack audio editing tools favored by the majority of Mac-based pros, you need Digidesign's Pro Tools/24 MIX. The software for this system is identical to the more affordable *Pro Tools PowerMix* we chose for our Mac sound-design studio, except that *PowerMix* doesn't offer support for Pro Tools' powerful hardware and TDM plug-ins.

FINAL NOTES

Constructing a studio such as this one is somewhat pricey, but by investing in top-level gear, you can draw a more select clientele. Pro Tools audio and session files are easily interchangeable between Windows and Mac platforms, so sharing work with other Pro Tools studios is no problem. With this desktop system, you should be able to handle almost any project that a client presents you.

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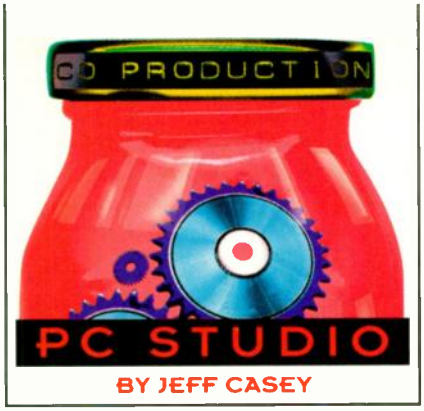

Mackie's HUI is an automated control surface featuring eight assignable channel strips, motorized faders, and even two mic preamps.

BECAUSE you'll be producing primarily your own projects in your basic studio, you won't need a lot of gear to get in the door. Fortunately, I have some excellent choices that will give you pro quality for a relatively small amount of money.

The centerpiece of the basic Windows studio is the Yamaha SW-1000XG PCI sound card ($700). The SW-1000XG provides an XG wavetable/physical modeling synth engine (complete with a software wavetable editor), a 12-track digital audio recorder and mixer, DSP effects, basic I/O, and *XGWorks* digital audio sequencing software—all in all, a comprehensive working environment for MIDI-oriented production.

The PCI card houses a 64-note, 32-part multitimbral AWM2 tone generator, which is capable of generating more than 1,200 sounds derived from 20 MB of wavetable ROM. You also get 46 discrete drum kits. The synth is compatible with Yamaha XG and General MIDI sounds, and Yamaha VL, VH, and DX sound generation is possible if you have the optional PLG100-series expansion boards. By choosing this card, rather than focusing on a software synth, you get plenty of nice synth voices without devouring CPU time. MIDI In and Out jacks are provided on a breakout cable.

On the audio side, the SW-1000XG can record up to four tracks simultaneously and can play back up to 12 tracks. Recording can be either 16- or 32-bit (but, oddly, not 24-bit), and sampling rate can be set to 8, 11, 22, 44.1, or 48 kHz. Channel EQs are available, as are seven independent, 24-bit effects processors that can be applied to the output of audio or MIDI tracks. Effects can also be applied to live inputs as they are recorded, giving you a means of conserving DSP power during mixdown.

However, assuming that you plan to do professional work, even with a basic system, the SW-1000XG's I/O configuration is inadequate. It gives you S/PDIF digital I/O on RCA connectors and only two channels of analog I/O, and the inputs accept either mic-level or line-level signals. The S/PDIF and analog ports are not independent, so this is really a 2-in/2-out card.

Yamaha's *XGWorks* digital audio sequencer is bundled with the SW-1000XG and provides enough features to get you started.

Therefore, the next component that I chose to add to this studio was Event Electronics' Layla ($1,099), which includes a PCI audio card and breakout I/O module. The system comes bundled with Syntrillium's *Cool Edit Pro* multitrack recording and editing software, which will come in handy. You can install multiple systems, and you're limited only by the number of PCI slots available on your CPU. Of course, we have already used up two slots.

Analog I/O abounds on Layla: the card has eight inputs and ten outputs, with 20-bit, 128× oversampling A/D and D/A conversion. S/PDIF digital I/O (which can handle 24-bit audio) is provided on RCA jacks. The S/PDIF ports are independent of the analog ports, so you get full-duplex recording, with 10 simultaneous record channels and 12 simultaneous playback channels. That takes care of our I/O problem nicely. The system can sync to word clock or Superclock as well as to MTC. Internal audio processing and recording is 24-bit, and all of Layla's recording functions are handled by the lightning-fast Motorola 56301 chip.

Syntrillium's *Cool Edit Pro* gives you an abundance of real-time and offline processing tools, in addition to support for Microsoft DirectX plug-ins. You get good waveform-editing tools, and more than 20 file types are supported. You can use *Cool Edit Pro* with a software sequencer; however, if you plan to do extensive audio/MIDI productions, you'll probably want to add an integrated digital audio sequencer to handle those chores.

SOFTWARE SAVVY

Although *XGWorks* comes bundled with the Yamaha SW-1000XG and provides decent integrated software for audio recording and MIDI sequencing, it's not on a par with dedicated digital audio sequencers. Fortunately, the SW-1000XG and Layla are compatible with

For manufacturer information, please see Contact Sheet, p. 179.

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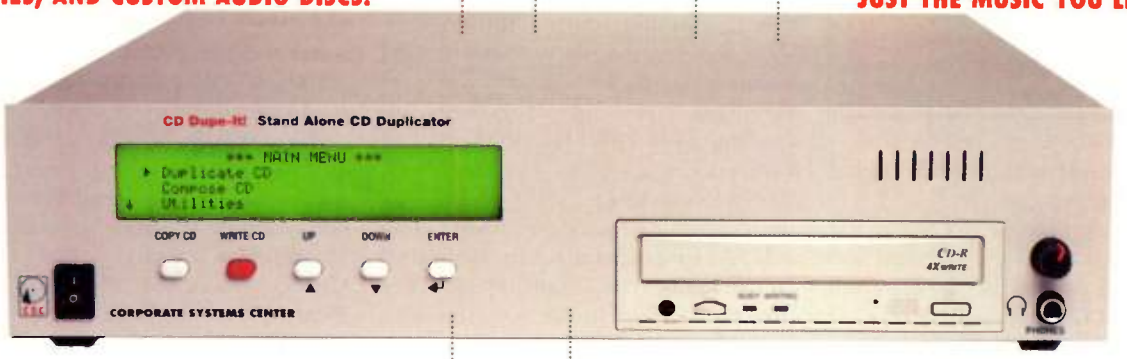

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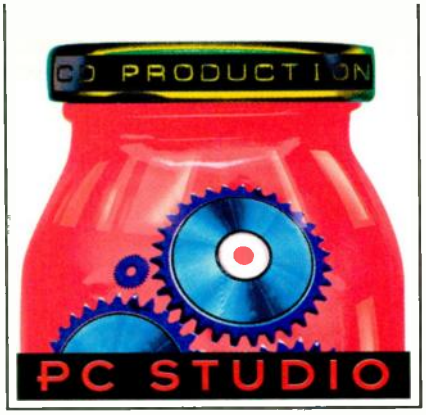

almost any modern third-party digital audio sequencer.

I have selected *Cubase VST/24* ($799) for several reasons. The program is very powerful and easy to use. It offers full GS, XG, and GM compatibility, so it works nicely with the Yamaha SW-1000XG. The sequencer gives you a wide array of editing tools, in addition to four arpeggiators, several quantize variations, and algorithmic-composition functions. MIDI Clock and MTC can be generated, and comprehensive notation and printing features are provided. Having scoring capabilities integrated with your sequencing and recording environment is an important feature if you want to copyright your compositions or provide scores for session players.

On the audio front, *Cubase VST/24* can handle up to 96 channels at mixdown, although your computer hardware will ultimately determine this number. Support is offered for several sampling rates and resolutions, including 24-bit, 96 kHz (useful if you upgrade to a system that supports 24/96 recording). ASIO is also supported, and, as an added bonus, *Cubase VST/24* interacts directly with, and routes audio from, another Steinberg program, *ReBirth* (more in a moment). Each channel features dedicated EQs, insert effects, and aux sends. An 8-unit effects rack accommodates any of the growing number of VST plug-ins on the market, and VST Master-Insert effects are also available.

Audio editing is delightfully straightforward with *Cubase VST/24*, and an abundance of tools are provided, including VST-format plug-ins. And remember, you also have *Cool Edit Pro*'s many tools. There are times when a dedicated 2-track waveform editor comes in handy.

Before moving on, I'll admit that I could have started with a less expensive version of *Cubase* and upgraded later. However, I really want *VST/24*'s 24-bit recording features, so I'm willing to spend the extra money up front.

If you plan to produce lots of urban and dance music, think about buying a phrase-based audio editor. My personal choice is Sonic Foundry's *Acid* ($399), which won our 1999 Editors' Choice Award for "Most Innovative Product" (see the January 1999 issue of **EM**). Although *Acid* can't run in sync with other recording or sequencing software, you can export *Acid* files to *Cubase VST/24*, *Cool Edit Pro*, or *XGWorks* for incorporation into larger projects.

Despite the wealth of VST plug-ins, my first plug-in purchase would be a non-VST package, TC Works' *TC Native Essentials* ($199) for DirectX. This package includes a reverb, equalizer, and dynamics processor, each of which can

MUSIC-CD PRODUCTION STUDIO SUMMARY

PRODUCT	Mac Basic Studio	Mac Advanced Studio	Windows Basic Studio	Windows Advanced Studio
Arboretum *Hyperprism* DSP plug-in				$349
BitHeadz *Retro AS-1* software synthesizer	$259			
BitHeadz *Unity DS-1* software sampler	$449			
Digidesign 888/24 I/O audio interface for Pro Tools		$3,695		
Digidesign Pro Tools/24 MIX digital audio workstation		$7,995		
Digidesign SampleCell TDM module		$395		
Digidesign SampleCell II Plus sample-playback card		$1,295		
Emagic Audiowerk2 audio card	$299			
Emagic *Logic Audio Gold* digital audio sequencer	$499			
Emagic *Logic Audio Platinum* digital audio sequencer		$799		
E-mu Audio Production Studio digital audio workstation/synth				$699
Ensoniq PARIS A/D card				$499
Ensoniq PARIS ADAT card				$499
Ensoniq PARIS D/A card				$499
Ensoniq PARIS (MEC bundle) digital audio workstation				$3,895
Event Electronics Layla audio card			$1,099	
Keyfax Phat.Boy MIDI controller	$250		$250	$250
Mackie HUI MIDI controller		$3,499		
MOTU MIDI Timepiece AV MIDI interface/synchronizer		$595		
NemeSys *GigaSampler* software sampler				$795
Peavey PC 1600x MIDI controller	$400			
Seer Systems *Reality* software synthesizer				$495
Sonic Foundry *Acid* multitrack audio editor			$399	$399
Steinberg *Cubase VST/24* digital audio sequencer			$799	$799
Steinberg *ReBirth* software synthesizer/sequencer			$199	$199
Steinberg *WaveLab* 2-track audio editor				$499
TC Works *TC Native Essentials* DSP plug-in package			$199	
Waves Native Power Pack bundle DSP plug-in package				$500
Waves TDM Bundle DSP plug-in package		$1,000		
Yamaha SW-1000XG sound card w/synthesizer			$700	
TOTAL	**$2,156**	**$19,273**	**$3,645**	**$10,376**

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Revolutionary transducer designs, optimized network topologies and innovative materials are some of the reasons why the LSR line is being hailed as 'the world's most advanced monitor'. JBL's all-new ***Differential Drive®*** woofer permanently dispels the notion that better linearity, higher power handling and greater dynamic accuracy are somehow an unobtainable, evil triangle. ***Dynamic braking*** produces truly accurate bass at higher SPL's with maximum reliability. Composite materials, including ***Carbon Fiber*** in the woofer as well as ***Titanium*** and ***Kevlar®*** in the high and mid frequency components, insures performance that is always optimally maintained.

Not Just A Better Spec... A Better Monitoring System

While all companies boast about their specifications, JBL went one step further. To guarantee that every component of the LSR family worked together for optimal performance, LSR development employed JBL's unique 'system-engineered' design philosophy. Simply put: the entire line was researched and refined as one, with an overall performance goal in sight. What this means to you is a monitor and subwoofer that work together as a system; delivering stunningly uniform and accurate performance in both stereo and multi-channel applications.

LSR 32
12" 3-way mid-field monitor with rotatable Mid/High Elements.

LSR 28P
8" 2-way close field monitor with bi-amplification and active filtering.

LSR 12P
12" Active Subwoofer with Bass Management System.

Carbon Fiber Composite Cone
Dual Top Plate
Dynamic Brake Coil
Neodymium Magnet
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accommodate multiple tracks at mixdown. Why do I like *Native Essentials*? It has the same high-quality processing capabilities as TC Electronics hardware devices.

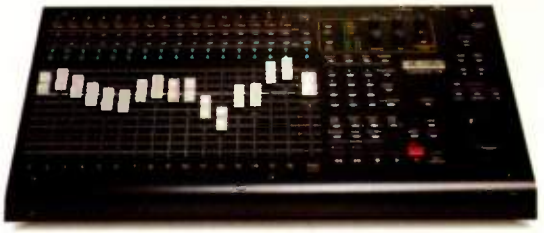
SOUNDS ABOUND

If you're going to produce a lot of electronic music, you'll probably want a wider variety of sounds than the SW-1000XG provides. You might decide that you'd rather have a second synth-equipped card than have the ample audio I/O of Layla, for example. Or you might want to use a software synthesizer. (Two good starting points for your research appear in the April 1998 issue of **EM**: the articles "Software Synths on Parade" and "Playing the Slots" offer comparative looks at software synths and sound cards, respectively.)

A neat arrangement exists between Steinberg's *ReBirth* software synth ($199) and *Cubase*. Steinberg's ReWire technology allows the two programs to share the same transport controls and internally streams *ReBirth*'s outputs directly into *Cubase VST*'s mixer channels. *ReBirth* offers some fantastic vintage techno sounds, and I know people who are making some killer grooves using this combination. You can extensively customize the program, and alternative versions are available on Steinberg's Web site at www.us.steinberg.net.

A KNOBBY QUESTION

Because *ReBirth* is now part of your basic Windows studio, you need a Keyfax Phat.Boy for controlling the program's real-time parameters. The Phat.Boy also is preprogrammed for controlling XG synths, so it's a fine match for our Yamaha sound card.



PARIS's control surface, the Control 16, has transport and locate controls, channel faders, channel EQ, aux send, pan pot controls, and a jog wheel. It comes standard as part of the PARIS package.

It's hard to imagine a personal studio for music production that lacks a MIDI keyboard of some sort. However, which one you choose for your studio depends on personal factors that cannot be addressed in this article. For example, you might be a MIDI guitarist, percussionist, or wind player who needs only a small keyboard controller for playing pads and simple lines. Then again, you might be a professional keyboard player who needs a controller with weighted keys and piano-like action. Therefore, I'm going to avoid making a recommendation here.

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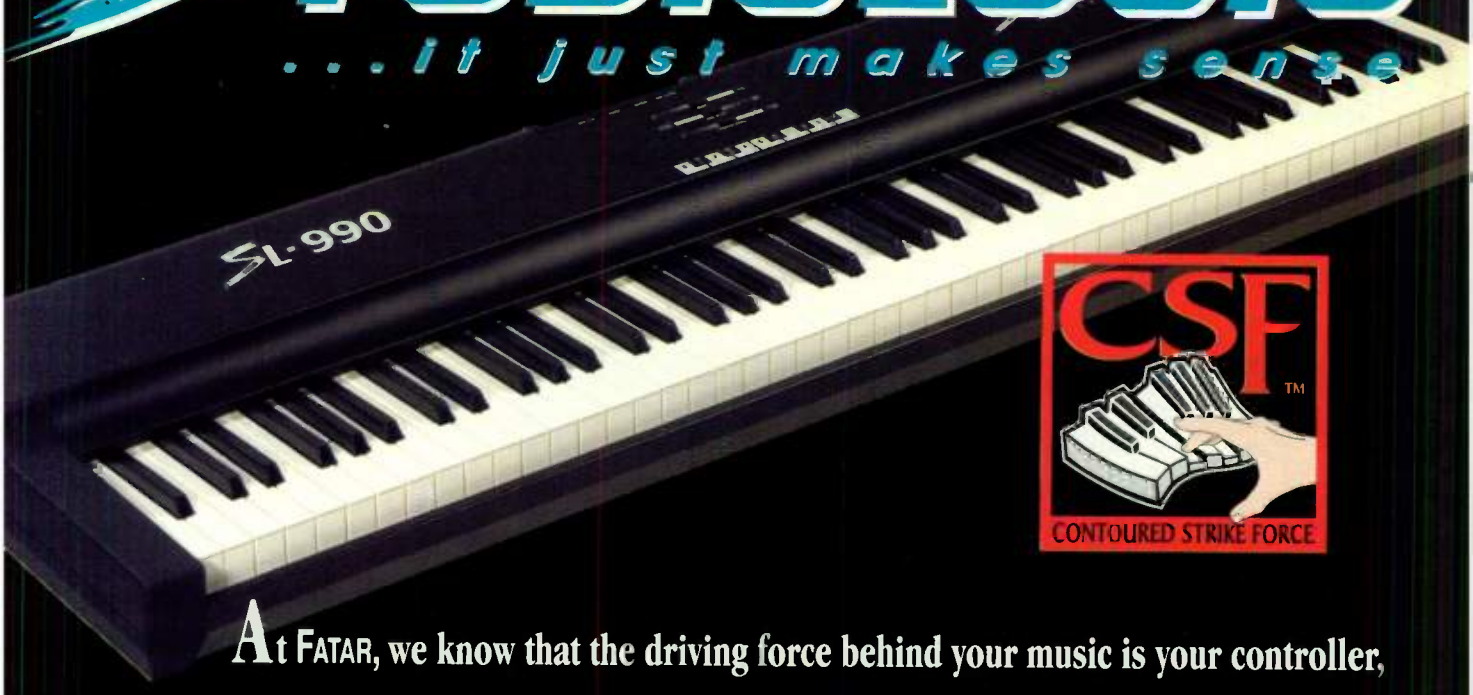

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MOVING ON UP

Designing the advanced music studio was easier than designing the basic one. That's because the advanced studio needs to have a wealth of hardware and software available to handle practically every task, and therefore—unlike with the basic studio—I wasn't forced to narrow down as many choices. Of course, this meant more fun for me spending my play money! But before I could indulge myself, I needed to settle on a core system. I found the solution in PARIS—not the city, the DAW.

HARD-CORE

I've been working with Ensoniq's PARIS in my personal studio for almost a year now, and saying that I've been pleased with the results would be an understatement. Before converting to PARIS, I was a die-hard user of Pro Tools, so you understand that I have always been picky about the tools I use for producing music. I still think Pro Tools is a fine product, but once I switched, I realized that PARIS is on a par with professional DAWs that cost two or three times as much.

At the heart of PARIS is a PCI audio card that supports 16 tracks of simultaneous playback and records at either 16- or 24-bit resolution. But 16 tracks is not a lot, which is why PARIS offers intelligent submixing: each group of 16 tracks can be submixed to a stereo pair, and eight submixes are permitted—quite a flexible arrangement. In addition, PARIS offers two recording modes, Constrained and Free-Form; the latter allows you to record multiple takes (up to 999) on every track.

The mixing section provides four bands of fully parametric EQ, eight aux sends, and five inserts on every channel. The effects are all top-notch and include an array of dynamics processors, reverbs, delays, and pitch effects. Support has recently been added for the VST and DirectX formats (more in a moment). Dynamic mixdown automation is available for level, pan, and mute, and you get a graphic automation-editing window. The system's block-style audio editing is surprisingly powerful, and PARIS comes bundled with Steinberg's *WaveLab Lite* for more detailed editing chores.

Unlike most other workstations, PARIS has channel EQs that are uncompromised by other engaged processing: a dedicated 4-band EQ is always available to every channel regardless of how many multi-effects or dynamics processors are in use. (I never want to have to tell a client, "I can't change that EQ because I printed it on the track to conserve DSP resources.") In my studio, I can typically open a dynamics processor on every channel, in addition to four or five multi-effects processors. Not bad. But even better, when you perform a submix, all DSP resources are freed up for the next group of tracks. Submixes can easily be recalled and tweaked, so you're not committed to any particular mix.

PARIS comes with a hardware control surface, the Control 16, which provides channel faders, transport and locate controls, and a jog wheel, in addition

For manufacturer information, please see Contact Sheet, p. 179.

Perfect Pitch in a Box

(and at $699,* Perfection's in Reach)

*Estimated street price based on an MSRP of $849. Your mileage may vary.

"[The ATR-1] is one of those few rare finds that I now find it hard to imagine making a record without."
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Electronic Musician magazine

"The ATR-1 saves us an unbelievable amount of time. It goes with me wherever I go."
Al Schmitt
Producer

OK, let's be honest. For most of you, "Perfect Pitch in a Box" is right up there on the credibility scale with Elvis sightings and miracle three-day weightloss. Unless, of course, you happen to be one of the thousands of audio professionals who already depend on Antares's amazing Auto-Tune™ pitch-correcting software for the Mac and PC. In fact, back when we introduced it, *Recording* magazine hailed Auto-Tune as a "Holy Grail of recording."

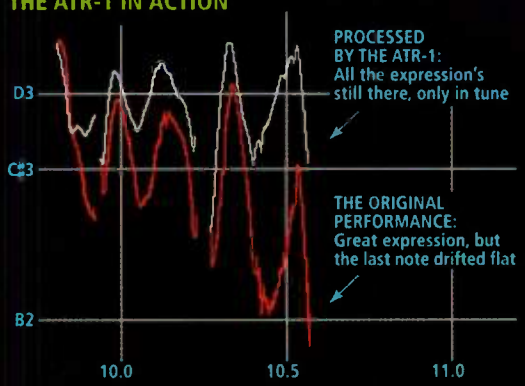
Now, with our new ATR-1™ Intonation Processor, you can get the power of Auto-Tune in a simple 1U box. Without the need for one of those pesky computers.

Simply stated, the ATR-1 corrects the pitch of a vocal or solo instrument, **in real time,** without distortion or artifacts, while preserving all of the expressive nuance of the original performance. Really. All the rest is just details.

Naturally, even those details are cool. Like the ability to eliminate vibrato from a performance. Or add it. Like being able to provide target pitches in real time via MIDI. Like a Song Mode that makes the ATR-1 as easy to use live as it is in the studio. Or a pristine data path with 56-bit internal processing, so the only difference between what goes in and what comes out is the intonation.

Of course, words are cheap (well, actually, when printed in a magazine ad like this they're fairly expensive). But hearing is believing. Try out the ATR-1 at your local Antares dealer or call us for a free demo CD. Either way, we're confident you'll be convinced. Really.

THE ATR-1 IN ACTION



Here's what some ATR-1 users have to say:

"With the ATR-1, vocal sessions can focus on attitude, not intonation."
~MADAME MARIE CURIE*

"Nothing helps your peace of mind on tour like an ATR-1 in the rack."
~FRANZ KAFKA*

*not their real names

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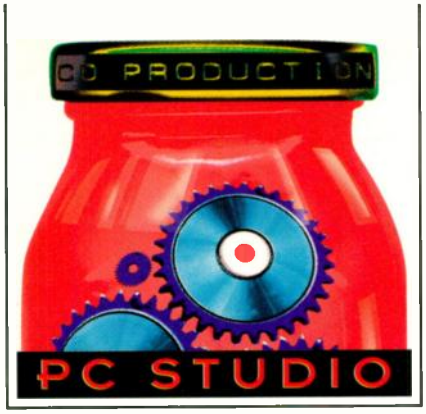


to channel EQ, aux send, and pan controls. In a project studio, it's important to have equipment that clients can see. Many analog diehards are reluctant to record digitally, let alone on a computer, and the thought of not being able to touch a mixing console might scare clients away. Overall, the combination of intuitive software and the Control 16 makes PARIS very easy to use.

PARIS is available in several configurations, each offering different I/O options. For this studio I recommend the Modular Expansion Chassis (MEC) bundle ($3,895). The MEC ships standard with four channels of 20-bit analog I/O, as well as S/PDIF and word-clock I/O. It provides nine expansion slots for adding any combination of 8-channel cards, including 24-bit A/D, 24-bit D/A, and ADAT optical I/O ($499 each). We're going to buy an extra A/D and D/A card, and we'll add an ADAT card for compatibility with the outside world. Incidentally, E-mu–Ensoniq is planning 8-channel Tascam TDIF and AES/EBU I/O cards, so PARIS will be able to interface with practically every major format. The 24-bit converters sound great, especially when used with PARIS's 24-bit recording capabilities.

To top it off, E-mu–Ensoniq has announced compatibility with a variety of digital audio sequencers, including our program of choice, *Cubase VST/24*. Coupling *Cubase VST/24* with PARIS is going to make one killer DAW.

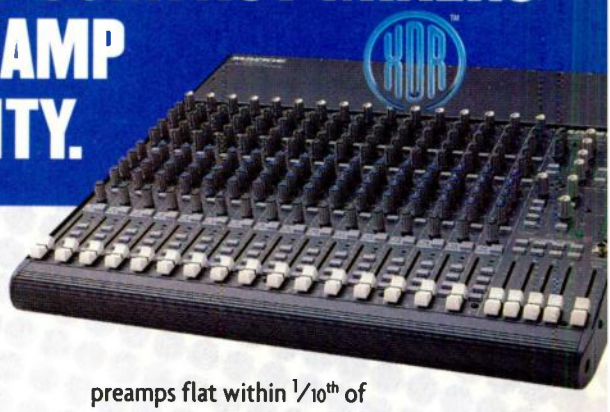
TAKING UP A COLLECTION

You're going to need a wealth of supporting software over and above what our core system provides, starting with effects plug-ins. With *Cubase* and PARIS, you have access to VST and DirectX plug-ins, and I'd start my plug-in collection with the Waves Native Power Pack bundle ($500), which includes the *L1 Ultramaximizer, C1 Compressor/Gate, Q10 Paragraphic EQ,* and *S1 Stereo Imager.* These plug-ins are industry staples. Also, check out Arboretum's *Hyperprism* multi-effects plug-in ($349); it's an amazing program.

Every professional studio has a sampler, and because we're doing the job on a computer, we're going to go for a software sampler. The NemeSys *GigaSampler* ($795) is a great choice because it allows you to play samples directly from your hard drive, eliminating the need for a RAM buffer.

For this studio, I'd consider Sonic Foundry's *Acid* a mandatory purchase—you can produce entire hip-hop and dance tunes using this program alone. You should also purchase a dedicated 2-track waveform editor. Although Steinberg's *WaveLab Lite* ships with PARIS, for this studio, you'll want the full-blown version, *WaveLab* 2.0 ($499), for its support of 24- and 32-bit audio files. Really, what's the point of recording at 24-bit just to do your mastering at 16-bit? And mastering is what *WaveLab* is all about—in fact, the program is designed specifically for assembling and tweaking music for CDs.

NEW VLZ PRO™. THE FIRST COMPACT MIXERS WITH ESOTERIC MIC PREAMP SPECS AND SOUND QUALITY.



You won't find any other mixer manufacturer admitting this dirty little truth: For years, expensive outboard mic preamplifiers have yielded better sound than the preamps in any size mixing console including "status mega-consoles." In fact, if you happen to have numerous extra thousands in cash lying around, we urge you buy an esoteric mic preamp or two or three right now.

But if your equipment budget is slightly more down-to-earth, we'd like you to enjoy the benefits of the most extensive analog engineering project in Mackie's history: The new XDR™ Extended Dynamic Range mic preamplifier.

Now for the first time, you can realize the full potential of the world's finest condenser microphones with an affordable compact mixer: Room ambiance so detailed you can practically hear the carpet pattern...high frequency resolution that defines cymbals, triangles and bells down to the molecular level... midrange that's as gentle and fluid as a warm bath...and tight, authoritative bass with intoxicatingly rich harmonic texture. In short, you can now achieve an aural panorama that's breathtakingly realistic, excitingly vivid and truly 3-dimensional.

You probably think we're laying it on a little thick—until you hear the XDR™ mic preamplifier in person. It really does have...

- The **lowest harmonic distortion** of any compact mixer mic preamp in existence (for example, ten times less THD than our previous VLZ™ series).
- **Lower Equivalent Input Noise** in the critical +20-+30dB operating range than most $2000 preamps.
- Over **130dB of dynamic range** to handle hot 24-bit/196kHz outputs from digital audio workstations.
- **Astonishing bandwidth** without RFI side effects. Not only are XDR™ mic preamps flat within 1/10th of a dB across the bandwidth of any known microphone but they're only 3dB down at 1Hz and 192kHz!

Warm, natural sound
0.0007% THD
130dB dynamic range to handle 24-bit/196k digital input sources
Lowest E.I.N. at real world gain settings
Impedance independent
Near DC-to-light bandwidth
The best RFI rejection of any compact mixers in the world

- **Controlled Impedance Interface.** Use the XDR™ mic preamp with mic/cable impedance combinations anywhere from 50 to 600 ohms and get the same ruler-flat frequency response.

There are also XDR™ benefits you won't hear:

- **The best RFI** (radio frequency interference) **rejection** of any compact mixer... without attenuating high frequency response.
- Comprehensive **protection against "hot patching" and short circuit damage** — a critical feature even some high-end mic preamps lack.

The mixers are pretty cool, too. XDR™ mic preamps are the latest major enhancement to our industry-standard CR1604, MS1402 and MS1202. For more information, call toll-free, log onto our web site or visit your nearest Mackie Dealer and hear the new VLZ™ PRO Series. Think of them as $2000 mic preamps with superb mixers attached.

CYNIC'S CORNER. Did we just slap a new buzzword on our "old" VLZ mixers? Emphatically NO! We spent two years and a quarter of a million dollars to produce the first no-compromise mixer microphone preamplifier design. XDR™ is a quantum leap ahead of anything but the most expensive outboard mic preamps. Plug a high-quality condenser mic into a VLZ Pro compact mixer and you'll hear the difference. Run a side-by-side comparison with a $1000-per-channel esoteric mic preamp and you'll be blown away.

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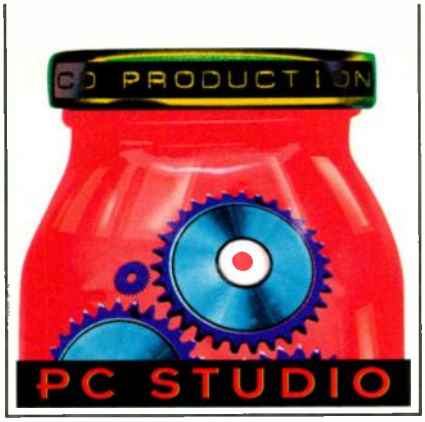

WaveLab supports the VST and DirectX plug-in formats, although the onboard dynamics processors and EQs are certainly good enough to tackle the most demanding mastering tasks. Steinberg's dedicated mastering plug-ins, specifically *Loudness Maximizer* and *Magneto* ($199 each), would make nice additions to the collection; the latter provides effective analog tape-saturation emulation for warming up digital signals. You might not be able to afford them right away, but plan to add them both later.

WaveLab also offers comprehensive playlist assembly. Although most CD-R drives come with disc-authoring software, you won't need it; *WaveLab* supports disc-at-once burning direct from a playlist. Granted, you can't use *WaveLab* to burn data CDs, but the program is quite efficient for creating audio masters and one-off reference disks.

SOUND ADVICE

You'll need to offer your clients an array of sounds, so a selection of sound cards and software synths is in order. Keep in mind that there will be a physical limit to the number of sound cards you can install in your CPU, and you will be able to use only one software synth at a time (assuming your computer is of average speed). This limitation is not a major one: you can save the output of the sequenced synth part as an audio track in *Cubase*. At worst, you might have to patch the output of a sound card to a PARIS input, and if you have digital I/O on the card, that's no big deal. A versatile sound card and software synth should suffice.

To start, I'd pick up an E-mu Audio Production Studio ($699), which provides two 32-voice synth engines. The APS has a unique all-RAM configuration that allows you to customize literally every sound in your arsenal. (The drawback to this is that an additional 32 MB of computer RAM must be allocated to the APS.) The APS provides MIDI In and Out ports, which eliminates the need for a separate MIDI interface.

Because you're using *Cubase VST/24*, you could go with Steinberg's *ReBirth* as your software synth (which allows direct audio transfer to *Cubase* mixer channels). However, I'd also purchase a copy of Seer Systems' *Reality* ($495), which offers an impressive array of synthesis techniques, including AM, FM, subtractive, and physical modeling.

HARDWARE CENTRAL

As noted, PARIS has a hardware control surface. In addition to this, you'll need a MIDI master keyboard controller; which one you choose is a matter of taste, but the Fatar keyboards are good bargains if you don't need onboard sounds. As with our basic studio, we can't resist the Keyfax Phat.Boy, which provides a great way to tweak real-time synth parameters.

NemeSys *GigaSampler* reads samples directly from hard disk, so you can use extremely large samples. The user interface mimics rack-mount hardware and includes Console, Loader, and Mixer components.

Finally, for your studio to be compatible with work coming from outside, I recommend purchasing an MDM tape recorder and a DAT recorder that supports AES/EBU and S/PDIF. Alesis ADATs are by far the most popular MDM format for music production, so being able to connect to that world is a major consideration. I won't spec particular models, nor will I put a DAT and ADAT on my list of purchases, but consider them essential extras, like reference monitors and microphones.

A PENNY SAVED

With the money I saved by using PARIS instead of Pro Tools, I was planning to show Gino Robair a thing or two about how to get high-level work done for less money. And indeed I have; I can do just about everything he can do for just over half the price.

But even when you keep your high-ticket items under control, it's easy to get carried away when designing a pro studio. You could certainly cut some corners in your studio—for instance, live with fewer plug-ins—and still be fine. Furthermore, you can start small and build up slowly to the next level. So don't let that big total scare you away; just plan carefully, with growth in mind, and enjoy the trip.

Associate Editor **Jeff Casey** *lives and works in his office. Associate Editor* **Gino Robair** *gives his special thanks to David Dvorin.*

RECOMMENDED MINIMUM SYSTEMS

Basic Music-CD Production Studio
Power Mac 604e/300 MHz CPU running Mac OS 8.x or Pentium/166 MHz CPU running Windows 95 or 98; 128 MB RAM; dedicated 4.5 GB SCSI hard drive with at least 5.0 MB/sec throughput; 4x8 CD-R drive; 17" monitor

Advanced Music-CD Production Studio
Power Mac G3/300 with Mac OS 8.x or Pentium/300 MHz CPU with Windows 95 or 98; 128 MB of RAM; dedicated 9 GB SCSI hard drive with at least 5.0 MB/sec throughput; 4x4x8 CD-RW drive; 19" monitor; SCSI accelerator card recommended for Mac

Hit record?

Hit "record."

The D8 Digital Recording Studio includes everything you need to record and mix your music. An 8-track recorder, a 12-channel mixer, onboard effects, a built-in 1.4GB hard drive and a whole lot more.

Because the D8 is easy to operate and uses the familiar concepts of analog tape recording, you can record and mixdown your songs in high quality digital audio without going through a long, frustrating learning curve.

And because it's digital and uses no signal-robbing data compression, it delivers consistently great sound quality—no matter how many times you bounce tracks.

State-of-the-art features like programmable snapshot memory make mixing a snap—the fader, EQ and pan settings can be memorized as a scene, up to 20 scenes per song. And with 130 digital effects programs (50 different types) you can add just the right studio polish to your all-digital final product.

With superior sound, simple operation and a low $1250 list price, the Korg D8 delivers everything you need to make your dream of making it big a reality. See your authorized Korg dealer today, and we just might see you on the charts in no time.

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KORG ***D8*** *Digital Recording Studio*

The Penguin's Song

Are you ready for Linux—and is Linux ready for you?

Symbolized by a logo of a cute cartoon penguin, Linux is the new darling of the mainstream computer press. This advanced clone of the Unix operating system was written from scratch over the past several years by volunteers. The Linux community openly and freely distributes the operating system's source code, the human-readable program for the OS kernel, or core program. This "open-source" development model means that thousands of eyes and hands help debug, improve, and maintain the code, resulting in an operating system so reliable, stable, and powerful that many are looking to it as a replacement for Windows NT and even for the more established versions of Unix used by large organizations.

But is there a place for it on musicians' computers? I've used both Linux and music software for years, which gives me a rare perspective on what an odd match these two worlds make. The players in the commercial music-software industry are aggressive about keeping trade secrets, enforcing software patents, and maintaining copy protection. Due to the relatively small size and high saturation of the market, manufacturers can live or die by handfuls of sales. As a result, music software is one of the few industries in which, for example, hardware dongles still constitute an acceptable method of license management. The philosophy of open-source software seems antithetical to this mind-set. On the other hand, Linux is gaining market share faster than any other operating system except Windows, so it's only a matter of time before these two communities will have to reckon with each other. To find out who the early Linux adopters are, I went to the 1999 Winter NAMM show in Los Angeles and spent four grueling days pounding the floor and pressing the flesh with representatives from the music industry.

By R Pickett

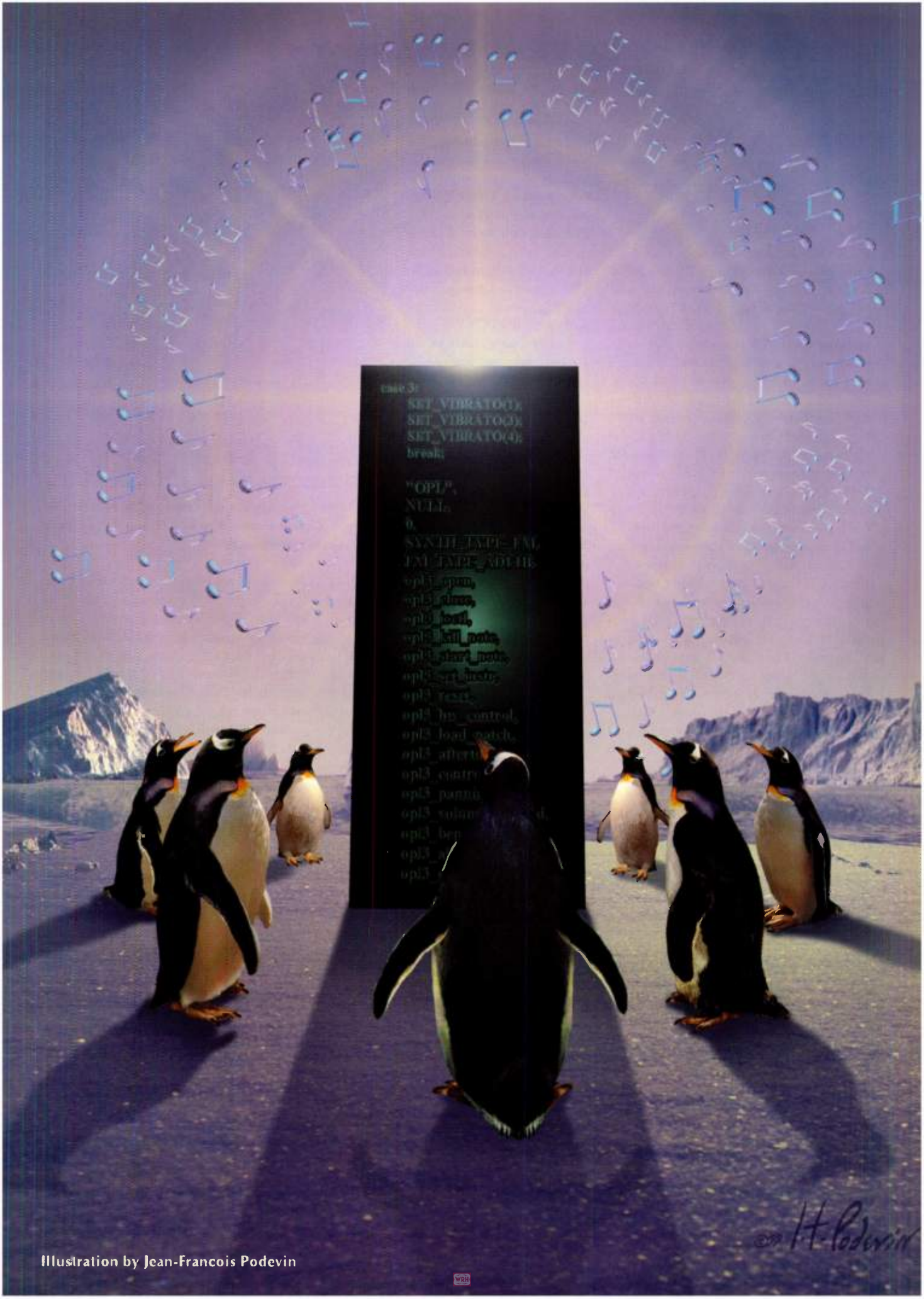

Illustration by Jean-Francois Podevin

STATE OF THE UNIX

One of the first things I noticed at NAMM was the degree to which marketing departments, at least, have blinders on when it comes to operating systems. "Completely cross-platform: runs on PC *and* Macintosh!" I heard screamed from display after display. "Not on my PC," I thought. I could see that alternative operating systems are in for an uphill battle, especially on the nomenclature front. If "PC" is taken to mean "Windows," and "Mac" to mean "Mac OS," then other operating systems that run on both of these hardware platforms, like Linux and BeOS, never even appear on the mental radar.

But the music industry can get out of psychological ruts when need be. Just a few years ago, music-hardware manufacturers still referred to an "IBM" when they meant "PC," and now they are all but cured of that habit. With that in mind, I visited the hardware manufacturers first, because they had already gone through one rethinking experience. Software could wait until I had more information about target hardware.

HARDWARE SUPPORT

To use a piece of hardware, such as a sound card or MIDI interface, an operating system needs a small piece of software called a *driver*. Linux has built-in audio and MIDI drivers for most common sound cards. These drivers are a subset of 4Front Technologies' commercial Open Sound System (OSS), which is an audio system for about 15 Unix and Unix-like operating systems, including Linux and BeOS. 4Front has generously contributed its basic system for use in the Linux kernel, while reserving high-end support for its reasonably priced commercial version. Linux's built-in support for consumer hardware is excellent and would be fine for anyone using standard sound cards for audio and MIDI applications. In recent months, however, the commercial OSS has started supporting higher-end hardware, so I visited the manufacturers that were working with 4Front first.

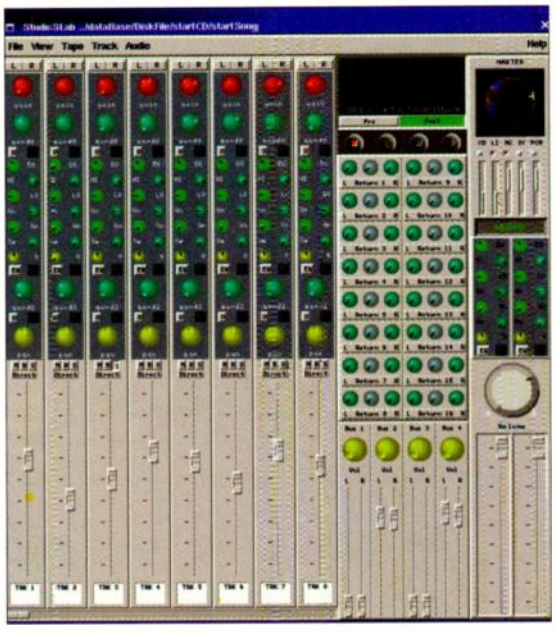

FIG. 2: *SLab* 2.3 is a free audio-recording software suite. The functions of its mixer controls should be obvious to anyone who has used a hardware mixer.

Sonorus announced OSS support for its StudI/O card several months ago. This driver is currently in beta testing. The folks at Sonorus seemed enthusiastic about alternative operating systems and were very knowledgeable about Linux. Heartened, I moved on.

According to a source at SEK'D, RME Audio has written an OSS driver for SEK'D's Prodif 32 cards, which is available from 4Front. An online press release at RME's Web site states that the Prodif 96 card may be supported in the near future. David Hoatson, president of Lynx Studio Technology, said that Lynx is optimistic about Linux support for its LynxOne card and has been attending to several requests for Linux drivers.

I spoke to quite a few big players in hardware and detected a common theme in their conversations: the large manufacturers said that they had no Linux support, no announced plans to create Linux drivers, no idea that interested third parties would do the legwork for them, and little interest in giving third parties the information necessary to write drivers. Most of the smaller manufacturers, on the other hand, were interested in talking with third-party developers, so I began to collect e-mail addresses.

One such contact was with Randy Wilson, the hardware-product manager at Opcode Systems, which recently began shipping a line of USB audio and MIDI devices. On paper, at least, USB is USB is USB, so any OS that has support for USB audio devices should be able to talk to any USB audio device. Linux's USB implementation is still being developed but supports devices such as mice and keyboards very well. Opcode agreed to loan some of its USB hardware to the Linux USB team for work on the USB audio driver. By the time this goes to press, work on the driver will be under way, thanks to Opcode's vision.

The most exciting development in Linux hardware support also came from a smaller company. Richard Homme from CreamWare told me that the company was in the process of porting its Pulsar music-production environment to several operating systems, and that Linux was on the short list for support. Homme explained that CreamWare will probably make hardware drivers available first but intends to port the entire Pulsar hardware and

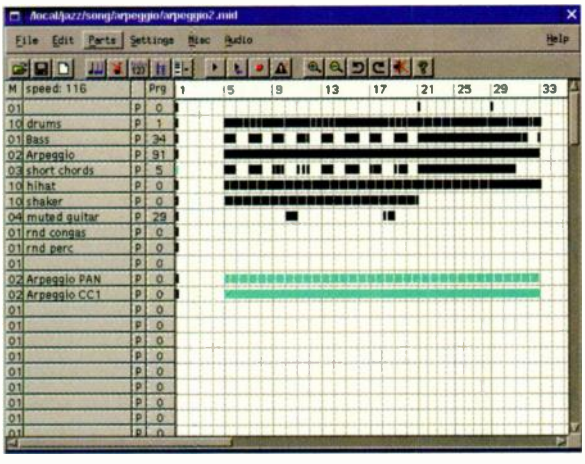

FIG. 1: *Jazz++* 3.2, from JazzWare, offers most of the standard features you expect to get in a MIDI/audio sequencer. It's no competition for the big guns in the industry, but at $50 for a shareware license, it's worth a look.

For manufacturer information, please see Contact Sheet, p.179.

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software suite to Linux. CreamWare president Frank Hund specified a target date of first quarter 2000 for this support. Hearing this from CreamWare reminded me that, without the software to make music, high-end audio hardware is nothing more than an expensive way to listen to our MP3 files.

SOFTWARE SUPPORT

My software search at NAMM was nearly a complete wash. I walked the aisles, hitting up all the music-software houses I could, and learned that the music-software industry does not understand Linux—if, in fact, it even knows Linux exists. I found myself in the role of educator more often than researcher. I did have a few good conversations with knowledgeable people from some of the software companies, though.

Jim Rippie of Cakewalk is extremely Linux savvy. He pointed out that getting information about the number of people using an OS that can be freely downloaded is a slippery proposition, making it difficult to create a proper business case for porting to Linux. He also noted that hardware vendors have a much easier time of it—a few kilobytes of driver code, and they're on their way to selling more cards. Porting a full MIDI and audio software application, however, is a much larger undertaking, so the risks are more serious.

A conversation with the techs at Steinberg focused on the fact that Linux, BeOS, SGI-Irix, and Mac OS X are all Unix-like in structure, so any software being written for or ported to one of these platforms can be moved to any or all of them with a small amount of overhead. One staff member pointed tantalizingly to Steinberg's *Nuendo* audio/MIDI workstation for SGI-Irix, which the company is porting to Windows NT. Just after the NAMM show,

HOW *DO* YOU PRONOUNCE "LINUX"?

There is considerable confusion about the correct pronunciation of *Linux*. Although there's no canonically correct way, *Linux Journal* has put up a Web page on the subject (www.ssc.com/lj/linuxsay.html), featuring a sound file of Linux author Linus Torvalds giving his pronunciation.

According to the *Journal*, Torvalds pronounces the word as "*Leenus*, where the *ee* is as in *feet* but shorter, and the *u* is like a much shorter version of the French *eu* sound in *peur*. Pronouncing it as the *u* in *put* is probably passable." However, the *Journal*'s Web page notes that "many English-speaking people pronounce it *Lih-nucks*, rhyming with the English word *cynics*. This is the pronunciation *Linux Journal* uses."

GEORGE SHEPPARD - CEO

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WRH

Be announced that Steinberg and several other music developers had signed on to write BeOS music applications, any of which could be ported to Linux with much less effort than it would take to port from Mac OS to Windows or vice versa.

Other than that small bit of cautious interest, the companies represented at NAMM were in no rush to embrace alternative operating systems. Most are still struggling to develop or stabilize their Mac and Windows core of support, while a handful are starting to cast an eye out as far as BeOS. It was time to dig in the same fertile fields that gave us Linux itself.

USE THE SOURCE, LUKE

Given the scarcity of commercial music software available for Linux, I decided to go to the source—the source code, that is. A dizzying array of Linux music software is available as open-source software or shareware, ranging from cryptic music-programming languages to DSP development tools, familiar-looking MIDI and audio applications, and strange algorithmic-composition tools. As you'd expect from a large collection of software that's maintained by volunteers, the packages are in various states: some complete, modern applications; some dusty old code that nobody's touched in years; and some just getting off the ground. I trudged through many of these packages and picked out what I consider the best software, as of this writing, for MIDI sequencing, audio recording and editing, and music notation.

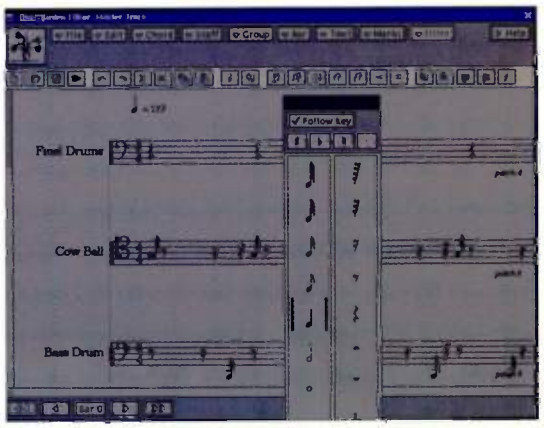

FIG. 3: *Rosegarden* 2.1's interface needs the overhaul it's slated for, but the notation program creates nice output and includes a powerful scripting language.

Jazz++ 3.2, a shareware MIDI and audio sequencer from JazzWare (see **Fig. 1**), is designed primarily for use with an onboard MIDI device such as a commercial sound card, but it includes support for GM, GS, and XG synths. It has a variety of standard features, such as piano-roll event editing, groove quantizing, and integrated MIDI and audio editing, as well as more esoteric functions, such as a fairly sophisticated random rhythm generator and a really cool guitar-neck note selector. The *Jazz++* audio integration works in an interesting way: you import WAV files or record them on the fly, and then assign them to MIDI notes. Audio events are then triggered by MIDI data in a track assigned to an audio device. *Jazz++* also has a built-in sample editor that offers the usual array of effects and editing tools, which makes working with audio events seamless and simple.

One problem with *Jazz++* is that it's geared toward a single MIDI output device and presumes that this device uses General MIDI. This makes the program much better suited to multimedia or demo work than to professional production. If you are a hobbyist, though, or are doing work within the General MIDI realm, you could do far worse than checking out *Jazz++*. It's available for Linux, Windows NT, and Windows 95 for a shareware license fee of $50.

SLab 2.3 is a 64-track, direct-to-disk recording application with a familiar,

GETTING MORE INFORMATION

For more information on Linux, visit www.linux.org. Popular distributors include Red Hat (www.redhat.com), Slackware (www.slackware.com), and Debian (www.debian.org), as well as several others—don't be afraid to try some of the smaller distributions, as most of them are also very cool. A version of Linux for PowerPC-based computers (for example, Power Macintosh) is available from LinuxPPC Inc. (www.linuxppc.com).

4Front Technology's page, with news about the latest version of the Open Sound System, can be found at www.opensound.com. The Linux-USB project is based at peloncho.fis.ucm.es/~inaky/uusbd-www. Information on RME's Open Sound System support (including Linux support) can be found at www.rme-audio.com/oss/oss.htm.

David Phillips operates the best-maintained page of links to the scores of music and sound projects for Linux systems. Phillips's page is mirrored at sound.condorow.net and sound.lovebead.com.

The entire open-source concept, although not new, has experienced a renaissance due to the success of Linux. In order to learn more about the economics and culture of the open-source movement, start at www.opensource.org.

Although Linux is the darling of the press these days, there is a large handful of other open-source operating systems. One in particular that is compared with Linux is FreeBSD, which you can explore at www.freebsd.org.

You should assuredly also check out BeOS, which isn't open source but has enough cool features that we'll forgive them that for now. Contact information for Be and other hardware and software developers mentioned in this article is provided in **EM**'s Contact Sheet on p. 179.

Finally, in the hope of continuing to be a liaison between the Linux community and the music industry, I'm putting together a site that expands upon the things I discovered while researching this article. Come check it out at www.hayseed.net/~emerson/linuxaudio.

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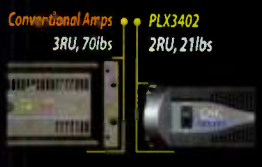

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mixer-style user interface. It has all of the features you would expect in such a program, including automated mixdowns, waveform editing, and built-in digital effects. Because *SLab* works with any OSS-compatible driver, I was able to record up to 48 kHz, 16-bit audio with my onboard sound hardware. *SLab* comprises several smaller mini-applications that work together in a suite, handling the mixing, transport, wave editing, and DSP functions of the studio. Each section's user interface resembles the analogous element of a real-world studio: a mixer, a tape deck, or an effects box (see **Fig. 2**).

I used *SLab* to hack together a simple 4-track vocal demo and was pleasantly surprised at how easy it was to operate after only an hour or so of working with the program. The rotary widgets on the mixer act oddly when you're trying to control them with the mouse, but they perform the expected functions. In fact, *SLab*'s biggest asset is the predictability of its interface. Although it looks unlike Windows or Mac OS applications, *SLab* is a breeze to work with if you've ever run a mixer and a tape deck. Assigning tracks to buses, working with the transport controls, and fiddling with effects settings are all a simple matter of clicking the mouse on interfaces that look just like their real-world counterparts. *SLab* is available for free download.

Creating notation with *Rosegarden* 2.1 is an interesting experience, to be sure. The user interface looks completely strange, although it is functional and easy to understand. The application prints notation not directly but through a complicated filter program called *MusicTeX*, and its online help is limited. Yet it qualifies for this list because it has a nice notation engine; it includes a powerful scripting language, Petal, for automating repetitive tasks; and it does a fine job handling MIDI files.

Rosegarden's interface is its biggest foible. It appears that the authors wrote their own code for things such as buttons and menus (see **Fig. 3**). As a result, these features look odd and react in an unfamiliar way, with menus sticking around when you don't expect them to and other such small distractions. In spite of this, a few moments of practice had me placing notes and rests on staves, and I was impressed with the smoothness of the underlying engine.

Although not state-of-the-art by any standard, *Rosegarden* 2.1 is capable of creating perfectly workable simple scores for those willing to get their fingers dirty. The authors are hard at work on *Rosegarden* 3.0, which will modernize the interface, add a plug-in architecture, allow direct PostScript output, and be able to import and export a vast variety of file formats. *Rosegarden* is an open-source application.

UNDER CONSTRUCTION

One of the hazards of writing an article about open-source software is that things can change drastically in the interval between writing and the time the article hits the newsstands. Accordingly, here are some of the more interesting open-source projects that were in development as of this writing but might well have started to bear usable fruit by the time you read this. Of course, other new projects may be under way that weren't even germinated as of this writing. Check the Web pages listed in the sidebar "Getting More Information" for up-to-the-minute news.

Some intrepid hackers have started a project to create a software synthesizer with the type of hands-on interface we've all come to know and love. Even at version 0.2, the copy of *Freebirth* that I examined was churning out interactive drum grooves and bass lines with ease (see **Fig. 4**). The activity on the developer's mailing list leads me to believe this project will go far, and quickly.

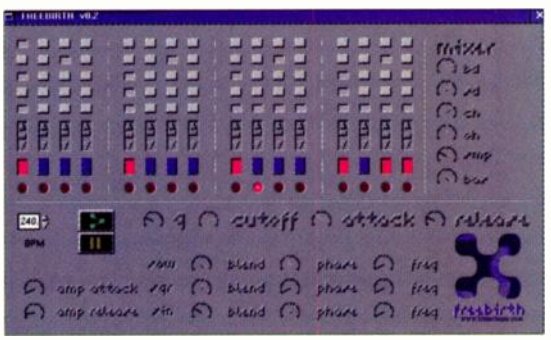

FIG. 4: *Freebirth* is still in an early-development phase, but the hands-on software synth already grooves. Thanks to the open-source software development model, you can expect fast and furious improvement.

Another group is authoring an alternative to OSS called Advanced Linux Sound Architecture (ALSA). At version 0.3, ALSA has less hardware support than the built-in kernel OSS, but the hardware list is growing rapidly, and the system's design will provide more and better services than OSS when it's completely implemented. One of the developers said that ALSA's audio driver can achieve latencies as low as 1.5 ms with good hardware, so this is a technology to watch.

Wine is a reimplementation of the Win32 API for Intel-based Unixes, allowing Windows programs to run unmodified. Although the project is nowhere near complete, many Windows applications, such as Microsoft *Word* and Intuit *Quicken*, already run under the system. Certain versions of Sonic Foundry *Sound Forge XP* and Syntrillium *Cool Edit* have been verified to run correctly under Wine, and the list of usable applications grows daily. The eventual goal is 100 percent compatibility so that Linux with Wine can host both Linux and Windows sound applications on the same desktop seamlessly.

The Audiotechque group is putting together a full-featured audio editor with a plug-in architecture. The project's current code snapshot doesn't do anything useful, but that's because work is presently focused on developing the audio engine and plug-in scheme. Once the team turns to creating an interface and effects, expect wonders. This group is also actively soliciting input, so I expect development to accelerate as more and more eyes and hands get into this code.

TO CODE OR NOT TO CODE

Even with all of this information, the question remains: should musicians consider using Linux for music applications? Although I am a Linux user myself and would like to say that everyone should run and install this OS tomorrow, the fact is that nobody is going to replace their Digidesign Pro Tools setup with a Linux-based system anytime in the immediate future. Although using Linux over Mac OS or Windows in most applications has compelling advantages, a wholesale move to Linux-based music production is

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not a viable option right now for mainstream music-production facilities, especially those that have already invested in existing technology. The killer app just isn't there yet.

For the musician who is just starting to look at computer-based music, Linux might well be worth considering, especially if you plan to use the same computer for other pursuits and would benefit from Linux's stability, speed, and excellent Internet capabilities. A person buying a machine strictly for musical ventures, though, will probably find Windows or the Mac OS more appealing.

However, **EM** readers are known for their do-it-yourself spirit and interest in experimentation. What Linux could offer music hobbyists, as well as professional musicians experimenting in their spare time, is participation in the development process. If you've ever looked at a music application and wished that the developers had implemented a particular feature, or wanted the user interface designed a bit differently, or just had a great idea for a new product, this is for you. Install Linux on a spare hard-drive partition on your PC or Mac, download a few of these applications, join some mailing lists, maybe even contribute some code yourself, and you'll be on your way to helping build exactly the tool you always wanted.

If the thought of being on the development team for the next killer music-software application interests you, here's your chance to get in on the ground floor of any project you like or gather like-minded folks together and start a new project of your own. Along the way, you'll be doing some of the things that probably drew you to music in the first place: creating, collaborating, learning, contributing, and making the world a better place.

R Pickett *(emerson@hayseed.net) has been a Linux user for five years. He is in therapy to correct his urge to slap marketers who don't understand that a PC is hardware, Windows is software, and those are two different things.*

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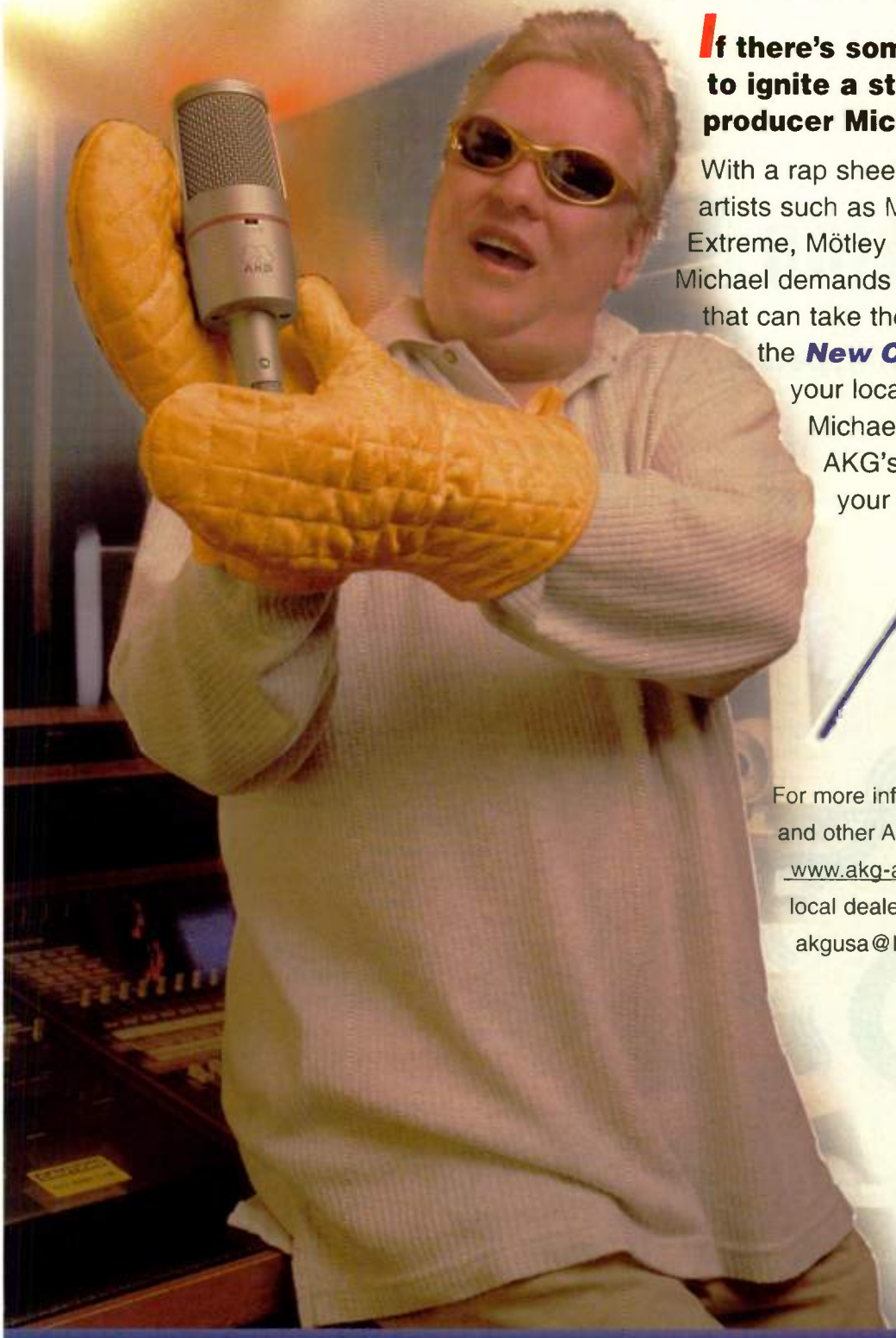

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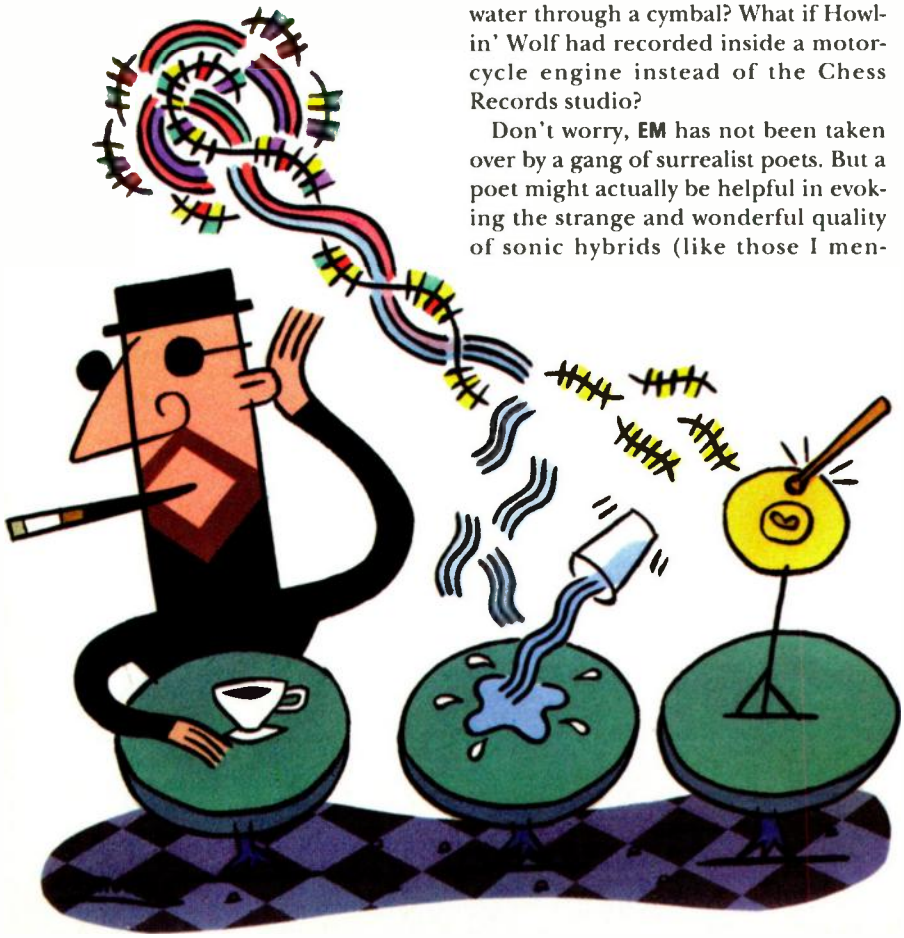
Convolution Number Nine

A look at a seldom-hyped but sonically rewarding DSP technique.

By John Duesenberry



Have you ever used a gong as a reverb unit, or listened to a flock of birds singing a violin arpeggio? Did you ever wonder what sound you'd get if you could pour water through a cymbal? What if Howlin' Wolf had recorded inside a motorcycle engine instead of the Chess Records studio?

Don't worry, **EM** has not been taken over by a gang of surrealist poets. But a poet might actually be helpful in evoking the strange and wonderful quality of sonic hybrids (like those I mentioned) that you can produce through *convolution*. When two signals are convolved, their spectra are multiplied. The output signal partakes of the timbral and temporal attributes of both sources, and convolution coils the signals together inextricably.

Engineers have known convolution as a fundamental operation of digital signal processing (DSP) for decades. However, information about convolution hasn't yet reached many musicians outside the academic and research communities. We hope to change that a bit, because many of its applications—including reverberation and other spatial effects, filtering, and cross-synthesis—are of interest to electronic musicians.

CONVOLUTION AND SPECTRUM MULTIPLICATION

Strictly speaking, the term *convolution* refers to a sample-by-sample operation on two signals; this is called *direct convolution*. I won't discuss the details of direct convolution, because it is seldom, if ever, used in the real world and is terribly inefficient. Instead, convolution software usually implements an analysis/resynthesis process called *spectrum multiplication*.

Spectrum multiplication is mathematically equivalent to direct convolution. The process begins with a fast Fourier transform (FFT) analysis of the spectra of two input signals. The analyzed spectra

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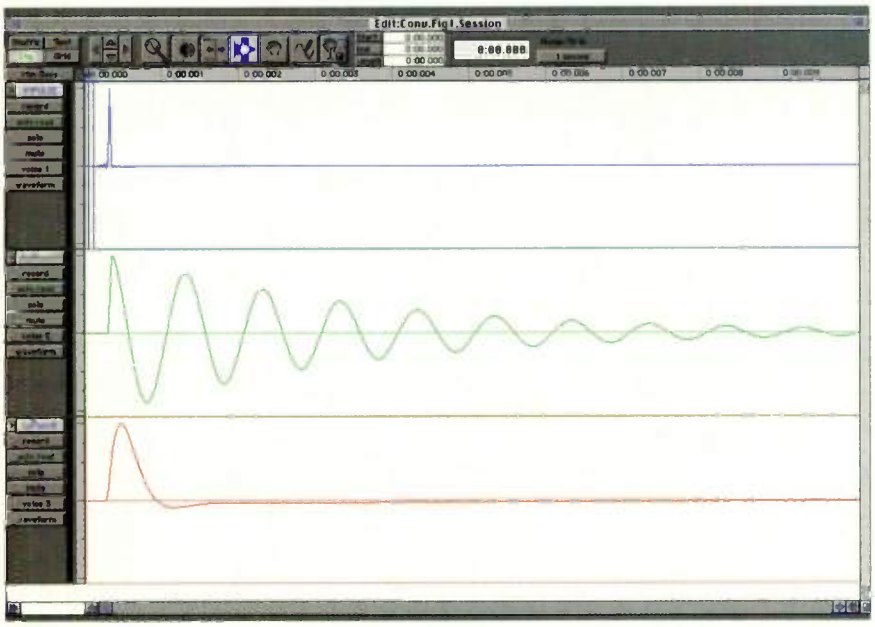


FIG. 1: This figure shows the impulse responses of two filters. The top track illustrates the impulse, the middle track shows the IR of a narrow bandpass filter, and the bottom track represents the IR of a shallow-slope lowpass filter.

are then multiplied. Finally, the output signal is resynthesized through a process called inverse FFT (IFFT). This may sound like a lot of computation, but a modern computer processor can scream through a lengthy spectrum multiplication in almost no time.

When the spectra of two signals are multiplied, like frequencies reinforce each other, while unlike frequencies weaken or disappear. This effect is called *spectral intersection*. In an effective convolution, the two input signals should have at least some energy in a common frequency range. If you convolve piano and clarinet samples, both at middle C, the spectra will have many common frequencies. Odd-numbered harmonics, which are abundant in the clarinet tone, will be strongly reinforced in the output spectrum.

But if you convolve the highest note on a piano with the lowest note of a bass clarinet, you'll get a rather faint signal because only the clarinet's weak upper harmonics will intersect with the piano note's spectrum. Looking at it in another way, you could say that the piano spectrum had "filtered out" the bass clarinet's fundamental and lower harmonics. Convolution is, in fact, intimately tied to filtering, as you're about to see.

For the purposes of this article, spectrum multiplication and convolution can be considered as synonymous. From now on, I'll stick to the simpler term *convolution*.

FILTERING & IMPULSE RESPONSE

In theory, convolution can reproduce the effects of any sort of filter—for example, lowpass, highpass, or even specific vintage filters like the Minimoog voltage-controlled filter (VCF). Before I delve into that sort of thing, though, let's go over some basic filtering concepts.

Filters are usually characterized by their frequency response curves. One way to obtain a frequency response curve is to pass white noise through a filter. Analysis of the output spectrum shows how the filter attenuates various frequency regions.

You can also think about how filters behave over time. A filter's *impulse response* (IR) is a measurement that embodies the same information as the frequency response but views it in the time domain. To obtain the IR, you feed an extremely short impulse, such as a gunshot, into the filter. Theoretically, the ideal impulse—an infinitely short one—would include energy at all frequencies, as does white noise. Engineers use the filter's output signal (the IR) in order to measure a filter's response to transients and observe whether it rings, or oscillates, at certain frequencies.

CONVOLUTION TOOLS

Convolution software for the desktop is readily available. For the Mac, Tom Erbe's *SoundHack* features both general convolution and a binaural processor that uses built-in HRTFs. You can get a free demo version of this sound-file processor via FTP at music.calarts.edu/pub/SoundHack. I definitely recommend paying a small shareware fee for the PowerPC-native version because it's much faster. BIAS *Peak* also implements sound-file convolution; check out www.bias-inc.com for information. A real-time convolver, developed with Cycling '74's *MSP*, is available for free at www.spectralnoise.com. James McCartney's SuperCollider synthesis language includes a demo program that does real-time convolution in about 20 lines of code. SuperCollider can be found at www.audiosynth.com.

On the PC side, convolution is available in two audio editors, SEK'D's *Samplitude* and dissidents' *Sample Wrench*. The *Acoustic Mirror* DirectX plug-in from Sonic Foundry is a powerful convolution engine. Lake DSP's Huron Digital Audio Convolution Workstation, hosted on Windows NT, comprises dedicated DSP hardware and software for 3-D audio, acoustic simulation, auralization, and other applications. Information and audio examples of the Huron are available at www.lakedsp.com.

E-mu Systems has featured convolution, under the name of Transform Multiplication, in a number of its products. These date back to the Emax sampler, making E-mu a pioneer in commercial implementations. The Emax SE, Emax II, ESI-32, ESI-4000, and all EOS systems also come with Transform Multiplication.

For manufacturer information, please see Contact Sheet, p. 179.

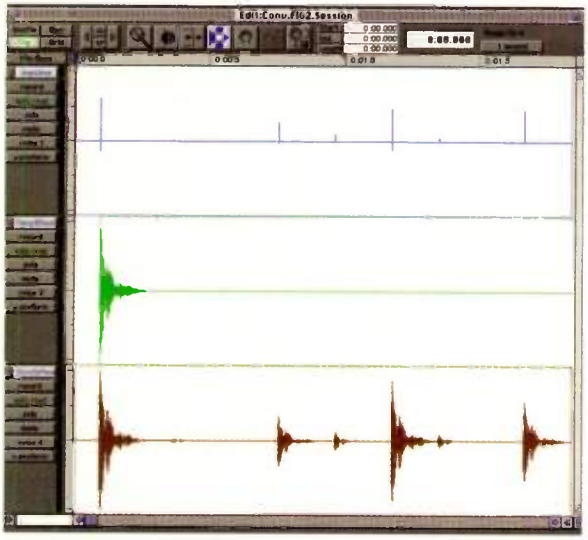


FIG. 2: A sequence of impulses (top) is convolved with a sample of a Japanese temple block (middle). The bottom track shows the convolution.

In the real world, the ideal impulse is approximated by a very short transient. **Figure 1** illustrates an impulse that was input to two filters, showing the resultant IRs. The top track contains the impulse; below it is the impulse response of a narrow bandpass filter with a center frequency of 1 kHz. The bottom signal represents the IR of a lowpass -12 dB/octave filter that has a cutoff frequency of 1 kHz. These two filters, which have very different frequency responses, also have very different IRs. The bandpass filter has a long IR—typical of filters with a narrow frequency response—and rings for more than 7 ms. Filters with a wider frequency response and a smooth slope tend to have a short IR, as shown by the lowpass output in the figure.

The relationship between convolution and filtering is far from obvious, so you'll have to take the following key concept on faith:

Axiom 1: *The output of any filter is the convolution of its input signal with its impulse response.* (See the sidebar "Further Reading" for sources of mathematical proof.)

It follows from Axiom 1 that you could use convolution to reconstruct any filter. To capture the characteristics of the Minimoog VCF, for instance, you would need only to dial up the desired settings on the filter, patch in an impulse source, and record the output. By convolving any signal with the recorded IR, you could obtain the sound of that signal filtered by the Minimoog. The most difficult part of this process would be finding a Minimoog!

There's a catch, though: your IR recording would capture the behavior of the Minimoog at one particular setting. Convolution is therefore impractical for variable or dynamic filtering, because it doesn't offer the parametric control available on the average synthesizer filter or equalizer.

SPATIAL EFFECTS

If we broaden our view of filters and impulse responses, things become even more interesting. The following truth is, I hope, self-evident:

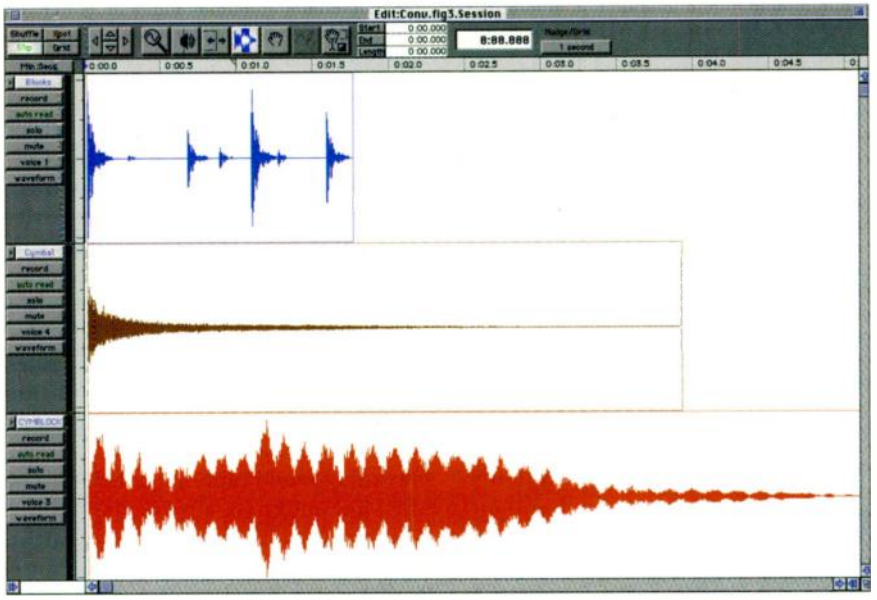


FIG. 3: A sequence of temple-block hits (top) is convolved with a cymbal sample (middle), generating a sequence of hybrid "cymblock" sounds (bottom).

Axiom 2: *Any system through which a signal might pass can be considered a filter.*

Many acoustic and electronic systems, though not designed to be filters, have filtering effects. Concert halls, amplifiers, and microphones are a few well-known (and often-cursed) examples of this. When we speak of a concert hall as "bright," we're thinking in the frequency domain—that the hall's resonances reinforce high frequencies. When sound technicians clap their hands to check how live a hall is, they're thinking in the time domain. The hand-clap test is an informal measurement of the hall's IR.

Reverb designers sometimes use convolution to study and simulate acoustic spaces. First, an IR recording is made in the space. The impulse source might be an electronic signal played back over a speaker, or an acoustic event such as the firing of a starter pistol. When a test signal (say, an instrumental recording made in an anechoic chamber) is convolved with the IR, the reverberant characteristics of the space are reproduced with remarkable accuracy. So if the test signal is a marimba recording, and the IR was recorded in Boston's Symphony Hall, the convolution sounds like that marimba being played in Symphony Hall. In fact, a good IR recording and a convolution program are the ingredients you need for an instant reverb unit of sorts. (If you want to try this technique, make sure you get permission before strolling into your local cathedral with a revolver and a portable DAT!)

A twist on this approach to reverb is the *dynamic room effect.* Suppose you recorded an IR in Symphony Hall and—because you were there anyway—from the hall's restroom as well. Suppose further that you took these recordings home and made an interpolation (that is, a crossfade) between the two IRs. If you convolved a marimba recording with the interpolated IR, you'd get the sound of the marimba in a room whose shape, size, and construction materials all mutated over time.

A head-related transfer function (HRTF) is a special IR recording made with mics located in the ears of a dummy head. Such a recording preserves effects of sound reflections off the head, outer ears, and shoulders of a listener. These reflections cause short time delays that produce a comb-filter effect, which provides cues to the three-dimensional location of the sound source relative to the listener. (For an introduction to spatial hearing, see "Square One: Lost in Space" in the May 1999 issue of **EM.**) To simulate these cues over headphones or near-field speakers, signals are convolved with HRTFs, giving the listener the illusion of hearing sounds located in a 3-D space. This technique is often used in computer games, training simulations, and virtual-reality applications.

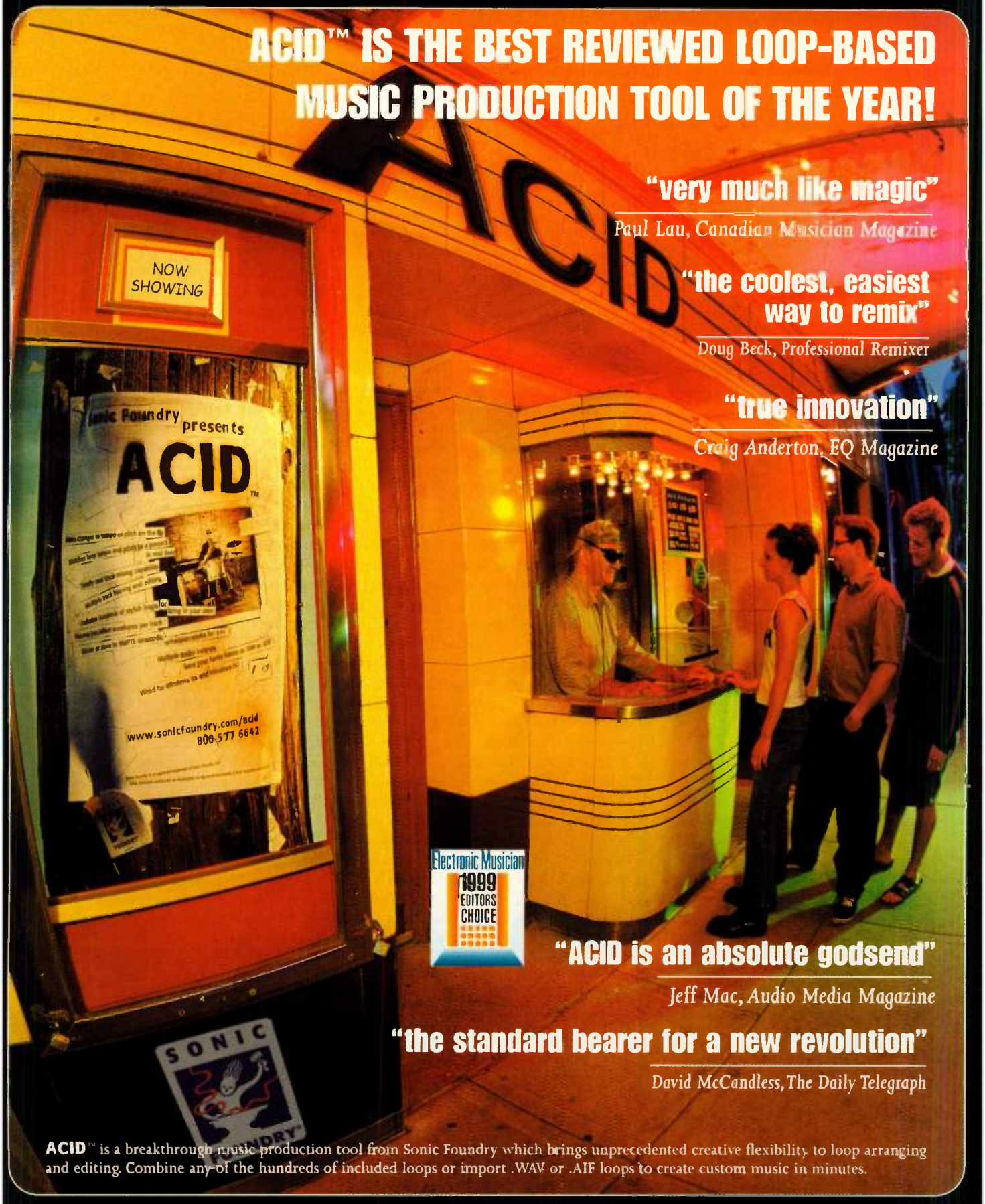
An easy way to become acquainted with HRTFs is to try the Binaural Processor in Tom Erbe's Macintosh-based *SoundHack* (see the sidebar "Convolution Tools"). If you're technically inclined, a library of HRTFs in raw 16-bit format is available from the Massachusetts Institute of Technology's Media Lab at sound.media.mit.edu/KEMAR.html. These HRTFs need to be decompressed, converted to a usable audio file format, and convolved with other signals through your software of choice. Check the Web site's FAQ for conversion instructions.

THE UNIVERSAL IR

If you extend the concept of the impulse response, a quite different range of effects becomes available. You can think about many acoustic sound sources in terms of an excitation/response model. Instruments such as tom-toms, bass drums, and wood blocks are good examples because they consist of resonant bodies that make a sound when struck. The excitation produced by striking the instrument can be considered a

FURTHER READING

Information about convolution in a musical context is far from being plentiful. Professor Richard Boulanger, one of the first musicians to realize the potential of convolution, published a discussion in the Spring/Summer 1986 issue of *Ex Tempore* (Department of Music, University of Alberta). This article is loaded with practical suggestions and is well worth hunting down. Boulanger's upcoming book on Csound (visit mitpress.mit.edu/e-books/csound) will also cover convolution. Curtis Roads's invaluable *Computer Music Tutorial* (MIT Press, 1996) treats the subject from both mathematical and musical standpoints. Many textbooks about digital signal processing, such as *C Language Algorithms for Digital Signal Processing* (Prentice-Hall, 1991), cover convolution from an engineering perspective and include program code.



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broadband impulse. The instrument body, which usually resonates in a narrow range of frequencies, acts as a filter. The sound of the instrument is, in fact, its impulse response. To generalize:

Axiom 3: *Any signal can be thought of as the impulse response of a (possibly imaginary) filter.*

Figure 2 illustrates how this idea can be used to construct a simple rhythmic sequence. Here the IR signal is a sample of a Japanese temple block (middle track). A sequence of impulses (top track) is convolved with this IR; the bottom track shows the convolution. The result is a sequence of copies of the temple-block signal that is rhythmically identical to the impulse sequence. The amplitude of each copy is proportional to that of the corresponding impulse. In effect, the impulses "trigger" the temple-block sounds.

The convolution track thus sounds like a recording of someone tapping an actual temple block with a stick. This sequence can be varied in several ways. If you were to prefilter each impulse by a different amount, the brightness of the temple-block hits would vary. To vary the timbre even more, different signals could be substituted for, or alternated with, the electronic impulses; samples of drumsticks or claves being struck together would work well here.

Of course, if the sample of the temple block had been loaded into a velocity-sensitive sampler, this particular sequence would have been much easier to create. **Figure 3** shows a variation of the previous sequence that would be harder to produce by conventional means. Here the temple-block events (top track) are convolved with a sample of a ride cymbal (middle track). The bottom track is a cross-synthesis of the block and cymbal sounds. This "cymblock," as I'll call it, retains the rhythm and accentuation of the blocks but has the overall character of a series of cymbal hits. The cymblock hits overlap each other *and* sound acoustically realistic. (Notice that convolution can overlap as many events as needed in this way without running out of voices.)

The waveforms don't show it, but the temple block has a strong resonance at around G5, which intersects with part of the cymbal's broader spectrum. The common frequencies reinforce each other, and the cymblock takes on the pitch of the temple block. This may be the most interesting feature of this convolution, because there is potential for a "morph." The original blocks and the cymblock tracks have common rhythmic, accentual, and pitch features; therefore, a careful crossfade can produce an interesting transformation in which the temple block appears to "turn into" the cymblock.

As the cross-synthesis of the cymblock shows, there is really no restriction on what impulses and IRs you choose to convolve together. With a general convolution program, the distinction between impulse and IR is ultimately a mere convention.

MORE EXPERIMENTS

If you'd like to experiment with convolution yourself, get hold of some software and start by trying to reproduce the examples shown in **Figures 2** and **3.** Then branch out by substituting different IR signals. Try convolving temple blocks with a gong, a piano chord, or a string tone cluster. Next, use a variety of impulse signals, such as a cowbell, an open or closed hi-hat, or a cello pizzicato. Impulses needn't all be percussive, either. Speech, for example, can be an interesting input: try using recorded lines of poetry as the impulse, with a cymbal or snare-drum roll as the IR.

Don't forget that purely electronic signals can be used to fine effect in a convolution. For a surprisingly good reverb effect, use white noise with a two- to three-second exponential decay as an IR. Filtering the noise colorizes the reverb. Noise with a long linear decay gives an *infinite reverb* effect. For a truly twisted effect, use an inharmonic FM sound as the "reverb"—if you like the result, you qualify as a hard-core convolutionary.

Even after running through all these suggestions, you will still have only scratched the surface of this fascinating sonic resource's possibilities. Convolution, unlike FM synthesis, is not a widely explored, well-documented electronic-music technique. But that is one reason why it appeals to the audio adventurer.

John Duesenberry's *electronic compositions are available through the Electronic Music Foundation's Web site at www.emf.org. If you come up with a really great convolution, e-mail him about it at johndu@world.std.com.*

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RECORDING MUSICIAN

Minimum Rig, Maximum Sound

Capture awesome stereo recordings with a low-cost, compact setup.

By Karen Stackpole

The magic that can happen during a live performance often eludes studio recordings. But that doesn't mean you can't document it for posterity. With the right tools and techniques, you can capture the unadulterated energy of live shows and turn out masters that you'd be hard-pressed to create in the controlled, overdub-prone environment of a recording studio.

Fortunately, you don't need to be rolling in cash to set yourself up as a location-recording specialist. Forget the big semi with the space-age control room and refrigerator-size racks of high-end processing gear. Keep it simple and keep it smart. You need only a minimal rig, a reliable set of wheels, and good ears to get this show on the road.

BRIAN KNAVE

The author used a coincident pair of AKG C3000s to capture the "Edge of Arrival" record-release performance of the San Francisco–based Apes of God. From left to right is Myles Boisen, Mark Schifferli, Deb Fox, John Hanes, Gilbert Marhoeffer, and Jason Gibbs.

Of course, live recording is not without its challenges. Once you leave home, you can kiss a "controlled environment" good-bye. Be prepared to do battle with all manner of gremlins and unforeseen circumstances. Problems you're likely to encounter include radio-frequency interference (RFI), lousy P.A. systems, awkward stage setups, unusual performances (and performers), unwieldy room acoustics, unreliable power (common in older buildings), unwanted ambient noise (like traffic outside the club), and countless technical gaffs. It's important, therefore, to prepare thoroughly.

You can record live using one of three basic approaches: multitracking, with each instrument individually miked and the mix completed later in the studio; mixing live to 2-track from multiple mics; and stereo recording using only two mics (or one stereo mic). This article covers the last of these.

The advantage of stereo-miking is authenticity: you capture the group as it sounded at the gig, complete with natural stereo imaging and the acoustics of the room. Another big plus is that there's much less gear to buy, maintain, and haul around. But even with the

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bare minimum of gear, stereo 2-track recording can yield CD-quality recordings that are ready to edit, master, and release.

THE GEAR

The first item in your toolbox should be a matched pair of quality condenser mics, either small or large diaphragm. Small-diaphragm condenser mics generally have better transient response and are more accurate in the highs; large-diaphragm condensers tend to have better low-end response and an overall richer sound. I use a pair of AKG C-3000 large-diaphragm condensers. These mics sound great and are reasonably priced.

A single stereo mic is also an option. Because stereo mics have two coincident mic capsules in one housing, they are very easy to set up and are inherently free of phase problems. However, quality stereo mics typically cost more than matched pairs do and may exceed the limits of some budgets. Moreover, a matched pair is more versatile than most stereo microphones because it allows for any number of setups.

FIG. 1: The Shure S15A is a lightweight, aluminum telescoping mic stand that is popular among location recordists. Its height can be extended to 15 feet.

GEAR LIST FOR STEREO RECORDING

- Matched pair of condenser mics (or a single stereo mic)
- Dual-channel microphone preamp
- DAT recorder
- Compressor/limiter (optional but highly recommended)
- Stereo bar with proper mic clips
- Power strip (plus a few ground-lifting outlet adapters, just in case)
- Pair of closed-ear headphones
- Necessary cables
- Necessary connectors
- Miscellaneous: extra DATs; notebook, pen, and pencil; flashlight; duct tape; assortment of extra cables and connectors; extra power strip
- Portable power conditioner (optional but recommended)
- Hand truck to cart everything

You'll also need a quality 2-channel mic preamp, preferably with phantom power (or a small mixer with good onboard mic preamps and phantom power), and a DAT recorder. Some portable DAT machines have built-in preamps and phantom power, but a quality outboard preamp will usually provide better sound, lower noise, and more options. I use a Focusrite Green 1 dual-channel mic preamp, and I love it. This preamp is clean, accurate, and bright without sounding brittle.

I highly recommend using a good stereo compressor/limiter, although it's not absolutely necessary. A compressor/limiter is used to prevent digital distortion resulting from mischievous transients that occasionally shoot into the red (overload) zone. Opt for one that is relatively uncomplicated to operate, adds little or no coloration to the signal, and has an attack time that is fast enough to be effective on peaky transients. I use a Drawmer DL231, which works beautifully for my needs.

Last but not least, bring a sturdy mic stand (a tripod base is best) with height-extension capabilities (see **Fig. 1**), a stereo bar with proper mic clips, and a pair of quality closed-ear headphones. Pack all necessary cables, an extension cord, and a power strip into a portable container, along with an assortment of adapters and extra cables (to deal with unexpected situations), a flashlight, a notebook, a pen, and extra DATs. You may want to bring a power conditioner to ensure clean power from potentially unreliable outlets. (Actually, although I know other live-stereo recording engineers who swear by such units, I've walked the tightrope successfully without one for some time now—and I've recorded in some *very* funky venues.)

CONNECTIONS

Cables and connectors, though less exciting than recorders and processors, are critical components of any recording rig. My advice is to buy the best you can afford. Sure, you can get by with bargain-bin cables—at least for a while—but it just doesn't make sense to spend top dollar on a quality preamp, recorder, and compressor only to connect them with inferior cables. Using quality cable ensures the integrity of the signal path and furnishes better protection against RFI and other unwanted noise; it provides peace of mind.

You will need at least two long mic cables (25 to 30 feet) and four short audio cables (to connect the preamp to the compressor and the compressor to the DAT recorder). It's smart, too, to pack at least one extra cable of each type you use, as well as an assortment of connectors. (For a rundown of connector types, see "Recording Musician: Will the Signal Be Unbroken?" in the May 1998 **EM**.) You should bring along an extra power strip, a spare IEC cord, and some extra ¼-inch-to-¼-inch cables for emergencies. And don't forget that roll of duct tape—it's indispensable for tethering cables out of harm's way. Believe me, you don't want your quality mic cables being trodden by the masses.

If you have to borrow or rent gear, be sure to check all inputs and outputs for the types of connectors that you'll

need, and determine whether the gear is rated at +4 dBu (pro level) or -10 dBV (consumer level). In one situation last year, I needed to borrow a DAT machine to do a live recording job for a sax player and his ensemble. In addition to the borrowed unit, I packed my usual gear and trotted off to the venue. I arrived early, spoke with the band leader, and started setting up. To my horror, I discovered that the DAT recorder had unbalanced RCA jacks only. My Monster Cable Prolink 500 XLR-to-XLR cables were *useless*.


BRIAN KNAVE

The author monitors the situation during location recording of the Apes of God.

I sped off to a nearby Guitar Center and ran to the door. Locked! The store had closed only minutes earlier. Frantic, I pounded on the doors until a clerk noticed me. He waved to dismiss me. "Emergency!" I screamed. Supplicating myself before the aloof employee, I begged for a female XLR-to-RCA adapter. He took pity and let me in. I rifled through the Hosa rack in vain. Finally, someone found what I needed in the basement. I made it back to the gig with only five minutes to spare. I got lucky.

STEREO-MIKING TECHNIQUES

Once your gear is together, you're ready to go out there and record—well, almost. First you should get familiar with various stereo-miking techniques. There are three basic types—coincident, near-coincident, and spaced pair—as well as variations on each. Which technique you use depends on a variety of things, including the kind of music you're recording, the stage setup, room acoustics, and personal taste. Of course, it also depends on what type of mics you use, because different stereo-miking techniques require different polar patterns.

Coincident pair. Coincident-pair techniques include XY, Blumlein, and Middle/Side (M-S). The XY coincident pair, which typically employs two directional (cardioid or hypercardioid) polar patterns, is one of the easiest and most popular ways to stereo-mic. *Coincident* refers to the fact that the two mic capsules are positioned as close to one another as possible, usually forming a 90-degree, or larger, angle (see **Fig. 2a**). This setup has the advantage of avoiding phase problems.

I generally use two cardioid mics for an XY pattern, angled toward one another somewhere between 90 and 130 degrees. The angle can be adjusted to

affect the stereo spread; listen carefully while adjusting it, though, because sounds from "center stage" can lose focus if the stereo field is too wide.

An interesting variation on XY coincident is the Blumlein pair, which uses two coincident figure-8 patterns angled 90 degrees apart. This arrangement not only captures an accurate stereo image but also picks up room sound on either side.

The M-S method employs a cardioid-pattern mic facing the ensemble and a figure-8-pattern "side" mic positioned to pick up sound from left and right. This arrangement captures a very stable center image and is thoroughly mono compatible. M-S, however, requires special "decoding" to create a complete stereo image. Such decoding can be accomplished with three mixer channels: the signal from the cardioid mic is panned dead center while the figure-8 mic's signal is split to feed two channels, one panned hard left and the other hard right. One of these "side" channels is then phase-reversed to complete the process. This can be done either with a phase-reversal switch on the console channel or by using a special "phase-reverse" cable (one that has "hot" and "cold" wires reversed). For 2-track location recording, signals from the middle and side mics are simply recorded to left and right channels of the DAT recorder. The side-mic signal can be processed later in the studio.

Special sum-and-difference boxes that do M-S processing are also available, and some stereo mics, such as the Shure VP88, are designed to record M-S and automatically decode the signals. Also, Grace Designs offers a portable dual-channel mic pre, the Lunatec V2, with built-in M-S decoding.

Near-coincident pair. Another popular stereo-miking technique is the near-coincident pair. Obviously, near-coincident means that the two mic capsules are near one another, but not immediately proximal (see **Fig. 2b**). The most commonly used near-coincident configuration, called ORTF because of its early use by the Office de Radiodiffusion Télévision Française, specifies two cardioid mics with their capsules seven inches apart (the average distance between the ears of an adult) and angled at 110 degrees (see **Fig. 3**).

The ORTF system produces a wide image and a good sense of depth. However, if the two signals are summed to mono, phase cancellations occur, which can cause comb-filtering effects, coloring the sound considerably. Actually, though, it is the slight time delay between left and right that produces the stereo spread, so as long as there's no need to reproduce the recording in mono, the ORTF technique can yield excellent results.

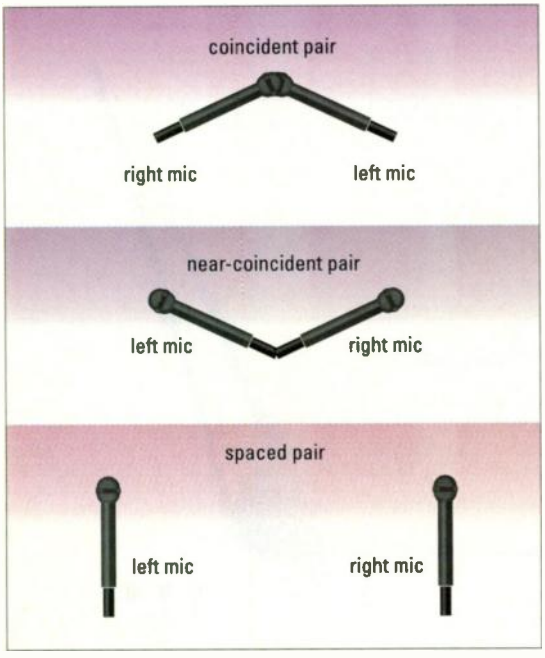

FIG. 2: These diagrams illustrate three common stereo-miking setups: (a) coincident pair, (b) near-coincident pair, and (c) spaced pair. The coincident pair is least likely to result in phase problems.

Spaced pair. The spaced pair (also called AB pair) is another very popular stereo-miking technique, especially for recording large classical and choral groups. However, it often requires a lot of trial and error to get right. Omnidirectional mics generally work best for this application, but cardioids can also work nicely.

The mics should be symmetrically spaced (see **Fig. 2c**) with the center of the ensemble being the bisecting line. In theory, the 3-to-1 rule is helpful in positioning the mics so as to avoid phase cancellation; this rule states that the distance between the mics should be at least three times the distance between the mics and the source. (See "Recording Musician: Avoiding Phase Cancellation" in the July 1997 **EM** for more information.)

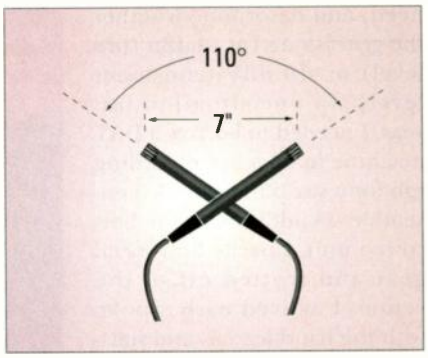

FIG. 3: In an ORTF configuration, two cardioid mics are angled at 110 degrees with the capsules separated by seven inches to simulate the distance between the listener's ears.

In practice, this approach sometimes results in too big a "hole" in the center of the image. Therefore, for spaced-pair mics, positioning is critical; you must generally audition several setups, listen carefully, and compare the results to determine the optimal arrangement. Move the mics in small increments, because a relatively small change can effect a big difference in sound. Although some phase cancellation is unavoidable, when you find the optimal spacing between the mics, as well as the right balance of direct and reverberant sound (which depends upon the distance of the mics from the source), this method can create an exceptional sense of spaciousness and realism.

MIC PLACEMENT

Regardless of the method you choose, proper mic placement is of the utmost importance, because it is the primary way to control the quality of the sound you pick up. The main thing to understand is that the closer you place the mics to the ensemble, the higher the ratio of direct to reverberant sound. An extremely live space, for example, requires putting the mics very close to the source to minimize room sound. (The stereo-miking technique you choose also plays into the equation, of course.)

The idea is to find the mic position that captures the most favorable blend of instruments (and the P.A. system, if you choose to have it in the mix) and to ensure that the sound is balanced in the stereo field. For XY miking, I usually start with the mics five or six feet back from the foremost instru-

ments in the ensemble, at a height of five to ten feet. Using headphones, I monitor carefully to make sure the left and right channels are sonically balanced, because sometimes a group sounds louder on one side of the stage than the other. If the musicians are unable (or unwilling) to adjust their positions, you'll have to compensate by repositioning the mics.

If no sound check is done, take note of the instrumentation and estimate the best place to put the mics based on your knowledge of the behavior of sound and on the characteristics of your gear. If you do have the luxury of a sound check, ask the musicians to play their loudest material at the volume they expect to play during the show. Of course, they might end up playing louder than that, especially when the room fills with people. Therefore, it's smart to pull back the gain a few decibels from where you set it during sound check, and then fine-tune the levels during the performance. (You'll rarely feel more alive than during those first few minutes of the performance as you work feverishly to finalize optimal settings.)

Keeping levels from being too low is important, because at low levels you lose digital-bit resolution as well as reduce the signal-to-noise ratio. I like the levels to hang around -3 dB on the DAT meter. This ensures a nice, hot signal, yet leaves a sufficient safety margin for transients that occasionally lurch toward digital overload.

BRIAN KNAVE

This close-up shows the XY configuration of AKG C3000s the author used to record the Apes of God.

COMPRESSION SESSION

Although I listed a stereo compressor/limiter as an option, I always bring one because live performances tend to be so dynamic. Be careful, though: you can't "uncompress" a signal once it is compressed, so strive to use the unit as sparingly as possible.

In general, taking a conservative approach by using moderate settings will sound the most transparent. I recommend a low ratio setting on the compressor, between 2:1 and 4:1, depending on the dynamics of the music. Set the threshold so that it will trigger only on the loudest sounds (usually drums, but possibly also vocals, sax, trumpet, trombone, or percussive guitar). If the compressor kicks in too frequently or compresses the signal by more than 3 or 4 dB, lower the input gain.

A moderate attack-time setting of 5 to 10 milliseconds is usually adequate. The release setting will vary depending on the music and room reverberation time,

but a good starting point is somewhere between 250 and 500 milliseconds. A reverberant room or music with lots of bass and percussion may require a longer release time, whereas in a very dry room, you can often get away with a shorter one.

I generally use a limiter only in situations that absolutely require one. For example, you may need a limiter when you're unsure what's going to happen musically or for performances that contain infrequent but extreme dynamic peaks. If you do use a limiter, keep in mind that some DAT recorders provide 2 or 3 dB of headroom above the 0 dB mark. That is, transients that shoot slightly into the red may not actually result in digital distortion. Therefore, experiment with setting the threshold so that the limiter doesn't kick in until just at, or slightly above, 0 dB on the DAT recorder.

THAT'S NOT ALL, FOLKS

If your objective is to create a CD from your live recording, remember to set your DAT recorder's sampling frequency to 44.1 kHz (the CD standard) before recording. Otherwise, a sample-rate conversion will be necessary—which can be expensive and sonically unsatisfactory.

Be neurotic about taking detailed notes on program numbers, start and end times for songs and sets, and any sonic mishaps or changes (such as digital overloads or repositioning of mics). All such information will prove helpful in post-production. Also, be sure to write your name and telephone number on the tape, especially if you give it to the client that same night, so that you can be properly credited if an album is released.

Location recording is challenging, but considering the relatively small outlay, the rewards are great. All you need to have is a modest rig, good ears, and the ability to keep your wits about you. The most important thing is to listen. Trust your ears first and foremost, no matter how wacky the situation. If the performance goes well and you've done a good job, by night's end you will have one hot DAT that conveys, in glorious stereo, the sense of being there.

Karen Stackpole *is a recording and mastering engineer and an active drummer/percussionist. She wanders the San Francisco Bay Area as Stray Dog Recording Services.*

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Sound Around Town

Creating interactive music using GPS, MIDI, and singing suitcases.

By Bean

The term *interactive* has been used to describe many forms of new media. However, I admit that last September I was caught off guard at the 1998 Ars Electronica festival by an "interactive" set of luggage that appeared to have a life—and sound—of its own. (For more on Ars Electronica, see "Performing Musician: URLS, Mines, and Ars" in the March 1999 issue of **EM**.)

Each suitcase had a distinct "voice," which changed as the luggage was wheeled through the streets of Linz, Austria. The movement of the pieces of luggage, as well as their proximity to specific landmarks and to each other, determined the sounds that they emitted. Only through active involvement did participants begin to understand the relationship between their physical gestures and the music produced by their singing Samsonites.

IAIN MOTT

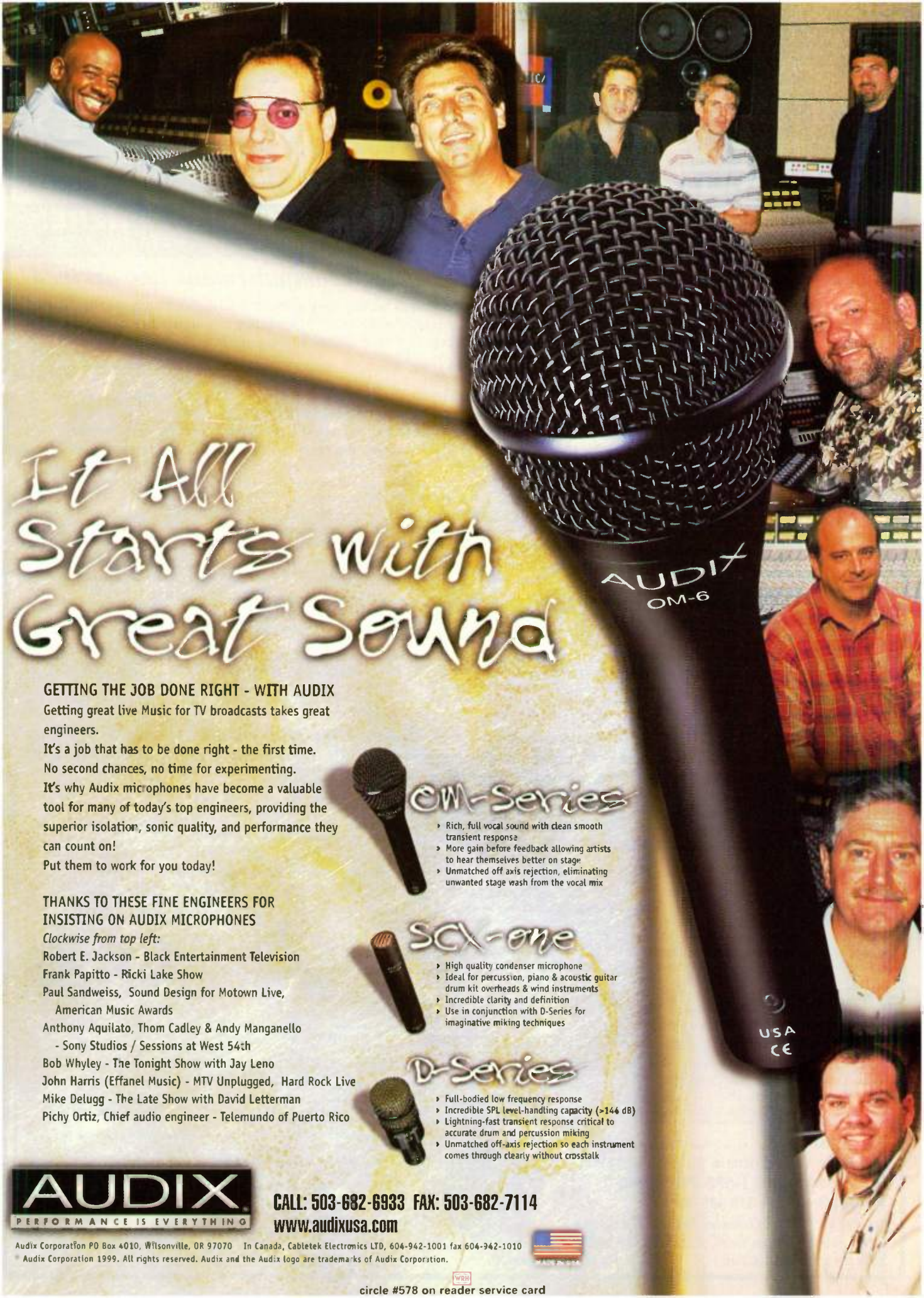
The sound-mapping project in action during the 1998 Ars Electronica festival in Linz, Austria. Each suitcase responds to its position relative to urban landmarks, as well as to other sound-mapping suitcases.

MAPPING GESTURES

Iain Mott, Jim Sosnin, and Marc Raszewski collaborated on this unusual installation, which they called *sound mapping*. The idea emerged from the trio's desire to create music by using the interaction between people and their environment.

To that end, four portable suitcases were equipped with piezoelectric gyroscopes and custom-built odometers to sense the movements of participants. The suitcases' locations were tracked using the satellite-based Global Positioning System (GPS). In order to translate gestures into sound, each suitcase was further outfitted with an FM transmitter, a Shure wireless receiver, a power amp, and a 12-volt battery. Sony car speakers were set into the front of each suitcase for audio output.

Sosnin programmed the custom Peripheral Interface Controller microcontrollers, which convert four channels of suitcase-motion data into a MIDI stream inside a large "hub" case (see **Fig. 1**). Once the data is received by the



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NEW! ADDITIONAL FEATURES IN VERSION 8.0

Band-in-a-Box 8.0 for Windows breaks new ground with over 80 additional features!

BAND-IN-A-BOX 8.0 IS HERE! This major new upgrade to Band-in-a-Box includes over **eighty new features!** Among them, the most amazing new feature is called "Automatic Songs". Simply select the style of song you'd like to create, and Band-in-a-Box 8.0 will automatically generate a complete song in that style, in the key and tempo that you want, complete with intro, chords, melody, arrangement and solo improvisations. It will even help you out by auto-generating an original title for your newly created song! This is HOT! The songs created using BB are of professional quality, and best of all they're different every time! And there's much more in version 8.0... a new full-screen "leadsheet notation" window, on-screen guitar fretboard, animated drum kit display, long filename support, "undo" option and much more!

OUR CUSTOMERS LOVE VERSION 8.0! ***"I'm in awe... it truly writes great songs!... Thanks for the full-screen notation, it's just what I was hoping for.... The Drum Screen is fun!... Hey, you guys actually read my Wishlist!... You've done it again, the Melodist is unreal!"***

NEW! ADD-ONS FOR BAND-IN-A-BOX 8.0!

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- **Styles Disk 14: Jazz/Fusion – 21 hot new Jazz-Rock Fusion styles**

GET THE LATEST BAND-IN-A-BOX STYLES! Euro-Techno/Pop dance grooves, hot Jazz/Fusion styles, and a variety of the popular country, swing, rock, waltz and boogie styles you've been asking for - all utilizing the newest Band-in-a-Box features!

• Soloist Disk Set 8: 3 new soloist KnowledgeBases ("Killer" Jazz Waltz, Older Waltz, Jazz Fusion) An exciting aspect of the Soloist feature in Band-in-a-Box is that the program is able to increase its musical intelligence with new Soloist Disk Sets – it learns by "ear" and constantly gets better and better! This stunning new Soloist Disk Set includes new KnowledgeBase files as well as new Soloist definitions to extend and improve Band-in-a-Box Version 7.0 or higher. When it is installed in your bb directory you'll see new Soloists available and the existing Soloists will be automatically enhanced with dramatic results!

SPECIAL! Styles PAK – all Styles Disk add-ons 4-14... $129
NEW! Styles PAK Upgrade – Styles Disk add-ons 12, 13 & 14... $49
SPECIAL! Soloist PAK – all Soloist Disk Sets 2-8 + Bluegrass MIDI Fakebook... $99
Available on CD-ROM or floppy disks

NOTE: Soloist Disk 1 is included with Band-in-a-Box 8.0 and upgrade, so it is not offered as an upgrade. Styles Disk 12 is included with the upgrade to Band-in-a-Box Version 8.0 from an earlier version.

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SYSTEM REQUIREMENTS: Windows 98, 95, NT, 3.1; 8MB available RAM; fast 486 or better; 15 MB available disk space (Pro version); any sound card (e.g. Sound Blaster) or MIDI module (e.g. Roland Sound Canvas).

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The Children's Pianist includes over 70 great piano performances of the worlds best-loved children's songs – ideal for listening or singalong! The words are displayed in a large "karaoke" style display while the song plays so you can sing along! (Windows only) These pieces are presented with the care, artistry, and craftsmanship that will spark the interest of young and old alike. Includes piano arrangement tutorials.

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The Latin Pianist features popular Latin pianist Rebeca Mauleón-Santana (editor of Sher Music's Latin Real Book) playing over 50 tunes in a wide variety of Latin piano styles. Includes authentic Latin and Salsa piano songs and styles such as Conga, Cumbia, Merengue, Son, Mambo, Cha-cha-cha, Guaracha, Samba, Partido Alto, and much more. This program is hot, hot, hot!

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THE CHRISTMAS PIANIST
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The Christmas Pianist contains great piano performances of over 50 all-time favorite Christmas songs and carols – ideal for listening or singalong. The words are displayed in a large "Karaoke" style display while the song plays so you can sing along (Windows version only)! The onscreen piano keyboard lets you see the music as it's played. Fill your home with wonderful piano music this Christmas!

THE NEW ORLEANS PIANIST
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Over 50 "New Orleans Style" piano music standards, played on MIDI keyboard by top New Orleans pianists Henry Butler, Jon Cleary, Doc Fingers, Tom McDermott, Joel Simpson and David Torkanowsky. This is the wonderful 'rolling', 'bluesy' New Orleans piano style made famous by Professor Longhair and Dr. John. This program makes it "too easy" to be a great New Orleans pianist!

THE JAZZ SOLOIST
Instrumental Performance Program

The Jazz Soloist is a music program with professional jazz quartet arrangements of over 50 songs (per volume). Each song features a great jazz solo played by top jazz musicians, as well as piano comping, bass and drums. Includes a standalone "Jazz Soloist" program with MIDI files (files also included in Band-in-a-Box format). Vol.1: Swing (50 pieces); Vol.2: Swing (50 pieces); Vol.3: Latin/blues/waltzes (60 pieces)

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hub case by way of FM transmission, it is sent to a laptop computer running Opcode's *Max*. "Before each exhibition, various interactive algorithms for each suitcase are linked to points on a map," explains Mott. "As the data enters the computer, *Max* first looks at the GPS locations of the suitcases on the map, then finds the hot spot nearest them and channels the incoming motion-sensing data from each case to corresponding algorithms."

The *Max* algorithms determine changes in timbre, pitch, and rhythm based on speed and positional data from the suitcases (see **Fig. 2**). "Each algorithm controls specific patches on the Kurzweil K2000 and the DigiTech TSR-24S effects processor by sending out MIDI note, Program Change, and controller data," continues Mott. "Ultimately, four channels of audio are produced—two channels each from the K2000 and the DSP unit."

There are no precomposed sequences: the music evolves from the physical exploration of space. When a suitcase approaches a fountain, for example (see opening photo), the algorithms linked to that particular region might evoke the sound of water. "Some algorithms, however, talk to the other algorithms of other suitcases," adds Mott. "So, at times, suitcases may interact musically with each other." Participants invariably become performers, generating complex musical compositions by moving—and thereby playing—their suitcases with other group members.

APPLIED LUGGAGE LANGUAGE

The Ars Electronica show was not the first time that Mott had created sound-mapping algorithms that generate music thematically related to the physical environment. At a show in Hobart, Tasmania, participants wheeled their cases along a dock close to small sailing ships. Filter sweeps and rhythmic bursts of glockenspiel-like sounds were used to evoke churning water and creaking rigging.

At another site, the challenge was to create an urban composition that emulated the sound of cars crossing a pair of metal bridges that have a metal-grid road surface. Performers pulled their suitcases along footpaths adjoining the bridges, modeling the traffic passing over the grid. By increasing or decreasing their speed, they controlled the frequency of a metallic, rhythmic pulse.

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DIFFERENTIAL SOLUTIONS

Providing the sound-mapping experience to people in other countries has proven slightly problematic because of the differences among the countries' Differential GPS systems (DGPS). The differential system enables users to gain a high degree of positional accuracy—within a margin of up to one meter.

"The big antenna on the hub case picks up the standard (and free) GPS signal and is connected to the basic GPS unit," Mott explains. "The smaller differential antenna and the differential receiver get the error-correction message over FM, which is sent from a nearby base station. Put simply, GPS receivers obtain their location by measuring the distance to a number of satellites in direct view. These measurements, however, are not all that accurate due to variable atmospheric conditions and *selective availability*, which is the deliberate degradation of the signal by the U.S. military. Differential error correction remedies these problems."

Sound mapping uses an inexpensive FM system made by Differential Corrections, Inc., that works in various areas, including Australia, North America, and the United Kingdom. However, with upcoming shows this year in Italy, Japan, and New Zealand, Mott may have to rent a costly satellite DGPS system because FM services are unavailable in those countries.

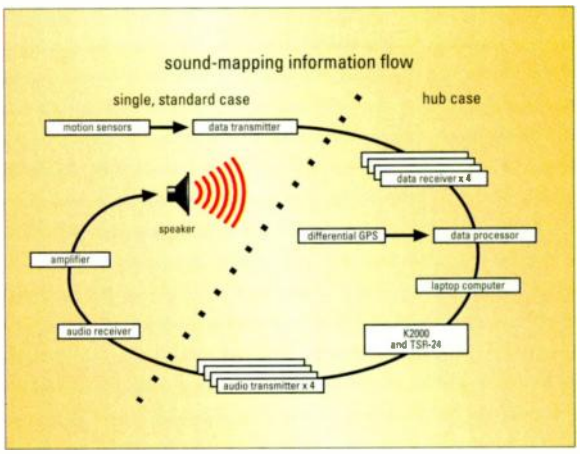

FIG. 2: Algorithms in Opcode's *Max*, running on a laptop computer in the hub case, determine changes in timbre, pitch, and rhythm based on speed and positional data from the suitcases.

Another problem is isolating the GPS unit and its aerial from the audio transmitters, which can jam the satellite signal. This was finally accomplished by shielding the audio and data leads, extending the GPS aerial, and reducing the power of the audio transmitters.

TRUE CONFESSIONS

Mott's interest lies in exploring the relationship of music to the act of making music and to the performance space. He hopes to increase the extent of physical audience interaction, as well as make it easier for the public to engage with sound directly.

"Musicians intuitively understand the relationship between music and their own bodies," Mott says, "even if they don't acknowledge it. Real music is something that is produced by their entire being: their mind, their hearing and sight, their touch, their physicality, and their cooperation with others. Physical engagement is essential to music, and perhaps to all art, and it is something that the consumer society generally denies the public."

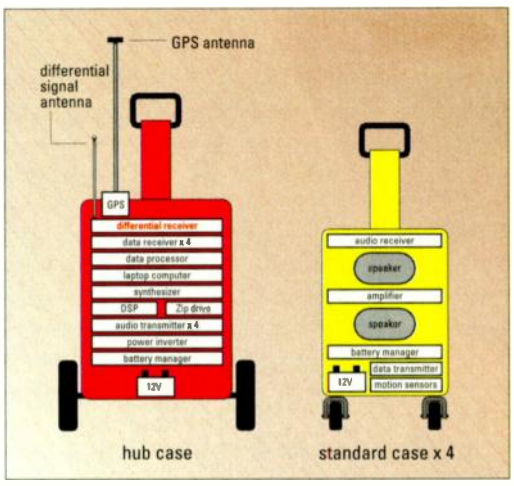

FIG. 1: The sound-mapping hub case contains the processing muscle needed to follow and interpret the positions of the four standard cases. Each standard case transmits movement information and receives and broadcasts the sound sent by the hub case.

Bean's *music-making methods include sneaking into schools around the Bay Area with her group, RhythMix. More information on the sound-mapping project is online at members.tripod.com/~soundart.*

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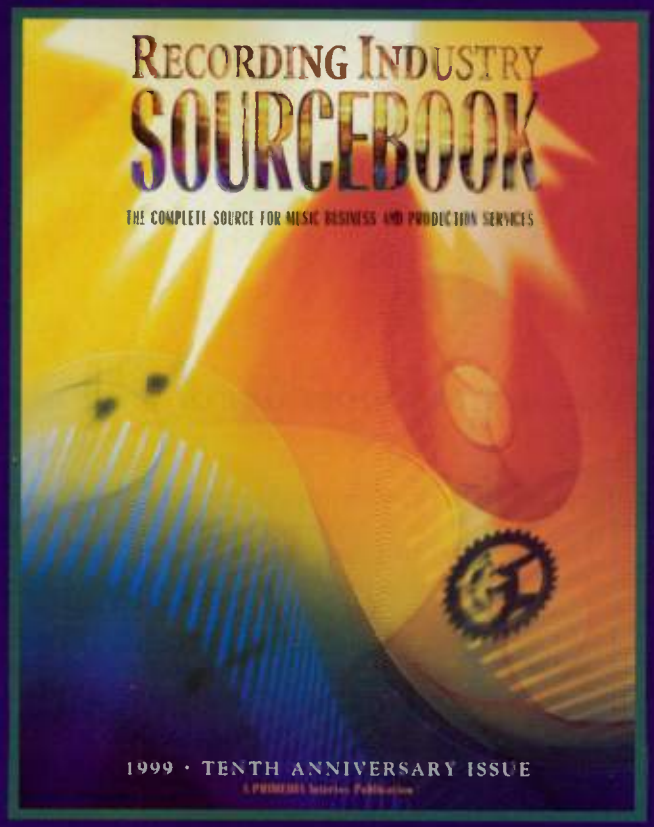

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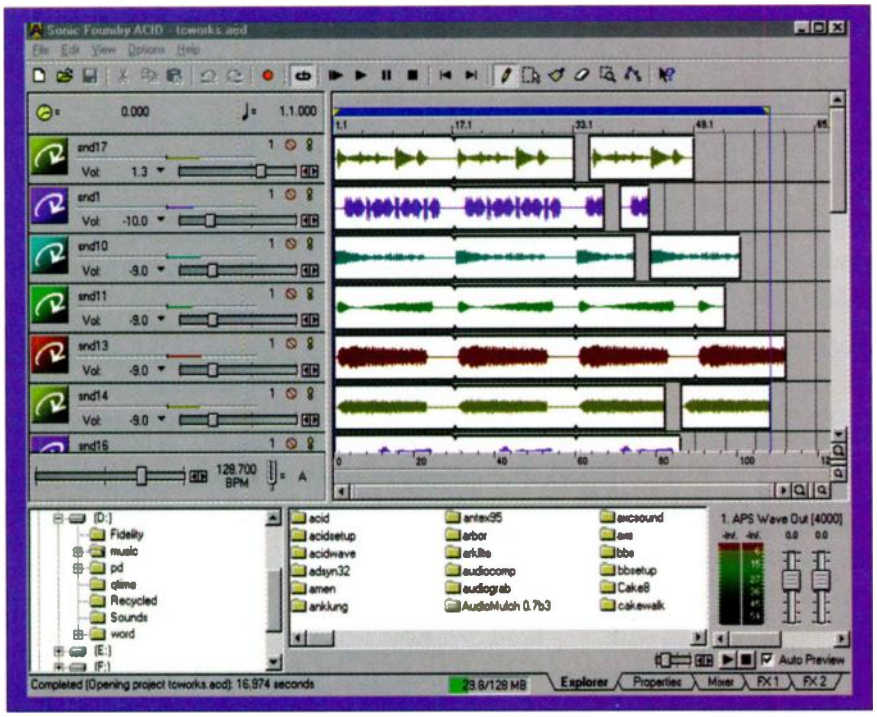
Expert Advice

Hot tips to help you get the most out of your favorite tools.

Compiled by Dennis Miller

This month's Operation Help column features tips from Mark of the Unicorn, Sonic Foundry, and Digidesign. Read about how to use QuickTime videos with *Digital Performer;* then learn some creative new ways to use the hot loop-assembly program *Acid*. We also give some valuable suggestions for managing your Pro Tools project files and present ideas about how to keep your Pro Tools files safe and sound.

We want to know how you've mastered your hardware and software, and encourage you to e-mail any of your own tricks, fixes, or work-arounds to emeditorial@intertec.com.



Sonic Foundry's *Acid* offers loop-assembly tools that can help you build pieces in short order.

SCORING FOR PICTURE WITH DIGITAL PERFORMER

On your next scoring project, consider using QuickTime digital video instead of locking to a video tape recorder. Lockup is instantaneous with QuickTime, and you need no additional hardware. If your client lacks the ability to deliver digitized cues to you on CD-R, you can buy a video card for as little as $300 or so to digitize them yourself. (It's fast—you can create a 30 fps movie in one pass.) If you have multiple hard drives, store the QuickTime movie on a separate drive from your audio to improve playback performance.

Importing a QuickTime movie into *Digital Performer* is a straightforward process. Just choose Movie from the Window menu and select it from your hard drive. If the cue requires a SMPTE offset, go to the Chunks window, select your sequence, choose Set Chunk Start Time from the mini-menu, and type in your offset.

Once you've imported the movie, you'll want to set up its soundtrack as a regular audio track in *Digital Performer*, so you can use it as an additional

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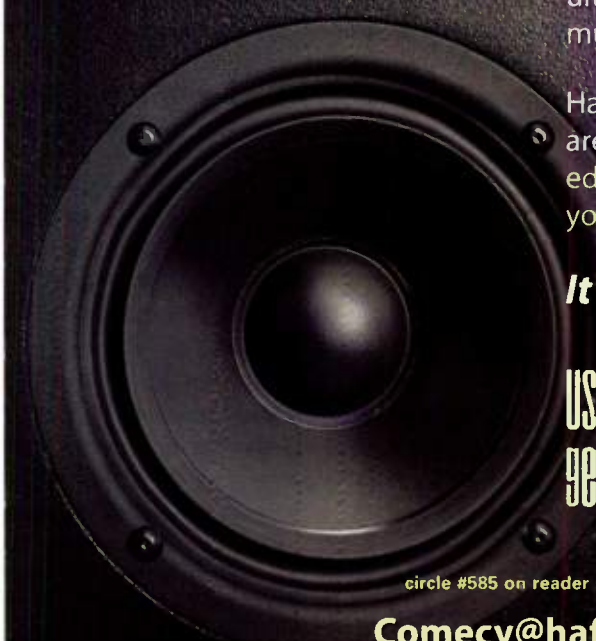
TRM10s



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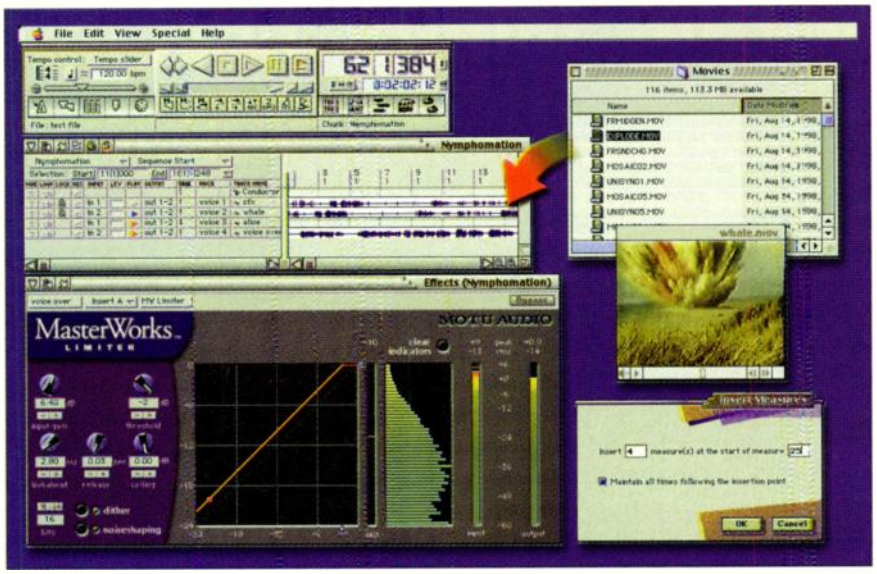


You can import QuickTime movies into *Digital Performer* in one easy step.

reference for cue points. *Digital Performer* will extract and import audio from QuickTime movies in one easy step. Simply drag the QuickTime movie from the Finder into the desired track in *Digital Performer*'s Audio Graphic Editor window.

Another technique involves sending the movie's soundtrack to your audio interface, along with the rest of your mix. You can adjust volume, pan, and output assignments. You can also add effects processing to the soundtrack. Try adding a little limiting (with *Digital Performer*'s MasterWorks Limiter plug-in) to increase the soundtrack's intelligibility while you score.

Sometimes you'll need to add both sound effects and music to picture. What if you have to change the tempo of the music after you have laid in the sound effects? *Digital Performer* allows you to lock tracks to an absolute SMPTE point to protect against tempo changes. Just click on the tracks that you want to lock in the Tracks Overview window's Lock column. Now your sound-effect tracks will remain unchanged while you experiment with tempo changes.

Here's a situation you are likely to experience when scoring to picture: you've just finished a cue only to have your client ask for some additional lead-in music before the cue starts. *Digital Performer*'s Insert Measures feature allows you to add any number of measures before a cue point while perfectly preserving the SMPTE location of all existing material. Choose Insert Measures from the Change menu, type in the desired insert point and number of measures, and be sure to check

the Maintain option for all times that follow the insertion point.—*Courtesy Jim Cooper, Mark of the Unicorn, Inc.*

MANAGING AUDIO FILES IN PRO TOOLS

Along with all the great editing features that Pro Tools offers comes some danger of losing track of your audio files and regions. Managing your files well can save you hours in certain situations. One very basic way to keep track of your audio files in Pro Tools is to name audio tracks *before* recording audio on those tracks. When you pre-name the tracks you are recording to, the names of the audio files you record on those tracks will automatically include the track names. If you do not name Pro Tools tracks before recording, you may wind up with a long list of generic file names that are difficult to identify.

As you edit your Pro Tools tracks, you will wind up with many regions on the list along with your parent audio files. Regions, by default, are given the name of the audio file from which they were edited, with incremental numbers added at the end of their names to distinguish them from each other. The default region names may be just fine, depending on what type of project you are doing and how you work. However, if you tend to have trouble distinguishing the regions in your Regions List, you may want to custom-name your regions as they are created.

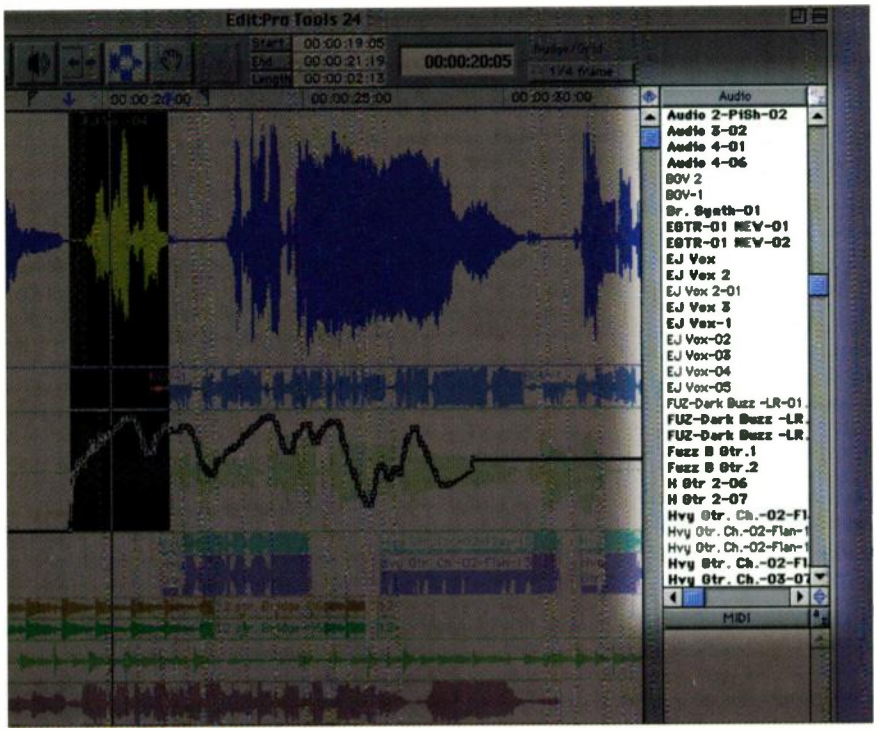
Keep in mind that separating a region in Pro Tools often adds *three* regions to the Regions List: the region you separated and the two remnants of the original file, from before and after the new region. You have the option of removing these remnant regions from the session, or of renaming them.

Removing unneeded regions and files will make it easier to keep track of the files in your sessions. The Select Unused function in the Audio submenu of Pro Tools will select all items in the Regions List that have not been placed on a track in the Edit window. Although this feature should not be used in all cases (because you may have items in the Regions List that you want to use later), it can help you identify which regions are not part of the edited tracks in the session. Once you have identified the regions and files that you will not need, you can remove them from the session using the Clear command in the Audio submenu.

Use caution when removing items from the Regions List: unless you have exported your region definitions (using the Export Selected command), they will be lost forever. Also take note of the difference between the Delete and Remove options. When dealing with audio files (rather than region definitions), Delete will permanently remove the files from your hard drive. The Remove option will pull the audio file out of the session that you are in but still leave it on your hard drive, so it is available for other Pro Tools sessions.

Also take care to check the Disk Allocation window before you record audio in Pro Tools. Depending on which Pro Tools system you are running and how it is configured, you may be able to write audio files to various drive partitions. So before you record, open the Disk Allocation window and select the drive partitions you want to record to. This can help you keep tabs on which files are on which drive partition.—*Courtesy Nick Benz and Jon Connolly, Digidesign*

For manufacturer information, please see Contact Sheet, p. 179.



Pro Tools regions organized in the Region List (the highlighted area) are easier to read if you custom name each region as you create it.

OPTIMIZING ACID

Sonic Foundry's *Acid* loop-assembly software allows you to quickly build projects using a variety of source material. Here are Sonic Foundry's top ten shortcuts and suggestions for getting the most out of *Acid*.

1. Change a track's length to make new sounds. Experiment with changing the length parameter on the Track Properties page. Halve or double the value to make the loop play back twice as fast or twice as slow. Enter other values for even stranger results.

2. Subtractive arrangement. Start with an overly complex arrangement. Turn off the Snap to Grid option, and use the Erase tool to selectively remove parts of loops for a more interesting sequence.

3. Paste advance. After pasting, the cursor advances to the end of the item pasted. This feature can be very useful when you have to repeat the same event multiple times—just copy and paste, paste, paste. For example, to get a snare drum to simulate a buzz roll, isolate a 16th- or 32nd-note snare hit, then copy it once and paste it 15 times in a row.

4. Change the start points of events. Offsetting a loop by an 8th- or 16th-note can create a syncopated, varied loop from an otherwise boring one. Experiment with starting events at different points within the sample by changing the Start Offset on the Event Properties page or by grabbing the corresponding blue marker.

5. Ten quick-locate points. The first ten markers you place in a project display a number at the tops of their stems. Pressing that number on the computer keyboard will cause *Acid* to jump to that song position. This feature is especially fun to use during playback.

6. Quick project overview. Double-clicking in the extreme lower-right corner of the Track View (by the small magnifying-glass buttons) zooms the project out all the way.

7. Precise tempo entry. Double-clicking on the tempo text allows you to input precise tempi by typing them in. You can also edit a song's position by double-clicking its text and typing in a new value.

8. Ganging faders/mutes. When you multiselect tracks, their faders, mutes, solos, and output selections will all be ganged.

9. Rapid movement. Page Down and Page Up move you to the next or previous Grid mark.

10. Further exploration. Explore the new loop tools in *Sound Forge* 4.5 and *Sound Forge XP* 4.5 to make cool *Acid*-ified loops.—*Courtesy Chris Moulios, Sonic Foundry*

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REVIEWS

EVENT ELECTRONICS

LAYLA (MAC/WIN)

A high-end digital recording system with a low-end price.

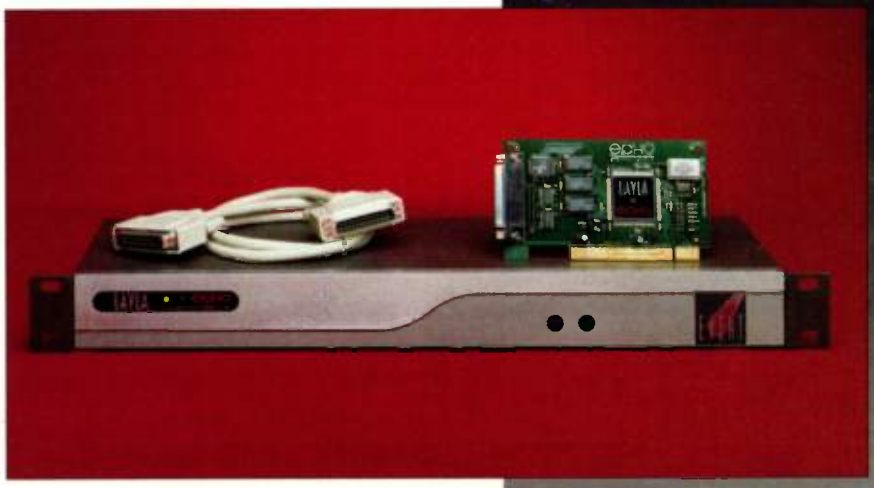
By Scott Garrigus

Ever since its debut at the Winter NAMM show in January 1997, Event Electronics' Layla hard-disk recording system (designed by Event strategic partner Echo Corporation) has been generating considerable interest among musicians worldwide. Layla joins the Gina and Darla audio cards to add an affordable professional-level option to Event's line of cross-platform hard-disk recording products.

The Layla system consists of a PCI interface card and a 1U rack-mount breakout box, which houses the A/D and D/A converters as well as the analog, S/PDIF, word-clock, and MIDI I/O connections. A 15-foot cable connects the card to the box, which lets you put some distance between the converters and your computer.

The front of Layla's rack-mount unit is relatively bare, with only a power switch, a power indicator, and two balanced ¼-inch inputs that are normalled to inputs 7 and 8 on the back of the unit. In contrast to the front, Layla's rear panel is packed with I/O connectors, including eight balanced ¼-inch TRS analog inputs and ten balanced ¼-inch TRS analog outputs. The analog I/O uses 20-bit, 128× oversampling D/A converters. You'll also find a set of 24-bit S/PDIF connections; word-clock/Superclock I/O; and MIDI In, Out, and Thru jacks.

An assortment of Windows software applications is bundled with the system,



The Event Layla system includes a PCI card and a sleek-looking rack-mount unit. A 15-foot cable connects the two components.

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including a scaled-down version of Syntrillium's *Cool Edit Pro*. These programs come without printed manuals; instead, the documentation is provided on CD-ROM in Adobe's *Acrobat* (PDF) format, which is a somewhat cumbersome arrangement. Of course, Layla is also compatible with a wide range of other Mac and PC audio software.

COMPATIBILITY

Before purchasing a Layla system, you should verify that it is compatible with your computer. To facilitate this process, Event provides a diagnostic program called *Echo Reporter* (see **Fig. 1**), which you can download for free from the Event Web site. *Echo Reporter* scans your computer and tests the speed of your hard drive to make sure you have enough power to work with Layla. After the tests are complete, the program displays a brief report that explains how your system fared and whether it's equipped to run with Layla.

Your computer should have a genuine Intel Pentium processor and a motherboard that supports version 2.1 of the PCI BIOS. Advanced Micro Devices and Cyrix processors sometimes work, but more often than not, they cause compatibility problems. Therefore, Event does not support them, nor does it support motherboards that are not PCI 2.1 compliant. Your best bet for avoiding trouble is to run *Echo Reporter* and let it determine whether your system is compatible.

Event also recommends that you disable the system sounds on your computer when installing and using Layla. Most system sounds have very low sample rates, and they reset Layla's sample-rate clock when they're played back. If you instinctively check the sampling rate every time you start a project, this may not be a problem, but if you were to forget, you could end up recording your next sizzling take at 11 kHz.

Other than that, installing Layla is simple: I popped the card into an empty PCI slot, connected it to the breakout box, and powered up my PC. After I turned on the rack-mount unit, Plug and Play worked its magic. Event offers updated drivers through its Web site, so be sure to check for the latest version.

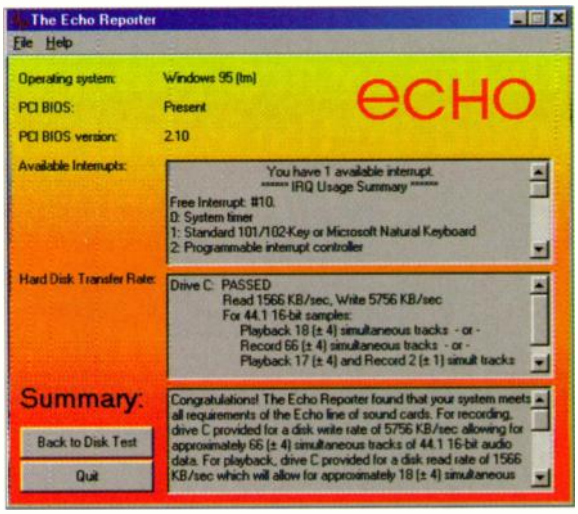

FIG. 1: *The Echo Reporter* is a free diagnostic program that is available for download from Event's Web site. It automatically determines whether your computer system is compatible with Layla.

CONSOLE YOURSELF

There are no controls on the Layla hardware; all of Layla's parameters are set through software. The *Echo Console* (installed with the driver software) provides an onscreen panel of faders and buttons that give you control over all of Layla's functions. You can adjust input and output levels, select synchronization settings, adjust input monitoring, and activate the EasyTrim gain-adjustment circuitry. EasyTrim automatically sets the input gain based on peak-level detection. To use it, you activate the EasyTrim mode on one of Layla's channels, play the loudest material you plan to record, and then deactivate EasyTrim. The input gain for that channel is automatically set to give the widest possible dynamic range. I found that this feature worked surprisingly well.

Each of Layla's inputs and outputs is represented by an onscreen fader and a bar graph peak-average meter. Each channel has mute and solo buttons, and you can gang channels into pairs for easy stereo level control. Each input and output channel is independently switchable between -10 dBV and +4 dBu operation, which is great if you have both pro and semipro gear in your studio.

In addition to the analog input/output controls, the *Echo Console* provides a set of meters for the S/PDIF output. An input monitor-mixer section lets you send up to five separate input mixes to the five output channel pairs. This feature is especially helpful if you plan to use Layla without a separate mixing console.

The *Echo Console* also lets you set the sync options. Layla can slave to word clock, Superclock, S/PDIF, and MIDI Time Code (MTC). It can also generate these sync signals and even translate one clock format to another. During my tests, I was able to lock Layla to MTC generated by one sequencer, and then have Layla generate MTC to drive another sequencer. Using Layla's sync features, you can lock multiple Layla units together to double or triple your available audio connections. In fact, you can connect as many Layla units to your CPU as you want, as long as you have enough card slots. Because Layla uses a PCI card, it doesn't require a DMA channel, and no matter how many units you connect to your system, they all use the same IRQ.

I encountered only two minor problems while working with the *Echo Console*. The first snag occurred when I initially tried to get some sound out of the unit. I had everything set up correctly, but I was getting nothing. The reason? Even with the *Echo Console* installed, Windows' Volume Control applet was overriding my audio settings, and the applet's settings were muted. Event recommends uninstalling Volume Control; another option is to leave Volume Control installed with everything unmuted and volumes cranked, and then just use the *Echo Console* to control your levels.

The other problem I had was with a clicking noise that appeared whenever I adjusted the level faders above zero. According to Event, the *Echo Console*'s mixer is intended to be a set-and-forget device, so under real-world use, the clicking—actually a bit of zipper noise—should not be a problem. Luckily, the noise was never introduced into the recorded audio, and when I used

Layla Specifications

Frequency Response	10 Hz–22 kHz, ±0.5 dB
Dynamic Range	>98 dB
Total Harmonic Distortion	<0.005%, 20 Hz–22 kHz, A weighted
Analog Inputs	(8) balanced ¼" TRS inputs with 20-bit, 128x oversampling A/D converters (individually switchable between +4 dBu and -10 dBV)
Analog Outputs	(10) balanced ¼" TRS outputs with 20-bit, 128x oversampling D/A converters (individually switchable between +4 dBu and -10 dBV)
Digital I/O	S/PDIF (up to 24-bit)
Other I/O	word clock/Superclock; MIDI In, Out, Thru

the mixers on other software packages, there was no noise at all.

TESTING 1, 2, 3

I tested Layla on a Pentium II/300 system with 64 MB of RAM and a variety of software applications. Sonic Foundry's *Sound Forge*, Steinberg's *Cubase VST* and *WaveLab*, Syntrillium's *Cool Edit Pro*, and Cakewalk's *Pro Audio* all worked flawlessly. Windows sees each of Layla's input/output pairs as a separate sound card, so you simply set your levels in the *Echo Console* and use your preferred audio application. Select your inputs and outputs, and you're off.

Layla's sound is spectacular. Even if you don't use balanced connections, you still get crystal-clear audio. Layla uses its built-in Motorola 56301 DSP chip for controlling the PCI bus, routing data through the system, calculating values for the *Echo Console* meters, converting sample rates, and dithering.

DON'T DELAY

As with other digital audio interfaces, incoming audio signals are slightly delayed when routed through Layla. The total amount of delay in this type of system is known as *latency*. According to Event, in the case of Layla, each conversion stage (A/D and D/A) adds approximately 0.75 ms of delay, so signals coming in the analog input and going to disk are delayed by 0.75 ms, and signals played back from disk and routed out the analog output are delayed by 0.75 ms.

With most audio interfaces, you monitor the output after the "live" signal has gone through an ADC, been processed by the computer's CPU, and then been sent back out through the audio interface's DAC. The computer CPU interacts with the audio card through a software driver, such as ASIO. This process adds significant delay to the conversion delay.

Let's say you are overdubbing a guitar on top of basic rhythm tracks. By the time the guitar goes through the converters and the computer CPU, you could end up with enough system latency to be quite noticeable. As a result, you hear your guitar through the monitors a good bit later than you played it, which can be very disconcerting. Some software and hardware combinations add more latency than others, but the problem is common.

Here is where Layla offers a great advantage. When you are monitoring while recording, Layla splits the audio

EVENT ELECTRONICS
Layla hard-disk recording system/MIDI interface
$1,099

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

PROS: Pristine sound. Ten simultaneous inputs and 12 simultaneous outputs. Individual switchable reference levels. Balanced connections. Multiple synchronization options. Future expandability. Built-in MIDI interface. Low latency.

CONS: No printed documentation for included software. Occasional clicking noise when using *Echo Console*. Limited CPU compatibility.

CIRCLE #437 ON READER SERVICE CARD

For manufacturer information, please see Contact Sheet, p.179.

Layla
Minimum System Requirements
Mac: PowerPC 604/120 (G3 recommended); 64 MB RAM; Mac OS 8.1; ASIO- or Sound Manager–compatible host application
PC: Pentium processor; 32 MB RAM; Windows 95/98; PCI BIOS version 2.1

stream right off its internal DSP chip, so your guitar overdub goes two places at once. One signal is recorded direct to disk, alongside your prerecorded basic tracks; because all tracks were converted with the same 0.75 ms A/D delay, they are recorded in sync.

However, unlike most audio interfaces, Layla routes the other signal—the monitor signal—from the ADC to the DAC, bypassing the computer. In theory, you have only 1.5 ms of system latency from your guitar's output to when you hear the sound on your monitor speakers. You probably won't notice that.

Your previously recorded rhythm tracks playing back from disk will therefore be delayed by 0.75 ms by D/A conversion; whereas the "live" guitar signal will be delayed by 1.5 ms. So there will actually be an 0.75 ms difference between playback of the prerecorded tracks and the "live" guitar signal coming from Layla's output—an insignificant disparity for monitoring purposes. Keep in mind that the recorded tracks will be in perfect sync.

S/PDIF AND MIDI

I also tested Layla's MIDI and S/PDIF capabilities and found them to work flawlessly. I noticed no delays or glitches while recording or playing back MIDI and audio simultaneously. Of course, you may already have a dedicated MIDI interface, but in case you need an extra 16 MIDI channels, Layla works just fine.

I didn't encounter any problems with the S/PDIF connections, either. You can use them simultaneously with the analog connections, and although the analog I/O is "limited" to 20-bit resolution, the S/PDIF connections can handle up to 24-bit resolution. And if you'd rather use the meters on your DAT deck for input monitoring, you can assign input monitoring to the S/PDIF output. The S/PDIF output can also be set to either Professional (IEC-958, Type 1) mode or Consumer (Type 2) mode, both of which ignore the SCMS copy-protection bit.

FINAL OUTPUT

Aside from the two minor problems that I had with the *Echo Console*, I found Layla a well-designed and well-behaved product. Some new competitors have already entered the marketplace, but Layla's expandability and wide range of features will keep it at the head of the pack for a while.

Layla provides high-quality, great-sounding analog and digital audio, a number of synchronization methods, 24-bit internal resolution, and a MIDI interface—all in one modern-looking rack-mount unit. You'll have a hard time finding a better deal.

Scott Garrigus *can't wait for the day when direct brainwave-to-digital audio processing is possible. You can reach him via e-mail at scott@garrigus.com or via the Web at www.garrigus.com.*

OPCODE SYSTEMS

VISION DSP 4.5 (MAC)

One of the original software sequencers gets a major face-lift.

By David Crigger

Recently, it seems as though almost every manufacturer of digital audio sequencers has revamped its product line. Opcode is no exception, and with *Vision DSP* (which replaces *Vision*), the company has made the jump into the newest generation of MIDI/audio sequencing, and simultaneously redefined the line between its two major sequencing programs.

The differences between *Vision DSP* and *Studio Vision Pro* are few but distinct. *Studio Vision Pro* gives you access to Opcode's audio-to-MIDI and MIDI-to-audio functions and supports Pro Tools TDM hardware; *Vision DSP* does not. Other than that, the two programs are identical.

Much has changed since **EM**'s last review of *Studio Vision Pro* 3.5 (see the March 1998 issue), and I will focus primarily on the newest features incorporated into *Vision DSP*. But I'll also point out some of my favorite old features along the way. Opcode currently offers a free 30-day trial of *Vision DSP;* the program is fully functional and can be downloaded from Opcode's Web site.

AUDIO FOR VISION

Over the past few years, major improvements have come slowly to the audio environments of *Vision* and *Studio Vision*. Now it appears that Opcode might simply have been waiting for the ASIO (audio hardware routing) and VST (audio effects plug-in) standards to be in place before making extensive changes. Opcode, the creator of OMS (Open Music System, formerly Opcode MIDI System), has long been a proponent of industry standards, so it's gratifying to see the company following its own advice by incorporating standards set by other manufacturers into its software.

At the heart of *Vision DSP* is Opcode's new Acadia audio system, which provides native processing and routing capabilities for ASIO-compatible hardware, Digidesign PCI-based hardware (other than TDM), and the Apple Sound Manager. Acadia can handle up to 128 different Audio Instruments, which are discrete audio voices or channels in *Vision*-speak. Because Audio Instruments can be either mono or stereo sources, the system supports up to 256 tracks of audio. Each channel has access to four bands of real-time EQ, up to four VST plug-ins, and four aux sends, which allows for some flexible routing (more on this later).

Of course, as with all native processing, the amount of digital signal processing that you actually get depends on your computer. Obtaining RAM and fast hard drives should present no problem for most people because of the current all-time-low prices of these items. CPU speed, however, is another matter entirely.

Even with today's crop of fast machines (Mac G3s working at 400 MHz, for example), it's possible to consume all of your processing power and still want more. Remember, audio mixing, routing, and processing, as well as MIDI processing and computer overhead, all draw from the same pool of horsepower. This doesn't mean that you can't do some serious work on a native system, but be aware that there is a ceiling no matter how fast your CPU. To help you watch out for this, *Vision DSP* includes a Performance meter, which monitors CPU, hard-disk, and RAM usage. It pops up whenever you cross the threshold.

Even so, you should make every effort to streamline your computer. Use the Extension Manager to create a lean *Vision DSP*–only startup set, and limit your monitor colors to 256 (what the software requires). Any resources that you free up will directly add to your machine's audio-processing capabilities.

Although predicting the exact performance of *Vision DSP* with your particular CPU is impossible, I will share the results that I got using the program on two different computers. My faster machine is a 300 MHz G3 desktop that has 192 MB of RAM, a 6 GB internal IDE hard drive, and an Adaptec 2940U SCSI card driving a 9 GB Quantum Viking II hard drive. The computer is connected to a MOTU 2408 using the MOTU ASIO driver.

I tested the *Vision DSP*/G3 combination with a project that included 21 Audio Instruments (14 stereo and 7 mono for a total of 35, 24-bit audio tracks). I was able to add 14 bands of EQ, five VST plug-ins, three stereo subgroups, and two effects sends before I noticed a tug on the computer's responsiveness. Mind you, everything worked fine; the controls just seemed a bit sluggish. I added more EQ to see how far I could go. By the time I got

FIG. 1: *Vision DSP*'s console is shown here with the CPU/Disk/RAM window, an EQ window, and Opcode's *opCOMP* VST compressor plug-in.

For manufacturer information, please see Contact Sheet, p.179.

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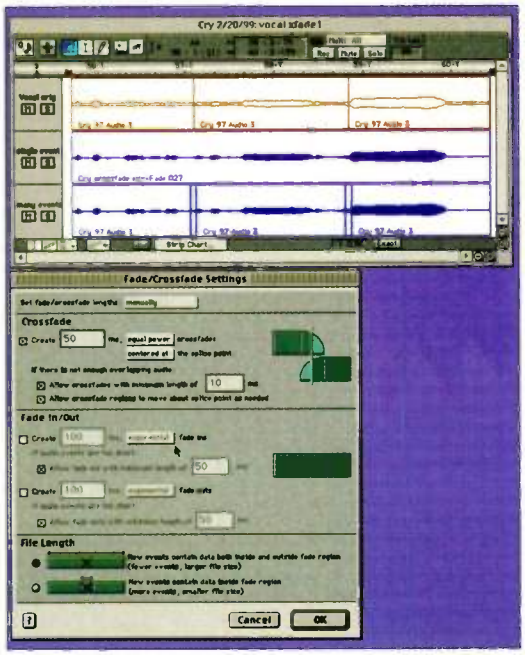


FIG. 2: The graphical editing window (top) illustrates how fades can be independent events or combined into a track. The Fade/Crossfade Settings window (bottom) allows you to adjust the parameters of each fade. Fades can be performed simultaneously across multiple audio segments.

up to 66 bands, things had pretty much fizzled out.

I then tested *Vision DSP* on a Power Computing 601/100 MHz computer configured with 56 MB of RAM, a 500 MB hard drive, and two Ultra-SCSI 2 GB drives running on the computer's internal SCSI bus. Though not a fast machine by today's standards—and below Opcode's recommendation for running even Acadia—I was able to open a file with 15, 16-bit audio tracks, some EQ bands, and a few plug-ins.

Acadia should function with almost any available Power Mac, with one exception: early PowerBooks, particularly the 1400 series, are not recommended, although the newer 3400s and G3s are supposed to work fine.

APPLE ISSUES

Apple has temporarily thrown users for a loop by upgrading to the USB (Universal Serial Bus) standard. Furthermore, because the new iMacs and G3s don't include floppy drives, the copy-protection schemes of several manufacturers, including Opcode, have been rendered obsolete.

Opcode has solved its copy-protection issue by using PACE Software's Challenge/Response system, which creates a personalized serial number and matching key number for each hard disk that the software is installed on. The serial port issue will eventually be resolved as more USB MIDI interfaces reach the market. Simple USB interfaces are available now, and multiport rack-mount units that support SMPTE time code should be available soon.

If you want to use your existing interface, your best option is the G-Port by Griffin or the Stealth Port by GeeThree .com. These small modules replace an internal modem with a single serial port, which the computer recognizes as a modem port. Unlike other serial port add-on devices, however, the G-Port and Stealth require no new drivers for OMS to function properly.

THE DSP FACTOR

Vision DSP comes with 12 VST plug-ins, including a chorus, flanger, ring modulator, multitap delay, resonator, plate reverb, and several compressor/gates. All are useful, and many parameters extend way beyond normal ranges, so those wishing to explore the weird outer limits will have no problems getting there.

Overall, the presets really helped me appreciate these plug-ins. The delay, auto-panning, and resonator plug-ins are excellent. And although initially I didn't like the plate reverb, after auditioning the included presets, I found the variety of colors available very impressive—particularly in the short- and medium-decay programs.

On the other hand, if you're expecting to find long, silky-smooth reverbs or vintage tube compressor emulators, you'll have to dig deeper into your wallet. No need to fret, though: there are an abundance of relatively inexpensive third-party VST plug-ins that will work quite well.

You can't automate changes made to each plug-in, but you can twiddle the sliders of any effect in real time while recording the resultant sound. And you can save any parameter changes you make to a VST plug-in as a separate program for later recall.

Vision DSP's new real-time EQ provides four identical adjustable bands per channel. Each band can be either high/low shelving, high/low cut, or parametric, with a center frequency selectable from 20 Hz to 20 kHz. Gain is adjustable from -18 dB to +18 dB, and bandwidth is adjustable between one-tenth of an octave and four octaves. Bands can be enabled individually to preserve CPU resources, and settings can be saved as templates. The EQ section features a really cool graphic editing window, which displays exactly what is being tweaked and by how much.

CONSOLES

Tying all this real-time processing together are the consoles (see **Fig. 1**), of which there can be four per project. The consoles are extremely powerful and flexible, especially with regard to routing. In fact, they're so flexible that they're a little confusing; a tutorial would be a welcome addition.

Every console handles up to 24 channel strips, each of which can control any audio or MIDI instrument, audio hardware input or output, or any of *Vision DSP*'s 16 audio buses. Each strip contains one large fader, usually assigned to volume, and one small fader, usually assigned to panning. I say "usually" because the channel strips can be split, so that the large fader controls one instrument, while the small fader controls a different one. Needless to say, many combinations are possible, especially when you consider that any fader can also be controlled from any outside MIDI source. Creating subgroups is a snap, as is routing audio to and from plug-ins. Moreover, any audio input, output, or bus can be selected as a recordable source. Want to combine those 12 background vocals to a stereo pair, complete with EQ, effects, and level changes? No problem.

On each channel strip you can view up to four audio aux sends (which can be sent pre- or postfader to any audio output or bus), up to four VST plug-in assignments, and either a simple EQ (with On/Off, Edit, and Phase Inverse buttons) or a more complex EQ (with any enabled EQ gain faders visible). All of these console parameters chew up monitor space, so unless you're running a couple of very large monitors, you'll need to hide things occasionally. Actual plug-in, EQ, and busing assignments are always visible in the Audio Routings window.

Automating a mix is simple using the automated console. You can edit your

mix's fader data just as you would MIDI data, with the same graphical editing environment that I've always considered to be one of *Vision*'s strongest features. Want to use this mix as the starting point for an alternate mix? Simply copy the current mix to a new mix track, mute the original mix, record-enable the copy, and perform your edits.

Unfortunately, the Solo function falls short. Any audio assigned to a bus or postfader aux send must have the source and target strips soloed in order for you to hear the sound. This problem is not a major one but is worth mentioning nonetheless.

MANIPULATING AUDIO

Although *Studio Vision* has always made handling stereo audio fairly easy, ever since the move to Digidesign's DAE, imported interleaved stereo files have needed to be split into two separate mono files—a time-consuming process when importing files from CDs or from programs such as Digidesign's *Sound Designer II*. With *Vision DSP*, interleaved files are back, and they can now be placed alongside their dual-mono cousins.

Vision DSP can import and export audio files in any number of formats, resolutions, compression types, and sample rates. Starting with version 4.2, multiple files could also be imported simultaneously. The Import Audio feature has been upgraded, and importing tracks from audio CDs or hard

OPCODE SYSTEMS
Vision DSP 4.5 digital audio sequencer
$495

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

PROS: Intuitive graphical editing of both MIDI and audio data. Support for ASIO, VST, and OMS. Extremely flexible audio routing. Crossfading. Automated mixing.
CONS: Has no waveform editing. Lack of tutorials.
CIRCLE #438 ON READER SERVICE CARD

disks is much easier than it used to be.

A Movie window allows you to import and display a QuickTime movie. You can easily play back existing audio, sync new audio and MIDI to the movie, and, if desired, save the new parts along with the movie.

All of *Vision*'s non-real-time audio processes are nondestructive, meaning that when a change is made, a new audio file is created and the original file is left intact. The collection of processing tools includes Normalize, Reverse, Pitch Shift, Formant Shift, Time Scale, Adjust Audio Tempo, and Fade/Crossfade.

Anyone who has edited extensively in a program like this knows how important crossfades are to rendering seamless transitions. With *Vision DSP*'s new crossfade feature, you can select as many audio regions as you want, and in one step, create crossfades of any length between any of the audio events that intersect. Fade/Crossfade provides a choice of either linear or equal-power fades.

You also have the option of inserting fades as separate audio events in your track or combining all of the audio—including the fades—into a larger, single event. The first option uses less disk space, but the latter makes it easier to move and further edit the segment (see **Fig. 2**). Of course, having a few more fade curves would be nice, but I'm not complaining.

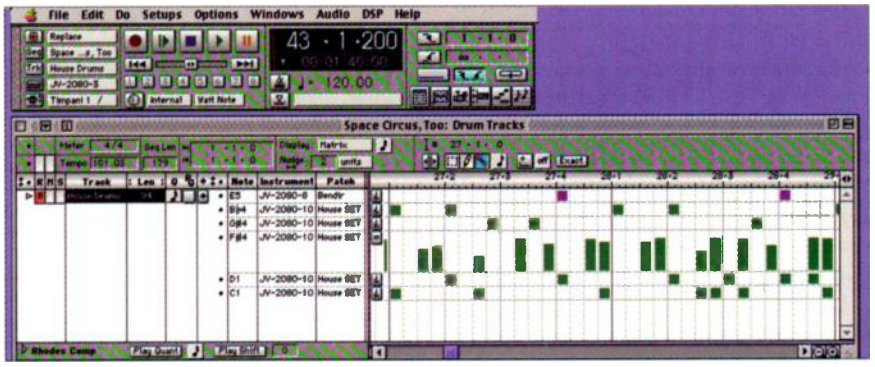


FIG. 4: Sporting one of *Vision DSP*'s new color schemes, the Pulse Edit window helps you create and edit drum tracks intuitively.

WHAT ABOUT MIDI?

Vision DSP includes dozens of non-audio-related improvements, both large and small. These include various Control Bar navigation enhancements; a redesigned, customizable Sequence window; the ability to assign Mac keyboard and MIDI commands to almost every aspect of the program; and a Nudge command for using keystrokes to move selected elements up and down in pitch or back and forth in time (all in user-definable increments).

The Tracks Overview window (see **Fig. 3**), like the Sequence window, now has columns that can be resized and reordered. But more important is the new Tracks Overview strip chart located at the bottom of the window. Similar to the strip chart available in each track's graphic editing window, this strip chart can be resized vertically, allowing for more precise editing. The Tracks Overview strip chart includes waveform tools for drawing controller data to create tremolo, vibrato, and ping-pong panning effects. The new—and very useful—Compress tool allows you to compress or expand data into a specified range. In addition, you can apply the same editing tool to multiple tracks simultaneously.

Overall, segments (formerly called subsequences) are much easier to control with *Vision DSP*, and they, along with audio events, are now mutable on a segment-by-segment basis. When a single track is selected, an area to the left of the Tracks Overview strip chart displays that track's playback timing offset and its record or playback quantize settings. Groove capabilities have been added to the playback quantize function.

Another function new to *Vision* is Select & Modify. It combines most of the data-modifying functions and the data-select functions into one window: the top half deals with selecting the data to be edited, while the bottom half is used to specify the editing function and its parameters. Common functions such as quantize and transpose can still be accessed individually, though you're now taken directly to the particular Select & Modify window preconfigured for that function. (Incidentally, the transpose function has been updated to include harmonizing, which adds the new harmony to your original selection instead of just transposing it.) The Move, Set Instrument, and Sub-

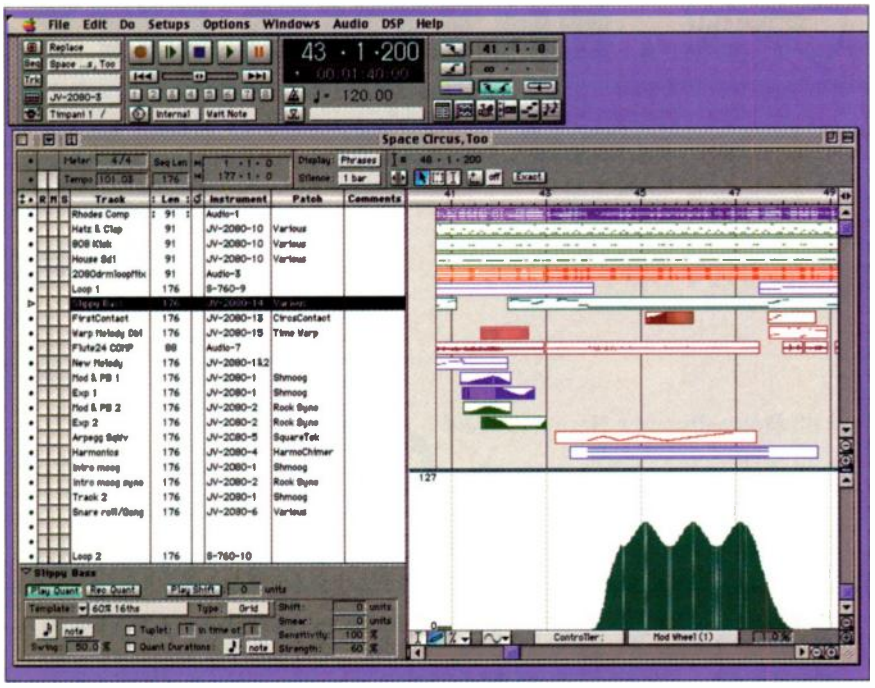


FIG. 3: *Vision DSP*'s Control Bar and Tracks Overview windows. The vertically resizable strip chart can be seen in the lower right, and the playback quantize settings area is visible in the lower left.

Vision DSP
Minimum System Requirements
PowerPC 603, 32 MB RAM, Mac OS 7.6, L2 cache

stitute functions can be saved as recallable setups. The combination of all these changes has turned what used to be a hodgepodge of various windows into a single, more cohesive working environment.

Those people who like seeing drum patterns displayed on little grids will love the new Pulse Edit window (see **Fig. 4**). Each line of the grid represents a single MIDI note number, and each can be opened to allow editing of note Velocities. Editing is done with the Magic Drumstick tool, which is also used to enter or delete notes. Tracks recorded outside the Pulse Edit window can be viewed and edited in a similar fashion without being quantized. Each line of the grid may then be individually quantized on playback, or individual notes can be nudged forward and backward in time using key commands.

A new Input Effects window controls *Vision DSP*'s built-in arpeggiator/repeater. Both of these can latch and sync to the counter, using any rhythmic value. The arpeggiator will transpose up to three additional octaves in any of the following fashions: up, down, up/down, or random.

ODDS AND ENDS

Because all multitrack audio editing is block-style, *Vision DSP* ships with BIAS's *Peak SE* waveform editor. By the time you read this, Opcode should be bundling *Peak* 2.0, a vast improvement over *Peak* 1.65, which lacked the all-important pencil-style waveform editing tool. Also included in the *Vision DSP* package is Opcode's excellent *Galaxy* librarian.

As mentioned earlier, *Vision DSP* could benefit greatly from the inclusion of more tutorials. The manuals (all 904 pages, as well as assorted PDF and Read Me files) are good but are primarily reference books. Fortunately, they are well indexed. Getting a handle on this powerful program was hard enough for me, so heaven help the novice. Having said that, however, mastering any complex musical tool takes time, and no one ever complains that the books and lessons necessary for learning to play the piano don't come with the instrument.

20/20 VISION

I've been using either *Vision* or *Studio Vision* for several years now. Although it wasn't the first MIDI sequencer that I learned, it's the one that I have used the longest.

Over the past couple of years, other sequencers have surpassed *Vision* in some areas, and I've been tempted to switch. But I stayed with *Studio Vision* to avoid the aggravation that a switch would entail. With this new release, however, I'm once again thoroughly pleased with my choice of sequencer, and I'm confident that *Vision DSP* will enable me to produce the music that I strive to create. I strongly suggest that you take this powerful and versatile program out for a test-drive.

David Crigger, *drummer with Burt Bacharach and Elvis Costello, searches for the free time to concoct odd-meter experiments that many will dance to without understanding why.*

editing ever devised on a keyboard, and it rightly holds an endless fascination.

In case you are not familiar with drawbars, each one corresponds to the length (in feet) of pipes on a pipe organ. (Doubling the pipe length drops the pitch by an octave.) The OX7 has four drawbars (8', 4', 2', 1') that add different octaves of the fundamental pitch; three others (2⅔', 1⅗', 1⅓') that add upper harmonics; and two more (16', 5⅓') that produce suboctaves. You mix and match the relative volumes of the nine drawbars by sliding them in and out and thereby produce harmonically rich and interesting sounds.

The drawbars can be tweaked in real time: hold down a chord and slowly add extra pitches, or play a big dramatic stab and then filter out all but a couple of drawbars. Additionally, drawbar moves can be recorded in real time to a sequencer using Control Change (CC) messages.

TWISTING AND TWEAKING

In addition to the drawbars, the OX7 offers lots of editing control. Some features are faithfully reproduced from real Hammond and Wersi organs, while others are modern enhancements.

The percussion feature adds a momentary harmonic to the beginning of a sound, making its front end sharper. As on a real B-3, you can choose between second and third harmonics; unlike a real B-3, the OX7 gives you the option of programming your own user harmonic. Percussion time can be short, medium, or long, and percussion volume is controlled by the effects-volume knob. Settings for this control can be stored in memory, but overall volume and reverb volume (the two knobs alongside it) can't be stored. Blue Chip reasons that effects levels generally correspond to the particular preset sound, while reverb level and overall volume might change from gig to gig.

Percussion can be routed through the vibrato or Leslie effect, or it can be applied unadorned. According to the manual, percussion can be monophonic or polyphonic, but changing this parameter gives a sonic result more like turning the legato control on and off.

Two envelope parameters, delay and sustain, can be lengthened independently or simultaneously. Although neither parameter produces a dramatic alteration in tone, both are helpful in adding some color and authenticity to the sounds.

The OX7's key-click feature imitates one of the Hammond's telltale faults: an edgy, electronic click when you depress a key. Key click can be added in soft, medium, or loud amounts. Although some Hammond organs offer built-in reverb, the B-3 does not. No matter; the OX7 provides six reverb settings, and the reverb level is controlled by a knob on the panel.

Organ sounds benefit greatly from some form of modulation; without *some* movement, they often sound lifeless. Vibrato is normally thought of as pitch oscillation; the OX7, however, offers three vibrato types—Normal, Chorus, and Celeste—each of which can operate at slow or fast speeds. I found the vibrato on this unit a little too shrill and piercing, but that's simply my personal preference.

A Hammond without a Leslie cabinet lacks authenticity. A Leslie cabinet

OX7 Specifications

Drawbar Voicing	Hammond B-3, Hammond H-100, Wersi Helios/Galaxis, Wersi Spectra/Atlantis
Multitimbral Parts	3 (Upper, Lower, Pedals)
Presets	100 editable
Effects	percussion/harmonics, delay, sustain, key click, reverb (6), vibrato (3), Leslie speaker simulation
Storage	Flash ROM (user upgradable)
Audio Outputs	(2) ¼" TRS
MIDI Connections	In, Out, Pedal
Other Connections	(3) ¼" TS footpedal jacks (sustain, swell, Leslie speed)
Dimensions	9.1" (W) x 2.55" (H) x 9.85" (D)
Weight	4.88 lbs.

For manufacturer information, please see Contact Sheet, p. 179.

consists of a drumlike bass speaker that spins in one direction and a high-frequency horn that spins in the other. Both can spin quickly or slowly, and each takes some time to accelerate or decelerate when switching speeds. Although digitally re-creating this classic effect is difficult (much of the Leslie's power lies in the physical movement of air), Blue Chip has done a good job. The speed-up/slow-down element is factory set, but the fast and slow speeds can be modified in Edit mode.

FINAL TOUCHES

It isn't just the normal Leslie effect that gives a Hammond B-3 its character. Overdriving a Leslie to generate distortion also provides much necessary grit, especially for rock music. So where's the distortion control? Well, Blue Chip missed the boat on this one. The company suggests that you crank up the modulation wheel on your keyboard controller to obtain distortion.

There are two problems with Blue Chip's recommendation. First, what if you want to run the OX7 from your software sequencer? Second, and more important, the effect just isn't the same as true analog distortion (or even analog distortion simulation). Modulation adds digital distortion, which might work if used sparingly but doesn't sound pretty if a lot is applied. Most organ modules—from the Korg CX3 to the Hammond XB-3—offer analog-distortion emulation as a parameter. This option would have been a much better choice for the OX7.

In defense of Blue Chip, however, it constantly provides software updates for the OX7, one of which will reportedly address the distortion issue. The company also plans to offer an optional 2-channel tube amplifier for processing the OX7's outputs, which could generate more appealing analog distortion.

ODDS AND ENDS

The amount of control afforded by the front-panel buttons will surely satisfy most people's itchy fingers. But if you want more—say, a slightly louder standard key click or a slightly slower fast Leslie effect—you do this in Edit mode. Items that you can customize include rotor speeds, percussion length, sustain length, key-click volume, and percussion stereo imaging.

The OX7 is more than just a MIDI-triggered box of organ sounds. You can receive or disable Control Change and Program Change messages as well as program new sounds and effects from your computer using SysEx and NRPN messages. Unfortunately, SysEx and NRPN messages can be difficult for the average user to manipulate in a sequencer. To ease your pain, distributor Music Industries Corporation will, upon request, supply a Cakewalk *Pro Audio* or Steinberg *Cubase* mixer map for the OX7, which should make sound editing delightfully straightforward. By the time you read this, the maps should be available on MIC's Web site (www.musicindustries.com). Of course, if you don't use either of these two sequencers, you're out of luck, at least for now.

RETRO MANIA

Drawbar tonewheel organs are a specialty product. They offer almost limitless sound permutation, but within a limited sound style. They don't sound like transistor organs, such as the Vox Continental or the Farfisa Compact, nor do they sound like synth organs, such as the ones made by Roland and Yamaha in the 1980s. Tonewheel organs have a distinct and identifiable sound, and if that's what you're looking for, the Blue Chip OX7 delivers very well.

Julian Colbeck *is retired from active duty on the road as a professional keyboardist, deeming running the U.S. branch of Keyfax Software/Hardware a more dignified midlife occupation.*

BOUNCING BABIES

If $1,595 is too much for you to spend on a collection of Hammond and Wersi organ sounds, you might be a candidate for the OX7's younger sibling, the Baby B. The Baby B packages the same range and quality of sounds as the OX7 in a half-rackspace module. Smaller drawbar sliders are provided for real-time control, and, although its sounds can be edited only with the help of a computer, the Baby B has all of the OX7's functions. As with the OX7, computer-based editing requires Cakewalk *Pro Audio* or Steinberg *Cubase*.

At a price of $900, the Baby B is a great way to get the OX7's sounds without spending the big bucks.

Blue Chip Baby B

BLUE CHIP
OX7 virtual tonewheel organ module
$1,595

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

PROS: Authentic-sounding Hammond and Wersi emulations. Extensive real-time control. Plenty of dedicated buttons. Good MIDI implementation.

CONS: Poor distortion solution. Shrill vibrato effect. Software editing maps available only for Cakewalk and Steinberg sequencers. Expensive.

CIRCLE #439 ON READER SERVICE CARD

ALESIS

Q20

Superior multi-effects with a host of professional I/O options.

By John Krogh

FIG. 1: A plethora of I/O options helps elevate the Q20 to pro status.

Well before the birth of the ADAT, Alesis enjoyed a reputation for making great gear at groundbreaking low prices. No product helped build that reputation more than the original QuadraVerb multi-effects processor, which offered four simultaneously programmable effects, as well as audio quality previously unavailable at its price point.

In 1995, Alesis upped the ante by rolling out the QuadraVerb 2, or Q2, which offered twice the number of simultaneous effects and was one of the first effects boxes to feature ADAT Optical (Lightpipe) I/O. Despite superior audio specs and many extra features, the Q2 didn't do as well as expected: perhaps because of the QuadraVerb moniker (the unit had been aimed toward budget users), recording professionals overlooked it. Home-recording folks, on the other hand, saw it simply as a rehashed QuadraVerb at a higher price.

Several new, fully professional features should make a real difference in clearing the way for the Q20's acceptance in the pro-audio world. These additions include S/PDIF digital I/O (as well as ADAT Lightpipe), 20-bit converters, 200 user programs (twice as many as the Q2), and an internal power supply. What's more, the additional 100 user programs in the Q20 include programs created by Todd Rundgren, Francis Buckley, the Angel, and many other well-known musicians, engineers, and producers.

Still, the Q20's operating system and front panel are virtually identical to those of the Q2 (reviewed in the June 1995 **EM**), so it's fair to look at the Q20 as an improved Q2 rather than as an entirely new animal. Therefore, I'll discuss the unit's navigational details only briefly and focus primarily on what's new and different about it.

OUTSIDE THE BOX

You could easily mistake the Q20 for the Q2 from the front, except that you won't find the name "QuadraVerb" anywhere on the box. However, you will find dual 4-segment LED level indicators for the analog inputs, concentric knobs for right and left analog-input levels, a generous backlit LCD, a knob for analog-output level (digital signal levels are controlled through the operating system), a Value/Enter wheel, and two rows of seven buttons that get you around the many pages of effects and system parameters.

A glance at the Q20's rear panel reveals a wealth of interface options (see **Fig. 1**). For starters, the analog inputs use Neutrik combination connectors that can accept either balanced XLR or ¼-inch balanced/unbalanced jacks. The S/PDIF I/O is on standard RCA connectors, which I'm happy to see because manufacturers of computer digital audio interfaces often favor this kind of connection over AES/EBU. Separate XLR and ¼-inch balanced outputs are also provided, and a BNC jack is on hand for receiving 48 kHz word clock.

Footswitch jacks for bypass and advancing through programs are also available on the rear panel. You can specify the range of programs you want to advance through—user programs 10 through 20, for example. After the last program has been selected, the Q20 will wrap back around to the first program of the specified range—an especially handy feature for live situations.

The back panel also houses MIDI In and Out/Thru jacks so that you can control a number of effects parameters in real time from your favorite controller or sequencer. And everyone should be happy that the "lump in the middle" power supply has been replaced by an internal power supply and standard IEC power cable.

INSIDE THE BOX

Programs can comprise up to eight effects algorithms, or blocks, which offer four basic functions: EQ, Reverb, Pitch, and Delay. Each function has several types of effects, such as flange, 3-band parametric EQ, and so on. (See the table "Building Blocks" for a complete list of effects.)

The Q20 uses the same 24-bit DSP chip used in the Q2, so none of the effects are actually new. However, the Q20's effects do sound better, thanks to the 20-bit A/D and D/A converters. In general, the box sounds crisper, and the reverb programs are clearer and smoother in their decay, especially in the highs. To my ears, the chorus programs rival those of units costing twice the money.

Anyone who is serious about tweaking will love the bevy of effects parameters in the Q20. You can modulate up to eight parameters per program in real time through MIDI. What's more, two modulation-source generators are available, each of which can be set to one of five types: input envelope, peak follower, ramp, LFO, or footswitch. You could, for example, use the two footswitch inputs (Advance and Bypass) as modulation sources to turn specific effects on and off.

In **EM**'s review of the Alesis Q2, Larry the O described several software shortcomings, most notably that direct signal wasn't passed through the effects blocks to the outputs when the unit's bypass was engaged. However, version 2 of the Q2's operating system (which is

The Alesis Q20 uses the same effects and operating system as version 2 of the QuadraVerb 2; thanks to 20-bit converters, it sounds noticeably better.

TUBES DON'T COME ANY COOLER THAN THIS

Radius 10 Tube Mic Pre Amp

Radius 20 Tube Parametric Equalizer

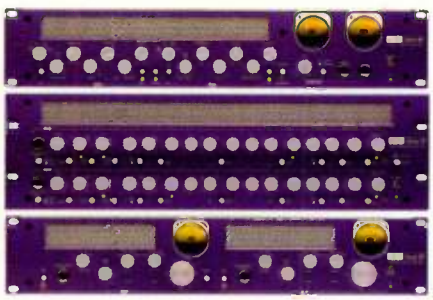
Radius 30 Tube Compressor

Radius 40 Tube Voice Compressor

Radius 50 Tube Mic Pre Amp / Compressor

HHB Radius

Easy on the eye. Easy on the wallet. Just wait until you hear what they'll do for your music. The new HHB Radius Series of tube processors combines classic British pro-audio know-how with the finest components and exacting manufacturing standards to make the unique warmth and presence of the vacuum tube affordable to all.



Drums become tighter and more punchy with the Radius 30 compressor, your mix gains warmth and depth with the Radius 20 parametric equalizer and even the cheapest dynamic microphone takes on the character of an expensive studio condenser with the Radius 10 mic pre amp. So for the coolest thing in tube processing, talk to your HHB dealer about the Radius Series.

Also available: Classic 60 Tube Compressor, Classic 70 Tube Parametric Equalizer and Classic 80 Pentode Tube Mic Pre Amp

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HHB Communications Ltd · 73-75 Scrubs Lane, London NW10 6QU, UK
Tel: 0181 962 5000 · Fax: 0181 962 5050 · E-Mail: sales@hhb.co.uk

http://www.hhb.co.uk

HHB

circle #602 on reader service card

Q20 Specifications

Analog Inputs	(2) Neutrik Combination XLR/¼" TRS, balanced/unbalanced
Analog Outputs	(2) XLR balanced, (2) ¼" balanced/unbalanced
Digital Input/Output	ADAT Multichannel Optical Digital Interface, S/PDIF, BNC jack for 48 kHz word-clock connection
Digital Converters	20-bit, 256x oversampling
Frequency Response	20 Hz–20 kHz (±0.2 dB)
Dynamic Range	>92 dB (20 Hz–22 kHz)
Distortion (THD + N)	<0.005% @ 1 kHz
Sampling Rate	48 kHz (variable from 40.4 kHz–50.8 kHz under external control)
Preset Programs (ROM)	100
User Programs (RAM)	200
Dimensions	19" (W) x 1.75" (H) x 7" (D)
Weight	4.25 lbs.

the same OS used in the Q20) addressed this issue and added another 100 programs, to boot.

Larry the O also took exception to the fact that the Q2's parameter display didn't show the effect of modulation, but Alesis has not addressed that concern.

PEDAL TO THE METTLE

I used the Q20 in several applications, including mixing a demo of a five-piece band. I also enlisted the services of producer/musician Bill Gould (of Faith No More) and sound designer Malcolm Fife—two people with very different effects-processing tastes and needs—to rate the Q20 on sound and general ease of use.

Comparing the Q20 with its predecessor, Fife noted that, although the Q20 offers the same effects as his trusty Q2, they sound much better coming from the Q20's 20-bit converters. "On the whole, they're noticeably more crisp. For my work, the difference in sound quality alone is worth the cost of upgrading."

The Q20 is a breeze to operate, even with all of its editable parameters. In fact, experienced users could probably get by without even opening the reference manual. Those who do use the manual, however, will find it well organized, clearly written, and thorough. (A "Quick Reference Guide" and lists of preset and user programs are provided separately on handy card-stock sheets.)

Effects range from utilitarian to bizarre, with an emphasis on reverb and chorus. There are 14 reverb types to choose from, including the usual suspects and spring, nonlinear, and reverse. Overall, the reverbs are smooth, transparent, and definitely expensive sounding. Gould agreed, saying that they "add presence and body, yet don't color the sound at all." My personal favorites are the room/ambience programs, followed by the plates.

Gould and I both noticed, however, that, when fully cranked, the Q20 has a considerable noise floor. With the output knob set to about 75 percent (the setting recommended by the manual), though, the noise was not noticeable.

If you want unusual sounds, the modulation and resonator effects are very cool. The Q20 has a good selection of delay/chorus programs, too, which are best suited for sound effects and general "moodiness." As for a wish list, mine would include some sort of lo-fi or overdrive effects like those currently heard in electronica and dance music.

BLOCK BUSTERS

Considering the depth of control available in the Q20, programming your own effects is relatively straightforward. Combinations of effects are made by connecting different types of blocks with virtual patch cords, for which you set level, source, and destination.

As stated previously, you can combine up to eight effect blocks to create one program. In most cases, though, only four or five blocks can be combined before the unit runs out of DSP power. Beyond that, trying to add more blocks generally results in a "DSP IS FULL" message.

Fortunately, the manual provides a list of how much DSP each kind of block uses. Therefore, with a bit of planning, you can squeeze out every last bit of DSP for large combinations. Of course, it would be nice to have some sort of DSP monitoring onboard to display the amount of processing power used by a program and to tell you how much a block would use before you add it.

20/20 VISION

The Q20 is a great-sounding box filled with lots of useful programs. Its programmability is extensive, with most effects parameters controllable through MIDI for some interesting real-time possibilities. The effects are well programmed, too, although dance and remix musicians might be disappointed by the lack of lo-fi sounds.

If you use effects primarily for live applications, such as sound reinforcement, then the Q20 offers but a few advantages over the Q2—for example, an internal

Building Blocks

Complex multi-effects can be created in the Alesis Q20 by combining up to eight of the effect types, or blocks, listed below. Blocks are combined by connecting them with virtual patch cords, which are displayed onscreen.

Block Type	Variations
EQ	lowpass, bandpass, highpass filters; lowpass, highpass shelf; 1-band low and high parametric; 2-band sweep shelf; 3- and 4-band parametric; 5-band graphic; resonator; mono and stereo tremolo; stereo simulator; soft and hard overdrive; panning; phase inverter
Pitch	mono and stereo chorus; quad chorus; mono and stereo flanging; phaser; mono and stereo Lezlie; pitch shift and detune; ring modulator; mono and stereo trigger flange
Delay	mono and stereo; ping-pong (with tap tempo); multitap (with tap tempo); sampling
Reverb	room (4); hall (2); plate (3); chamber (2); spring; nonlinear; reverse

For manufacturer information, please see Contact Sheet, p. 179.

power supply and locking XLR connectors. Beyond that, the appeal is limited. After all, most users aren't likely to need digital I/O for live shows, and the improvement in audio quality probably wouldn't be noticeable out front.

However, if you do most of your work in a studio, especially with desktop recording systems, then consider upgrading. The unit's digital I/O provides a lot of options. For example, in a hybrid computer/ADAT recording system, you could access the Q20's arsenal of software effects over the Lightpipe connector—which would be very handy if you ran short of CPU memory while trying to add another reverb plug-in. For processing field-recorded sound effects completely in the digital domain, you could run digital signals from DAT through the Q20 and then into your computer's S/PDIF digital input.

These abilities are something to crow about in a box with this price tag. In fact, it's hard to cite any direct competitors for the Q20, because the closest comparisons come from processors costing far more. (Alesis's own Q2 is perhaps the best head-to-head competitor.) Although more processing power would have been nice, overall the Alesis Q20 is a great addition to anyone's toolbox.

San Francisco–based music journalist **John Krogh** *is currently wrapping up pre-production with his band My New Gun for its upcoming release on Geffen Records.*

ALESIS
Q20 multi-effects processor
$999

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

PROS: Excellent sound quality, with 20-bit converters. ADAT Lightpipe and S/PDIF digital I/O. Easy to use. Extremely programmable.

CONS: DSP typically limits programs to no more than four effects. Middle-of-the-road effects selection.

CIRCLE #440 ON READER SERVICE CARD

AUDIX

CX-111

This large-diaphragm condenser mic should turn a few heads.

By Tom Carr

I don't like trade shows much, but I felt compelled to attend the AES show last September in San Francisco for two reasons: first, it was just a short drive away, and second, I wanted to see what the folks at the Audix booth had going. I was disappointed, though, when Audix vice president Cliff Castle showed me a familiar-looking large-diaphragm condenser mic—one that I have seen in at least three incarnations from several other companies in the past six years.

Castle assured me, however, that the new Audix mic, dubbed the CX-111, was different. Audix engineers had tweaked the design heavily, he explained, until they were happy with the mic and confident about its quality. And given the success and quality of other Audix microphones, his statement carried some weight.

The CX-111 is a single-pattern (cardioid) mic with a satin-black finish on a brass body. It features a 10 dB pad and a 200 Hz bass rolloff. (A less expensive model, the CX-101, is available without the pad and rolloff.) The mic comes in an attractive, foam-lined aluminum flight case, complete with a shock mount.

The Audix CX-111 is a cardioid-only, true condenser mic featuring a 1-inch diaphragm, 10 dB pad, and 200 Hz bass rolloff. It sounds great and is very affordable.

GROUP SAX

Audix sent me a matched pair of CX-111s to review, which showed up just in time to include in the sax-mic lineup for a big-band jazz project that I was recording. The project was being recorded live to 2-track DAT through a Neve 8036 console. All the lead players would be taking solos from their respective sections. I put one CX-111 on the first alto and the other on the first tenor, who also doubled on lead baritone.

Two characteristics of the Audix mic became clear as we began recording. The first was that the CX-111 required 5 dB less gain than the mic I typically use for recording saxes, an AKG C 414 B/ULS. (I like the C 414 because it helps keep the sound of the sax section from getting too thick in the mids during solo passages.) At first, I thought this might be because the musicians occupying the first-chair positions were playing more loudly than the others, but the mic proved 5 dB hotter in all subsequent trials, too. Any help in improving signal-to-noise ratios is always a good thing.

The second characteristic was that the soloists sounded wonderful. The alto sax was smooth with plenty of alto bite, yet never shrill. The tenor and baritone saxes sounded even and full throughout their respective ranges, with the bari coming across as particularly sweet and well detailed. Altogether, the CX-111s delivered beautifully on saxophones.

HOLDS MARRED

As I was setting up, I discovered that the CX-111's shock mount, though easy to use, is not trustworthy. It works like a binder clip: you squeeze two wirelike handles to open a felt-lined metal cylinder, and then slip the mic inside. When you let go of the handles, the cylinder closes and the mic stays put—or should.

However, if you don't insert the CX-111 fully into the cylinder, it's easy to accidentally push the mic up and out of the assembly. I did exactly that and nearly dropped the mic while trying to position it. One should be especially careful when mounting this mic upside down.

APPLES TO PRICIER APPLES

For a more specific sense of how the CX-111 sounds, I compared it with a couple of Neumanns—a new TLM 103 and a Klaus Heyne–modified U 47 FET—on the telling strains of acoustic guitar. The three mics were connected through Canare cables of identical length into a 4-channel Focusrite Red Range Model 1 mic preamp. Line-level signals were patched into the monitor section of the Neve 8036 so as to bypass the 1081 preamp stage, allowing me to meter each mic.

One of our house engineers at Music Annex Studios, Chris Cooper, is an ace guitarist, and he played while I listened. We used a Yamaha acoustic guitar—admittedly not a high-end instrument, but one that Chris and I knew translated well to tape. The mics were tightly grouped in a line about five feet high, angled down toward the guitar about two feet back from the soundboard.

In this lineup, the TLM 103 and CX-111 sounded great next to the U 47, which sounded only passable and had a boxy honk to it. At first I thought that the U 47's position in relation to the guitar was the cause; so I moved it to the middle spot, but it sounded the same. From that point on, the "competition" was between the new Audix and the new Neumann.

After matching levels to compensate for the CX-111's hotter output, I was startled by the sonic similarity of the CX-111 and the TLM 103. I kept listening and comparing the sounds, concluding that the only difference was that the TLM 103 provided a little extra sparkle, which made the guitar strums sound more present.

Other than that, the CX-111 was an aural dead ringer for the Neumann mic. That's pretty impressive, considering that the CX-111 costs nearly $400 less and provides two features—the pad and rolloff—that the TLM 103 lacks. And by the way, these impressions were not mine alone: other folks—engineers

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and clients—listening in the control room were as incredulous as I was.

GOING THE DISTANCE

To test the CX-111 on voice and piano, I put it up against a favorite of mine, the Neumann TLM 193. This mic is significantly more expensive than the Audix ($1,495 versus $599). Its linear diffuse-field response allows me to position it at greater distances from sound sources than other mics, and I was curious to see how the CX-111 would hold up in that type of application.

First, I recorded myself reading text (without a pop filter) at a distance of six inches from the TLM 193. I then recorded the same passage at six inches from the CX-111. These tracks were intended mainly as a reference for the next part of the test, distant-miking, in case there was any question about undue influence from mic positioning. Next, I positioned the mics side by side, with the signals patched to discrete channels on the DAT, and recorded the two tracks simultaneously while reading at a distance of 18 inches from the two mics. (As it turned out, the side-by-side positioning did not color the sound.)

On the CX-111 track recorded from six inches away, my voice had richer lows and crisper highs than I expected—enough, in fact, to keep me from having to use any EQ. The presentation was flattering, and for a moment it inspired me to pretend I was one of those triple-scale union voice-over guys.

The TLM 193 at six inches had an even sound characterized by a "satiny" finish. I preferred the CX-111 track, however, because it was more present and "in your face."

AUDIX
CX-111 condenser microphone
$599

AUDIO QUALITY ■■■■■
VALUE ■■■■■
1 2 3 4 5

PROS: Sounds great. Very affordable. Hot output. Low self-noise.
CONS: Shock mount doesn't hold mic securely in all applications.
CIRCLE #441 ON READER SERVICE CARD

On the tracks recorded at 18 inches from the mics, the TLM 193 pulled up ahead in the comparison, revealing its different "flavor" of design. It sounded as it had at six inches, again providing a very even presentation of my voice. This confirmed my sense that the TLM 193 is particularly well suited to applications requiring miking from a distance. The CX-111 track recorded from 18 inches sounded good, but it provided less low end and immediacy than the close-miked CX-111 track.

To check my results, I repeated the tests, this time singing a cappella. Again, the CX-111 imparted that cozy, immediate touch to my voice when I was close, and the TLM 193 gave a truer picture of my voice when farther back. The CX-111, therefore, seems an appropriate choice for recording pop vocals (which are usually worked close), and the Neumann TLM 193 is better suited for classical vocals (which are typically recorded from farther back).

CX-111 Specifications

Element	true condenser
Diaphragm	1" gold-vapor-deposited Mylar
Polar Pattern	cardioid
Frequency Range	20 Hz–20 kHz
Dynamic Range	109 dB
Signal-to-Noise Ratio	83 dB
Sensitivity	16.5 mV/Pa
Self-Noise	17 dBA/26 dB
Maximum SPL	135 dB; 145 dB with 10 dB pad
Highpass Filter	200 Hz, 6 dB/octave
Attenuation Pad	10 dB
Dimensions	7.5" (L) x 2" (D)
Weight	17 oz.

For manufacturer information, please see Contact Sheet, p. 179.

THE PIANO CHALLENGE

Engineers who record primarily acoustic instruments would probably agree that achieving a great recording of solo grand piano is one of their biggest challenges—and when accomplished, one of their biggest thrills. Aside from the human voice, what other instrument is as capable of producing notes that are alternately sweet and edgy, lush and percussive, hushed and explosive? Indeed, the grand piano's orchestralike range of dynamics and timbre tests the mettle of microphone, engineer, and studio alike.

The grand piano at Music Annex Studios is a Yamaha C-7. I did a double stereo-miking with the CX-111s routed through the 4-channel Focusrite to one Panasonic SV-3800 DAT recorder and the TLM 193s routed through the Focusrite to a second SV-3800. The upper-register microphones were positioned nine inches above the Yamaha logo on the soundboard and angled to capture the top four octaves or so. The lower-register mics were positioned eight inches above the harp and angled to cover the bottom three octaves. The amount of space taken up by the double stereo pair required that one brand of microphones be closer to the strings, so I made sure to swap the positions and test twice.

Although drawing a more defined line as to recommended usage was easier on the voice test, my impression after comparing the quality of the piano tracks was still that "more expensive" doesn't always mean "better." The CX-111s sounded much more open in the top end than did the TLM 193s, adding quite a sparkle to the upper harmonics. Of course, this could prove undesirable when recording, say, a classical piano—especially on Yamahas, which tend to be bright. But on pianos that are inherently dull sounding or are located in spaces that impose dullness on the sound, the CX-111's response would provide a definite advantage and would also help in achieving an airy, spacious quality.

The TLM 193s imparted a slightly smoother quality to the mids than the CX-111s did, but otherwise, in the mids and lows, the Audix and Neumann mics sounded very similar. Also, the mics were equally able to handle hot levels; even when I banged out my best "piano bar in hell" imitation, neither went into clipping.

VERSATILITY, AFFORDABILITY

The Audix CX-111 will fill several roles in the studio world. For personal, project, and midlevel recording facilities, the CX-111 could easily cover multiple applications, in particular vocals and acoustic instruments. For location recording, the hot output level, bass rolloff, 10 dB pad, and open quality of the top end would make it a good choice for instrumental or vocal ensembles.

For the big-budget crowd that can afford to destroy large-capsule condensers, the low price of the CX-111 makes it very attractive. A major studio could afford to buy a bunch of them and then go crazy recording under extreme conditions, all the while sounding terrific.

I have only one cautionary note for CX-111 users. Take care when using the shock mount: if the mic is not fully inserted, it can easily slip out and fall. Aside from that, though, the CX-111 is a great mic at a terrific price.

Tom Carr *is senior mixer and CD-mastering engineer at Music Annex Studios in Menlo Park, California.*

ZOOM

RHYTHMTRAK 234

A quality drum machine with an ear for the unusual.

By Steve Wilkes

There's an enormous number of drum machines on the market today, and it takes a lot for one of them to stand out in the crowd. Even in the under-$500 price range, competition is fierce, and there are no signs that it will let up any time soon.

Recently, Zoom entered the fray with its RhythmTrak 234. Not content to produce just another drum machine, Zoom souped this one up with a bank of bass patches, a collection of ethnic percussion, and a couple of performance-oriented features that, at $329, give the unit a leg up on the competition.

FIRST LOOK

The RhythmTrak is compact enough to fit in a briefcase, yet it offers 124 drum and percussion kits, 50 bass patches, 32-note polyphony, and 16-bit samples. The sequencer has 99 preset patterns, 99 user patterns, 99 user-programmable songs, and a maximum memory capacity of 13,000 notes, and it offers both real-time and step-time recording.

You can play either individual drum sounds or Groove Play loops from the RhythmTrak's 13 Velocity-sensitive keypads. These double as function keys for editing the tuning, quantization, pad sensitivity, and controller assignment. There are also a 6-character LED display and two pairs of increment and decrement buttons to help with editing.

The machine's most unusual feature is the Sound Jammer slider, a real-time performance control that can change the pitch and volume or select variations of a sound. Sound Jammer slider movements can be recorded as part of a pattern or song, and the slider can also be used to scroll through values when editing.

On the rear panel are the master volume control, a pair of ¼-inch outputs, a headphone output, and a ¼-inch input for mixing in an external signal (see **Fig. 1**). Another pair of jacks allows you to add an expression pedal (which can function as the Sound Jammer slider) as well as a standard footswitch. You get a MIDI In port (the unit syncs to MIDI Clock) and a jack for the 9 VDC wall wart. However, the RhythmTrak does not have MIDI Out.

The RhythmTrak 234 by Zoom has 13 Velocity-sensitive keypads for playing samples and triggering patterns. The unique Sound Jammer slider allows you to change a sample incrementally and record the changes into your sequences.

ALL THINGS SEQUENCED

The RhythmTrak 234 includes a 4-track sequencer. Tracks A, B, and C play any of the RhythmTrak's 124 internal drum kits; the fourth track is reserved for bass. When you select a drum kit or bass patch, it is automatically assigned to the 13 keypads for easy access during recording. Although you can mix the relative levels of the four tracks, you can't set the relative volumes of the instruments within a drum kit before you begin sequencing. Your only choice is to rely on Velocity or use the Sound Jammer slider to control the volume of each instrument while you're recording your sequence.

To create a pattern in Real-Time Recording mode, you choose a user pattern and erase the contents. (Each user-pattern slot contains a copy of the corresponding preset pattern until you record over it.) Next, you choose the track you wish to record on, press Record, and play the keypads. The RhythmTrak can provide a metronomic accompaniment if you wish. As the pattern cycles, you can overdub repeatedly on the track until it sounds the way you want.

The RhythmTrak has only three preset time signatures to choose from (2/4, 3/4, and 4/4), and you can't create your own time signatures. The absence of 5/4 time is especially glaring. Quantization can be set from quarter notes up through 32nd-note triplets. You can also record in real time without quantization. The RhythmTrak's resolution is 96 ppqn, which is standard for drum machines in this price range.

Patterns and songs are assigned numbers; unfortunately, you are not allowed to name them. You'll need to keep a notebook handy to jot down the number of each pattern, or keep the list on your computer, so you can easily find them when you assemble your songs.

ROCK MACHINE

It's obvious that the RhythmTrak has serious rock leanings, in terms of the style of the sounds and many of the preset patterns. In fact, Zoom verified that this machine is primarily aimed at the young rock guitarist.

The RhythmTrak has a balanced selection of common styles, which is okay as far as it goes, but I would have liked

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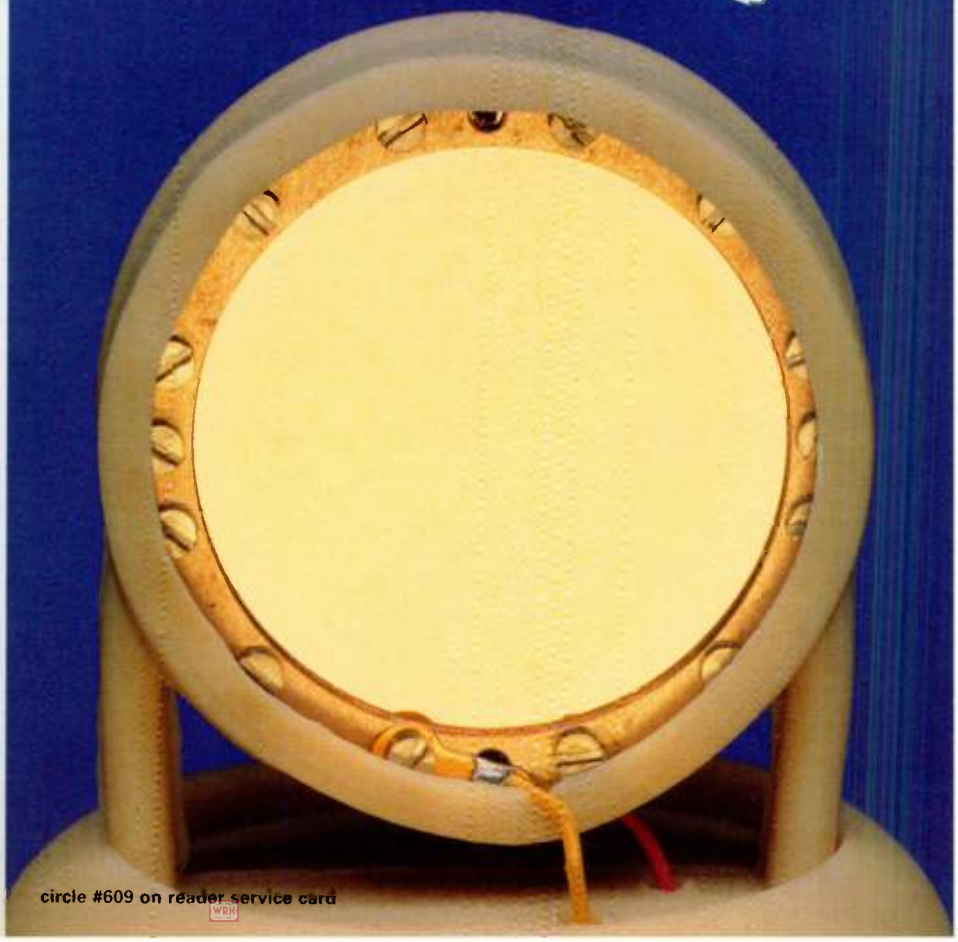

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more patterns for dance and electronica. Some preset patterns are compelling and right on the money, such as the trance and hip-hop selections, but many of the rock-oriented patterns and some of the electronica patterns sound generic and uninteresting. Of the 22 world-music patterns, only the Indian ones were remarkable.

FIG. 1: The RhythmTrak 234 includes a ¼-inch input on its back panel, so you can plug in and play along with your sequences.

SONG A LA MODE

When you are ready to link your patterns into an arrangement, you press the Song button to go into Song mode. The RhythmTrak allows you to link up to 255 patterns to form a song, and you can create up to 99 songs. When you're finished building your song sequence, simply hit Stop; the RhythmTrak automatically remembers and stores your edits.

All editing is destructive, so be careful when recording over your work. Because the RhythmTrak lacks MIDI output, you can't save patterns and songs to an external device.

ZOUNDS

According to Zoom, the company took tremendous care in recording the RhythmTrak's sounds, using vintage drums tracked to analog 2-inch tape or recorded digitally at 44.1 kHz. Most instruments were close-miked, and room ambience was added using an additional stereo mic pair. The basic drum samples (kick, snare, and toms) are beefy and warm, and pack quite a punch.

When you select a drum kit, each instrument is mapped to one of the unit's 13 keypads. Each drum kit contains a kick, snare, three toms, open and closed hi-hat, and three cymbals. The instruments are always mapped to the same keypads, and you can't change where they reside. In addition to the usual ten drum sounds, there are three auxiliary pads, called Extra 1, 2, and 3, that contain a variety of effects, such as cowbell, rim tap, tambourine, or hand claps, depending on the drum kit.

Drum kits are divided into categories such as Live Rock, Studio, Standard, Funk Trap, Rap/HipHop, and Techno Beat. Each category has ten variations; for example, Live Rock 1 through 10, Studio 1 through 10, and so on.

With the exception of Live Rock 10, all Live Rock kits have the same tom-tom set. The Live Rock kick and snare samples vary from kit to kit: Zoom began with two kick and snare samples for each kit category and then tweaked them for each individual kit. Despite the limited amount of variation in the Live Rock toms, I like the basic samples. They're powerful and would be effective for any number of gigs that call for serious rock attitude.

Unfortunately, the RhythmTrak doesn't allow you to create your own drum kits from the selection of internal

For manufacturer information, please see Contact Sheet, p. 179.

sounds, and although the Sound Jammer slider allows you to tweak a sound, you can't save these changes. However, the 4-track sequencer lets you use three different drum kits simultaneously in patterns and songs, which provides some variety.

URBAN AND ETHNIC

The RhythmTrak includes 24 percussion sets, including Rap/HipHop and Techno Beat kits that contain a nice selection of Roland TR-808 and TR-909 drum samples. Of special interest is the collection of ethnic percussion samples, which is very unusual for a drum machine. As with many of the RhythmTrak's sounds, some of these samples are more realistic than others. For example, Indian Percussion contains a decent set of tablas. The sounds range from low *whooomp* effects to high-pitched, ringing staccato hits. They might not be quite as good as sounds from a specialized CD-ROM library, but they could definitely hold their own in a mix.

The Lo Percussion kit features a deep, resonant *dom* (a low, open attack normally produced by a thumb on the sweet spot of a frame drum). Drum Skins is a good collection of tribal, hand drum–type sounds, combined with the requisite Latin sounds of timbales and congas.

Also worth noting is the Velocity Layers kit. These samples give you a single instrument when you play at lower Velocities and add a second instrument at higher Velocities. For example, a low tribal drum is combined with a shekere at higher Velocities, a low tabla gets an added ring, and a wonderful shaker sound becomes "swishier."

A couple of sets in the percussion collection are somewhat disappointing. Tuned over the range of 13 keypads, the set of Temple Blocks sound more like finger-in-the-mouth pops than wooden blocks. Agogo Gamelan is almost good enough to use within the context of a sampled Balinese ensemble, but as a stand-alone gamelan sound, I found it lacking.

BASSES LOADED

For the fourth sequencer track, devoted to bass, you have 50 bass patches to choose from. You assign pitches to keypads by holding down the keypad that you want to tune and using the increment/decrement keys to select its note. Once you've created a scale across the 13 keypads, you can easily transpose your scale by pressing Function, hitting keypad 1 (which acts as the scale tonic), and using the value buttons to shift the note on keypad 1 up or down. The unit defaults to an E on keypad 1 when powered up.

The bass patches are surprisingly good for a machine in this price range. Studio Bass sounds like a clean Fender Precision that would have been at home on a Steely Dan album. Hit and hold a keypad, and the patch produces a realistic string-against-fretboard sound as it decays. Hit and quickly release a keypad for a sharp staccato attack. The patches are Velocity sensitive and produce a nice range of attacks.

Zoom has included a solid crop of useful basses in this unit. They run the gamut from traditional basses (Acoustic, Funk, Ballad, Picked) to synth basses (Techno, Analog, Analog Fifths) to some very cool "ethnic" basses (Tabla Bass Tones, Temple Tones, Conga Keys). I wasn't crazy about a few of the patches, such as Funk Pops and Funk Pulls, which lacked articulation and warmth.

SLIDING AND REPEATING

The RhythmTrak has a couple of unusual features, of which my favorite is the Sound Jammer slider. This controller lets you change an instrument's volume or pitch, or select variations of a sample in real time. Although you can't save these manipulations globally, you can record them into your patterns.

Another cool feature is the Repeat function. If you hold down a keypad while pressing Repeat/Step, the instrument will repeat in tempo. The pulse of the repetition is linked to the quantization resolution. For example, if you have the quantization set to 16th notes, and the pattern is playing at 88 bpm, the RhythmTrak will play continuous 16th notes on the hi-hat at 88 bpm when you press the hi-hat keypad and Repeat/Step simultaneously.

I tried the Repeat function in tandem with the Sound Jammer on one of the first grooves I recorded. After recording a half-time funk pattern, I set the quantization resolution to 32nd notes. I then selected Pitch with the Jam Function button and hit Record. Next, I held down the Repeat/Step pad with one finger and moved the Sound Jammer slider to its top position with my other hand. Using another finger, I held down the cymbal-bell keypad and simultaneously moved the slider slowly downward from its top position. The cymbal bell cycled through fast 32nd notes while its pitch steadily descended, resulting in a beautiful bell-tree effect.

I repeated the process using the slider to control volume as well as sound variation. All of these changes were recorded flawlessly into my pattern. To make things even easier, you can use Zoom's optional FP01 expression pedal ($69) to control the Sound Jammer slider, or you can control one parameter with the expression pedal while the Sound Jammer slider controls another, giving you a lot of real-time expressive control over the sounds as you record.

GROOVY FEATURES

Groove Play mode allows you to assign and trigger patterns from the keypads. These triggered patterns (referred to as "grooves") lock into the tempo of the pattern that's already playing, making this effect perfect for real-time, DJ-esque looping and layering.

Each of the 13 keypads can be assigned one of the 99 preset grooves. In many cases, the preset grooves are more compelling and interesting than the preset patterns. Fortunately, any pattern can be used in Groove Play Mode, so you can create your own breakbeats and loops if you wish. You can play up to four grooves or patterns simultaneously on the keypads.

Another nice feature is the RhythmTrak's handy ¼-inch input on the rear panel. This allows you to plug in your instrument and play along with the sequencer. I plugged in a friend's acoustic guitar pickup, and the signal sounded clean, both through my studio monitors and through headphones. My friend liked how easy it was to transpose the bass patterns. The RhythmTrak has no line-in volume control, so you'll need to adjust the volume on the instrument to balance the mix.

MIDI OR NOT

One of the first things you'll notice about the RhythmTrak is that it has no MIDI Out. Consequently there's no way to transfer your patterns to a sequencer, back up the memory, or slave another device to the unit. Once the memory is full, you'll have to erase previous work in order to save your current work. This omission is baffling, considering how competitive the electronic-instrument market is. Zoom originally conceived of the RhythmTrak as a "garage band in a box" for young guitarists, who, the manufacturer evidently feels, don't need a MIDI output jack. However, it seems to me that Zoom's decision unnecessarily limits the sales potential of an otherwise appealing product.

I successfully triggered the RhythmTrak using both a Roland D-50 and Alternate Mode drumKAT. I used a Roland MC-505 to trigger patterns on the RhythmTrak, and I used the MC-505's tempo control to speed up and slow down the patterns. The RhythmTrak followed without a glitch. The RhythmTrak also responds well to MIDI Volume (Control Change 7) messages.

However, there are some MIDI quirks. For example, you can call up

RhythmTrak 234 Specifications

Synthesis Engine	sample playback
Maximum Polyphony	32 notes
Drum Kits (ROM)	124
Bass Programs (ROM)	50
Patterns	99 ROM; 99 RAM; 99 grooves in ROM
Audio Inputs	(1) ¼" unbalanced
Audio Outputs	(2) ¼" unbalanced; (1) ¼" stereo headphone
Other Ports	MIDI In; (2) footswitch jacks
Options	expression pedal; footswitch
Sequencer Tracks	4
Sequencer Note Capacity	13,000 notes
Sequencer Resolution	96 ppqn
Dimensions	11.69" (W) x 1.69" (H) x 8.46" (D)
Weight	2.2 lbs.

ZOOM
RhythmTrak 234 drum machine
$329

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

PROS: Good balance of sounds, including ethnic percussion and an assortment of bass guitars. Compact and portable. Keypads are Velocity sensitive. Can record Sound Jammer movements into patterns.
CONS: No MIDI Out. No external backup capability. No battery capacity. No line-in volume control. Cannot name user patterns or songs. Limited time-signature support. Problematic MIDI Program Change compatibility.
CIRCLE #442 ON READER SERVICE CARD

the RhythmTrak's drum kits using MIDI Program Change messages, but this doesn't change the drum kit that's assigned to the RhythmTrak's keypads. If you want to play RhythmTrak's drum kit 10 from the drumKAT, and you want that same drum kit assigned to the RhythmTrak keypads, you have to do the assignment on the unit itself, rather than via MIDI, which requires an unnecessary extra step.

Another problem is that Program Change numbers are inconsistently offset. For example, drumKAT Program Change 6 calls up RhythmTrak drum kit 3, and drumKAT Program Change 7 calls up RhythmTrak drum kit 4, but Program Change 10 calls up RhythmTrak kit 6. One final thing that bothers me is that you can't trigger Groove Play patterns from an external MIDI device.

ON TRACK

The compactness of the RhythmTrak makes it ideal for the practicing musician. Whether you're using it as a click track or as a de facto rhythm section, it's a great companion. My students often look for affordable, portable drum machines, and the RhythmTrak fits the bill: it tucks easily into a knapsack or gig bag for use anywhere there is AC power. I wish it could operate on battery power, though, because many impromptu practice sites (like a train or the back of a van) are devoid of AC outlets.

The RhythmTrak 234's portability and price certainly make it a nice drum machine. However, I need to call out Zoom on its failure to include a MIDI Out. In addition, the ability to save custom drum kits would improve this unit's desirability. It could also use a hipper selection of preset patterns, support for more time signatures, and the option of running on battery power.

Ultimately, the Sound Jammer slider, the repeat function, and Groove Play won me over. I had fun with the RhythmTrak and was able to use it musically—two very important points. If Zoom were to make a few of the improvements I've noted, the RhythmTrak 234 could graduate from being merely a fun practice mate to a nifty, yet inexpensive, rhythm sequencer.

Steve Wilkes *is the drummer for the Boston production of the Blue Man Group's hit show* Tubes *and plays percussion with the Empire Brass Quintet.*

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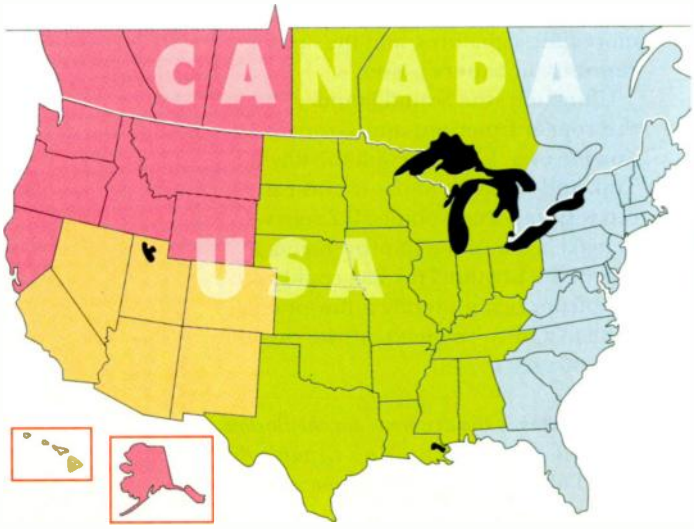

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YAMAHA

WX5

The latest generation of MIDI wind controllers has it all—almost.

By Scott Wilkinson

Yamaha is one of the only manufacturers that has remained committed to developing MIDI wind controllers over the past ten years. Back in 1989, Yamaha introduced the WX7, which was followed by the WX11 in 1993. Unfortunately, the WX11 omitted many cool features of the WX7, but it was the only game in town for wind players who wanted to control MIDI synths.

Well, the next generation of Yamaha MIDI wind controllers has finally appeared. The WX5 offers many improvements over the earlier models. Many of the features from the WX7 have been reinstated, and many new and useful features have been added, thanks in part to input from players like Tom Scott, Brandon Fields, and Matt Catingub.

KEYS TO THE KINGDOM

The WX5's key layout is basically the same as its predecessors'—much like a standard saxophone—with the addition of two keys at the very top (see **Fig. 1**). These high D and D♯ keys are useful for certain fingerings, and they can be programmed to send other MIDI messages (more on that in a moment). I have always wished for a low C♯ key in addition to the low C and D♯ keys at the bottom, but none of the WX models have it.

Yamaha has completely redesigned the octave keys. The previous models have a row of identical buttons under the left thumb, with a blank space in the middle that corresponds to a central or nominal octave. On the WX7, the blank space is in a straight line with the octave buttons, which I find somewhat awkward. On the WX11, the blank space is raised, which is much more comfortable. In both cases, each button shifts the pitch by one octave.

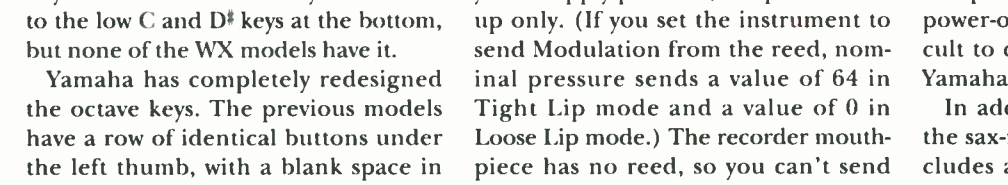
On the WX5, the octave buttons are crescent shaped and nested above and below a circular blank space (two above, two below; see **Fig. 2**). In addition, they behave differently than buttons on the previous generations. Pressing the one nearest to the blank space shifts the pitch one octave up or down; pressing both buttons above or below the blank space shifts the pitch up or down by two octaves; and pressing only the button farthest from the blank space shifts the pitch up or down by three octaves.

Although this arrangement seems more elegant than what you get on the WX7 or WX11, I find the buttons to be uncomfortable to play for any length of time. The points of the crescent shapes quickly irritate my left thumb. Moreover, the buttons are very sensitive; if you don't push and hold them just right, the octave can jump around erratically.

DON'T GIVE ME ANY LIP

The instrument comes with two types of mouthpieces: saxophone and recorder. The sax mouthpiece includes a "reed" that sends Pitch Bend or Modulation (CC 1) messages when you bite on it. As with the other WX models, you have the option of playing in Tight Lip or Loose Lip mode. Tight Lip mode requires moderate nominal pressure on the reed while playing; more pressure bends the pitch up, less pressure bends the pitch down. Sax players normally find this mode more natural.

In Loose Lip mode, you apply no nominal pressure while playing. When you do apply pressure, the pitch bends up only. (If you set the instrument to send Modulation from the reed, nominal pressure sends a value of 64 in Tight Lip mode and a value of 0 in Loose Lip mode.) The recorder mouthpiece has no reed, so you can't send Pitch Bend or Modulation from it.



The Yamaha WX5 offers many improvements over previous generations of MIDI wind controllers.

Two tiny red LEDs near the mouthpiece are oriented so the player can see them in normal playing position. One LED indicates breath pressure (which is called "wind" in WX parlance), and the other indicates pressure on the reed (which is called "lip"). The Lip LED usually remains on whether or not you apply lip pressure, which is a bit disconcerting. (Even though I play the recorder rather than the saxophone, I use the sax mouthpiece for bending the pitch, and I play in Loose Lip mode.)

UNDER THE HOOD

The controls and connectors are found on the underside of the WX5. One significant improvement over the previous models is the MIDI Out jack on the body; a belt pack is no longer needed for sending MIDI messages to a sound module. You can also send MIDI messages by using the WX output (which has the same type of multipin cable and connector found on the WX7 and WX11) to control a Yamaha VL70-m sound module (see the sidebar "Yamaha VL70-m").

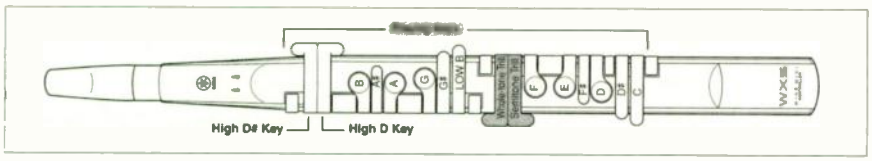
Unlike its predecessors, the WX5 is powered by six AAA batteries in its body. (The belt pack provides power to the WX7 and WX11 with six AA batteries.) You can also use a wall-wart power adapter, although having an extra wire dangling around would be highly cumbersome. If you use a WX cable to control a VL70-m, the sound module will provide power to the WX5, which is a significant advantage of this configuration.

Unfortunately, the WX5 does not power down automatically after a period of inactivity. This is a real drag if you use batteries; I burned up quite a few batteries by forgetting to turn off the power. Including an automatic power-off function can't be that difficult to do, so I don't understand why Yamaha decided against it.

In addition to the lip sensor under the sax-mouthpiece reed, the WX5 includes a spring-loaded rocker under the right thumb. The WX7 has this control, but it was omitted on the WX11. I'm very glad to see it return. The rocker sends Pitch Bend messages and can be programmed to send other MIDI messages, making it a flexible and powerful controller.

The new rocker also offers another improvement over the WX7's. On the

For manufacturer information, please see Contact Sheet, p. 179.



COURTESY YAMAHA CORP

FIG. 1: The WX5's playing keys resemble those on a standard saxophone. The high D and D♯ keys at the top are new to the WX5.

earlier instrument, the right-thumb rest gets in the way of pushing the rocker all the way up. On the WX5, the position of the thumb rest is adjustable, which lets you move it out of the way to allow unobstructed rocker motion while supporting the weight of the instrument with a neck strap.

Wind and lip set-screw adjustments are available under little rubber covers. Wind and Lip Zero set the minimum breath and lip pressure needed to send a Note On and Pitch Bend or Modulation message, respectively. Wind and Lip Gain adjust the change in output for a given change in breath and lip pressure. Players can adjust these to suit themselves.

CHIPS AND DIPS

Most user parameters are set with a series of DIP switches under a rubber cover. Again, this was implemented on the WX7 and omitted from the WX11. Yamaha expanded the available functions on the WX5 beyond those found on the WX7.

Both the WX7 and WX5 allow you to select from three transpositions—C, B♭, and E♭—which is great for sax players. The WX5 uses two DIP switches to make this selection, so another transposition could have been included; I'd like to see an F setting for recorder players. The DIP switches on both units also let you select Loose Lip or Tight Lip mode, as well as one of two breath-response curves.

The WX5's new parameters include a selection of four fingering patterns: Sax A, Sax B, Sax C, and Flute. The Sax fingerings are similar to the standard saxophone fingering patterns, with alternate fingerings and trill options available. The Flute pattern resembles standard flute fingering. In this case, lip pressure jumps up one octave instead of bending the pitch or sending Modulation messages; this is meant to resemble overblowing a flute.

One of my favorite new features is the Response mode, which determines how quickly the WX5 will respond to each note as it's played. In Fast mode, a new Note On is sent the instant any key is pressed or released. This generates "glitch" notes when you are not absolutely precise in your fingering, especially when several keys must be pressed or released simultaneously. In Slow mode, fewer "glitch" notes are generated by imprecise playing. This feels more like an acoustic instrument, which takes a few milliseconds to establish a new note.

HIP MIDI

Many of the DIP switches determine which MIDI messages are sent in response to various gestures; these settings provide a much more flexible MIDI implementation than the previous models. As mentioned earlier, lip pressure on the sax mouthpiece can send Pitch Bend or Modulation, and the range of values can be normal (restricted range) or wide (full range). You can further set the instrument to send General Control #3 (CC 18), along with Pitch Bend or Modulation, in response to lip pressure.

On the WX5, you can select Breath Controller (CC 2), Volume (CC 7), or Expression (CC 11) to be sent in response to breath pressure. The WX5 uses two DIP switches to select this message, so Yamaha could have implemented Aftertouch as a fourth choice, or possibly a combination of Expression and Volume, which would have been great for synths with no response to Breath Controller messages and limited controller routing.

The Velocity of each Note On message can be determined by initial breath pressure or fixed to a value of 100. Variable Velocity is great for sounds that don't respond to continuous control, such as basses, guitars, and pianos. On the other hand, fixed Velocity is preferable for sounds that do respond to continuous control messages, such as winds and bowed strings. The WX7 and WX11 offer only variable Velocity, which makes it difficult to play wind-instrument sounds that start soft and crescendo to a loud volume. This setting is a very welcome addition to the WX5.

The spring-loaded right-thumb rocker can be set to send four different sets of messages when you move it toward the mouthpiece (up) and away from the mouthpiece (down): Pitch Bend up/down, Modulation up/Pitch Bend down, General Controller 1 (CC 16) up/General Controller 2 (CC 17) down, and Brightness (CC 74) up/down. This assignment can be specified with the Setup button and octave keys as well as with the DIP switches. I appreciate this level of flexibility.

As I mentioned, the high D and D♯ keys can play notes or send MIDI controller data. Specifically, the high D key sends General Controller 6 (CC 81) in a momentary fashion (value 127 when pressed and value 0 when released). The high D♯ key sends General Controller 5 (CC 80) in a toggle fashion (value 127 and 0 alternately each time it's pressed). This is another example of the WX5's improved MIDI implementation compared with previous Yamaha wind controllers.

HOLD THAT PROGRAM CHANGE

Like the WX7 and WX11, the WX5 includes three buttons near the right-thumb rest: Setup, Key Hold, and Program Change (see **Fig. 2**). The Setup button is used to set certain parameters,

WX5 Specifications

Output Ports	(1) MIDI Out; (1) WX cable output
Sensors	(1) wind sensor; (1) lip sensor
Power Supply Options	(6) AAA batteries; (1) 12 VDC wall wart; or (1) WX cable connected to a VL70-m
Dimensions	2.5" (W) x 2.75" (H) x 24.06" (L)
Weight	1.15 lbs. (without batteries)

YAMAHA VL70-M

Longtime EM readers might recall my review of the VL1 Virtual Acoustic Synthesizer (June 1994), about which I waxed rhapsodic. It was Yamaha's (and the world's) first commercial synthesizer based on physical modeling, which has been near and dear to my heart since college. It was also very expensive, especially for a monophonic lead/bass synth; the keyboard version listed for $4,995. Soon thereafter, a rack-mount sound module, the VL1-m, was introduced with a list price of $2,995. Despite its high price, I bought a VL1-m because I love to play it with a MIDI wind controller. Its models are based on wind instruments, so this is really no surprise.

The next generation of Yamaha's Virtual Acoustic Synthesis (VAS) is embodied in the VL70-m ($799.95), a half-rack sound module that lists for less than a third of the VL1-m's cost. The VL70-m is designed to integrate with other Yamaha XG synths in appearance and functionality. The display is very bright and easy to read, with large letters and numbers. In addition, the display includes large Breath Controller (or Velocity, depending on program) and Pitch Bend bar-graph indicators.

This sound module uses one element for each program instead of two. As a result, it's strictly monophonic; the Hold functions of the WX are irrelevant with this synth. This means it is unable to play a bagpipe drone and chanter at the same time or have different models for two instrumental ranges simultaneously, as the VL1 can.

The VL70-m offers monophonic physical-modeling synthesis in a half-rack package.

You get two ROM Preset banks with 128 programs each. Many of the programs in Preset 1 are not breath sensitive (for example, basses, guitars, and so on). Sending variable Velocity that corresponds to initial breath pressure is better with these voices than those that are breath based. Most of the programs in Preset 2 are breath sensitive.

You can save edited sounds in one internal bank with 64 locations. Although many of the VL70-m's parameters can be edited, it doesn't allow you to change the models or dump completely new sounds into these locations. However, one Custom bank has six programs that can be completely new, with sound models from the software editors available (for Mac and Windows) from Yamaha's Web site (www.yamaha.co.uk/synth; click on Software Downloads). This requires a huge amount of memory, which is why only six such memory locations exist.

One of the things I like best about the VL1 is that all of its memory locations are writable. In the VL70-m, Yamaha returns to its normal design philosophy of including mostly presets with some user memory locations. I suppose this reversal was necessary to keep costs down.

The VL70-m includes four effects as specified by the XG standard: Reverb, Chorus, Variation, and Distortion. The Reverb, Chorus, and Distortion effects are self-explanatory; Variation can be any one of 44 effects.

Most of my favorite breath-based emulative programs (programs that emulate acoustic wind instruments) from the VL1 are missing in the VL70-m. Many of the wind-instrument emulations in the VL70-m sound thin and electronic compared with the best VL1 counterparts (many of which also employ a single element). In particular, the saxes and brass are unconvincing, although some of the trumpets sound surprisingly good. There are a few really good emulations—for example, some of the programs with exclamation points at the end of their names—especially in the double-reeds category.

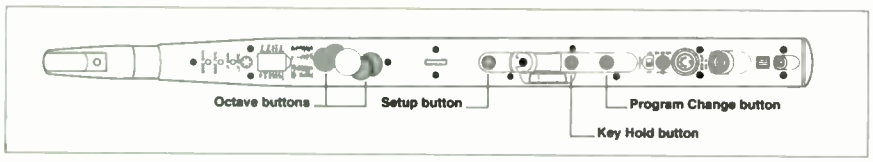
The VL70-m also has many emulative plucked-string voices, such as basses and guitars. Many of these are good, allowing wind players to effectively fill these roles (at least monophonically). However, they are not generally breath sensitive, so Velocity should not be fixed from the WX5.

In addition, some excellent synthetic sounds include hybrids of different types of acoustic instruments (for example, an oboe with a flute mouthpiece). Many of these hybrids are great fun to play.

Overall, you get a lot for your money in the VL70-m, and it's a lot easier to carry than the VL1 or VL1-m. I wish it had more user memory, especially for new sounds from the software editor, but I suppose this would increase the price. Nevertheless, the combination of a WX5 and VL70-m is a great one for any wind player who wants to add electronics to their gig bag.

VL70-m Specifications

Audio Outputs	(2) ¼" TS
Additional Ports	stereo minijack headphone output; breath-controller input; WX input; MIDI In, Out, Thru; serial port
Polyphony	1 note (monophonic)
Sound Engine	physical modeling
ROM/User RAM Programs	256/70
Effects	reverb (12 types); chorus (10 types); distortion (3 types); variation (44 types)
Dimensions	8.7" (W) x 1.8" (H) x 8.4" (D)
Weight	2.9 lbs.



COURTESY YAMAHA CORP

FIG. 2: The octave keys have been completely redesigned for the WX5. The right-thumb rocker is between the Setup and Key Hold buttons.

including the Wind Gain (one of five sensitivity settings, not to be confused with the hardware Wind Gain setting), Octave Transpose (±2 octaves), and Audition mode, which sends MIDI Note On/Off messages without breath.

The Key Hold button lets you select one of four Hold modes, in conjunction with the octave keys, and activates the selected mode while playing. Normal Hold mode sustains one note while you play other notes over it. Follow Hold mode plays a second note at a fixed, user-specified interval from the fingered note, resulting in a parallel melodic line. (Of course, these modes work only with a sound module that can play polyphonically.) Sustain mode sends a Sustain On/Off message (CC 64) each time the Key Hold button is pressed, and Portamento mode sends a Portamento On/Off message (CC 65) each time the button is pressed.

Another improvement in the WX5 is its ability to send any Program Change and Bank Select message. As with the previous models, you start by holding the Program Change button. Under this condition, the high D and D♯ keys increment and decrement the program number, respectively, and the B through E keys send Program Change numbers 0 through 9.

The low D♯ and C keys are used to specify Bank Select MSB (Most Significant Bytes; CC 0) and LSB (Least Significant Bytes; CC 32), respectively. When you hold one of these keys with the Program Change button, the B through E keys specify bank numbers. However, a Bank Select message isn't sent until you also specify a Program Change message; I wish that the WX5 would send the Bank Select message separately.

It is great to be able to send any Program change and Bank Select message right from the controller, although this procedure takes some getting used to. I especially love being able to step through programs by using the increment and decrement keys. The Program Change button also lets you change the MIDI transmit channel, reset all parameters, and send Mono/Poly On and Portamento On/Off messages in conjunction with other buttons.

HOT WIND A-BLOWIN'

I played the WX5 with a VL1-m and VL70-m in a variety of performance and recording situations. As you might expect, it blows much the same as the WX7 and WX11. The only real difference is the Slow Response mode, which feels much better and more natural than the Fast mode. I had no trouble playing fast passages in Slow mode.

As mentioned earlier, I usually play in Loose Lip mode with the sax mouthpiece. I typically use the reed to bend the pitch down by inverting the Pitch Bend curve in the sound module, at least with wind-instrument emulations. (Most acoustic wind instruments can bend the pitch downward more easily than upward.) I like to use the rocker to send General Controller 1 and 2 to invoke other sound-modifying parameters, such as Growl and Scream in the VL1-m and VL70-m. This provides a lot of immediately accessible control possibilities from the WX5.

The procedure for setting the Wind and Lip Zero points is much easier on the WX5 thanks to the LEDs, which let you know when the wind and lip sensors are at their maximum sensitivity. Setting the other parameters is also much easier than with the previous models. However, don't lose the tiny screwdriver that comes with the WX5; it's essential for adjusting the set screws and DIP switches.

Because of its larger girth, the WX5 has a more substantial feel in the hands than the WX7 and WX11. The keys feel sturdier than the WX11's, but less sturdy than those on the WX7, which has a very solid, professional feel. All the WX instruments are much easier to play with a neck strap, which leaves the right hand free to manipulate the Key Hold and Program Change buttons, as well as the rocker on the WX5 and WX7.

The manual offers documentation in three languages. Each section is only 31 pages long, but the information is surprisingly complete and well organized; I had no trouble finding any information I looked for. A reasonable index is provided, which is all too rare for user manuals in our industry.

GONE WITH THE WIND

The WX5 eliminates most of the limitations of the WX7 and WX11 and adds many useful features. In particular, I'm pleased with the Slow Response mode, fixed Velocity option, MIDI Out on the body of the instrument, and right-thumb rocker (with adjustable thumb rest), the ability to send any Program Change and Bank Select message from the instrument, and the much more flexible MIDI implementation.

For me, the only negatives are the new octave-key arrangement and the lack of an automatic power-off function. And I really wish Yamaha offered a hard case for the WX5, like the WX7's; the included soft case provides too little protection for my comfort. (According to a Yamaha rep I spoke with, the company is considering offering such a case, which is good news.) Otherwise, the WX5 is a wonderful MIDI wind controller, giving wind players just about everything they need to join the MIDI band in style.

EM *contributing editor* **Scott Wilkinson** *has been playing wind controllers for 15 years.*

YAMAHA
WX5 MIDI wind controller
$749.95

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

PROS: Slow Response mode. Fixed Velocity option. MIDI Out on the body of the instrument. Right-thumb rocker (with adjustable thumb rest). Ability to send any Program Change and Bank Select message from the instrument. Flexible MIDI implementation.
CONS: Awkward octave-key arrangement. No automatic power-off function. No low C♯ key. No hard case.

CIRCLE #443 ON READER SERVICE CARD

QUICK PICKS

TC WORKS

TC Native Bundle (Win)

By Brian Smithers

If you liked TC Works' *TC Native Essentials* (reviewed in the January 1999 **EM**), you'll love TC Native Bundle ($599; $299 upgrade from *Native Essentials*), a suite of top-shelf DirectX plug-ins. Offering the same great sound as *TC Native Essentials*, with significantly more power and flexibility, TC Native Bundle is an exceptional value for anyone operating on a slightly higher budget.

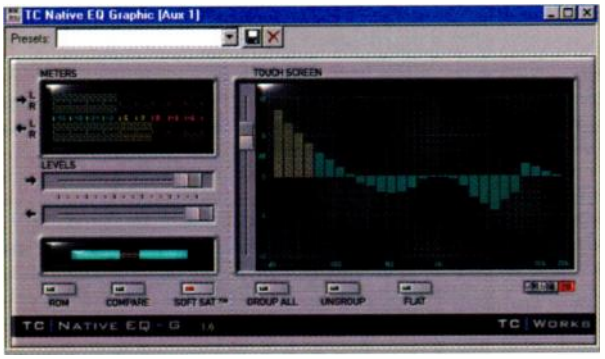


FIG. 1: TC Native Bundle's graphic equalizer features a "virtual touch screen" on which you can draw EQ curves with your mouse. The yellow bars at the lowest frequency bands have been grouped together. This powerful plug-in includes additional features such as input and output levels and metering, and TC's SoftSat soft-clipping algorithm.

Bundle of Joy

Included in the bundle are reverb, compression, and equalization. (Version 2.0, which should be available by the time you read this, includes a limiter.) Each of these tools features a well-designed interface with ample control over all the important parameters. All three include input and output metering with defeatable peak hold, intuitive displays, and a selection of usable presets.

Overall, *TC Native Reverb* sounds terrific. The sense of a real acoustic space is almost palpable: close your eyes as you adjust the various parameters, and you can feel the shape, size, and characteristics of the room changing around you. You can choose from three room shapes and nine room sizes. Decay time is variable from 0.1 to 20 seconds, and in addition to diffusion and predelay, you can control the reverb's "color," a proprietary algorithm that affects the reverb's timbre. Decays of any length die away smoothly and naturally, and I found the "color" control to be very useful.

The Native Bundle's *DeX* is a versatile and powerful compressor that provides complete control over attack, release, threshold, and ratio, and features a soft-knee curve with a variable width. A defeatable automatic makeup gain feature raises the compressed material's level so that it peaks at 0 dB, eliminating the need for normalization. As if that weren't enough, *DeX* features a de-esser, a sidechain key input for ducking, and a soft-clipping algorithm called SoftSat. The de-esser is "level independent," meaning that its threshold tracks the incoming material's level so that sibilance doesn't sneak back in during softer sections or fades.

The *EQ Works* plug-in includes a 10-band parametric equalizer and a graphic equalizer with as many as 28 bands. The parametric equalizer offers seven bands that can be configured as high-shelf, low-shelf, parametric, or notch filters, with independent control of left and right channels. An additional three bands, for treble and loudness, are controlled by an interesting virtual joystick. The graphic EQ allows you to draw the desired curve onscreen with your mouse (see **Fig. 1**). You can group bands in order to maintain their relationships as you adjust them, and a master fader enables you to scale the whole curve up or down. Both equalizers feature SoftSat.

Give Me the Works

I'd like to see a bypass button, especially on the equalizers. I also had some difficulty with TC's copy-protection scheme, which prevented me from installing the Bundle on my notebook. Still, this is a great product: it's expensive, but for the kind of power and audio quality it provides, it is a great value.

Overall EM Rating (1 through 5): 4

CIRCLE #444 ON READER SERVICE CARD

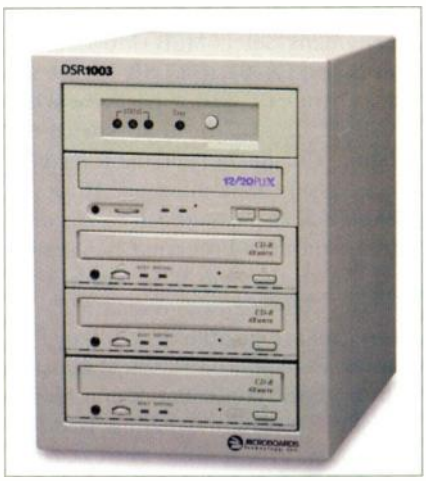
MICROBOARDS

DSR 1003

By Rudy Trubitt

I've burned a lot of CDs over the past few years—audio discs for demos, masters for replication, sound-effects libraries, multitrack song-session backups, and more. All of these discs have one thing in common: I had to burn them one at a time on my Yamaha 4x CD recorder. Recently, I've received requests from clients for dozens of copies of the same disc, but I hesitate to tie up my computer while I run off one copy at a time. Fortunately, several companies are shipping stand-alone CD duplicators that function without a computer (and I'm not talking about the new crop of dual-well CD-dubbing decks aimed at consumers). Unfortunately, however, these units require special "music-only" blank media, discs that are four to six times more expensive than regular CD-Rs.

There's a new alternative on the market: MicroBoards' DSR 1003, which burns audio CDs or CD-ROMs onto regular (inexpensive) blank CD-Rs. The DSR 1003 is about the size of a PC minitower. Its front panel contains a Plextor CD reader and houses up to three CD writers. The unit can be purchased with one ($1,695), two ($2,195), or three burners ($2,695) prein-



The DSR 1003 CD duplicator from MicroBoards burns up to three copies simultaneously on inexpensive media without tying up your computer.

For manufacturer information, please see Contact Sheet, p. 179.

stalled. If you choose not to buy a fully loaded unit, you may add more burners after the initial purchase. Bear in mind, however, that all writers must be of the same model and firmware revision, which may necessitate returning the entire unit to the manufacturer for the upgrade.

Easy Bake

Operating the unit is simple: turn it on, hit the individual eject buttons to open the reader and writer trays (no caddies required), put your master disc in the top slot, and load the writers with blank discs. Mounted above the top drive is a controller module featuring four green LEDs and one unlabeled button. Once your discs are loaded, press this button to begin the copying process. Copying happens at a speed of 4x, so an hour-long audio CD—including a little overhead—is done in around 17 minutes. When the write is complete, the DSR 1003 chirps briefly and opens the trays containing your new copies (mmm...still warm).

A SCSI connector on the rear panel allows you to connect the unit to a computer. Be aware, though, that each CD drive *and* the built-in controller occupies its own SCSI ID, so you'll need to have a pretty empty SCSI chain on your computer to avoid SCSI-ID conflicts. It's nice to have the option to connect the DSR 1003 to a computer, but the main value of the unit is as a stand-alone device. MicroBoards feels—and I agree—that the users of this device are likely "second-generation" CD-R users who already have single CD-R units connected to their computers and plan to use the DSR 1003 in order to duplicate, rather than master.

Ups and Downs

Overall, I was delighted at the ease with which the DSR 1003 allowed me to churn out copies of audio discs. I also used it to create data CD-Rs in both Mac HFS and ISO 9660 formats. The unit provides no postwrite verification for audio or data CD-Rs, but in the one instance that a copy inexplicably failed, the three resulting audio discs were obviously suspect, so I was in no danger of unwittingly passing bad discs on to a client. The only audio CDs that the unit consistently refused to duplicate were sound-effects discs that contain tracks of less than four seconds. Although the Red Book specification requires a minimum track length of four seconds, shorter tracks sometimes turn up, so I would prefer that MicroBoards be less sticky about regulations.

I do have several other quibbles. For starters, the cooling fan is noisy. Also, the user interface for status and error reporting is downright primitive: three LEDs that blink in various combinations. Mercifully, these blinking error and status codes are translated on a decal that is attached to the unit's case, saving you the trouble of digging out the manual (which is undergoing a much-needed rewrite). Finally, the rear panel includes push-button SCSI-ID selection switches that are not connected to anything. Newly manufactured units will ship without these inoperative switches, so future users will be able to change SCSI IDs by opening the case and moving jumpers on the individual drives.

Takes the Cake

Despite these minor annoyances, I readily recommend the DSR 1003 to anyone who has the client base to make this unit pay for itself. Do the math: the going rate for 25 CD-Rs from a short-run duplicating company is around $5 a disc, while blank discs can be had for about a buck apiece. If your clients need medium-sized quantities of CD-Rs (say, 25 to 200), the MicroBoards DSR 1003 will deliver the discs.

Overall EM Rating (1 through 5): 3

CIRCLE #445 ON READER SERVICE CARD

SWEETWATER SOUND

Total Stereo Session Drums

By Rob Shrock

When Sweetwater put together *Total Stereo Session Drums* (CD-ROM; $329), the idea was to assemble a stereo library of acoustic drums worthy of serious studio recording. You won't find any techno beatbox sounds or lo-fi loops on this disc. What you will find is more than 1,200 stereo samples of kicks, snares, toms, cymbals, hi-hats, and various percussion instruments in Kurzweil K2000/K2500 format, totaling over 400 MB of data.

***Total Stereo Session Drums* is a great source of drum-kit and raw percussion samples for Kurzweil users.**

Kits of All Kinds

The sounds on this disc, recorded by EM author Jim Miller, are all true-stereo, 44.1 kHz, unlooped samples, providing the full decay of each hit. Twenty kits are constructed in the Kurzweil Drum Map layout, with such names as Ballad, Funk, Fusion, Garage, Latin, Rock, Reggae, '70s, Jazz Brush 1 & 2, and so on. Four percussion kits are included: Bongos, Congas, Mega Percussion, and Roto Toms. Five GM kits are also available. The kit sizes average around 12 MB, with the largest kit weighing in at 18 MB, all using multiple samples for most instruments. (Many of the kits use ten separate hi-hat samples alone.)

The kit groupings will help you find a suitable sound palette with which to begin your work. The disc also includes a directory of raw samples that can replace or augment the sounds in the kits. Here you can load many, but not all, of the available sounds by type (snares, kicks, and so on). The documentation implies that these are all leftover samples that did not make it into the 20 kits, but that is not entirely the case. Although there are sounds in the raw sample directory that are not in any of the kits, many of the raw sounds are also duplicated in the kits. This is a good thing—I wish *all* of the kit sounds were available as raw samples. (The toms, for example, are found only in the kits.)

Super Sonics

The programming on *Total Stereo Session Drums*, by V.A.S.T. gurus Daniel Fisher and Gary Phillips, is superb. Extensive tweaking and some clever tricks (including an eight-layer keymap) have been used to make all of the samples, especially those grouped into kits, sound natural together. There are no problems with mismatched imaging, size, or frequency content between samples, as there are in many other libraries. In fact, you can easily swap any corresponding keymap without sonic compromise when auditioning various samples, except for the sounds that feature additional room

ambience. This makes it simple to loop a sequence and find the combination of drum sounds you want without having to worry about them fitting together. Programming for Velocity, sustain, mod wheel, and data sliders allows you to further control the samples and custom effects. Some hidden extras are dispersed throughout the disc, as well, but I'll leave you to find them yourself.

Of course, it's still about the sounds. Although the included percussion is not exhaustive, *Total Stereo Session Drums* delivers lots of great acoustic drum sounds, from delicate to punchy to raucous. I ran all of the kit demo sequences through a phase meter and spectrum analyzer, and the overall frequency content was balanced from 40 Hz to 20 kHz. Except for a few percussion samples, the mono compatibility was excellent across the board. *Total Stereo Session Drums* incorporates both stellar raw samples and immaculate programming into a useful library that no K2000/K2500 owner should be without.

Overall EM Rating (1 through 5): 4

CIRCLE #446 ON READER SERVICE CARD

BIG BRIAR

Moogerfooger MF-101

By Alex Artaud

Big Briar's new Moogerfooger line of inexpensive processors makes Bob Moog's engineering affordable to a new generation of musicians, and it should please the old analog aficionados in the audience, too. The first unit in the series, the MF-101 Lowpass Filter ($299), is designed with a modular aesthetic in mind. The box has a vintage look and feel, with dark, wooden sides, Minimoog-style knobs and switches, and a sleek black chassis. Although Big Briar touts the Moogerfooger's ability to be used as a stompbox, the last thing I'd want to do is put my grimy sneaker on it. It is, however, a sturdy box built to take plenty of abuse.

FIG. 1: The Moogerfooger Lowpass Filter is a voltage-controlled, variable-resonance filter that offers control of signal mix, cutoff frequency, and envelope amount.

One Mean Moogerfooger

The top panel of the MF-101 is split into three sections (see **Fig. 1**). On the right is the Filter section, with pots for adjusting the amount of resonance and the cutoff frequency between 15 Hz and 12 kHz. As you crank up the resonance, overtones are gradually boosted. At higher levels, the filter will begin to oscillate at the cutoff frequency, producing a tone that responds to your playing. Between the Cutoff and Resonance knobs is a switch

that selects between 2-pole and 4-pole filter settings. The 2-pole filter emits a brighter tone, and the 4-pole setting produces a warmer sound.

Pushing the Envelope

On the left side is the Envelope (or envelope follower) section, with Amount and Mix pots for controlling the filter's envelope. Essentially, an envelope follower allows you to play the filter; in other words, the filter's envelope responds to your input. You can switch between a smooth and fast response, depending on the effect you want. Between the Filter and Envelope sections are the Drive knob, which is always active, and three LEDs that indicate signal presence, envelope activity, and bypass status.

The back panel provides an input and output on unbalanced ¼-inch connectors, as well as a wall-wart power-supply jack. Four expression pedal inputs allow you to control key functions of the MF-101, including cutoff, resonance, mix, and the amount of envelope. An Envelope output can send a control voltage to other Moogerfooger pedals or to an analog synthesizer.

And the Sound?

The MF-101 is a powerful, intuitive unit and a knob-twiddler's delight. It sounds fantastic, with a rich tone color that can change gradually or dramatically, depending on the application. I ran analog-synth sequences through the unit while adjusting the Resonance knob to generate spacey ringing overtones. The Envelope output proved an effective link to a Minimoog, essentially turning the MF-101 into another synth module. Playing through it with a guitar, I easily captured a fluttering wah and other signature '60s sounds. My bass guitar benefited from a deep, low-end growl that I could adjust in real time with expression pedals.

I found little to complain about with the MF-101, save for picking up radio-frequency interference, which was endemic to some early units and, according to Big Briar, was easily fixed. Also, to make the MF-101 a truly performance-oriented instrument, you'll need a couple of expression pedals. The manual is a tribute to brevity, with good sample settings and advice on getting the most out of the unit. The MF-101 is one addition to my studio that won't be leaving any time soon.

Overall EM Rating (1 through 5): 4

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The K2500 series from Kurzweil utilizes the acclaimed V.A.S.T. technology for top-quality professional sound. Available in Rack mount, 76-key, and 88 weighted key keyboard configurations, these keyboards combine ROM based samples, on-board effects, V.A.S.T. synthesis technology and full sampling capabilities on some units.

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KORG

Trinity Series Music Workstations DRS

Korg's Trinity Series represents a breakthrough in sound synthesis and an incredible user interface. It's touch-screen display is like nothing else in the industry, allowing you to select and program patches with the touch of a finger. The 24MB of internal ROM are sampled using ACCESS which fully digitizes sound production from source to filter to effects. Korg's DSP based Multi Oscilator Synthesis System (MOSS) is capable of reproducing 5 different synthesis methods like Analog synthesis, Physical Modeling, and variable Phase Modulation (VPM).

FEATURES–
- 16 track, 80,000 note MIDI sequencer
- Flexible, assignable controllers
- **DRS (Digital Recording System)** features a hard disk recorder and various digital interfaces for networking a digital recording system configured with ADAT, DAT recorder and hard disk.
- 256 programs, 256 combinations
- Reads KORG sample DATA library and AKAI sample library using optional 8MB Flash ROM board

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(Digital I/F, SCSI, Hard Disk Recorder, and sample Playback/Flash ROM functions are supplied by optional upgrade boards)

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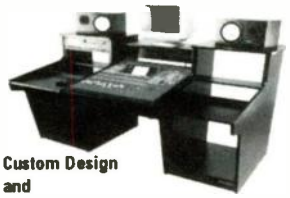

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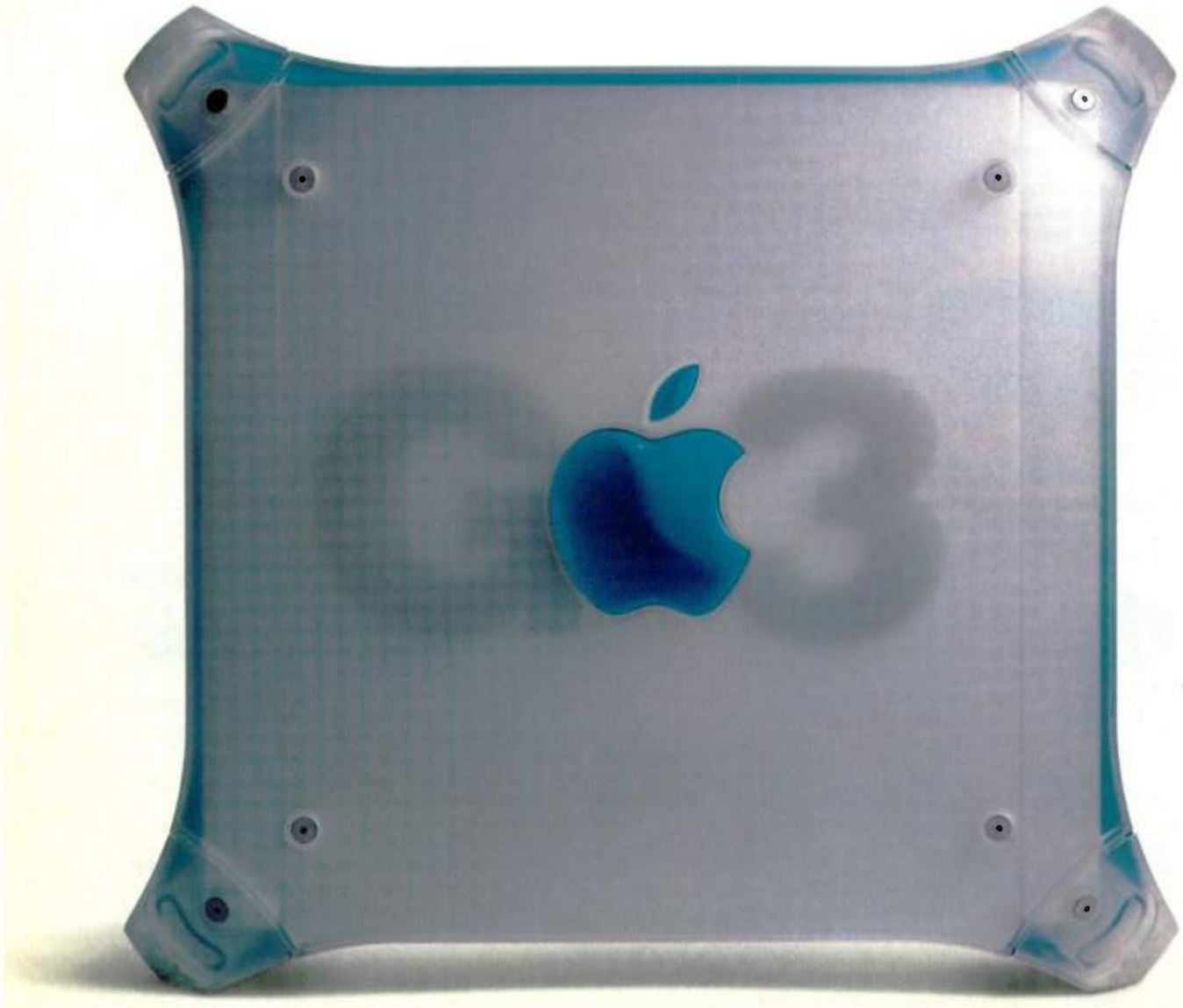

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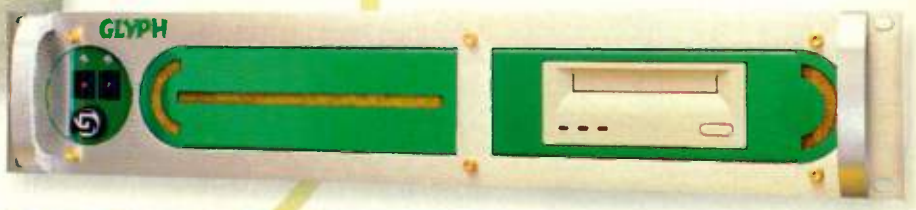

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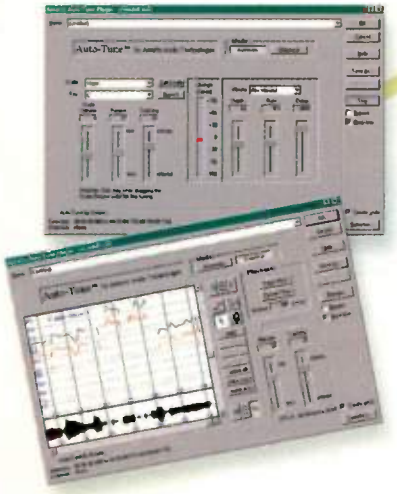

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FINAL MIX

By Larry the O

White Mice Can't Jog

I have written numerous times about the importance of tactile controllers. In fact, I was an early advocate of MIDI control for signal processors, which I accomplished by controlling effects parameters with sliders, wheels, and buttons. [Longtime **EM** readers may recall Larry the O's ground-breaking article "Digital Signal Processors in Live Performance," which was our January 1987 cover story.—*Ed.*]

Now I want to write about the importance of virtual controllers. Face it: although there are many parameters, like Volume and Pitch Bend, for which physical controllers are best, many programs offer parameters that are difficult to control with physical devices. Physical control is not always the most effective means of manipulating a large number of parameters, and time-variant parameters are often better represented graphically. The question is how best to edit these onscreen.

As computers increasingly infiltrate audio production, interface designers must try to present information in a way that is easily accessible to users who are accustomed to other working methods. One of the first lessons that sequencer and audio-editor programmers learned was to keep the tape machine–style interface, with its Record, Play, Stop, Fast Forward, and Rewind buttons. The familiarity of these controls reduces user intimidation and facilitates working faster.

Lately, this trend has been taken to its extreme in the many software plug-ins that have graphic user interfaces (GUIs) emulating the controls on analog gear. Knobs, buttons, dials, and lights offer more opportunities to endow a product with a "pretty face." Analog gear has those controls because they are efficient in the physical realm; in the virtual realm, however, many of them are as advantageous as using drag-and-drop techniques to buy window glass.

For instance, few tools are as inexact for editing as the virtual jog wheel: precision circular mouse movement is darned difficult. Even when a straightforward control such as a text box is used, the implementation is not always sensible. I've seen at least one interface with a graphic representation that could not be edited graphically and text boxes that did not allow direct text entry. Come on, now! Graphic editing is one of the greatest advantages of a GUI, and text entry is as basic as it gets.

Perhaps the ultimate example is a GUI I saw that has a tiny two-line LCD, just like a hardware box. This is ridiculous: the hardware box has such a small display only because of the cost and real estate that larger displays entail, and these considerations just aren't pressing in the world of GUIs. If I hated it on the hardware, why would I like it in software? This gives the user less control, not more.

In considering onscreen editing interfaces, I was surprised to realize that the best, most useful such interface I could think of was one of the very first created: David Zicarelli's DX7 editor for Opcode. It offers breakpoint editing, overview screens that allowed deeper editing by clicking on a graphic, text entry, dragging to scroll values, and so on. That interface is so potent that Opcode uses it, and derivations of it, to this day. Many of Zicarelli's ideas were adopted by numerous other developers and now seem standard. Certainly, there have been audio and music programs with good GUIs, but I've not seen anything that drastically improves on the Opcode editor interface, and many don't come close to it.

It's unrealistic to say, "Forget the pretty interface, give me function," because pretty faces sell. But functionality doesn't have to be compromised for the sake of glamour. An onscreen jog wheel could turn into a slider when clicked, instead of functioning the way it appears onscreen. A representation of a two-line LCD could turn into a pop-up display. What you see does not *have* to be what you get, and, in the case of some controllers, it shouldn't be.

Larry the O *is no longer a San Francisco–based musician, producer, and engineer. He is still a sound designer at LucasArts Entertainment. He's been grooving heavily on microphones lately.*

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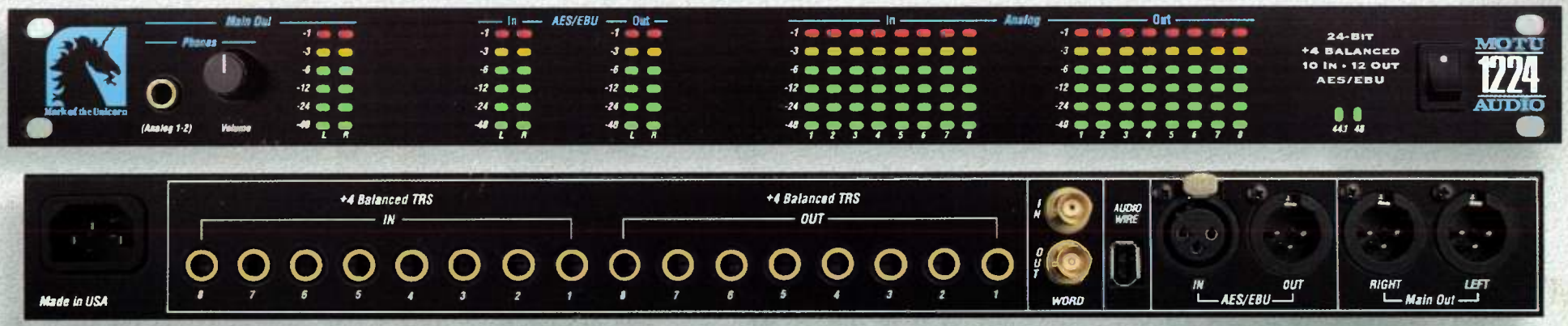

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