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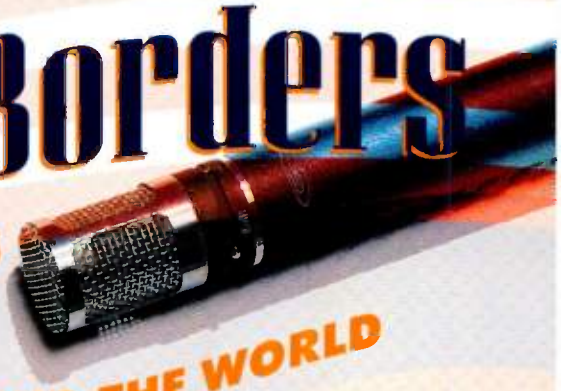
Electronic Musician

www.emusician.com

March 2000

Mics Without Borders



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WEB PAGE: Know Your e-Copyrights

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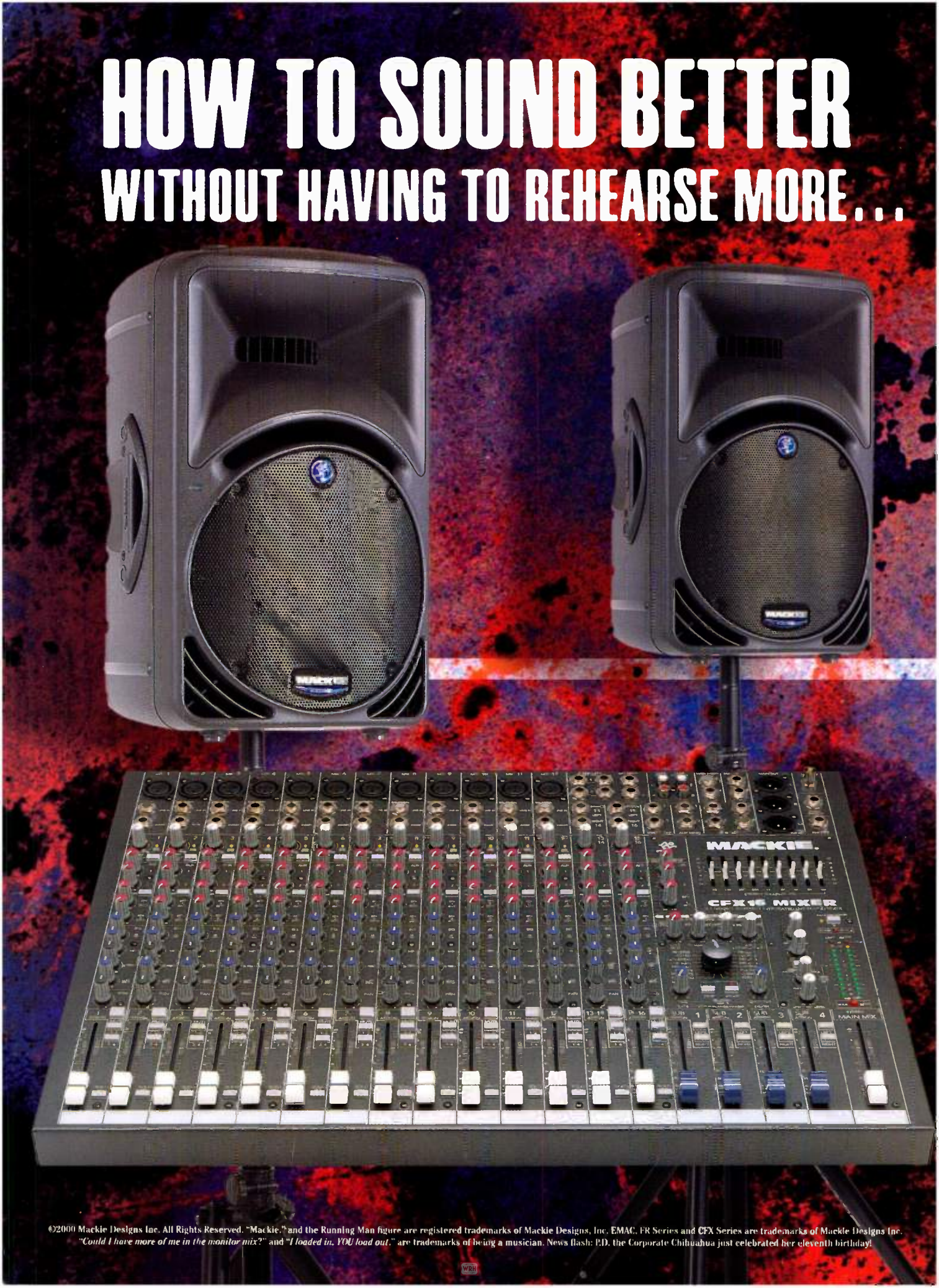

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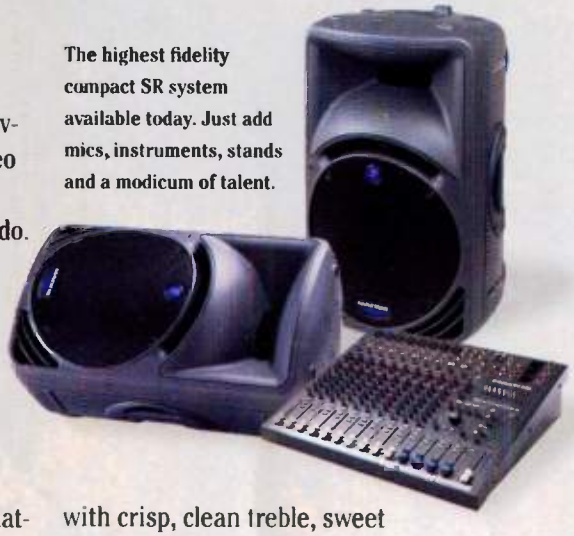
CFX Series mixers are easy for non-technoids to set up and use, yet are packed with features seasoned pros appreciate, such as 3-band EQ with sweepable midrange, variable effects parameters, and a way-cool Break Switch that mutes all channels and automatically switches to tape input (which has its own level control, no less).



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CFX•12 12 total channels • 4 buses • 8 mic/line channels • 2 stereo line-level channels • 8 channel inserts

CFX•16 16 total channels • 4 buses • 12 mic/line channels • 2 stereo line-level channels • 12 channel inserts

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The reason? Custom-transducers that we make ourselves, a unique multi-cell aperture horn design, true active servo-coupling between transducers and internal FR Series™ high-current amps...and electronic time and phase correction.

Call us or visit our web site for more info. Better yet, hear (and buy) the unbeatable CFX/SRM450 combination at your nearest Mackie dealer.

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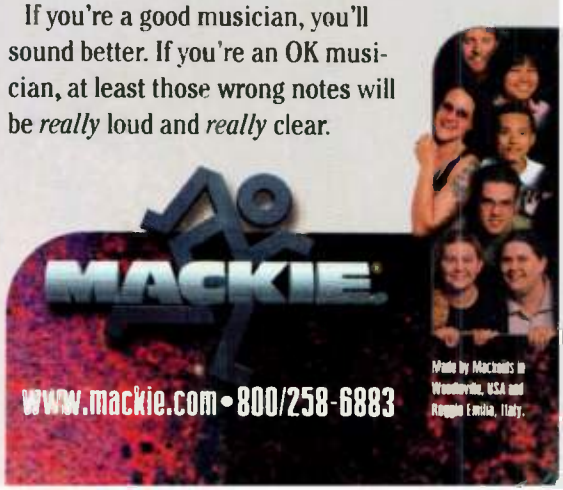

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300W + 300W Stereo
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Digital Effects Powered
Mixer

XR886

= FLS® Equipped

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600W + 600W (CS® 800S)
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Mixer

XR2012

- Three-Band EQ with Sweep Mid on Mono Channels
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- Discrete Ultra Low Noise Mic Preamps
- PFL on All Channels
- DSP Based Full "DeltaFex®" Effects Library
- 4 Auxes - 2 Monitor, 1 Effects, 1 Aux
- 2 x Nine-Band Graphic EQ with Feedback Locating System
- Mutes on Every Channel and Reverb
- DDT™ Speaker Protection

Before Peavey developed FLS®(Feedback Locating System), using graphic EQs was either educated guesswork or trial and error (mostly error). FLS lights an LED above the frequency band with feedback. To stop the feedback, just pull down the slider for that band.

Now, that's smart.

And only Peavey has it!

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- EFX send on each channel
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- Main/Monitor Mode Switch
- DDT® speaker protection
- Electronically balanced mono output

XR1204

SMART SQUAD.

XR®684

- 2x200 W @ 4 ohms, 420 W @ 8 ohms bridged power amp w/ DDT™
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- Two nine-band graphic EQ's with FLS® Feedback Locating System
- 16-bit audio, 32-bit precision DSP-based stereo reverb/delay with two parameter controls
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FLS® Equipped

16 stereo Deltafex effects

The industry standard improved!

XR®600F

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- Two nine-band graphic EQ's with FLS® Feedback Locating System
- 16-bit audio, 32-bit precision DSP-based stereo reverb/delay with two parameter controls
- Monitor send w/ main/monitor power amp mode switch

FLS® Equipped

XR®560

- FLS® Equipped Precision 7-Band Graphic EQ (patent pending)
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FEATURES

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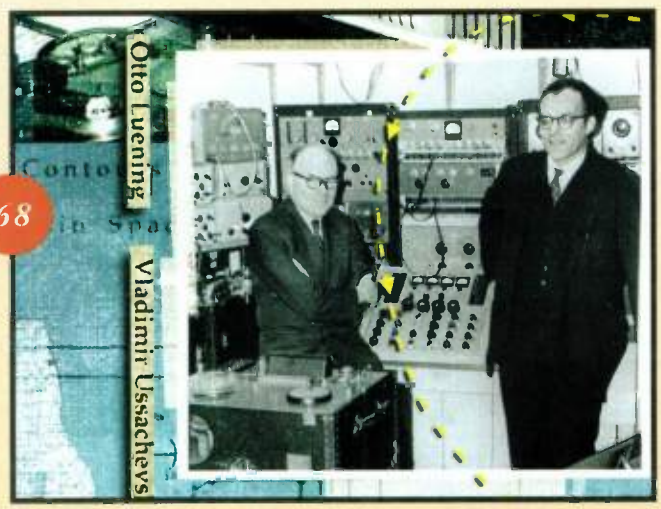

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DEPARTMENTS

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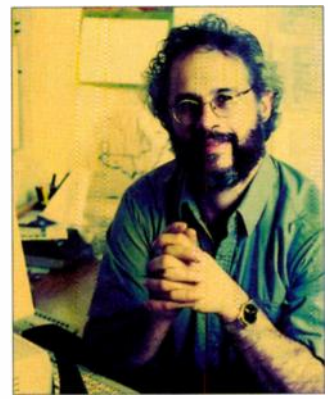
MARCH 2000 VOL. 16, NO. 3

COLUMNS

REVIEWS

Cover: Photography by Ron Miller

Keepers of the Flame


ANTHONY PIDGEON

Recently, I interviewed a job candidate who is a folk musician. When I asked whether she had ever studied music, she replied that studying music might "ruin" her as a folkie. This, of course, is not a new idea. Many people fear that once they learn advanced harmony, they won't be content to play less complex music. It's sort of like saying, "Learning to read ruins you for honest labor."

Although I take issue with her conclusions, our fearful folkie is not entirely off base. Music students (and even professionals) often fall into the elitist trap of thinking that the complex music learned in formal study (for example, classical and jazz) is inherently better or more challenging than harmonically simple folk music.

But it doesn't have to be that way if you continue to respect the music and understand that different genres call for distinct musical approaches. Learning jazz does not negate your ability to play traditional, three-chord Delta blues. And playing even the simplest music at an extremely high level is challenging. If you don't think so, try taking on B. B. King in a blues cutting contest.

I hope that as we mature as musicians, we come to understand that the goal is to make good music—music that successfully communicates beauty and emotion (or their opposites), and perhaps tells a story. Technique and theory are merely useful tools. Traditional music can be every bit as powerful and valid as any other type of music. If we remember that, we can educate ourselves and still play the old tunes in the old-fashioned way. In other words, we can play appropriately for each musical situation.

Of course, you don't need a formal education to become a superior musician. But if you really want to grow as a musician, formal music training is a great way to go. You have nothing to lose but your ignorance.

Unfortunately, American music instructors are woefully underpaid and underappreciated. These teachers and their programs need our active support and assistance. MENC: The National Association for Music Education draws attention to this worthy cause through its annual Music in Our Schools Month, which is observed throughout March. For more information on this campaign, visit MENC's Web site, www.menc.org.

There is much more we can do to help. Give your children the opportunity to learn music. Donate time and money to a music school. Mentor a less-accomplished musician, or at least take the time to patiently answer questions. Lobby your local and national politicians to support music-education programs.

Ensuring educational opportunities for our fellow musicians is an inherently good thing; it also serves our enlightened self-interest. Remember that we in the music industry are the keepers of the flame of musical knowledge, and we all bask in its warmth. Please do your part to keep the flame burning brightly.

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National Editorial, Advertising, and Business Offices
6400 Hollis St., #12, Emeryville, CA 94608
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KILLER DRUM COMPLAINTS

Nothing personal, but you can go to hell for the "Creating Killer Drum Grooves" article [in the January 2000 issue of **EM**]. It's articles and attitudes such as this that are putting musicians out of work and killing rock music.

The technology has gotten so great that people who don't know a thing about music theory, song structure, and all of the principles involved in writing music can just push a few buttons, paste some patterns together, and get a song.

Don't get me wrong. It's not that I'm opposed to technology. In fact, I'm very excited... [Text ends.]

Ray Squared
via e-mail

Ray—As you can see, I did not receive the full text of your message, but I think I get the drift. If you're going to get down on us, at least don't do it for something we never said or intended to say. (I'm amused by your opening, "Nothing personal, but you can go to hell," though. "You can go to hell" is kind of personal, after all. But I'm not offended. I know it's the article you're mad about.)

Just because we are willing to teach people how to program their drum machines better does not mean we think that drum machines are the answer to everything, that they should replace real drummers, or that they are appropriate for all music. Some music works well with a drum machine—the whole electronica/dance scene is based on them and on other electronic "grooves." Other types of music are better with a real drummer.

The **EM** *editorial staff includes three drummers (Gino Robair, Matt Gallagher, and Brian Knave), and two of our contributing editors are also drummers (George Petersen and Larry the O). I certainly don't think we are the drummer's enemy.—Steve O.*

VEGAS PRO-TEST

I appreciate the effort and expertise that go into your product reviews and annual Editor's Choice Awards. However, I was quite surprised to see the **EM** staff swayed by the *Vegas Pro* hype.

A few months ago I bought SEK'D *Samplitude 2496*. After spending two weeks with the *2496* demo, I then spent two weeks with the *Vegas* demo. I found it embarrassing that Sonic Foundry could retail *Vegas* for around the same price as *2496* with about one-third of its features. To get the same features offered in *2496* (integrated mixing, phenomenal editing features, extensive mastering features, basic MIDI, and integrated CD burning), one would have to buy not only *Vegas*, but *Sound Forge*, *CD Architect*, and a couple of Waves DirectX effects. The street price would easily be three times that of *2496*. And still no MIDI!

The 5.5 upgrade of *2496* (which missed your deadline) offers an improved track count that exceeds even that of *Vegas*. Add built-in MP3, 5.1 surround sound, and a great mixer, and you've got an incredible all-in-one program.

The only strengths that *Vegas* offers are learning ease, Internet file matching, and audio for video work. So maybe *Vegas* should have won in a category with a different name. At this point (version 1.0), *Vegas Pro* has a long way to go as an all-in-one multitrack recording software package.

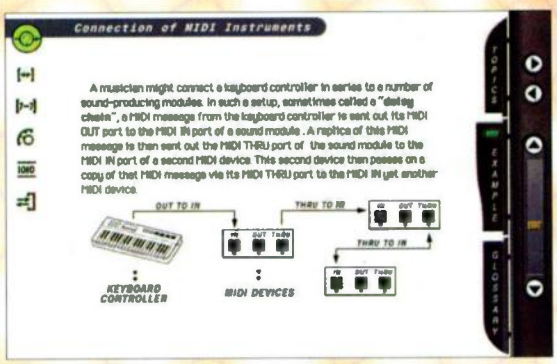
Craig Allen
via e-mail

Craig—We agree with you that Samplitude 2496 *is a powerful program, which is why we gave it last year's Editors' Choice Award. The point here is not* Samplitude 2496 *but* Vegas Pro. *As we stated in the*

WEB SITE OF THE MONTH

ELECTRONIC MUSIC INTERACTIVE

Whether you're a newcomer to the universe of electronic music or a serious tweaker, you're sure to find useful information at the University of Oregon's Electronic Music Interactive site, located at nmc.uoregon.edu/emi. Developed by the university's New Media Center, the site contains easy-to-digest explanations of topics such as synthesizers, sound waves, and MIDI systems. You'll also find 80 informative diagrams, 50 animations with sound, and 150 interactive glossary terms. The site is also easy to navigate, with three main sections: Topics, Examples, and Glossary. It's a helpful reference that's definitely bookmarkworthy. **EM** assistant editor Rick Weldon isn't going to trash his reference books any time soon, but he still thinks this site's got it going on.



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VC5 Kitchen 2-Channel EQ with "vintage" hi-tone for days $399.99

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got meek?

article, Vegas Pro *is easily the most adept multitrack editor at preparing music for the Internet on the market today. That is the number-one goal for a vast number of musicians, which is one of the main reasons we gave the program this year's award.*

It's true that Vegas Pro *doesn't have all the editing features of a dedicated stereo editor such as Sonic Foundry's* Sound Forge, *but I suspect that many people looking at* Vegas Pro *have a stereo editor already. In fact,* Vegas Pro *includes a link that connects you to an external waveform editor, so the company obviously designed the program with that in mind. Yet* Vegas Pro *has a wide range of mixing features that should be suitable for many types of music projects, and because its interface is so intuitive and well organized, many people will find it more than adequate for their needs.*

Samplitude 2496 *and its predecessors have been favorites of mine for years. But with the range of styles, venues, and uses for music today, no one program can be all things to all people. In the multimedia and Internet projects category,* Vegas Pro *is as good as they come and deserves the award.—Dennis Miller*

MANUFACTURER INPUT

At its inception, more than 500 units of the VC6Q were sold in less than two months, and another 500 units were on the way to fill back orders. During this period, only the two VC6Qs you received and one other had a failure. Unfortunately, you were one of the unlucky ones to get those units [see the Joemeek VC6Q review in the February 2000 **EM**].

So out of 500 VC6Qs shipped, three had a problem. That is about 0.45 percent, way below the acceptable level for any manufacturer. Our quality-control standards are very high, and we perform additional QC at our location in Torrance, California. Most failures are related to mishandling by freight companies, and the others to parts that test fine before shipment but then prove faulty. Most manufacturers are at the mercy of parts vendors and, yes, some parts do fail. But PMI Audio Group is committed to and proud of the service we provide in backing up every product we sell.

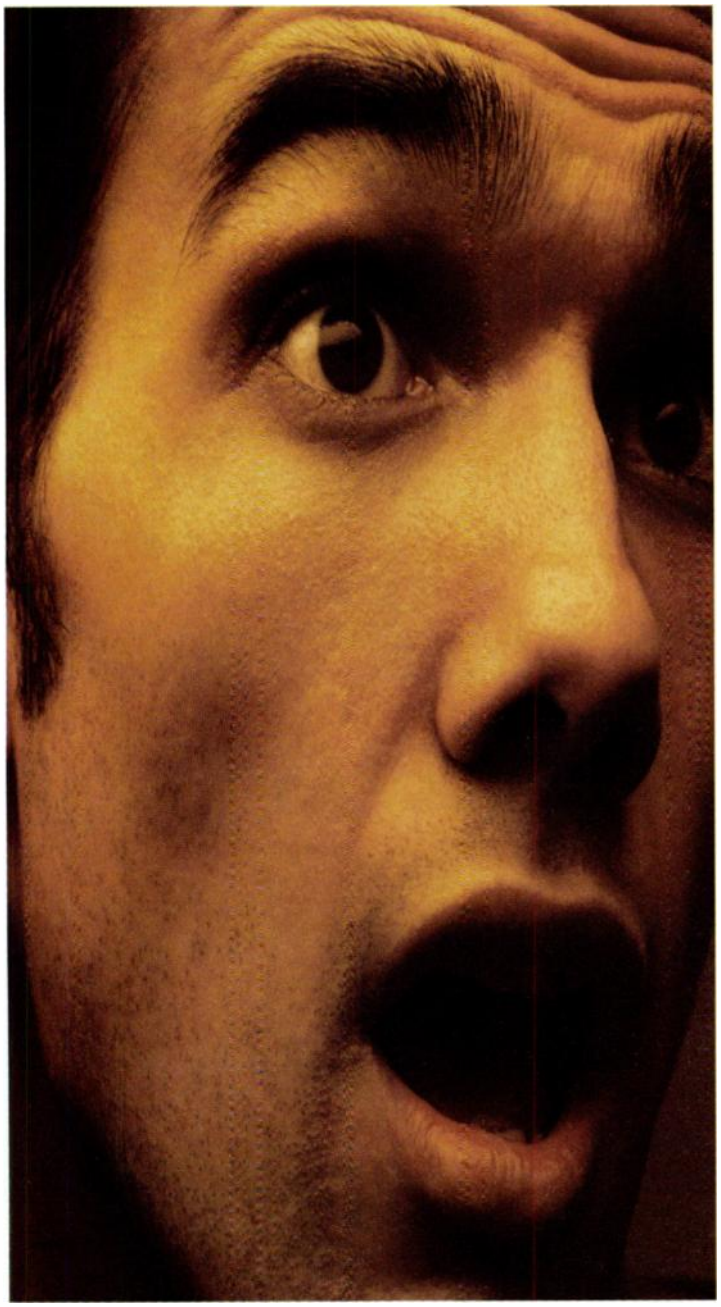
Alan Hyatt
Peninsula Marketing, Inc./
Joemeek

ERROR LOG

January 2000, "Virtual Sampling," p. 36: NemeSys's *GigaSampler* also supports DirectSound-based audio cards.

WE WELCOME YOUR FEEDBACK.

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



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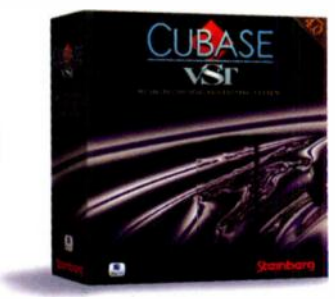
Get connected to the Cubase community at our new user site: www.cubase.net



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*Actual unit is 19" wide and will not fit in your computer drive bay.

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Tube Pre 386

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How much would you expect to pay for a mic pre with all these features? A thousand? Eight hundred? Less than six hundred? **You're getting warmer.**

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WHAT'S NEW

By Barry Cleveland and Rick Weldon

HYCD PLAY & RECORD 3.0

Play & Record 3.0 ($19.95; Win) from HyCD is a software package that allows you to record 16-bit, 44.1 kHz audio files; burn CD-Rs and CD-RWs from your computer; play back and translate between WAV, audio, and MP3 files; and integrate album graphics and lyrics into your files. The utility employs an MP3 encoder licensed from the German company Fraunhofer.

Using the FX feature, you can remove scratch and pop sounds and select from 25 preset audio effects to personalize the sound before burning a CD-R. The ID3 Tagging feature lets you tag your music with song lyrics and info about you or your band. You can also tag a link to a Web site, import your album graphics, and list the price of the song.

The software comes with True Dimensional Sound's *TDS* audio-enhancement plug-in—designed to improve the sound quality of audio and MP3 files—and with Cognicity's digital watermarking plug-in. *Play & Record* 3.0 requires a Pentium with 32 MB of RAM running Windows 95, 98, or NT. HyCD, Inc.; tel. (408) 244-7007; fax (408) 244-7077; e-mail sales@HyCD.com; Web www.HyCD.com.

ROLAND VSR-880

Roland is shipping the VSR-880 ($1,795; includes 6 GB hard drive), a 2U rack-mount version of the company's VS line of portable digital studios. The front panel of the unit follows the design of the VS-880 and VS-880EX, using the same LCD screen to show track levels, remaining record time, beats and measures, and track time. Transport buttons are the same as on the VS-880, as are the Time/Value dial, the edit buttons, and the channel-status buttons, which glow red, yellow, or green depending on a channel's current operating mode.

Like its predecessor, the VSR-880 records eight tracks of digital audio, but it has 24-bit A/D/A converters and can record up to eight 24-bit tracks simultaneously. It also adds a second bank that accommodates eight more physical tracks. In either bank, you can record and play back up to eight virtual tracks (or V-Tracks). This makes for a total of 128 available tracks, eight of which you can play simultaneously.

Other VS units offer a mixer and gain on each record channel, but the VSR-880 has two balanced ¼-inch TRS inputs on its front panel, each with adjustable gain on a single concentric knob. On the rear panel are eight line-level inputs and outputs on unbalanced RCA connectors. Stereo S/PDIF digital I/O is provided on both RCA and optical connectors.

An 8-channel R-bus digital I/O connector allows you to connect up to six VSR-880s for a maximum of 48 tracks of simultaneous recording using Roland's VM-7000 digital mixer. Roland plans to offer ADAT, Tascam, AES/EBU, and analog interfaces for the R-bus port. A 25-pin SCSI port is provided for burning CD-Rs and CD-RWs, and a new direct CD-burning mode lets you burn an audio CD without having to create an image file. Roland Corporation U.S.; tel. (323) 890-3700; fax (323) 890-3701; Web www.rolandus.com.

FOSTEX NF-1

Fostex has introduced its NF-1 passive monitors ($599 each), which employ a radical woofer-design concept. Instead of a standard, conical speaker, each woofer is shaped into a "hyperbolic paraboloid" (HP), a shape chosen for its known structural integrity.

According to Fostex, the 16 cm woofer's shape results in several improved sonic characteristics. One benefit is that the straight lines in the HP promote a more uniform diaphragm strength and faster responsiveness. The lines, because they are of different lengths, prevent the generation of standing waves. The curved areas of the diaphragm dampen resonant frequencies.

The 20 mm tweeter is made from a polyurethane film and a polyester cloth laminated together. The NF-1s use a 6 dB/octave active crossover filter centered at 12 kHz. Both tweeter and woofer are housed in die-cast aluminum frames designed to dissipate heat and further downplay potential resonant frequencies.

Fostex rates the NF-1s' frequency response at 50 Hz to 40 kHz. Fostex Corporation of America; tel. (562) 921-1112; fax (562) 802-1964; e-mail info@fostex.com; Web www.fostex.com.

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The 1224 I/O ($995) — 24-bit analog (8 ch) with 116 dB dynamic range; quality that rivals even the most expensive I/Os.

The 308 digital I/O ($695) — 24 channels of 24-bit digital, AES/EBU (8 ch), S/PDIF (8 ch), and optical S/PDIF (8 ch).

The 24i I/O ($1195) — Twenty four 24-bit analog inputs (!), switchable +4/-10, in one affordable rack space.

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RUIDOSOFT TRACKTRACKER 1.3.1

TrackTracker 1.3.1 (Mac/Win; $40), from the Spanish company Ruidosoft, provides a system for documenting, organizing, and linking all the technical and artistic information commonly generated during the recording process. *TrackTracker*'s windows let you assemble information on songs, individual tracks, and audio signal pathways.

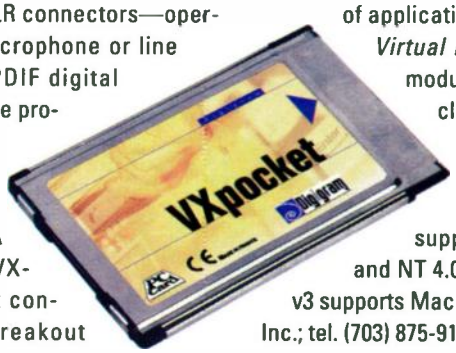
The Song List window has fields for track title and artist name, as well as other fields for notes. You can import audio tracks into the program and play them back by clicking a button in the Song List window. The Track List window lets you organize information on track names and numbers; it also has fields for recording dates, performers' names, comments, start and end times, and recording media used. You can list devices in a path sequentially in the Signal Path window, and the Process window allows you to define the number of fields to keep track of audio processors' parameter values, cable types, mic pad and filter settings, and so on.

Macintosh users will need Mac OS 7.1 or higher and at least 4 MB of RAM. PC users require an Intel-compatible CPU; Windows 95, 98, or NT; and at least 8 MB of RAM. A freeware version of the program, *TrackTracker_lite*, is also available for download at the company's Web site. The free application is identical to the full version except it lacks the ability to store parameters of the stages in the signal path. Ruidosoft; e-mail ruidosoft@ruidosoft.com; Web www.ruidosoft.com.

DIGIGRAM PCXPOCKET & VXPOCKET

Digigram has expanded its line of Type II PC cards with the release of the PCXpocket v3 ($1,500) and VXpocket ($729). The two products are designed to transform a Mac or PC laptop into a complete mobile audio workstation, letting you record up to 24-bit files at sampling rates of 8, 11.025, 16, 22.05, 24, 32, 44.1, and 48 kHz. Both of the cards are full duplex, so you can perform simultaneous recording and playback on your laptop.

The PCXpocket v3 has 24-bit A/D and D/A converters and onboard DSP. A breakout cable gives you two balanced analog inputs and two balanced analog outputs—all on XLR connectors—operating at either microphone or line level. Stereo S/PDIF digital input and output are provided on RCA connectors. The LTC sync input also uses an RCA connector. The VXpocket has 24-bit converters and a breakout connector as well, but it does not come with an LTC input.



The PCXpocket v3 and VXpocket are designed to work with a wide range of applications using Digigram's *Virtual PCX* audio-resource modules. Each product includes Microsoft WAV, Apple Sound Manager, and ASIO drivers. Both cards support Windows 95, 98, and NT 4.0, and the PCXpocket v3 supports Mac OS 8 and 9. Digigram, Inc.; tel. (703) 875-9100; fax (703) 875-9161; e-mail input@digigram.com; Web www.digigram.com.

DESTINY MEDIA CLIPSTREAM AND RADIODESTINY BROADCASTER

Destiny Media Technologies has released two Macintosh- and PC-compatible applications, *Clipstream* ($99) and *RadioDestiny Broadcaster* (free), both designed for streaming audio over the Internet. Neither program requires a special server for setting up the audio.

Destiny's *Clipstream* is a Java applet that compresses audio. End users can receive this audio from your Web site without any plug-ins or other applications. The utility detects the capabilities of the user and optimizes the bit rate to correspond with your connection speed.

RadioDestiny Broadcaster is designed to let anyone with a computer, a sound card, and an Internet connection stream compressed audio in Destiny's proprietary DNY format. If you have at least a 28.8 Kbps modem, you can listen to this audio after downloading the company's free *Destiny Media Player* (which also plays MP3 files, streaming MP3, WAV files, and audio CDs). According to the manufacturer, the audio exhibits AM-radio quality when used with 28.8 Kbps modems, and is substantially better when streamed over digital lines.

Each program requires either a Pentium 166 with Windows 95, 98, or NT, or a Power Mac running Mac OS 7.5 or higher. To run *RadioDestiny Broadcaster*, you'll need 16 MB of RAM; *Clipstream* requires 32 MB of RAM for Windows and 4 MB for the Mac. Destiny Media Technologies; tel. (604) 609-7736; fax (604) 609-0611; e-mail sales@destiny-software.com; Web www.destiny-software.com.

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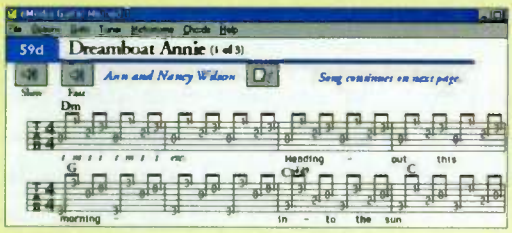
GET SMART▲▲▲▲

▼ EMEDIA

EMedia has released a new version of its *Guitar Method 1* instructional CD-ROM ($59.95). Its several new features include an animated fretboard, enhanced soundtracks, and additional



lessons. You can now read music in standard notation or guitar tablature, view the fretboard from different angles, and manipulate the program's interface.

Twenty-five new lessons and exercises show you how to read music, and some of the video lessons are given by an onscreen teacher. Other features include an automatic tuner, an audio recorder, a chord dictionary, and a metronome. All of the program's functions are accessible by shortcut keys.

More than 70 songs are represented, including such popular numbers as "Knockin' on Heaven's Door," "House of the Rising Sun," "Downtown Train," and "La Bamba." These feature bass, keyboard, and drum accompaniment parts. The program's Animated Fretboard displays a virtual guitar neck that demonstrates how the fingering for chords and notes change as the music plays. (Left-handed players can use the fretboard, too—it's reversible.) The new Fretronome feature combines a metronome with the Animated Fretboard, displaying changing notes and chords at any tempo. Sections of songs can also be looped as needed.

Guitar Method 1 requires at least an 80386 PC running Windows 3.1, 95, or 98; Mac users need a 68020 or better processor and Mac OS 7 or higher. eMedia Corporation; tel. (206) 329-5657; fax (206) 329-0235; e-mail jennya@emedia.org; Web www.emedia.org.

WIZOO

Wizoo, a German company that has made several product-specific guides as well as sample CDs, has released *Audio in Computers* ($29.95), a book that takes you on a step-by-step journey through your computer, showing you how it can help you make music. The book is formatted for everyone from beginners to advanced computer recordists.

Introductory chapters explore how a sound wave is converted into a digital file, and later chapters describe advanced techniques such as how to remedy problems caused by incorrect sampling rates. There are general-interest chapters on the advantages and drawbacks of digital technology, random-access recording, data backup, sound cards, modular digital multitracks, portable MiniDisc studios, stand-alone hard disk recorders, samplers, mixing consoles, recording and file formats, and synchronization. Chapters written for advanced users cover topics in greater depth. They include advice on dithering, using various digital audio connection formats and storage formats, overcoming latency issues, and working with word clock and time code. Still other chapters are designed to help you troubleshoot typical problems such as sync errors, incorrect sampling rates, and mixing with files that use different word lengths.

The book includes an extensive glossary and comes with a CD that offers online support. Wizoo; tel. 49-421-701-870; fax 49-421-706-435; e-mail info@wizoo.com; Web www.wizoo.com.

▶ INTERACTIVE MUSIC

You can find online guitar and piano lessons at the Net Music School (www.netmusicschool.com) hosted by Interactive Music. You get a single free introductory guitar and piano lesson; after that, $8.95 buys 12 months of unlimited lessons that remain on Interactive Music's server, accessible by password. The lessons are animated and can be viewed by downloading Macromedia's free *Flash* 4 plug-in.

The beginning guitar lessons teach you the basics of playing—describing the instrument and its accessories, how to hold the guitar, tune it, and read tablature. Later lessons cover chords, fretting, waltz rhythms, and more. You'll also learn to play such hits as "The House of the Rising Sun," "La Bamba," and "Love Me Tender."

The piano lessons show you how to sit, how to hold your arms and hands, how to read from the bass and treble clefs, how to read measures and bar lines, how to change time signatures, and more.

The Net Music School site offers several other features as well, including a guitar-chord database, advice on what to look for when buying a piano, lessons covering standard notation for guitar and piano, and tips and tricks for making practice more beneficial. Visitors can link to www.MusicTeacherFind.com, a music-teacher database run by Interactive Music that you can sort by instrument and city. The database is a free service. Interactive Music, Inc.; tel. (212) 242-2464; fax (212) 242-2805; e-mail comments@imusicinc.com; Web www.netmusicschool.com.

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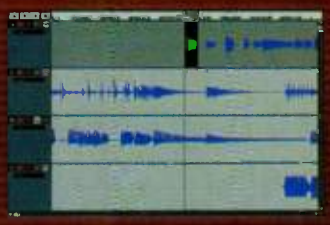

New hard disk recorders were all over the place at this fall's AES convention. A fair amount of the buzz was at the Mackie booth.

The HDR24/96 was the only recorder with built-in non-destructive graphic waveform editing. Just plug in a mouse, keyboard and SVGA monitor to view all recorder parameters on screen in real time. And enjoy complete editing control with unlimited levels of undo, drag-and-drop crossfades with 9 preset combinations plus fade/crossfade editor, DSP time compression/expansion, pitch shift and lots more.

The HDR24/96 was the only recorder that uses pull-out Ultra-DMA hard drives, so affordable that you can keep one for each project —over 90 minutes of 24-track recording time costs less than a reel of 2-inch tape!

The HDR24/96 was the only recorder with built-in 100Mbs Ethernet. And of course the only one that interfaces directly with the Digital 8 • Bus.

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KEY CHANGES

Audio Ease has released a handy application called *VST Wrapper* ($29.95). The program allows users of **MOTU**'s *Digital Performer* and *AudioDesk/2408* to use VST plug-ins exactly as they would plug-ins in MOTU's proprietary MAS format. *VST Wrapper* is designed to be invisible, and according to Audio Ease, it uses very little processing power, so there is no degradation in plug-in performance. The application is available only as a download from the company's Web site at www.audioease.com...Doug Wyatt, author of **Opcode**'s Open Music System (OMS), has posted an open letter to Henry Juszkiewicz, CEO of the **Gibson Guitar Corporation**, online at www.sonosphere.com. The letter asks Gibson to release the source code for OMS (a Mac system extension for managing MIDI devices and MIDI interapplications communication) so that developers can update it for use with upcoming Apple operating systems. OMS has been freely available since its creation in 1990 and became the property of Gibson when the company purchased Opcode in 1998. You can sign an e-mail petition about OMS at the Sonosphere site...**CreamWare** users can now find additional resources for the company's Pulsar and SCOPE systems in the Interactive Service Area at www.creamware.com. This part of the site offers direct purchase of new items such as the *STS-4000* software sampler ($198.30), *SB-404* monophonic software synth ($129.19), *ADS-16i* software drum machine ($69.10), and several others... **ConnectSound** offers online purchase of a wide variety of audio products, as well as an extensive glossary and an audio FAQ page. Use the site's ConnectSound Configurator to assemble a sound-reinforcement system optimized for a particular space. Fill out a questionnaire, and the Configurator provides a complete list of necessary components, from mixers to connectors.

APPLIED ACOUSTICS TASSMAN

Tassman (Win; $395), from Applied Acoustics Systems, is a software synthesizer with modular architecture that physically models analog-synthesizer hardware and acoustic instruments. Using a graphical interface inspired by analog hardware, you can build instruments from on-screen modules and perform real-time processing of audio files. All of the program's functions can be mapped to MIDI controllers.

Tassman's library contains more than 40 modules, including VCOs; LFOs; attack, decay, sustain, and release envelopes; filters; and distortion. There are also modules of acoustic objects—such as plates, beams, strings, membranes, tubes, flute embouchures, and reeds—whose geometric and physical properties can be adjusted. You can patch the modules together to reproduce classic synth and acoustic instrument sounds, or to create new ones. Presets include vintage analog synths by Moog, ARP, and Sequential Circuits, as well as electric pianos, flutes, and percussion instruments.

Tassman performs calculations with 32-bit floating-point resolution at 44.1 kHz, with either stereo audio or WAV file results. Its polyphony is limited only by your computer's performance. The program requires at least a Pentium 266 with 32 MB of RAM running Windows 95 or 98. Applied Acoustics Systems; tel. (514) 871-4963; fax (514) 871-4964; e-mail info@applied-acoustics.com; Web www.applied-acoustics.com.

APHEX THERMIONICS 1100

Aphex's new Thermionics division has released the 1100 ($2,495), a dual-channel tube mic preamp with 24-bit, 96 kHz A/D converters. Each channel offers a 20 dB pad, phase reverse, and 48V phantom power. Other features include a test-tone button and the MicLim circuit, which limits the input signal before preamplification to prevent digital clipping. Each channel also has a low-cut filter that provides up to 20 dB of cut, with selectable cutoff points between 30 and 195 Hz.

The Thermionics 1100's solid-state amplifier uses discrete, Class A circuitry. The signal then passes through the company's patented Reflected Plate Amplifier tube circuitry, and another set of these tubes is used at the output stage. This design discourages noise while providing tube coloration.

Input is on balanced XLR and balanced ¼-inch connectors. Analog output is on balanced ¼-inch connectors, and you can select between +4 dBu and –10 dBV operating levels. The 1100 features AES/EBU digital output on XLR connectors. You can sync from internal or external word clock using the unit's rear-panel BNC connector. You can select output sample rates of 44.1, 48, or 96 kHz.

Aphex rates the 1100's frequency response at 20 Hz to 22 kHz, dynamic range at 97 to 101 dB (depending on preamp gain setting), and equivalent input noise at –135 dB (at full gain). Aphex Systems, Ltd.; tel. (818) 767-2929; fax (818) 767-2641; e-mail sales@aphexsys.com; Web www.aphexsys.com. ●

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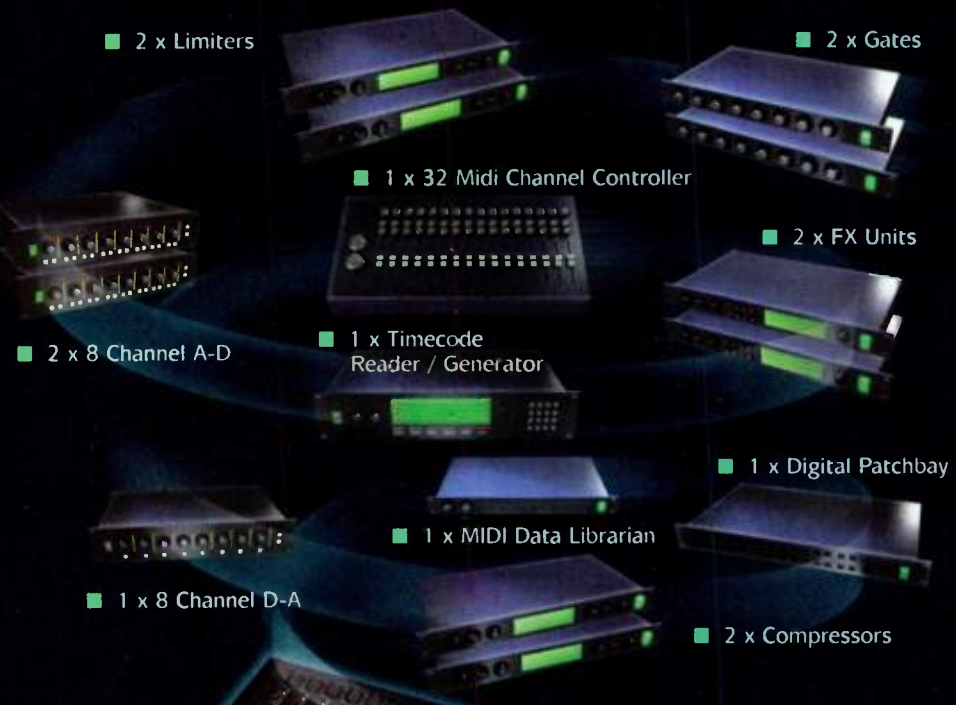

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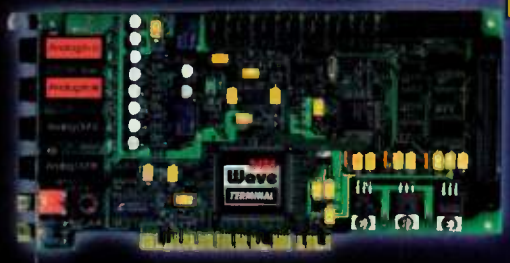

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By Scott Wilkinson

Broadband Battlefield

Many fundamental aspects of life in the 20th century, such as electricity, radio, the telephone, and computers, had their beginnings at the end of the 19th century. So it seems reasonable to imagine that the seeds of the technology that will influence society in the 21st century have been sewn over the last decade or so. One of these seeds is certainly the Internet, which will undoubtedly grow to become as ubiquitous as television and telephones are today.

The fight is on to provide the fastest Internet access.

Before that can happen, however, access to the Internet must speed up dramatically. There are several technologies aimed at bringing *broadband* (high-speed) Internet access into the home. For example, standard phone lines can accommodate digital subscriber line (DSL) technology, which carries data to the end user at up to 8 Mbps (see "Tech Page: The Need for Speed," in the March 1997 **EM**), although most affordable subscription packages provide rates of no more than 1.5 Mbps. Among other factors, the practical speed depends on your physical distance from the phone company's switching center and the type of DSL that is being used.

Cable modems use television cable connections to download data at a theoretical maximum rate of 30 Mbps, but many users experience 300 to 400 Kbps, at best, from their cable ISP. In addition, cable access is shared among all subscribers in a neighborhood, which can further reduce its effective bandwidth for each user. And with most DSL and cable modem services, uploading is typically much slower than downloading.

With current technology, the ultimate wired connection would be fiber-optic cable that reaches all the way into the home. This type of cable can carry data at 100 Mbps or faster, but it is still prohibitively expensive to equip most homes with a fiber-optic connection. As a result, cable modems employ a *hybrid fiber-coax* (HFC) system, which uses the cable company's fiber-optic backbone as a distribution conduit and standard copper coaxial cable to carry data "the last mile" into each home.

To avoid the pitfalls of wired connections, some companies are turning to wireless satellite communications. One promising possibility is the use of low Earth orbit (LEO) satellites less than 1,000 miles above the ground. Various companies are planning LEO systems with an aggregate bandwidth of 1 Gbps. However, all satellites deployed for individual use are likely to be limited only to downloading for the foreseeable future: because terrestrial transmitters remain very costly, uploading will still require some form of slower, wired connection.

Despite the advances in network access speeds, all users will face a number of practical limits. For example, most current PCs are limited to a 10 Mbps ethernet link (although this should increase to 100 Mbps or more as 100BaseT ethernet or the IEEE 1394 spec become more commonplace). Other limits include network processing times and, ultimately, the speed of light, both of which place an unavoidable boundary on download times no matter what access method is used (see **Fig. 1**).

What does all of this mean to musicians? High-quality, real-time audio will certainly be available through any broadband conduit once current speeds increase even slightly. CD stereo audio requires 1.4 Mbps, as does 5.1-channel DTS audio, while 5.1-channel Dolby Digital audio uses only 640 Kbps or less. Because of this, I fully expect to see real-time, interactive, online CD previewing and ordering in the near future.

The Internet has already become a very important medium for musicians of all persuasions. But just imagine a future in which Web access is hundreds of times faster than it is today. High-quality music will be easily available—and I suspect that we'll need it more than ever to soothe the savage breast in the social upheaval that will surely result from this quantum leap in information overload.

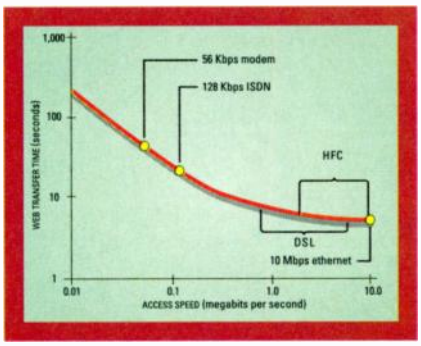

FIG. 1: Faster access speed reduces download time. However, most PCs are limited to about 10 Mbps. Even a fiber-optic connection at 100 Mbps would take about 6 seconds to download the hypothetical Web page represented in this graph because of network processing time and the ultimate limitation: the speed of light.


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ON A WING

Bats have long, leathery wings. To re-create the sound of bat wings in flight, I followed the suggestion of Foley artist Jana Vance and recorded the flapping of leather gloves. It took a bit of practice to get the gloves to sound rhythmically even and winglike. Mic choice and placement were also important; I used a Neumann TLM103 with a pop filter, about 12 inches from the source, inside my homemade isolation booth. Once I got these elements together, the recordings sounded wonderful.

I recorded single glove flaps and pairs of gloves flapping in long rhythmic streams at several different tempos. I experimented with pitch shifting and EQ, dropping the flaps two semitones and pumping up the low end slightly. Then I edited out any stumbles in the performance. At this point I had long, steady recordings of a single bat's wings. But I needed the sound of a large group of bats, so the next step was to animate these steady sounds into the "pass-by" effects of many bats fluttering past your head.

DOPPLER EMULATION

To convincingly re-create the Doppler-shifted sound of an object moving past, it is important to look at the volume, pitch, pan, and EQ elements of a sound all at once. As a sound begins far away, it is quiet and dark, often with some reverberation present. As it moves toward you from one side, the volume increases and the sound brightens up a bit. At the moment the object hits the center of the stereo field, the sound is at its loudest and brightest, and the direct sound completely overpowers any reverberance. As it moves past, heading toward the other side of the stereo spectrum, the pitch of the sound bends down about a semitone, the volume fades away, and the EQ darkens again.

All these timbral changes need to be timed correctly to make the effect convincing. Fortunately, a number of great resources are available for this purpose, including the Doppler program from volume 1 of the *GRM Tools* TDM plug-in (see **Fig. 2**) and a number of presets on the Lexicon PCM 80 effects processor. The PCM 80 algorithms were originally meant for automobile pass-bys, but I use them on all sorts of material to create a sense of motion.

To create the illusion of thousands of flying bats, I began by layering section after section of bat-flap steadies and pass-bys on top of each other in *Pro Tools*. Once I had layered about 30 tracks, I pitch-shifted many of them up or down a small amount to add variation. This gave me the sound of a small flock of bats.

But moving from a small flock to a massive group was a stumper. When I tried to add more layers, it sounded like more of the same, rather than thousands of bats. Nothing worked, until the director came up with the solution: an enormous number of wing-flapping bats push an incredible amount of air, creating wind. So I edited ferocious, blustery wind recordings to fit the motions of the bat flock (matching the amplitude envelope and playing with the brightness and pitch), and the number of bats suddenly seemed to increase.

Although the original bat flaps were good, they contained too much detail to sound like such a large number of the animals. In effect, the wind added depth and suggested the motion of thousands more bats in the background.

GAINING WEIGHT

A common technique in sound design is to increase the weight and impact of a sound by enhancing its low frequencies. Extra thuds attached to punches, bullet hits, and castle-door slams can, when used judiciously, help sell the effect and jar the audience out of their seats. In this era of subwoofer-happy theaters, home surround systems, and PC-game speaker systems, low-end impact "sweeteners" have become de rigueur. Here are some ways to add low-end punch to the sound of an impact.

EQ. Sometimes all it takes is a bit of low-shelving boost starting at about 125 Hz. If the low components are not part of the original sound, however, EQ can't do the job.

Generating synthesized subharmonics. For this, you can use processors that analyze existing material and add low-frequency subharmonics that were not previously there. The Waves *MaxxBass* and Aphex *Big Bottom Pro* plug-ins do this well, but my favorite device for this task is an inexpensive analog signal processor, the dbx 120XP Subharmonic Synthesizer (see **Fig. 3**). By making a few short dial twists, particularly when I'm using them in-line with a compressor, I have turned the filtered pink-noise output of an ancient, cheap synthesizer into the thrumming blast of a rocket jet capable of shaking the walls. I've seen the dbx 120XP in the racks of many a sound designer's studio.

NICK PECK

FIG. 1: Sound designers often find themselves in strange and unusual places. Here the author records the sound of chicken clucks near a hen house. He later transformed the recordings into bats and used them in the movie *Vampire Hunter D*.

Adding a pitch-shifted duplicate. One quick and dirty variation that sometimes works well is to make a copy of the original sound and drop it an octave or two while preserving the duration. Compress this new pitch-shifted copy, if necessary, to beef it up, then line it up as a new separate track under the original. Align the initial transients as closely as you can, while repeating the sound-design mantra, "Smeared transients equal mud!" When I'm using a pitch-shifted duplicate, I often filter out most of the mids and highs that are left in the copy to clarify the harmonics of the original.

I tend to use the Eventide H3000

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Harmonizer or the Lexicon PCM 80 with the PitchFX algorithm card for pitch-shifting, but virtually all sound-editing programs have DSP functions that do the same thing.

Low-frequency sweetener. Often the best approach is to add a different punch or thump to the original sound. This new addition, known as a sweetener, should have very little character of its own. My preference is to have virtually no frequencies above 150 Hz. The sound should be short, punchy, and generated from materials that sound similar to the effects you are trying to augment.

For example, I've created a series of body-fall enhancers by throwing myself into a sturdy carpeted wall. (Dedicated sound designers will do anything for their art.) The carpet muffled much of the high-frequency content, but I still got the general character of a body hitting a surface. I then applied a bit of Waves' *Renaissance Compressor* and some *Renaissance EQ* to roll off the highs and mids. I picked the best hits and now have a file in my library called "carpeted bodyfall LFE sweeteners" that will add punch in many projects to come.

FIG. 2: The *GRM Tools* plug-in is a good choice for creating spatial effects.

PERSPECTIVE

Sounds don't exist in a vacuum, except in science fiction movies. Any recorded sound in the real world got recorded in some type of spatial environment. Much of the time, sound designers try to record sounds as dry as possible, often in a dampened small space such as a vocal booth. This gives us maximum flexibility in adding appropriate reverberation later on. But while working with sound designer extraordinaire Ren Klyce *(Fight Club, Seven, The Game)* on the film *Being John Malkovich*, I gained a whole new perspective on the art of recording at a distance. The simple truth is that EQ and reverb can simulate only distance and room size: nothing sounds as authentic as something recorded in a room of the appropriate size, with the mics matching the camera's distance from the action.

In the film's "Malkovich Malkovich" scene, John Malkovich finds himself in a restaurant filled with clones of himself.

People are heard eating in the background, a pair of Malkoviches toast each other across the room, and so forth. I recorded the sounds of forks and knives clattering on plates, wine glasses clinking, and general body movement in a room that's approximately the size of the restaurant, with two mics recording in stereo and positioned about as far away from the sound as the camera was from the action. The results were perfect, and they worked much better than if I had recorded the sounds in a vocal booth, rolled off the top and bottom, and added reverb. Digital reverbs are wonderful, but they can never match the quality of a natural space.

Recording with distance, or in roomy environments, is useful not only for creating realism but also for concocting big, imposing sounds. Using a large stairwell with a long, gorgeous reverberation, I recorded door slams and latch clicks that captured the feeling of being locked in a big, spooky dungeon. I also used the sounds in other settings—when I needed to add weight and power to explosions (the door slams) and simulate the cocking of a menacing weapon (the latch clicks).

FIG. 3: The dbx 120XP Subharmonic Synthesizer is a powerful tool that can enhance the low end of any sound.

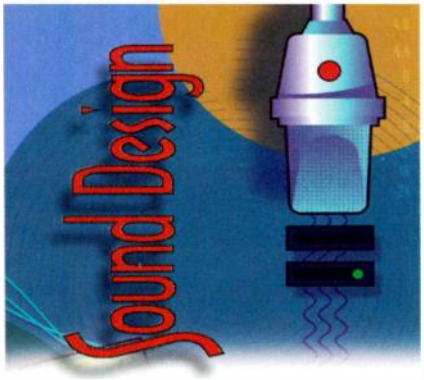
FOLEY FEST

A critical part of any convincing sound-effects track is Foley—the art of recording human movement and interactions in sync with a motion picture (see **Fig. 4**). Without it, the actors' movements seem empty and lifeless.

Foley is usually recorded on a sound stage after the picture has been filmed. An actor's movements are typically recreated in three passes: footsteps, clothing (rustling cloth, jingling keys, and so on), and prop handling (ordinary interactions with objects, such as picking up a towel and drying your hands).

Foley is a well-established practice in film making, combining with the ambient background and "hard" effects to create the effects layer. I've noticed that it often gets short shrift in game development, though. Often, the best we can expect in a game environment is four- or six-footstep samples on each of a few surfaces (usually wood floor, cement, grass, metal, and puddles). These footsteps are often cut from the same sound-effects CD libraries that everyone has, so we end up hearing the same footsteps in game after game.

I'm a proponent of taking Foley much further in games. For the LucasArts Entertainment title *Grim Fandango*, the supervising sound editor, Jeff Kliment, gave me a good deal of leeway in adding short Foley sounds. Though my equipment was not fancy, I had everything I needed: an Earthworks microphone, a quiet space in which to record, and some simple props such as Velcro, coconuts, bits of wood, bottles, coats, and keys. As a result, the game



breathes, the 3-D characters move around with much more life, and the overall experience is improved. (You can read about the music created for *Grim Fandango* in "Dance of the Dead," in the September 1999 issue of **EM**.)

A simple but effective example of Foley in *Grim Fandango* is in the management of inventory. You, playing main character Manny Calavera, choose from your currently held objects by riffling through your jacket pocket and pulling out one item at a time until you find the one you want (see **Fig. 5**). This aspect of the game was clarified and improved with Foley sounds for each type of inventory.

Each time you want to get an object in the game, the action starts with a cloth rustle as the hand goes into the jacket. As the hand comes out holding the object, there is another rustle: small if the object is small, and more cloth moving and stretching if the object is big. Finally, each object has a little sound to help identify it as it appears on the screen: crinkling paper for notes and maps, a little hollow sploosh for a bottle filled with liquid, a small gun ratchet for the dart gun, and so forth.

SOUND DESIGN IN 3-D

When I try to figure out what an individual sonic event should sound like, I like to step back and picture the entire sonic tableau. I plan out a sound within the larger audio context by thinking about how it will fit in three dimensions: frequency range, amplitude envelope or shape, and a more ephemeral dimension of timbre, aesthetics, and meaning that I like to think of as "color."

Pitch: the vertical dimension. Let's start with the frequency range. Should a sound be focused in the low end (such as the engines of a starship), the midrange (a door opening or wind blowing), or the high end (car keys jingling, glass breaking)? Should the sound fill the whole frequency spectrum? Explosions and rocket launches are built from white noise and often have low, medium, and high components. The trick is to create a niche within the frequency spectrum for your sound to inhabit uniquely.

When sounds have similar frequency content, they have a tendency to mask or interfere with one another. This problem is particularly acute in the midrange, where you have to make sure you don't mask the dialog. Low-end sounds can easily build up into a thick, muddy soup if you're not careful. And lots of high, brittle sounds mixed together are just plain irritating. For example, I've created explosions that were to be used in the same events for which the composer had written timpani hits; mixing

NICK PECK

FIG. 4: Foley artist Jana Vance creates the sound of a creaking rope bridge by kneeling into a wicker ottoman.

NICK'S 12 TIPS FOR SUCCESSFUL SOUND DESIGN

Here are my Top 12 suggestions for effective sound design. Feel free to try these ideas at home!

1. Using compression on sound effects can be a blessing or a curse. At best, it pumps up sounds and makes them beefier. At worst, it can squash the dynamic range and reduce the overall drama of the sounds. Try compression on your material to see what works.

2. Work quickly. This allows you to capture the inspiration of the moment and create sharp edges that would otherwise lose their impact through too much fussing.

3. Take all the time you need to bevel and etch each sound effect to perfection.

4. Record your own sounds. If you can't do this, borrow someone else's recordings. If you can't do either, resort to CD libraries, but layer and edit different sounds together to create something new.

5. Foley and point-source hard effects are usually mono; ambiences are always stereo. Big effects usually sound best in stereo. Interactive sound effects (games, multimedia) are nearly always mono, but lobby for stereo music and ambiences.

6. Clean up low-end mud, high-end hiss, and all buzzes, hums, ticks, and miscellaneous junk that aren't part of the sound you want.

7. Leave handles (extra sound) at the tops and tails of sounds for film, and cut sounds for games and multimedia as tightly as you possibly can.

8. Trim files so that they begin and end on zero crossings, or put tiny fades at the top and tail of each file. Be careful, though, not to disturb powerful initial transients when you add your fades.

9. Find a sound-editing package that has a fast and easy user interface, and get really good at using it. Memorize the program's macro key commands. Speed and directness are more important than features.

10. Listen to the world. Record it. Live it. But watch out for wind rumble.

11. Avoid cheesiness.

12. Be yourself.

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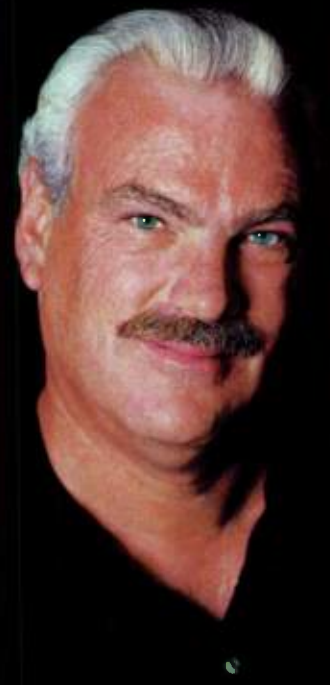

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the two elements together was a recipe for instant mud.

The best solution is to use EQ to create a space in the frequency spectrum for each element. When working on middle- or upper-register sounds, I frequently run a high-pass filter to clear out any unnecessary frequencies on the bottom. Start with a cutoff frequency of 85 Hz and increase the frequency until it audibly changes the midrange in a way you *don't* like—then dial it back a bit. We often record low rumbles without even realizing it; this EQ technique will clean them up. The goal is to leave a clear, open space for each sound to be heard.

Shape. Imagine a sound as a physical object. What does it look like? Is there a "shape"? Is the sound sharp and pointy (such as metal impacts or gunshots), jagged or crunchy (scrunching Velcro or walking on gravel), swaying and colorless (wind gusts blowing through trees), or pillowy and soft (such as filtered ocean waves)?

I like to think of the shape of a sound as being related to its amplitude characteristics. Combinations of opposing shapes, such as a soft sound and a sharp sound, work well together because it is easy for the ear to tell them apart. Shapes that are too similar are more likely to heard as a single, jumbled entity, particularly if the shapes inhabit similar frequency ranges.

Color. I think of a sound's color as involving its timbral characteristics, as well as the literal and symbolic meanings of the sound. This approach is quite personal and aesthetically oriented; as with dreams, everyone pictures sounds using symbols and colors that are meaningful to them.

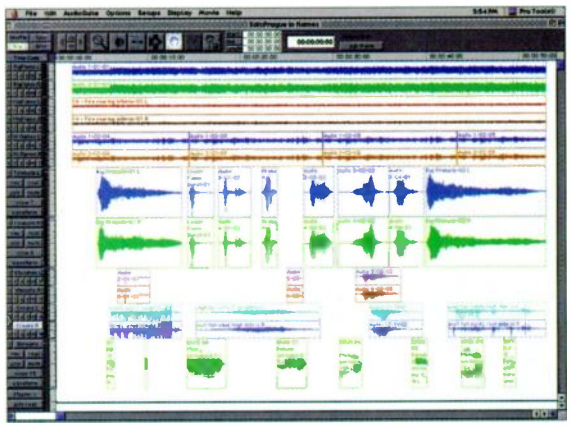

FIG. 6: The music for *Vampire: The Masquerade* (Nihilistic Software) involved a large number of overlapping audio tracks. The actual audio layout for one scene is shown here in a *Pro* Tools edit window.

LIGHT MY FIRE

As an example of this visual, three-dimensional approach to sound design, let's look at the background ambience of medieval Prague in flames that I created for Nihilistic Software's game *Vampire: The Masquerade*. I imagined the flames as long yellow and brown strips moving horizontally across the picture, with little pits and holes. The strips represented the fairly steady noise components of the sound, and the pits and holes represented the crackles and sputtering of burning wood.

I wanted the flames to sound huge, so I decided to create a full-frequency experience with them. Since these elements would have little variation in frequency or amplitude, I could fill up the frequency space without overshadowing the shorter sounds that would stand out and add variation and color (see **Fig. 6**).

The background flames consisted of three layers of pads. The first was a low, rumbling furnace, with all the highs rolled off and the lows boosted to create an earthquake-like low end. The midrange was a big roaring wood fire, and the top end was a small crackly brush fire, complete with wet sputters and spits. When mixed together, these elements created an inferno with depth and weight.

To give variation and movement to the fire, I placed the sounds of flames in motion over the steady bands of color. I did this with a series of flame "whooshes" and fireballs created by whipping a torch past a microphone as well as changing the envelopes and EQ of wood-fire samples. Although similar in timbre to the background flames, the fireballs ebb and flow from the background because of their difference in shape. The combination of sounds adds motion and excitement without appearing to be created from separate layers.

Next, I added different sounds that were not based on fire to complete the scene of a city in flames. I imagined the inferno causing huge wooden timbers and trees to burn and fall, things to break, and general chaos to erupt. I mixed deep wood creaks with some underplayed wood crashes, and added spooky, crumbly cracks and grinds to portray the chaos. (Remember that these sounds need to sit in the background. Anything too far out front would detract from the interactive elements in the foreground that are added during game play.)

For the final layer of this background scene, I added human screams to enhance the mood. I grabbed some male and female screams from previous projects, created new ones in my vocal booth, and chose a few more from CD libraries of sound effects. I wove the best ones around the wood creaks and flame bursts, roughing them into place and then fine-tuning them until all the elements came out clearly. Because the screams were meant to be far away and were not portrayed by anyone on-screen, I lowered their volume 10 to 15 dB until they were audible but not out front. I panned the voices across the stereo space to diffuse them, then added a touch of reverb to soften them further.

Once I had the final mix the way I liked it, I listened with my master fader

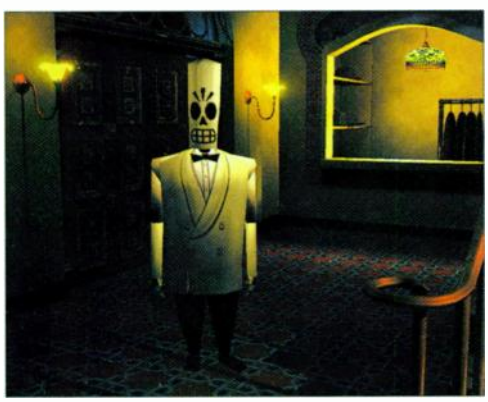

FIG. 5: *Grim Fandango*, a game produced by LucasArts Entertainment, is highly regarded for its creative audio effects. The author used many props to create realistic sounds for the actions of the main character, Manny Calavera.

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down low. When the feeling of the track met my initial image, and the screaming and wood-creaking events poked out just enough to add depth without being obtrusive, I knew the mix was done. I added a hair of *Renaissance Compressor* to bring the overall level up 2 dB, then I used the Waves *L1* limiter with a ceiling of –0.1 dB to make sure there was no digital clipping. Finally, I used the *Pro Tools* Bounce to Disc command, which created a 2-track mix of all the tracks.

DON'T FALL IN LOVE

Bear in mind that it is rare to hear the entire soundtrack (including voices and music) while you are working on the effects for a project. The music is usually being created at the same time as the effects, and final dialog is often not available either.

The big trick behind good sound design is to get enough experience doing it to know what works, then try anything anyway. When working on the sound of experiencing the world from inside of John Malkovich, I shoved a $20 Radio Shack lavalier mic up my nose and into my sinus cavity to record breathing from inside my head. The result was great—a thick, rumbly, dark sound. But since I didn't fall in love with it, I wasn't heartbroken when it ended up in the *Pro Tools* equivalent of the cutting-room floor.

Do your best to imagine where your sound will live within the final tapestry, and create the best work you can—but be ready to change or lose it at the mix. It's no fun when that happens, but it is the nature of this business. Unless you are working in a vacuum on a project where no one else has any input, it's likely that some of your work won't make the final cut. Remember, you are there to serve the director's vision of the finished product, not your ego.

Nick Peck *designs sound for films and games. He also composes and performs with the band Ten Ton Chicken. For more information, see www.tyedye.com/nick.html, or e-mail him at nick@tyedye.com.*

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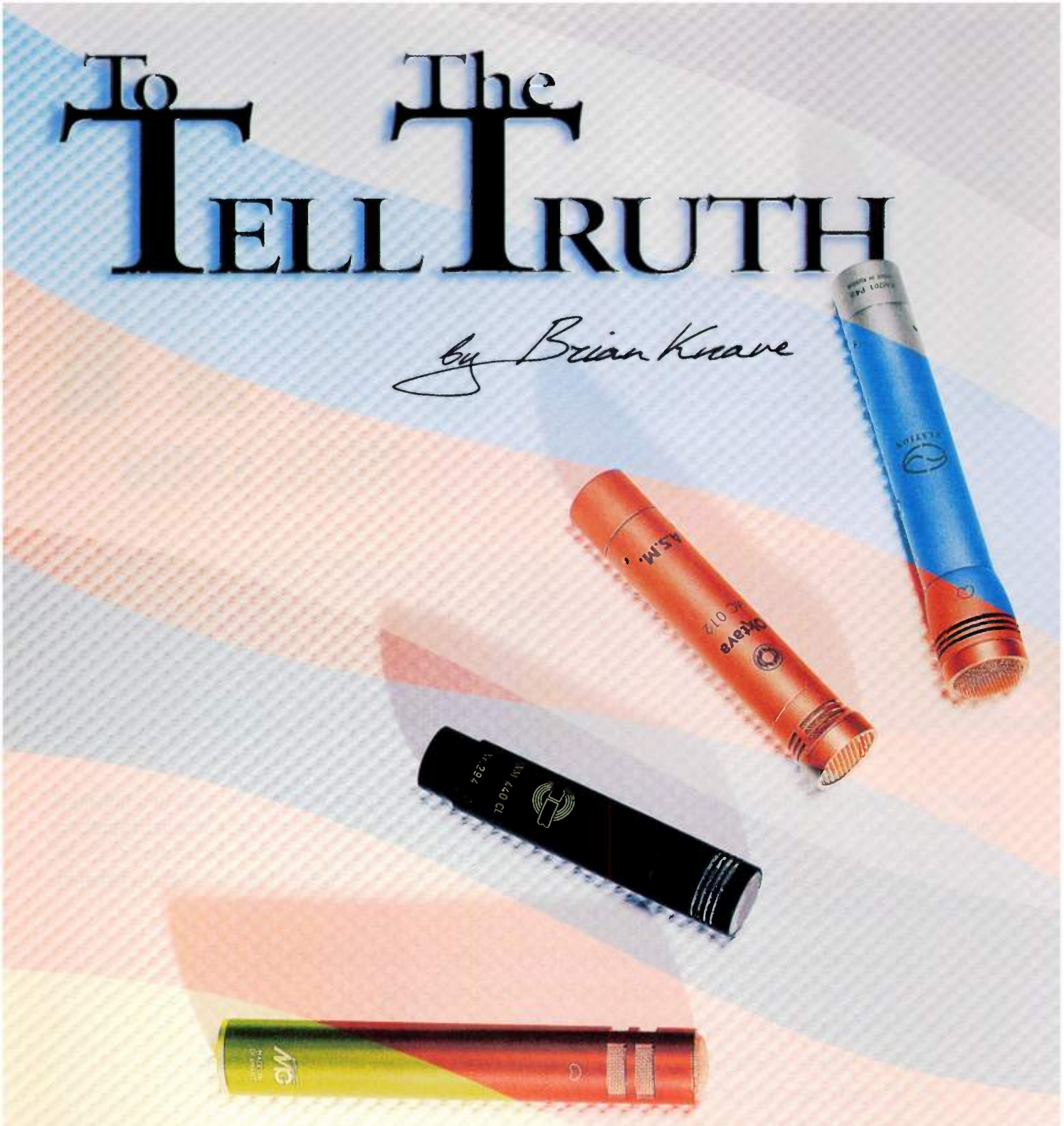
To The Tell Truth

by Brian Knave



When you need to record acoustic instruments, a pair of small-diaphragm condenser mics is all but indispensable. Large-diaphragm condensers are usually favored for vocals (among other things), but when tonal accuracy is the goal, smaller-diaphragm mics are often the better choice, thanks to the presence boosting and other coloration they typically provide. Not only do smaller-diaphragm designs generally offer a more linear frequency response, they also tend to respond more quickly and accurately to transients—a key element in conveying a sense of realism. For these reasons, small-diaphragm condensers are often designated "instrument" microphones. (They are also popular for 2-track live recording.)

Realism is also the motive behind having a matched pair of mics, which allows you to record in stereo. (For a discussion on matched pairs, see the sidebar "Match, Anyone?") With certain mic-placement techniques (for example, coincident or near-coincident), stereo miking can greatly augment the sense of realism by capturing the spatial cues—width, height, and depth—

LISTEN IN AS EIGHT AFFORDABLE SMALL-DIAPHRAGM CONDENSER MICS TAKE THE STAND—THE MIC STAND, THAT IS!

that our ears normally glean. Stereo miking can also be used simply to bolster the sound by picking up different frequency content from the source—for example, a spaced pair on an acoustic guitar, with one mic positioned near the 12th fret to capture lows from the sound hole and highs from the strings, and the other aimed at the body to pick up more woody warmth and midrange.

Clearly, for recordists looking to expand their microphone palette, a pair of small-diaphragm condenser mics are a smart buy. But the question is, as always, Which ones are the best choices? We found more than 30 models currently available—a formidable array to choose from. But some of those mics were prohibitively expensive, and others, like the venerable Shure SM81, are well-known elements (no pun intended) with which many engineers and recording musicians are already familiar. So we whittled our list down to a manageable number of models—eight—in the hope of shedding some light on these unsung transducer heroes.

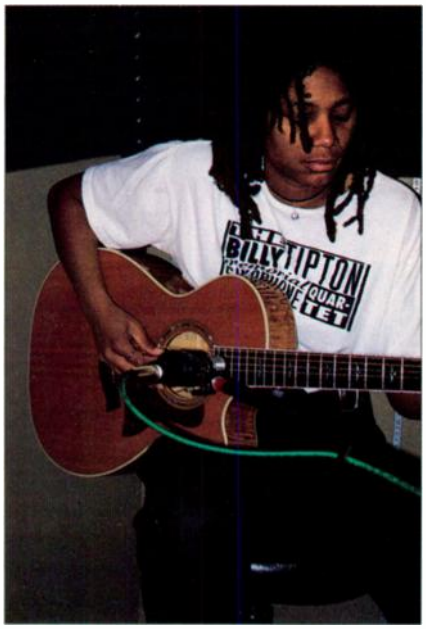
PHOTOGRAPHY BY RON MILLER

To The Truth

"IF I HAD MY CHOOSE"

With so many mics to choose from, the selection process was difficult. Fortunately, our overall mission was clear from the start. First, we wanted to focus on affordable mics, but without limiting ourselves to the cheapest available. So we set our maximum price at $600 (U.S. retail), reasoning that anything above that figure would be more than most of our readers are willing or able to spend. Nevertheless, we decided to pass (at the manufacturer's request, in some cases) on a few mics costing less than $300 each, on the grounds that such units often are fraught with compromises in materials, workmanship, or both—and are probably put together overseas by cheap labor, to boot.

Familiarity was another consideration, in the sense that we chose to focus on newer or lesser-known mics, if only for the sake of fair coverage. That means we intentionally shied away from microphones made by the big and familiar manufacturers, including AKG, Audio-Technica, Beyerdynamic, Electro-Voice, Sennheiser, Shure Brothers, and the rest. We also excluded mics that have already received coverage in **EM** (such as the Neumann KM 184 and the Crown CM-700), with one notable exception—the Earthworks SR77. We included the SR77 for a couple of reasons: one, because of its atypical design (it employs an exceptionally small diaphragm), and two, because it was our 2000 Editors' Choice for small-diaphragm condenser mic. Having given it this award, we were curious to see how the SR77, which we knew from experience to be very accurate, would compare to the other mics.



ALEX BUTKUS

FIG. 1: Shelley Doty's Taylor 612-C guitar is miked with a stereo pair of GT Electronics AM30 microphones. (The other mic is off-camera to the left.)

EAST MEETS WEST

What began to emerge at this point in the selection process was a kind of East-meets-West theme, which we found intriguing. There were three "Eastern bloc" mics: the Microtech Gefell M300 (eastern Germany), and the Elation KM201 and Oktava MC012 (both from the former Soviet Union). And three mics qualified, more or less, for a "Made in USA" designation: the AM30, from GT Electronics (a division of Alesis Corporation), the Audix SCX-one, and the Earthworks SR77.

We expanded the East-West theme a bit with the addition of two other mics we were curious about—one West German, the MBHO MBNM 440 C-L, and the other British made, the Hebden Sound CM1050C. But the question still loomed in our minds: Would there be quantifiable sonic differences between mics made in the United States (as well as the two other "free-market" nations) and those made in countries that until relatively recently were separated from the rest of the world—and its technology—by the Iron Curtain?

COMMON GROUND

Like "large diaphragm," the descriptor "small diaphragm" gets tossed around a lot but is rarely defined. Then again, maybe that's the beauty of it. Though typically used to refer to diaphragms a half-inch in diameter or smaller, the term's inexactness allowed us some latitude—in this case, to include the Microtech Gefell M300 and the GT Electronics AM30, both of which employ a ¾-inch diaphragm. (The other mics have ½-inch diaphragms except for the Earthworks SR77, at ⅜ inch.)

More important than diaphragm size, of course, is the *purpose* of the microphone. All of those tested here are intended primarily as instrument mics, which is reflected in the fact that each one is front-address (whereas large-diaphragm condensers typically are side-address). Also, most of these mics are relatively small and slender, facilitating easy positioning in tight spaces.

One of the mics tested here, the Earthworks SR77, is an "electret" style condenser (that is, it has a fixed-charge, back-plate permanently polarized capacitor); all the others are "true" condensers. The more we researched this distinction, the more we came to believe that it didn't matter for the purposes of this article. Of course, being condensers, all of these mics require standard 48V phantom power.

As for polar pattern, five of the mics are fixed-cardioid, while the others are modular in design and come with a cardioid capsule. We tested all of the mics in cardioid, which is the pattern most commonly used for the applications on which we focused.

ROAD TESTS

We requested a pair of each type of mic, which allowed us to stereo mic all sources. We tested the units in four different musical applications: two in the studio and two in a concert venue.

In the studio, we used spaced pairs to record acoustic guitar and XY-coincident pairs as drum overheads. Local up-and-comer Shelley Doty (see **Fig. 1**), who was one of the two winners in the 1999 San Francisco Lilith Fair Talent Search Contest, brought in her Taylor 612-C for the acoustic-guitar tracks and played—ten or more times in a row, and with remarkable consistency—an original Celtic-style composition titled "Young Dragons in Love." (The mics were positioned as a spaced pair in the manner described in the introduction to this article.)

For the second studio test, I played the drums, laying down a simple beat with prescribed rides, rolls, and crashes. (I made a chart first, and played to a click track.) Fills at the end of each section moved slowly from snare to toms to kick drum, an approach that allowed us to listen critically to each element of the kit. The mics were positioned in an XY-coincident pair about three feet above the kit.

We were fortunate to be able to record both grand piano (a Steinway) and choir at one of the premier jazz-performance

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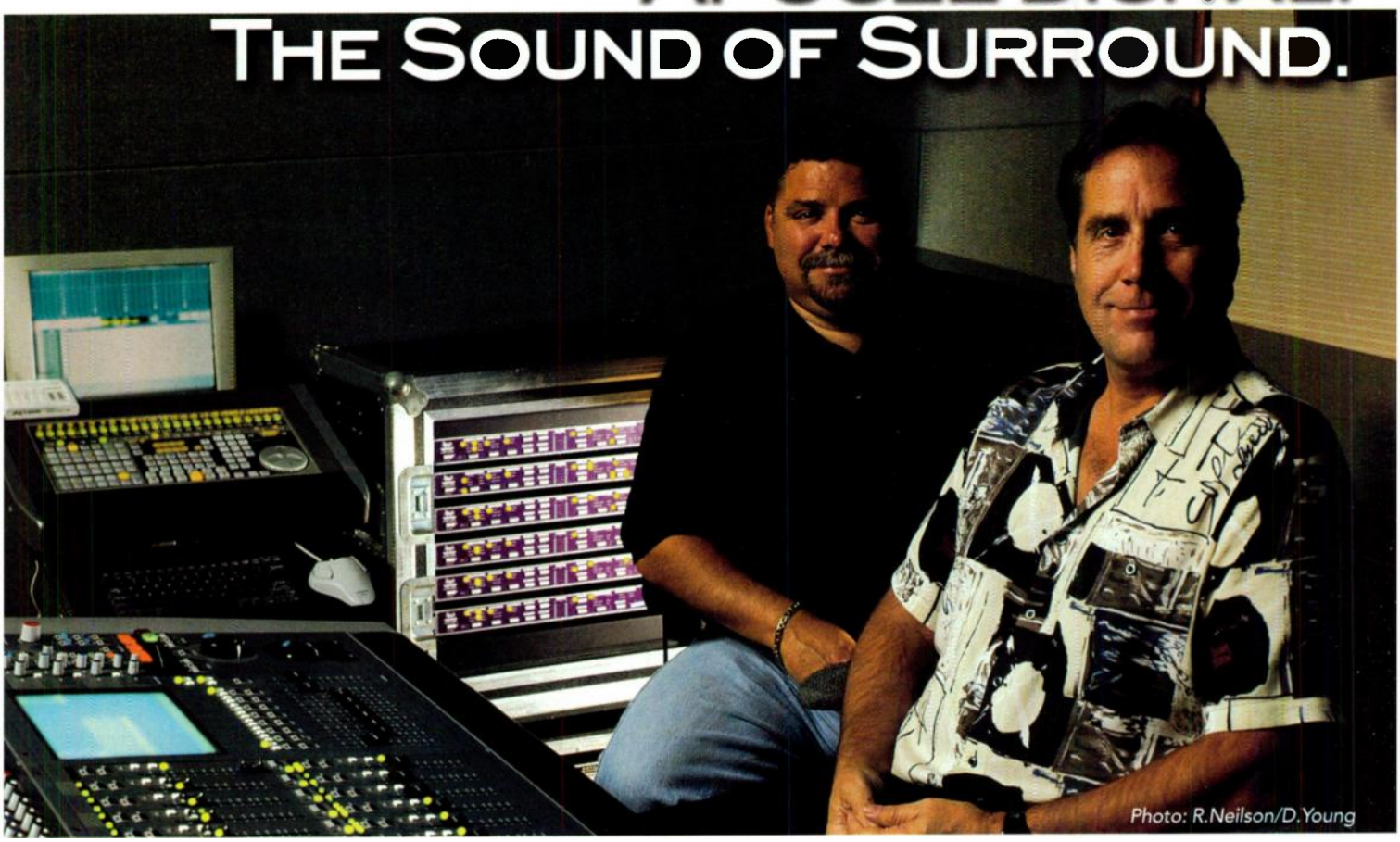

Gary Lux and Ken Caillat (right) at their Los Angeles facility.

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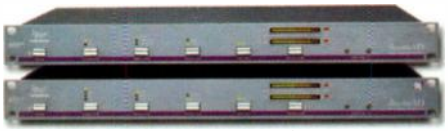

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To Tell The Truth

spaces in the country, Yoshi's Jazz House at Jack London Square in Oakland, California. The piano was played by **EM** author Peter Drescher, a veteran performer who has worked with Joe Louis Walker and the Pickle Family Circus, among others. Drescher played one of his trademark pieces, Duke Ellington's "Don't Get Around Much Anymore." After experimenting with both XY and spaced-pair miking, we settled on the spaced pair, with one mic aimed at the bass strings (at the far end of the piano) and the other positioned to capture the treble register and hammers (see **Fig. 2**).

We also had the good fortune of working with members from the Oakland Interfaith Gospel Choir—one of the finest such groups in the country. Although the full choir of 65 people wasn't available, Director Terrance Kelly kindly gathered six members of the choir's smaller (16-person) ensemble for the microphone tests. This group of four women and two men performed "Ding Dong Merrily on High," a piece that Kelly had chosen for its diverse range of voices—he doubled on falsetto soprano and bass—and its wide dynamic range. For these recordings, I had "tech support" from local musician, engineer, and bass player extraordinaire Mike Sugar, who helped greatly with setting up and tearing down, keeping tabs on tracks and levels, and so on. We tried a few different miking arrangements and found that we got the best results from an XY-coincident pair positioned above the choir and aiming downward (see **Fig. 3**).

STEVE JENNINGS

FIG. 2: A pair of Audix SCX-one mics captures Peter Drescher's performance on the Steinway Grand at Yoshi's Jazz House in Oakland, California.

DIRECT PATH

All performances were recorded direct to Alesis ADAT XT20s using BLUE (Baltic Latvian Universal Electronics) Kiwi microphone cables, stock converters on the ADATs, and BASF preformatted ADAT Master Tape. I employed a variety of mic preamps, including a Focusrite Green for the acoustic-guitar and gospel-choir tracks; an Earthworks Lab 102 for the drum-overhead tracks; and for the piano tracks, Mackie's new XDRs, which were stock on the 1202-VLZ Pro that the company kindly lent us for this review. For the recordings done at Yoshi's, I patched the returns through the 1202 and monitored on NHTPro M-00 powered monitors and Sony MDR-7506 headphones (see **Fig. 3**).

I recorded the stereo tracks side by side, keeping the same order for each instrument, for a total of 16 tracks. Great pains were taken to ensure near-equivalent levels from one pair of mics to the next (the outputs varied considerably). In addition, I fine-tuned stray levels further before critical playback.

For the listening phase, I simply brought up all 16 tracks (muted) at once, and then unmuted any stereo pair at a time for easy A/B comparisons. All listening tests were conducted on NHTPro A-20 monitors and, in some instances, on Grado Labs SR325 headphones. Naturally, all monitor channels were free of EQ and effects, and the tracks were panned identically for each stereo pair.

THE PANEL

Six people, including me, listened to and compared the final tracks. Reasoning that the musicians who played the instruments should be in on the listening, I recruited Drescher to review the piano tracks, Doty the guitar tracks, and Stev Schwartz, one of the singers from the Oakland Interfaith Gospel Choir Ensemble, the choir tracks. For help with the drum tracks, I enlisted **EM** assistant editor Rick Weldon, who is a versatile musician as well as an accomplished engineer and producer.

STEVE JENNINGS

FIG. 3: Six members of the Oakland Interfaith Gospel Choir Ensemble were kind enough to sing for the mic tests at Yoshi's. (From left to right: Kathleen Enright, Debra Bell-Sturdevant, Donalda Gilligan, LaDonna Harris-Pridgeon, Stev Schwartz, and the director, Terrance Kelly.) The author, seated, uses an XY-coincident pair of Microtech Gefell M300 mics to capture a stereo image of the performance.

I also thought it sensible to ask a complete outsider—someone who had not been involved in the recordings and who knew nothing about the various mics—to come in and listen to *all* of the tracks. That daunting task went to a local musician and producer named Keith Nelson whom I have worked with on and off for the past year and whose ears I have grown to trust. Nelson not only sings and plays bass, guitar, drums, and keyboards, but he's also a fastidious and demanding producer—all traits that made him ideal for this job.

Only I knew which mics were which during the listening tests; the other folks did their listening "blind," referring to the mics only by number (one, two, three, and so forth). I revealed the identities of the mics only after all comments were in.

People have biases, naturally, and in a subjective listening test such as this one, it's helpful to know those biases up front. Interestingly, each of the listeners expressed a preference for warm tones and lots of bass—a predilection that definitely affected judgment, and must be taken into account. Drescher, who was less than

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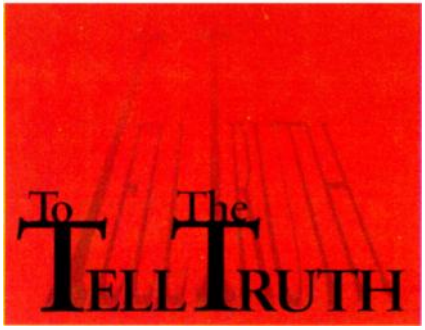


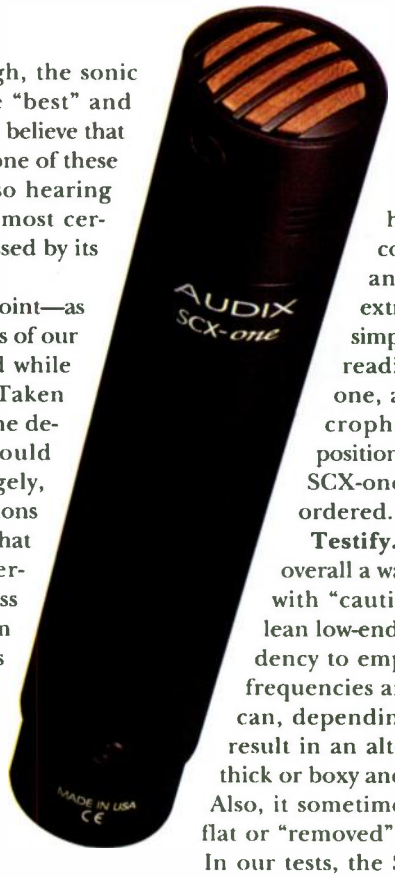
thrilled from the start with the brightness of the Steinway we recorded, said, "I prefer warmer-sounding pianos, and generally I like big, round tones and lots of bass." Nelson expressed a similar bias: "I like big bass sounds, and I tend to prefer pretty sounds over accurate ones." (Nelson's other comments also indicated an affinity for bright, crystalline highs.) Said Doty, "For this particular guitar, which tends to be somewhat midrangy due to its small body and maple back and sides, I prefer a mic that flatters the sound by adding some extra warmth and bass." Regarding the drum tracks, Weldon said, "I could always add highs and make the drums sound brighter if I wanted, so I usually wouldn't choose a mic that already does that."

THE BIGGER PICTURE

From the get-go, everybody agreed that the differences between the same-instrument tracks were, with the occasional exception, subtle. In fact, at first they sounded so similar that several of the listeners expressed dismay, wondering if they would really be up to the task of distinguishing between the minute variations in tone—not to mention the other difficult part: putting those distinctions into meaningful language! But after 10 to 20 minutes of acclimation time (the recorded performances were 2 to 4 minutes long), the listeners got their bearings and settled into critical listening mode. Beyond that, it took another 30 to 60 minutes of careful listening—per instrument—for the listeners to render considered judgments.

Everyone agreed, too, that all of the mics sounded good. As Nelson put it, "I'm sure if I went into a session and got handed any one of these mics, I'd be happy." Which is not to say that there weren't qualitative differences between the tracks, or that we had no difficulty deciding which mics we liked most or least for a given application (although there *was* the occasional toss-up). Rather, the opinions expressed by the listeners were remarkably consistent. For the most part, though, the sonic differences between the "best" and "worst" tracks were slight. I believe that if you were to put up any one of these mics by itself without also hearing the others, you would almost certainly be favorably impressed by its sound.

I urge you to keep this point—as well as the particular biases of our listening group—in mind while reading the comments. Taken out of context, many of the descriptions that follow would seem unduly harsh. Largely, that's because the distinctions are made in comparison: that is, once one sound is perceived as "warm," those less warm suddenly seem "cold." So the harshness comes in part from the dualistic nature of our language. English doesn't have the words to describe all the gradations of sound, so for this test we were pretty much stuck with a handful of antonyms (*bright* and *dark, warm* and *cold, clear* and *muddy*) and a smattering of modifiers (*slightly, ever so slightly, a tad, a bit*).



Audix SCX-one

On top of all that, there's the whole problem of trying to describe sound with words. As someone once put it, "Writing about music is like dancing about architecture." With these thoughts in mind, you may now proceed.

AUDIX SCX-ONE

Typical of small-diaphragm condensers both in shape and size, the SCX-one ($598) is distinguished by Audix's clear attention to precise construction. From the gold-plated capsule screen and XLR pins to the precision brass machining, flawless black-matte finish, and fine silk-screening, every detail bespeaks quality craftsmanship.

The SCX-one employs a transformerless design and is a modular system with interchangeable capsules that screw into place atop a spring-loaded, gold-plated contact. The SCX-c cardioid cap is stock, and three other caps are available: the SCX-hc hypercardioid ($299); the SCX-o omnidirectional ($299); and the SCX-op "omni presence" ($299), which provides a presence boost for maintaining high-frequency response when distant-miking. Another available option is an insertable 10 dB pad ($89).

The microphone comes in a sturdy, foam-fitted, hard-plastic case complete with a clip and spaces for two extra caps. The clip is simple in design, slides readily onto the SCX-one, and holds the microphone fast in any position. Matched pairs of SCX-ones can be special-ordered.

Testify. The SCX-one is overall a warm-sounding mic with "cautious" highs and a lean low-end response. Its tendency to emphasize midrange frequencies and downplay lows can, depending on the source, result in an alternately rich and thick or boxy and muddled sound. Also, it sometimes sounds slightly flat or "removed" from the source. In our tests, the SCX-one did best on acoustic guitar, for which it produced a warm, woody tone. "Definitely woody," confirmed Doty. "Not bad at all," said Nelson.

On grand piano, the SCX-one sounded warm but slightly muddy, with mild bass and a slightly dull dynamic response. Drescher described the sound as "flat, with not much presence or depth." Nelson called it "midrangy with not much top or bass, and slightly fuzzy or unclear."

As drum overheads, the pair of SCX-ones produced a slightly covered sound, with decent imaging and sufficient attack but not much tone from the toms and kick drum. Nelson described the result as "kind of lifeless." Weldon remarked that there was "plenty of attack but not much tone."

On the choir, the SCX-ones didn't capture a sense of the performance space as well as some of the other mics, and gave less low end overall. The highs were "more forgiving than with some of the brighter mics," noted Schwartz, "which helped hide our mistakes." Nelson called the sound "boxy, with a dull top end and slightly muddy, overbearing mids."

EARTHWORKS SR77

Over nine inches long and resembling an alien surgical probe more than a conventional mic, the Earthworks SR77

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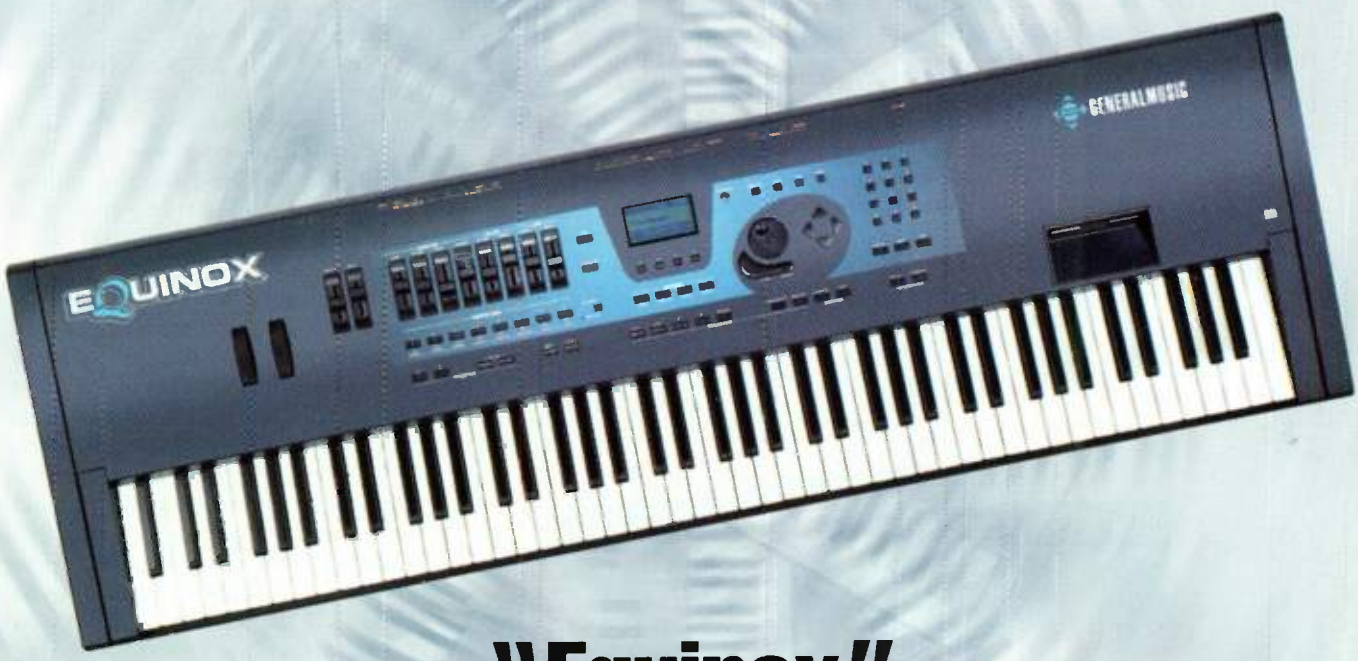

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($599) is definitely the odd man out in the looks department. But it's a handsome unit nonetheless. Machined from a solid piece of aluminum and finished in matte black, the mic's distinctive shape cuts an impressive figure in the studio or on stage.

The SR77 ships in a unique clear acrylic tube that offers excellent protection, thanks both to the ruggedness of the tube itself and to the screw-on base that provides a plastic lock-down nut for the mic. The SR77 comes with a windscreen; a high-quality nylon clip (a knockoff of the Beyerdynamic MKV 9) is included in a separate acrylic tube. A matched pair of SR77s ($1,300) in a gorgeous solid-cherry box lined with red velveteen is also available.

Testify. For the most part, the SR77 maintained its reputation for capturing realistic, uncolored sound with exceptional dynamic response. However, compared to some of the other mics' tracks, the realism was not always flattering to the source. Also, because this mic is designed to be flat at six inches, with the bass rolling off at distances greater than that—the frequency-response chart shows 100 Hz down by about 5.5 dB at a miking distance of three feet—the SR77 generally fared better on the close-miking applications (guitar and piano) than on the more distant-miked sources (drums and choir).

On acoustic guitar, the SR77 pair produced accurate-sounding tracks with sparkling highs and mild lows and low mids. Listeners disagreed about the character of the highs, with Nelson describing the top end as "really sweet" and Doty calling it "a bit boxy." As compared to the other mics, the SR77's cardioid pattern seemed fairly open, in general capturing more ambient sound. The SR77 was also the noisiest mic of the bunch, to an extent that could be problematic if the tracks were heavily compressed.

For the piano, Drescher described the sound as having "good presence—you can really hear the surrounding area," but he thought the tracks were "kind of light on the bass." Nelson was impressed by the "nice, clean highs" but also felt that "there weren't quite enough lows." Overall, he judged the tracks "clear and accurate but uninspiring."

As drum overheads, the SR77s captured a clear, bright sound with good imaging but not much low end. Weldon noted the lack of lows and described the highs as "a bit too sizzly for my tastes."

The openness of the SR77s was readily apparent with the choir, for which the mics captured lots of room sound and a realistic sense of the performance space with superior imaging. The overall sound was smooth but, again, weak in the lows. Schwartz thought that the spacious quality made the choir "seem distant," but he remarked favorably on the imaging. Tonally, he liked how the SR77s "took some of the edge off the sopranos and made the tenors sound warm." But he felt shortchanged by the weak bass

MATCH, ANYONE?

Matched pair of mics means different things to different people, including the folks who make them. Some manufacturers, for example, maintain that any mic they produce of a certain model sounds or "specs" so closely to others of that model there is no reason to specify matched pairs—essentially, they claim that any two of the mics constitute a match. Others offer, for an additional price, to put their mics through extra testing and then pair those (typically in a single box) that sound and spec the most alike. Still others offer matched pairs with consecutive serial numbers, the idea being, perhaps, that two mics made immediately one after the other (or at the same time, as the case may be) offer a greater likelihood of being sonically matched as well.

I've tested many mics in recent years, and the fact is, there were sometimes clearly audible differences between two mics of the same model, whether dynamic or condenser. (Of the few ribbon mics I've tested, this was not the case.) Therefore, for critical stereo applications, I prefer pairs that are sonically matched. As for consecutive serial numbers, that seems to me more a cosmetic concern.

Earthworks SR77

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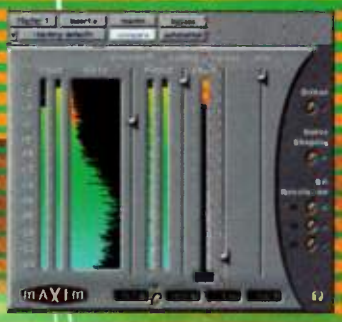

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response, which "didn't capture the resonance of our voices." Nelson declared the sound "a bit midrangy and uninspired—you can hear everybody, but there's no richness or excitement."

ELATION KM201

Made in Moscow by a private company that spun off from the venerated Nikfi research laboratory, the Elation KM201 ($399) is a standard-size small-diaphragm mic with a somewhat rough, unlacquered, matte-bronze finish and a capsule assembly that flares smoothly from the mic body. A hand-built unit with a modular design, the stock KM201 has a cardioid capsule, although hypercardioid ($175) and omnidirectional ($175) heads are also available.

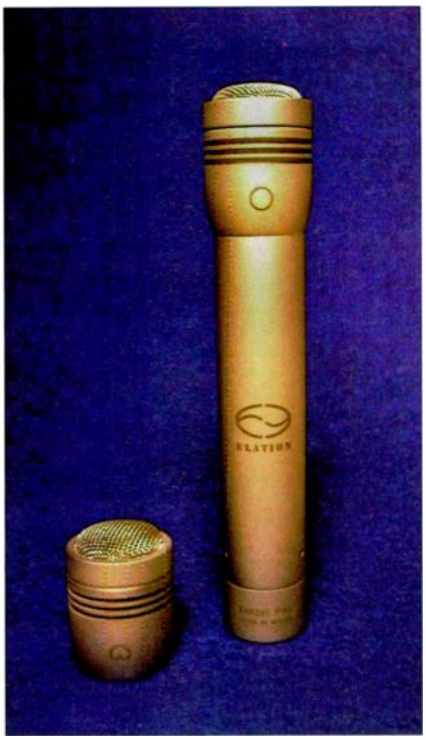
The KM201 is imported by Russian Transducer Technologies (RTT) at The Sound Room—"specialists in Russian microphones"—which repackages the mics in lovely cedar boxes (the kind you find in gift shops in the Ozarks). In the boxes I received, the foam was sloppily cut, requiring removal of the head from the body before the two pieces would fit into the box. According to RTT, however, the boxes will be fitted with new laser-cut foam by the time this article is in print.

A hardmount clip is included with each KM201. The clip looks kind of chintzy and has plastic rather than metal threads. Yet it works well, snapping easily onto the mic and holding it extremely secure: even the most vigorous shaking failed to dislodge the mic—thanks in part, it would seem, to the KM201's rough finish. Once you do remove it, though, a blackish residue from the clip remains on the mic. (According to RTT, this is easily removed with a pencil eraser.)

Testify. The KM201 has a full, rich, balanced sound that was flattering in all our applications. On acoustic guitar, the mic pair captured a tight, natural sound with good dynamic response. Although Doty detected a slight midrange emphasis, she found it complementary to the tracks. The KM201 proved to be my favorite on the acoustic guitar, was Doty's second-favorite, and was Nelson's third—an impressive showing.

The KM201 also won Drescher's approval on the grand piano (he chose it as his third-favorite). In describing the sound, he cited its "warmth and fullness," "good bass," and "smooth highs that were never harsh or tinny." Nelson, too, chose the KM201 as his third-favorite on the piano. He described the tracks as "accurate sounding" but not particularly "lively or exciting—they could have richer bass for my tastes."

As drum overheads, the KM201 pair captured a full, round sound with plenty of lows and an overall realistic and complementary tone. Imaging and dynamic response were also exceptional. Weldon picked this mic as his favorite on the drums, describing the sound as the "most all-around balanced and natural, especially on the cymbals...you can hear the body of the rack toms, and the attack is not overemphasized." Nelson also described the tracks as "realistic, with nicely balanced mids and lows," but again he thought the overall effect "a bit uninspiring," noting that "the top



Elation KM201

LISTENERS' TOP THREE PICKS

Different tastes and applications notwithstanding, the six people (including me) who listened to the test tracks consistently chose, for the most part, the same three or four mics as their favorites. We may have beaten the Communists in the Cold War, but they appear to have held their own in the small-diaphragm transducer department!

	Acoustic Guitar (Doty)	Acoustic Guitar (Nelson)	Acoustic Guitar (Knave)	Piano (Drescher)	Piano (Nelson)	Piano (Knave)	Drums (Weldon)	Drums (Nelson)	Drums (Knave)	Choir (Schwartz)	Choir (Nelson)	Choir (Knave)
First Choice	Microtech Gefell M300	Oktava MC012	Elation KM201	Hebden Sound CM1050C	Hebden Sound CM1050C	Microtech Gefell M300	Elation KM201	Oktava MC012	Oktava MC012	Oktava MC012	Oktava MC012	Microtech Gefell M300
Second Choice	Elation KM201	Microtech Gefell M300	Oktava MC012	Microtech Gefell M300	Microtech Gefell M300	Hebden Sound CM1050C	Oktava MC012	Microtech Gefell M300	Elation KM201	Elation KM201	Microtech Gefell M300	Oktava MC012
Third Choice	Oktava MC012	Elation KM201	Microtech Gefell M300	Elation KM201	Elation KM201	Elation KM201	Microtech Gefell M300	GT Electronics AM30	Microtech Gefell M300	Microtech Gefell M300	Elation KM201	Elation KM201

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Press comments

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JUST LISTEN.

end is somewhat dull—the cymbals aren't as clear and ringing as I like."

For the choral group, Schwartz chose the KM201 as his second-favorite of the lot. "This one really sounds good!" he said, describing the sound as "really balanced—you can hear everyone equally well, yet the overall sound is smooth and doesn't come at you too sharp or brittle." He did note, however, what seemed to him a "slight bit of compression—but it works." Both Nelson and I chose the KM201 as our third-favorite mic in this application. We were equally impressed by its balanced tone, smooth highs, good imaging, and realistic sense of space.

GT ELECTRONICS AM30

The largest and heftiest of the mics we tested—it's over seven inches long, more than an inch in diameter, and weighs three-quarters of a pound—the GT Electronics AM30 ($499) is a handsome unit with a black-matte body topped by a stainless-steel screen assembly that screws off to reveal the stock C1 cardioid capsule mounted above a spring-loaded, gold-plated contact. The capsule in turn screws off to accommodate the interchangeable C2 (supercardioid) and C3 (omnidirectional) capsules, optionally available for $129 each.

The AM30 employs Class A FET (Field Effect Transistor) preamp circuitry and provides both a 15 dB pad and an 80 Hz roll-off filter. The steel switches for the pad and filter, located beneath the screen assembly, are easily accessed and have a sturdy, reliable feel.

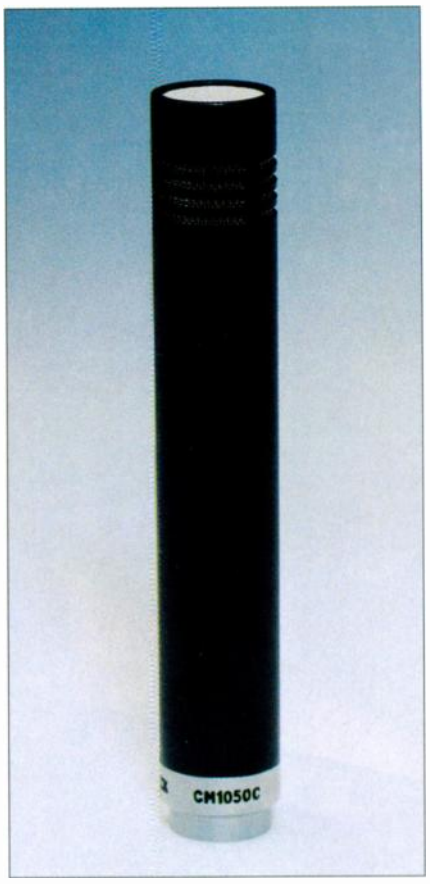
The AM30 comes in a rugged, lockable, foam-fitted hard-shell case complete with a satin drawstring bag (for the mic) and a key for the lock. A hardmount clip is included, and an optional shock-mount (which I also tested) is available for $49.95. Both the clip and shock-mount are perfectly fitted to the mic, and each provides a handy wing-nut release for easy swivel positioning. I especially liked the shock-mount, a hardy steel-tube design with beefy elastics for suspending the mic. It is as quick and easy to use as the clip, and both accessories hold the mic securely at any angle.

Testify. The AM30 has a bright, sparkly, very detailed sound that is quick to impress. However, the mic's surfeit of highs and lean midrange response sometimes result in a thin, edgy sound. The acoustic guitar tracks sounded bright and "in your face," with cutting highs, slightly scooped mids, and mild bass. Doty described the result as "bright and thin." Nelson called it "nice and clear on top, but a bit thin overall" and suggested that the mic would be more appropriate for "fingerpicking and Spanish-style guitar" rather than "solo chordal stuff."

On the grand piano, the AM30 was again bright, with excellent clarity and good dynamic response. Drescher described the sound as "stingy on bass, with a tinny, kind of crackly high end." Nelson thought the tracks had "mostly highs and upper mids, with not much fullness or bottom."

As drum overheads, the AM30s captured excellent attack from the drums and cymbals, making for a lively sound. But overall the drum tracks were a bit brittle and lacking in warmth for my tastes—and that was with wood-tipped sticks on dark, hand-hammered cymbals. Weldon described the sound as "okay, with lots of highs," but noted that he "couldn't hear *into* the drums" as well as he could with some of the other mics.

On the choir, the AM30s produced a big, bright sound with amazing clarity: we could hear every detail, including lip smacks and the rustle of robes. Schwartz commented that this mic "stuck out more than the others" and that "there was no mistaking what each singer was doing, as if each one had a separate mic...you can really zero in on each vocal part." This, he thought, would make the AM30 well suited "for a bunch of individual stars," adding, however, that "for a group like the Statler Brothers, where you want more of a blend, the AM30s would not be my first choice." Nelson described the tracks as sounding "very clear and precise but lacking a bit in warmth and low end."



Hebden Sound CM1050C

HEBDEN SOUND CM1050C

Hebden Sound is a new microphone company that picked up where the original company, Calrec, left off. (The resurrected Calrec does not manufacture microphones.) Undertaking maintenance and repair of the original Calrec microphone range, as well as continuing to manufacture the mics, Hebden Sound offers seven microphone models—all essentially variations on the same model—including both modular and fixed-pattern designs.

The CM1050C ($369) is the fixed-cardioid model and is the least expensive of the Hebden Sound line. Slightly bigger than most of the mics in this review,

GT Electronics AM30

it has a plain, brass-tube body with a matte-black finish and a stainless-steel screen protecting the capsule. The CM1050C employs a transformer-based preamp (a transformerless version is available for the same price) and is one of the two mics in our test sample to use an aluminum-coated diaphragm rather than the usual gold-sputtered Mylar.

The mic comes in a nice foam-lined, soft-shell vinyl case that zips shut. A high-quality nylon clip (the same knockoff of the Beyerdynamic MKV 9 that comes with the Earthworks SR77) is included; however, there's no room for the clip in the mic case.

Testify. With its tight cardioid pattern, deep lows, scooped mids, and bright yet smooth highs, the CM1050C proved the most distinctive-sounding mic of the bunch. Opinions were divided, but everyone was quickly able to pick this microphone out from the others during the blind listening tests. The CM1050C's performance was distinctive, too: while it worked exceptionally well on some sources, it was barely passable on others. This unit was also the least hot of the eight mics, requiring up to 18 dB more gain to match most of the others' outputs.

The CM1050C performed most impressively on the grand piano, and was both Drescher's and Nelson's favorite in this application. "This mic picked up more bass detail than any of the other mics," said Drescher. "I could really feel the soundboard, making it clear that it was a grand piano. And the highs were very articulate without being harsh. Overall, a very smooth sound." In Nelson's words, "Although this mic doesn't represent the midrange as well as some of the other mics, you don't miss it because the overall sound is so big, lifelike, and pleasing. I feel like I'm sitting right next to the piano! This mic can really handle the low notes and the big chords."

Nelson was also impressed by how "live" the CM1050C sounded on the guitar tracks, and maintained that "this is the kind of mic I'd always want around." However, in this application he felt that "the mids were missing and the top end was a bit scratchy." Nor was Doty enthusiastic about how the CM1050C portrayed her guitar. "It sounds notched," she said, "with high highs and low lows but not much in between. It almost sounds more like a banjo than a guitar."

The CM1050C pair also sounded unbalanced as drum overheads, boosting the highs and lows so much that they began to irritate after continued listening—the highs because they were so piercing and the lows due to a strange resonance that sounded like a phase problem. "Where did the mids go?" asked Weldon when the CM1050C tracks came up. "Every sound on the kit is represented by high and low content only." Nelson, who described the sound as "way too resonant, with sloppy, boomy lows," added that "unless you really rolled off the bass, it would be hard to use these mics as drum overheads because the low frequencies are so out of control."

The CM1050Cs made a better show with the choir, where the rich bass they delivered proved agreeable both to Nelson ("Way cool") and to Schwartz, who liked how the mics punched up the two male voices in the mix. I found the bass a bit over the top, and somewhat processed sounding. But the bigger problem was the lack of midrange content and overly soft, mellow tone. Tonal imbalances aside, though, Nelson felt strongly that the voices "sounded real rather than recorded, like they're here in the room with us."

MBHO MBNM 440 C-L

Like most things German, the MBHO MBNM 440 C-L ($341) boasts first-rate workmanship and attention to detail. One of the smallest mics we tested, it has a short brass body with a matte-black finish; a fine-mesh, stainless-steel screen protecting the capsule; and gold-plated XLR pins. One distinctive feature is that the mic provides automatic current switching between 48 and 22 volts, allowing for optional battery-powered operation.

The 440 C-L can be ordered in matched pairs, and the two I received came together (with consecutive serial numbers) in a black-vinyl-covered, foam-fitted hardboard box complete with two mic clips—a quite handsome and compact little package that any concert "taper" would appreciate. The clips are small and simple, but they work great. They provide a wing-nut release for easy swivel positioning, hold the mics securely in any position, and snap on and off with ease.

Testify. The MBNM 440 C-L is a very bright, present-sounding mic with lean lows and a tendency to minimize the sense of ambient space. Interestingly, it made all the sources in our tests seem closer than they did with the other mics. Also, like the Hebden Sound CM1050C, the 440 C-L required considerably more gain than the other six mics (although not quite as much as with the CM1050C).

The 440 C-L's tonal persuasion was most flattering to acoustic guitar, where it captured a sparkly, jangly sound with decent dynamics. "I like it a lot," said Doty. "Not bad," said Nelson. In my estimation, acoustic-guitar tracks captured by the 440 C-L would work best in a busy mix, of which too much low and low-mid content would only get in the way. For solo acoustic, though, the sound was a bit thin.

Not surprisingly, the 440 C-L captured bright, clear highs but not enough bass from the grand piano. Drescher liked "the high-end presence, despite a bit of edginess"; however, he felt that the highs "broke up a bit on the hard hits." He also bemoaned the 440 C-L's providing "no sense of size—it makes the piano sound more like an upright than a grand." Nelson also appreciated the clarity of the highs but felt that the sound wasn't "warm or round enough" and that the "bottom end just isn't happening."

The drum tracks followed suit: very

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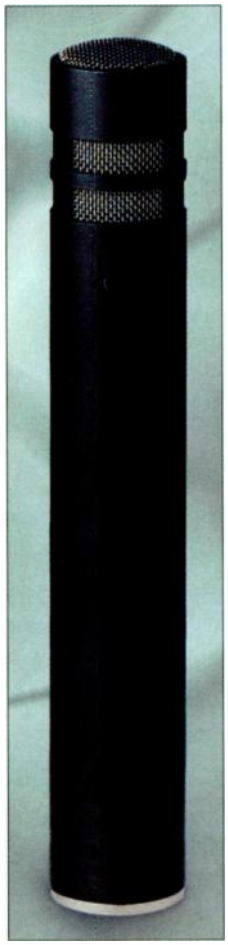
bright, present, and close sounding, but lacking in lows and low mids and with not much sense of the ambient space. Weldon judged the highs "slightly harsh" and described the toms as "clicky" and "papery" sounding. Nelson liked how the mic presented the snare drum, but he found the overall sound "too toppy and brittle." Some slight distortion, he thought, was evident on loud cymbal crashes.

On the choir tracks, the 440 C-L pair once again produced a bright, present sound with weak bass representation and not much sense of the performance space. Schwartz considered the mics "more friendly to the sopranos—but they made us guys sound like we were coming through a little radio." However, he did comment favorably on the clarity of the sound and on the good imaging. Nelson, too, praised the clarity ("I can hear everything!"), although he thought the overall sound was "lacking in warmth."



Microtech Gefell M300

MICROTECH GEFELL M300

The Microtech Gefell M300 ($495) looks very plain at first glance, yet a close inspection reveals the superior craftsmanship and aesthetic sensibility that went into its making. The brass body is consummately machined and finished in a lustrous dark bronze, and the silkscreening is impeccable. The M300 has a fixed-cardioid polar pattern, employs a transformerless circuit design, and comes with gold-plated XLR pins.

The mic ships in a very attractive foam-fitted hardwood box but doesn't come with a clip. (The manufacturer recommends the Beyerdynamic MKV 9.) I tested the M300 using the optional EA 20 shock-mount ($130). Although pricey, the shock-mount is a fine piece of engineering that worked beautifully.

Testify. The M300 garnered consistently high praise in all our applications. The mic has a full, well-balanced sound with slightly boosted highs, mildly attenuated lows and low mids, and excellent dynamic response. These characteristics proved especially favorable on the acoustic guitar, where the mic presented a clean, balanced, and commanding sound that was distinctive for its depth and resonance: I could hear what seemed to be the "hollowness" from the sound hole, which increased realism. Doty, who picked the M300 as her favorite on her guitar, described the sound as "very even and well defined" and "mildly compressed—but in a good way." Nelson found the sound slightly "less warm" than he would have liked, but he still chose the mic as his second-favorite in this application.

The M300 was my favorite mic on the grand piano, from which it captured a full, realistic, and balanced sound with rich harmonic content. "All notes present and accounted for," I wrote in my notes. Drescher and Nelson liked the M300 on the piano, too, both selecting it as their second-favorite. Interestingly, Nelson described the sound as "a bit compressed," echoing Doty's remark. Drescher wished only for a bit more bass, so at his request I boosted 80 Hz shelving by 3 dB on the recorded tracks. "Now the sound is *all* there!" he exulted.

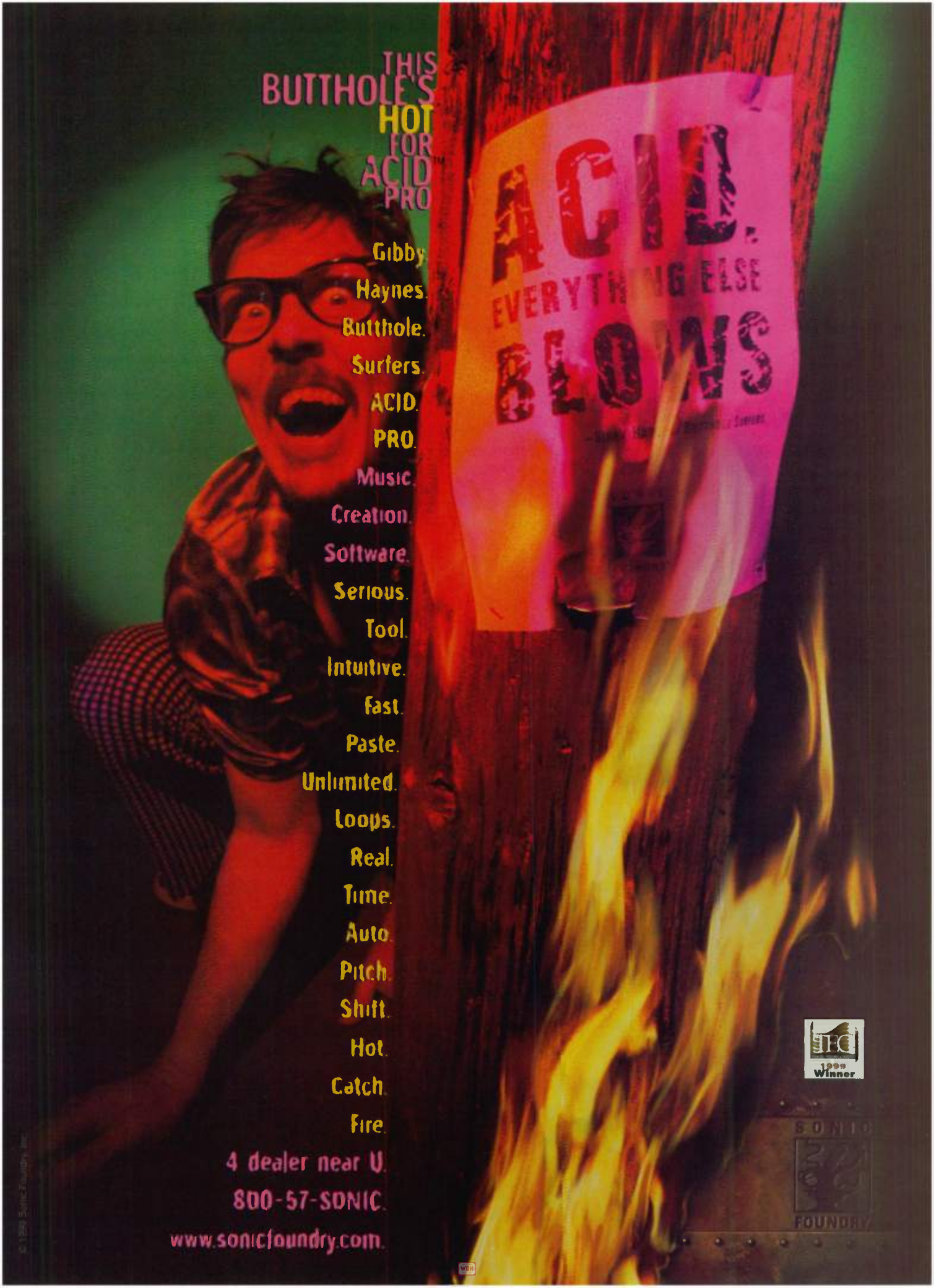
The M300s captured plenty of tone from the drums, and overall the sound was balanced and very agreeable. However, the slightly boosted highs struck both Weldon and me as vaguely unrealistic sounding. Nelson, on the other hand, liked the highs, and also remarked on how "tight and controlled" the bottom end was, wishing only (again) for a tad more "warmth" in the lows and low mids.

Oktava MC012

The M300 was my favorite on the choir, too. Although it made the sopranos seem slightly too forward, the overall sound was tight and well defined, and the vocal blend was excellent. Also, the mics captured a very realistic sense of the acoustic space. Schwartz, who chose the M300 as his third-favorite in this application, said, "Wow! That sounded like the real thing. The four women were a bit out front [in terms of relative volume], and we were in the back a bit, which is probably how it was at Yoshi's." Nelson cited "great tonal definition—it sounds like a group singing together and blending well, yet you can still hear each singer clearly." Nelson chose the M300 as his second-favorite on the choir and again remarked favorably on its high-end clarity. However, in this application he thought the mic sounded "a bit boxy."

OKTAVA MC012

Designed at the Nikfi research laboratory in 1963, the Oktava MC012 ($599.99 "manufacturer list price" at Guitar Center, but regularly priced at $249) is easily recognized by its distinctive "flat-top" capsule assembly. It is a modular system that comes with three capsules (cardioid, hypercardioid, and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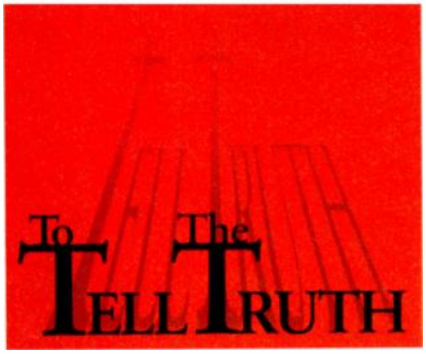

omnidirectional), as well as an insertable 10 dB pad; the preamplifier circuitry is transformerless.

The MC012 and its accessories all have a matte-bronze finish similar to the Elation KM201's, only lacquered. The package, available at Guitar Center, comes in a foam-fitted hard-plastic box complete with an unusual pressure-clamp mic clip. The clip is sturdy and very user-friendly—you just squeeze the clamp arms, insert the mic, and let go. It holds the MC012 snugly at any angle, and the mic is as easy to extract as it is to insert. Optional accessories for the MC012 include a custom shock-mount (available from Oktava) and the M1 large-diaphragm capsule ($349 from Russian Transducer Technologies/The Sound Room).

Testify. Like its fellow Russian-made mic, the Elation KM201, the MC012 performed consistently well in all applications—in some instances sounding nearly identical to the KM201. Overall, the sound was smooth, warm, solid, and nicely balanced. The only noticeable hype was in the low mids, which accounts for its consistently warm but sometimes muddled sound.

The MC012 was Nelson's first, my second, and Doty's third pick on acoustic guitar (although for me it was pretty much a toss-up between the Oktava, Microtech, and Elation units). Doty deemed the sound "pretty accurate" with a "woody" quality. I described it as "very even and solid, with sweetly boosted low mids." Nelson raved, saying the mic "leaned toward the bottom end a bit, for that warm sound I like, yet there are still plenty of all the highs and high mids—overall, a very unified sound."

The MC012 fared slightly less well on the grand piano. As Drescher put it, "There's nothing seriously wrong, but it doesn't make me jump out of my seat. Sort of a flat sound with not much depth." To my ears, the dynamics were somehow off, resulting in kind of a soft sound. Also, the surfeit of low mids caused some muddiness. Nelson appreciated the smoothness of the highs but found the bass a bit "cold" and the overall sound "somewhat small, considering it's a grand piano."

The pair of MC012s worked very well as drum overheads, where they provided excellent imaging and a very full and balanced representation of the multifarious tones. Highs were smooth, accurate, and nongrating, and the mics picked up enough lows and low mids to make individual tom miking all but

Microphone Specifications

Company	Model	Diaphragm	Element	Polar Pattern	Frequency Response	S/N Ratio	Self-Noise
Audix	SCX-one	½", 6-micron, gold-evaporated Mylar	external-DC polarized	fixed cardioid	40 Hz–20 kHz	75 dB	19 dBA
Earthworks	SR77	⅜" Mylar	fixed-charge, back-plate permanently polarized capacitor	fixed cardioid	30 Hz–30 kHz (±1.5 dB)	123 dB	22 dBA
Elation	KM201	½", 5-micron, gold-coated Mylar	external-DC polarized	modular (comes with cardioid capsule; hypercardioid and omnidirectional optional)	20 Hz–20 kHz (±1 dB)	n/a	16 dBA
GT Electronics	AM30	¾", 6-micron, gold-evaporated Mylar	external-DC polarized	modular (comes with cardioid capsule; hypercardioid and omnidirectional optional)	20 Hz–18 kHz	n/a	20 dBA
Hebden Sound	CM1050C	½", 6-micron, aluminum-coated P.E.T. (polyester)	external-DC polarized	fixed cardioid	18 Hz–20 kHz	77 dBA	17 dBA
MBHO	MBNM 440 C-L	½", gold-evaporated Mylar	external-DC polarized	fixed cardioid	40 Hz–20 kHz	80 dB	14 dBA
Microtech Gefell	M300	¾", 3-micron, gold-evaporated Mylar	external-DC polarized	fixed cardioid	40 Hz–18 kHz	78 dBA	16 dBA
Oktava	MC012	½", 6-micron, aluminum-coated Mylar	external-DC polarized	modular (comes with cardioid, hypercardioid, and omni capsules)	20 Hz–20 kHz (±3 dB)	n/a	18 dBA

unnecessary. The MC012s were my first pick as drum overheads—although if I were miking each tom, I might well choose differently. Nelson also chose the MC012s as his favorites in this application. He described the sound as "warm, lively, and fun" and "nicely balanced with great imaging" but "sometimes a bit boomy in the lows and low mids." The MC012s impressed Weldon, too. He thought they were especially smooth and complementary with the cymbals; but he relegated them to second place, saying, "The lows were clearly boosted a bit."

The MC012s were also all-around favorites on the choir: both Schwartz and Nelson put them first, and I put them second. Again, the sound was tonally well balanced, the imaging excellent, and the capture of the performance space very believable. The mics were also very complementary with the vocal blend, sounding clean and articulate yet warm and smooth. Schwartz described the MC012s thus: "The smoothest of the bunch—they sound fuller than the other mics, and the imaging is so good I can close my eyes and see the location of each singer. These mics give me the feeling of the performance. They bring out everyone, but without letting anyone get out of control." Nelson also commented on the "exceptional distinction between the voices, but still a smooth, warm blend," and he described the overall sound as having "a great balance of highs, mids, and lows."

LINES OF DEMARCATION

Overall, this is a very impressive bunch of microphones. In the hands of an able recordist, any of them could capture great-sounding tracks. But distinct sonic characteristics did emerge in our listening tests—along with enough similarities among some of the mics to warrant rough grouping.

First, to address the question posed earlier, the three "Eastern bloc" microphones definitely sounded similar to one another, as well as different from the other mics. (This fact seems also reflected in the favorites selected by our listening panel; see the table "Listeners' Top Three Picks.") The Eastern-bloc mics tended to sound warmer and fuller than the others, with an impressive balance of lows, mids, and highs at any distance.

The Audix SCX-one and the MBHO MBNM 440 C-L might also be grouped together, as they sounded similar in many of the applications. Compared to one another, though, the 440 C-L was the brighter mic and the SCX-one the more midrangy.

The remaining three mics are harder to categorize, as each turned in a quite distinct performance. As mentioned previously, the Hebden Sound CM1050C was the most identifiable

Maximum SPL	Pad	Bass Rolloff	Matched Pair	Dimensions	Weight	Accessories	Price
128 dB	no	no	yes	4.15" (L) × 0.8" (D)	4.4 oz.	mic clip, hard-plastic case	$598
145 dB	no	no	yes; $1,300 with wood case	9.25" (L) × 0.87" (D)	4 oz.	mic clip, foam windscreen, acrylic storage tube	$599
140 dB	no	no	yes; $849 ($1,199 with two sets of capsules)	5" (L) × 0.93" (D)	4.2 oz.	mic clip, wood case	$399
132 dB; 144 dB with pad	15 dB	80 Hz	tba	7.5" (L) × 1.15" (D)	12 oz.	mic clip, hard-shell case	$499
135 dB	no	no	yes; no additional charge	5.5" (L) × 0.88" (D)	4 oz.	mic clip, soft case	$369
126 dB	no	no	yes	4.8" (L) × 0.8" (D)	3 oz.	mic clip, hard-board case	$341
135 dB (for 0.5% THD)	no	no	consecutive numbers, but "all capsules match"	5.1" (L) × 0.83" (D)	3.7 oz.	wood case	$495
140 dB	10 dB (insertable)	no	no	4.13" (L) × 0.79" (D)	2.47 oz.	2 extra capsules, insertable 10 dB pad, mic clip, hard-plastic box	$599.99 (complete) $499.99 (with pad and cardioid cap only)

To The TELL TRUTH

mic in the blind-listening tests because it was the least neutral sounding. The GT Electronics AM30 also had a fairly recognizable sound, thanks to its bright, incisive highs and overall "in-your-face" quality. (I expect that the company's new AM40, which uses the same capsules as the AM30 but has a tube rather than solid-state design, sounds warmer than the AM30.) And the Earthworks SR77 was distinctive in its own way, if only for sounding relatively uncolored and open.

VERDICT, SCHMERDICT

Now, before you rush out with money in hand to purchase one of the "winning" mics, it would behoove you to put some things into perspective. First, it bears repeating that the qualitative distinctions expressed by our panel of listeners were made in comparison only—an approach that, while useful, has its pitfalls, some of which I discussed in the earlier section "The Bigger Picture." However, there are other drawbacks—for example, the fact that adding a different mic to the proceedings would likely throw a different light on the results.

Another important point involves mic positioning. For the sake of consistency, once positionings were established for each of our test applications, we used the same positionings for each mic pair. However, the best position for one mic is not always the best for another.

Yet another limitation is that we listened to the test tracks in isolation rather than in the real-world context of mixes. This is a crucial point to keep in mind. For example, guitar tracks that sound great on their own—full, rich, and warm, with lots of low-mid and bass content—may sound very different once you add, say, a drum set, bass, keyboards, strings, and vocals to the mix. Indeed, at that point you may find yourself cutting bass and low mids like mad and counting your blessings for those bright highs that, on their own, sounded "a bit harsh."

The same is true for drum overheads: if all you can afford (in terms of tracks) is two overhead mics and perhaps a third mic on the kick, you'll be grateful if those overheads capture enough lows and low mids to make the toms sound full and resonant. On the other hand, if you're close-miking the snare drum and each tom, the low and low-mid content from the overheads could screw you up more than it helps—in which case you may be better off with mics that mildly attenuate the lows and low mids. After all, on multimiked drums, the main function of the overhead mics is typically to capture the cymbals while adding some "air" and realism to the sound, not to represent the tonality and depth of the individual drums.

For these reasons (and still others), the notion of designating a "winning mic" seems specious at best. Rather than declare a winner, then, our goal here has been to describe, as much as possible, the "sonic predisposition" of each of these eight microphones, based how it compares to similar mics and how it sounds in a few isolated, but for the most part real-world, applications. From this, hopefully, you can deduce which applications each mic is best suited for. (Of course, it is up to *you* to determine which, if any, is appropriate for your own applications—and budget.)

TRUTH OR CONSEQUENCES

I began this review with the supposition that, in general, tonal accuracy is one of the defining characteristics—if not the main goal—of small-diaphragm "instrument" mics. But one thing I have learned in conducting these tests is that accuracy is not always what the doctor ordered. Yes, there are times when "telling the truth" is desirable; but coloration, too, has its place in the domain of instrument mics. Therefore, rather than discounting a given mic, or rating one as better than another, the wiser approach is to appreciate each mic as a unique tool and a different color in the palette of sound possibilities.

Brian Knave *is an associate editor at* **EM.**
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The Electronic Century

PART II:

Tales of the Tape

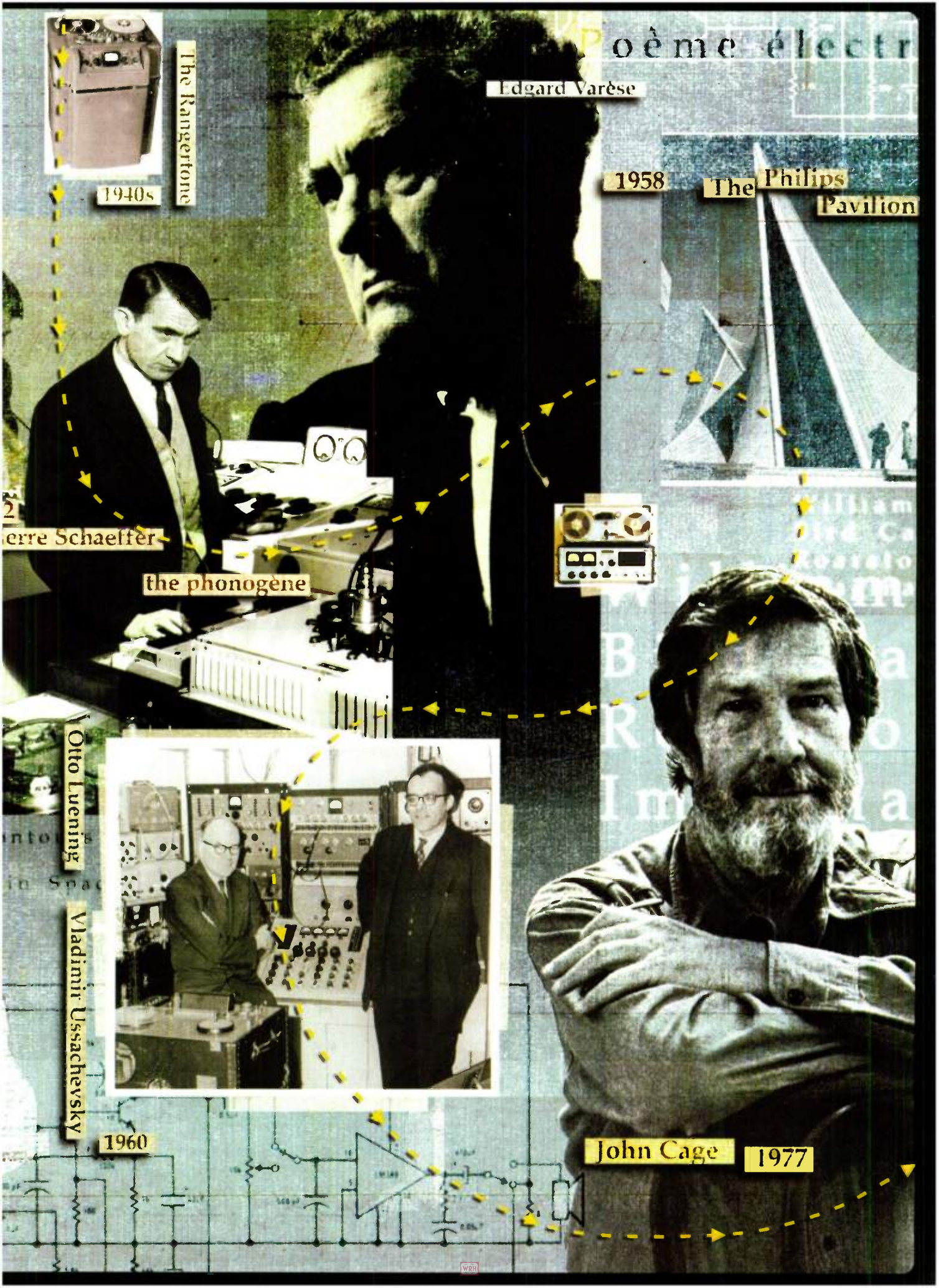
When tape recorders were introduced to the market around 1950, composers embarked on a musical revolution. Magnetic recording made it possible for them to record sound sources anywhere in the world—whether a railroad locomotive in Paris or a department store in Tokyo—and arrange them into any order. In fact, the term "tape music" refers to music composed with sounds that have been recorded on tape, then edited into a particular continuity.

The first steps toward inventing the tape recorder took place in 1898 in Denmark, when Valdemar Poulsen developed a device to record sound on a steel wire. In the following years, many people formed businesses—not all of them successful—to exploit Poulsen's invention. By the late 1920s, patents had been filed for magnetic tape, and in 1935, Allgemeine Electrizitäts Gesellschaft (AEG) demonstrated the first version of a tape recorder at the German Annual Radio Exposition in Berlin. This helped establish magnetic recording as a viable technology. By the late 1940s, Ampex, Rangertone (see Fig. 1), and other companies had been formed to manufacture tape recorders, and Minnesota Mining and Manufacturing (3M) developed an improved magnetic tape.

The tape recorder gives composers the world of sound.

Written by Joel Chadabe

Illustration by Terry Miura


oème électr
The Rangertone
1940s
Edgard Varèse
1958
The Philips Pavilion
erre Schaeffer
the phonogène
Otto Luening
Vladimir Ussachevsky
1960
John Cage
1977

The Electronic Century

Tales of the Tape

Found Sounds

The use of tape recorders to create musical compositions grew out of a tradition that began in the early years of the century. That tradition used "found" sounds rather than composed sounds. As early as 1917 in Paris, France, Jean Cocteau conceived the ballet *Parade*, which called for the sounds of sirens, a steam engine, and other mechanical devices, as well as music by composer Erik Satie. In 1926, George Antheil used an airplane engine onstage in a Paris performance of his *Ballet Mécanique* (recently revived in a production by Paul Lehrman at the University of Massachusetts at Lowell).

American composer John Cage, however, was the first to consistently explore the use of nontraditional sounds in music (see **Fig. 2**). In the style of Ferruccio Busoni and Edgard Varèse, who earlier in the century had theorized that music might include all sounds, Cage said: "I believe that the use of noise to make music will continue and increase until we reach a music produced by the aid of electrical instruments...." In 1939, Cage included a number of variable-speed phonograph turntables in his composition *Imaginary Landscape no. 1*. (Many of the works mentioned in this article are available on modern recordings. See the sidebar, "Tape-Music Hit Parade," for a list of recommended recordings.) Throughout the 1940s and 1950s, Cage used radios, phonograph records, tin cans, and other nontraditional sound sources in his works.

Musique Concrète

While Cage was largely interested in performance, Pierre Schaeffer (see **Fig. 3**), a radio announcer at Radio France in Paris, was primarily interested in recording his own work. In 1948, during the course of developing a medium he called "radiophonic sound," Schaeffer completed an important experiment. He recorded railroad locomotives, then combined those sounds into a short composition. Before he had access to tape recorders, he would cut the sounds directly onto plastic discs, play back several sounds simultaneously on different players, and select and mix the sounds as they played.

He named his composition *Étude aux Chemins de Fer* (Railroad Study). He then coined the term *musique concrète* to describe his technique of recording and combining sounds. By using the phrase musique concrète ("concrete music"), he hoped to contrast a concrete way of working with sounds with an abstract way of working with them, in which the sounds are represented by notes in a musical score.

To understand Schaeffer's work, it is important to remember that there was no television in 1948 and that radio was the most universal theater of the time. Dramatic programs, serials, and adventure stories, as well as music and news, were broadcast on the radio, and the sounds in radio programs inspired a high level of creativity.

Schaeffer, in fact, developed the idea of radiophonic sound into an art form. He finished four additional musique concrète studies in 1948 and broadcast them on Radio France on October 5, 1948. The program, called *Concert de Bruits* (Concert of Noises), was tremendously successful. Composing music using recorded sound was an idea whose time had come.

The Paris Studio

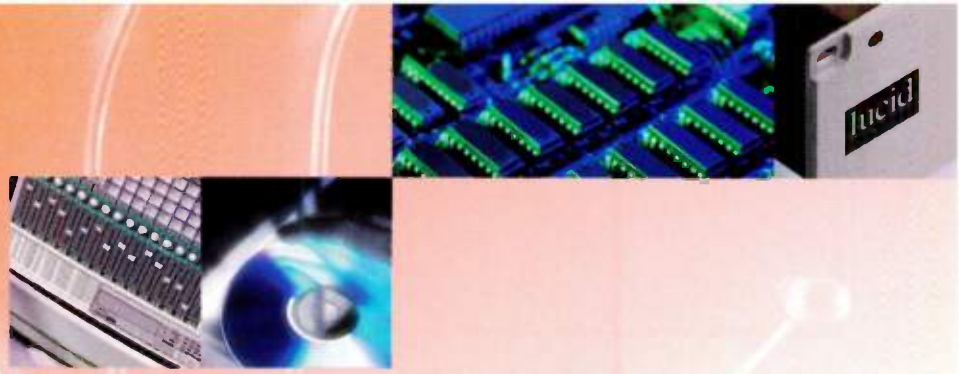
Encouraged by the positive public reaction to his work, Schaeffer requested and received support from the administration of Radio France. He was then able to hire Pierre Henry as his musical assistant and Jacques Poullin as technician. He was also given support to form a studio specifically to compose musique concrète.

Over the next few years, Schaeffer and Henry collaborated on many projects, among them 1950's *Symphonie pour un Homme Seul* (Symphony for One Man Alone), one of the first major works in the new medium, and *Orphée* (1951), a musique concrète opera. In 1951, the first tape recorders arrived at Radio France. Poullin designed different types of recorders to create special musical effects and developed a spatialization system to direct sounds to different loudspeakers around a concert hall. The studio grew through the 1950s and attracted many composers, among them Pierre Boulez, Karlheinz Stockhausen, Luc Ferrari, Olivier Messaien, and Iannis Xenakis.

Xenakis, in particular, produced several important works using classic musique concrète techniques such as manipulating sounds by varying tape speed or playing sounds backward. The sound sources in *Diamorphoses* (1957) include earthquakes, airplanes,

COURTESY DAVID MORTON, IEEE HISTORY CENTER

FIG. 1: The Rangertone was an early tape recorder developed by Colonel Richard Ranger, who played a key role in bringing German recording technology to the United States at the end of World War II.



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and bells. In *Concret PH* (1958), Xenakis modified the sound of smoldering charcoal. For *Orient-Occident* (1960), he recorded bowed objects, bells, and metal rods, while *Bohor* (1962) is based on the sounds of Middle Eastern bracelets and other jewelry clanking together.

In 1958, Pierre Henry left Radio France to form an independent studio. Apart from his professional work, he produced many important pieces on his own using musique concrète techniques. Perhaps the most interesting, due to the simplicity of its sound sources, is 1963's *Variations pour une Porte et un Soupir* (Variations for a Door and a Sigh).

The Cologne Studio

Many paths crossed in those early days. Karlheinz Stockhausen, who had come from Cologne, Germany, to study at the Paris Conservatory, worked in Schaeffer's studio. In 1953, Stockhausen returned to Cologne to begin working in the studio newly established by Herbert Eimert at West German Radio, and he soon became the studio's director and principal composer.

The initial philosophy of the Cologne studio was very different from that of musique concrète. Whereas in Paris sounds were recorded in the real world and recombined by editing as in film, in Cologne, the first idea was to generate sounds electronically by additive synthesis. Considering that the studio owned one sine-wave oscillator, it was a laborious process. Sine waves were made on a 4-track tape recorder, then mixed down onto a single-track recorder. The mix was then bounced to one track of the multitrack recorder, additional sine waves were added on the other tracks, and all the tracks were again mixed down on the single-track recorder. This approach was called *elektronische Musik*.

Stockhausen began by composing

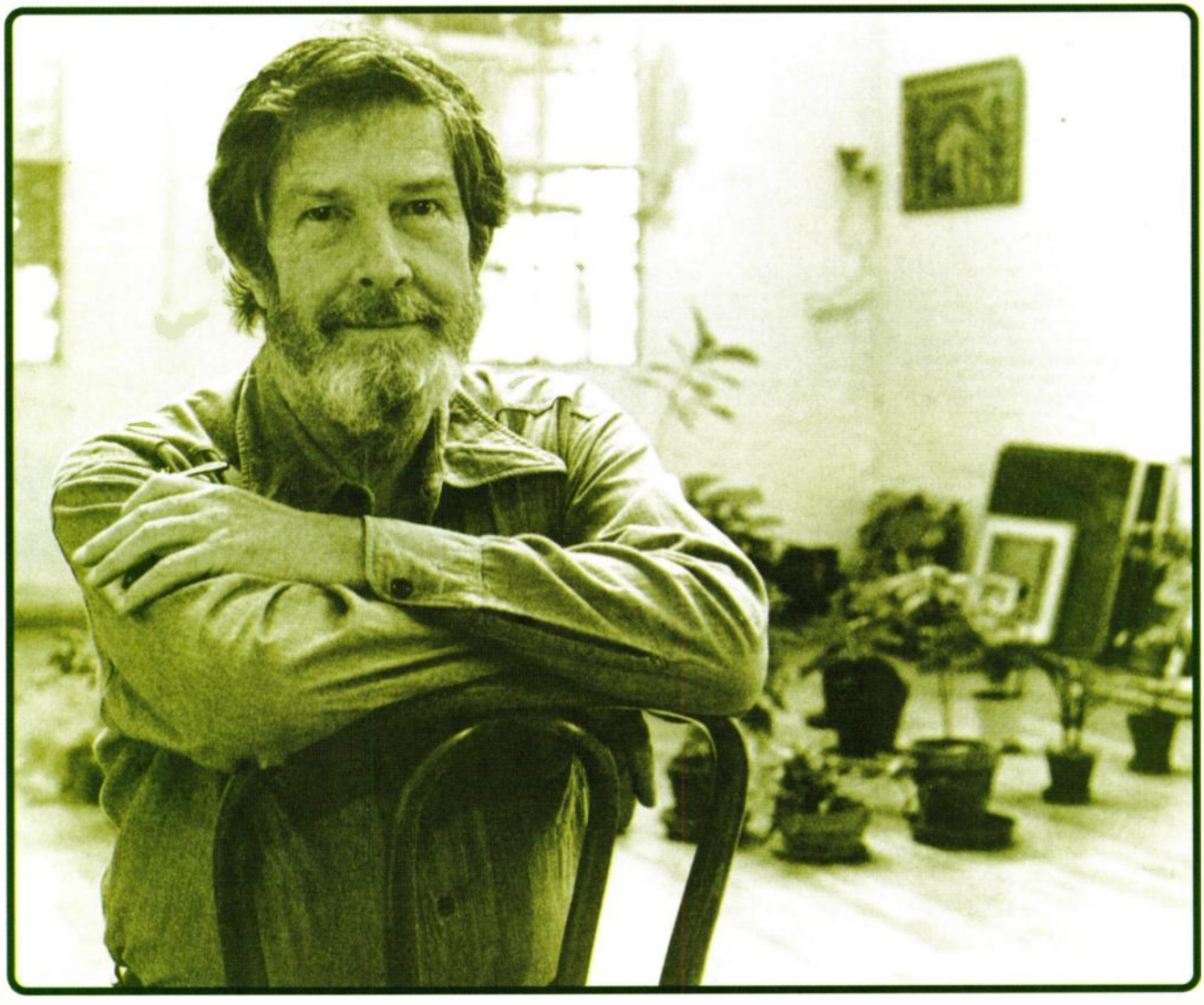

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FIG. 2: John Cage in his studio on Bank Street, New York City, in 1977. Photo by Rhoda Nathans.

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Tales of the Tape

two studies using only electronic sounds. In 1956, he finished *Gesang der Jünglinge* (Song of the Youths), the first major work to be composed in the Cologne studio and one of the first masterworks of tape music. In *Gesang der Jünglinge*, Stockhausen mixed a young boy's voice with electronic sounds so that the words were variously intelligible and completely abstract and musical.

In 1960, he went on to compose *Kontakte* (Contacts), in which the sounds suggest percussion and piano timbres. During a trip to Japan in 1966, he composed *Telemusik* (Telemusic) with sounds recorded in Japan, Bali, the Sahara, and other places. He modulated all of the sounds in such a way that their sources are unrecognizable. In 1967 in Cologne, he composed *Hymnen* (Anthems), in which he electronically processed national anthems from around the world. By this time, Stockhausen's techniques had changed dramatically from working with purely electronic sounds to processing recorded material.

The Brussels World's Fair

Although known primarily as a composer, Iannis Xenakis had a particular nonmusical impact on the history of electronic music. Trained initially as a civil engineer, he had worked since the late 1940s with Le Corbusier, one of the best-known European architects of the time.

In 1956, Philips Corporation, a major electronics company based in Holland, invited Le Corbusier to design its pavilion for the 1958 Brussels World's Fair. Le Corbusier replied, "I will make you a *poème électronique*..." and asked Xenakis to design the pavilion. Xenakis came up with an idea based on hyperbolic paraboloids (see **Fig. 4**). During the world's fair, the building was used as a shell for multiple projections of images Le Corbusier had created and as a music playback system that included 425 loudspeakers. The music included Xenakis's *Concret PH*, which was less than three minutes long, played between performances of Edgard Varèse's *Poème Électronique*. More than 2 million people attended the event.

In 1957, Philips had invited Varèse to create *Poème Électronique* in its Eindhoven laboratory. Varèse used recordings of traditional musical instruments, percussion, electronic sounds, a singing voice, and various machines. All of the sounds were processed electronically. *Poème Électronique* is a definitive statement of musique concrète.

New York, New York

While the Paris studio was getting started in the late 1940s, Louis and Bebe Barron established a small commercial studio in New York. They composed

TAPE-MUSIC HIT PARADE

The following recommended materials are available from CDeMUSIC at www.cdemusic.org.

John Cage 25-Year Retrospective Concert (Wergo) includes *Imaginary Landscape no. 1* and *Williams Mix* from the Project for Music for Magnetic Tape.

Forbidden Planet (GNP Crescendo) by Louis and Bebe Barron is the original 1956 soundtrack to the famous science fiction film.

Pierre Schaeffer: L'Oeuvre Musicale (EMF Media) brings together all of Schaeffer's musical works, including his collaborations with Pierre Henry.

Xenakis: Electronic Music (EMF Media) includes all of Xenakis's early works.

Pierre Henry (Harmonia Mundi, France) includes *Variations pour une Porte et un Soupir*, one of the most elegant works of early musique concrète.

Elektronische Musik 1952–1960 (Stockhausen Verlag) includes Karlheinz Stockhausen's *Gesang der Jünglinge* and *Kontakte*.

Hymnen (Stockhausen Verlag), by Karlheinz Stockhausen, uses the national anthems of the world as source material.

Mikrophonie I and II; Telemusik (Stockhausen Verlag), by Karlheinz Stockhausen, includes sounds from Asia and elsewhere.

Electro Acoustic Music Classics (Neuma) includes Edgard Varèse's *Poème Électronique*, first performed at the 1958 Brussels World's Fair.

Electronic Music Pioneers (CRI) includes works by Vladimir Ussachevsky and Otto Luening that were played at the Museum of Modern Art in New York on October 28, 1952.

Henri Pousseur (BV Haast) includes *Scambi*, composed in 1957 in Milan.

Berio/Maderna (BV Haast) includes Berio's *Omaggio a Joyce*, based on text from James Joyce's *Ulysses*.

John Cage Bird Cage (EMF Media) is a major collage work by John Cage, based largely on the sounds of birds recorded in aviaries.

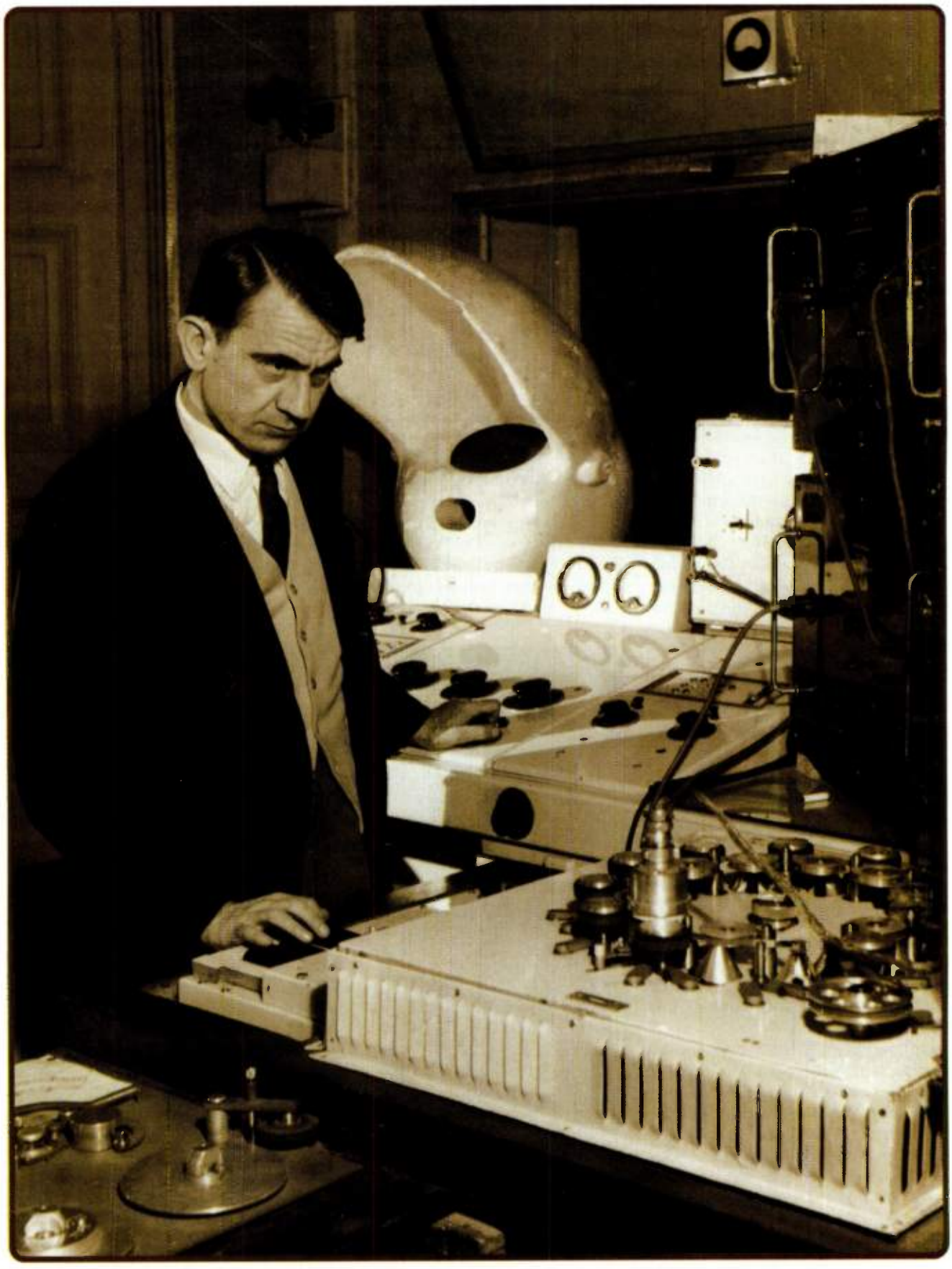
Roaratorio (Wergo), by John Cage, includes Cage reading, Irish musicians playing and singing, and all the sounds mentioned in James Joyce's *Finnegans Wake*.

Pauline Oliveros: Electronic Works (Paradigm) includes *I of IV* and other early compositions that use tape.

I Am Sitting in a Room (Lovely Music), by Alvin Lucier, uses tape recorders and room resonance to transform words into abstract sounds.

A Sound Map of the Hudson River (Lovely Music), by Annea Lockwood, records the Hudson River from its source in the Adirondack Mountains to the Lower Bay of New York City and the Atlantic Ocean.

You can read more about tape music and the history of electronic music in the book *Electric Sound* by Joel Chadabe (Prentice Hall, 1996).



COURTESY GROUPE DE RECHERCHES MUSICALES, PARIS

FIG. 3: Pierre Schaeffer established the first electronic-music studio in France in the 1940s. Schaeffer is shown here in 1952 with two versions of the phonogène, a variable-speed tape recorder built by Jacques Poullin.

The Electronic Century
Tales of the Tape

several electronic film scores, among them one for the well-known 1956 film *Forbidden Planet*. They also worked with John Cage in 1951.

As soon as tape recorders became available, Cage became interested in exploring ways they could be used in composing music. He decided to start what he called the Project for Music for Magnetic Tape. An architect and friend, Paul Williams, was willing to fund the project. In 1951, Cage began working with the Barrons to assemble a large and varied library of taped sounds. He worked first with David Tudor, then with Earle Brown, to cut and splice those sounds into a tape composition, *Williams Mix*.

The work took place in Cage's loft on Manhattan's Lower East Side. Cage cut the tapes into short pieces, then flipped coins to decide how to order them. Using this method, Cage and Brown finished *Williams Mix* together. They then worked together on Brown's *Octet*. In 1954, the Project for Music for Magnetic Tape wound down, partly because the money ran out and partly because Cage moved on to other projects.

While John Cage and Earle Brown spliced together snippets of tape in lower Manhattan, other events were unfolding uptown. In 1952 at Columbia University, Vladimir Ussachevsky presented a concert that included his first electronic compositions. Shortly afterward, he began working with composer Otto Luening in Bennington, Vermont, and in various living rooms and studios in New York City.

On October 28, 1952, Ussachevsky and Luening presented a concert of their music at the Museum of Modern Art in New York—significant because it was the first public concert of tape music in the United States. The program included Ussachevsky's *Sonic Contours* and Luening's *Fantasy in Space*. After that, the two men became busy with radio appearances, other concerts, commissions, and fellowships. This flurry of activity led to the establishment of a tape studio at Columbia University in 1955 (see **Fig. 5**).

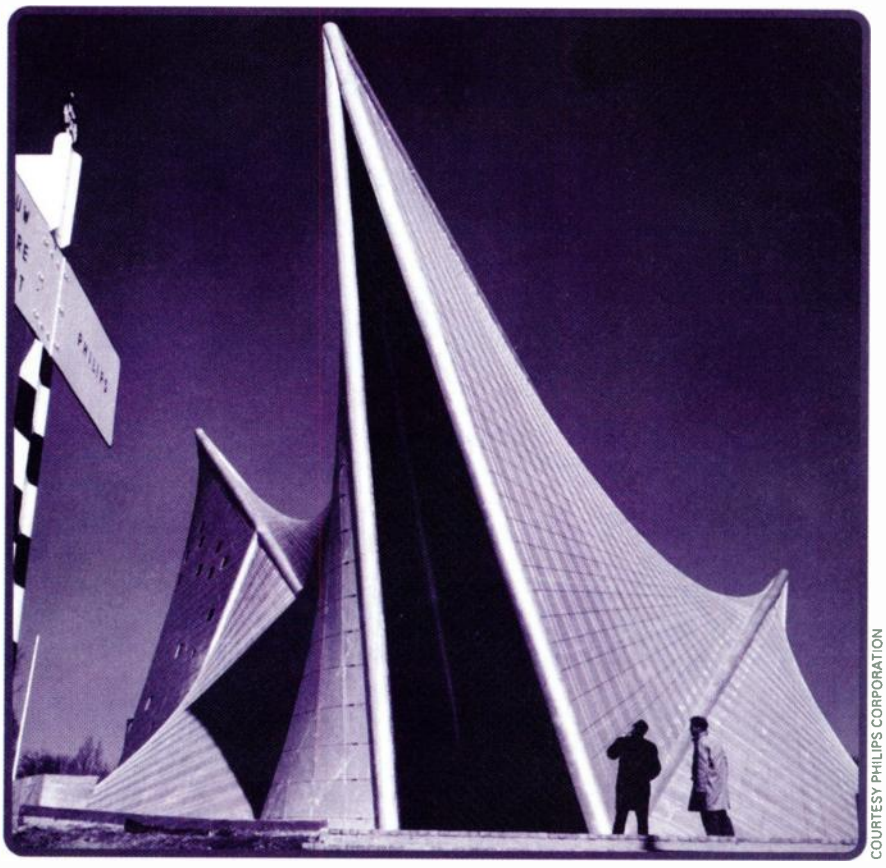
The studio flourished. In 1959, with support from the Rockefeller Foundation, Ussachevsky, Luening, and Princeton professor Milton Babbit established the Columbia-Princeton Electronic Music Center and acquired the Mark II Electronic Music Synthesizer. The center also housed three tape studios, and in the next ten years, more than 60 composers from 11 countries came to New York to work there.

Among them was Mario Davidovsky, who arrived from Argentina in 1960 and became one of the major composers of tape music. Davidovsky's *Synchronisms no. 5* (1969), based on an interplay between electronic sounds on tape and live percussionists, is a good example of his style. His *Synchronisms no. 6*, for piano and tape, won the Pulitzer Prize for music in 1971.

On to Milan

Ussachevsky and Luening's concert at the Museum of Modern Art had another important consequence. Luciano Berio, visiting New York from Milan, Italy, was in the audience and became excited by the possibilities of this new medium. When he returned to Italy a few months later, he met composer and conductor Bruno Maderna, and they decided to work together to explore the potential of tape music. In 1955, they established *Studio di Fonologia* at the Radio Televisione Italiana (RAI) studios in Milan.

Berio's best-known work to come out of this studio was *Omaggio a Joyce* (Homage to Joyce), finished in 1958. Berio asked his wife, Cathy Berberian, to recite from chapter 11 of James Joyce's *Ulysses*. He then processed the words electronically and with tape-recorder manipulations. Of particular interest is how he mixed different versions of the same sound to produce



COURTESY PHILIPS CORPORATION

FIG. 4: The Philips Pavilion at the 1958 Brussels World's Fair, site of the performance of Varèse's *Poème Électronique*.

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Tales of the Tape

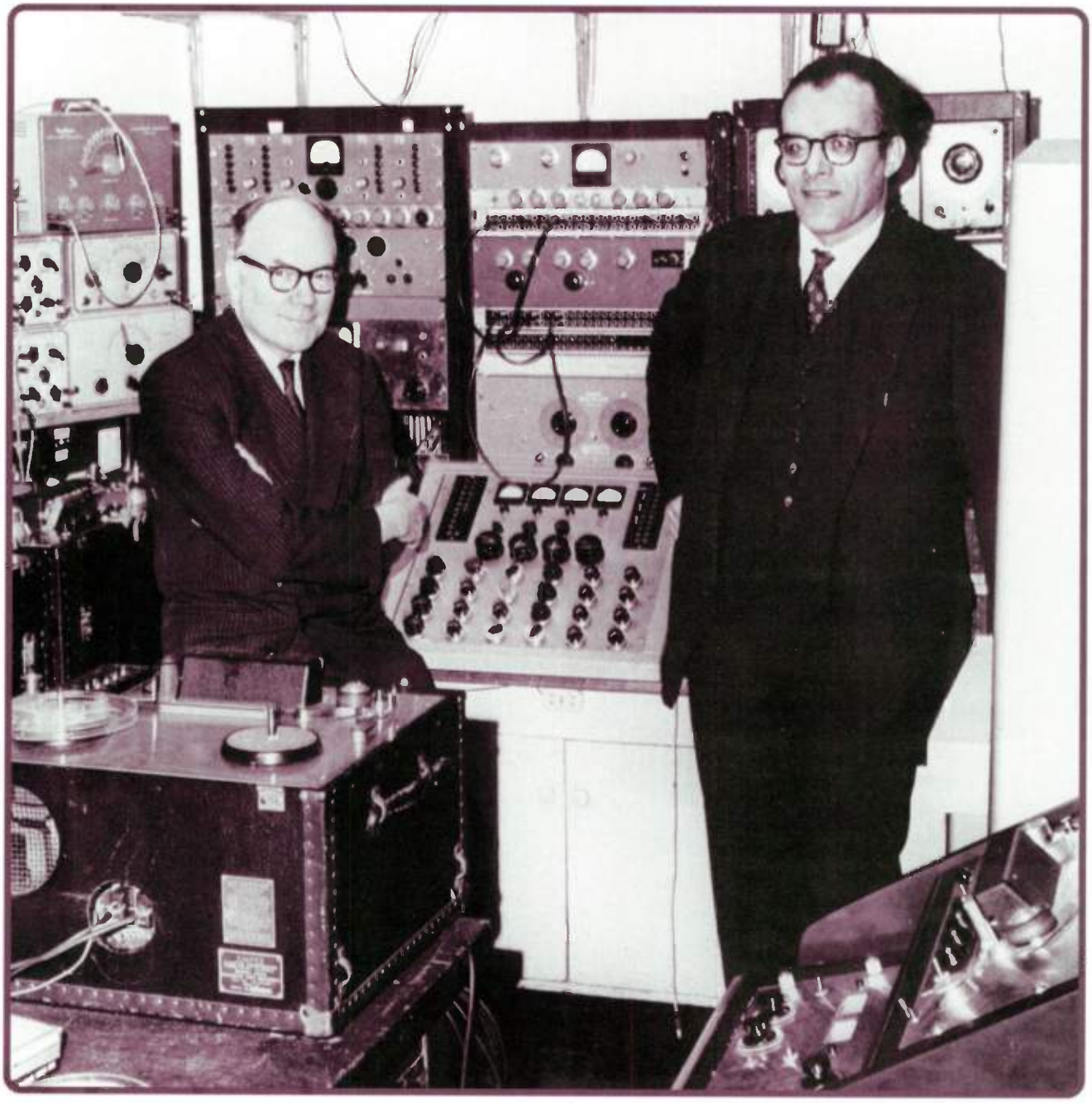
sounds that suggest the meanings of other words.

Many other composers worked at the Milan studio. Henri Pousseur composed *Scambi* (Exchanges) in 1957 by filtering white noise. In 1958, John Cage visited Milan and composed a tape version of his earlier composition *Fontana Mix* by using random numbers to determine the length of the tape segments. (While there, Cage distinguished himself by appearing on an Italian television quiz show, correctly answering questions about mushrooms.)

The End of the Beginning

John Cage continued his groundbreaking work into the 1970s. In 1972, he composed *Bird Cage*, which juxtaposed the sounds of birds recorded in aviaries, the sounds of Cage himself singing *Mureau* (an earlier composition of his based on Thoreau's writings), and sounds recorded randomly from the environment.

In 1979, Cage composed *Roaratorio*,



COURTESY ROBERT MOOG

FIG 5: Otto Luening and Vladimir Ussachevsky in the Columbia Tape Studio, about 1960.

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The Electronic Century

Tales of the Tape

the largest in scope of all tape music compositions in the number of sounds used and a fitting piece with which to designate the end of an era. In it, Cage recorded, collected, and randomly combined all of the sounds that James Joyce mentions in *Finnegans Wake*. In performance, the tapes were played while Cage read his own recomposed version of *Finnegans Wake*. At the same time, Irish musicians played traditional Irish folk music. *Roaratorio* gathered an enormous variety of sounds—doors

closing in Dublin, a river flowing, a glass placed on a bar, a car passing in the street—and assembled them as music.

The idea of using tape to juxtapose sounds in any combination from any source was so powerful that tape studios quickly formed throughout the world. The first round of work was done not only in New York, Paris, Cologne, and Milan, but also in studios formed in London, Tokyo, Buenos Aires, Toronto, Stockholm—in short, everywhere.

It was an exciting time in the history of music, and it seemed to many composers that anything was possible. Around the world they shared the common goal of creating a new kind of music based on the availability of all sounds.

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

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WRH

RACK MOUNTING YOUR PC

A SIMPLE PROJECT THAT PUTS YOUR PC IN ITS PROPER PLACE.

PHOTOGRAPHY BY ANTHONY PIDGEON

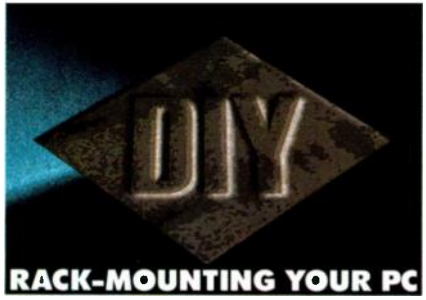
DIY

My computer is an integral part of my home recording studio, functioning as a musical instrument, hard disk recorder, editor, video editor, sequencer, mastering station, CD duplicator, and much more. I've upgraded my custom-made PC many times over the past couple of years. It currently includes a Pentium III 450 with 384 MB of PC-100 RAM, three different high-end sound cards, and 46 GB of Ultra-DMA hard disk space. I've designed this system to get the most out of the personal-studio experience and to make sure the hardware can handle the demands made by my recording, sequencing, and effects software.

One of the biggest problems I've always had with my PC is where to put it. To help me organize my gear and manage the personal-studio "spaghetti factory" of cables, I purchased an Omnirax ProStation MC studio workstation. Like most studio furniture, it provides ample rack space and a great place to put the computer monitor and speakers, but it isn't very accommodating to the minitower ATX cases that house most Pentium computers these days. While this particular desk provides a pullout shelf for a desktop AT or ATX case, cabling issues make it the wrong solution for me.

In addition, both desktop and minitower cases tend to be crowded inside, making it difficult to get around in them when you're trying to add cards, change drives, add or replace RAM, and so on. As anyone who uses a computer in the recording process can attest, you're inside your computer's case a lot!

By Mike Lawson



Heat is another problem with most types of computer cases, particularly when you're running multiple sound cards and large-capacity hard drives (not to mention today's faster processors and larger amounts of RAM). Heat kills chips and motherboards, and the more peripherals you run, the hotter it gets inside that little box, especially when it's on for extended periods. Conventional computer cases have only one cooling fan, on the back of the power supply. The only other cooling mechanism is the fan attached to the processor chip, but that cools just the processor.

I decided that a rack-mounted computer was the best solution to the problems of placement, internal access, and cooling. I've seen ads for preconfigured, rack-mounted computers in Japanese recording magazines. A couple of companies that advertise in **EM** will also configure a computer system for home recording and sell it to you in a rack-mount case. But what about someone like me, who simply needs a rack-mount ATX case to house an existing computer system? Where could I buy such a case, and what would I need to know about these cases in order to install my system in one?

INFITECH TO THE RESCUE

I learned that there are surprisingly few options. Some computer-parts retailers have rack-mount cases for servers, but they're not appropriate for ATX PCs. The music retailers I visited said, "Cool idea, but we've never seen one."

Finally I found a company on the Web that would deal with individuals, not just major accounts and bulk orders. Infitech makes and distributes high-quality rack-mount computer cases for the computer and telecommunications industries. The company had never received a request from a musician looking to rack-mount a computer, and the people I spoke to were somewhat surprised that there was a need in our industry for their products. However, they were eager to help me and pass along some great information to other musicians looking for a similar product.

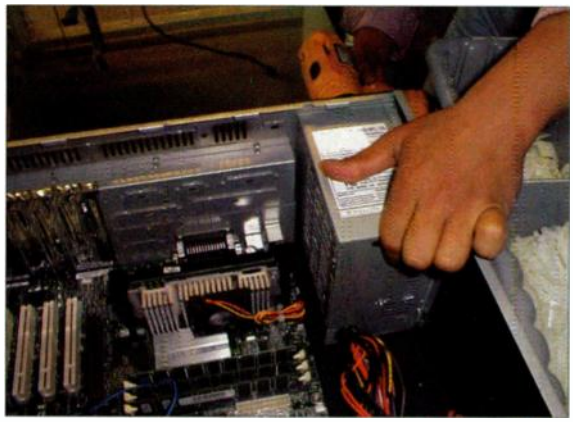

MIKE LAWSON

FIG. 2: Installing the power supply should be straightforward.

I took my computer to Infitech and looked at their cases, which come in 4U and 5U heights. In addition, I had to choose between an imported case and one made domestically. The 4U cases are optimal for the home studio. The 5U cases hold more drives, but they're larger than most home-studio musicians need. Because of this, I'll only discuss the 4U cases.

The 4U imported case lists for a mere $139 without a power supply. The 4U American-made case lists for $325, also without a power supply. If you're taking your computer out of an ATX case, you should have no trouble removing the old power supply and placing it in the rack-mount case. Otherwise, be prepared to spend between $40 and $200 for a new power supply, depending on how much power you need.

The 4U rack-mount case is 19 inches wide by 7 inches high by 18.5 inches deep and weighs in at a hefty 30 pounds. Its body is made out of electro-galvanized steel with an aluminum front, and it comes in any color you want—as long as it's black!

The domestic model has three 5.25-inch horizontal, front drive bays and two 3.5-inch vertical, internal bays, while the imported version features two 5.25-inch horizontal, front drive bays and three 3.5-inch vertical, internal bays. If you have a recording computer with two internal CD devices—such as a CD-ROM and a CD-R—these will occupy both 5.25-inch bays in the import model. If you also have an internal 5.25-inch input device—such as an E-mu APS, Yamaha DSP Factory, or even the new Sound Blaster Live Platinum—you're out of luck. You must forsake one of the three devices to use the less-expensive imported case (as I did) or select the domestic model to accommodate all of them.

Placing your computer in a rack provides better air circulation, thus helping to keep those expensive components cool. The case itself is larger, but you also have the benefit of at least three fans: one in the power supply, one on the processor, and the rack's front fan. The domestic cases have, in addition to the power-supply and processor fans, two fans in front and one in the middle.

These fans keep things cool, but they also produce noise. The front-mounted fans (which are covered by an air filter) are the biggest noise problem. But the imported model's single front fan seems only about as loud as the regular ATX case once the unit is placed in a rack. And, of course, you can easily reach inside the case and unplug the fan's power cable if necessary.

The 3.5-inch and 5.25-inch devices you install are all mounted into one vibration-dampening, shock-mount chassis. This is a wonderful feature if you need to take your rack-mounted computer on the road in a flight case. You also get an LED power light, a hard disk activity light, a sturdy power

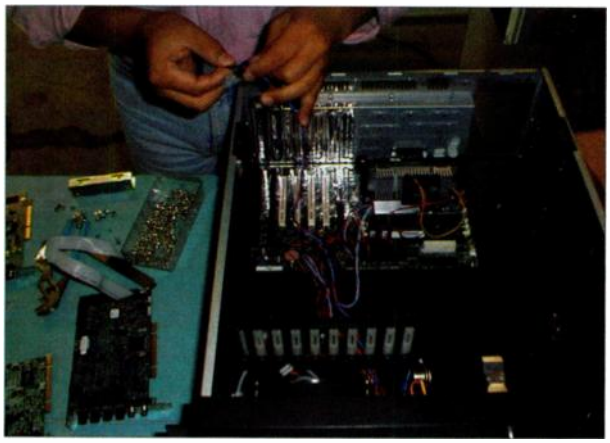

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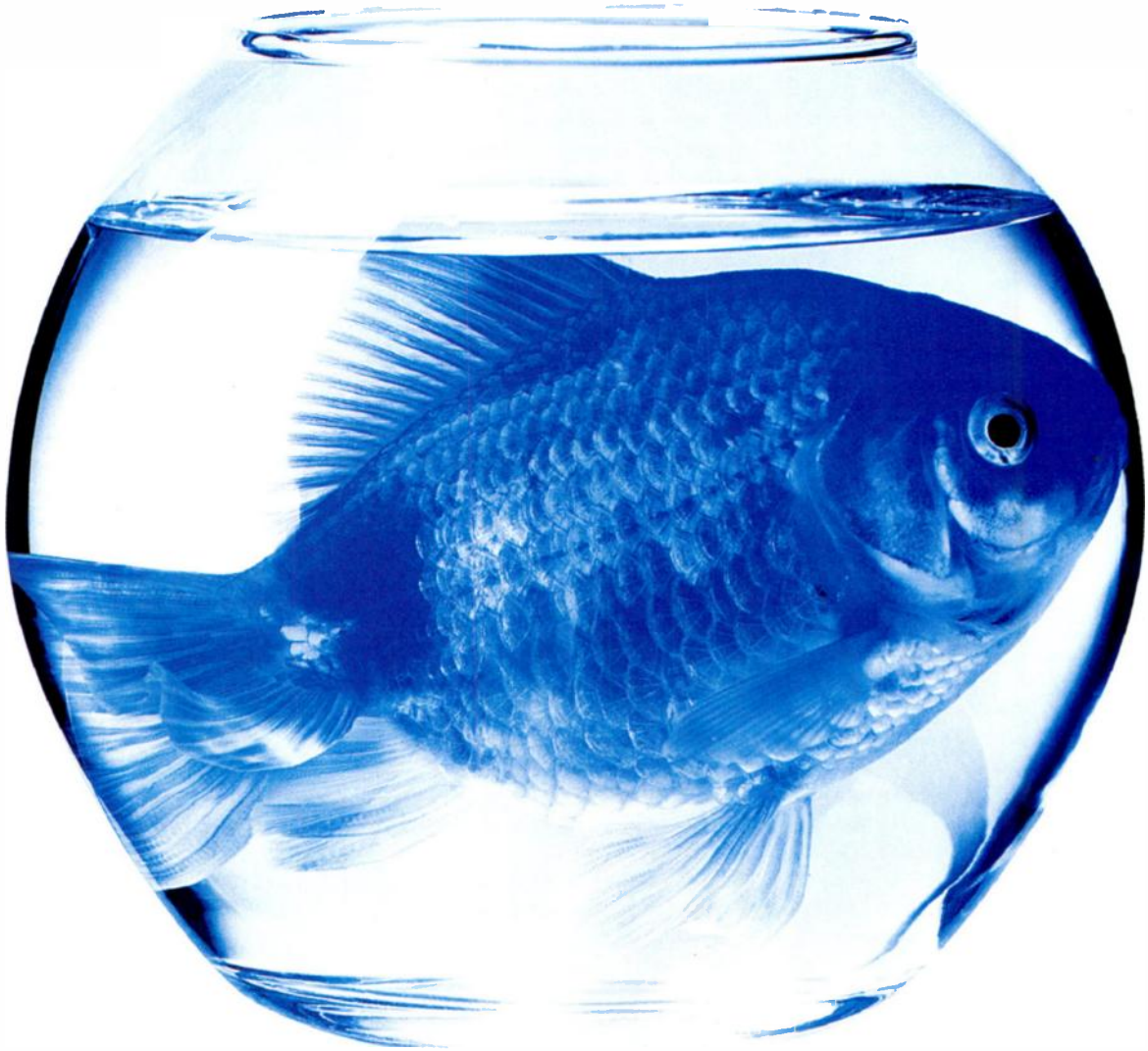
FIG. 1: While you're installing the motherboard, don't let it touch any metal parts.

For manufacturer information, please see Contact Sheet, p. 175.

Accept no hardware limits.



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switch, and a lockable front door that provides access to the drives.

GET TO WORK

Assembling a computer is a lot of work. But the rack case provides a lot of space to work with, so it's much easier to read all those little white words on the dark green motherboard and figure out where to plug things in.

Here are some basic tips for taking your computer out of one case and putting it into another:

1. Gather pencil and paper, a small Phillips screwdriver, and a small flathead screwdriver.
2. Make sure the computer is powered down and unplugged.
3. Discharge the static electricity in your body before touching anything inside the computer. It's best to use a wriststrap grounding cable that attaches to

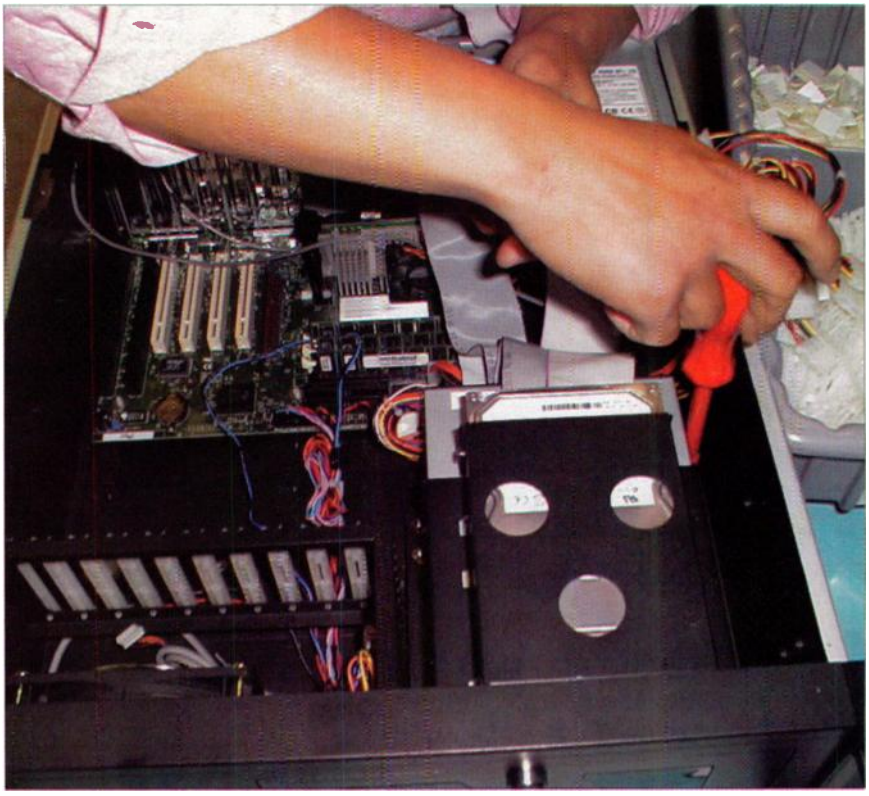

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FIG. 3: You install the drives in a shock-mount chassis.

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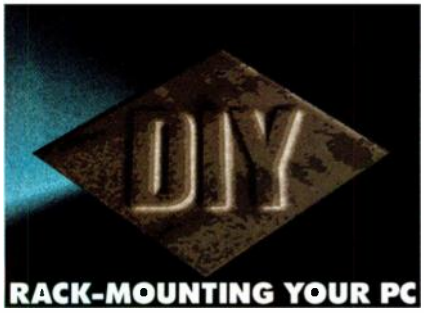


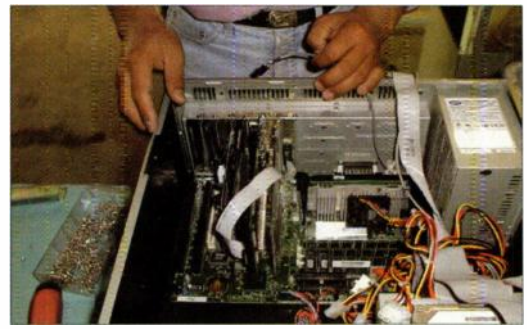
the metal chassis of the case you're working on. If you don't have one, at least touch the metal sides of the case before you reach in and grab a card.

4. Perform the transfer on a big workbench or table, such as a dining-room table. This enables you to place the ATX minitower on one end of the table and the rack case on the other, giving you room in between to lay out the parts, screws, and cables.

5. Remove all cards from the computer. Put them on the table in the order they came out or write down the order so you can put them back the same way.

6. Take note of the position of the red line (or broken red line) on any ribbon cables. This line indicates the location of pin 1, letting you determine the correct orientation of the cable. On most modern devices, the cable is designed so that you can connect it in only one way. However, some devices do not offer such a foolproof connector; if you make a connection backwards, you can cause yourself a lot of headaches. Write down which side of the device has the red line. Sketch it out if you need to.

7. Gently remove the drives, making sure to note the order in which they were connected inside the old case. If you have four IDE devices (two masters and two slaves), know which is which so you can plug them back in correctly.



MIKE LAWSON

FIG. 4: Install all cards and make all connections just as they were in the old case.

8. Once you've removed all the devices (except for the RAM and processor/fan), unplug the power supply from the motherboard, remove both from the old case, and install them in the new case (see **Figs. 1** and **2**). Don't let the motherboard touch any metal in the new case, otherwise it will form a ground loop that will prevent the computer from working.

9. From here, put everything into the rack case in the order they came out of the old case (see **Figs. 3** and **4**). This process isn't exactly rocket science, but it can be an all-day task if you don't take a little time to put things back the right way.

UP AND RUNNING

When you've reassembled your computer and powered it up to confirm that everything works properly, you're ready to place your new rack-mount computer where it belongs—in the rack! But the fun doesn't end here. That computer is heavy, so place it in

the bottom of the rack to make sure gravity stays your friend. I left a 2U gap above the computer so I can pop the top and get inside as needed. I also left the top cover unscrewed so it's easy to remove.

Use isolation washers to keep metal cases from touching the metal rack rails. This will prevent ground-loop noise from other devices in the rack—especially important for rack-mounted components powered from the computer, because they might not work at all if there's a ground loop. In fact, you might want to put these components in a separate rack altogether.

Now that the hard work is done, I am greatly enjoying having a rack-mounted computer. It's easier to get in and out of the chassis, the cables are better organized and integrated with the other rack-mounted gear, and I've freed up space on my desktop for other things. I highly recommend this conversion for anyone who needs to make better use of space in a home or pro studio and wants to enjoy the benefits a rack-mounted computer can bring.

OTHER OPTIONS

After I completed this project, I learned that Middle Atlantic Products offers ATX and AT rack-mount computer cases. Both cases list for $469 and include a power supply. Wave Digital also offers computer cases with shock-mount drive bays. The simplest case lists for $389; the full-featured case, which includes a power supply, lists for $469.

Mike Lawson *is a San Francisco Bay Area songwriter, guitarist, and home recording junkie with numerous performing and recording credits. He's served on the Board of Governors of the San Francisco chapter of the National Academy of Recording Arts and Sciences (NARAS) and is also the publisher of* MixBooks *and* EMBooks. *Visit his Web site at www.mikelawson.com.*

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By Elizabeth Papapetrou

Are you ready for a challenge? Take about 240 strings; stretch them across a mutant harp; attach 88 hammers, mechanical contrivances, and keys; mount it all over a soundboard; put the whole mess in a giant wooden box; and make noise with it. Then grab a bunch of microphones and try to capture the true sound of the glorious, pulsating, ultimate acoustic music machine you've created. Intimidated yet?

Let's go further. The piano was created to be the ideal composing and performing tool, the entire orchestra at a player's fingertips. Consequently, the instrument has a vast frequency range, covering seven and one-third octaves with tonal color—that's way beyond the range of any other acoustic instrument. Its full name is *pianoforte,* which means *soft/loud,* reminding us that the dynamics of the instrument are incredible, ranging from the softest whisper of a single note to spine-jarring thunder in an avalanche of heavy chords.

That's only the beginning. There are dozens of different styles and sizes of pianos, from tiny uprights to monster grands, and each one has its own distinctive tonal character. When you add to these factors the instrument's condition, the recording space, the musical style, and the player's technique, you have yourself a monumental miking task. But if the instrument is in tune and working correctly, every engineer should be able to capture a usable sound from a piano in most situations.

ELIZABETH PAPAPETROU

Elizabeth Papapetrou miked this seven-foot Baldwin in the beautiful Spanish court of the Thomas Center in Gainesville, Florida. She found the perfect spot for an XY pair of Elation KM201 small-diaphragm cardioid condenser mics: approximately six feet from the "crotch" and six feet off the ground.

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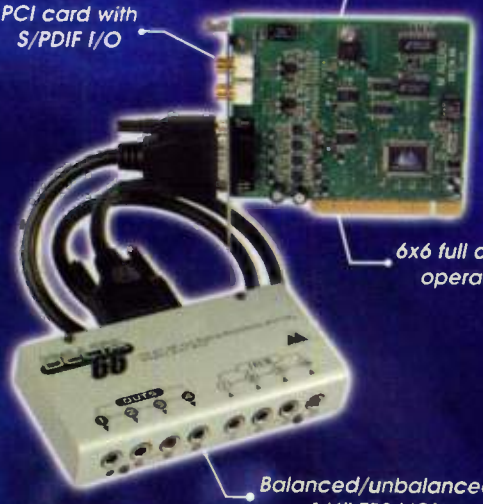

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ELIZABETH PAPAPETROU

FIG. 1: Ronny Cates mounts a pair of Røde NT2 mics over the piano, one centered over the bass and mid strings and the other centered over the treble strings. Both mics face the strings and are six to nine inches back from the hammers. Note that Cates placed the piano between parallel walls for a more ambient sound, and he removed the lid.

and the room. Be patient and methodical. If you suspect that the piano needs service or tuning, call a qualified technician. Don't try to do it yourself unless you're sure of what you're doing. And if the piano is really a mess, forget it.

This leads me to a point I hope you will take very seriously: you are not necessarily stuck with the instrument at hand. Pianists often choose a studio in which to record based on the sound and action of the studio's piano, sometimes even when it means accepting an inferior room. Classical pianists traditionally prefer a darker-sounding piano, such as a Steinway or Bosendorfer. Pop recordings are often suited to the brightness of a Yamaha or other typical Japanese-made pianos. Any piano recording benefits from a superior instrument.

The bottom line—if the piano at hand is not going to make you happy, don't use it. You can find good pianos in almost any town, so if you must, record somewhere else. Rent or barter for time in a room with a good piano, rent a good piano, or pay to have a friend's piano tuned in exchange for permission to record it. You and your client will have to live with this recording for a long time, so don't screw it up by using an inferior piano.

THE POWER OF TWO

Judging from my experience and the conversations I've had with many recording engineers, it's almost always best to record piano with a combination of mics that results in a stereo recorded image. It's pretty much impossible to capture the full tonal, frequency, and dynamic ranges of a full-blooded grand piano, for example, in any other way.

Of course, an iffy upright might have so many faults that you *want* to limit what you pick up. In that case, careful placement of a single mic is the key. But you might be best off changing pianos.

THE PERFECT PLACE

Let's begin at the sublime end of the spectrum and talk about recording a fine grand piano in a special room. Three-time Grammy winner Ronny Cates, formerly of Christian supergroup Petra, now produces and engineers tracks for major-label artists at Mirror Image Recording Studios in Gainesville, Florida. Cates is proud of his 500-square-foot, "live" studio room with a floating floor and tailored acoustics.

"There are a million ways to record piano," Cates says. "The sounds required for classical and pop/rock genres are totally different. Classical tracks require much more 'air' and spatial depth in the mix than pop/rock, which usually needs to cut through electric instruments with a tighter sound and stronger top end. Bear that in mind, but it's best to put your habits on the back burner and alter your thinking for each individual artist—particularly in the eclectic pop/rock world.

"First, really get to know the piano in question, then consider strange combinations of sound sources. Maybe put a mic or two through a Marshall amp and mix the results with a natural signal. Listen to artists who are creative with such things: Ben Folds Five, for example.

"Whatever you do, remember the golden rule: Garbage in, garbage out. And stick to first principles. Take care with mic and polar-pattern selection, mic placement, room selection, and instrument positioning in the room. Forget about fixing in the mix. Get the right sound first. Take time to figure out where in the space available the piano sounds best for your needs. Note that this varies for each session, even under apparently identical circumstances. Never assume."

Cates's quick and easy starting point for getting the most natural sound out of the Young Chang baby grand in his studio is placing two Røde NT2 cardioids overhead in a spaced pair, 18 inches above the soundboard (see **Fig. 1**). The two mics aren't matched, but they're close to it. This placement picks up a lot of string and hammer-action noise and allows the recorded sound to cut through a mix, yet remain quite natural and airy. For this combination of piano and mics, Cates generally uses outboard API 3124 mic preamps with a bare minimum of compression and EQ.

Remember that, as with virtually all acoustic instruments, the true sound of a piano results from the interaction of its components (soundboard, strings, hammers, lid, and so on) in an acoustic space. Therefore, you capture the most natural sound when you mic the instrument from about six feet back.

ELIZABETH PAPAPETROU

FIG. 2: A pair of Elation KM201 cardioids are set to pick up a balanced sound from inside the piano. Note the limited space. Prop open the lid with the long stick first, but make sure the lid can clear the mics, mounts, and stands when on the short stick as well.

Manual, Shmanual

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To cut through a sonic wall of distorted guitar, try brighter mics—such as AKG C 414s or AKG C 3000s—in the same position. If you don't have a pair of good condenser mics, Shure SM57s can give good results.

Superior microphones portray the depth and spatiality of a piano dramatically better than other mics. The Røde NT2, for example, is a very nice mic, but you will hear the difference if you compare it to an appropriate higher-end mic from a company such as Neumann, Schoeps, or Earthworks. Similarly, when you replace a mediocre preamplifier with a superior preamplifier, the sonic improvement is impressive. You won't always have the option of using higher-end products, but if the session is important enough, consider borrowing or renting them.

The three-to-one rule of microphone placement instructs us to make sure the distance between the mics is three times greater than their distance from the sound source. However, as we are miking a single (albeit complex) source, the phase problems caused by breaking the rule are minimal.

Cates utilizes interesting surfaces—such as cloth, wood, and acoustic baffles—when he mics the room. "I often play with gobos, blankets, curtains, or whatever seems appropriate for molding the naturally occurring sound in the room," he says. "Sometimes it's nice to make a room like this sound smaller, with less-reflective surfaces. I often wander around the room while a player is practicing and find a particularly nice spot where the room and

PERFORMING UNDER PRESSURE

A PZM (pressure zone microphone), or boundary microphone, is an omnidirectional microphone capsule (typically an electret condenser) that is fixed very close to a flat surface, at a distance shorter than the wavelength of the highest frequency to which it responds (see **Fig. A**). At the surface, or boundary plate, reflected and direct sound effectively act as one reinforced signal, eliminating time-displacement effects (that is, comb filtering).

Due to the boundary, rear rejection is 100 percent. The boundary converts the capsule's omnidirectional polar pattern into a hemispherical pattern, with the boundary plate determining the hemisphere's equator. The result is a great ambient-recording microphone. It's particularly nice for concert recordings and for adding color.

Low-frequency pickup (below 350 Hz, for instance) drops off if the wavelength is longer than the boundary plate, so if you have the 5 by 6–inch plate typical of some Crown PZMs, you might want to mount it on a larger plate (2 by 2 feet, or even 4 by 4 feet). These mics become directional at high frequencies when mounted on a small surface.

Boundary microphones were invented in 1980 by Ken Wahrenbrock, a ham-radio enthusiast who was asked to do a lot of live, spoken-word recordings. Frustrated with ambient-mic techniques of the time, he decided to develop a microphone that worked more like the human ear. Wahrenbrock's breakthrough came when he discovered that one main difference between a conventional microphone and the human ear is the ear has a pressure gap beneath the eardrum that makes part of the ear act as a reflective boundary. This led to experiments with flat boundaries and small condenser capsules. Well-known engineers Ron Wickersham and Ed Long later helped refine Wahrenbrock's design and develop it into something that could be controlled and manufactured easily. Their design was licensed by Crown International, which is still a leading manufacturer of PZMs.

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FIG. A: Mark Pinske holds up a modified Radio Shack Realistic PZM to show the all-important gap between the capsule and the boundary.

In 1981, Wahrenbrock demonstrated prototypes of his new microphone for Frank Zappa and Zappa's personal-studio engineer, Mark Pinske. These days Pinske engineers and masters at Skylab Studios in Gainesville, Florida. "Ken brought us these weird-looking mics, and we were blown away by them, particularly for ambience," recalls Pinske. "The first thing we recorded was a big, five-octave bass marimba. It sounded awesome through the PZMs. We worked with Ken on development for two years and did all sorts of crazy things with the mics.

"Sometimes Frank recorded his solos on PZMs in an empty concert hall because he liked the natural reverb, and we dropped them into recordings later. For five years we kept the PZMs set up behind the P.A. cabinets—one stage left, one stage right—in order to get an ambient audience sound that was similar to what Frank heard on stage. Then, in 1984, we recorded *Orchestral Works* using 30 or 40 PZMs, trying all sorts of weird Plexiglas constructions to change the boundary characteristics. We put them everywhere: scooplike plastic dishes over violin stands, little wedges that sat on the floor in front of the cellos and basses, and big 4-by-4, Plexiglas sheets that hung from the wall behind the percussion. It was awesome."

Further technical information about PZMs is available in *The PZM Boundary Booklet*, free from Crown International (see Contact Sheet on p. 175).

—Elizabeth Papapetrou and Steve Oppenheimer

For manufacturer information, please see Contact Sheet, p. 175.


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piano sound right. I'll mic that area, usually with another large-diaphragm condenser. I like large-diaphragm mics for piano. Or if I'm recording an ensemble live in this room, I'll mic the underside of the piano for a more contained sound. It's often worth trying that in conjunction with overhead mics, too."

ON LOCATION

If you are blessed with a great-sounding room that you can easily shape to your needs, you're fortunate. But most of us don't have that privilege, and we can record grand pianos only on location. I talked with noted longtime live-sound and recording engineer Taylor Johnson of The Sound Room in Hebron, Connecticut, about location-recording grand pianos.

"Most location grand pianos are 6- or 7-foot models, or perhaps a 5-foot baby," he says. "If you happen to come across a 9-foot monster, use the techniques I'm outlining here, but be aware that the piano is going to be incredibly resonant and, consequently, more difficult to mic. I put Sonex (acoustic foam), sound blankets, quilts, or what-have-you on the floor underneath the piano. I even pack foam beneath the piano's soundboard. You end up miking primarily the strings and beaters, eliminating almost two-thirds of the resonance.

"For an open, airy, 'classical' sound, prop open the lid on full stick. In a fairly resonant hall, I use a pair of small-diaphragm cardioid condensers in an XY [see opening photo] or ORTF pattern [see the sidebar "ORTF: The Basics"] pointed into the piano 'crotch' and about four to eight feet out from center. Remember that in this case the piano lid is directing some of the sound to the mics. If you set the mics close in, you'll likely get good midrange response, but you may find that the right-hand treble strings are outside of the mics' cardioid patterns. On the other hand, setting up far away will result in too much general reflection.

ELIZABETH PAPAPETROU

FIG. 3: Two modified Radio Shack Realistic PZMs are mounted on ¼-inch Plexiglas and taped, in the appropriate positions, to the inner part of the piano lid. The lid is on the long stick for clarity. Note that the capsules face the keyboard. Use good-quality, Permacel-type gaffer's tape that won't damage the instrument's finish.

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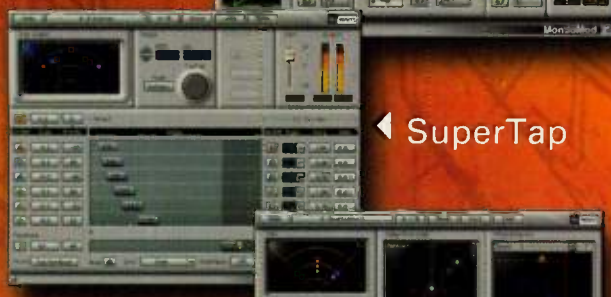

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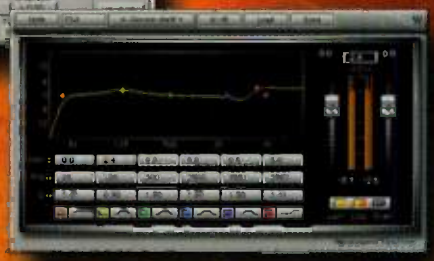

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"Mounting the microphones at the height of the piano (four feet) will enable you to capture more reflection off the stage floor, but that might not help if the floor is composed of tile or stone. In that case, try putting the blankets underneath. Otherwise, try placing the mics eight feet high, past the point of reflection off the piano soundboard and, of course, floor reflection.

"The idea is to balance the reflections of the hall and the attack of the piano," Johnson continues. "Other factors are the player and style of music. Use your ears to find the right spot, try the mics there, and make adjustments as common sense and intuition direct you.

"You might also try a spaced stereo pair of large-diaphragm condenser microphones, but those will pick up a lot of ambient resonance off the stage and hall. That's good if the hall has exceptional acoustics, but having a great hall, fine piano, good stage, wonderful player, and perfect material is rare."

A TOUGH ROOM

You should usually consider close-miking only when the space detracts from the sound of the instrument, when you want isolation (while recording a live band, for example), or when you want the mechanical aspects of

ORTF: THE BASICS

With ORTF miking, you place a pair of cardioid mics about 6.69 inches apart and facing outward at a 110-degree angle (see **Fig. B**). The mics are aimed at the left and right edges of the sound source. The perceived spatial position of the source is achieved through sound intensity as well as phase differences.

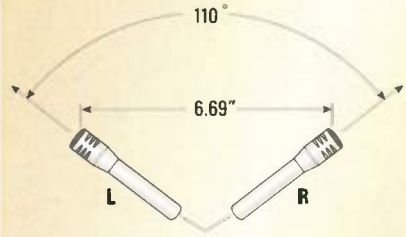

FIG. B: ORTF, a near-coincident, stereo mic-placement technique, consists of two cardioid mics 110 degrees apart with 6.69 inches between the capsules.

The greater the angle of the mics, the smaller the stereo image. This is because turning the mics outward exposes more of their off-axis sides to the source. When the mics are at a tighter angle, the source is more on-axis to both mics.

In general, ORTF (short for *Office de Radiodiffusion Télévision Française,* the French government radio network that developed the technique) is easy to use and gives good spatial definition. It also produces a very pleasant sound with a lot of depth that warms the brightness of small-diaphragm microphones. ORTF works better with small-diaphragm condenser microphones than with large-diaphragm microphones, which have a relatively weaker off-axis response.

—Steve Oppenheimer

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the piano, such as the hammers, to be integral to the sound. Close-miking isn't recommended for baby grands under any circumstances because they are strung loose and tend to rattle and bang.

Johnson offers several approaches to close-miking. "I tend to use a pair of small-diaphragm cardioid condensers," he says. "My favorite method is to place the mics about four inches above, and parallel to, the soundboard and prop open the lid with the short stick (see **Fig. 2**). I put one mic at the second sound hole from the side, pointed at the hammers or at the center of the keyboard. I generally put the other mic near the fourth sound hole from the side, pointed across the strings at or close to the place where the bass strings cross the mid strings. Some engineers put the second mic on the opposite side, at the other point where the strings cross, but I find that way too bassy."

Another technique is to tape PZMs to the lid in the same positions Johnson suggests for small-diaphragm cardioid condenser microphones (see **Fig. 3**). Although the short stick is recommended in this example, you can also place the lid in an almost-closed position. (For more information on PZMs, see the sidebar "Performing Under Pressure.")

If your session is in a particularly bad space and you are recording without an audience, consider setting your microphones inside the piano. Wrap the body of the piano with acoustic blankets, quilts, packing blankets, comforters, ordinary blankets, or any other soft material that feels appropriate. I call this the "woolly mammoth" approach, and it often works, even in the most difficult spaces. An added benefit of the technique is that it almost fully separates the piano from other instruments.

ELIZABETH PAPAPETROU

FIG. 5: A pair of small-diaphragm cardioid condenser mics are pointed at each other, four to six inches from the edge of the opening and two to three feet above. Also try angling the mics downward 20 degrees or so.

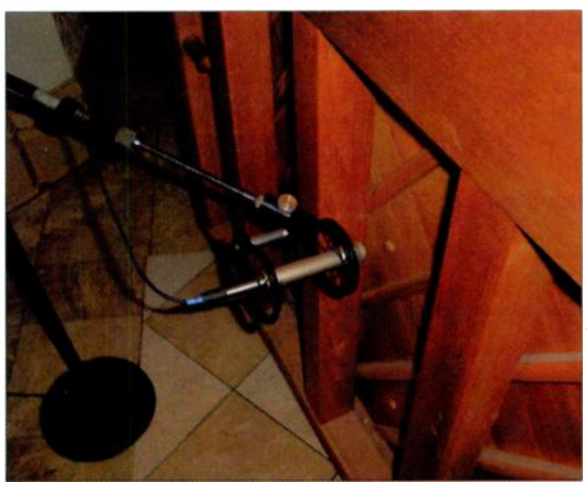
UPS AND DOWNS

The tip I've received most often on recording upright pianos is to not do it at all. It's almost impossible to get a convincing piano sound from an upright, even one that's beautifully built and in perfect working order. In an upright, all the hardware of a grand piano has been shoehorned into a tiny space, which makes it difficult to separate the mechanical noises from the music. If you're looking for that tinkly, honky-tonk, hammer- and pedal-heavy upright sound, you can get it. You can even paint the hammer felts with nail polish or stick thumbtacks into them to accentuate the piano's trebly hammer-attack sound. But you'll have difficulty achieving a natural sound.

Unfortunately, an iffy upright in a difficult space may be your only available option. So here are a few tricks and tips that might help.

Harvey Gerst of the Indian Trail recording studio in Sanger, Texas, is a gold record–winning songwriter, studio musician, recording engineer, producer, and microphone designer. He recommends that you move an upright away from any walls in the space and mic the back of the piano (see **Fig. 4**). "If you can't get it away from the wall," Gerst says, "angle the piano so it's not parallel to the wall. Use your ears to find any spots that ring—which is a particular problem with uprights—and find the spot that rings least. If that doesn't work, try to mic from farther away, at the position that works best for you."

Johnson adds: "Some of the best recordings of uprights have been made by miking restored player pianos that have the machine works removed and the piano-roll door left open. You access the sound with a single, large-diaphragm condenser microphone, directly off the soundboard. I've gotten the best results from a pair of cardioid-pattern, small-diaphragm condenser mics, one at each end of the fully open top. You also might want to take off the front above the keyboard, particularly if only half the top opens (see **Fig. 5**). An alternative is to place a similar XY pair above the player's head, about six inches in front of the opening."



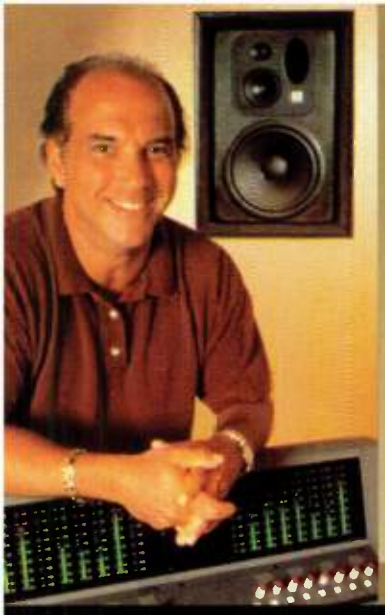
ELIZABETH PAPAPETROU

FIG. 4: A small-diaphragm mic is pointed at the piano back, about an octave below middle A. Start about four to six inches from the back and pull away to find the optimum spot. This will be clanky rather than pretty, but at least it will be loud.

PANDORA'S BOX?

We've barely scratched the surface of an enormous subject. Much depends on your insight, patience, ingenuity, common sense, and—most important—ears. But if you have a sufficient supply of these virtues along with the appropriate electronic equipment, you can get a usable sound wherever you record and—within reason—with any instrument.

Elizabeth Papapetrou *has been writing for music magazines and recording for 17 years. She loves microphones and focuses on recording solo and small-ensemble acoustic music.*



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Tackling Technology

Is copyright law keeping up with music on the Internet?

By Michael A. Aczon

The Internet. Faster than a personal computer with the latest microprocessor. More powerful than a stack of guitar amplifiers. Able to leap the entire Silicon Valley in a single bound. Just in the past year, the Internet has evolved into a powerful tool for communication and commerce, especially as regards entertainment. Let's take a look at how U.S. copyright law, enacted at the turn of the last century, is doing its best to keep up with the technology and business practices of the new century.

JACK DESROCHER

BASIC TRAINING

Music is distributed on the Internet in three basic ways. The first is the *virtual store* that sells traditional "hard copy" music media (CD, cassette, and vinyl). In this incarnation, retail stores have shifted to an online form to distribute music, but they haven't changed the format of the music they sell. When you purchase music from a virtual store, you still receive the product in a familiar form—usually a CD—shipped to your home.

The second way music is distributed online is in *downloadable files*. Literally thousands of Web sites such as MP3.com and emusic.com are making whole catalogs of music available that you can download from the Internet onto your computer. With the correct software, you can listen to this downloaded music and even copy it from your computer to a free-standing audio device.

(One of the early legal battles over copyright on the Internet took place in 1998. The traditional record industry attempted to block the sale of Diamond Multimedia's MP3 player—a portable device approximately the size of a pack of cigarettes that enables users to digitally record downloads and listen to the recording away from their computers.)

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It's a new dawn, the thought police are at the door and all they want you to do is visit a nice little web site called Live365.com. Just type in the URL and what at first seems a pleasant diversion is soon an all-consuming sonic passion. Your night, your day, Your wrong your right. *And before you know it, you're hypnotized in front of your computer speakers for the umpteenth day in a row and little Joey and Jane America are pledging allegiance to the Iraqi flag.* Resist temptation! Read on!

Darryl Jackson aka DJ Darryl aka
THE DOMIN-ATOR aka Rasta D
THis unlicensed DJ's (Death Jockey!) reggae show now has 100,000 desperate addicts.How many more must fall under his spell before we awaken from our slumber???

LIVE 365.COM™

**this "curious" pattern appeared one morning in an Idaho cornfield. THe handiwork of an overzealous farmer and his mower? Think again!!!!!

+**Ignore the following at your own peril*****:

MYTH 1

"All you're gonna feel is good." Sure, the "tunes" seem good, the DJs seem good, it's all good. !!!!At FIRST!!! But then you're hooked and the turntables turn. Just how "good" are you gonna feel when you have to move what's left of your belongings into a box car?!?

MYTH 2

"I can quit listening any time I want."
Nail biting, slouching, "close" dancing--these are things you can quit. Live365.com is not. Pretty soon, you'll be skipping work. Kids will be playing hooky. And who's that sitting in your barca-lounger? Why it's Saddam Hussein!

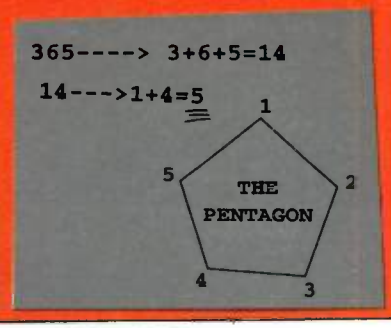

fig1. fig.2 fig.3

Intelligence sources will "neither confirm nor deny" the so-called insidious Brain-Devolution associated with repeated exposure to said "broadcasting' procedure(Live365.com.)

MYTH 3

"Free music on the Internet *is good.*"
That's just what the Trilateral Commission (aka the Illuminati aka the Bilderbergers) wants you to believe. Wake up, Nancy! Free music leads directly to Free Love... and next thing you know you're keeping time to the music with a big dose of the Clap!

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Wrong for America

Paid for by the citizens against live365.com

packets—again, with the proper software—on the fly. Internet sites such as broadcast.com are encouraging listeners to think of streaming as customized online listening sites, or as "online radio" that allows people to listen to anything from their favorite local radio stations to music from foreign countries.

A ROYALTY PAIN IN THE...

As with any change in technology and commerce, the laws must try to keep up. One of the major problems in music distribution on the Web is determining which type of royalty applies to what kind of technology.

The online-store model is protected in a way we're all familiar with. If your song is included on a preexisting CD sold over the Internet, all the vendor must do is keep track of the sale and pay the label the appropriate price for the CD. The label pays royalties to the artist for the use of each song on the CD.

The other two forms of distribution are trickier. When the files are made available by digital download, should the traditional mechanical license and the appropriate royalty apply to everyone who wants to download the song onto a computer? Many companies selling downloaded music are adopting this interpretation of the law. By making consumers pay to download a song, each download is treated as a sale just as it would be if it were a CD—meaning the price takes into account the various royalties to be paid for the copyrighted works. Once the company collects the sale amount, it makes a royalty payment to the record company for use of the copyright-protected master, as well as a mechanical royalty payment to the publishing company that controls the song.

Because streaming audio resembles radio use, performance rights societies (in the United States these are ASCAP, BMI, and SESAC) have stepped up the pace to protect performance rights for copyright holders. One of the rights outlined in U.S. copyright law is the right to perform, which brings with it performance-right income. This means that every time a composition is played, be it on the radio, on television, or in a restaurant, the artist earns a performance royalty. Citing this portion of copyright law, the performance rights societies are seeking to issue licenses to Web sites that "broadcast" music. The rights organizations collect royalties for the use of songs and pay the appropriate amount to songwriters and publishers. If you would like to stay informed about the performance rights societies' efforts to protect your songs on the Internet, you can visit their Web sites (www.ascap.com, www.bmi.com, and www.sesac.com) and read the Frequently Asked Questions sections that cover the Internet and new technology. If you are planning to set up a Web site that broadcasts music, it is advisable for you to contact the performance rights societies and obtain a license.

Copyright law also protects other artwork associated with your music that could be used on the Web, such as your photographs, videos, and written material like bios and lyrics. Conversely, if someone wants to use your music in connection with a video to be broadcast online, you should consider issuing a sync license (see "Working Musician:

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From Song to Screen" in the January 1998 issue of **EM**) and notifying your performance rights society of the additional use.

Many musicians ask me about sampling material off the Web and reusing it. Copyright law still protects against making a derivative work of copyrighted material, regardless of where it was appropriated. So, whether you grab a sample off the Web or off a vinyl LP your dad bought in 1972, the "derivative work" provisions of the copyright law still apply.

PIRATES ON THE HORIZON

Protecting against piracy of musical works—whether as streaming music recorded off a computer or the sale of digital downloads—is an extremely difficult task. Because the technology is so readily available to the public, we are seeing case after case of "leaked" prereleases of television shows, movie trailers, and independent and major-label artists uploaded by copyright pirates who allow others to download the work free of charge.

To protect creators of copyrighted works in cyberspace, the copyright law was retooled and updated as the Digital Millennium Copyright Act. It now includes the No Electronic Theft (NET) provisions, which allow for substantial penalties—including criminal—for copyright infringers. One of the showstoppers of this act was making the party providing pirated content responsible for any copyright infringement.

TANGLED WEB

Watching the law change with technology can be a frustrating experience for the little guy. If major corporations can't prevent people from ripping them off, how can an independent musician possibly avoid it? If the history of the music business is any indication, a combination of key legal cases, the public's embrace of technology, and the music marketplace will determine how copyright law will be enforced in cyberspace. As I write this column, I'm also logging on to the Net to look at the various lawsuits and criminal actions being brought against copyright infringers to protect artists' rights. As with the uproars over home taping in the '70s, DAT technology in the '80s, and the Diamond Rio MP3 player in the late '90s, it will take some time for the legal process to adjust, but the industry and market for recorded music will adjust with it.

Some of the technological changes taking place include the use of "Web robots" that track music online for royalty purposes; encryption technology that prevents copying; watermark technology that helps track down repeated copying of downloaded works, and a variety of other new security products. The real key for the industry—starting with the independent artist—is self-policing. Ever since the inception of copyright law, it's been said that the music business is a business of pennies. Every pirated piece of sheet music, record, and download takes money out of creators' pockets. Everyone, from top-selling pop acts to self-produced home-studio prodigies,

▼

One major problem is determining which type of royalty applies to what kind of technology.

gets hurt by this. Think twice before making that "courtesy copy" for a friend or looking the other way when others do.

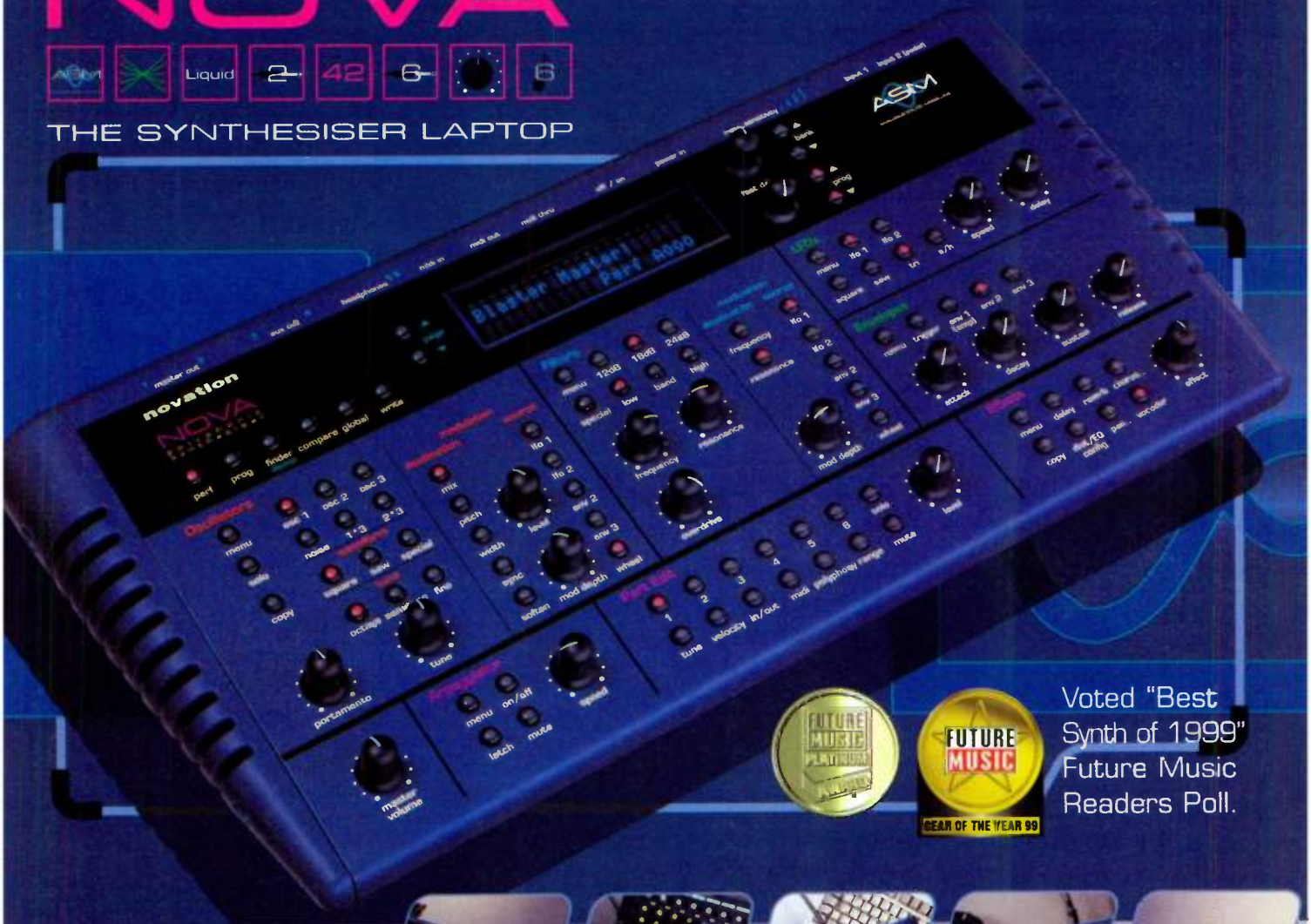
The business of music on the Internet is moving at lightning speed. Much like gear rolling off the assembly line, today's interpretation of the law in relation to the Internet may be obsolete in a matter of weeks. It's more important than ever for you to be aware of these legal issues and changes. Regardless of what technology is used to get an artist or song to the public, the connection of human spirit, emotion, and art is still necessary to create a demand for the music industry. Embrace the art, the technology, and the law when you rock the Web with your tunes.

Writer, instructor, and entertainment attorney **Michael A. Aczon** *looks forward to enjoying the fresh air at the San Francisco Giants' new baseball park with his family.*

NOVA

Liquid 2 42 6 6

THE SYNTHESISER LAPTOP



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Expert Advice

Tips for getting the most out of your gear.

Compiled by Mike Levine

Welcome to the March 2000 installment of "Operation Help." This month we hear from Roland on bouncing VS-1680 tracks with effects, from BitHeadz on setting up *Unity DS-1* and *Retro AS-1* to work with ReWire, and from Akai on how to use the BPM Match feature on its S5000/S6000 samplers. Plus, we'll reach into our e-mail bag and answer readers' questions about their gear.

FROM THE MANUFACTURERS

Bouncing Tracks with Effects on the Roland VS-1680

If you're using effects on your project, it can be beneficial to include the effects processor's output when you bounce tracks—this is sometimes referred to as *printing the effects*. In doing so, you make the effects a permanent part of the audio, freeing the processor for use on a different track or for adding a different effect on the same track. Use the following procedure to bounce tracks 1 to 14 to tracks 15 and 16, with effects.

1. Assign tracks 1 to 14 to any of the available effects processors (1 to 4).

2. Hold down the track 15/16 Status button and press Clear.

3. Hold down the track 15/16 Status button and press Track Select buttons 1 to 14 consecutively. The Track Select buttons will start flashing.

4. Hold down the track 15/16 Status button and press the Eff Rtn button for all of the effects processors being used. For example, to record Effect 1 to tracks 15 and 16, hold down the track 15/16 Status button and press Eff 1/3 Rtn. (Note: If you are using Effect 3 or 4, hold down the track 15/16 Status button, Shift, and Eff 1/3 Rtn or Eff 2/4 Rtn to assign effect 3 or 4 to be recorded on tracks 15 and 16.)

5. Press the track 15/16 Status button repeatedly until it is set to Source mode (the button glows orange). Repeatedly press the Status buttons for tracks 1 to 14 until they are set to Play mode (the buttons glow green).

Bouncing with effects frees up the Roland VS-1680's processors for use on other tracks.

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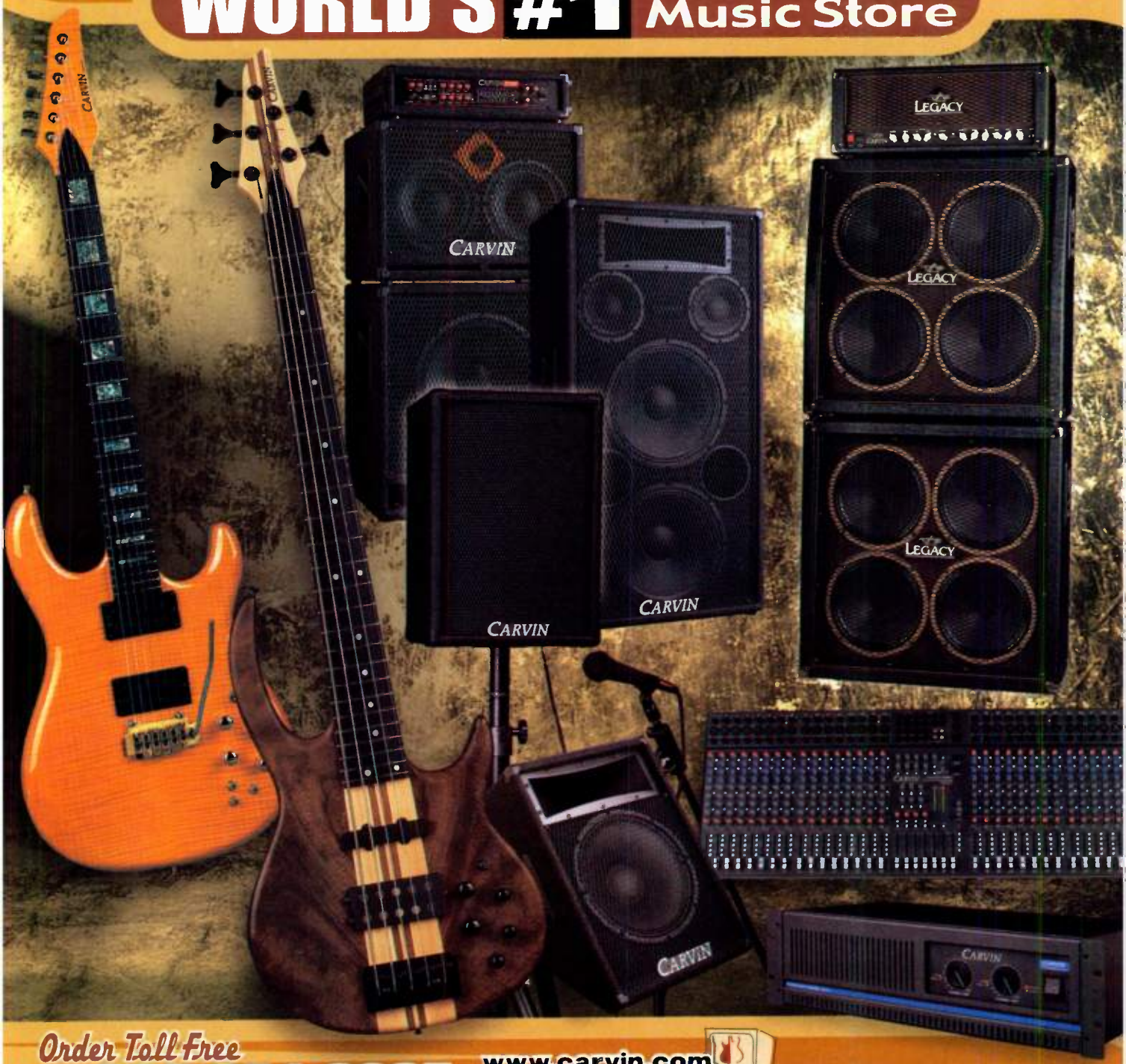

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6. Press Play and adjust the level and pan settings for tracks 1 to 14 as desired. Press Stop when you're finished.

7. Repeatedly press the track 15/16 Status button until it is set to Record-Ready mode (the button flashes red).

8. Reset your song to the beginning. Press Rec, followed by Play.

9. Press Stop when your song is finished playing. Now tracks 15 and 16 will contain a stereo mix of tracks 1 to 14 with the effects included.—*Duane McDonald, Roland Corporation U.S.*

Setting up BitHeadz *Unity DS-1* and *Retro AS-1* to Work with ReWire

BitHeadz' flagship products—the *Unity DS-1* digital sampler and the *Retro AS-1* analog synth—support ReWire (a digital audio transfer protocol developed by Propellerhead Software and Steinberg) under both Mac OS and Windows 95/98. In a sequencer that supports ReWire, you can route the audio outputs of either program directly into individual audio tracks. This allows you to work entirely in the digital domain.

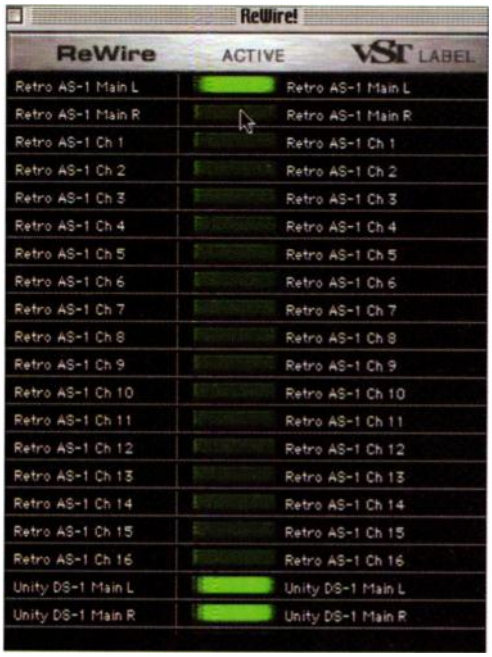
Here's how to set up *Unity DS-1* and *Retro AS-1* with ReWire in Steinberg's *Cubase VST* and Opcode Systems' *Studio Vision*. On the Mac, you'll need Steinberg's *Cubase VST* 4.0r3 or later, or Opcode Systems' *Studio Vision* v. 4.5.x. On the PC side, use *Cubase VST* 3.6 or later.

1. ReWire driver installation. The only difference between the ReWire configuration under Mac OS and the configuration under Windows 95/98 is the driver install. Under Windows 95/98, the *Cubase VST* installer will properly load the ReWire drivers, and the BitHeadz installers will update the drivers if necessary. Under Mac OS, you must copy both the *Unity DS-1* ReWire plug-in and the ReWire v. 1.1.0 extension to the Extensions folder. These drivers are in the *Unity DS-1* Utilities/ReWire folder on your hard drive. Follow the same procedure for *Retro AS-1;* look for the drivers in the Goodies/ReWire folder on your hard drive.

2. Software configuration of the *Unity DS-1* and *Retro AS-1* engines. The rest of the configuration happens within the software, in the *Unity DS-1* and *Retro AS-1* control panels. On the Mac, choose Apple Menu → Control Panels → Unity DS-1 (or Retro AS-1). On the PC, click on the Start button and choose Programs → Unity DS-1 (or Retro AS-1) → Unity DS-1 (or Retro AS-1) Control Panel.

In the control panel, specify Plug-in as the audio-output type for the program. The audio output of the *DS-1* or *AS-1* will now be directed to the ReWire channel inputs in *Cubase* or *Studio Vision*.

3. Configuration in the ReWire sequencer host. The next time you launch *Cubase VST* or *Studio Vision*, you'll be able to access the audio outputs of the *AS-1* or *DS-1* as ReWire returns. First, however, you must enable the appropriate ReWire channels in your sequencer. Do this by choosing Panels/ReWire in *Cubase*, or Windows/Audio Instruments in *Studio Vision*.

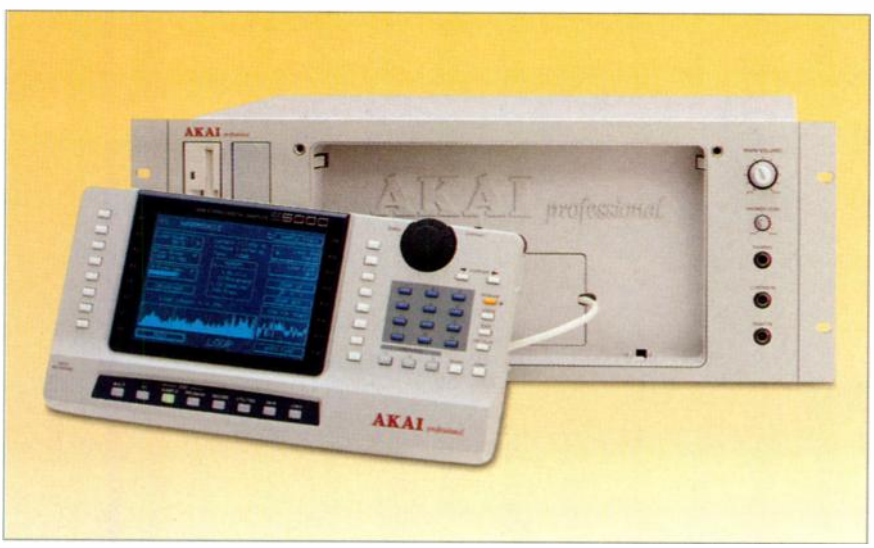


Routing the outputs of BitHeadz Unity DS-1 and Retro AS-1 through ReWire lets you keep their sounds in the digital domain.

4. Notes on MIDI setup. On the Mac, use OMS to establish MIDI communication between *Unity DS-1* or *Retro AS-1* and *Cubase VST* or *Studio Vision*. After you install the program, go to System Folder → OMS folder and make sure that the appropriate OMS driver is installed. Then launch the OMS Setup application and create a new studio setup. OMS will scan through its driver bank and "see" the BitHeadz driver. It will then include *Unity DS-1* (or *Retro AS-1*) in your Current Studio Setup. If you can't find the *Unity* or *Retro* OMS driver, reinstall the program from your CD-ROM, update to the current version, and try again.

Under Windows 95/98, *Cubase VST* will recognize *Unity DS-1* and *Retro AS-1* as MIDI devices. Use the Multimedia control panel (Start button → Settings → Control Panel → Multimedia → MIDI Devices and Instruments) to verify that the program's driver is active and enabled. Then run *Cubase VST*'s Setup MME utility to define and verify the MIDI input and output instruments.

That's it! Now you can route the audio output from *Unity DS-1* or *Retro*



Loop users will appreciate the Akai S5000/S6000 samplers' BPM Match feature, which allows easy adjustment of an audio sample's tempo.

For manufacturer information, please see Contact Sheet, p. 175.

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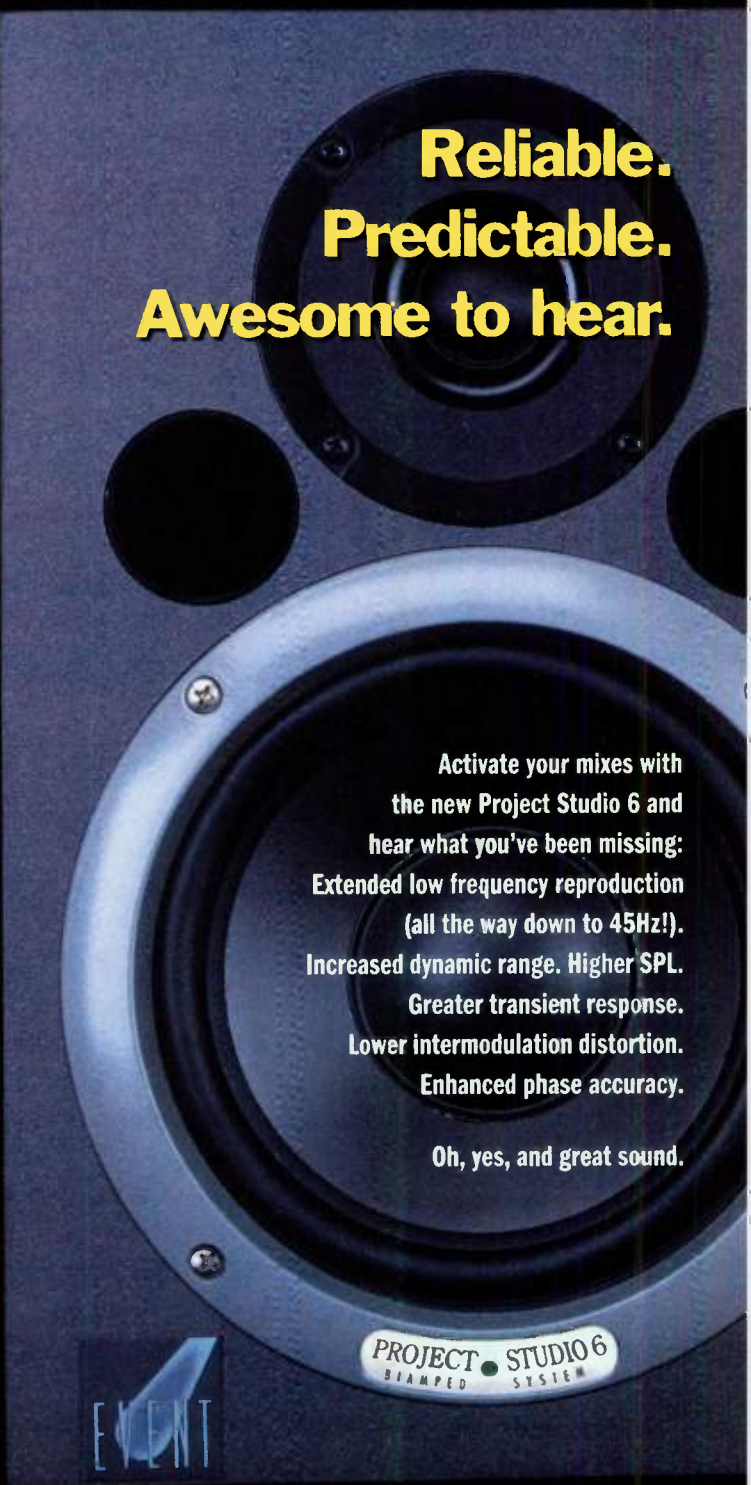

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AS-1 right back into your ReWire host. Enjoy!—*BitHeadz support team*

Using BPM Match on the Akai S5000/S6000

Akai has significantly improved the TimeStretch feature on its S5000/S6000 samplers. One notable enhancement, the BPM Match function, allows you to choose a sample at a known tempo and have the sampler automatically time-stretch it to a new tempo.

BPM Match is an operation performed on individual samples, so you access it in Edit Sample mode by pressing the F13 soft key. Enter the original tempo of the sample in the Source Tempo field, then enter the desired tempo in the New Tempo field. If you don't know the original tempo, you can probably estimate it by matching it to a click track on your sequencer.

Next, select the preset that best describes the source sample. Because different types of sounds respond differently to time-stretch operations, Akai has provided 18 different presets you can select from the Preset field. Each has three variations (represented by the letters *A*, *B*, and *C*), making a total of 54 presets.

Variation A provides a time stretch of average quality and the fastest processing; Variation B provides a time stretch of better quality but slightly slower processing; and Variation C provides the highest-quality result but the slowest processing.

For example, let's change the tempo of one of the samples from the factory disk set. First, load the Workstation #2 disk. We will change "M.Loop 1," but first we need to loop it. To loop the sample, go to the Edit Sample/Loop page and change the Loop End point to 108907. This will provide a proper loop at about 97.6 bpm. Now go back to the BPM Match page to continue the TimeStretch operation.

Enter the source tempo (97.6 bpm) in the Source Tempo field. Select 120 bpm (the default selection) as the desired tempo of the new sample. Then choose an appropriate preset. Because the sample contains a lot of midrange frequencies, select the Mfreq Rhythm B preset. It provides a nice balance of quality and speed. Press the Match New BPM soft key (F16), and the sampler will execute processing.

Once processing is complete, you can audition both the original sample and the newly created sample to determine whether the result is worth keeping. Keep the original sample, keep the new sample, keep both, or overwrite the old with the new. If you're satisfied with the results, you're done.

If you're not happy, press the Preset key (F10) again to open the Preset window, and try tweaking the Adjust parameter. As a basic rule of thumb, setting the Adjust parameter to a positive value improves the processing of high-frequency and percussive-type sounds, whereas a negative setting improves the processing of sounds with a lot of bass. Remember that when you're using any time-stretch feature, experimentation is the key to good results.—*David Whittle, Akai*

QUESTIONS FROM READERS

PowerBook Quandary

Q: I teach band/music at the high-school level, and our school has agreed to purchase a new Mac for the

music department. I would like to get a new PowerBook, but any new machine would be an improvement over the Power Mac 6100 and PowerBook 575 I'm currently using. I use Mark of the Unicorn's *Mosaic* and FreeMIDI extensively and plan to get into sequencing, recording, and CD burning. I have an Alesis QS6 MIDI keyboard with a rear serial port; it connects to my Mac via a direct serial connection (no MIDI interface).

Because the new PowerBooks do not include serial ports, I would like to use a simple adapter solution, like the Keyspan USB twin serial adapter. There are also PCI cards and internal (modem-slot) adapters that provide serial MIDI, but for those I would need a desktop Mac, not a PowerBook. Do you have any ideas on using new PowerBooks for music/MIDI applications, or should I abandon the idea and get a desktop system? Or should I hold out for the G4? Any suggestions would be greatly appreciated.

Bernie Stellar
Mount Carmel, CA

A: Your letter raises several interesting issues well worth exploring. But your central issue—employing a USB-to-serial adapter to avoid using a MIDI interface—is really just a red herring. Without trying it myself, I can't verify that the Keyspan device will actually function in your system, although it might work fine.

The bigger question is, Why are you designing your desktop music system around a PowerBook in the first place? Unless you do some of your best work while commuting to and from school or while sitting in airports and restaurants, it makes little sense to build a music production system around a laptop computer. A laptop is by its very nature a heavily compromised device. How else could you cram a full-size desktop machine into a case the size of an omelet pan? Certain things just have to be left out—like expansion slots, drive bays, a full-size monitor, a mouse, and several other noteworthy items.

I have a PowerBook 1400c that I like very much, but I wouldn't dream of trying to run a score notation/layout program such as *Mosaic* on it. Viewing a full orchestral score on a laptop display would be like viewing the Sistine Chapel through a keyhole. And notation programs are not unique in that regard. Most of today's sequencers and digital audio editors offer so many editing views, mixing consoles, effects windows, plug-in displays, toolbars, and other screen elements that you need a good, clear, 17-inch (or larger) monitor for professional-level productivity.

Especially in an academic setting, a large, bright monitor, a full-size keyboard, a mouse, and a good set of speakers are essential components of a desktop music system. As for the CPU, you don't need a unit so powerful that the State Department starts watching your house. Any current G3 model with at least 64 MB of RAM (more is

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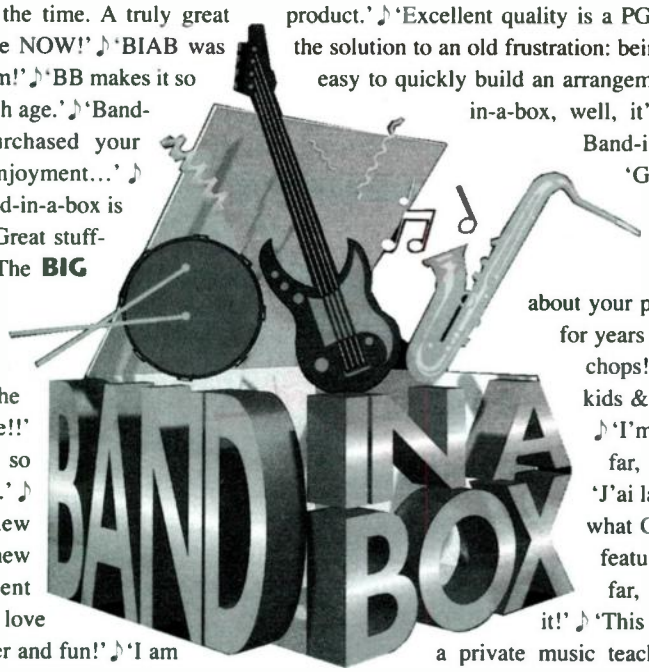
Thanks to BIAB I can still swing with the help of the fabulous cats living inside BIAB.' ♪ 'The immediate feedback is a **first-class** learning environment!' ♪ 'BB is my best learning tool.' ♪ 'I use BIAB all the time. A truly great product.' ♪ 'Excellent quality is a PG Music standard! Band in a Box is an awesome tool for getting projects done NOW!' ♪ 'BIAB was the solution to an old frustration: being a musician. Now I am a musician.' ♪ 'Band-in-a-Box is one heck of a program!' ♪ 'BB makes it so easy to quickly build an arrangement for composing.' ♪ 'I've used BIAB for a year now and it just gets better with age.' ♪ 'Band- in-a-box, well, it's just a great program!' ♪ 'Excelente programa o Band-in-a-box!' ♪ 'I purchased your Band-in-a-Box four weeks ago, I have had the **GREATEST** FOUR WEEKS of enjoyment...' ♪ 'Great software and accessible to everyone who loves music! ♪ 'Your Band-in-a-box is fabulous! Congratulations!' ♪ 'BIAB has made me a much better player. ♪ 'Great stuff- not enough time in my lifetime to cover all bases on this program.' ♪ 'The **BIG LYRICS SCREEN** is a blessing for singers...' ♪ 'Can't say enough good about your products. You obviously understand our needs exactly.' ♪ 'Been a BIAB user for years and years! Great for music bed starters and better still for working improv chops!' ♪ 'Band-in-a Box – *Cool!!! Cool!!! Cool!!! Wow!!! Wow!!! Wow!!!*' ♪ 'The kids & I love it.' ♪ 'Love your products. They make creativity a more fluid experience!!' ♪ 'I'm looking for those perfect band mates and just discovered they live in a box... so far, so good!!!' ♪ 'Thank You Very Much for my first great Jam Buddy, BIAB.' ♪ 'J'ai la premiere version de Band-in-a-Box et **j'aime beaucoup**.' ♪ 'Who knew what Coltrane would sound like soloing over country music!! Love it.' ♪ 'I love the new features in BB Keep up the good work!!' ♪ 'Ces logiciels sont absolument far, so good!!!' ♪ 'Thank You Very Much extraordinaires.' ♪ 'I just got BB and I love it!' ♪ 'This is the best music program I've ever seen. It makes piano practice a lot easier and fun!' ♪ 'I am a private music teacher, and since getting Band-in-a-Box years ago my jazz teaching has improved immeasurably!' ♪ 'A great package! Now I can have a backup band whenever I practice the guitar.' ♪ 'Are you sure it's legal to have this much fun???' ♪ 'I use your program with my saxophone students. They love to play with a "real" band in the back!' ♪ 'I do love your products. BIAB is the best.' ♪ 'You guys are doing a ***GREAT JOB*** in providing not only cool software, but outstanding customer service. I hope other software companies follow your example!' ♪ 'Awesome software at a fantastic price! ♪ 'BIAB continues to amaze me.' ♪ 'It's a great **educational tool**. ♪ BIAB is the most powerful, cost effective, **user friendly** music software I have seen.' ♪ 'Solid software, well designed by people who are obviously musicians.' ♪ 'What a time-saver!!! ♪ 'To say it's overwhelming is an understatement.' ♪ 'I loaded the program, put in some chords, selected solo and trade 4's – now I start jamming and these cats are blowing me away. Miles, Freddy Hubbard, Coltrane, all of them are killing me!' ♪ 'If you ever need an endorsement for a magazine ad let me know!' ♪ 'Congratulations on a great new version – you've done it again!' ♪ '***BRAVO!!*** It is truly a knock-out program.' ♪ 'BIAB is, indeed, fantastic! I'm sometimes a little frightened when it plays a series of choruses and the randomized piano part will play something hip, I catch myself nodding at the computer saying "yeah nice ma... oh wait!' ♪ 'I am very impressed with your fantastic **improvisational** program. It is very **revolutionary** and I am sure it will do wonders for the future of jazz education.' ♪ 'This is a genius program.' ♪ 'BB is a fantastic program. It has changed my life.' ♪ 'I have been a long time fan. As a performer and music educator Band-in-a-Box is **heaven sent**.' ♪ 'The program does more than advertised.' ♪ 'It will revolutionize the way students are taught to improvise **jazz solos**.' ♪ 'I always upgrade, I'm never disappointed... ♪ 'A class act company with the customer in mind. Great program. More companies should follow your example. Keep up the good work and **THANK YOU!**'



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REVIEWS

E-MU SYSTEMS

ULTRA

The newest line of Emulators offers more bang for the buck.

By Jeff Burger

Through the years, E-mu's E-series samplers have maintained their status as heavyweights in the sampler market. The company's newest line is the Ultra series: the E4XT Ultra, E-Synth Ultra, and E6400 Ultra. Across the board, the Ultra models combine faster hardware with improved software features at significantly lower prices than their predecessors.

Aside from their labels, the three models in the Ultra series are cosmetically and architecturally identical. The differences are in each model's standard features. For this reason, I'll talk about the Ultra line as a platform and point out distinctions between models where applicable.

Before I move on to the Ultra series' new features, allow me to set the stage. The Emulator's voice architecture is powerful and well established, with matrix modulation providing a great deal of flexibility between a formidable complement of sources and destinations.

Z-Plane filtering, which E-mu has included in most of its instruments since the Morpheus, yields unique dynamic sounds by allowing various control sources to morph between two filter types. The Emulator's sampling and looping are intuitive and straightforward, and dozens of 24-bit onboard effects round out the package. Other than this whirlwind refresher, I'll bypass features that haven't changed.

CORE ISSUES

At first blush, the Ultras look identical to their immediate antecedents. All the Ultra models are 3U rack-mount devices. (E-mu has not announced any

The new Ultra line's flagship is the E4XT Ultra, which comes loaded with 64 MB of RAM and a 3.2 GB hard drive.

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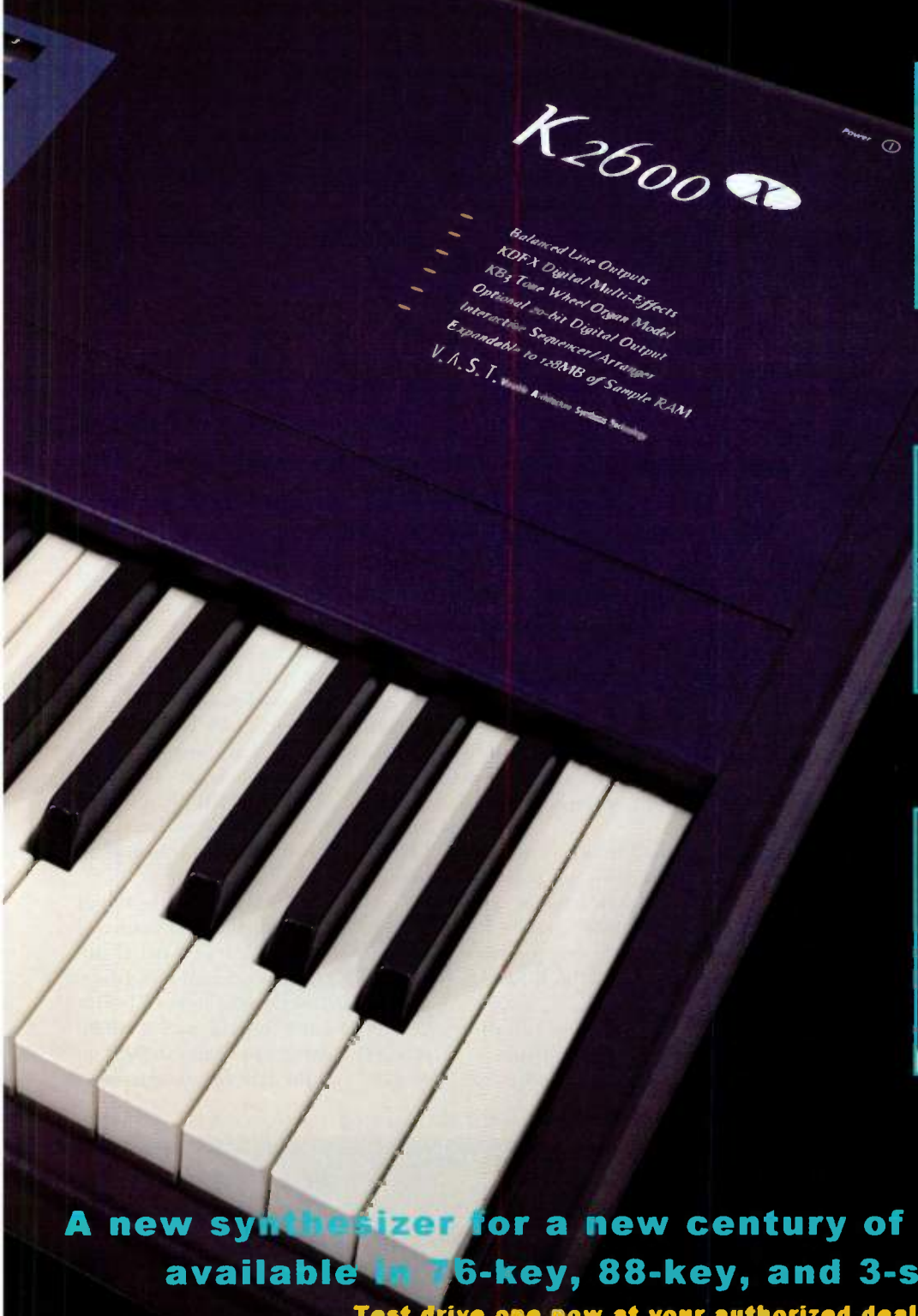

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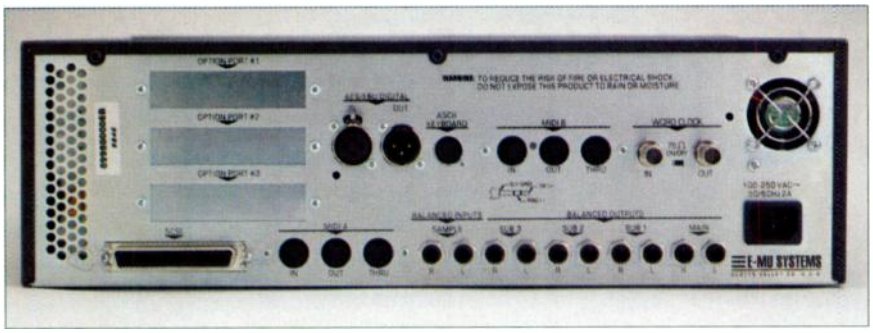

FIG. 1: The E4XT Ultra back panel includes two sets of MIDI I/O, eight ¼-inch balanced outputs, and a jack for an ASCII keyboard, useful for naming samples and sequences.

keyboard products in the Ultra line.) Indeed, the only front-panel change is a cold-cathode fluorescent display replacing the backlit electroluminescent display. The former is much brighter and has few of the viewing-angle issues associated with its forebears.

I was surprised not to see the complement of real-time control knobs that E-mu has been putting on units such as the Proteus 2000 and Audity 2000. However, you can assign most parameters to respond to MIDI controllers via matrix modulation.

The real hardware changes are under the hood. The Ultras' predecessors used a 32-bit processor clocked at 22 MHz. The Ultras use a 32-bit processor too, but this one is a reduced instruction set computing (RISC) chip running at 33 MHz. It executes 25 million instructions per second (MIPS), significantly greater than the mere 7 MIPS of the earlier machines. This translates to speed improvements in just about every area of the unit, including MIDI response time, signal processing, and sampling. The Ultras are lightning fast!

As with earlier models of the sampler, the operating system (EOS) resides in dedicated flash RAM, allowing for easy upgrades. The Ultras also have 8 MB of flash RAM, quite a jump from the 1 MB of RAM in the previous generation of instruments. Approximately half of this RAM is reserved for the operating system; the other half is split between presets and sequences.

The system can address up to 128 MB of sample RAM in the form of 72-pin SIMMs (4, 16, or 64 MB). Though 128 MB seems quite respectable, it's actually conservative in today's computer and sampler worlds. The chassis of the Ultra units also accommodates four additional 16 MB ROM or flash memory cards. (E-mu says that 32 MB ROM support is forthcoming.) Flash memory lets you store your favorite samples and presets for instant access—a real plus for performing musicians.

Current ROM choices include the E-Synth 16 MB sound ROM (a blend of traditional instrument samples and digital waveforms with 500 presets) and the Orbit/Phatt Sessions 16 MB sound ROM (which includes all the samples for E-mu's Orbit and Planet Phatt modules and 500 presets). The E4XT Ultra comes with 64 MB of RAM, the E6400 Ultra ships with 16 MB of RAM, and the E-Synth Ultra includes 16 MB of RAM as well as 16 MB of sound ROM. Unfortunately, the Ultras can address only 64 MB of sample RAM while accessing ROM, but a software control lets you temporarily disable the ROM in order to access all 128 MB of RAM.

Interestingly, the Ultras let you create a 16 MB bank of samples and presets in flash memory and then transfer these sounds to a Proteus 2000. Some Ultra preset parameters don't map exactly to the Proteus 2000, so you'll have to do some minor tweaking.

Previous models of the sampler were limited to 64-voice polyphony, but the Ultra platform supports 128 voices across the board. The E4XT Ultra comes loaded with all 128 voices. The E-Synth Ultra and E6400 Ultra can be upgraded to 128 voices from the stock 64 with the addition of an optional kit ($595).

SYSTEM I/O

The Ultras' I/O has been upgraded to 18-bit A/D converters and 20-bit D/A converters, adding enhanced sound quality, clarity, and headroom to already impressive specs. (Internal effects processing uses 24-bit resolution.) There are two analog inputs and eight analog outputs (a main stereo pair and three submix stereo pairs; see **Fig. 1**). Analog I/O uses ¼-inch balanced connectors.

Three Option Ports let you expand the standard I/O. For example, the Analog Output Expander ($795) adds another eight ¼-inch balanced outputs, allowing greater separation and flexibility in external mixing and processing. The ADAT Interface ($549) gives you 16 output channels and an additional eight input channels via an ADAT optical interface.

The D-WAM daughterboard adds more I/O features: AES/EBU for transferring digital audio between devices, word clock for synchronizing with other digital devices, a jack for an ASCII keyboard, and an additional MIDI In, Out, and Thru, which boosts the number of addressable MIDI channels to 32. The D-WAM board is stock on the E4XT Ultra and E-Synth Ultra, but it's optional on the E6400.

The Ultra units have a single 50-pin SCSI port for connecting to outboard storage devices. In a new twist, the Ultra now supports internal IDE drives, with a practical capacity limit of 18 GB. The E4XT Ultra ships with a 3.2 GB internal IDE drive. (You can use SCSI internally, but the IDE format currently

The E-mu E-Synth Ultra includes 16 MB of ROM-based sounds.

For manufacturer information, please see Contact Sheet, p. 175.

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offers the best performance for the money.) An optional mounting kit is available to add one internal drive to the other models. Unfortunately, EOS does not currently support sampling directly to disk, which would open up a new realm of possibilities.

As with the previous generation, a software switch allows the Ultra to negotiate with a computer with SCSI ID 7 (the standard for Macs) in the same SCSI chain so that both master devices can coexist peacefully. This not only allows the sharing of resources such as a CD-ROM drive, but also facilitates communication with computer-based software applications at a much faster rate than serial or MIDI connections.

The Ultra also has an internal floppy drive, used primarily for transferring EOS updates to flash RAM. There is no onboard CD-ROM drive, so you'll have to connect one externally via SCSI. E-mu reasons that this maintains the rack size of the Ultra models while not locking you into a specific drive—an important point, given the rate at which CD-ROM drive specifications improve.

The E-mu E6400 Ultra has half the polyphony of the E4XT Ultra but can be upgraded.

SIDE EFFECTS

The architecture and algorithms of the dual 24-bit signal processors have not changed. A quick recap: Effects A has 44 varieties of reverb, and Effects B offers 37 additional effects, such as chorus, flanger, delay, and distortion. The effects' quality is respectable, although their parameters are not accessible via matrix modulation. The effects can be placed in parallel or serial. With most instruments, however, you get a maximum of one effect from each of the two categories for the entire instrument—even in multitimbral mode.

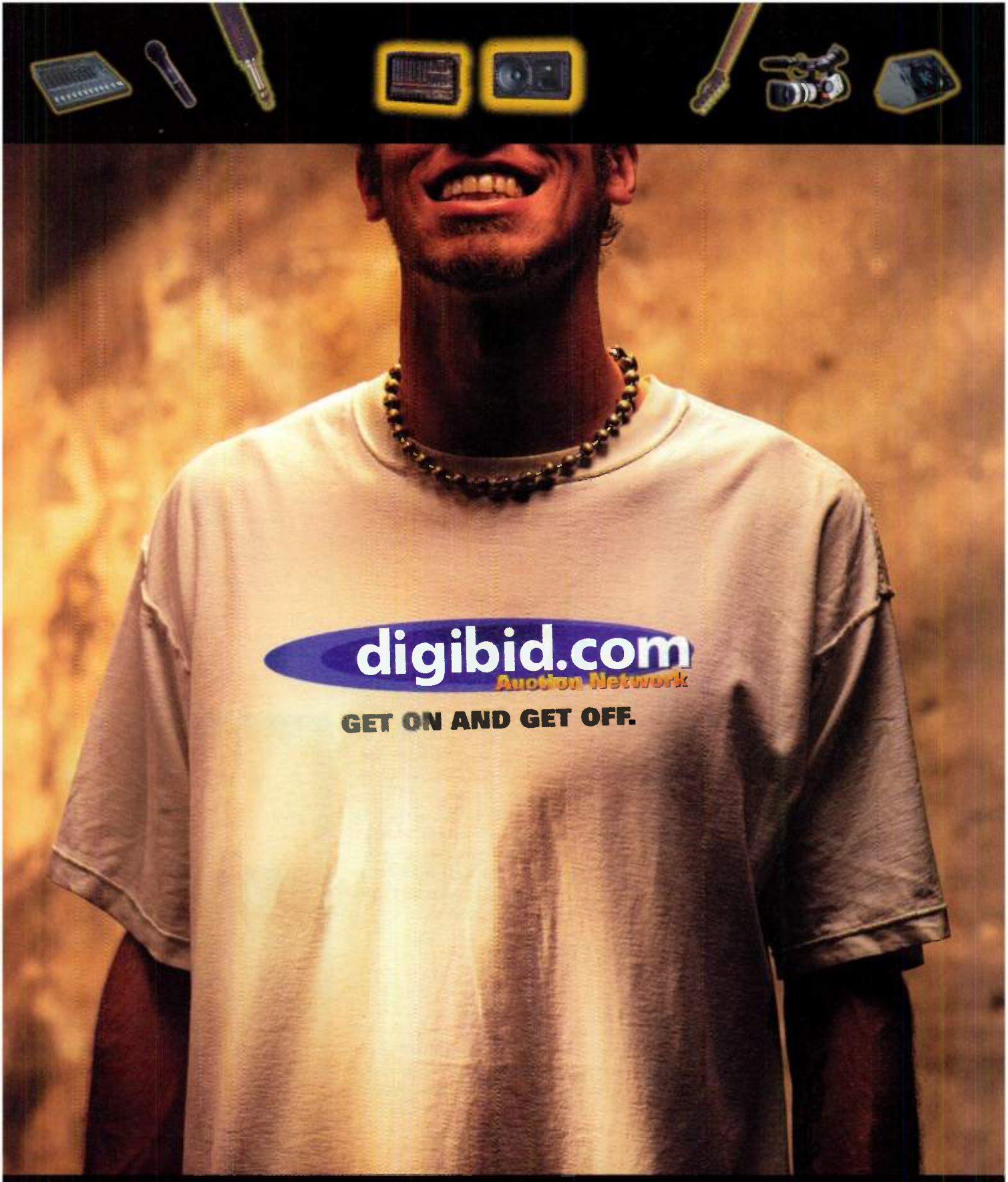
E-mu will soon offer an improved collection of effects, greater routing capabilities, and 24-bit I/O with its optional RFX-32 card ($795). The card mounts in a dedicated slot within the machine. This 32-bit, multibus, multichannel processor is said to offer 16 simultaneous, studio-quality stereo effects, complete with extensive routing and I/O features. The RFX-32 board should be available this spring.

EOS

The remaining new features of the Ultra line are all part of the EOS operating system, currently at version 4.02. A simple software upgrade allows users with older EOS-based samplers to access these features. (You should check

Ultra Specifications

	E4XT Ultra	E-Synth Ultra	E6400 Ultra
Polyphonic Voices (stock/maximum)	128/128	64/128	64/128
Effects Processors	(2) 24-bit stereo	(2) 24-bit stereo	(2) 24-bit stereo
Number (type) of Effects	Processor A (reverb): 44; Processor B (delay, chorus, distortion): 37	Processor A (reverb): 44; Processor B (delay, chorus, distortion): 37	Processor A (reverb): 44; Processor B (delay, chorus, distortion): 37
RAM	64 MB (expandable to 128 MB)	16 MB (expandable to 128 MB)	16 MB (expandable to 128 MB)
Hard Drive	3.2 GB	optional	optional
Input Resolution	18-bit	18-bit	18-bit
Output Resolution	20-bit	20-bit	20-bit
Internal Processing	32-bit	32-bit	32-bit
Analog Inputs	(2) balanced ¼" TRS	(2) balanced ¼" TRS	(2) balanced ¼" TRS
Analog Outputs (stock)	(8) balanced ¼" TRS	(8) balanced ¼" TRS	(8) balanced ¼" TRS
ROM/Flash Card Slots	4	4	4
ROM Sounds	optional	standard	optional
Digital I/O (stock)	AES/EBU	AES/EBU	none
Sampling Rates	22.05, 24, 44.1, 48 kHz	22.05, 24, 44.1, 48 kHz	22.05, 24, 44.1, 48 kHz
Other Ports (stock)	(2) MIDI In, Out, Thru; (1) ASCII keyboard input	(2) MIDI In, Out, Thru; (1) ASCII keyboard input	(1) MIDI In, Out, Thru
Signal-to-Noise Ratio	105 dB	105 dB	105 dB
Frequency Response	20 Hz–20 kHz (±1 dB)	20 Hz–20 kHz (±1 dB)	20 Hz–20 kHz (±1 dB)
THD + Noise	0.044%	0.044%	0.044%
Dimensions	3U × 14" (D)	3U × 14" (D)	3U × 14" (D)
Weight	16.8 lbs.	15.4 lbs.	15.25 lbs.



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with E-mu to make certain that your particular model will work as planned.)

In addition to reading Emulator file formats, EOS currently reads discs for the Akai S1000, S1100, and S3000, as well as the Roland S-700 series samplers. This combination of formats means that the Ultras can access the lion's share of important third-party offerings. EOS also imports and exports AIFF and WAV files.

The Ultras ship with *EOS Link*, a cross-platform application that emulates the front panel in software on your computer. *EOS Link* is certainly useful for remote Ultras, but it provides no additional functionality and can't be used with some of the SCSI-intensive functions such as Beat Munging (more on this in a moment).

More problematically, *EOS Link* is not MIDI aware; the only way to hear a sound is by using the Audition button on the emulated front panel. An onscreen keyboard would at least be a step in the right direction. In short, *EOS Link* does not effectively substitute for an editor/librarian like Emagic's *SoundDiver*.

EOS now includes a rather standard but serviceable arpeggiator, which arpeggiates notes up, down, up or down, or randomly, with up to a three-octave extension. You can set the tempo manually or tap it in using a front-panel button. Tempo divisions range from half notes to 32nd notes, including triplets. You can also specify whether the notes sound immediately or are triggered during the next clock cycle. There is no key-latch function as is found in some arpeggiators.

BEAT MUNGER

At the top of the list of EOS improvements is a new feature called Beat Munger (rhymes with *plunger*), a looper's dream that resides on its own screen. Beat Munger is intended for creating loops from rhythmic passages, especially grooves. To put Beat Munger to work, you tell the Ultra to analyze a rhythmic passage that doesn't deviate in tempo. The software identifies where the transients are, extrapolates the tempo, determines where the actual beats are, and automatically creates the perfect loop. In this way, Beat Munger fits into the same software application genre as Steinberg's *ReCycle*.

Easy looping is a nice feature, but the real power of Beat Munger is its ability to manipulate sampled grooves. For starters, you can adjust the tempo of the sampled passage to taste without changing pitch. Of course, you can accomplish similar results with a traditional time-scaling algorithm, but the fact that Beat Munger is aware of beats removes the guesswork and calculations, making the process much more intuitive. You can also change the time signature (for example, from 4/4 to 5/8), not to mention adding or removing swing from a groove.

Perhaps the most intriguing feature of Beat Munger is editing with the eighth-note grid. The display presents a grid representing eighth notes across two bars. When you turn off a note in the grid, the software skips over that rhythmic element and jumps right to the next one during playback. For better or worse, this process also affects the analogous beats in the subsequent measures of grooves longer than two bars. In addition, you can specify the grid elements that determine the beginning and end of the loop.

Fine-tuning controls allow you to finesse Beat Munger's results. The Grunge control determines the length

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E4XT Ultra $3,595
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AUDIO QUALITY ■■■■■
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PROS: Robust sonic architecture. Faster hardware. Numerous expansion options. Professional I/O specs. Extensive sound-library and sample-format support. Beat Munger. SCSI and IDE drive support. *EOS Link* software provided for remote Mac/PC programming. Authors Proteus 2000 flash ROMs.

CONS: Can't address more than 64 MB of RAM while accessing ROM. *EOS Link* lacks advanced editing and auditioning capabilities. No sample-to-disk. Maximum RAM complement of 128 MB. No internal CD-ROM drive.

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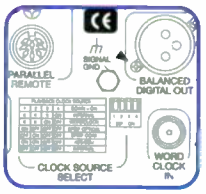

CDR850 PLUS adds a Word Clock input and balanced digital out.

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of crossfades at the splice points in the new beat. The results range from smooth to coarse. Similarly, the Comb control adjusts the distance between splices. You can use this control to tighten up the groove, create comb-filter effects, or generate echo effects, depending on the sample. For example, the Comb control can help eliminate flutter side effects when reducing the tempo of a passage.

The success of Beat Munger depends on the source material you ask it to interpret. To increase the chances of success, E-mu's engineers have added controls that help the user identify the tempo and downbeat of a groove.

All in all, Beat Munger is a blast of creative fresh air. The big kick is that you can experiment with many of these parameters while auditioning the loop. (Note that Beat Munger is an EOS software feature, but it requires the processing power of the Ultra hardware to work.)

OTHER NEW DSP TOOLS

The Bit Converter lets you reduce a sample's resolution by automatically manipulating its level. The most conventional application of this feature is to scale the resolution down for specific sound-design applications. A more creative use would be to lower the fidelity of a sample by dialing in a lower bit rate. Bit Converter has a single control for setting the new resolution in 1-bit increments. Setting this control at 0 bits transforms an existing sample into a silent sample of the same length.

Transform Multiply is not a new effect, but the Ultras' processing power brings it into new light. This DSP effect merges two samples, accentuating common frequencies and discarding dissimilar ones. Although the final results are difficult to predict, source samples with rich harmonics yield the best sounds. On the E-mu EIV, it could easily take an hour or more to process samples of modest length. The Ultra reduces the wait to a few minutes or more, depending on the length of the source samples.

E-mu has also licensed the Aphex Aural Exciter for use in the Ultra machines. This effect adds sheen, presence, and clarity by adding new high-order harmonics to the sample. Controls include Amount, Tune, Fade-in, and Fade-out. The effect is subtle, but useful.

There is also a new Phase Linear Filter that exhibits much less distortion around the cutoff frequency compared with ordinary filters. Therefore, it is better suited to processing samples—especially when splicing. (More specifically, this is a non-real-time fixed filter that is not under envelope control.) Filter types include lowpass, highpass, bandpass, notch, and allpass. The allpass mode lets you create new in-phase formants by combining a processed sample with the original.

SEQUENCER

E-mu added a basic sequencer to EOS 2.0 around 1997. The rudimentary capabilities in that sequencer made it useful only as a scratch pad for ideas or for importing and playing Standard MIDI Files created elsewhere. The sequencer in EOS 4.02 is improved enough that I'll treat it as new.

As mentioned earlier, presets and sequences share approximately 4 MB of system RAM. Users can specify the ratio of memory allocated to presets versus sequences. (Presets require very little memory.) Each megabyte can hold approximately 100,000 notes of sequencing data. The sequencer imports and exports Standard MIDI Files using high-density MS-DOS floppy disks and uses the standard DOS "eight-dot-three" character-naming conventions.

The sequencer now boasts 48 tracks, which are primarily manipulated in a single screen bearing some resemblance to the Multimode page. (The F6 key toggles the functionality of the other five function keys between transport controls and menu selectors.) Each track is assigned a Preset as well as initial volume, pan, and audio outputs. Status options for each track include Play, Mute, Solo, Overdub, or Re-record (overwrite).

You have several options for channelizing incoming data. You can record on only one track at a time, but a track can record and contain data on multiple channels simultaneously. Another function splits individual channel data from a multichannel track onto separate tracks for greater flexibility.

The sequencer can quantize and apply swing to MIDI notes during recording. In addition to notes, the sequencer records controller information as well as SysEx data, useful for receiving bulk dumps from other instruments.

Most of the editing options can be applied to entire tracks or segments between user-defined start and end points. Note-editing functions include quantization, swing, transposition, and Velocity changes, either by percentage or offset. Tracks can also be copied for backup and other purposes.

The sequencer doesn't explicitly let

E5000 ULTRA

If an E6400 Ultra would still break the bank, you might be able to get most of the features you want for even less. E-mu's new E5000 Ultra ($1,695) offers exactly the same voice architecture, RISC processor, effects, and I/O resolution along with most of the same expansion slots and software features, such as Beat Munger. Even the front panel is the same, except that the display is a backlit LCD rather than the more expensive cold-cathode fluorescent display found in the other Ultra units.

So what's the catch? For starters, you can't expand the E5000 Ultra's 64-voice polyphony. Similarly, you can add only two 16 MB sound ROMs. The unit can accept up to 128 MB of sample RAM, but it ships with only 4 MB; you'll undoubtedly shell out for more RAM pronto. An internal hard drive is optional as well.

There are only four analog outs on the E5000 Ultra instead of eight. (You can expand to 12 outs by adding the 8-output expander.) In addition, the D-WAM board sporting AES/EBU, word clock, an ASCII keyboard port, and MIDI B is optional rather than stock; you get two library discs instead of the nine that ship with the other Ultras; and *EOS Link* is optional ($40). Although it's expandable, the E5000 Ultra offers fewer voices and outputs than its siblings, but it offers the same processing power at a lower price point.

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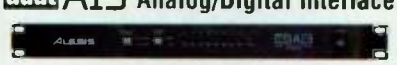

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you arrange segments in a song mode, but the Jukebox allows seven sequences to be played in turn. However, to make it useful for a song mode or performance set, you need to program silence at the end of songs and be quick with the Stop button.

Most likely, you'll do all your arranging with the Cut, Copy, and Paste functions. Fortunately, these operate rather intuitively. Cutting a segment slides subsequent data back in time to close the gap. Alternatively, you can erase notes, a single controller, all controllers, or all data between specified points. Pasting options include inserting (in which case subsequent existing data slides forward in time) with an optional number of repetitions, as well as replacing or merging a selection with existing data.

The sequencer has a metronome with a programmable count-off, but you must load and assign an appropriate preset and notes to make the associated sound—flexible, yes; instant gratification, no. Unfortunately, you can specify these notes only from the front panel, and selected notes are not auditioned. It would be more useful to be able to input the notes with MIDI. On the plus side, you can set the metronome for quarter-, eighth-, or 16th-note intervals.

You can set the initial tempo and meter of a sequence, but there's no provision for changing these parameters in midsequence. (The sequencer does perform tempo and meter changes in imported Standard MIDI File sequences.) You can also clock the sequencer from an external source or vice versa.

Speaking of clocks, you can record the output of the onboard arpeggiator into the sequencer because they use the same clock. The Ultra's sequencer is quite serviceable for basic tracking, although like most onboard sequencers, it pales in comparison to dedicated software.

ULTRA POWERFUL

The E4XT Ultra, E6400 Ultra, and E-Synth Ultra are tenth-generation instruments with robust hardware and software, featuring the sound quality, programming power, ease of use, and voluminous sample library E-mu is known for. There's not much new in the way of hardware functionality with the Ultra series, but the MIPS spec alone tells you that the new hardware is significantly faster than the previous generation's.

Beat Munger might just be the killer application that inspires people's lust for an Ultra. Anything that provides the tools to create new grooves is a hot commodity, and Beat Munger fits the bill. I still want some more advanced Beat Munger features, but these can always be implemented in future software upgrades.

Perhaps the most exciting thing about the Ultra series is that the scalable architecture puts E-mu's top-of-the-line samplers in a price range that more musicians can afford. The Ultra's expandability yields anything but a dead end. (E-mu also offers an upgrade path to owners of its earlier models.) In particular, the RFX-32 card promises to turn any Ultra sampler into an even more powerful production machine. The E4XT Ultra, E6400 Ultra, and E-Synth Ultra each represent a great synthesis of power and price.

Jeff Burger *is a digital media producer and consultant in Sedona, Arizona.*

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

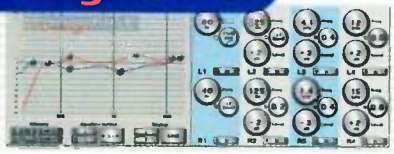
—ROGER NICHOLS, EQ MAGAZINE 11/99

AND 3 MORE REASONS TO GO FOR IT.

1 DSP PLUG-INS!

certified d8b plug-in

Massenburg DesignWorks



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

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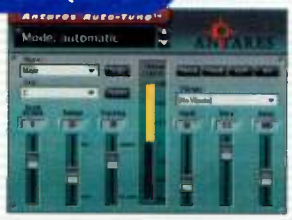
ANTARES



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

certified d8b plug-in

DRAWMER

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

certified d8b plug-in

t.c. electronic

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

2 FREE OS UPGRADE!

OS 3.0: OVER 30 NEW FEATURES!

Our Programming Department has been chugging the double lattés to create Mackie Realtime OS™ Version 3.0, packed with more new features and enhancements than you can shake a mouse at.

Here's just a partial list of what 3.0 adds to the already amazing D8B.

- **New key (sidechain) inputs** for all 48 onboard dynamic processors featuring soft knee architecture and single band 20-20k parametric EQ for frequency dependent processing such as de-essing
- **3rd-party plug-ins** via our new UFX card. Up to 16 simultaneous plug-ins on the first 48 channels, pre or post DSP, pre-fader via up to 4 UFX cards. Each plug-in is available twice — once when tracking, and again at mixdown!

- **Multiple Undo List** — 999 levels!
- Externally or internally accessible **inserts across Mains and Buses** plus **channel inserts pre and post DSP.**
- **Updated GUI** including 48-channel fader bank view screen.
- New **Snapshot libraries.**
- **MixLink™ networking** allows cascading of multiple Digital 8•Buses and remote control console mirroring of D8B from a second D8B or laptop via Ethernet.
- **Time Offset** (delay) adds a delay of up to 999 samples to the signal at the pre-DSP (dynamics / EQ) point in the signal path.
- **New surround capabilities** including depth-of-center control (LCR mixing with divergence), multiple surround panner window, individual LFE channel level control.
- **Multiple direct outs** per channel.
- **Optional level to tape** fader control.
- **Assignable, bi-directional MIDI control** of all D8B parameters.
- **Cross patching** allows substitution of channels between various banks.

3 '99 TEC AWARD!

We have a strict policy of not naming competitors in our ads. But in this case, Mix Magazine published who we competed against for their 1999 TEC Award for Outstanding Technical Achievement in Small Format Consoles: Allen & Heath's GS-3000, Digidesign's ProControl, Panasonic's WR-DA7, Spirit's Digital 328 and Yamaha's 01V.

Thank you to all who helped us win this prestigious award.

The list of top engineers and producers who use the award-winning Mackie Digital 8 • Bus is growing daily. For info on the D8B, the new UFX card, 3rd-party plug-ins and how D8B owners can get their free OS upgrade, call toll-free or visit www.mackie.com. While you're at it, call or e-mail us for a free Windows®/Mac®-compatible demo of the Digital 8 • Bus' 2.0 software.

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CAKEWALK

GUITAR STUDIO 2 (WIN)

Guitar players can now have a piece of the Cake.

By Scott R. Garrigus

Keyboardists are often considered the most savvy music-technology users. Lately, however, guitar players have also come to embrace the computer as a member of the band. Unfortunately, music software developers have been slow to recognize this trend, leaving guitarists with few applications geared toward their unique music-production needs. The situation is about to change, however, with the introduction of Cakewalk's *Guitar Studio* 2.

Guitar Studio is a digital audio sequencer that was first released in July 1998. It surprised the music community by providing guitar-oriented features not normally found in standard sequencers. The product was a solid first effort, but it wasn't quite complete. Now, at version 2, *Guitar Studio* boasts just about every feature a guitarist could ask for, including a built-in chromatic tuner, a fretboard display, tablature editing and printing, a drum-machine feature for creating professional-quality drum tracks, a vintage-amplifier simulation plug-in for audio tracks, and much more. And all this is in addition to a full-blown digital audio sequencer.

Guitar Studio
Minimum System Requirements
Pentium 166 (Pentium 200 recommended); 16 MB RAM (32 MB recommended); Windows 95/98/NT; 16-bit sound card

POWERFUL SEQUENCING

Cakewalk has added plenty of tasty ingredients to its latest recipe, including everything you'd expect in a good midlevel (and perhaps even high-end) sequencer (see **Fig. 1**). You'll find lots of editing windows, or views, for manipulating your data in all the usual ways. The Track view provides access to MIDI and audio tracks and the sections of data (called Clips) within them; the Piano Roll view lets you graphically edit MIDI note and controller data; and the Event view allows numerical editing in a chronological list. The Audio view provides a waveform editor; the Staff view lets you display, edit, and print your MIDI data as standard music notation; and the Console view mimics a typical mixing board for onscreen control of MIDI and audio tracks.

Guitar Studio also offers a full arsenal of processing commands, including sophisticated MIDI quantizing functions (such as Groove Quantize), Fit to Time, and Fit Improvisation (for recording without a fixed tempo). The audio tools include graphic and parametric EQ, normalize, and crossfade, among others. In addition, more than 16 MIDI and audio effects come with the program, and they can be applied in real time or offline. The audio effects include pitch shift, EQ, delay, chorus, flange, and reverb. Among the MIDI effects are an arpeggiator and an echo/delay. Unfortunately, *Guitar Studio* lacks an audio dynamics processor. Though you could buy an effects plug-in for this purpose (*Guitar Studio* supports DirectX plug-ins), I feel that a program aimed at guitar players ought to have a built-in compressor/limiter.

Nevertheless, *Guitar Studio*'s feature set is impressive. In fact, the program provides many of the features found in *Pro Audio* 9, Cakewalk's most advanced sequencer. For example, *Guitar Studio* now includes Cakewalk Application Language (CAL) and StudioWare. CAL is a scripting language that enables you to create your own MIDI editing functions; StudioWare lets you control your outboard gear via customizable onscreen panels. *Guitar Studio* 2 offers ready-to-use StudioWare control panels for several popular products, such as Roland's GR-1 guitar synth and Line 6's Pod effects processor/preamp. (The first version of *Guitar Studio* didn't include CAL; it had StudioWare, but you couldn't create your own panels.)

In essence, *Guitar Studio* has become a scaled-down version of *Pro Audio* 9. It remains in the midlevel category mainly because it supports only 16 audio tracks, 16 real-time effects, and 16-bit audio resolution. But these "limitations" are misleading—a project can actually have a total of 256 MIDI and audio tracks. (This number includes archived audio tracks, which can't be unmuted during playback.)

During playback, however, a maximum of 16 audio tracks can be active. If this is a problem, you can simply bounce down a number of audio

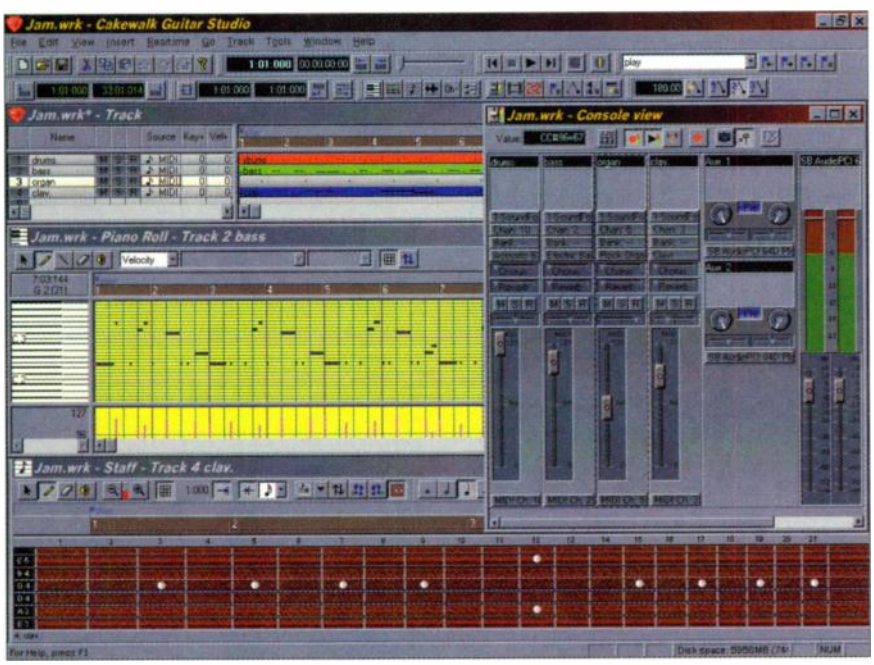

FIG. 1: Cakewalk's *Guitar Studio* 2 includes all the editing windows typically found in an integrated digital audio sequencer, along with several guitar-specific features.

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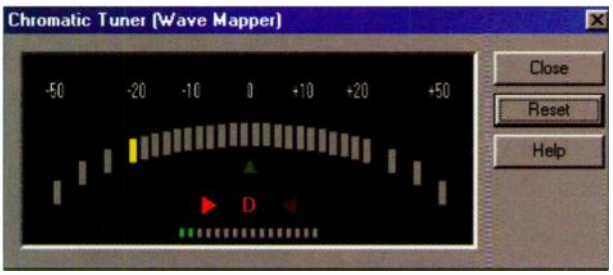

FIG. 2: The Chromatic Tuner provides a quick and easy way to tune your guitar. You can plug an electric guitar directly into your sound card or use a microphone for an acoustic instrument.

tracks to free up others, and because you still have access to the original source tracks, you don't really lose editing flexibility.

You can apply effects offline, so being able to use only 16 effects in real time isn't much of a limitation. If it does cramp your style, consider using one or more effects as aux sends, which is more efficient than applying the same effect to a number of tracks on a track-by-track basis.

Finally, *Guitar Studio*'s lack of support for high-resolution audio probably won't be an issue for most users. The program doesn't offer 24-bit audio the way *Pro Audio* 9 does, but 16-bit quality is fine for audio that is destined for CD (unless you plan to apply a large amount of processing to your material, in which case higher bit rates can be useful). Furthermore, *Guitar Studio* supports sampling rates of up to 48 kHz.

As you can see, *Guitar Studio* 2 provides a great deal of sequencing power, enough for most projects. And we haven't even explored the cool guitar-oriented features yet.

TUNE IT UP

Guitar Studio has a Chromatic Tuner with a display that imitates handheld digital guitar tuners (see **Fig. 2**). Simply plug your guitar into your sound card (Cakewalk includes a ¼-inch–to–⅛-inch plug adapter) and start plucking. The Tuner analyzes the input signal, determines which string you are trying to tune, and displays the string's name.

The small VU meter at the bottom of the Tuner display shows the string's loudness; the large meter above it shows its intonation (in cents). When the string is in tune, an up arrow lights up. If the string is sharp or flat, a right arrow or a left arrow, respectively, lights up. I found the Tuner to be very quick and accurate. By the way, you can also use it to tune any other electric instrument and even acoustic instruments (you simply plug a microphone into your sound card).

DEGLITCH

If you use a MIDI guitar controller/synthesizer system, you'll appreciate *Guitar Studio*'s Deglitch function. It allows you to filter out the extraneous note data often generated by MIDI guitar controllers. You can also use Deglitch to clean up other types of MIDI performances. The filter parameters include pitch, Velocity, duration, and any combination of the three.

You can set up Deglitch to remove notes higher than a specified note, softer than a certain Velocity, and shorter than a specified duration (in ticks or milliseconds). And you can select which tracks (or sections within a track) are to be processed. It's important to set the parameters to reasonable values, however, or you might filter out some of the actual music data. *Guitar Studio* 2 helps you by highlighting the notes in the selected region with the highest pitch, the greatest Velocity, and the longest duration.

FRETBOARD

Guitar Studio's Staff view includes a real-time fretboard view. It displays the notes in a MIDI track as they would be played on guitar (see **Fig. 3**). This is a great tool for learning prerecorded riffs.

What's more, you can also input data with the fretboard. By right-clicking on the fretboard, you can change the cursor to a Select, Draw, Erase, or Scrub tool. These tools allow you to select, add, delete, and quickly audition notes in a MIDI track, and any changes you make with the fretboard are automatically reflected in the standard music notation. So even if you have trouble reading music, you can still compose using the fretboard and then see how your input looks as notation—yet another educational benefit. As a guitarist, you may find that working with the fretboard is quicker. Entering chords, melodies, and bass lines is very easy.

TABLATURE

The Staff view can also display MIDI bass or guitar tracks as tablature. This is a new feature of *Guitar Studio* 2. You can enter and edit notes as tablature or generate it from existing data. (Notes entered via the fretboard can also be translated automatically into tablature.) As with the fretboard display, any data that you enter in the Staff view as tablature is instantly translated into standard notation, and all three views—fretboard, tablature, and standard notation—are synchronized. In addition, you can print your music, including lyrics, chord symbols, and

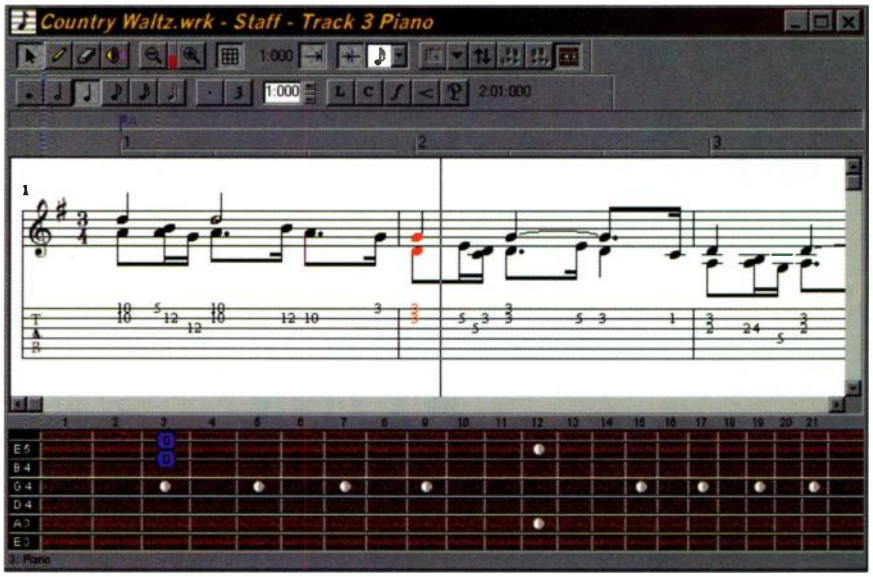

FIG. 3: On the onscreen fretboard, notes appear in real time as they are played back. You can also compose music by clicking on the fretboard to add notes to a track.

For manufacturer information, please see Contact Sheet, p. 175.

PLUG-iN SOME REAL DRUMMERS

In a perfect world Bill Bruford, or Gavin Harrison, or Paul Kodish descends on your studio in person to lay down some rhythm tracks. You sit sipping non-fat lattés and discussing the finer points of the material while a crew of smiling but monosyllabic assistants assemble the drums. The session is a blast: the tempos perfect, the feels peerless. You can use everything.

But then Bill/Gavin/Paul slips you an envelope. S***, the invoice: You open it with trembling fingers to read the words 'No Charge,' and you look up into Bill/Gavin/Paul's smiling eyes and waving finger as he says "But next time, man, you're gonna play on my record, OK? Deal?"

You both laugh, knowingly, as only fellow and equal artists can do. And then sushi arrives.

In an imperfect world you've just spent another lousy hundred bucks on another sample CD. It's got some loops you can use but, heck, you've heard a lot of these a zillion times on the radio. When did this come out? 1997. You curse the clerk at BigBucks Megastore.

But by lunchtime you've got a groove loaded and found a workaround to incompatibility issues between your sequencer and digital audio package. The tempos are kind of limp, which you can fudge. Still you wish you could change the sound of the snare. You wish you could program decent drums yourself. At the end of a hard day you fill in some sample clearance forms and toss a pizza into the microwave.

In a smart world you reach up for the Jewel-Case marked Twiddly•Bits Vol 8 MIDI BreakBeats and flip open the lid. You insert the disk into your PC (or Mac), open Cubase (or Cakewalk, or Performer..). and load a file. You Solo one of a dozen tracks containing exuberant 2-bar drum 'n' bass loops, and hit play. Geez! Are those sounds coming out of *my* gear? Still in shock, you loop the groove over 16 bars and snip out the final bar, substituting it for a death-defying fill currently residing on Track 14. You switch to an ambient drum kit. Yea! the groove becomes even more intoxicating, especially when you hit the gas and effortlessly take the tempo up to 155. The track already has life, energy, and your own slant on things. You wonder how many grooves are on this disk. You look. About 700. For how much? $39 bucks? Why haven't I bought any of these before? Food comes in and you don't even notice.

GET CONNECTED

Drummers we use include Gavin Harrison (Level 42, Incognito), Bill Bruford (Yes, King Crimson), Shane Meehan (Us3), Alfredo Dias Gomes, Paul Kodish (Chemical Brothers, Appollo 440), Chronic Music's The Beat Professor Ron E. Beck, Hugo Degenhardt (Womack & Womack, Steve Hackett), Dave Spiers, Andrew Small, and T.E.T (Anthill Mob, Doug Wimbish), and Al Eaton (Queen Latifah, Ice-T).

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performance notes, along with the tablature and notation.

Guitar Studio comes with a QuickTab feature that creates tablature based on standard fingering patterns. If you need something different, however, you can easily define your own tablature styles and save them as presets. A tablature style is defined as Floating, which allows the notes to use the entire fretboard; Fixed, which specifies a region on the fretboard where notes must be played; or MIDI Channel, which determines the string on which a note must be played according to the MIDI channel being used. If you choose Fixed, you define the region you want to use by setting the Finger Span and Lowest Fret parameters. The MIDI Channel option is handy if you use a MIDI guitar and record parts with each string transmitting on its own MIDI channel.

To further define your preset, you can input the number of frets to be used, and you can specify an alternate tuning, such as Guitar Open G, Bass Drop D, and others. You can also create your own alternate tunings, but they must be saved with the tablature preset.

CHORD SYMBOLS

Guitar Studio lets you add chord symbols and guitar chord grids to your notation in the Staff view. The program includes a comprehensive library of predefined chords, but if you don't find the chord you need, you can create your own. To do this, you simply supply a chord symbol or create a corresponding guitar grid by choosing a finger number (you get additional choices, including thumb, open string, and muted string) and clicking on a string within the grid. *Guitar Studio* will play the chord so you can hear how it sounds.

The chord features are quite flexible and highly useful. I'd like to see a QuickChord feature (similar to QuickTab) that would enable *Guitar Studio* to analyze the music and add default chord symbols to the score automatically. Depending on its accuracy, such a feature could save a lot of time. Perhaps we'll see this in a future version.

VINTAGE AMP

No audio-recording software for guitarists should be without an analog amplifier simulation plug-in. (Its absence was one of the factors that made the first version of *Guitar Studio* incomplete.) *Guitar Studio* 2 comes with a special edition of the *Amp Simulator* plug-in from Cakewalk's Audio FX 2 amplifier- and tape-simulation effects package (see **Fig. 4**). This DirectX plug-in lets you turn your guitar recordings into some really cool and raunchy tracks. I tested it on a number of electric guitar tracks, and I was able to

FIG. 4: The *Amp Simulator* plug-in lets you add some nice analog amplifier effects to your audio tracks. Unfortunately, *Guitar Studio* 2 includes only the "lite" version.

produce quite a few effects, such as deep, muffled grunge and screechy, bright distortion.

The *Amp Simulator* plug-in includes two amplifier models: American Lead and British Overdrive. Each lets you adjust a number of parameters for fine-tuning: drive, presence, volume, and EQ (bass, mid, and treble). You can also select No Speaker (direct out) or a 4 by 12–foot Cabinet Enclosure with on/off settings for Open Back and Off-Axis. *Amp Simulator*'s tremolo controls are disabled because this is a "lite" version. You can get some great sounds from it, and you can upgrade to the full version for $149. Still, it would be nice if Cakewalk were to include the fully equipped plug-in with *Guitar Studio*.

SESSION DRUMMER

Although the Session Drummer isn't exactly a guitar-oriented feature, it can provide valuable assistance to percussion-impaired guitarists. It takes the place of the Song Wizard (which was included in the first version of *Guitar Studio*) and automatically generates MIDI drum tracks for quick compositional assistance and inspiration (see **Fig. 5**). In essence, the Session Drummer is a software drum machine that lets you put together Songs by combining Patterns from several Styles. You can set each Pattern in a Song to loop a number of times, and once a Song is complete, you can apply it to an open MIDI track in your project. Songs can also be saved to disk in a proprietary format for later recall. The Session Drummer has 69 Styles that cover genres ranging from alternative to world, and each Style has approximately 25 various Patterns.

FIG. 5: Use the Session Drummer to assemble MIDI drum tracks by selecting Patterns from Styles and combining them into a Song.

As with any good drum machine, you can create your own Styles and Patterns, and because they're stored as Standard MIDI Files, you can easily share them with other musicians. However, you have to create your Patterns using the usual MIDI recording functions in *Guitar Studio*. This might seem cumbersome at first, but in the long run it's actually a good thing because it provides great flexibility and lets you create Patterns in real time (free of quantizing, if that's what you want). This helps ensure that your tracks keep their human feel.

ROCK ON

At $249, *Guitar Studio* 2 packs a lot of power into a midlevel package. Although I covered most of the program's important features, there are still a few I didn't mention, such as the vector-based track volume and pan automation and the video support. These may not be specifically guitar-oriented features, but you never know

CAKEWALK MUSIC SOFTWARE
Guitar Studio 2 (Win) digital audio sequencer for guitar
$249

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

PROS: Lots of sequencing power for the price. Specialized features for guitarists, including Chromatic Tuner and fretboard display. Tablature editing and printing. Customizable chord symbols and guitar grids. *Amp Simulator* plug-in effects. DirectX support.

CONS: No audio dynamics processing. No printed documentation. "Lite" version of *Amp Simulator* plug-in lacks some features.

when they'll come in handy, especially for film-scoring gigs.

Guitar Studio 2 still has room for improvement, though. For example, the next version of the program definitely needs some kind of dynamics processing. Another annoyance is the lack of a printed manual. The documentation comes on the CD in Adobe Acrobat format, so you have to print it out (prepare to use a lot of paper) or read it onscreen while you're trying to use the program. Still, these are minor complaints.

So, if you own the original *Guitar Studio*, should you upgrade? Most definitely. This latest version brings the software up to semipro status, whereas the first version was geared much more to beginners. If you find that you need even more power, consider Cakewalk's *Pro Audio* 9 multitrack recording studio; it includes everything in *Guitar Studio* 2 and more. In any event, if you're a guitar player looking to make technology a part of your act, you can't go wrong with Cakewalk's latest offering.

Scott R. Garrigus *is an author, musician, and multimedia expert. In addition to his frequent contributions to* **EM**, *he publishes his own online periodical,* Comp-media *(www.garrigus.com/comp-media).*

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Use the 100mm motorized faders to make perfect mixes every time. View switches allow you to navigate any number of channels. 8 high resolution rotary knobs control panning, EQ, dynamics, effect send levels and more. When addressing DSP plug-ins, you can power through 8 parameters at a time. Backlit LCD panel displays the channel labels, rotary knob settings, routing and meters. So if the mouse is cramping your style or you are tired of searching for controls on your monitor - consider the power and simplicity of Motor Mix.

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AUDIO-TECHNICA

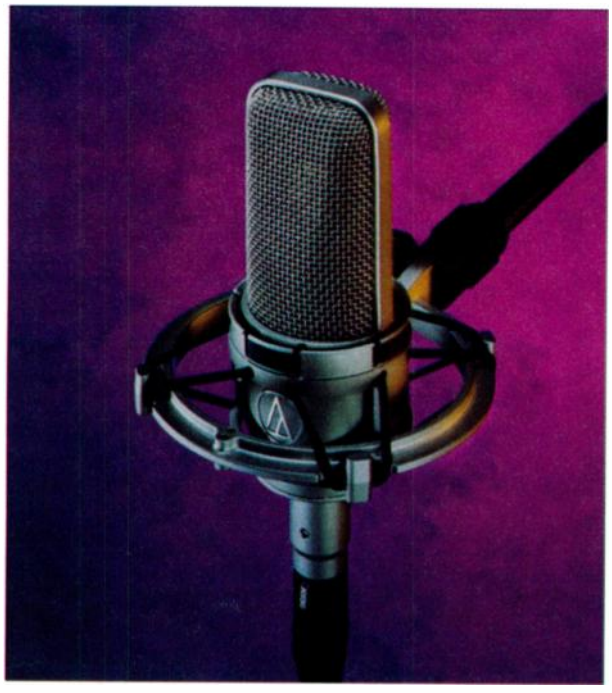
AT4047/SV

Heavenly sound at a down-to-earth price.

By Randy Tobin

The AT4047/SV is the latest member of Audio-Technica's extensive line of studio microphones. What sets it apart from other Audio-Technica 40-series mics is a transformer-coupled output and an element tuned to sound reminiscent of certain now-vintage Field Effect Transistor (FET) mics introduced in the 1970s. In brief, the 4047 is meant to sound warm compared with its predecessors. The 4047's other distinguishing characteristic is its brushed silver exterior, a departure from the usual black finish of Audio-Technica mics. The mic has a fixed cardioid polar pattern, provides switches for a 10 dB pad and 80 Hz highpass filter, and requires 48V phantom power.

The 4047 comes with a cast-metal, dual-isolation shock-mount and a shock-isolation system that's built into the unit. The mic ships in a plastic case lined with sculpted foam. A slip-on foam windscreen is not included, although a small hole on the shock-mount looks as if it could be used to hold the wire end of a pop screen.



Audio-Technica hits a sweet note with its latest large-diaphragm condenser mic, the AT4047/SV. Studios at every level will appreciate this mic's stellar sound—and none can moan about the price.

AUDIO-TECHNICA
AT4047/SV large-diaphragm condenser mic
$695

AUDIO QUALITY ■■■■■

VALUE ■■■■■
1 2 3 4 5

PROS: Great sound. Great value. World-class shock-isolation system. Low self-noise. Versatile.

CONS: Hard to tell which side is the front when shock-mounted. No foam windscreen included. Documentation does not include application notes.

TWO OF A KIND

I received two 4047s, which enabled me to evaluate their consistency. When I used both on the same sound source, the results were virtually identical. If my experience is an indication of the model's consistency, you should be able to use a pair of off-the-shelf 4047s for matched stereo applications instead of paying extra for factory-matched pairs.

Over the past 25 years, I've acquired an assortment of microphones chosen for sound quality, specific usage, and reliability. I started with Shure SM57s and progressed to more expensive mics, such as Countryman Isomax ultra-miniature condensers, Langevin CR3As, an original AKG C 414, and AKG's Tube—our studio's flagship mic.

Still, I don't buy microphones that often. But I will almost certainly buy an AT4047/SV, if not two of them. Why? Because the first time I used the 4047 side by side with the Tube on a critical track of a male narrator, I was impressed by how similar the two mics sounded. Considering that the Tube cost more than $2,000—12 years ago—and the 4047 has a suggested retail price of $695, that's really saying something.

The only difference in sound that I noticed was that the 4047 did not provide quite as much low end as the Tube. (Initially, as is customary to my way of working, I engaged the low-cut filters on both the console and the mics.) But I compensated for this easily by disengaging the console filter and using the low-cut filter on the mic only. For a mic that is being promoted as warm sounding, the 4047 provides plenty of high end. However, it is not edgy sounding like the AKG C 414 in my collection.

TRUE TO SOURCE

Over the course of six weeks, I used the 4047 to record narration, vocals, acoustic guitar, trumpet, trombone, tuba, flute, saxophone, and percussion. In all cases, the mic performed admirably and predictably, producing an uncolored sound that did not vary with the dynamics of the source. We've never used any exotic mic preamps here, just the standard preamps in our Ramsa WR820B analog consoles (we have two of them linked together for 80 inputs), so the mic had to prove itself a worthy contender in rather standard circumstances, and it did.

One of the toughest sources to record well is a vocal ensemble. Using a stereo pair of 4047s, we recorded four singers with the mics placed about 6 feet apart and angled toward the quartet. The mics stood their ground with no annoying artifacts, such as I've heard with other, often more expensive, mics. We also gathered four people in a semicircle around one 4047 for a backup vocal session, and the mic picked up everyone well, with minimal off-axis coloration.

When I used the 4047 alongside the Tube on a solo female vocalist, there was, again, virtually no discernible difference in sonic quality between the two tracks. This is quite remarkable. I've compared several other mics—including some expensive and highly regarded models—with the Tube over the years, and none has come this close to its accuracy and adaptability.

On acoustic guitar, the 4047 sounded full-bodied and clear, without any

For manufacturer information, please see Contact Sheet, p. 175.

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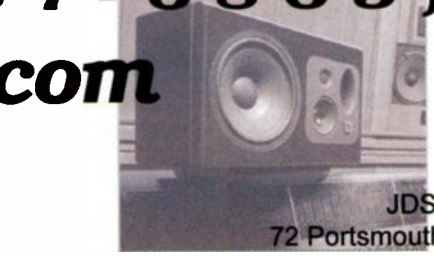

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AT4047/SV Specifications

Element	externally polarized (DC bias) capacitor
Diaphragm	1", 2-micron, gold vapor–deposited Mylar
Polar Pattern	cardioid
Frequency Response	20 Hz–18 kHz
Dynamic Range	140 dB (1 kHz @ maximum SPL)
Sensitivity	17.7 mV/Pa
Signal-to-Noise Ratio	85 dB (1 kHz @ 1 Pa)
Self-Noise	9 dB
Maximum SPL (for 1% THD @ 1 kHz)	149 dB (159 dB with 10 dB pad)
Highpass Filter	80 Hz; 12 dB/octave
Dimensions	6.7" (H) × 2.1" (D)
Weight	14.5 oz.

perceptible mic noise when the sound source was fading to silence. This is a quiet mic with a dynamic range of over 140 dB, and for really loud sources, there's always the 10 dB pad. I put the mic's impressive dynamic range and SPL handling to the test with trumpet, trombone, and saxophone. There was no distortion; the mic reproduced only the natural tone of each instrument exactly as it sounded at the source.

THE GOODS

The dual shock-mount that comes with the 4047 is the best I've ever used. It employs a pair of flat elastic bands to suspend the mic at six points. The ring that holds the bands is isolated and supported at 16 points by tubular, cloth-covered elastics connected to the outermost ring of the mount. Yet despite its beefy construction, the assembly is not huge and unwieldy.

Care is required when routing the mic cables, as the least bit of tension will angle the mic, causing it to touch the metal on the inner ring. Also, when the mic is in the shock-mount, the A-T logo that indicates the front of the mic is hidden from view, so you have to feel for the raised logo between the elastic bands to verify correct orientation. Perhaps Audio-Technica could finish the back screen in a different color to facilitate setup.

On the plus side, the lock nut holds the sturdy shock-mount assembly in place without the aid of pliers or other implements of torture. (How many times have you crunched your wrists while trying to tighten the boom on a microphone stand?)

Sometimes a windscreen is desirable, especially when recording two singers side by side. But generally this is an issue only when large amounts of air are being blown at the mic, a situation that is more common outdoors than in the studio. For those who want one, though, a large, cylindrical foam windscreen, the AT8137, is available for $48.

Actually, I was able to use a windscreen from one of my other mics on the AT4047/SV. But impressively, when I recorded the four singers in a semicircle, I didn't use a windscreen or pop filter and the mic still didn't register unwanted plosives.

LOOK NO FURTHER

The Audio-Technica AT4047/SV is both a serious recording tool and a great bargain. Clearly, Audio-Technica has done its research, and the result is an expensive-sounding microphone at a personal-studio price. I recommend the 4047 as the main mic for any personal or project studio, and it deserves consideration from professional facilities looking to grow their mic collections.

Of course, no words can really describe the sound of a microphone—it is something you must personally experience. I therefore suggest that you get to your local dealer and audition an AT4047/SV. I'm confident it will hold its own alongside similarly priced mics, as well as many costing much more.

Randy Tobin *is a composer, musician, producer, engineer, and founder of Theta Sound Studio and Audio Post in Burbank, California. He can be reached at www.thetadata.com/thetasound.*

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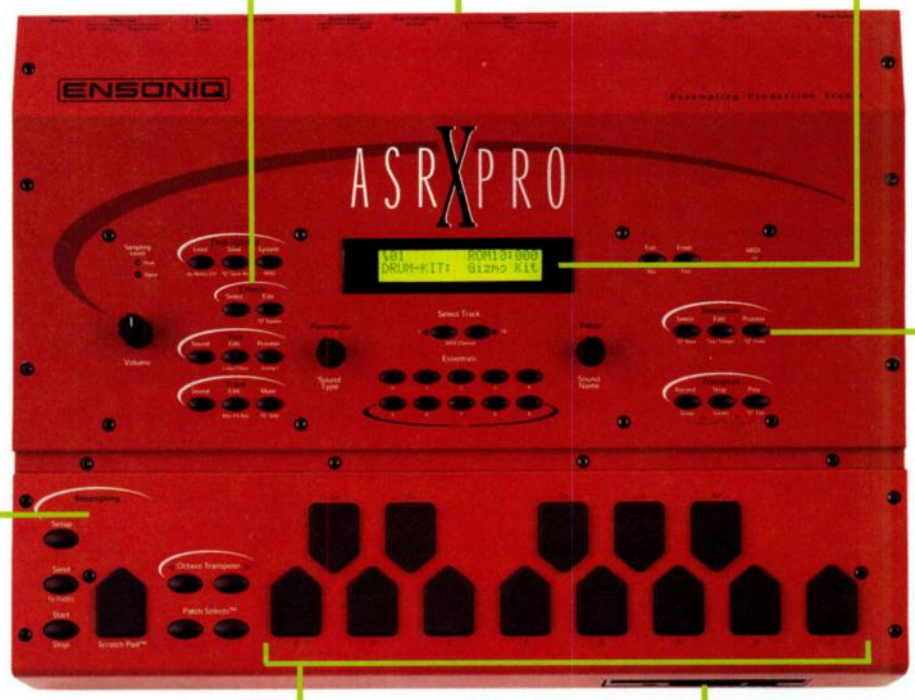

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ELEKTRON

SIDSTATION

Early '80s technology finds new life in a dance-oriented synth.

By Tim Perkis

Every instrument has its own sound. As much as some synthesizer manufacturers would like to create a universal synthesizer that can create any sound imaginable, they never succeed. Or if they come very close—as with advanced sampling workstations—it is still the quirky little corners of the system that musicians always seem to seek out in their quest to find something unique and special.

The designers of the SidStation haven't tried to make a universal synthesizer at all. Instead, they've made something that has a unique, edgy sound all its own. The SidStation is a distinctive and powerful synthesizer that proudly sports a hacker or experimentalist orientation—absolutely every parameter of the sound can be programmed by the user.

VINTAGE CHIPS

The SidStation is based on the MOS6581 sound chip—also called the Sound Interface Device (SID) chip—which was designed to be the sound subsystem of the Commodore 64 PC. Elektron wrapped the venerable SID chip in a new operating system that provides all the trappings of a modern synthesizer, such as MIDI control and synchronization, preset voices, and voice editing. But at its heart is the SID with its own strange (some would call it cheesy) sound that you either love or hate.

When the Commodore 64 (C64) was first released in 1982, it represented a breakthrough not only in cost, but also in multimedia capabilities for a personal computer. It was designed from the ground up to be a game machine, and it was packed with innovations in both software and hardware to support this goal. The C64 introduced hardware support of sprites, which are essential for rendering the moving players; bullets; and bombs. It could be connected to color television sets and play games stored in plug-in cartridges, and it had advanced (for its day) built-in sound support in the form of the SID chip as well.

The SID is a hybrid analog-digital chip that implements three voices of a fairly classic analog synthesis structure. Each voice has one digital oscillator and an analog filter section. Users can freely route ADSR envelopes, as well as four LFOs, to nearly any sound parameter. In addition, there is a variety of unusual modulation and sync modes (these are described later) that are unique to the SID chip and that are perhaps the reason this chip has the cult following that led to the creation of this box.

SID chips are in short supply in the world, as they have not been manufactured for at least ten years. Elektron has somehow obtained a number of factory-new SID chips—it won't say how many—making the SidStation inherently a "limited edition" item. Connoisseurs of the SID will be happy to hear that the chips are of the R4 batch, which are reputed to have the highest sound quality.

SHINY BEAST

The SidStation is a brushed-chrome, drum machine–style tabletop box with a simple and clear user interface that reveals its hackerish roots (see **Fig. 1**). On the sloping top surface are a 2-line LCD panel, a large parameter wheel, four continuous controller knobs, and a 16-button keypad. Like a telephone, the keypad includes number, star, and pound keys, as well as an extra column of keys on the right labeled A, B, C, and D. The letter labeling doesn't seem to really denote anything: perhaps the keypad is a surplus item that's being recycled like the SID chip itself. Directional arrows are silk-screened below the pad and to the right of the pad, indicating the true use of the non-number keys in providing simple left or right and up or down navigation of the LCD panel menus.

The operating system for the SID is stored in flash RAM and can be easily updated by downloading a new file from the company's Web site. As with other MIDI devices, the system code file is encoded into a SysEx message in a MIDI file. The OS is then updated by playing this SysEx sequence from your computer sequencer into the SidStation. This is a very convenient and useful feature, as it eliminates worry about system obsolescence or having to live with version 1.0 bugs forever.

Elektron's Web site is well designed and well trafficked. On this site the company provides system updates, curates a lively user discussion forum,

FIG. 1: The futuristic-looking SidStation has an astutely designed user interface. For example, the four user-definable control knobs reside above the data wheel and keypad.

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David Leach
(Ben Harper)


Tito Puente
("The Mambo King")


Mike Malinin
(Goo Goo Dolls)


Giovanni Hidalgo,
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WRH

FIG. 2: The SidStation's back panel features MIDI In, Out, and Thru connectors, an audio input and output, a DC input, and a knob to adjust the LCD contrast.

and maintains a growing library of user-uploaded patches. The "soft" nature of this synth means that Web access is really essential for anyone using this synthesizer. The factory preset patches, like the OS, are stored in flash memory, and it's quite possible to erase the original patches completely—I know, because I did it while testing the unit! I was able to download the patch set from the Web site and be back playing in five minutes.

Sound editing on the SidStation is straightforward; you can do everything with the keypad. But the rotary encoder wheel and the controller knobs can be used to select and modify voice parameters as well. The number keypad looks a little clunky at first, but it's actually a great way to edit voices once you know your way around. At any one level of the menu hierarchy, hitting a number key moves the focus to one of the available menu items and selects it, all in one move. This has all the earmarks of a good user interface: there are multiple ways to accomplish the same thing, ways that are a bit slower but clearer for the novice as well as speedy shortcuts for users who are more familiar with the box. The four controller knobs can be assigned to give you real-time control over any four parameters of a voice. In edit mode, the knobs can be used to set values that appear on the screen.

However, editing voices by hand on this machine is a daunting task, primarily because of the range of possibilities available. There are well over 100 user-adjustable parameters for any given sound, and many of the parameters interact in strange and complex ways. This is a rich field to work in, but it's also easy to find yourself in a corner of the parameter space where voices are not sounding, and it's hard to tell how to remedy the situation.

MIDI SAVES DAY

The SidStation's MIDI implementation is so extensive that for many users working with computers or MIDI controllers, voice editing may not be necessary. This is one of the few synthesizers that have gotten their MIDI controller implementation right. Most synths regard the mapping of MIDI controllers as a property of a patch: if you want certain parameters of a sound to be tweakable with a MIDI controller, you have to specifically set up that mapping.

This is not the case with the SidStation. All of the parameters of a sound are always adjustable in real time by a fixed mapping of MIDI controllers—102 of them in all. For example, Oscillator 3 Ring Modulation is always controlled by MIDI Control Change 79, LFO2 Depth is always CC 95, and so forth. This kind of setup is outstanding for experimentation and for creating new sounds from existing patches.

In a synth that has patch-based mapping of MIDI controllers, experimenting with real-time control is extremely laborious. First, you have to guess which parameters might be interesting to make adjustable in real time. Then, you have to traverse menus to edit a voice in order to make those parameters sensitive to MIDI adjustment. If you're wrong, you have to go back and change the mapping. And if you're right, you have to repeat the entire process for every voice you want to explore.

With fixed global mappings as on the SidStation, however, each voice can easily be driven into any weird and outlandish mode you fancy. With this configuration, you are much more likely to stumble upon interesting variations that you couldn't have planned in advance if you had to deduce which parameters to make active. Of course, the usefulness of this feature is based on the assumption that the user has a computer or MIDI controller hooked up to the SidStation.

The unit's four front-panel knobs are user-definable MIDI controllers and can be linked to control any parameter. The knobs also transmit Control Change messages through the MIDI Out on the SidStation so that they can be used to control external MIDI equipment.

CLASSICAL ARCHITECTURE

The SidStation's voice architecture at first looks like a fairly classic analog synth voice: LFO, oscillator, filter, envelope. However, there are some mighty strange details lurking in there that give this synthesizer something of its unique character.

The oscillators are digital, and can be switched between basic wave shapes such as triangle, saw, pulse, noise, or a mix of them. Ring modulation and several sync modes can link oscillators in a number of ways, leading to more nasty timbral richness.

Things get really weird, however, with the addition of a unique SidStation feature, the waveform table. This is a sequence of up to 32 oscillator settings (including waveform, ring modulation, pitch number, and sync state) that the machine can run through once or in a loop for each note attack. Conceptually, it's a little like a Wave Sequence in a Korg synthesizer. But on the SidStation, these sequences are usually looped very quickly, often at audio rates, and this creates highly unique timbres. The results lean toward wildly robotic and

SidStation Specifications

Synthesis Type	analog-digital hybrid
Polyphony	monophonic
Analog Inputs	(1) unbalanced ¼"
Analog Outputs	(1) unbalanced ¼"
MIDI Ports	In, Out, Thru
Power Supply	external wall wart
Dimensions	9.45" (W) × 2.76" (H) × 7.87" (D)
Weight	2.87 lbs.

For manufacturer information, please see Contact Sheet, p. 175.

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complex sonorities that are more reminiscent of the sound of a modem than that of an orchestral instrument.

LFO INTERLACE

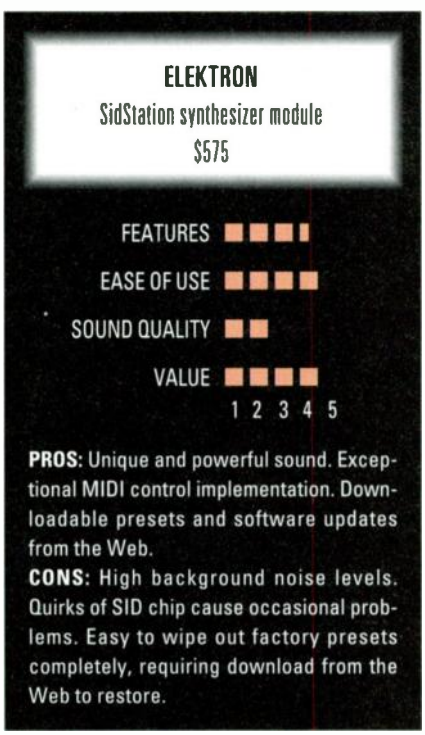
The LFOs have a few tricks of their own as well. You can, of course, select the basic waveforms and modulate them in the traditional manner. However, the SidStation also offers a unique set of modifications that can be made on these signals.

One of the coolest effects is an Interlace parameter, which allows you to chop together two different LFO waveforms. This results in a noncontinuous waveform that incorporates three frequencies: the frequencies of the two different waveforms and the chop rate. Because the waveforms can be quite complex, the result is often a crazy digital sound unlike anything you've heard elsewhere.

GOT NOISE?

So what does this thing sound like, anyway? Well, you better like noise and distortion. The noise floor is extremely high, just as in the original Commodore 64. The philosophy of Elektron seems to be to give you the real, unvarnished thing: if you want to run it through noise gates to clean up the sound, you're free to do it yourself. (A good amount of the chat on the Elektron Web site has to do with ideas about cutting down the SidStation's noise.)

And distortion! This is a synthesizer for lovers of distortion. All the SidStation's wacky digital-modulation schemes lead to a richly varied palette of nonharmonic goodies.



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All of the parameters are always adjustable in real time.

The analog filters have a distinctive sound and coloration of their own. They're quite flexible and are switchable between lowpass, bandpass, and highpass, as well as various quirky combinations of them all. An audio input is available on the box (see **Fig. 2**) for processing signals through the filter section. However, you're going to pick up a lot of computery hash noise along the way. You just have to like that kind of thing if you're going to get into this box.

GABBA HEY!

The SidStation is ideal for technologically savvy experimentalists and hardcore dance stylists. Others may find the noise level, distortion, and occasional flakiness of the venerable SID chip not to their liking.

The SidStation really shines at creating heavy, distorted 303-through-a-fuzzbox bass lines, as well as intelligent variants of the classic computer-game beeps and explosions. Think gabba and other hard European-techno dance styles and you'll get the picture. The musical samples available on the SidStation Web site show to good effect what the device can do.

I like the whole-world view that went into this synth. It really seems to be about finding and exploiting a unique sound source and giving the users direct and total control over it. You have to be willing to go through a few rough spots at first. But for those interested in the edgy, frankly electronic part of the spectrum, the SidStation offers many rewards.

Tim Perkis *(www.perkis.com) writes and makes rude noises in the San Francisco Bay Area and elsewhere.*

We loved *Recording* magazine's SampleTrak review so much, we had to rip it off.

"Effects quality here is exactly what's needed for remix and dance music production. Filters and the ring modulator have a very "analog-ish" sound, and the time-based effects are clean and crisp."

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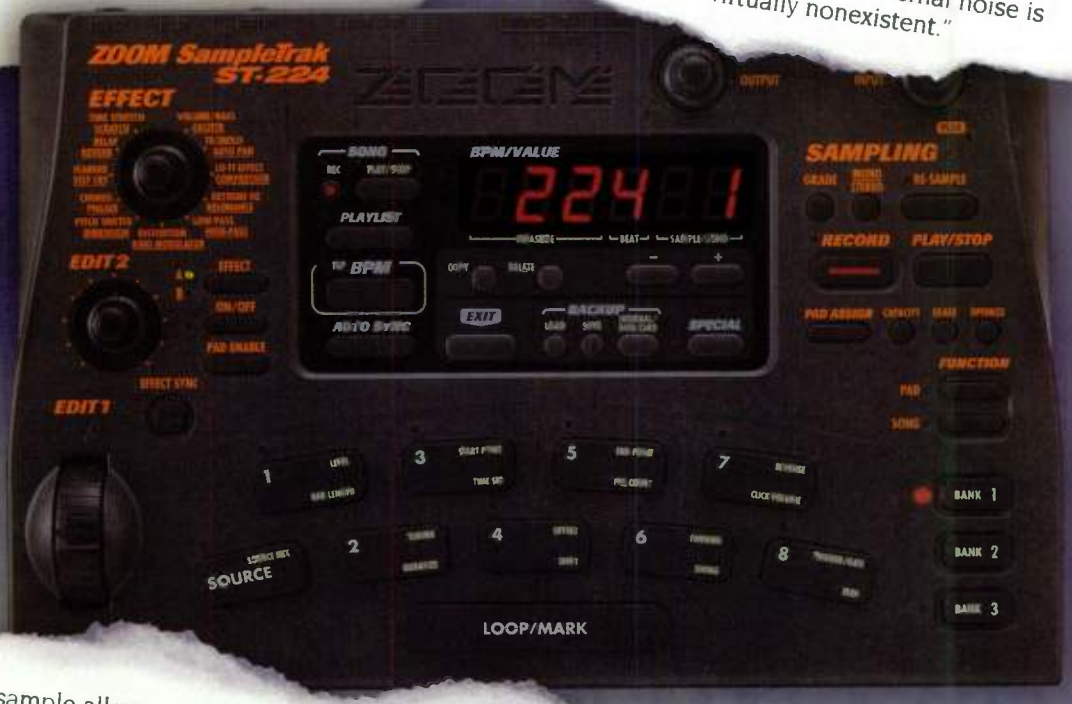
"The ST-224's internal noise is virtually nonexistent."



"Resample allows you to take material already in the ST-224, route it through the machine's effects and alter it, then save the results to another pad without routing anything out of the box...This feature takes the ST-224 and puts it into a higher league."

DAC Crowell
Recording, September 1999

"In the end, the Zoom SampleTrak ST-224 is less like a phrase sampler and more like a little shrunken-down sampling workstation ...one that doesn't cost all that much more than those little loopers. Lots of **KA-BOOM!** for the buck."

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SEASOUND

SOLO (MAC/WIN)

An audio interface for the desktop musician.

By Mike Lawson

Late in 1998, famed synthesizer guru Tom Oberheim founded SeaSound with the stated purpose of manufacturing high-quality, reasonably priced digital recording and audio products designed to address the practical needs of musicians. The company has achieved its goal with its first release, the Solo, a cross-platform PCI card and audio interface package that offers a host of innovative features at a very competitive price.

The Solo can handle the functions of several different pieces of studio hardware. It's a high-quality audio interface with two channels of analog I/O; two channels of S/PDIF I/O; and excellent 24-bit, 96 kHz converters. The rack-mount unit also offers two custom mic preamps with switchable phantom power; MIDI In, Out, and Thru ports; and a complete monitoring section with a simple, built-in mixer and a pair of headphone amps.

For those interested in recording into their computers with a minimum of additional gear, purchasing the Solo could obviate the need to buy a separate mixer, mic preamp, and MIDI interface. Musicians with more full-blown setups will also find the Solo's versatile feature set quite useful. Let's take a closer look.

SOLO I/O

The Solo consists of a PCI card and a handsome, metallic blue, 2U rack-mount interface that connects to the card via a 25-pin cable; this cable also supplies power to the interface from the computer. The rack unit houses most of the Solo's connections and controls. On the front panel are an XLR mic connector and a ¼-inch instrument jack for each of the unit's two input channels. Each channel also has a front-panel Trim control that governs both the mic and instrument input, and a Record Mode switch that enables it for recording.

Line-level signals are brought into the unit via a pair of ¼-inch inputs on the back panel, where you'll also find two ¼-inch auxiliary inputs that you can use to bring in stereo sources for monitoring purposes. The line and auxiliary inputs are unbalanced because SeaSound's designers felt that most users would be desktop musicians who wouldn't need to run cables longer than 15 feet. The rear panel also sports two ¼-inch TRS insert jacks for patching effects such as compression and EQ into the recording chain.

In addition, the back panel is home to a variety of ¼-inch outputs. The stereo Master outputs can be used to feed a DAT machine or other mixdown deck. The stereo Control Room outputs can connect to the monitor inputs on an external mixer or drive a pair of powered monitors directly. You can use the Direct outputs as an aux send, with the signal returning through the auxiliary inputs. This lets you monitor with effects but print a dry signal.

I'm not happy about the placement of the Solo's S/PDIF jacks, which are located on the PCI card rather than the interface. Depending on the layout of your studio, this arrangement could be inconvenient. For instance, I was using a guitar effects processor with an S/PDIF output, and I wanted to connect it to the Solo. This meant I had to crawl behind my studio desk and plug directly into the PCI card. Of course, there are work-arounds. You could connect the card's S/PDIF jacks to a patch bay, or plug a couple of male-to-female RCA cables into the

SEASOUND
Solo (Mac/Win) PCI audio card and interface
$699.95

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

PROS: Easy to use. Great-sounding mic preamps and converters. Switchable phantom power. Built-in mixer. MIDI capabilities. Quality construction.
CONS: S/PDIF connectors located on card only and not on rack-mount interface. *Solo-o-meter* software available only for PC at time of review.

With its mixer functions, 2-channel mic preamp, and MIDI jacks, the Solo is more than just an audio interface.

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The back panel is home to the majority of the Solo's analog I/O, as well as the MIDI jacks and an input for a yet-to-be-released external controller.

S/PDIF jacks as extensions. Nonetheless, considering that the rest of the unit is so elegantly and thoughtfully designed, this flaw surprised me a bit.

ADD THIS TO THE MIX

The Solo's built-in mixer is definitely its most innovative feature. When you use it in conjunction with the various I/O jacks on the interface, you can mix and monitor signals that are being recorded as well as existing audio and MIDI tracks.

The mixer's design is simple but effective. Each of the two front-panel input channels and two rear-panel line inputs has its own level control, which governs how much signal is sent into the computer and to the two front-panel, ¼-inch headphone jacks. These inputs also have monitor-pan knobs. Of the four Monitor Mix knobs, two control the monitor levels of all inputs (mic, instrument, line, and auxiliary), and two govern the audio coming back from the computer. A 10-segment, 2-channel LED ladder on the front of the unit helps you set levels; it can be switched to display input or output. You also get a peak-hold switch and four clip-indicator LEDs. In addition, the Control Room outputs, Master outputs, and both headphone jacks have their own separate volume knobs.

Overall, SeaSound has designed the Solo's mixing section very well. When you use it with the built-in mixers and effects plug-ins found in audio-recording software, you have everything you need—from a mixing and monitoring standpoint—to do an entire project. The only things that the Solo doesn't provide are a set of headphones and a pair of powered monitors.

WILL YOU MIDI ME?

In keeping with the all-in-one design of the Solo, MIDI In, Out, and Thru jacks are provided on the back of the interface, and MIDI activity LEDs are on the front panel. Granted, these can't match the performance of a multiple-port MIDI interface, but for the desktop musician at whom SeaSound is targeting this product, a limited MIDI interface may well suffice. After all, there are plenty of musicians who get the majority of their synth sounds from a single GM module or even a Sound Blaster–style card.

The audio capabilities of the Solo are far superior to those of the typical PC sound card, but it doesn't provide internal synth sounds. Therefore, if you have a Creative Labs Sound Blaster or a similar card, it's a good idea to use it along with the Solo. I was able to use the Solo with an Alesis ADAT-PCR card *and* a Sound Blaster Live Platinum card, which is a testament to its well-written drivers.

TESTING 1, 2, 3

Getting the Solo up and running was a snap. First I downloaded the latest drivers from the company's Web site. Then I installed the Solo's "plug and play" PCI card into my Windows 98 computer without a hitch. (The Solo is compatible with both Mac and Windows 95/98 computers and most software that supports ASIO, Sound Manager, or WAV drivers.)

I tested the Solo on a 450 MHz Pentium III system with 384 MB of RAM; I also witnessed the card performing well on a 400 MHz Celeron system with only 64 MB of RAM. I had no compatibility problems using the Solo with the following products: Sonic Foundry's *Vegas Pro, Acid Pro* 1.0, *Acid Rock*, and *Sound Forge* 4.5; Cakewalk's *Pro Audio* 9; Steinberg's *Cubase VST;* and Emagic's *Logic Audio Platinum* 4.0. The Solo comes bundled with Steinberg's *Cubase AV* as well as SeaSound's *Solo-o-meter*, a utility that gives you onscreen metering and the ability to change sampling rates and signal routing. (At the time of this review, *Solo-o-meter* was available for the PC only.)

I tested the Solo's custom mic preamps (designed by Oberheim and the team at SeaSound) while cutting vocal tracks with a CAD E-100 mic. The results were uniformly excellent. In fact, when it comes to sound quality, I'd

Solo Specifications

Analog Inputs	(2) XLR microphone (switchable phantom power); (2) ¼" instrument; (2) ¼" line; (2) ¼" auxiliary
Analog Outputs	(2) ¼" Master; (2) ¼" Control Room; (2) ¼" Direct; (2) ¼" TRS headphone
Digital Inputs (stereo)	(1) S/PDIF (RCA)
Digital Outputs (stereo)	(1) S/PDIF (RCA)
Inserts	(2) ¼" TRS
MIDI I/O	In, Out, Thru
A/D Converters	24-bit, 96 kHz
Sampling Rates	6, 8, 9, 11.025, 12, 16, 22.05, 24, 32, 44.1, 48, 88.2, 96 kHz
Distortion (THD + N)	0.005% (20 Hz–22 kHz)
Power Requirements	supplied by computer
Dimensions (rack-mount unit)	19" (W) × 3.5" (H) × 15.3" (D)
Weight (rack-mount unit)	13 lbs.

For manufacturer information, please see Contact Sheet, p. 175.

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Solo
Minimum System Requirements
Mac: G3 or Power Mac with Level 2 cache; 32 MB RAM; Mac OS 8.6; CD-ROM drive
PC: Pentium 133 (Pentium III recommended); 32 MB RAM; Windows 95/98; CD-ROM drive

rank the Solo's preamps with many of the dedicated preamps that I've used. I was able to plug the mic into the Solo's XLR input, switch on the phantom power, engage Record mode, and go! That's one of my favorite things about the Solo: the signal path is short and direct, unlike the serpentine routings of a standard mixing board.

However, just because the Solo lets you bypass your main console during tracking doesn't mean your mixer is destined for the scrap heap (or eBay). In fact, my 16-track analog board has found a new life as a submixer. I run the outputs from gear such as my synth module, vocal processor, and computer sound card into the mixer, and run the mixer's sub outputs into the line inputs on the Solo. That way, I don't have to do a lot of repatching when I want to print a track to disk from one of these sources. This setup also makes it easy to add EQ and effects in the analog domain prior to recording the signal.

THE LAST WORD

SeaSound really did its homework and came up with a truly innovative and practical design for a sound card–audio interface product. And despite the many features not found on rival systems, the price is more than competitive. The first time you get your hands on the rack-mount box and give the knobs a turn, it'll be obvious to you that the company didn't skimp on parts. From the elegant exterior design to the smooth control pots to the well-placed connectors on the front and back, this product is a winner.

My only complaint is the placement of the S/PDIF jacks, but in the end that's only a minor point. I highly recommend this impressive product. Whether you're contemplating your first audio card purchase or looking to replace or augment your current model, you should strongly consider going Solo.

Introducing

WaveCenter/PCI

OK, you see what's happening: digital mixers are looking pretty cool. After all, they've got incredible sonics, built-in effects, and the automation capabilities you could only dream about before. But if you hook that puppy up to the NoiseRacket analog soundcard that came with your computer, you're right back in ****ville. (Rhymes with "Snapville.")

Here's a better idea: keep it digital with our new **WaveCenter/PCI** card. It has all the connections you need to integrate your digital mixer into your computer-based studio. Transfer up to 10 channels of digital audio simultaneously using ADAT lightpipe and S/PDIF, with 24-bit resolution on all channels. Use one of the built-in MIDI ports for mixer automation, and the other to connect your synthesizers.

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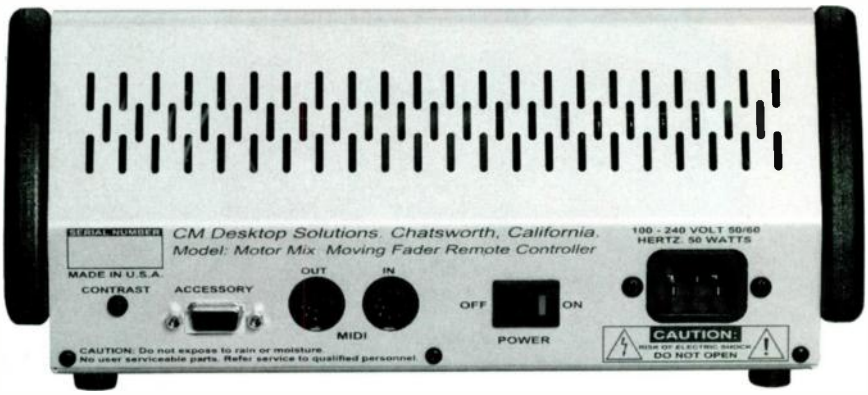
CM AUTOMATION

MOTOR MIX

Control your onscreen mixes with real faders, knobs, and buttons.

By Erik Hawkins



The Motor Mix's rear panel includes a contrast control, a power switch, MIDI jacks, and a serial port that will be addressed by future hardware releases.

In this brave new world of virtual recording studios and software plug-ins, it's nice to get your hands on something tangible. There's nothing quite like the feeling of real faders, buttons, and dials under your fingertips. Pushing a mouse and typing commands on a QWERTY keyboard are fine for word processing, but not for recording and certainly not for mixing. To bridge the gap between digital audio workstation and musician, we need a machine that translates the virtual, onscreen elements into physical, real-world controls. To meet this need, several companies are now manufacturing MIDI-based work surfaces that look and feel very similar to actual recording consoles. One such machine, just introduced, is the Motor Mix by CM Automation.

Although CM Automation is not yet a household name, the company has been around for almost a decade, working behind the scenes to help develop audio and MIDI products for several big-name manufacturers. So even though it may seem to be a newcomer to the scene, it really isn't. In fact, the experience of the CM Automation staff was undoubtedly instrumental in bringing to fruition this 8-channel, button-laden control surface with motorized faders at the reasonable price of $999.

MOTOR MIX BASICS

The Motor Mix is amazingly compact, measuring a mere 10.5 inches wide by 4 inches high by 12.5 inches deep and weighing only 10 pounds. It's highly portable and can easily be moved around on your tabletop, cradled in your lap, or carried to another location. It's solidly built with a steel chassis and black faux-wood side panels. A rocker-type power switch is located on the rear panel (the unit takes a standard IEC type II cable), as are the MIDI In and Out jacks.

The Motor Mix utilizes bidirectional MIDI communications, which means that it sends and receives MIDI controller data. As a result, when you adjust one of the Motor Mix's motorized faders, for example, and record that move in your software, the fader moves correspondingly when you play the sequence back.

The Motor Mix allows you to control your MIDI- and audio-recording software with actual faders, knobs, and switches.

FADING IN

The Motor Mix's eight 100 mm faders slide easily, with very little resistance. Are they the smoothest I've ever used? No. But at this price point I have no complaints. There's a slight delay between when you move a fader and when the onscreen fader element responds to that motion, but that's true with all control surfaces of this type. The delay is only visual, however, and does not affect audio or MIDI response. There is no perceptible delay between the time you actually move a fader and when you hear the volume change.

Because there are only eight physical faders and in many situations you will be working with 16, 24, or more channels in your multitrack software, the Motor Mix allows you to step through those channels in various ways to get to the ones you want to control. This is similar to the "fader layer" concept that many digital mixers use. It's accomplished via the left and right arrow switches and the Bank and Group buttons.

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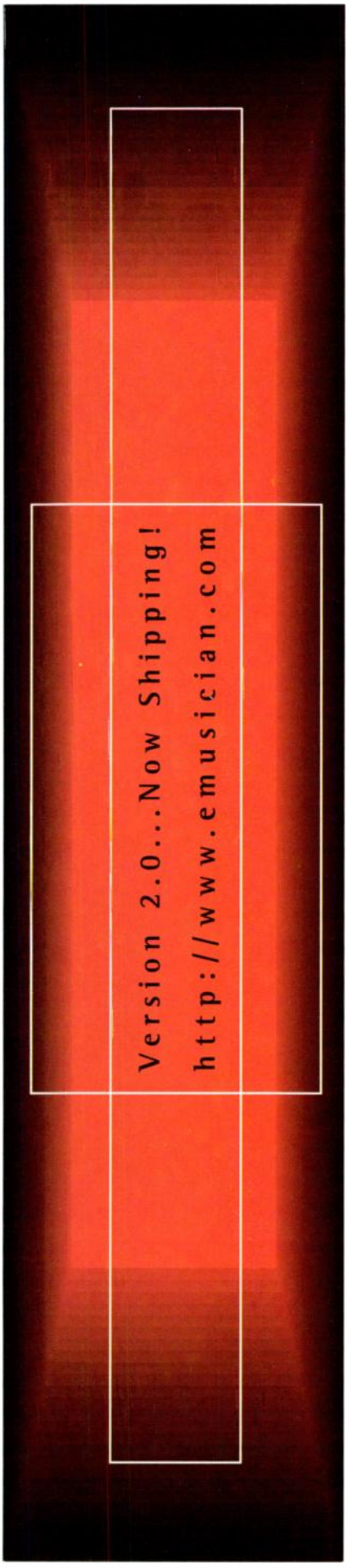

You have the choice of advancing through your multitrack's channels in single increments or in banks of eight. If your software's mixer lets you set up groups of nonadjacent faders, you can set the Motor Mix to switch between these by pressing the Group button followed by the arrow switches. My only quibble is that considering how important these buttons and switches are (you push them constantly during a mix), they could be much larger.

Just like on the channel strip of a mixer, there are mute and solo switches above each of the faders. Each physical channel also has a Multi control—a switch you can set to turn functions in your software, such as EQ, dynamics, and delay, on and off—and a Burn switch you can configure for various functions, including record-enable.

FUNCTIONS GALORE

On either side of the faders sits a bank of eight clear-plastic, backlit function switches. In many cases, the switches control more than one function. Primary functions—such as Stop, Play, Plug In, and Undo—are labeled above the buttons. Secondary functions are labeled below. Examples of the latter include Create (for grouping faders), Compare (for comparing plug-in settings), Tools (for toggling between tools), and Mode (for viewing a channel's automation mode). Secondary buttons are accessed by hitting the Shift key—conveniently located at the bottom left corner of the unit's face—while pressing one of the function switches.

Near the top of the Motor Mix are eight rotary pots that can be assigned to control everything from panning to aux sends to the parameters of software plug-ins in the host program. These knobs are rubberized for nonslip gripping and provide some resistance when turned, which is good for accuracy. (Pots that turn too easily can be squirrelly, making values difficult to nail.) A slightly larger knob (also rubberized), called the Rotary Selector, allows you to select the function that the rotary pots are controlling. It has push-button action and is detented. Above it is a two-character LED that reflects the pots' currently selected functions (such as Pan, Aux Send 1, Aux Send 2, and so on).

▼

Getting Motor Mix to work with your software is relatively simple.

DISPLAY ME

A two-line, 40-character, backlit LCD spans the top of the Motor Mix (about ¾ by 6¼ inches in size). At first glance I thought it might not be big enough,

Motor Mix Specifications

Faders	(8) 100 mm, motorized
Mute Switches	(8) with individual status LEDs
Solo Switches	(8) with individual status LEDs
Burn Switches	(8) with individual status LEDs
Multi Switches	(8) with individual status LEDs
Channel Select Switches	8
View Control Switches	4
System Keys	16
Rotary Pots	(8) for controlling selected functions
Rotary Selector Knob	(1) detented
MIDI Ports	In, Out
Display	(1) 2-line, 40-character backlit LCD; (2) 7-segment LEDs
Power Supply	built in
Dimensions	10.5" (W) × 4" (H) × 12.5" (D)
Weight	10 lbs.

For manufacturer information, please see Contact Sheet, p. 175.

but after trying out the unit I was pleasantly surprised at the display's usefulness. The Motor Mix's designers did a wonderful job of cramming a ton of information onto this no-frills screen.

Channel labels and parameter names are displayed on the top line, and values and soft-key labels (such as window select, special transport keys, and plug-in select) appear on the bottom line. The buttons directly beneath the LCD act as soft keys. Labels and numbers on the screen are nicely aligned with the channel strips for easy operation. It's simple to see which function lines up with which soft key or pot. A contrast control is located on the unit's rear.

UP AND AWAY

Getting the Motor Mix to work with your software is a relatively simple process: plug it into your MIDI interface, assign it a port, and choose the Motor Mix profile in your multitrack software. (The profile is written into the software and enables the program to recognize and interact with the Motor Mix.) I tested Motor Mix on my Mac using two different digital audio programs: Digidesign's *Pro Tools* 4.3.2 and Steinberg's *Cubase VST* 4.0. (Many digital recording and sequencing programs for Mac and Windows support the Motor Mix fully or partially. To find out about support for a particular program, check with the software manufacturer. According to CM Automation, the company's Web site will soon offer compatibility information.)

Because *Cubase* has a Motor Mix profile, it was a snap to get it working. However, at the time of this review, the Motor Mix was only partially supported in *Cubase*. Even though a controller profile appeared in the VST Remote menu, the Motor Mix controlled only faders, mutes, and solos. All other functions, including transport control, required the mouse and computer keyboard. Even so, I had a lot of fun doing fader moves and hitting mutes and solos—all in real time. Supported features worked smoothly, and I envision that *Cubase* and the Motor Mix will make for a killer combination, especially for remix-oriented personal studios. Full *Cubase* support for the Motor Mix should be available by the time you read this or very soon thereafter.

At the time of this writing, *Pro Tools* does not offer a Motor Mix profile. (CM Automation reports that one is in the works.) However, the Motor Mix can be set to Pro Tools mode, which gives it control over a wide array of functions. CM Automation accomplished this by designing Pro Tools mode to address the Mackie Designs HUI profile that already exists in *Pro Tools*. (The HUI is a dedicated *Pro Tools* control surface.)

Due to the lack of a specific profile, not all of the Motor Mix's buttons are active when using *Pro Tools*. (Some controls on the Motor Mix aren't addressed in the HUI profile, such as the Next and Last keys for stepping forward or backward between locate points. These keys will work when *Pro Tools* supports the Motor Mix with its own controller profile.) Nevertheless, I was able to access just about everything I needed in *Pro Tools* directly from the Motor Mix's front panel.

Functions without discrete buttons can be controlled via soft keys. For instance, there aren't RTZ, End, or Loop transport controls, but pressing the Transport key brings these functions to the LCD. Then all you need to do is hit the appropriate soft key beneath the listed function, and voilà—it's executed. This design facilitates some interesting ergonomics. With the soft

CM AUTOMATION
Motor Mix DAW control surface
$999

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

PROS: Solidly built, compact, lots of buttons. Installation is a snap and software compatibility is very high for such a new product. Excellent bang for the buck when compared to the competition.
CONS: Fader bank buttons are too small. Weak manual.

keys doubling certain discrete keys, as is the case with the FF and RW controls, two types of FF and RW are available at the same time. The hard FF and RW keys are latching (they stay on until disengaged), whereas the soft FF and RW keys are momentary (they're active only when depressed). Pretty neat. *Pro Tools* supports up to four controllers, so four Motor Mixes can be used simultaneously. (That's 32 channels with a street price below $4,000!) They're even designed to be easily attached into one large unit.

MASTERING THE MIX

Before I tested the Motor Mix, my expectations for it were modest at best. After all, I'm a HUI user, and I'm accustomed to that product's large size, meter bridge, jog/shuttle wheel, numeric keypad, and analog I/O—none of which the Motor Mix offers. But once I got up to speed on the Motor Mix (it didn't take long), I discovered that its features and performance greatly exceeded my expectations. I found the control surface to be very intuitive, and I needed little more than a cursory glance at the manual to grasp the basic operating principles. (The thin and somewhat sketchy manual is not one of the product's strong points.)

One fact to bear in mind is that the Motor Mix is a work surface dedicated to handling operations that occur within the mix window of your audio software only. Therefore it offers no control over editing functions. CM Automation decided to address the edit window separately and is developing a full-featured work surface that will handle those functions.

FINAL ADVICE

When shopping for a control surface, explore your options before making a decision. Besides the Motor Mix, there are several other dedicated controllers with moving faders on the market: Peavey's StudioMix, JL Cooper's 3800, and the Mackie Designs HUI. The HUI and the 3800 offer larger work surfaces, a jog/shuttle, and a meter bridge (the HUI also features analog audio I/O),

▼

Motor Mix is amazingly compact.

but they are considerably more expensive than the Motor Mix ($3,495 and $2,895, respectively). The StudioMix could be real competition for the Motor Mix. It has many of the same features as the HUI and the 3800 (including a jog/shuttle wheel and analog I/O) and a retail price of just $899. However, the StudioMix works only with Cakewalk software, has no LCD, and offers only half the number of buttons found on the Motor Mix.

As more software manufacturers begin to support the Motor Mix, it will undoubtedly become a personal-studio staple. Does it have the breadth of features that its more expensive competitors do? No. But it gets the job done, and you can't beat the price.

Erik Hawkins *is a musician and producer working in Los Angeles County and the San Francisco Bay Area. Check out his fledgling indie label at www.muzicali.com.*

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HHB Radius Tube Processors (left).
Also available: HHB Classic Tube Processors (right).

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FIRST WE LISTEN

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MUSITEK

SMARTSCORE 1.3 (MAC/WIN)

From sheet music to MIDI in minutes.

By David Rubin

I have always been fascinated by optical character recognition (OCR) systems. Taking a page of text or a chart full of numbers and converting it into an editable file seems to take more than a bit of magic. What's more, the technology seems to be improving at a steady rate as new applications emerge. The postage-stamp vending machine at my local post office, for example, now accepts bills of any denomination, not just one-dollar bills. The machine scans my hard-earned dough and promptly returns the correct change after each transaction. That seems pretty impressive to me, but it's mere child's play compared with what Musitek's new *SmartScore* can do.

SmartScore is a music software package that lets you scan printed music and convert it into a specialized music notation file that you can modify, edit, and process in various ways. More important, however, you can play back *SmartScore* files through your sound card or MIDI sound module to hear what the music sounds like. For many people, this is just the sort of music software they've been waiting for: a printed-music playback system that lets you listen to notated music without performing it. Of course, the process is far from foolproof, and there are several steps in getting from page to playback, but the possibilities are certainly intriguing.

Band directors can now scan a marching band score and quickly transpose the piece into an easier key. Choir members can scan a choral score and learn their parts by singing along to a MIDI accompaniment. Students can create their own "music-minus-one" style arrangements, and anyone can audition pieces that they've never heard. Indeed, schools and churches are among Musitek's most ardent customers.

SmartScore evolved from Musitek's earlier *MIDIScan* software (released in 1993). The more sophisticated *SmartScore* offers improved recognition algorithms, greatly expanded score layout and editing options, and a fully functional MIDI sequencer with Piano Roll and Event List views. You can also create scores from scratch using one of *SmartScore*'s 15 templates, and you can record and edit MIDI files directly in the sequencer section without using scanned music. The program supports up to 32 staffs, and you can assign any MIDI channel to any of four independent, color-coded voices per staff. Surprisingly, *SmartScore* even handles collapsing and expanding scores (in which staffs are dropped when instruments aren't playing).

SmartScore
Minimum System Requirements
Mac: Power Mac; 32 MB RAM; Mac OS 8
PC: Pentium 120; 16 MB RAM; Windows 95/98/NT

YES, I SCAN

In spite of its various ancillary talents, *SmartScore*'s primary raison d'être is to translate printed music into playable MIDI files. The multistep process begins, of course, with a scanner. *SmartScore* supports most TWAIN-compatible scanners, so getting started should be easy, especially considering that many scanner models are now available for less than $100. I got excellent results by plugging an inexpensive USB-equipped Microtek scanner into my PC. (If you don't have a TWAIN-compatible scanner, you can prescan the pages outside of *SmartScore* and save the images in one of several dozen graphics formats, including TIFF, BMP, EPS, JPEG, PICT, and PCX.) Microtek recommends a resolution of around 300 to 400 dots per inch (dpi); the default setting is 300 dpi. Higher or lower settings may adversely affect recognition accuracy, although higher settings may be necessary for miniature scores.

For the best results, it's important to position the page squarely in the scanner to avoid an image file with staffs that angle uphill or downhill. This affects the recognition results during the subsequent step. However, if your image does appear skewed, *SmartScore* provides a Deskew function that straightens out the staff lines. *SmartScore*'s Edit menu also provides commands that let you crop a selected area, rotate the image, and add lines or shapes using a few basic drawing tools.

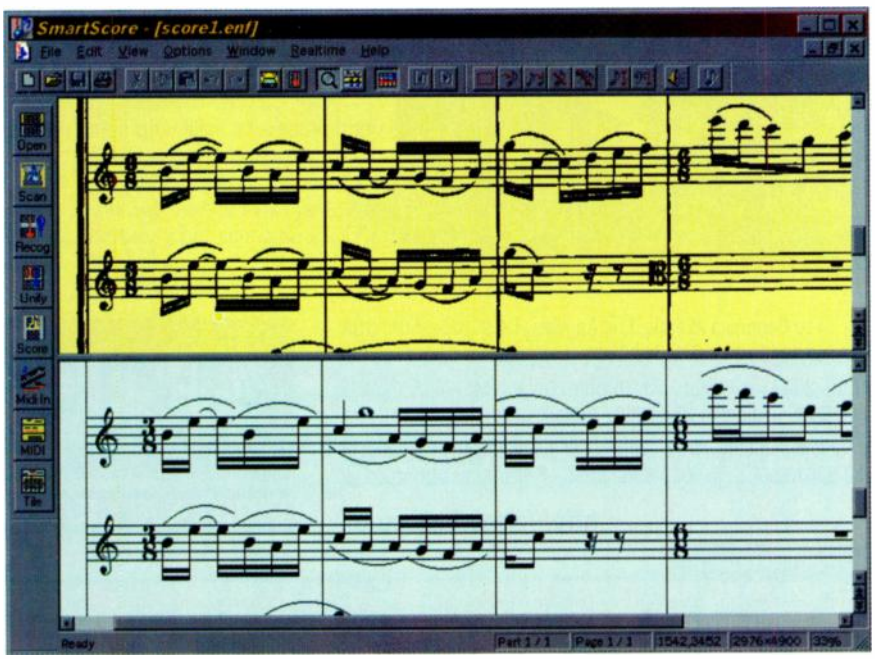

FIG. 1: In *SmartScore*'s main window, the scanned score appears above its ENF translation; the synchronized scrollbars keep the views together. You can correct recognition errors—such as the extra whole note and missing 16th note in the first staff and the missing tie and clef change in the second staff—with *SmartScore*'s extensive set of editing tools.

ENF IS ENOUGH

Once you're satisfied with your scanned (or imported) image file, the next step is to add it to the Begin Recognition

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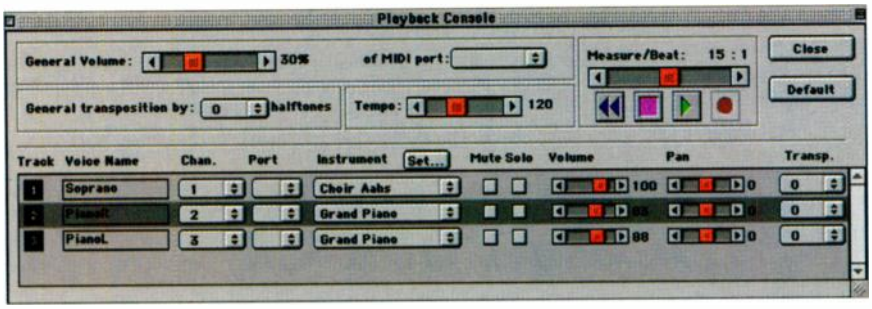

FIG. 2: *SmartScore*'s Playback Console window allows you to make real-time changes to a number of MIDI parameters.

window. There you select the file (which may consist of one or more pages) and click the Begin Recognition button. *SmartScore* analyzes the image and generates a new Extended Notation Format (ENF) file, which appears in a divided window beneath the original scanned image (see **Fig. 1**). The original and the ENF score each have a separate vertical scrollbar, but the sliders are synchronized so that moving one moves the other by the same amount. The Zoom tool works similarly, zooming both displays at once. In that way, the same staffs always appear in both displays at the same time and at the same size.

The ENF file is much more than simply an editable version of the image file. *SmartScore*'s conversion algorithm can actually recognize multiple voices within a single staff, display them in different colors, and assign them independent MIDI channels. This "voice-line threading" feature is at the heart of the program's MIDI playback capabilities, and it allows you to do such things as split chords into separate lines (useful for breaking out the parts in SATB choral scores) and assign separate MIDI instruments to different contrapuntal lines within a staff.

During ENF playback, *SmartScore*'s Playback Console window (see **Fig. 2**) lets you mute and solo parts and make other real-time changes to a number of MIDI parameters, including volume, Pan, Tempo, Program, and Transposition. However, these changes are not reflected in the score; they only affect the playback. With *SmartScore*'s extensive set of notation-editing tools, you can directly alter the ENF file with many of the same capabilities found in dedicated scoring programs. (Changes made to the score are automatically reflected in the underlying MIDI file.) A separate set of MIDI editing tools allows you to work directly with MIDI data to make permanent changes to the notated score (more on this in a bit).

TOOLS OF THE TRADE

Although *SmartScore*'s recognition algorithms have been significantly improved over earlier versions, they are still imperfect. For starters, *SmartScore* doesn't recognize text or text-based symbols, such as tempo indications, lyrics, expression markings, alternate (multiple) endings, and dynamics abbreviations (such as *mf* and *pp*). These have to be added back into the score. Although the software does well at recognizing clefs, key signatures, meters, and crescendo and decrescendo wedges (hairpins), it does not recognize tuplets, fermatas, and trills.

For the most part, slurs and ties are preserved, but slur placement is often altered enough that many slurs have to be erased and replaced. Unfortunately, you can't simply grab a slur or tie and reposition it or change its shape by dragging with the mouse. You must first delete the existing mark and then insert a replacement. It's easy enough to do, but a bit inconvenient nevertheless. (According to Musitek, version 2 will include grab handles for many of the elements in the score, including ties and slurs.)

I tested *SmartScore* with several kinds of music and found some variability in the program's translation accuracy. Large, clearly printed scores seemed to work better than smaller, more densely packed scores with lots of markings. Individual instrument parts (extracted from a score) came through surprisingly well, as did several types of relatively simple music. Imported MIDI files also translated well. I had less success with guitar music, in part due to its idiomatic nature. In addition, *SmartScore* does not currently recognize tablature. Regardless of the type of music you scan, some correction and cleanup of the ENF file must be performed. Common translation mistakes include incorrect pitches and rhythmic values, missing bar lines, unrecognized symbols and score elements, and improper brackets and groupings. However, *SmartScore*'s split-screen user interface makes it easy to locate discrepancies between the original and the ENF score, and the program's extensive editing capabilities make it possible to prepare and print out a respectable-looking score.

Most of *SmartScore*'s notation tools reside on its nine floating palettes, which provide a familiar-looking environment for editing (see **Fig. 3**). In many areas, however, *SmartScore* takes a decidedly different approach to editing scores because the program centers mainly on fixing up scores derived from scanned images. Unlike most notation programs, which are optimized for creating scores from scratch, *SmartScore* assumes that much of your editing time will be spent adding symbols or marks that were not recognized by the conversion algorithm, or removing or replacing spurious notes and other elements.

MODUS OPERANDI

To distinguish between various editing operations, *SmartScore* relies on different editing modes that are accessible from the ENF toolbar at the top of the window but best approached by using keyboard shortcuts. Pressing the C key, for example, toggles between Insert and Change modes. In Insert mode, you can deposit objects (selected from one of the palettes) anywhere in the score. In Change mode, clicking on an existing object in the score changes it to the currently selected object.

Pressing the X key toggles between Delete Any mode and Delete by Type mode. Delete Any mode lets you erase whatever object you click with the mouse. Delete by Type mode removes only objects that reside in the currently active tool palette. Notes are handled in various ways depending on whether they are individual notes or part of a chord. Insert, Change, and Delete modes work as usual with separate notes, but to add or delete a note within a chord you must first activate the Cluster tool so you can edit the notes individually without affecting the neighboring notes in the group. (Notes sharing a single stem are treated as a single object unless

For manufacturer information, please see Contact Sheet, p. 175.

you split them into separate voices.)

You can activate a handy QuickSelect function by Control-clicking on an object. QuickSelect lets you choose objects from the score rather than from one of the tool palettes. You can then perform insertion or deletion operations as usual. Myriad keyboard shortcuts let you add or subtract score elements. For example, the D key toggles between Insert a Dot mode and Delete a Dot mode; the V key toggles between Insert Tie and Delete Tie modes. Other keys affect such things as accidentals, rests, bar lines, clefs, tuplets, dynamics, and stem direction.

If all of these editing modes and toggle options seem a bit confusing, well, they are. And *SmartScore*'s approach to editing does take some adjustment if you're used to a traditional notation program. When I started using *SmartScore,* I constantly found myself inserting an object when I meant to change an object, or deleting a whole chord instead of a single note. In many cases the program didn't seem to respond predictably, which caused some initial frustration. Nonetheless, after I used the program for a while, a certain method to the madness began to emerge. Moreover, the program does what it can to keep the user interface intuitive. For instance, the cursor changes appearance to reflect the current activity, adopting the look of the selected tool and graphically indicating the editing mode.

SmartScore's design strongly encourages the use of keyboard shortcuts to speed up the editing process, and indeed, just about every tool in the program has a key assigned to it. (You can even switch between tool palettes with the Function keys.) Musitek suggests positioning your left hand so that your index finger rests on the C key with your other fingers resting on the X, Z, and Control keys. By maintaining that position, you can toggle in and out of various editing modes and clean up most common problems by combining right-hand mouse-clicks with easy-to-reach left-hand selections.

Some tools remain awkward to use. For example, the Note palette includes three beaming tools: one for beaming to the right (for the first note in a group), one for beaming to the left (for the last note in a group), and one for the middle notes. You can toggle between the three tools with a keyboard shortcut, but they still remain cumbersome to use. (Musitek plans to have automatic beaming in a future update.) Another shortcoming is the lack of horizontal repositioning capability. You can drag notes up and down to change pitch, but if you want to move a note or other object (such as a slur, rest, or hairpin) horizontally, you must first delete it, then reinsert it where you want.

To help you better visualize voice assignments, *SmartScore* lets you view your onscreen notation in one of two color modes. In Part mode, each staff is assigned its own MIDI channel and appears with its own color. In Voice mode, individual voices within a staff appear as one of four preset colors, with each voice having its own MIDI channel and parameter settings.

MIDI MANIPULATIONS

As part of its new recording and playback capabilities, *SmartScore* includes the equivalent of an entry-level MIDI sequencer. ENF files automatically generate MIDI note pitches and durations as well as various performance characteristics, such as dynamics, meter changes, and articulations. When you alter notes in the sequencer, the changes do not appear in the accompanying score unless you apply them. That allows you to modify the playback performance without changing the score's appearance—a handy feature. You can also add program changes, controller data, and meta events to the accompanying MIDI file, although these won't be reflected in the ENF score.

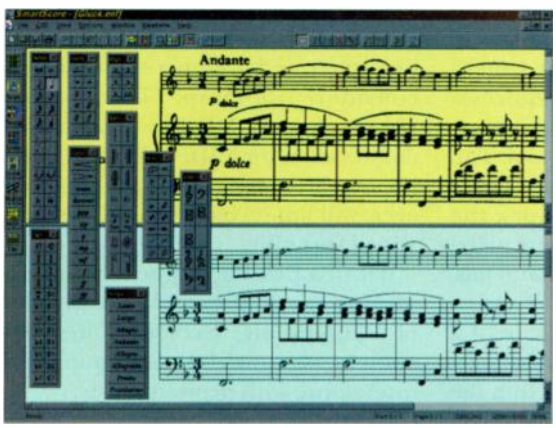

FIG. 3: You can access most editing tools from the program's nine tool palettes and through keyboard shortcuts.

For viewing and editing MIDI data, *SmartScore* provides a rather primitive Track Overview display, a traditional Piano Roll window, and an Event List window (see **Fig. 4**). The Track Overview display shows the different staffs (tracks) on the left; small black bars on the right indicate the presence of MIDI notes. You can zoom in and out by dragging the vertical and horizontal dividers to shrink or enlarge the track and measure areas. I found this approach to be needlessly awkward; a pair of Zoom buttons would make a welcome addition.

The Piano Roll window takes the same awkward approach to zooming, but its other editing features are more typical in design. You won't find menus filled with editing commands and MIDI processing options, as in a dedicated sequencer, but you can easily change note characteristics and copy, paste, add, or delete notes with the mouse. Dragging the left edge of a note changes its start time, the right edge changes its duration, the top and bottom edges adjust the Velocity, and the center lets you drag the note vertically or horizontally. Double-clicking a note opens the Note Event dialog box, where you can change parameters with numerical fields. A Measure Settings dialog box lets you create repeats and multiple endings and change the key and time signatures and tempo of the MIDI file.

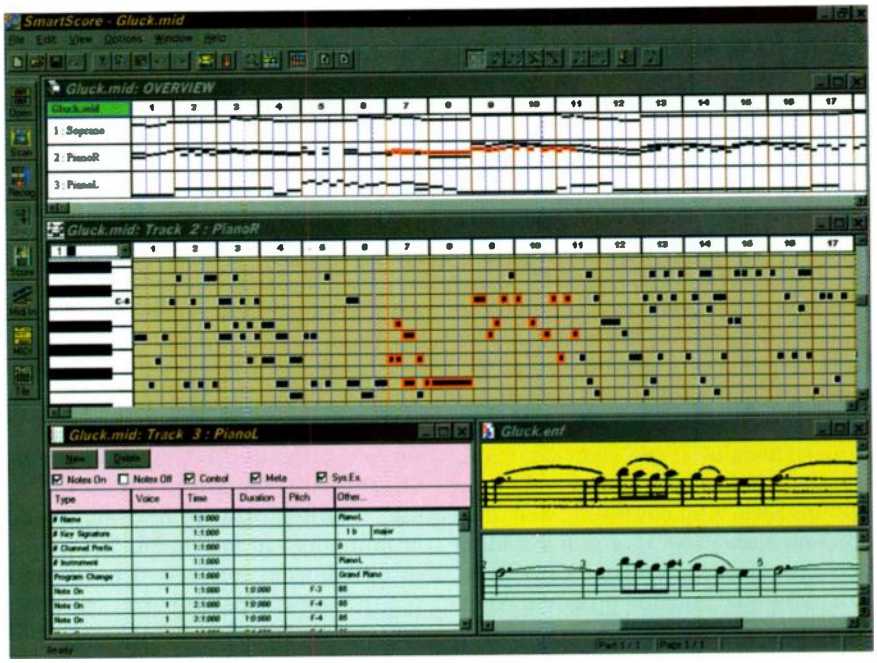

FIG. 4: The MIDI sequencer section includes a Track Overview, Piano Roll, and Event List window.

The Event List window lets you view, insert, and edit note events, controller data, program changes, meta events, and other types of data. Dialog boxes allow you to change note parameters and to create various types of new events. Recording options include a MIDI metronome, punch in and out recording (by measure), and input quantization.

FINAL MEASURE

SmartScore's documentation consists of a 143-page spiral-bound user manual, which includes a few short tutorials that introduce the program's main features. (A PDF version of the manual is also provided.) The tutorials definitely help get you started, because, as I mentioned earlier, *SmartScore* requires a unique notational mind-set before it becomes an effective scoring tool. The documentation is easy to read, but it suffers from a number of errors; the glossary in particular should be avoided by music students, as it's filled with mistakes and misinformation.

Ultimately, however, the value of a program like *SmartScore* depends largely on how comfortable you are with the user interface and how proficient you become with the program. After all, since you're starting with a printed score in the first place, you could always use a notation program to reproduce the score from scratch and play it back. In some cases, that might actually be the logical path to take.

But for many types of scores, *SmartScore* provides a significant head start on the scoring process, and the program's intelligent MIDI playback capabilities add to its usefulness. In fact, *SmartScore* may prove to be especially interesting to users of Coda's *Finale 98*, because *SmartScore* can export its ENF files as *Finale*-readable files for further editing. In addition, *SmartScore* supports NIFF files, so it can also work with notation programs that support this nonproprietary format. *NIFFViewer*, a freeware utility that can open NIFF files and play back or print the music, is available from Musitek's Web site.)

If you work only with one- and two-line staves and are on a tight budget, consider *SmartScore Piano Edition* ($149). It lacks MIDI sequencer and doesn't allow for MIDI recording, but it imports MIDI files. Most people, however, will appreciate the full version's added versatility.

With its flexible importing and exporting capabilities and extensive set of editing tools, *SmartScore* offers exciting possibilities for auditioning and interacting with printed music.

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

MUSITEK
SmartScore 1.3 (Mac/Win)
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FEATURES ■■■■
EASE OF USE ■■■
DOCUMENTATION ■■■
VALUE ■■■■
1 2 3 4 5

PROS: Works with most scanners. Deskew function straightens misaligned scores. Handles collapsing and expanding scores. Includes a full range of notation-editing tools. Detailed MIDI playback and editing capabilities. Imports a wide assortment of graphics file formats. Exports to *Finale* format. Supports NIFF files. Recognizes a wide variety of printed music types.
CONS: Doesn't recognize text or text-based symbols. Lines and markings lack grab handles. Beaming tools awkward to use. Lacks horizontal repositioning capability. Multiple cursor options can be confusing.

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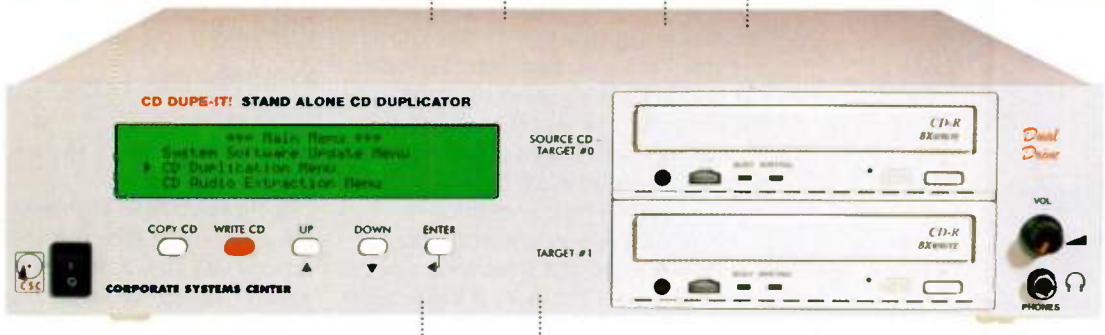

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Dual Drive Model is pictured above.

QUICK PICKS

LUCID

AD9624 and DA9624

By Erik Hawkins

With the advent of new chip sets, both the AES-3 (formerly AES/EBU) and S/PDIF standards can now handle sampling rates of up to 96 kHz. Lucid has taken advantage of these developments, adding the latest standard for AES-3 and S/PDIF digital connections to its new AD9624 ($899) and DA9624 ($749) converters.

The Lucid converters are not your average run-of-the-mill, no-frills A/D/A boxes. They are nicely designed, ruggedly built half-rack units that can be mounted side by side with the optional RM-4 rack adapter ($39). Power is supplied via a lump-in-the-line adapter.

Extra Frosting

Metering is accomplished with two 20-segment LED ladders. D/A meters go up to 24 dB over 0 dBu and –33 dB below, in 3 dB increments. The A/D meters are in 3 dB increments from –42 dBFS to –6 dBFS; from –6 dBFS to 0, they're in 1 dB divisions, so they're well suited for precision work. A clip LED lights up after three digital overs occur.

AES-3 is transmitted on standard XLR connectors; S/PDIF is on standard RCA electrical and optical. (The optical ports are not Lightpipe compatible, however.) Word lengths of 16 and 24 bits are supported, and sampling rates run the gamut: 32, 44.1, 48, 88.2, and 96 kHz.

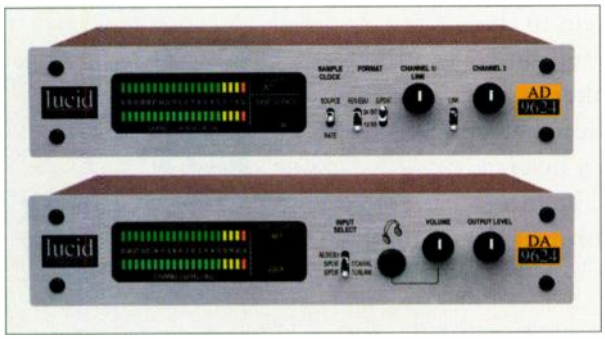
All the digital formats are available simultaneously on the A/D converter. You can also choose different bit depths for different outputs. This wonderful feature enables you to send a 24-bit signal to one recorder and a 16-bit signal to another; for example, you can send the master 24-bit signal to your digital audio workstation (DAW) and a backup 16-bit signal to your DAT. Noise shaping is used for 24-bit to 16-bit downward conversion.

The AD9624's inputs are on XLR connectors, whereas the D/A's balanced outputs are on XLR and ¼-inch jacks. A BNC input is available for word-clock sync. Signal is output from both at the same time, which is great for parallel feeds. And on the DA9624's front panel is an extra-special, frosting-on-the-cake feature: a headphone jack with its own associated level control.

Hear Everything

These units sound excellent. They are wonderfully precise—perhaps painfully so. I put up some old mixes that I had done using Digidesign's 888/24 I/O and was surprised to hear details in the high end that I had never heard before. In particular, I noticed some digital errors on a vocal track. I flipped back to the 888/24 and listened more carefully. I could hear the errors, but they weren't as apparent and were a hair less sharp. The Digidesign converters sounded more pleasantly warm; the Lucid crisper and less rounded. Often the trade-off between warmth and accuracy is a fine one, and the converters will sound nearly identical to most listeners. But I definitely heard a difference in the super-high-end detail, probably 14 kHz and up.

With all the pro features these converters offer, their retail prices are extremely reasonable. The units' multiple formats and flexible I/O are sure to please even the most jaded of engineers. Best of all, when the new 96 kHz sampling rate settles in and every sound card is up to spec, your Lucid converters will be there, ready to help you reap the benefits of the increased fidelity.



Lucid's AD9624 and DA9624 offer precise reproduction, flexible I/O, and multiple digital formats.

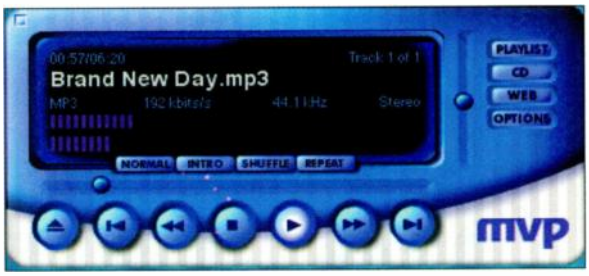
Overall EM Rating (1 through 5): 5

QDESIGN

MVP 1.0 (Mac/Win)

By Roger Maycock

As big as the MP3 phenomenon has become, you would think that cross-platform tools would now be common. However, most MP3 encoding and playback tools run on either the Mac OS or Windows, but not both. Fortunately, the audio-compression experts at QDesign have stepped in with *MVP* ($19.95), an inexpensive Mac and Windows utility for creating, playing, and managing MP3 and other digital content.



QDesign's *MVP* gives Mac and Windows users alike a common application for ripping and encoding MP3 files. *MVP* can play back any digital media file format supported by QuickTime 4.

The software supports variable bit-rate playback, rips and encodes in a single pass (with up to 60:1 compression when using the QDesign Music Codec), supports custom playlists, offers customizable playback meters, and provides links to various music-related sites. Thanks to its use of Apple's QuickTime 4, *MVP* can play back at least 20 types of digital media files, including AIFF, WAV, CD Audio, MIDI, AVI, and QuickTime Movies. Conversion between audio formats is promised for a future update.

Playback is smooth and uninterrupted through most common computer operations. Unfortunately, *MVP* has no EQ, leaving you at the timbral mercy of your playback system. Similarly, the software does not support loading files into portable playback devices such as the Diamond Rio MP3 player.

Getting Started

MVP is available for download from QDesign's Web site. A simple installation gives

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QUICK PICKS

you access to all of *MVP*'s features. However, the encoder times out after 30 days, at which point you can upgrade to the unlimited version of the program for $19.95.

Minimum system requirements are modest: for Mac users, a Power PC 601/100 MHz running Mac OS 7.5.3 will do the job, while PC users need at least a Pentium 100 or better running Windows 95/98/NT. (I used an iMac G3/333 MHz with Mac OS 8.6.) You also need a CD-ROM drive, an Internet connection, and QuickTime 4.

Getting Ripped

Upon launching *MVP*, I was greeted with a stylish, blueberry-and-white-striped main window accompanied by CD player–like transport and eject buttons. At the base of the display are four additional controls for normal playback, Intro (10-second playback), Shuffle (random), and repeat playback. On the far right of the main screen are four additional function keys: Playlist, CD, Web, and Options.

The buttons function exactly as one would expect, with one exception. With an individual file loaded, the Go to Start and Go to End buttons access the beginning and end of the file, but with a playlist of songs loaded, these two buttons take you to the previous or next song, not to the start or end of the list.

MVP's default configuration launches your dial-up connection and automatically logs into the CD Database (www.cddb.com). Because every CD has a unique ID code, the program can obtain titles, track length, and so on by querying the database. This is fine if you plan on ripping and encoding some music, but it's annoying if you simply want to play existing files. Fortunately, you can turn off automatic dialing so that the program only connects to the Internet when you want it to.

Latest and Greatest

Shortly after I completed my research, QDesign released *MVP* 1.1. One interesting improvement in the update is support for Streamlink files. These tiny (as small as 1 KB) files provide a direct link to streamed online content, such as a piece of music or a Web radio station. To promote your latest masterpiece, you can create a Streamlink file that links to your sound or video file, then e-mail the Streamlink file to your fans. They can enjoy your music simply by double-clicking on the file. *MVP* users can also save the Streamlink file to an *MVP* playlist, creating a way to access favorite videos and music regardless of whether the content is stored locally or online.

In addition to on-demand streaming, the new version of *MVP* has more versatile MP3 encoding—including speed and quality parameters—and displays ID3 tags, which are used to display album artwork and artist information. Finally, the upgrade allows you to format and submit music to the Artist Uplink section of IUMA (Internet Underground Music Archive; www.iuma.com), the self-styled "granddaddy of all music Web sites."

Most Valuable Player?

QDesign's *MVP* has an intuitive interface and encodes to MP3 very well. Creating playlists is a breeze, and you can work on other projects without interrupting playback. Tech support is handled via e-mail, and my several inquiries were answered promptly.

My only real gripe is the lack of EQ. Most similar programs provide this, and *MVP* should as well. QDesign promises that a future upgrade will support portable playback devices, but its current absence is a minor issue because portable players are bundled with software.

MVP is a solid utility. Not only does it get the job done well, it gets the job done using the latest technology and with the same interface for Mac and Windows. By adding Streamlinks in version 1.1, QDesign has clearly shown that it intends to continue making cyberspace better for musicians.

Overall EM Rating (1 through 5): 4

MEDIAFORM

CD5900

By Erik Hawkins

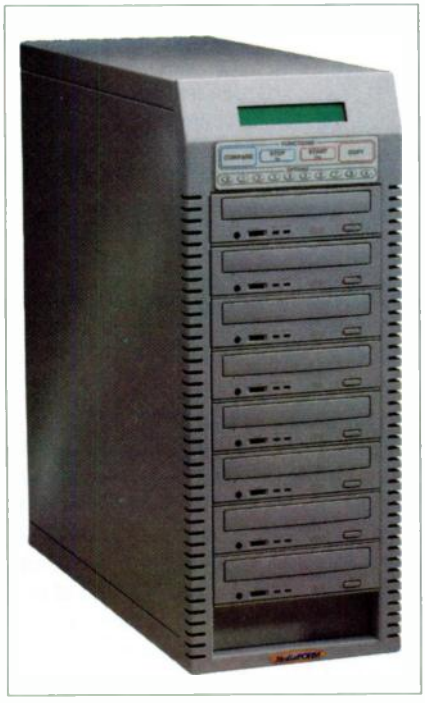
MediaForm's CD5900 ($6,795) can burn up to eight CD-Rs at a time, using 8× write-speed burners and a 4.5 GB internal hard drive. This stand-alone unit can fulfill all your CD-R manufacturing desires at blazing speeds, without a computer. The unit I received for review also had the Easi-DAT and Easi-Audio options installed ($995 and $425, respectively). Easi-DAT provides AES/EBU (XLR) and S/PDIF (optical and RCA) for DAT to CD-R transfers. The standard CD5900 has RCA jacks available for stereo monitoring. Easi-Audio has a stereo minijack for input and RCA jacks for monitoring.

You can connect an Iomega Jaz drive via the SCSI connection on the back of the

unit, allowing you to copy a Jaz cartridge formatted for DOS or Windows to CD-R. Although the Mac format is not supported, Macs read can Windows-formatted cartridges, so just stick with this format for both platforms.

Burn, Baby, Burn

All controls are located on the unit's face. Four large buttons show the main commands: Compare, Stop, Start, and Copy. Below them, ten much-smaller numeric keys (0 through 9) let you access different pages and modes. A 2-line, backlit LCD shows modes, play time, and percentage of the job completed. Menu hierarchies can



The CD5900 from MediaForm can burn up to eight identical CD-Rs simultaneously at a blazingly fast 8x write speed.

get confusing with such a spartan control surface, but I eventually learned how to get around on the unit.

Straight CD-to-CD duplication is a piece of cake. Pop a master CD in the top drive, load up to seven CD-Rs in the other drives, scroll through a couple of pages to reach the correct mode, and hit Start. A 650 MB CD burns in a lightning-fast 8.5 minutes. Before you can burn DAT or analog material to CD-R, you must first transfer it to the internal hard drive, which can store up to four CDs' worth of information. The CD5900's fast-forward and rewind functions let you preview the audio on disk.

The Easi-DAT option is perfect for

ADVERTISER INDEX

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mari_stancati@intertec.com

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julie_clark@intertec.com

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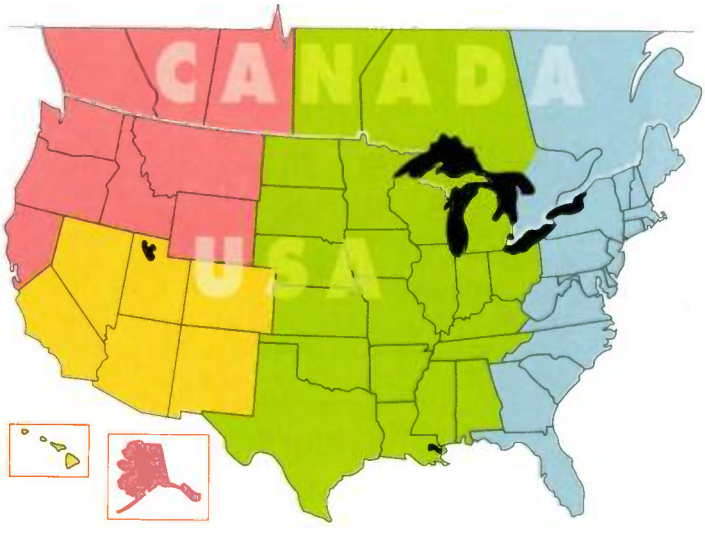

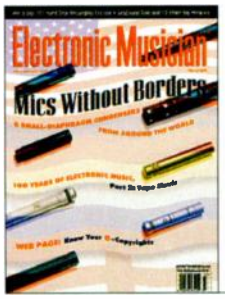

CONTACT SHEET

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

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Earthworks tel. (603) 654-6427; fax (603) 654-6107; e-mail earthwks@jlc.net; Web www.earthwks.com

Elation/The Sound Room (distributor) tel. (877) 425-0220 or (860) 228-8098; fax (860) 228-2837; e-mail sales@sound-room.com; Web www.sound-room.com

GT Electronics (a division of Alesis Corporation) tel. (800) 525-3747 or (310) 255-3400; fax (310) 255-3401; e-mail info@alesis.com; Web www.alesis.com

Hebden Sound/Fortress-Novo (distributor) tel. (415) 665-6680; fax (415) 566-0510; e-mail fortress@ricochet.net; Web www.fortress-group.com

MBHO/MTC (Music Trade Center) (distributor) tel. (718) 963-2777; fax (718) 302-4890; e-mail info@mbho.de; Web www.mbho.de

Microtech Gefell/G Prime, Ltd. (distributor) tel. (800) 322-4414 or (212) 765-3415; fax (212) 581-8938; Web www.microtechgefell.com

Oktava/A & F McKay (licensed worldwide distributor) tel. 44-1483-208-511; fax 44-1483-208-538; e-mail fmckay@ibm.net; Web www.afmckay.demon.co.uk

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Infitech tel. (408) 436-2822; fax (408) 436-0399; Web www.infi-tech.com

Middle Atlantic Products tel. (973) 839-1011; fax (973) 839-1976; Web www.middleatlantic.com

Wave Digital tel. (877) 653-0709; fax (651) 653-0048; e-mail info@wavedigital.com; Web www.wavedigital.com

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Acoustical Solutions tel. (800) 782-5742 or (804) 346-8350; fax (804) 346-8808; e-mail info@acousticalsolutions.com; Web www.acousticalsolutions.com

Crown International tel. (800) 342-6939 or (219) 294-8200; fax (800) 294-4094; Web www.crownintl.com

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Akai Musical Instrument Corporation tel. (800) 433-5627 or (817) 831-9203; fax (817) 222-1490; e-mail akaiusa@ix.netcom.com; Web www.akai.com/akaipro

BitHeadz tel. (831) 465-9898; fax (831) 465-9899; e-mail info@bitheadz.com; Web www.bitheadz.com

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Roland Corporation U.S. tel. (323) 890-3700; fax (323) 890-3701; Web www.rolandus.com

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Adaptec tel. (800) 442-7274 or (408) 957-7274; fax (408) 957-7295; e-mail salesbtc@btc.adaptec.com; Web cdr.adaptec.com

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CM Automation tel. (888) LUV-MIDI or (818) 709-4732; fax (818) 709-4039; e-mail pmontes@cmautomation.com; Web www.cmautomation.com

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MICROPHONES & PREAMPS

SHURE

KSM-32SL Cardioid Condenser Mic

The reviews are raving about Shure's new "classic" microphone. The KSM32 features Class A, transformerless preamplifier circuitry, low self-noise and increased dynamic range, all necessary for critical studio recording. It has a 15 dB attenuation switch for handling high SPLs, making it suitable for a variety of sound sources including vocals, acoustic instruments, ensembles and overhead miking of drums and percussion. For studios, the **KSM32/SL** has a light champagne finish and includes an aluminum carrying case, shock and swivel mounts and a velvet pouch. For live applications, the **KSM32/CG** has a charcoal grey finish and includes a swivel mount and padded zipper bag.

- **Frequency response 20Hz - 20kHz**

JOE MEEK

TRAKPAK TP-47

JM-47 MIC/ VC-3 MIC PRE KIT

The new Joemeek TP47 TrakPak is an ideal front end to go between you and your digital multitrack. It includes the VC3 mic-pre compressor, and enhancer, and the new Joemeek JM-47 "Meekrophone" (microphone). This all in one system is all you need to get the warm and punchy vintage sounds of the 60's on to your digital recordings.

JM-47 MEEKROPHONE FEATURES-

- 1" Gold 6 micron hand assembled true condenser capsule
- FET pre amplifier with transformer output
- Low noise, minimalist electronics
- 10dB Pad, switchable
- High pass 100Hz filter
- Quality shockmount
- Classic and full bodied sound
- Frequency response, substantially flat 20Hz to 20KHz
- Output impedance, 200ohms balanced, earth free floating
- Power supply, 48V phantom

VC-3 FEATURES-

- Superlative Mic input with ultra low noise and vast headroom
- Input gain control with 60dB range on mic and 30dB range on line
- Phantom power (switched on/off) with LED indicator
- Compression attack speed switch high/low
- Compression depth control with LED indicator
- Compression release speed control
- Compression in/out switch
- Enhancer drive control with LED indicator
- Enhancer depth control
- Enhancer resonance control (Q)
- An accurate peak reading meter
- Output volume control
- XLR type microphone input standard jack line input
- Standard jack Insert point after the mic amp and pre compressor
- Standard jack additional mic input port pre compressor
- Dual line level outputs
- Compact half of 1U size

ALSO INCLUDES-

- Heavy duty road case • 5m Meekrophone cable

ART

APPLIED RESEARCH AND TECHNOLOGY

Pro Channel

Tube Mic Pre/ Compressor/ EQ

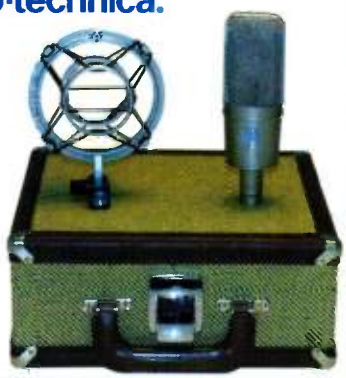
The Art Pro Channel is an all-in-one mic/line channel strip featuring a tube mic preamp, compressor and four band parametric EQ. The compression section utilizes the coveted variable mu design found in vintage broadcast limiters that is distinctively fat sounding with a fast aggressive attack. Like all other ART products, the Pro Channel is also affordable. Ideal for professional recording channels for professional recording, project and home studios as a DI box for Instruments, as a front end for Digital Audio Workstations & Computer-based Recording as well as Voice-Over, Broadcast, and Edit Suites.

- Professional Tube-Based Microphone/Line Recording Channel featuring a tube mic pre, switchable optical/ variable mu compressor, and tube
- Dynamic Range >100dB (20-20KHz)
- Frequency Response 10Hz to 20KHz (± .5dB)
- Low-Cut Filter Variable; -3dB@10Hz to 250Hz
- XLR balanced & 1/4" unbalanced Inputs and Outputs
- 1/4" unbalanced Insert Connections Between Preamp and Compressor, and Compressor and EQ
- Phantom Power +48v DC (switchable)
- Three Hand-Selected Vacuum Tubes
- Optical/ variable mu Tube based compressor with, variable threshold, compression ratio, attack and release controls • Four-band parametric equalizer with selectable Q for the two sweepable mid-bands
- Selectable VU Metering (mic pre out, compressor out, or Main Out)
- Five-Year Warranty

audio-technica.

AT4047SV

Cardioid Condenser Mic



The AT4047 is the latest 40 Series large diaphragm condenser mic from Audio Technica. It has the low self noise, wide dynamic range and high sound pressure level capacity demanded by recording studios and sound reinforcement professionals.

- Side address cardioid condenser microphone for professional recording and critical applications in broadcast and live sound
- Low self noise, wide dynamic range and high SPL
- Switchable 80Hz Hi Pass Filter and 10dB pad
- **Includes** AT8449/SV shockmount
- **Also Includes a limited edition tweed flight case while supplies last!**

GT

AM-52 Class A FET

The GT Electronics AM52 uses a super-clean Class A FET circuit. It amazingly sensitive large diaphragm is capable of handling extremely high sound pressure levels and offers a choice of three polar patterns, for unsurpassed versatility. A perfect choice for virtually any recording application ...from vocals to acoustic and amplified instruments.

- Class A FET preamp for extremely transparent, low-noise performance
- Cardioid, Omni and Figure 8 polar patterns
- Large-diameter, super-thin 3 micron gold evaporated Mylar diaphragm
- Switchable -10dB attenuation pad and 80Hz low frequency roll-off filter
- High SPL handling for very loud sources
- Includes hard-shell case and hard mount
- **Frequency response 20Hz - 20kHz**

AM-61 TUBE

The GT Electronics AM61 offers classic tube performance in a fixed cardioid, large diaphragm condenser mic. An outstanding addition to any project studio or large commercial recording facility seeking rich, warm tube sounds and unsurpassed value.

- Groove Tubes military-spec GT5840M vacuum tube preamplifier
- Large-diameter, super-thin 3 micron gold evaporated Mylar diaphragm
- Fixed cardioid polar pattern response
- Switchable -10dB attenuation pad and 80Hz low frequency roll-off filter
- Includes hard-shell case, shock mount, hard mount, 6-pin cable and external power supply
- **Frequency response 20Hz - 20kHz**

- **ALSO AVAILABLE** AM-51 cardioid class A FET condenser mic
- **ALSO AVAILABLE** AM-62 multipattern tube condenser mic

AKG

C4000B

Electret Condenser Mic

This new mic from AKG is a multi polar pattern condenser microphone using a unique electret dual large diaphragm transducer. It is based on the AKG SolidTube design, except that the tube has been replaced by a transistorized impedance converter/ preamp. The transformerless output stage offers the C4000B exceptional low frequency response.

FEATURES-

- Electret Dual Large Diaphragm Transducer (1st of its kind)
- Cardioid, hypercardioid & omnidirectional polar patterns
- High Sensitivity
- Extremely low self-noise
- Bass cut filter & Pad switches
- Requires 12, 24 or 48 V phantom power
- Includes H-100 shockmount and wind/pop screen
- **Frequency response 20Hz to 20kHz**

STUDIO MONITORS

Hafler

TRM-6

Bi-Amplified Studio Monitors

Offering honest, consistent sound from top to bottom., the TRM-6 bi-amplified studio monitors are the ideal reference monitors for any recording environment whether tracking, mixing and mastering. Supported by Hafler's legendary amplifier technology providing a more accurate sound field, in width, height and also depth.

FEATURES-

- 33 Watt HF & 50 Watt LF amplification
- 1" soft dome tweeter &6.5" polypropylene woofer
- 45Hz - 21kHz Response
- Magnetically Shielded
- Electronically and Acoustically Matched

KRK

V-6

Bi-Amplified Studio Monitors

These bi-amped studio monitors from KRK supply 90 watts of clean power. Their 6" woofer & 1" silk dome tweeter ensure consistency from top to bottom with crystal clear highs and a solid bass response.

FEATURES-

- 53Hz - 20kHz frequency response
- 1" silk dome tweeter and 6" long stroke, polyvinyl woofer • Magnetically shielded
- 30 Watt HF & 60 Watt LF amplification
- Variable system gain +6dB -30dB
- Neutrik XLR - 1/4" TRS combo connector

MACKIE.

HR824

Bi-Amplified Studio Monitors

These close field monitors from Mackie have a wide deep response with exceptional detail. Each pair of these biamplified speakers has been clinically matched to ensure optimum performance.

FEATURES-

- 8.75" polypropylene woofer, 1" aluminum dome tweeter
- 150W HF & 100W HF amps
- Full space, half space and quarter space placement compensation • 1/4" and XLR inputs
- Hi frequency adjustment, lo fequency roll-off switch
- Frequency Response 39Hz to 22kHz, ±1.5dB

ALESIS

M1 Active

Bi-Amped Ref. Monitor

The new M1 Actives feature custom designed dual amplifiers and an internal active crossover fro accurate response. The specs are outstanding with a 1" silk dome tweeter, a 6.5" woofer and 8th order high and low pass electronic crossover filters, perfect for both project and pro recording applications.

FEATURES-

- 75 watt LF and 25 watt HF amps
- 1500Hz crossover point for low midrange coloration
- Dual front mounted ports • Magnetically shielded
- Combination XLR/1/4" connectors with input level control

VIDEO and PRO AUDIO

COMPUTER BASED DIGITAL AUDIO SYSTEMS

MOTU AUDIO Hard Disk Recording Systems

The MOTU Audio System is a PCI based hard recording solution for the Mac and PC platforms. At the heart of the system is the PCI-324 PCI card that can connect up to three audio interfaces and allows up to 72 channels of simultaneous I/O. Audio interfaces are available with a wide range of I/O configurations including multiple analog I/O with the latest 24-bit A/D/A converters and/or multi channel digital I/O such as ADAT optical and TDIF I/O as well as standard S/PDIF and AES/EBU I/O. Each interface can be purchased separately or with a PCI-324 card allowing you to build a system to suit your needs. Includes drivers for all of today's hottest audio software and AudioDesk, multitrack recording and editing software for the Mac.

THEY ALL FEATURE–

- Mac OS and Windows compatible
- Includes software drivers for compatibility with all of today's popular audio software plus AudioDesk, MOTU's sample-accurate audio workstation software for Mac OS
- Host computer determines the number of tracks that the software can record and play simultaneously, as well as the amount of real-time effects processing it can support
- Front panels display metering for all inputs and outputs
- **AudioDesk Audio Workstation Software** for Mac OS features 24-bit recording, multi-channel waveform editing, automated virtual mixing, graphic editing of ramp automation, real-time effects plug-ins with 32-bit floating point processing, crossfades, support for third-party audio plug-ins (in the MOTU Audio System and Adobe Premiere formats), background processing of file-based operations, sample-accurate editing and placement of audio, and more

2408 FEATURES–

- 7 banks of 8 channel I/O: 1 bank of analog, 3 banks of ADAT optical, 3 banks of Tascam TDIF, plus stereo S/PDIF
- Custom VLSI chip for amazing I/O capabilities
- Format conversion between ADAT and DA-88
- 24-bit internal data bus for full 24-bit recording via digital inputs
- 20-bit A/D and D/A converters on analog ins & outs
- Standard S/PDIF I/O for digital plus an additional S/PDIF I/O for the main mix
- Sample-accurate synchronization with ADATs and DA88s via an ADAT SYNC IN and RS422

1224 FEATURES–

- 24 bit analog audio interface
- State-of-the-art 24-bit A/D/A
- Simultaneously record and play back 8 channels of balanced (TRS), +4 dB audio
- Stereo AES/EBU digital I/O
- 24-bit balanced +4 XLR main outputs • Word clock in/out
- Dynamic range of 116 dB (A-weighted)
- Front panel displays six-segment metering for all inputs and outputs
- Headphone jack with volume knob

308 Features–

- 8 channels of coaxial S/PDIF using 4 RCA input and 4 RCA output connectors
- 8 channels of optical S/PDIF using 4 toslink input and 4 toslink output connectors
- 8 channels of AES/EBU using 4 XLR male and 4 XLR female connectors • Word Clock I/O allows the 308 to synchronize with digital audio environments

24i Features–

- 24 high quality, 24-bit analog inputs
- Balanced 1/4" analog outputs
- Optical and coaxial S/PDIF outputs • Word Clock I/O
- Front panel headphone output with level control
- Connect up to three 24i rack I/Os to a PCI-324 audio card for a total of 72 inputs and six outs

Also available with MOTU's award-winning Digital Performer audio sequencer software package

Lexicon CORE 2 Recording System

High quality, true 24-bit computer based audio system at an affordable price. Easy to use interface offers 4 analog inputs and 8 outs as well as coaxial S/PDIF and and 8 channels of ADAT optical digital I/O. Dedicated hardware takes on the burden of CPU intensive tasks putting less strain on the computer's processor.

FEATURES–

- Ultra wide-range 24-bit A/D and D/A converters
- Four channels of analog in, eight channels of analog out.
- Eight channels of ADAT™ digital I/O and a stereo S/PDIF pair.
- Selectable dbx Type IV™ soft-knee limiting on every input channel to simulate tape compression and provide 4dB of improved headroom.
- Ships with Lexicon Drivers and Control Panel for Win 95/98
- Includes Syntrillium's Cool EditPro SE, providing as many as 64 mixing tracks.
- An optional MP-100 daughterboard will be available soon and will include all of the effects found in the Lexicon MPX 100 Dual Channel Effects Processor: Chorus, Flange, Pitch, Detune, Delay, Echo, Rotary, Tremolo and Lexicon Reverb and Ambience

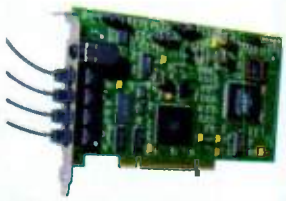
NEW LOWER PRICE

SONORUS STUDI/O 24-bit Audio Card

The Sonorus STUDI/O is a 16-channel plug-n-play digital audio card for Mac and PC. It's based around two ADAT compatible toslink connectors that support 24-bit audio at 44.1 and 48khz sample rates. The toslink connectors are software switchable between ADAT lightpipe and standard optical S/PDIF I/O. The hardware specs are enhanced further by the ease at which this card is configurable as well as its compatibility to today's leading Mac and Windows software.

FEATURES-

- Two optical inputs and outputs ("lightpipe" connectors) software selectable between ADAT(8-channel) & S/PDIF
- 18-bit 1/4" headphone/monitor output
- 16-channels, phase-locked and in sync. No ground loops, no noise
- 24 bit audio is supported- ready for the latest generation of digital audio hardware
- Software configurable so there's no jumpers to mess with
- Comes with its own Control Panel software that makes setup simple and allows you to customize & save your settings
- PCI Plug-n-Play Cross-platform compatibility
- Full Windows audio drivers for PC and Cubase VST and Logic Audio (PC & Mac) • Onboard sample rate converter



SOFTWARE

Digital Performer MIDI/AUDIO Software for Mac

Their second major update this year, with a relentless stream of new advanced features, like sample-accurate editing, sample-accurate sync and MOTU's innovative RAM-based loop recording tool called POLAR. DP is packed full of features you won't find anywhere else:

FEATURES-

- Includes over 50 real-time MIDI & audio effects plug-ins
- POLAR window - Interactive audio loop recording the way it should be
- 24-bit recording and editing
- 32-bit native effects processing - incredible sounding EQ and other FX
- 64-bit MasterWorks™ Limiter and Multiband Compressor plug-ins included
- Advanced waveform editor
- Sample-accurate - the most reliable editing and tightest sync you can get
- OMF export - transfer your entire session, crossfades and all, into Pro Tools
- Samplers window - drag & drop samples between your Mac and your Sampler
- PureDSP™ stereo pitch-shifting and time-stretching
- Unlimited audio tracks, real-time editing, full automation and remote control • QuickTime digital video support, and much more • Compatible with Pro Tools|24, the MOTU 2408 and today's other popular systems
- Digital Performer is an entire recording studio inside your computer

Vegas Multi-track Recording Software

From the company that brought you Sound Forge and Acid Pro comes Vegas Pro, the non-linear multitrack recording and editing software, for Windows. Whether you need better than CD quality 24-bit/96kHz file support for tracking your next album project or are authoring content for streaming audio on the internet, Vegas Pro's got you covered.

FEATURES–

- 24-bit/96kHz file support • Unlimited Tracks (dependent on CPU speed and RAM) • Non-destructive Editing
- Supports multiple file formats and sample rates on a single track • DirectX plug-in support with 32 Assignable FX sends • 26 Aux outputs • Unlimited Undo/Redo
- Multiple I/O support • Dual monitor support
- MIDI Timecode support
- 4-band EQ and compressor inserts on every channel
- Audio/Video Scrub
- Direct internet streaming file authoring 9Windows Media Technologies and Real Networks G2)

Unity DS-1 Digital Sampler

Turn your computer into a full featured digital sampler with the Unity DS-1 from BitHeadz. Recreate the sounds of acoustic instruments or any other audio source. All of the features of dedicated hardware samplers are here- 16 part multi-timbrality, 64 voice polyphony , a complete synth engine and the ability to create layers and splits all with full MIDI control. Compatible with Akai, SampleCell, .WAV and .AIFF and CD audio files that can all be edited using the integrated audio editor.

TC WORKS SPARK 2-Track Editing For Mac

ULTIMATE SOFTWARE MACHINES

Intuitive, easy to use 2-track editing software for the Power Macintosh. 24 and 32-bit file support is ideal for music mastering. SMPTE synchronization and quicktime movie import capabilities for editing audio for film and video. A host of compression algorithms such as QDesign make editing audio for the web a snap. Most major professional samplers are also supported and the Loop Tuner helps create perfect loops every time.

FEATURES-

- Browser View- File database, audio editor and play list all in one easy to use display with movable border lines- Eliminates the need for surfing several windows to access and edit files
- Wave Editor- Perform off-line editing, processing, and create markers and non-destructive regions
- Supports AIFF, SoundDesigner, .WAV and QuickTime file formats
- DSP Processing Includes- Normalize, Reverse, Fades, Crossfades, and Sample Rate conversion and **realtime Time Stretching**
- VST Plug-in compatible
- Supports file swapping with most major samplers and any sampler that supports SMDI
- Batch Processing
- Bundled with Adaptec's Toast Pro you can burn your audio on CD
- Extract audio from a quicktime movie for editing and then export the audio along with the video into a new file

WAVES Pro-FX Bundle Plug-ins For Mac or PC

The latest Bundle from Waves has some of the coolest sound design plug-ins available for the Mac and Windows platforms.

SuperTap- Six taps of mono or true stereo delay (up to Six seconds) • Global LFO modulation • 2 feedback modes • Q10-style filtering for each tap • rotation (stereo panning) • Delays are adjustable in milliseconds and note values • Tap out delay times or patterns using the Tap Pad.

MetaFlanger - Vintage tape-flanging, phaser-emulation, and special effects • True dual-delay flanging sounds • Wet signal include filters so you can flange or phase just part of the signal • Factory presets of vintage emulations (Mutron, MXR, Itchycoo Park) and more.

MondoMod - AM, FM, and Rotation (stereo panning) modulators • Gentle wandering guitar solo panning or bizarre destructive effects

• Single LFO drives all modulators with independent phase offsets between the modulator signals.

UltraPitch - Formant-corrected pitch shifter with 6-voices

• Excellent gender-bending

• Independent stereo panning and delay • Animator delay-randomizer. Set the pitchshift by musical intervals (with 5 cent resolution)

• Manual formant mapping as well as presets that perfectly match instrumental formant responses • Creates huge and thick stereo chorusing, doubling, parallel harmonies, excellent vocal slap/spread effects, and much more.

EM MARKETPLACE

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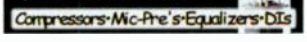

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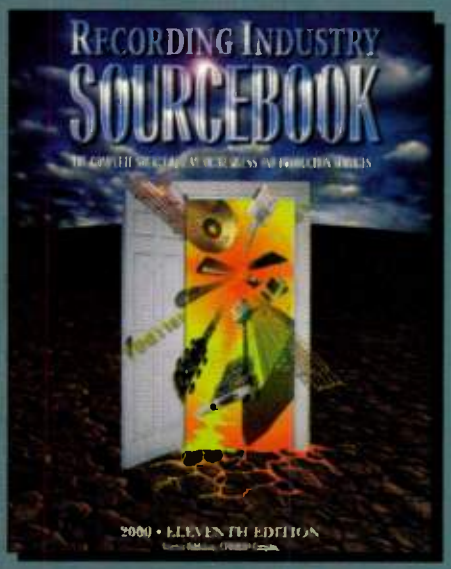

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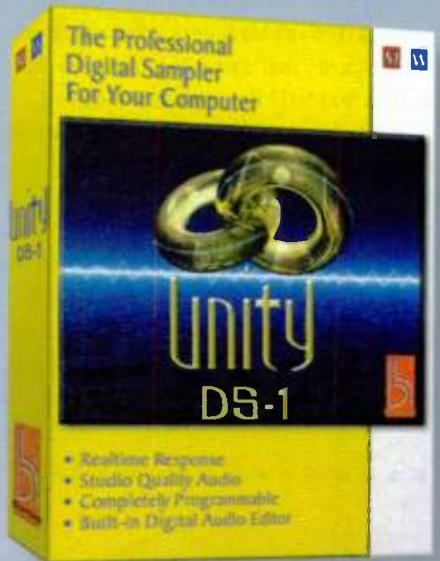

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By Larry the O

Larry Potter and the Producer's Stone

Larry's parents had never told him he was a producer, but events had always hinted at it. There was the time a seven-year-old Larry hung a single microphone to tape himself and his brother playing music together—and afterwards played back a lush, wide stereo recording. Thus, it really was not a surprise when Larry received a singing telegram (ever heard of those?) informing him—in surround, of course—that he had been accepted by the EarWigs Academy for Sonic Wizardry.

At EarWigs, Larry started to learn that there was more to producing an album or a soundtrack than sipping froufrou tropical drinks with little umbrellas in them while telling the singer, "Wow, that's really great. Maybe we should try one more for safety," or deciding whether the third tambourine overdub should come down a smidge in the mix.

Fortunately, Larry was learning from the best: Professor HiPass Rumblefloor. Professor Rumblefloor instructed Larry in the myriad aspects that, along with creativity, mark a professional production: planning, logistics, and budgeting. Some lessons were hard to learn, such as the rough fact that sometimes you have to just crank things out, declare them done, and move on. Other things seemed to come easily, like picking the take with the most impact and putting artists at ease when they were uncertain whether it sounded good when, in actuality, it sounded great.

One day, after conjuring a weak Telecaster rhythm track into a swirling, shining guitar hook, Larry said to Professor Rumblefloor, "Now I understand all the things you've been teaching me. Is this what they did to make *Sergeant Pepper's* or *Dark Side of the Moon?*"

Rumblefloor chuckled deeply and infinitely wisely, then replied, "Well, yes, but they had a little more than that working for them." "Oh?" queried Larry. "What do you mean? What else did they have?" "I guess you're old enough now for me to tell you about the Producer's Stone." A chill ran up and down Larry's guitar neck as he squeaked, "The Producer's Stone? What is that?"

Rumblefloor sighed long and hard, but infinitely wisely, and explained, "Many people produce a couple of projects and call themselves producers. Some of them are, and all of them can claim to have produced something, regardless of how well or badly it turned out." He finished this last sentence in a melancholy, yet somehow infinitely patronizing, tone.

"There are so many different jobs that a producer may be called upon to do that no one could hope to learn them all. In spite of that, magnificent albums have been produced that far exceed the capabilities of the equipment and, sometimes, of the people that made them! This is the work of the Producer's Stone. It cannot bring you things you don't already have, but it will enable you to turn your inspiration into a gold album, even if your tracks are less than perfect. The Stone also grants you the Equalizer of Life, which allows you to maintain your focus and keep an ongoing perspective on the job at hand when technical or personal demons are crawling out of the woodwork to distract you. Yes, the Producer's Stone is great and powerful—in the right hands."

"And in the wrong hands?" Larry whispered, a shudder passing through his faders. "Remember all those small-label albums that came in a big wave six months after ADATs first hit?" the professor inquired.

Larry's head swam nauseatingly, yet infinitely wisely, at the idea. "So where is the Producer's Stone now?" he asked. Rumblefloor looked at Larry for a long time before saying anything. Finally, he reached one of his long, craggy fingers to his forehead and started slowly scratching. Without taking his eyes from Larry's, the powerful professor began to murmur an incantation: "Did Froom send it back that last time? Or does Dan Lanois have it again? Darn, I hate it when this happens!" ●

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The Pro Tools|24 Mix Plus 2-card system thunders across the audio production tools landscape like a rampaging diplodocus. With Pro Tools|24 Mix Plus you can pretty much do everything and anything right there at your workstation—compose, record, edit, mix the entire album or soundtrack without the need for extra DSP cards or an expansion chassis. Push your digital workstation into uncharted territory with Pro Tools|24 Mix Plus! ~~$7995~~

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CIRCLE #019 ON PRODUCT INFO CARD

Introducing the MOTU 1296

MOTU 1296

- 12 channels
- 96 kHz
- 117 dB S/N
- +4 balanced XLRs
- AES/EBU with Sample Rate Conversion
- Expandable to 36 channels

The new high-end audio workstation.

- The MOTU 1296 — a 24-bit / 96 kHz audio workstation for Macintosh or Windows, available as a core system and expansion I/O.
- Impeccable analog I/O — 12 independent inputs and outputs on +4 balanced XLRs.
- Stunning sound — 24-bit / 96 kHz converters with 117 dB dynamic range (A-weighted @ 48 kHz); extremely low-jitter crystal.
- Advanced design — isolated analog circuit & R/CORE transformers.
- Flexible AES/EBU digital I/O — sample rate converters on input and output, with independent crystal and word clock input.
- Ideal for surround mixing and recording — supports two 5.1 surround mixes in and out simultaneously.
- Expandable — connect up to three 1296 interfaces to a single computer for 36 channels of 96K input and output.
- Compatible with your favorite audio software — includes standard ASIO 2.0 and Wave drivers for Macintosh and Windows.
- Upgrade your current MOTU system — just plug it in to add 96K recording to your 2408, 1224 or any other MOTU system.

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