MAJOR-LEAGUE TECHNIQUES FOR RECORDING LATIN PERCUSSION

Electronic Musician®

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October 2002

FIELD OF DREAMS

Choosing a hard-disk recorder that will go the distance

COLLABORATING OVER THE INTERNET

Do pro audio schools deliver in the clutch?

THE STARTING NINE:

Tascam DM-24,
Cakewalk Sonar XL 2.0,
Behringer DDX3216,
E-mu Proteus 2500,
Røde NT4/NT5, and more
hard-hitting reviews

A PRIMEDIA Publication

$6.99US $8.99CAN

World Radio History

14 complicated reasons (and 2 simple ones)

WHY THE 1604-VLZ® PRO MIXER

can make your creative product sound better.

Year in and year out, more professionals use Mackie VLZ® PRO mixers than any other brand. For TV and film soundtracks, ads and bumpers, for song demos, for video post and for submixing into larger consoles.

While this ad features our "industry standard" 1604-VLZ® PRO, you'll find many of the same innovations on our three other models, right down to the diminutive 1202-VLZ® PRO.

If you're serious about your creative product, you owe yourself the low noise, high headroom and sweet musical sound we've designed into all four VLZ® PRO compact mixer models.

1 16 XDR™ mic preamps get the most from any microphone. Meticulously designed to achieve the same fine definition and pristine specifications as $2000-per-channel outboard mic preamps, XDR™ provides 130dB dynamic range to handle hot digital inputs, ruler-flat response (down just 3dB at 192kHz!) and 0.0007% THD. Our exclusive design also has the best RF rejection of any compact mixer mic preamps.

2 Warm, musical equalization. 12kHz and 80Hz shelving EQ plus swept mid with gentle 2-octave peak. The 1604-VLZ® PRO's "midrange" actually sweeps from 3kHz all the way down to 80Hz, so you can realistically use it as a second mid-bass LF equalizer, too.

3 VLZ® circuitry for ultra-low noise. 1604-VLZ® PRO owners tell us it's by far the quietest mixer they've ever used. With all 16 channels wide open, they "can't even tell it's on." Judicious application of Very Low Impedance circuitry dramatically reduces thermal noise at critical signal path points as do new, advanced 2068 op-amps.

1202-VLZ® PRO

12 total channels • 4 XDR™ premium mic preamps • 4 mono line level chs. • 4 stereo line level chs. • Extra ALT 3-4 stereo bus • 3-band equalization • 75Hz low cut filters on mono chs. • 2 aux sends per ch. • 2 master stereo aux returns with EFX to Monitor • Control Room/Phones source matrix • Rotary gain controls • Built-in power supply

1402-VLZ® PRO

14 total channels • 6 XDR™ premium mic preamps • 6 mono line level chs. • 4 stereo line level chs. • Extra ALT 3-4 stereo bus • 3-band equalization • 75Hz low cut filters on mono chs. • 2 aux sends per ch. • 2 master stereo aux returns with EFX to Monitor • Control Room/Phones source matrix • 60mm log-taper faders • Switchable AFL/PFL

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World Radio History

4 Easy level setting. Just press a channel strip PFL Solo button and adjust the Trim Control to minimize noise and optimize headroom.

5 Constant Loudness Pan pots maintain uniform sound level when you pan hard right or left.

6 6 aux sends per channel, each with 15dB gain above Unity for cranking effects and running outboard gear at optimal output levels.

7 Sharp 18dB/oct. 75Hz Low Cut filters minimize room rumble, truck noise, mic stand thunks and P-pops without losing audible bass.

3 Flexible stereo aux return routing. Aux Returns 1 & 2 can be folded back into Aux Sends 1 & 2 (so musicians can hear EFX in their headphones); Aux Return 3 can be sent to the main mix or either Sub Bus 1-2 or Sub Bus 3-4; Aux Return 4 can sent to Ctl Rm/Phones only.

Simple reason ❶: It's built like a tank. Solid steel main chassis. Thick mil-spec fiberglass circuit boards. Sealed rotary controls. Real metal jacks. Buy a 1604-VLZ® PRO now. Leave it to your kids in 20 years.

Simple reason ❷: It just plain sounds better. Don't believe us? Ask one of the thousands of satisfied owners. Or better yet, demo a VLZ® PRO series compact mixer at a Mackie dealer today.

9 Separate Aux Returns Solo button.

10 Control Room/Phones Source Matrix lets you route any combination of Tape, Subs 1-2, Subs 3-4 or Main Mix to headphones or control room monitors.

11 Separate Tape input gain control and Tape To Main Mix switch so you don't have to tie up a channel strip adding CD EFX or click tracks.

12 RUDE Solo light flashes brightly any time a channel is soloed. Doesn't sound like a biggie until you're sleep-deprived at 3 a.m. and can't figure out why no sound is coming out of the @%&$#! mixer.

13 4-bus design with L/R assigns on each bus and bus assigns on each channel strip.

14 60mm log-taper faders provide linear level change throughout their length of travel. You can do precise fade-outs all the way down to ∞ instead of losing the sound at about -20dB. Compare to our competition and hear the difference.

1642-VLZ® PRO

16 total chs.• 4-bus w/double-bussed outputs • 10 XDR™ premium mic preamps • 8 mono line level channels • 2 hybrid mono mic/stereo line-level channels • 2 mono/ stereo line level chs.• 3-band EQ w/swept mid on mono channels, 4-band on stereo channels • 75Hz low cut filters on mono chs. • 4 aux sends per ch. • 4 stereo aux returns with EFX to Monitor • Control Room/ Phones source matrix • 60mm log-taper faders

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I N S I

FEATURES

38 MAKING THE GRADE

Hundreds of educational programs claim to prepare you for a career in pro audio; they range from brief weekend courses to four-year university degrees and beyond. The educational philosophies of these schools differ, and it's hard to be sure which school is right for you. We'll cut through the hype and tell you what to look for in an audio program and how to figure out whether a school is likely to deliver the goods as promised.

By Daniel Keller

50 COVER STORY: FIELD OF DREAMS

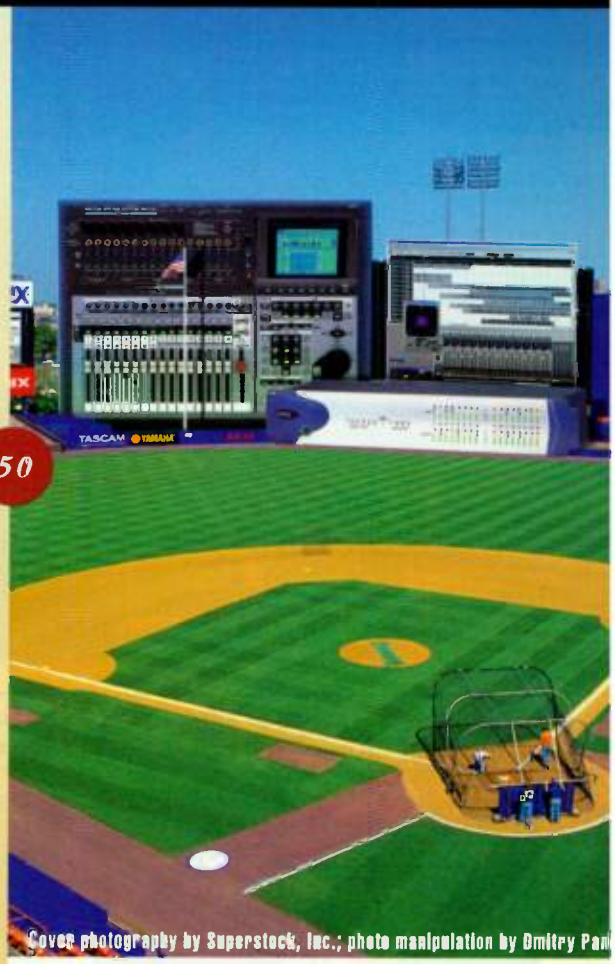
A hard-disk recording system can be a computer-based digital audio workstation, a modular hard-disk recorder, a portable digital studio, or a combination thereof. Which tools are best for your studio? We break down the different types of systems, evaluate their strengths and weaknesses, and help you through this important and sometimes difficult decision-making process.

By Gino Robair

72 BANDS WITHOUT BORDERS

Thanks to the Internet, songwriters, arrangers, and composers of all kinds can collaborate on musical projects, even when the players are scattered around the globe. Here's how desktop musicians from all corners of the world can join forces.

By Gary S. Hall



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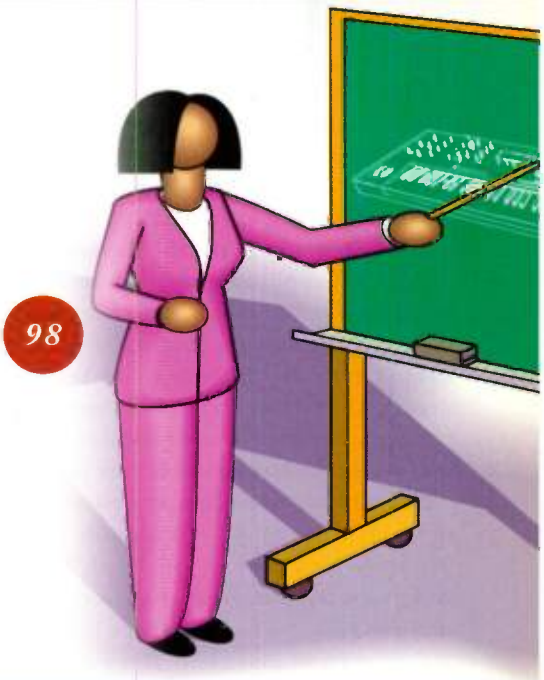

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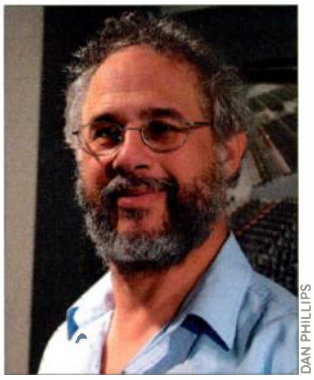
Take Me out to the Ball Game!


DAN PHILLIPS

I am an ardent sports fan, and I especially love professional baseball and basketball. I'm a dedicated San Francisco Giants fan and have attended major- and minor-league games all over the country. As for basketball, I am a die-hard Golden State Warriors fan—crazy, I suppose, but at least it shows dedication to the sport.

Team sports incorporate important values that are directly applicable to music making: teamwork balanced with individual achievement, physical conditioning, clean competition, fair play, courtesy, a striving spirit, and grace in losing. Yes, yes, I know pro sports are a big business and that many athletes don't even come close to those ideals. Most musicians don't reach them, either, but the ideals are worth cherishing, and in striving for them, success is possible on and off the field (or on the stage and in the studio).

Like athletes, musicians are well advised to learn their craft as well as follow their muse. Practice might not actually make perfect, but good practice habits will get you a lot closer to your goal. Top athletes and musicians know that good technique, self-discipline, good work habits, situational awareness, and proper conditioning make a big difference in their ability to reach their potential.

Athletes and musicians also want to live their dream. Amateurs and minor-leaguers play hard, aspiring to the big leagues. Meanwhile, they ride old buses between small cities and towns, patiently building their skills. Most will never make it, but that doesn't stop dedicated players or musicians from giving it their best shot.

Those who do succeed generally have paid their dues along the way. Success for baseball players and musicians can be defined in many ways: Some will never be big stars but are ace role players who know their tools and their craft, are solid on fundamentals, play consistently well, maintain a winning attitude, and understand teamwork. Some players are true superstars, but most won't lead the league in anything except games played for a winning team. Most successful managers, bandleaders, and producers employ several of these players along with the big stars.

Part of mastering your tools is choosing the appropriate tools to begin with. Sure, Barry Bonds can hit the ball 450 feet with his bat, but he's an incredibly powerful man; maybe you need a lighter bat. Just because Bob Clearmountain or Elliot Scheiner prefers a particular hard-disk recorder doesn't mean that's the one you should buy. The fact that these champions use those tools certainly is a sign of quality, but their tools might not suit your style.

Choosing the right tools for the job entails knowing yourself. In this issue's cover story, "Field of Dreams," Associate Editor Gino Robair helps you get to know yourself better by providing you with a set of questions to answer before deciding which type of hard-disk recorder to buy. He then breaks down the three major types of hard-disk recorder and shows you how your answers to these questions help answer the question of which HDR is right for you. Just remember that the winner might be the big-name star, but it also might be the solid role player who never throws tantrums and consistently delivers in a pinch.

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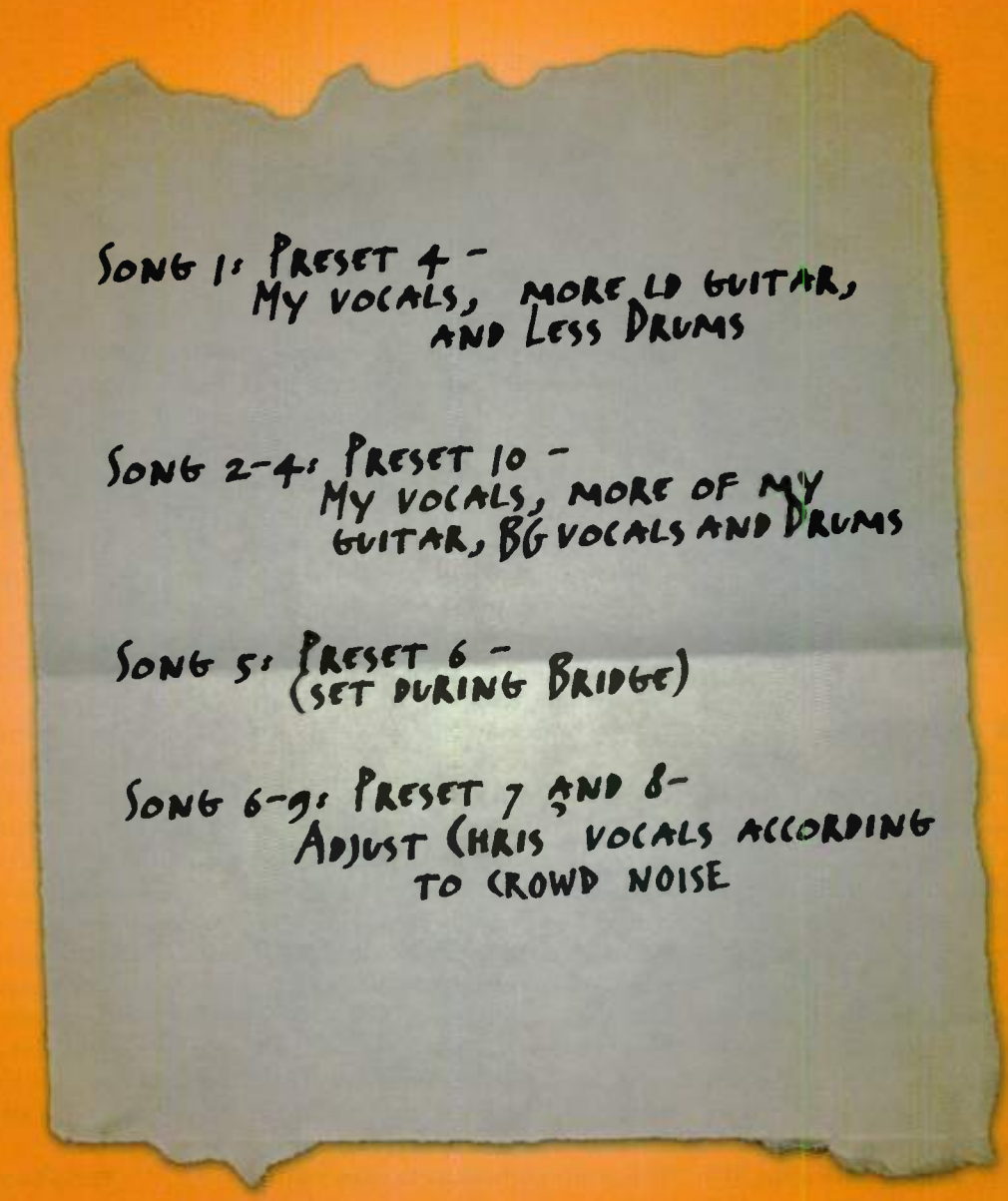

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A-16T Transmitter
(Not Shown)
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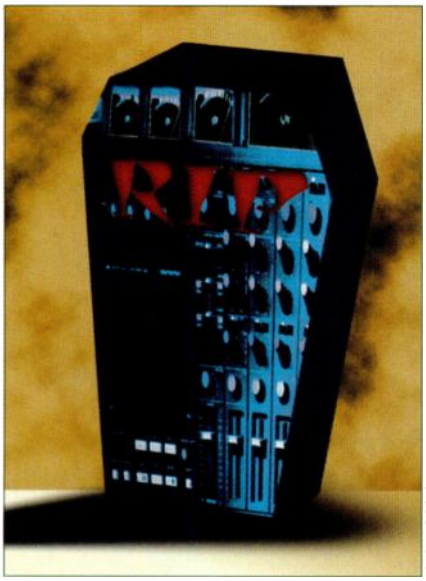

MAE LAROBIS

DOLLARS AND SENSE

There seems to be some sort of warped sense of value in the world of the arts. I have a few friends that paint, mainly wildlife and landscapes. They do excellent work and I wouldn't begrudge them any money they can make from their work.

However, their expenses for art supplies are low when compared with what it cost me to equip my personal studio. They each work for a week or so on a painting in their spare time, make prints, and sell them for $60 apiece. I spend a year of spare time writing, performing, recording, and producing a CD. I'm lucky to receive $10 apiece for them. Many of my friends, including the painters, seem to think that I should give them my CDs for free. All of my fellow musician friends have the same problem, so I don't believe it's a reflection on the quality of my work. It appears to me that the general public loves music but puts little monetary value on it. Somehow we need to convince the public that our time, talent, creativity, and hard work are worth something, and that we deserve to be compensated monetarily.

Dan Nestor
Woodbury, MN

CATCH SOME WAVS

I found the July 2002 cover story, "Build a Personal Studio on Any Budget," to be very entertaining and informative. However, I found an error.

In the segment about building a Windows-based studio for $5,000, Dennis Miller chooses Tascam's GigaStudio 32 as his sampler. He reasons that it will work nicely with the system that he planned. The flaw is that GigaStudio 32 is really nothing more than a $100 'demo' version of the program. It appears from Tascam's advertisements that GigaStudio 32 is merely a version with a much lower voice count. But GigaStudio 32 omits an essential feature: the ability to capture its output into a WAV file. This is no trivial feature. It makes it impossible to use GigaStudio 32 without a second PC and digital audio interface. I discovered this when I upgraded GigaSamplerLE to GigaStudio 32. I was suspicious, so before upgrading, I contacted Tascam's tech support by e-mail and was told that GigaStudio 32 did indeed capture its output. Had I known that it wouldn't do so, I would have chosen to stay with GigaSamplerLE.

I think any individuals on a small budget who are considering going with GigaStudio 32 instead of GigaStudio 96 will be disappointed when they realize that they can't record its output. The Record button in GigaStudio 32's display tersely informs you that this version of the program has no Capture-to-WAV utility. I expected much more from a fine company like Tascam than the deceptions and game playing employed by so many little shareware outfits. I suggest that **EM** readers avoid this 'demo' version.

Philip Chance
via e-mail

Philip—I spoke with Tascam about your concerns and was assured that the original specification for GigaStudio 32 included the all-important capture-to-disk feature,

MEET THE "DREAM STUDIO GIVEAWAY" WINNER

Stephen Simmons (pictured here) of Antioch, Tennessee, was the lucky winner of the NAMM Summer Session's Dream Studio Giveaway sweepstakes, cosponsored by **EM**, *Mix*, *Remix*, and the National Association of Music Merchants (NAMM). Simmons's name was drawn on July 21 for prize gear valued at $21,129; the gear was from NAMM exhibitors ADK, Akai, AKG, ArtistPro, Behringer, Crown, dbx, Electro-Voice/Telex, Eventide, Fostex, Hosa, JBL, Line 6, Marshall Electronics, Martin Guitar, Music Industries Corp., Peavey, Peterson, Roland, Rolls, Shure, Tascam, TC Electronic, Technics, Ultimate Support Systems, and Yamaha. Thanks to all who entered their names in the sweepstakes and to all participating sponsors.

World Radio History

Karl Steinberg, Chief Technical Officer, Steinberg Media Technologies AG

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and that the feature had been disabled inadvertently during production. They also assured me that it would be reenabled soon, and that all owners of the program would be entitled to a free upgrade.—Dennis Miller

WHAT ABOUT THAT GUY?

Regarding Barry Cleveland's review of the Shure KSM27 microphone (July 2002): is it just me, or did a good portion of the "Skins and Winds" section seem like a plug for the toys created by the Artist General, aka the guy in the Navy outfit? For a moment, I thought I was reading different article.

As interesting as the Lakota Slide instrument might be to the author, it doesn't help the reader to learn that the KSM27 could accurately pick up the nuances of a bizarre instrument to which few people can relate.

I don't know. Maybe Mr. Cleveland owed the Artist General a favor or something. Otherwise, it was a fine article and an informative review.

Joe Fry
via e-mail

Author Barry Cleveland replies: Joe—Thanks for taking the time to share your concerns.

When evaluating a microphone I attempt to use it on as wide a variety of sources as possible, which are limited by who happens to be working in my studio during the evaluation period. In this case, I happened to be recording Michael Masley (aka the Artist General). Mr. Masley has worked with the likes of Ry Cooder, Garbage, and Tom Waits, so he needs no favors from me.

As I explained in the review, I chose to test the KSM27s on a few of Masley's original instruments because they produce very rich and complex sounds, with wide frequency responses and dynamic ranges. I included detailed descriptions of the sounds, along with a photo of the Artist General holding a Reedslide, to clarify what was involved. The idea was not to instruct the reader on recording these specific instruments, but rather to demonstrate how the mics handled such significant challenges.

MATH PROBLEM

With regard to David Battino's article on latency ("Square One: Better Latent? Never!" June 2002), I question the statement that an analog-to-digital converter requires 1.5 ms to convert a sample. Before the converter was done with a sample, 65 more samples would need to be converted, making quite a pipeline out of the device (based on 44.1 kHz sampling). The same goes for output DAC.

Earl Kiosterud
via e-mail

Author David Battino replies: Earl—The 1.5 ms figure arose in a quote from programmer Dug Wright of BIAS. Independently, Emagic told me that each D/A or A/D conversion stage introduces a delay of approximately 1 ms. The point of the article was that latencies as high as 10 ms are acceptable in many situations if you know how to work with them; therefore, I didn't focus on the submillisecond discrepancy. However, you weren't the only reader to question the figure. Chip designer Joe Bryan of Universal Audio wrote, "Most ADCs and DACs have only about 27 to 34 samples of delay in their internal digital (downsampling) filters, plus a few samples in the hardware interfaces. That means the total A/D/A delay is around 64 samples, or 1.33 ms at 48 kHz, not 1.5 ms for each A/D or D/A conversion."

Wright remarks, "Joe is correct. Because the A/D/A latency of the hardware is the smallest part, I was probably just rounding up to 1.5 ms. I goofed [when I] said there was [that much delay] on both ends." He notes, though, that the computer interface itself can also increase latency. "As an example," he says, "USB adds another delay because all data must be transferred to the host on the USB transport's time scale—usually 1 ms intervals. So there can be more than 1.33 ms before the application is notified that the data is ready."

Bryan adds that FireWire, in contrast, "transfers data every 125 microseconds, but the hardware actually has significantly larger buffers, and the 'standard' AM824 protocol [used in mLAN and other implementations] is moving towards using several hundred samples of buffering to overcome multidevice bridging and merging issues. These delays are unacceptable in professional audio applications, so there is still a need for a low-cost, low-latency, multichannel, digital audio transport." Bryan says he's working to form an industry group to create one.

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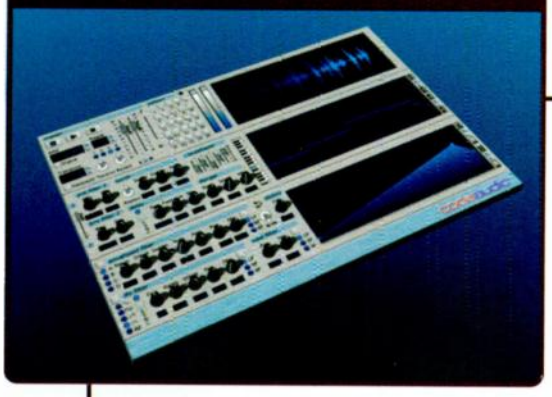
FRONT PANEL

Download of the Month

By Len Sasso



BeatBurner (Win; $50; www.beatburner.com) is an addictive VST plug-in that can be used to lightly touch up or completely revamp a loop in real time. BeatBurner passes your loop through a series of processors, each with its own mix control.

You begin with a crossfade between two resonant bandpass filters. This allows you to highlight two frequency zones without squashing the rest of the signal. The signal then flows through a tuned resonator, the pitch of which is set 128 times per loop using a built-in step-sequencer. The pitches of each step can be set in real time using MIDI or drawn in with a mouse.

The resonator is followed by a waveshaper, an unusual trio of multimode filters (each offers lowpass, highpass, and bandpass modes), and three effects: distortion, delay, and flanging. The first filter has an envelope follower that extracts the loop's amplitude envelope and uses it to modulate the filter cutoff in one of four ways. The second filter's cutoff frequency can be modulated with a synced, multiwaveform LFO. The mix is fed into the third filter, which has its own graphically programmed break-point envelope.

Everything in the plug-in can be synced to the host's tempo, and a Randomize function is included. Presets and loops can be selected with MIDI, and you can set the morph time between presets. There are memory locations for 25 presets and 10 loops.

Although you can certainly get radical with BeatBurner, its charm is in its subtlety. You can hear an example of a basic loop with processing that morphs from subtle to severe in the MP3 file "BurnedBeats."

TIPS

Cool Tip of the Month

FIG. 1: Setting the Virtual Instrument interface to the Controls view allows parameters to be controlled with sliders rather than knobs.

Automating Virtual Instrument Parameters in Logic

The **EM** *Cool Tip of the Month is presented courtesy of Cool Breeze Systems.*

In today's audio-production world, the ability to automate track parameters is almost a necessity. Emagic Logic 5 includes many new and powerful automation features that make it easy to automate not only track volume, pan, and mute, but also just about every parameter of compatible Virtual Instruments (VIs).

Here's a tip for automating the parameters of a VI in Logic 5:

1. Open the Track Mixer (use Command + M or Alt + M). Insert your favorite Emagic or VST2-compatible VI in the top insert slot of an Audio Instrument Channel strip, and record a MIDI performance.

2. There are several ways to automate parameters. Let's start by recording changes on the fly. On the Channel strip, select the Write option from the Automation selection mode pop-up window.

3. Double-click on the top insert to open the VI editor you'd like to automate (see **Fig. 1**). In this example, we will automate specific parameters by moving the controls with the mouse. When using the mouse, you might find it a little easier to use the Editor switch on the top of the Plug-in window to set the VI interface to Controls view. That allows parameters to be controlled with sliders

World Radio History

Band on the Web

By Gino Robair

JÖRG LANGE

Few artists have taken the DIY attitude to the limits as successfully as composer, improviser, inventor, luthier, and designer Hans Reichel. For his most recent CD release, *Yuxo: A New Daxophone Operetta*, Reichel built the instruments, wrote the music, recorded and mixed the songs, created the Flash-based Web site, and designed the fonts used in the CD packaging and Web pages.

The German-born artist first gained notoriety in the '70s as an improviser playing highly customized guitars. A consummate craftsman, Reichel began building his own stringed instruments—which occasionally featured multiple bridges and necks—from exotic woods. The results are as sonically unique as they are visually striking. His most important invention, however, is the *daxophone*, a collection of elaborately shaped wooden sticks played with a bow and a fretted wedge. The instrument has an animalistic vocal quality, and Reichel enjoys creating choruses of these voices for his compositions.

Reichel's Web sites are peppered with images of the daxophone. The site based on his CD *Shanghaied on Tor Road*, www.daxo.de, offers the visitor a friendly, gamelike experience. But unlike many Flash-oriented Web sites that feature empty displays of the technology, Reichel's uses Flash to slowly reveal aspects of his work, as well as his wit, including photos and sound files of his instruments, interactive games, and musical sequences with animation.

"I've always liked animation," explains Reichel. "As a graphic-design student in the late '60s, I made some short ones. But the technical possibilities were quite limited at that time. Some years ago I was introduced to the classic computer game Myst, which has inspired me quite a bit. I made my first interactive game using Macromedia Director, but it's much too big to put on the Web. Now I use Macromedia Flash, a vector-based tool that enables me to create complex structures which require very little memory."

Reichel has created a site for his latest release (www.yuxo.de). Although under construction as of this writing, it already features a wider variety of sounds and new animations in the style of Terry Gilliam.

Key Changes

By Marty Cutler

Big Briar, Inc. is now **Moog Music, Inc.** (www.moogmusic.com) . . . **Mark of the Unicorn** (www.motu.com) is offering a free public beta download of its Clockworks software for Mac OS X, which supports MOTU MIDI interfaces under Mac OS X 10.1 and higher. MOTU expects to release Digital Performer for Mac OS X in the second half of this year . . . **Tascam** (www.tascam.com) has a new network forum for owners of its Pocketstudio 5 portable digital studio. The company will provide registered Pocketstudio users with an online peer-to-peer contact database, allowing sharing of files and correspondence through e-mail . . . British mixing-console manufacturer **Allen & Heath** (www.allen-heath.com) has formed a new company, **North American Pro Audio,** to provide U.S. distribution for its product line . . . **M-Audio** (www.m-audio.com) has announced that Midiman products will be marketed under the M-Audio brand, dispensing with the Midiman corporate name . . . **IK Multimedia** (www.ikmultimedia.com) has announced the release of the SampleTank RTAS (Mac/Win) sound-module plug-in for Digidesign's Pro Tools systems. Amplitube RTAS for Windows, a guitar-amp-modeling plug-in, will be released shortly thereafter . . . Version 2.26 software for **Mackie Designs'** (www.mackie.com) UAD-1 Powered Plug-Ins DSP card adds support for MOTU's Digital Performer . . . **TC Works** (www.tcworks.de) announced that its SparkLE VST audio-editing software will be bundled with Adobe Premiere 6.5 for the Mac. Windows users will receive the TC Native Essentials bundle for DirectX.

TIPS

rather than with knobs, which can sometimes be a little tricky to move smoothly. Of course, these moves are even easier if you have a MIDI control surface.

4. Hit Return to play from the beginning of the song. Move the VI control sliders as you see fit and stop the song (by hitting the Spacebar) when you're done.

5. Hit Return, and you'll hear and see your parameter changes being played back. You will notice that the Automation-mode selection now reads " touch." If you touch (adjust) any parameters during playback, your adjustments will be recorded and will replace your previous moves.

Make sure to check out the CoolSchoolOnline library's streaming movie of this tip to see a demonstration of this procedure and additional automation options. Visit www.emusician.com/cooltip for this online adventure. Also, if you dare, take the quiz to review what you've learned!

—Steve Albanese

Polyphony in Peril

If you write complex MIDI arrangements with piles of layered sounds, you may find yourself skirting the limits of available polyphony. When your synths start dropping notes, it's time to edit your MIDI data. Here are several strategies:

1. Remove inaudible and/or redundant notes. If several notes occur on the same beat, it's likely that at least one note is being masked by the others. For example, if a hi-hat, snare drum, and crash cymbal occur together, it's unlikely that you'll be able to hear the hi-hat. In fact, any quiet note could disappear in the mix.

2. Shorten notes to avoid unnecessary overlaps, especially for slow pads with long releases. Move notes when possible to stagger them slightly, and avoid overquantizing to keep everything from happening right on the beats.

3. Don't overuse the sustain pedal. It's easy to gobble up polyphony without even realizing it whenever the sustain pedal is down. Use it with caution.

—David Rubin

For more EM Cool Tips, visit our Web site at www.emusician.com.

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Rev Up

By Marty Cutler

Epinoisis Software

Version 4.02 of Epinoisis Software's Digital Ear now offers real-time pitch-to-MIDI conversion with an improved pitch-recognition engine. The software captures audio input and boasts as little as 5 ms tracking resolution for pitch changes. Like earlier versions, Digital Ear 4.02 can dynamically translate pitch, amplitude, and timbral information into appropriate MIDI data.

The Settings Wizard lets you optimize settings for different types of instruments to achieve the best conversion results. You can customize and save settings for any instrument or sound to create a library of favorite settings.

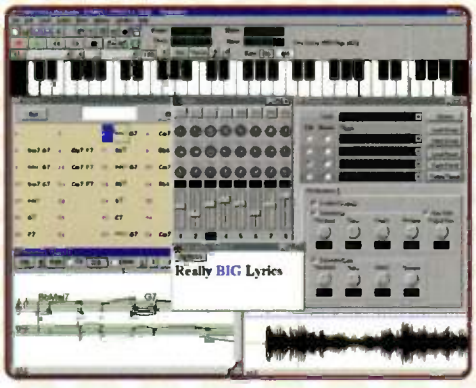
Once your audio is converted to MIDI data, you can edit the file with the Soft Quantization feature for more natural-sounding pitch correction, correct questionable tracking areas with the drag of a mouse, and remap MIDI Control Change messages. The program supports all GM and XG Control Change data as well as instruments that don't conform to GM or XG messages. Epinoisis Software; e-mail info@digital-ear.com; Web http://digital-ear.com.

PG Music

PowerTracks Pro Audio 8.0 (Win, $49; upgrade, $29) features a redesigned 32-bit audio-processing engine; support for 24-bit, 96 kHz audio; an enhanced user interface; and more. Power Tracks Pro 8.0 is compatible with third-party DirectX plug-ins and ships with a library of plug-ins.

The software now supports real-time DirectX effects; you can chain up to four plug-ins and save grouped effects and settings for instant recall or for use with other PowerTracks Pro Audio projects. Version 8.0 adds support for automated mixing, including volume, pan, and control for auxiliary buses. Audio tracks offer automation with MIDI Control Change messages, and the Audio Event List lets you edit automation values. The Audio I/O Latency Delay feature lets you align audio-track playback with software synthesizers to compensate for latency-induced differences in timing. You can store audio data in the program's Scrap Buffer and paste it to a track in the current song. Tracks can harbor mono or stereo audio.

MIDI enhancements include automatic rechanneling of MIDI data in the Tracks Window. New to Version 8.0 is the Chord Sheet window, which displays chord changes in user-defined styles and fonts. The Chord Wizard automatically interprets chord symbols from Standard MIDI Files and displays them in the Notation or Chord Sheet windows. You can scrub notes in the Notation window to learn difficult passages or hunt for mistakes. The software offers 100 levels of undo for MIDI and audio edits.



PowerTracks Pro 8.0 provides Part markers for delineating sequence sections. Additional features include location to song position by clicking on lyrics, a redesigned audio VU meter with a clipping indicator, and multiple-track lead-sheet viewing and printing. PG Music; tel. (250) 475-2874; e-mail info@pgmusic.com; Web www.pgmusic.com.

TIPS

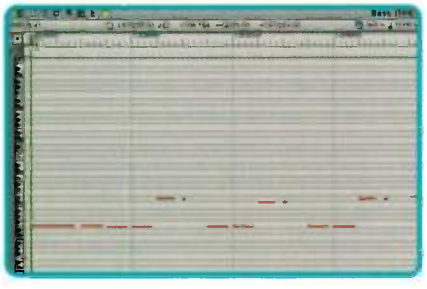


FIG. 2: Selected notes in this bass line are abbreviated to between 15 and 30 ticks.

X Marks the Spot

One of the more difficult aspects of emulating electric bass in a sequence is reproducing the x-note, a picking technique that produces a damped, percussive pluck with virtually no pitch. To do this properly, your MIDI notes need to be extremely short so that only the sample's attack transient "speaks." If necessary, edit your sequenced x-notes so they are no more than a few ticks in length. (You may have to exaggerate their velocity slightly for emphasis; see **Fig. 2.**) If your x-notes still have too much pitch information, edit your bass patch for a quicker release time.

—Marty Cutler

Mixing Board Layouts in DP3

When you run out of room for all the windows you want to open in Digital Performer 3 (DP3), you can save space by using the Mixing Board Layout capabilities to create custom views that you can instantly open with a click and a drag.

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WHAT'S NEW

By Marty Cutler

▲ DAVE SMITH INSTRUMENTS EVOLVER

Rather than offer a carbon-copy analog synth, Dave Smith Instruments created the Evolver ($475), a 4-oscillator monophonic synth that combines two analog and two digital oscillators with FM and extensive feedback-processing capabilities. The analog oscillators offer pulse-width modulation and sync; the digital oscillators offer accurate reproductions of wavetables from the revered Sequential Circuits Prophet VS.

Evolver's two analog lowpass filters (one per channel) are resonant, and you can switch them between 2- and 4-pole operation. You also get a true VCA per channel.

Modulation capabilities include four LFOs and an analog-style step sequencer that can sync to MIDI Clock, and three ADSR envelope generators. The digital oscillators let you select a different waveform for each step of the sequencer, so you can create basic wave-sequencing patterns.

Evolver has MIDI In, Out, and Thru jacks and a pair each of unbalanced ¼-inch outputs and inputs for processing external signals. Dave Smith Instruments; e-mail dave@davesmithinstruments.com; Web www.davesmithinstruments.com.

▶ LINE 6 VARIAX

Line 6's Variax ($1,399) has no standard electric guitar pickups. The guitar uses a hexaphonic bridge pickup and physically models a variety of stringed instruments. The algorithms re-create the characteristics of the modeled instrument—pickup position, tone controls, and physical structure. The Variax offers a single knob and a five-way switch for selecting sounds, and the response of the volume and tone controls are tailored for each model.

Modeled instruments include a Fender Stratocaster and Telecaster; a Gibson ES-335, Firebird, and Les Paul; a variety of Rickenbacker guitars; a Martin D-28 and 018; a Dobro Number 32; a Gibson Mastertone banjo; 12-string electric and acoustic guitars; and a Coral electric sitar.

The 22-fret Variax has a contoured alder body, a maple neck, and a rosewood fingerboard. The guitar has a standard ¼-inch high-impedance jack and a balanced XLR jack suitable for sending guitar output to a P.A. system. Line 6; tel. (818) 575-3600; e-mail info@line6.com; Web www.line6.com.

▼ PLUGSOUND

Plugsound is building a series of sample-playback plug-in modules for MAS, VST, and RTAS formats. The first three titles in the series are Drums & Percs Elements, Hip Hop & R'n B Toolkit, and World of Synthesizers (Mac/Win; $99.95 each).

In a Plugsound instrument, each sample voice has its own playback engine. You can load multiple Plugsound modules without a significant increase in processor toll.

Drums & Percs Elements contains 5,500 samples recorded at 24-bits and 44.1 kHz; internal processing for the synth engine is 32 bit. The instruments include percussion instruments and acoustic and electronic drum kits. The drum kits comply with GM drum maps, but you also receive keyboard maps containing variants of single instruments. Many of the kits offer Velocity-switching instruments. Percussion samples provide more than 60 different instruments, including congas, djembe, and bongos.

Hip Hop & R'n B Toolkit contains more than 600 patches, including construction kits for funk, hip-hop, and other styles, followed by drum loops, bass loops, keyboard parts, hits, synths, and effects. An additional 200 programs are for multisampled instruments: clavinets, basses, electric pianos, guitars, drums, and other keyboards. World of Synthesizers has 512 patches representing retro and modern synth sounds including flutes, voices, tines, and bells.

All Plugsound modules offer control over pitch, filter settings (including resonance and filter type), envelope, and LFO settings. You can also edit velocity curves and play in Legato Mode (with Portamento controls).

Plugsound requires a host program that supports VST, MAS, or RTAS plug-ins. Mac users need a PPC 604e/300 MHz, OS 8.6, and 128 MB of RAM. Windows users need a Pentium II/300 MHz, 128 MB of RAM, and Windows 98, ME, 2000, NT, or XP. Big Fish Audio (distributor); tel. (800) 717-FISH or (818) 768-6115; e-mail info@bigfishaudio.com; Web www.plugsound.com.

World Radio History

From mic-pre to CD...

DPS24 DIGITAL PERSONAL STUDIO

The DPS24 is the only affordable integrated hardware digital workstation that offers 24 tracks of recording without data compression. Most types of data compression throw out portions of your audio during recording, and use a mathematical algorithm to approximate the original audio upon playback.

Data compression can adversely affect your audio quality and stereo imaging, especially with multiple generations of track bouncing.

Kind of sounds like your old cassette multi-track, doesn't it?

It's important to know what you're getting when you invest in any recording solution. The DPS24 was designed from its inception as a professional production tool and not simply a scaled-up portable studio.

We combined a 24bit/96kHz linear 24-track hard-disk recorder, a 46-input moving-fader automated digital mixer, a sample-accurate multi-track graphic waveform editor, 4 stereo multi-effects processors, ak.Sys TrackView and VST plug-in platform software, and a CD mastering and archiving suite without creating the performance or user interface compromises found in many integrated workstations.

Utilizing our Q-Link navigation design, the DPS24 offers access to any major function with one button press. The Q-Channel strip of automated LED rotary controls enables instant access to any channel strip on the mixer.

Features like two banks of inputs to eliminate re-patching, balanced channel inserts which enable external mic preamps to bypass the on-board preamps, multi-function Q-Knobs for realtime effects control, and up to 24 channels of ADAT I/O offer professional production capabilities that give you the real-world advantages you need to bring your artistic vision to its full potential.

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▶ DIGIDESIGN DIGI 002

The Digi 002 ($2,495) is a 24-bit, 96 kHz FireWire interface with an integrated control surface, eight analog inputs and outputs, and a pair of analog monitor outputs. The control surface offers an array of eight touch-sensitive faders, eight rotary encoders, and ten four-character LCD scribble strips. The manufacturer claims that the encoders offer control over almost every Pro Tools LE 5.3.2 feature and parameter, including plug-ins. A 32-track version of Pro Tools LE comes with the package, along with standard DigiRack plug-ins such as D-Verb. Also included is a suite of third-party plug-ins, including Waves Renaissance Collection, IK Multimedia's AmpliTube, and Native Instrument's Pro-52 software synthesizer. You can use the control surface independent of the Pro Tools software as an eight-channel, four-bus stereo digital mixer with onboard EQ, dynamics processing, delay, and reverb.

The control surface offers coaxial S/PDIF I/O and eight channels of ADAT Lightpipe I/O. Analog inputs include four mic preamps (with 48V phantom power, variable gain controls, and a highpass filter) and four balanced ¼-inch jacks. You also get eight analog outputs on balanced ¼-inch jacks, monitor outputs on RCA jacks, one MIDI In port, and two MIDI Out ports (collectively supporting 32 MIDI channels).

The Digi 002 will run on any FireWire-equipped Mac G4 running OS 9 with 256 MB of RAM. Windows users will need a Pentium IV or Athlon XP, 256 MB of RAM, and Windows XP. Digidesign; tel. (800) 333-2137 or (650) 731-6300; e-mail prodinfo@digidesign.com; Web www.digidesign.com.

▼ EDIROL UA-700

Dubbed the "Everything Box" by its manufacturer, Edirol's UA-700 ($595) is a compact USB digital audio interface that features 24-bit, 96 kHz audio; a built-in effects processor with EQ; guitar-amp and mic modeling; and MIDI ports. The unit lets you record two channels simultaneously.

The top panel sports knobs for each of the effects processors as well as buttons for toggling features on and off. For example, the guitar-amp modeling section lets you adjust amp drive, select from 11 amp models, and choose your amp model's speaker array. You can save amp-modeling adjustments as patches in one of six user locations. Knobs for mic modeling let you match an input mic with a mic model; yet another knob lets you select a sampling rate of 44.1, 48, or 96 kHz.

The UA-700's top panel has a pair of Neutrik Combo jacks; buttons for phantom power, a –20 dB pad, and a low-cut filter; a ¼-inch high-impedance jack for guitar or bass; left and right RCA auxiliary inputs; and left and right master outs. The rear panel offers a second pair of RCA master outs, a USB port, coaxial and optical S/PDIF I/O, and MIDI In and Out. The unit supports WDM and ASIO 2.0 drivers. Roland Corporation U.S. (distributor); tel. (323) 890-3700; e-mail edirol@edirol.com; Web www.edirol.com.

▶ KORG MICROKORG

The 37-minikey Korg MicroKorg synth ($500) boasts the same combination of analog-modeled and sample-playback oscillators as the MS 2000 and adds a few tricks of its own. For starters, you can run the MicroKorg from the supplied 9V AC adapter or with six AA batteries.

The instrument has two oscillators; oscillator 1 offers 71 waveforms, ranging from typical analog waveforms to Korg's single-cycle DWGS waveforms. Oscillator 2 provides sawtooth, square, and sine waves. You can use oscillator 2 as a modulator for oscillator sync or ring modulation.

The MicroKorg has four resonant filter modes: 12 dB lowpass, bandpass, and highpass filters, and a 24 dB lowpass filter. The two ADSR envelope generators and two LFOs sync to MIDI Clock, and you can program the pitch-bend and modulation wheels to control a variety of synthesis parameters. Five knobs provide additional real-time control and transmit Control Change (CC) messages. All parameters are accessible from the top panel of the unit.

You can process external audio through the MicroKorg's filter, effects, or the 8-band vocoder. The effects include three modulation types, four delays, and EQ. The vocoder can capture formants from your voice or other external signals and superimpose them across the range of the keyboard without pitch change. The instrument includes a mic that mounts on the top panel. The built-in arpeggiators offer six patterns: you control gate time, swing, and pitch (over four octaves), and you can turn individual pattern steps on or off.

Audio outputs are on a pair of unbalanced ¼-inch jacks and a stereo ¼-inch headphone jack. The keyboard also includes a pair of ¼-inch unbalanced inputs for processing external signals; ¼-inch jacks for a control pedal and a footswitch; and MIDI In, Out, and Thru ports. Korg U.S.A., Inc.; tel. (516) 333-9100; Web www.korg.com.

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By Scott Wilkinson

Spin Doctors

Electrons' spin states: the next step in computer evolution?

As conventional electronic components approach the physical limits of miniaturization, scientists are looking for ways to exploit the quantum-mechanical properties of subatomic particles to increase storage density and processing power. One intriguing possibility is a new type of circuitry that is based on a property of electrons called *spin*.

Conceptually, you can think of an electron as a tiny, electrically charged sphere that spins about an axis. Because the spinning sphere carries a charge, it forms a current loop that gives rise to a magnetic field with poles at either end of the spin axis. (In reality, electrons are not tiny spinning spheres, and the exact nature of spin is too complicated to discuss here.) Interestingly, all electrons have exactly the same amount of spin, which is restricted to a discrete value by the laws of quantum mechanics.

Spin is traditionally depicted by assigning a direction to the axis: if you view the "rotation" as going west to east, the axis points north or up, as with the Earth. An external magnetic field affects the electron's energy according to the relative orientation of the field and spin axis.

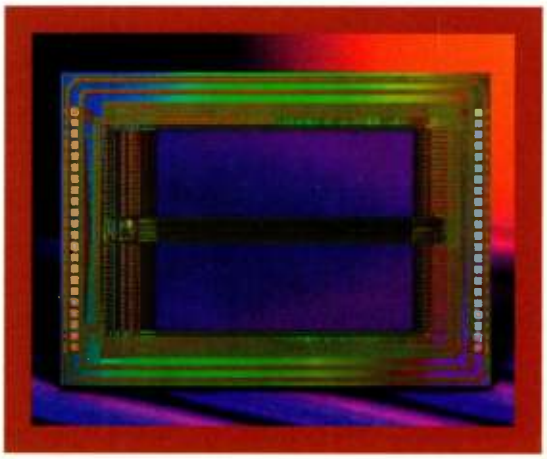
In ordinary electrical current, the electrons' spins point in random directions and have no effect on the operation of the circuit. However, circuits in which the spin direction plays a role offer some significant advantages in performance and power consumption; such circuits are known as *spin-based electronics*, or *spintronics*. Perhaps the simplest example is a current passing through a magnetized ferromagnetic metal, such as iron or cobalt, which tends to impede electrons in all but one spin direction, resulting in a spin-polarized current.

That is the basis of a magnetic tunnel junction, in which two ferromagnetic layers are separated by an insulating layer. One of the ferromagnetic layers is permanently magnetized in a specific direction, while the other one's magnetic orientation can be changed at will. Electrons entering the fixed, or *pinned*, layer are spin-polarized, and if the magnetic field of the variable layer is parallel to that of the pinned layer, some of the electrons tunnel through the insulator (a fascinating quantum effect in itself). If the magnetic fields of the two ferromagnetic layers are antiparallel, the electrons do not tunnel through the insulator.

A single magnetic tunnel junction can be used to store one bit of data within a larger structure that is called magnetic random-access memory (MRAM), which retains its data whether the power is on or off and offers switching rates and rewritability comparable to that of conventional RAM. Motorola has fabricated MRAM chips with capacities of one megabit (see **Fig. 1**), and commercial products should become available in the next couple of years.

A similar idea might be applied to field-effect transistors (FETs), as proposed in 1990 by Supriyo Datta and Biswajit A. Das, then of Purdue University. In the Datta-Das spin FET, a ferromagnetic source electrode injects spin-polarized electrons into a semiconductor channel that connects the source with a ferromagnetic drain electrode. If a voltage is applied to the gate electrode directly above the channel, the resulting electric field changes the spin direction of the electrons, causing them to be rejected by the drain's magnetic field; otherwise, they pass through the drain unimpeded.

Changing the spins in this manner takes much less energy and time than pushing electrons out of the channel as in a conventional FET. In addition, it might be possible to change the magnetic orientation of the source and/or drain to alter the logic gate's function on the fly. As yet, no one has constructed a spin FET, but recent experiments with ferromagnetic semiconductors hold great promise for the future of spintronic computers and the musical applications they might serve. ❦



COURTESY MOTOROLA

FIG. 1: Prototype MRAM chips have reached capacities of 1 Mb using spintronic magnetic tunnel junctions to store data.

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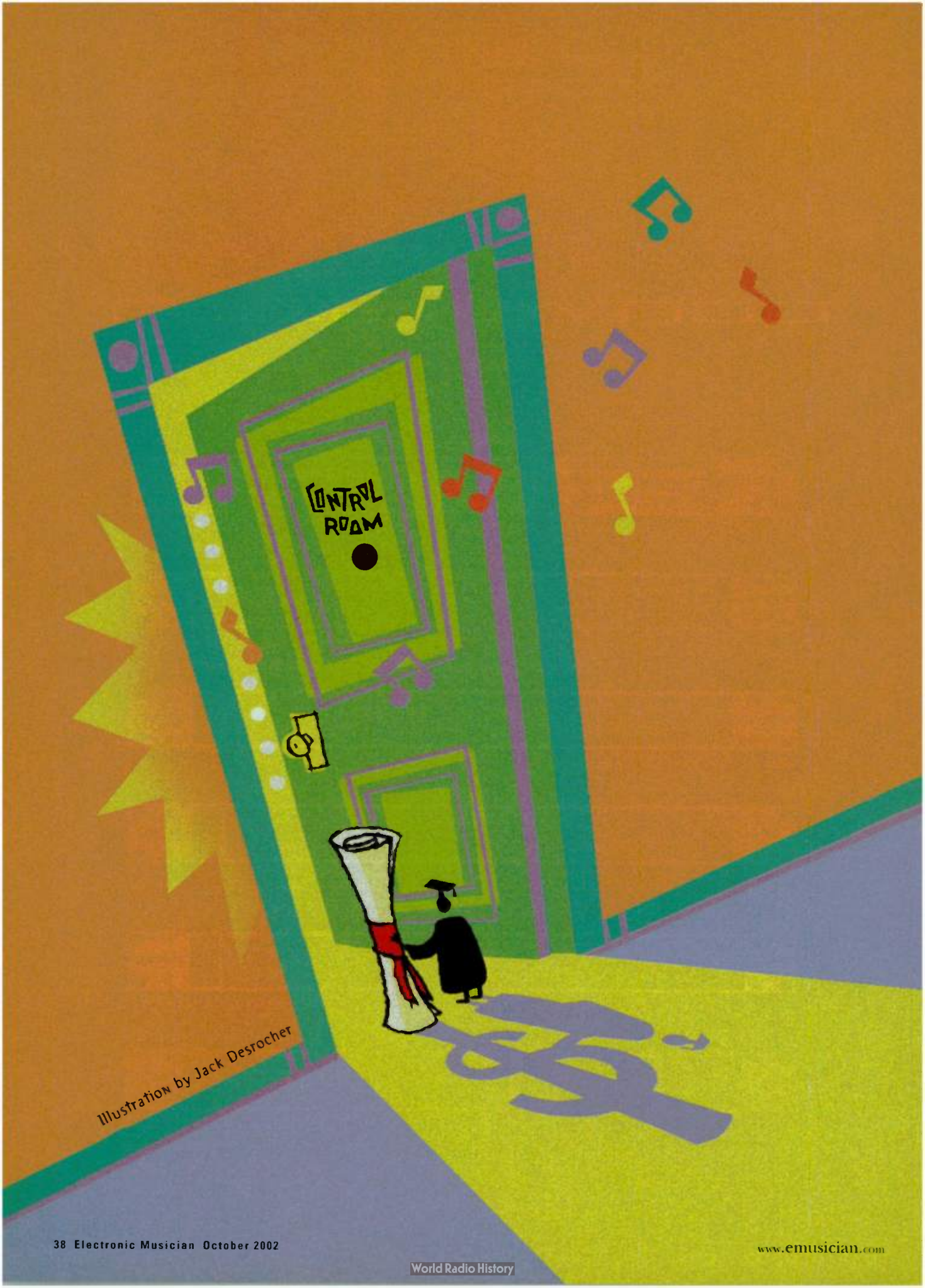

Illustration by Jack Desrocher

World Radio History

Making the Grade

By Daniel Keller

Remember the first time you knew for certain you wanted to work in a studio? For me, it was when my band went in to do our first demo. I remember the whoosh of air as I pulled open the heavy door to the control room; as I gazed over a miniature city of multicolored lights, my ears rang with the deafening quiet of that space. Never mind that the mixing console made about as much sense to me as the cockpit of a 747—I knew I'd be flying it some day. Standing in the vocal booth before a huge vintage Neumann that could practically hear the dates of the dimes in my pockets, I knew it was my destiny and that this was where I belonged.

So assume you've had a similar epiphany, and you feel certain that a life as a studio rat is for you. Or maybe your own personal revelation involves working in post-production or touring the world mixing front of house for major concerts. Whatever your motivation, may I extend you both congratulations and condolences on your life-shaping career decision. Working as an audio professional can be one of the most creative, fascinating, exhilarating, totally cool lifestyles anyone could ever wish for. It can also be 40 flights of mind-numbing, body-abusing hell, the likes of which have probably been outlawed in a hundred Geneva Conventions. A lot of it depends on you and what you make it. By committing yourself to a goal, you've taken the first step toward becoming a professional. Keeping that goal in sight will require perseverance, self-discipline, and a never-ending desire to learn.

As with most careers in the music biz, there are as many different paths into audio as there are people working in it. But they all have one thing in common: the professionals you see before you have all put in the time, educating themselves and perfecting their craft. Most have come up through the ranks, starting out as interns or gofers, receptionists or solder jockeys. They got a foot in the door any way they could, and then they stayed, listened, and learned.

Do pro-audio schools deliver as promised?

Redefining the Studio™

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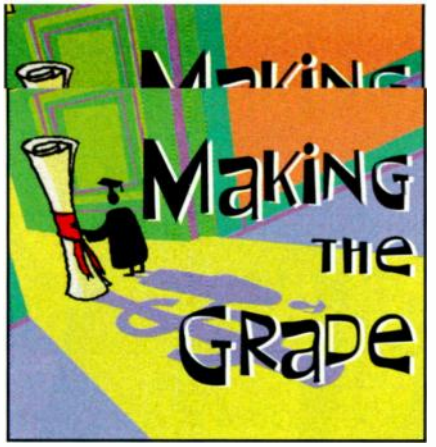


DOING THE BASICS

Theory matters. Most schools take you through at least a bit (hopefully more than just a bit) of recording theory and signal flow before heading for the faders. Though you may be eager to get your hands on the equipment, having at least a basic understanding of what you're doing will save you lots of time and prevent mistakes later. Ideally, the school should offer at least an initial few weeks of classroom-based theoretical training. That should be followed by some additional in-depth book and lecture courses given concurrently with hands-on lab time.

The schools I queried varied only slightly in their ratios of classroom to lab time. In all but a few, the first 35 to 40 percent of the overall course time is dedicated to basic theory. Most of the schools provide the more theoretical training aspects in a traditional lecture format, using textbooks, technical journals, and audio-visual materials. Generally speaking, this classroom time is the least complicated to administer, and most schools do a pretty good job of conveying this information.

Another important consideration is actual class size. Though a class of 20 to 25 students can be considered almost intimate in a lecture setting, a class that size in a studio means you'll spend far more time craning your neck to see the mixing board than actually working on it. The schools I surveyed usually reported relatively larger classroom sizes, but lab sizes normally were held to 12 or fewer students. Some, such as Nashville's School of Audio Engineering (SAE), state that the maximum number of students in the studio is two, with 75 to 80 percent of labs undertaken alone. Miriam Friedman, president of New York's Institute of Audio Research, states, "Lectures are limited to 30 students and labs to 20 students, and studio sessions are held to 12; our labs offer each student individual state-of-the-art workstations" (see Fig. 2). Full Sail's Mylod says: "Here the first three months are composed of lecture classes of 50 to 100 people. Once students begin the hands-on phase, we guarantee our lab classes contain no more than nine students."

MICHAEL A. MARCUCCI

FIG. 2: Students at the Institute of Audio Research work in small groups in state-of-the art teaching labs. Each student has access to his or her own workstation.

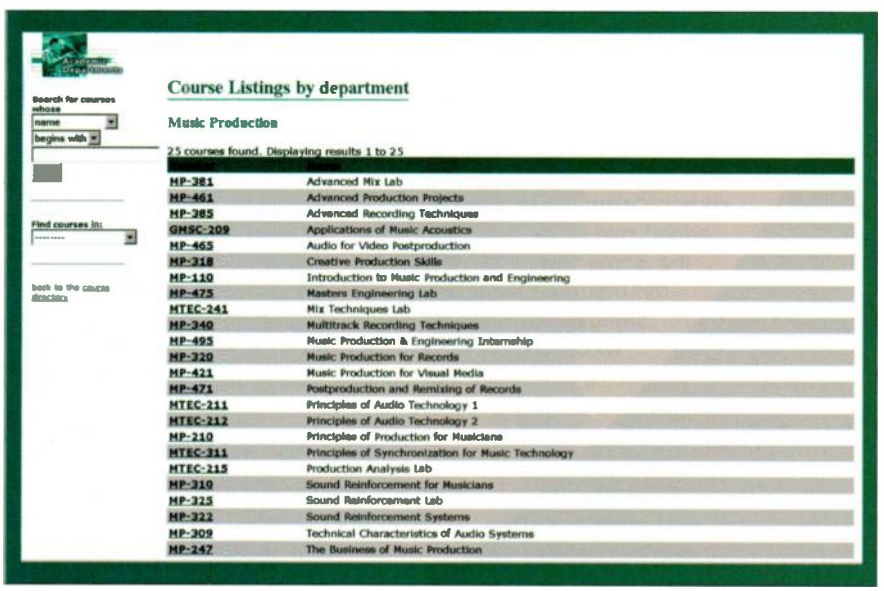
ON SITE

The schools I examined varied considerably in the actual facilities they offer for hands-on training. Most do offer actual recording facilities ranging from modest one-room studios to elaborate, multiroom facilities with one or more live-recording areas and several lab stations for mixing and editing.

An important consideration is how the live setups are used in the course study (see Fig. 3). Is the school just setting up a previously recorded session for teaching signal flow, or is it bringing in live bands for full sessions covering mic setup, recording, overdubbing, and mixing? Of course, it's difficult for any school to fully emulate a real-world environment, because musicians recording in a school situation tend to pay lower rates and are far more tolerant than in the real world of paying clients. Still, working with talent in a live situation provides indispensable exposure to many scenarios you will encounter.

TO THEIR CREDIT

To be fair, accreditation is not necessarily an indicator of a school's reputability nor of its academic standards. That said, it can have a bearing on your



Course Listings by department

Music Production

25 courses found. Displaying results 1 to 25

MP-381	Advanced Mix Lab
MP-461	Advanced Production Projects
MP-385	Advanced Recording Techniques
GMSC-209	Applications of Music Acoustics
MP-465	Audio for Video Postproduction
MP-318	Creative Production Skills
MP-110	Introduction to Music Production and Engineering
MP-475	Masters Engineering Lab
MTEC-241	Mix Techniques Lab
MP-340	Multitrack Recording Techniques
MP-495	Music Production & Engineering Internship
MP-320	Music Production for Records
MP-421	Music Production for Visual Media
MP-471	Postproduction and Remixing of Records
MTEC-211	Principles of Audio Technology 1
MTEC-212	Principles of Audio Technology 2
MP-210	Principles of Production for Musicians
MTEC-311	Principles of Synchronization for Music Technology
MTEC-215	Production Analysis Lab
MP-310	Sound Reinforcement for Musicians
MP-325	Sound Reinforcement Lab
MP-322	Sound Reinforcement Systems
MP-309	Technical Characteristics of Audio Systems
MP-247	The Business of Music Production

FIG. 1: Like other professional institutions, the Berklee College of Music in Boston offers a wide range of audio-production courses. This list shows many of the required courses in the school's music-production and engineering degree program. Other courses in music and general education are also required.

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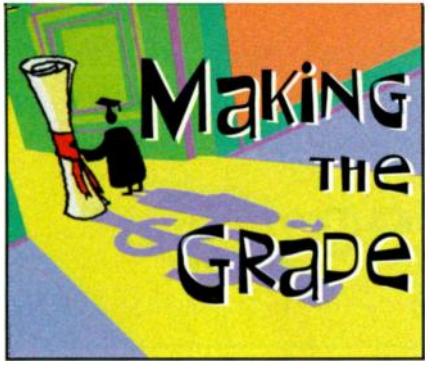

students at an internship. Students submit a list of facilities they'd like to go to, and the internship department procures that. The internship department has a huge list of relationships with facilities all over [and outside] the country."

Some students argue that, with the availability of low-priced equipment these days, it makes more sense to focus on a small home- or project-studio setup. They figure that a few months of producing demos for friends and local bands will hone their engineering chops faster than weeks of watching over someone's shoulder will. It's certainly true that you'll get more time behind the mixing desk that way, and it's not a bad idea in any case to outfit yourself with whatever gear you can afford.

But there are far more valuable skills to be learned through an internship, and they can't be taught in your spare bedroom. An internship is where you'll learn firsthand the realities of having to work and socialize in close quarters with a wide array of personalities and artistic egos. It's a time to discover how to keep cool under pressure, how to stay cheerful even when your stomach's grumbling and your head's pounding, and how to turn stressful situations from potential artistic nightmares into memorable performances.

It's also a time to develop your networking skills. Even more than some other professions, this business is built upon relationships. The people you meet now could very likely play a role in your future, and their recollections of you can make a big difference in what that role might be. When that Joe Nobody engineer-producer you worked with last year is nominated for a Grammy, your phone is more likely to ring if he remembers you as helpful, easy to get along with, and nearly invisible until needed rather than as someone with more opinions than sense.

After graduation, will your school offer assistance with finding an entry-level position in the industry? What about with basic skills such as résumé building? Though there's much to be said for developing job-hunting chops by knocking on doors, a referral from your alma mater will do more than simply help get you in the door. It will assure a much better match than cold calling, affording both you and your potential employer a more mutually beneficial situation. Again, most schools I spoke with offer some degree of placement assistance. Some, such as CRAS, report that the majority of their unpaid interns parlay those relationships into paid positions after graduation.

MAKING CONTACT

Ardent Studios
www.ardentstudios.com

Berklee College of Music
www.berklee.edu

Conservatory of Recording Arts and Sciences (CRAS)
www.cras.org

Full Sail Real World Education
www.fullsail.com

Institute of Audio Research
www.audioschool.com

Line 6
www.line6.com

Roland
www.rolandus.com

Russ Berger Design Group (RBDG)
www.rbdg.com

School of Audio Engineering (SAE)
www.sae.edu

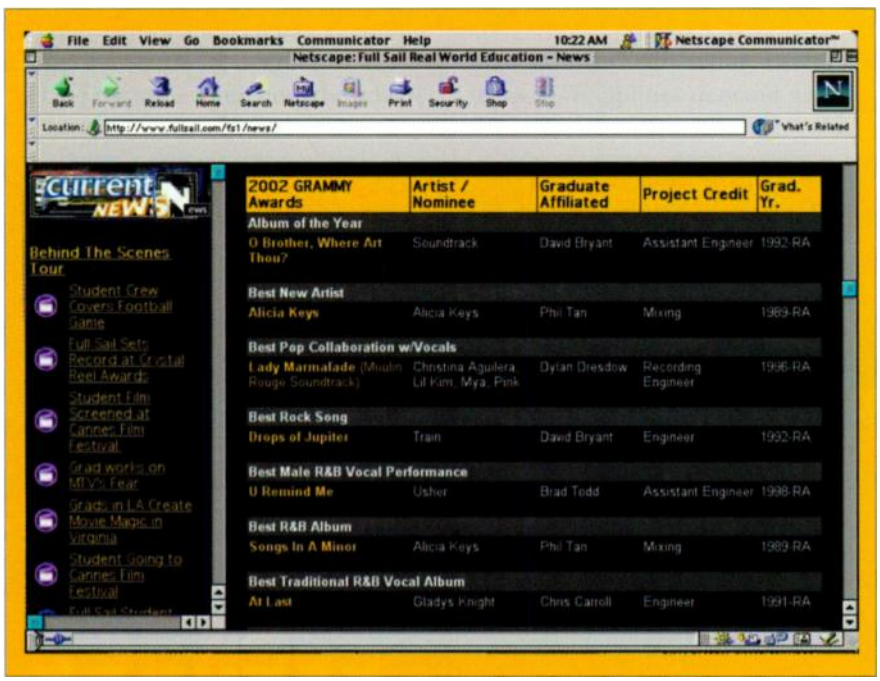

FIG. 4: One important measure of a school is the success of its graduates. Full Sail's alumni include a number of recent Grammy Award winners.

TRACK RECORD

Generally speaking, most of the studio owners I spoke with are satisfied with the level of technical knowledge of the students they interview. That was not always the case with the more technically oriented positions, but for the most part, those employers are understandably adamant about their needs for full academic degrees from accredited university programs. As Berger puts it, "We find potential applicants with the skill sets we require only from universities

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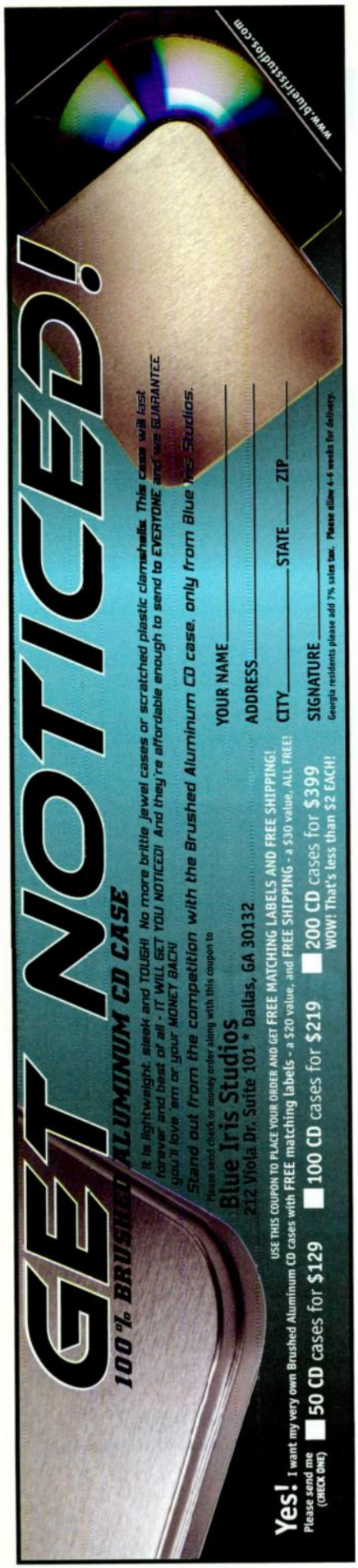

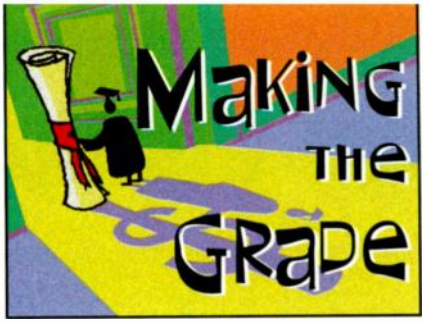

and from within the industry." For the most part, though, the schools seem to be doing a good job imparting theoretical knowledge and technique.

Sadly, one of the most common criticisms cited by those doing the hiring concerned the lack of people skills and professionalism in grads applying for jobs. Clearly, these are skills more difficult to quantify and certainly harder to teach. As Jody Stephens, studio manager at Ardent Studios in Memphis, says, "I'm sure it's hard to teach basic communication skills and good manners, but some applicants who come to us, while well trained in audio theory, are deficient in those areas."

In fact, the one mistake made most frequently by new studio employees is forgetting to leave their egos outside on the coatrack. The most important lesson you probably won't learn in school is about dealing with people. As an engineer, you're there to capture the best performance from an artist, and that goes much deeper than simply having all the mics in the right place and hitting the red button. It's about learning to relate to the person or people in front of you, getting inside their creative psyche, and understanding their artistic vision. Those are things not easily taught in school.

Similar observations were made by those in other areas of the pro-audio community, who also cite a lack of professionalism as the issue they most often encounter with new hires. Deborah Parmenter, Roland's Human Resources director, puts it gently: "Sometimes we find that students and musicians aren't used to the rigidity of a corporate environment, and it takes some transitioning." Others, such as Line 6's Wolf, cite a lack of even basic skills: "It's surprising, but I frequently see a lack of computer skills in candidates from schools. Obviously, this is more relevant for administration-level positions, but even in more technical positions, it is a must to have basic computer knowledge."

Certainly, Wolf makes an important point: computer skills in general are an area no aspiring audio professional should overlook. That is true not only when learning the basics but also when keeping up-to-date. In fact, that can be said of most aspects of a career in professional audio—the people who get and stay ahead in this business do it by keeping their skill sets current. And they do it not so much out of a sense of obligation, but with enthusiasm and a dedication to excellence. It's a rare school that can teach this to anyone without his or her own motivation.

DO THEY DELIVER?

So is a pro-audio course of study right for you? Which school is the best choice? How good a job do these schools do in preparing you for the real world? As you might expect, the answer is, "It depends." Most of the larger, more reputable institutions can teach you the basics; for the more important and intangible stuff, it's largely up to you. Though the schools I spoke with all acknowledged the importance of professionalism, the majority agreed that it's a difficult concept to teach.

As with most things in life, it comes down to the individual and what you make of it. If you're dedicated to your goals, you'll certainly benefit from the training these schools offer. If you're not, the most highly acclaimed faculty and killer gear won't help. As RBDG's Berger says, "Attitude is everything. Find something you love, determine what skills are required in your field of choice that will allow you to make a difference to an employer, passionately pursue those skills, overcome all obstacles, and make learning and continual self-improvement your lifestyle." That advice should take you a long way.

Daniel Keller *is a writer and independent producer and engineer based in Southern California. His projects include a real-time compression algorithm allowing for 32-hour days.*

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FIELD OF DREAMS

By Gino Robair

The number of hard-disk recorders on the market continues to grow, and there is a recorder for every task and almost every budget. The winner is the musician who has a personal studio, because a powerful recording system is easily within his or her grasp.

But how do you sort through the terrifying array of options? Simply ask the right questions. This article will show you how to narrow down your search and pick the recorder that's right for you.

THE FIRST STEP'S A DOOZY

It's natural to want what you see in the four-color ads. But before you make that impulse buy, a bit of self-evaluation is in order. Buying the right recorder requires thought, research, and lots of patience. It's difficult to put off your shopping spree, but the more you know about your individual needs and tastes, the more likely you'll purchase the perfect system—the first time.

Ask the right questions before you buy a hard-disk recorder.

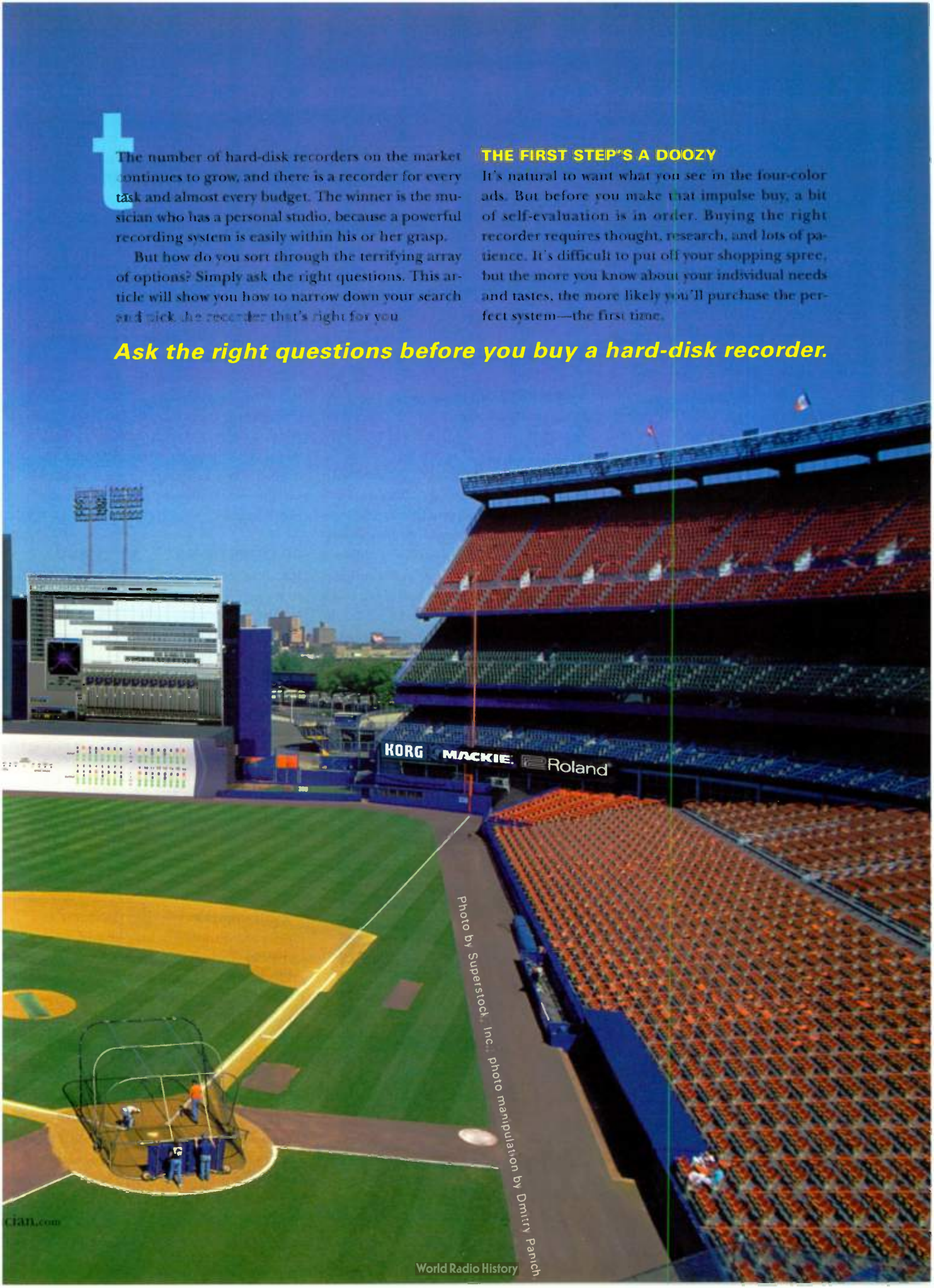

Photo by Superstock, Inc.; photo manipulation by Dmitry Panich

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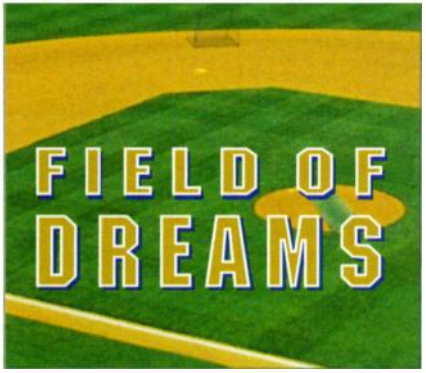

A hard-disk recorder can be used as an entity unto itself, or it can exist as part of a larger studio system. The products are as individual as the people who will use them, so it's just a matter of finding the perfect match. For example, the film composer who wants to sync sequenced MIDI instruments to audio tracks will have different needs from the classical guitarist who merely wants to document his playing in the studio and onstage.

Hard-disk recorders fall into three categories: the computer-based digital-audio workstation (DAW) that combines hardware I/O and a software interface; the personal digital studio (PDS), which includes a mixing surface and effects; and the modular hard-disk recorder (M-HDR), which is a stand-alone recorder. Each format offers nonlinear, random-access recording; nondestructive editing (sometimes with unlimited undos); and sync capabilities that don't require you to waste an audio track.

The defining characteristics of each format go beyond the recording and editing capabilities. The interface of each recorder helps determine the unit's suitability for certain tasks, but size, features, and adaptability—not to mention your own style of working—also play an important role.

PERSONALITY AND STYLE

Recordists often fit somewhere between two basic personality types. At one end is the person whose main goal is to get the new system up and running quickly, with as little downtime as possible. Such people are satisfied with what today's technology offers and will be happy with a system that is stable, is easy to use, and serves their immediate needs. The expansion capabilities of the recording system are unimportant. In fact, these users will avoid most upgrades and expansion in order to keep the system stable. That makes sense for anyone whose livelihood rides on a dependable system.

At the other end of the spectrum are the people to whom the technology itself is as important as the music. These people want a system that can expand and grow with their needs and with the technology. In fact, the ability to totally customize the recording setup is a big plus. For someone in this camp, a closed system, such as a PDS, may not be a good choice, because it offers little or no expandability. This mind-set almost certainly guarantees the need for future investments in gear, such as a faster computer, which leads to plug-in and software upgrades.

The above examples are indeed extreme, and users will likely place themselves somewhere between the personality types. But knowing which traits you relate to is helpful, because manufacturers design products with either—or both—of these potential users in mind.

20 QUESTIONS . . . AT LEAST

It's time to determine what you need to make music now and in the future. Don't let this seemingly endless list of questions intimidate you; you may already know the answers!

Although many of the questions that follow seem obvious, be careful not to rush through them—especially the ones that are closely related. Evaluating your answers in order and one at time is the key to a successful purchase. Answering all of them will help you view your options from different angles. In addition, write down your answers as you go. That will help you remember minor details and give you a place to explore new questions as they arise.

I will mention specific products to clarify ideas throughout; please do not construe those mentions as product endorsements. To see a comprehensive list of what's available in hard-disk recorders, visit **EM**'s *Personal Studio Buyer's Guide*, 2003, online.

What kind of work will you do? Will you be scoring for picture? Recording your band's CD? Making music for computer games? Your immediate and future needs will determine the system you choose. The more you know about your plans, the easier it will be to pick the system that's right for you; each

The analog inputs and outputs on the Fostex VF-16 are conveniently located on the face of the unit.

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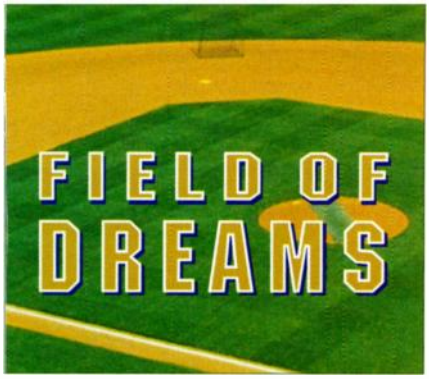

type of hard-disk recorder has its own strengths and weaknesses, and you want to make sure the recorder you choose will do what you need it to.

If your requirements seem to point toward a DAW-based virtual studio, for example, where all recording, sequencing, and processing are done in software, then choose a software package that does what you need (see **Fig. 1**). Occasionally, that will narrow down the options for computer platform, I/O, drivers, and plug-in formats.

On the other hand, if you want a DAW based around a hardware control surface and your software needs are simple, check out controllers first. Most control surfaces come bundled with a lite version of one of the popular music applications, which allows you to get up and running fairly quickly. Starting with a lite version is also a good way to find out if an application suits your music-making style before you spring for the full version. If you're on a very tight budget, you'll need to decide whether it's more important to have the software you really want or buy a control surface right away and live with the bundled lite software until you can afford to move up.

What is the destination? Is your music destined for the Web, for film, for CD, or for DVD? Do you want a system that lets you record, mix, and master your music, and spits out a CD-R when you're done (see **Fig. 2**)? Does the CD-R need to be fully compliant with the Red Book standard, or do you want it to contain standardized files, such as WAV or MP3? Knowing the final delivery format for your music will help you determine your data-resolution needs.

Perhaps you want the ability to record and edit basic tracks at the highest audio quality possible, with the intention of using a commercial facility for overdubbing, mixing, or mastering. In that case, data format and compatibility are important factors to consider.

How many audio tracks do you need? It's easy to underestimate the number of tracks you'll need, especially if you've never used a hard-disk recorder. Unlike analog and digital tape-based devices, some hard-disk recorders offer virtual tracks, which allow you to record more than the specified track count: you just can't play them back all at once (see **Fig. 3**). You can record multiple passes of a solo to virtual tracks, for example, and then choose the best of the bunch. Of course, the more tracks you have, the more tracks you are likely to use.

Another question to ask yourself is how many channels you need in order to move between devices in your studio. Will you have the connections to do that? Are they built in to the device you are buying, or do you have to purchase additional I/O cards? This is especially important if you plan to move high-resolution multitrack audio between, say, a digital mixer and your recorder.

What data resolution and sound quality do you want? The factors that affect the sound quality of digital recorders include the converters, the data resolution (bit depth and sampling rate), and the use of data compression. But sound quality is not determined by numbers alone. Like any product, digital converters vary in quality, and you may have to pay a little more for your interface to get the sound quality you want.

Although the Red Book standard for CD—16-bit, 44.1 kHz—is still the most prevalent commercial delivery format, there are plenty of reasons to record at higher or lower resolutions. If your music is destined for DVD, for example, you might choose a recorder that supports 24-bit, 96 kHz resolution. (Some even promise 192 kHz and higher.) If you're creating music for games or the Web, you want a system that lets you easily create files that don't take up much bandwidth.

High-resolution audio comes with its own set of concerns. On most systems, recording at high sampling rates lowers the track count. Typically, a recorder that offers 24 tracks at 16-bit/48 kHz, will give you 12 tracks at 24-bit/48 kHz, and 6 tracks at 24-bit/96 kHz.

FIG. 1: Steinberg Nuendo (Mac/Win) is a complete software-based workstation that allows you to use VST effects and instruments and do surround mixes.

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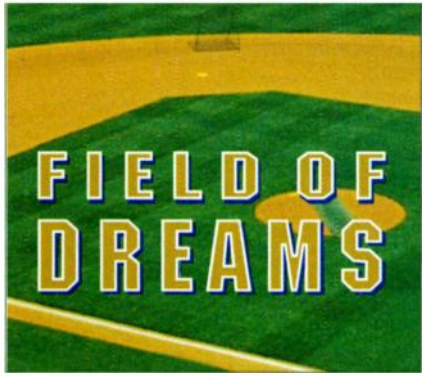

In addition, the greater the bit depth and sampling rate, the more disk space you'll need. Your hard drive will begin looking smaller once you store 24 channels of 24-bit, 96 kHz data on it.

Finally, moving multiple channels of 24-bit, 96 kHz audio between, say, an M-HDR and a digital mixer is not a trivial matter. Interfacing your system with the outside world will require specific I/O cards and a suitable clocking setup so that you don't degrade the audio quality you spent so much money to capture.

At the other end of the resolution spectrum is data compression. Compressed files take up less space on a disk, which results in more recording time. The trade-off, of course, is reduced audio quality, and each compression scheme sounds different. Some of the Roland PDSs, for example, offer as many as six compression schemes. The trick is to use the data compression that suits the project. Some kinds of music—particularly those with high levels and a small dynamic range—tolerate data compression better than others.

What sorts of instruments will you record? Will you record acoustic instruments or voices that require mics and preamps; line- or instrument-level electronic instruments; or a combination of these? Knowing what you plan to record will help you determine the kinds of I/O you need (XLR, balanced ¼-inch, RCA, and so on), and it may further clarify your needs in terms of audio quality (see the sidebar "Two Exercises").

How many tracks do you want to record simultaneously? Just because a hard-disk recorder is a 16-track machine doesn't mean it can record all 16 tracks at once. If you answered the previous question, you already know the kinds of inputs you'll need. Now you need to determine which ones you'll use at once. The more tracks you want to record simultaneously, the more you can expect to pay for your system.

VIRTUAL TRACKS	TRACKS 1	2	3	4	5	6	7	8
1	OH/R	OH/L	BD	BASS	GTR 1	VOX 1	HARP	KEYS 1
2					GTR 2	VOX 2		KEYS 2
3						VOX 3		KEYS 3
4								STEEL
5								
6								
7								
8								

FIG. 3: This is a generic illustration of how virtual tracks work. In this case, you can play only the top layer of eight tracks. However, each track is eight layers deep, giving you total of 64 virtual tracks to choose from.

What are your editing needs? Every hard-disk recorder gives you tools for moving sections of a file. If all you need is a way to rearrange parts of a song, you will be satisfied with the editing capabilities of any system you choose. On the other hand, if you need the ability to edit waveforms at the sample level, your system choices narrow down considerably.

Do you need a sequencer? If you do need a sequencer, how do you plan to use it? As a fancy metronome for laying down tracks? As inspiration for songwriting? Or will it be the main focus of your music? If you want an integrated recording and sequencing setup, you've again narrowed down your list of system choices.

But just because you want to use a sequencer doesn't mean you have to go with a computer-based digital audio sequencer. A number of PDSs, for example, include internal sounds and offer basic sequencing and looping capabilities. The trick is to determine the level of sequencing you need, whether it's simple loop-based song assembly or full control of the deeper aspects of MIDI, such as event lists and Control Change messages.

How will you use MIDI? MIDI is not just for playing instruments. It can be used for controlling effects, starting and stopping machines, and automating fader levels. Do you want a recorder than can act as master and slave to the

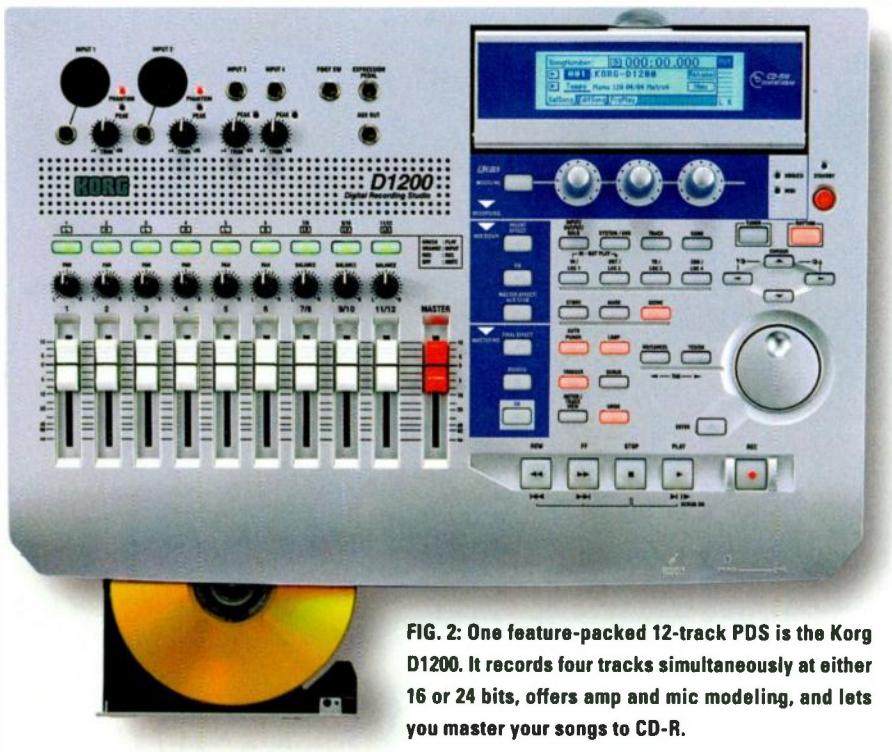

FIG. 2: One feature-packed 12-track PDS is the Korg D1200. It records four tracks simultaneously at either 16 or 24 bits, offers amp and mic modeling, and lets you master your songs to CD-R.

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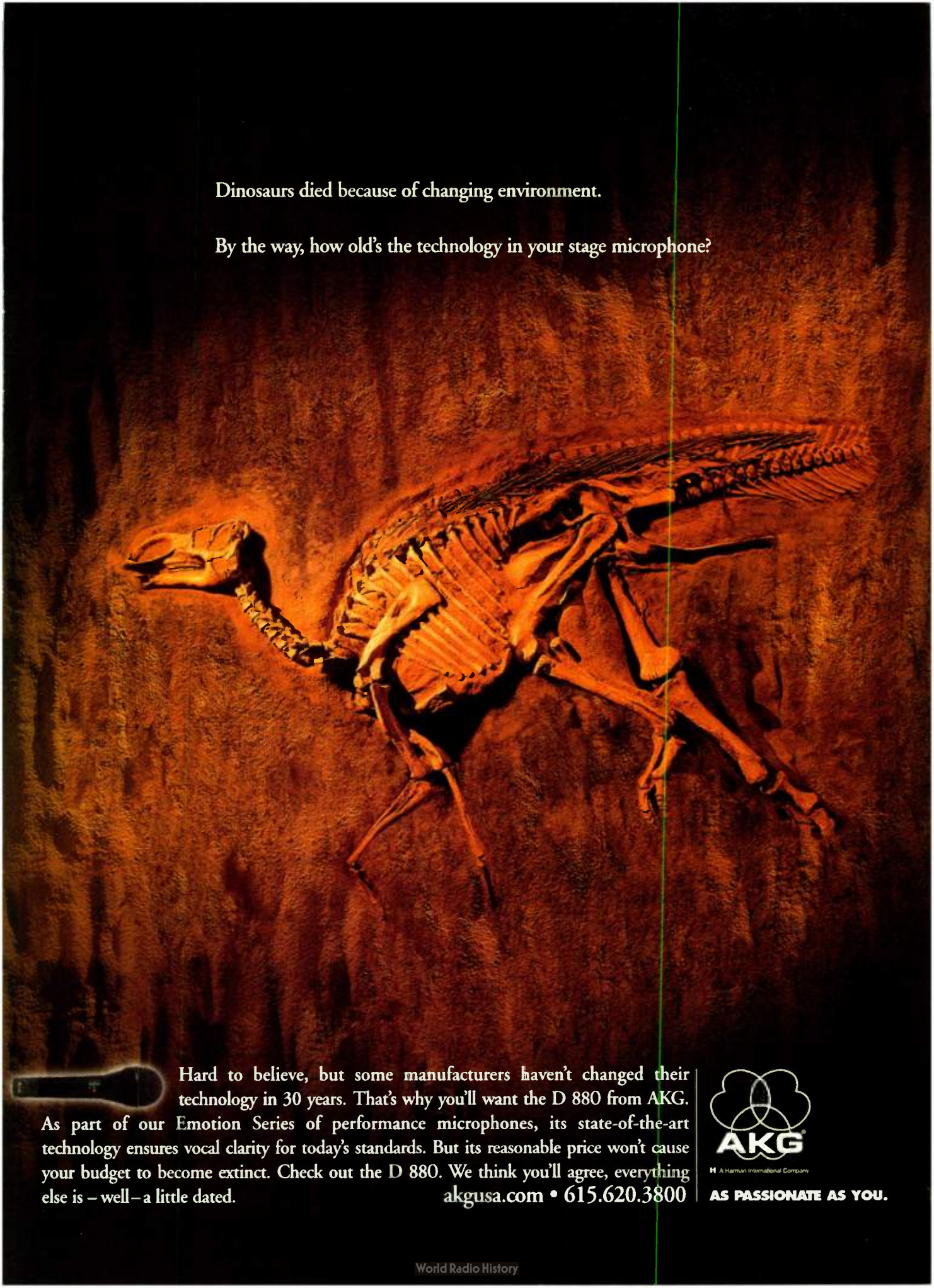
Dinosaurs died because of changing environment.

By the way, how old's the technology in your stage microphone?



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other devices in your studio? If you have a digital mixer and want to supplement it with a hard-disk recorder (so you can engage the recorder's transport controls remotely, for example), choose an M-HDR that supports MIDI Time Code (MTC) and MIDI Machine Control (MMC).

Do you need portability? If it were easy to move your studio to another place for a day—such as a church, warehouse, or another studio—would you do it? If the answer is yes or even maybe, a portable system is worth considering. Each hard-disk format is available in a portable configuration. But if mobile recording is a high priority, the more portable, the better.

Begin by determining your requirements: Do you need ease of setup? Durability? Flexibility? Regardless of other considerations, you will need a device that lets you simultaneously record a specific number of tracks and contains the I/O to do it. In addition, you need to consider the amount of disk space needed to store all of your tracks for the duration of the session or concert. Recording an hour-long concert on two channels of 16-bit, 44.1 kHz audio takes much less disk space than at 24 bits and 96 kHz. If you do your homework, you'll know exactly what to pack for the road.

Yamaha's AW4416 offers a large dedicated meter display. All inputs and outputs reside on the unit's back panel.

Do you have components you want to keep? Knowing what to buy often includes determining how much to buy. Many musicians assemble the various odds and ends they've collected over the years into a studio-like situation without considering the bigger picture. Such a setup may combine consumer devices (with unbalanced I/O operating at –10 dBV) and professional-level

TWO EXERCISES

Here are two scenarios designed to help you hone your skills in selecting a hard-disk recorder. Put yourself in the shoes of the following prospective buyers and decide which kind of system you would pick. Compare your system to the ones in the sidebar "Check Your Answers."

Solo artist. In this scenario, you are a singer-songwriter who is new to recording technology. You have two decent mics, an old desktop computer, and very specific requirements: a low-cost, highly portable system that records two tracks at a time; simple assembly editing features; and the ability to burn an audio CD-R. You want CD-quality audio for recording live performances, but you don't mind reduced sound quality if it buys you more hard-disk time when you write songs. You want to pay as little as possible.

You're in the band. Now you're a member of a five-piece, guitar-based rock band that wants to make its own record. You've recorded to cassette multitrackers but have also collected bits and pieces of quality studio gear—an analog mixer, mics and preamps, and effects processors.

Although you like to record songs by overdubbing one track at a time, you also plan to record the full band during rehearsals and at gigs. Your simultaneous recording requirement is eight inputs: two guitars, bass, lead vocals, backing vocals, and three mics on the drums (one on kick and two overhead). You don't plan to do any fancy editing but would like to cut and paste song sections. And because the band members (two of whom have laptops) are splitting the cost, you can shell out a couple of grand for the recording system.

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- Mic on instrument
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  - Sax/Woodwinds
  - Trumpet/Brass
  - Kick drum/set
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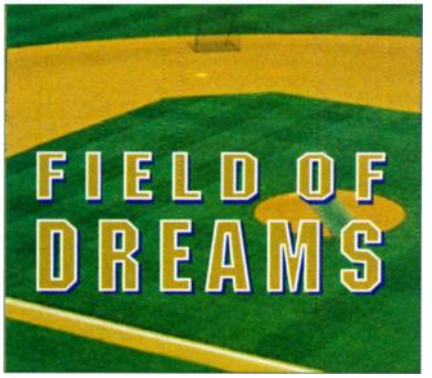

gear (with balanced I/O operating at +4 dBu) without level converters. This is not an ideal situation, especially if you plan on doing professional work.

However, some of the components may be compatible with your new hard-disk recorder. For example, if you're happy with the mixer, mic preamps, and effects processors you already have, explore the M-HDR option. If you recently purchased a computer and it has enough RAM and a fast enough processor to run the applications you like, consider the DAW option. The hands-on type should consider control surfaces with audio interfaces, which come in many sizes and price ranges (see Fig. 4). On the other hand, if the gear you want to keep operates at –10 dBV, your choice of recorder should include interfacing options that match. This kind of planning will keep you from spending money on redundant items.

Although these suggestions seem obvious, deciding to scrap parts of your studio can be difficult. It requires you to be honest with yourself about your goals and then follow through. Change is difficult, especially in the realm of music making.

Does it play well with others? If you plan to work with other musicians and in other studios, compatibility and connectivity are prime considerations. As you examine a recording system, note how it interfaces with the outside world. Can you easily import and export files? What audio file formats does it support? Are they common ones, such as WAV or AIFF files? What multitrack I/O formats does it offer (see Fig. 5)?

How will you back up files and synchronize your devices? Once you have stored your data, you will want to back it up. The more convenient it is to do this, the better. Find out what kinds of file-transfer and backup options are available, and which ones are built in to the unit. Transferring the data from high-resolution multitrack recordings may require add-ons, and you'll want to know about them in advance.

A related issue is synchronization. If you have multiple digital devices in your studio, you will want the ability to clock the components from a single, stable source. Can the recording system act as a master and slave for word clock and MTC? If you plan to create sound for picture, the hard-disk recorder you choose should be able to work at the common frame rates.

Do you want integrated instruments and effects? Many studio chores, such as effects processing and synthesis, that are commonly relegated to hardware can be done in software. In addition, modeling technology opens up the world of speaker-cabinet and mic-preamp emulation.

Note which of these technologies interest you. Some recording formats are stronger in these areas than others, and knowing how tweaky you are will help you determine to what level of madness you're willing to descend.

Are you already familiar with a particular interface? You need to determine how much time you want to spend setting up and learning the new system. Choosing a recorder similar to one you're used to will make for a comfortable transition.

Selected Review Resources

Portable Digital Studios	Issue
Akai DPS16	6/01
Fostex VF-16	2/01
Korg D16	7/00
Korg ToneWorks PXR4	5/02
Roland VS-2480	3/02
Yamaha AW4416	3/01
Zoom MRS-1044	4/02
Modular Hard-Disk Recorders	
Alesis ADAT HD24	7/02
iZ Technology Radar 24	7/01
Mackie HDR24/96	10/01
Tascam MX-2424	12/00
Digital Audio Workstations	
Digidesign Digi 001	4/00
Digidesign Pro Tools 24|Mix	7/00
Digidesign Pro Tools|HD	9/02
MOTU Digital Performer	1/02
Steinberg Nuendo	7/01
Tascam US-428	9/01

FIG. 4: The Event EZbus is a digital-audio interface with a control surface. It includes two phantom-powered mic/line inputs and transport controls for sequencing and DAW programs.

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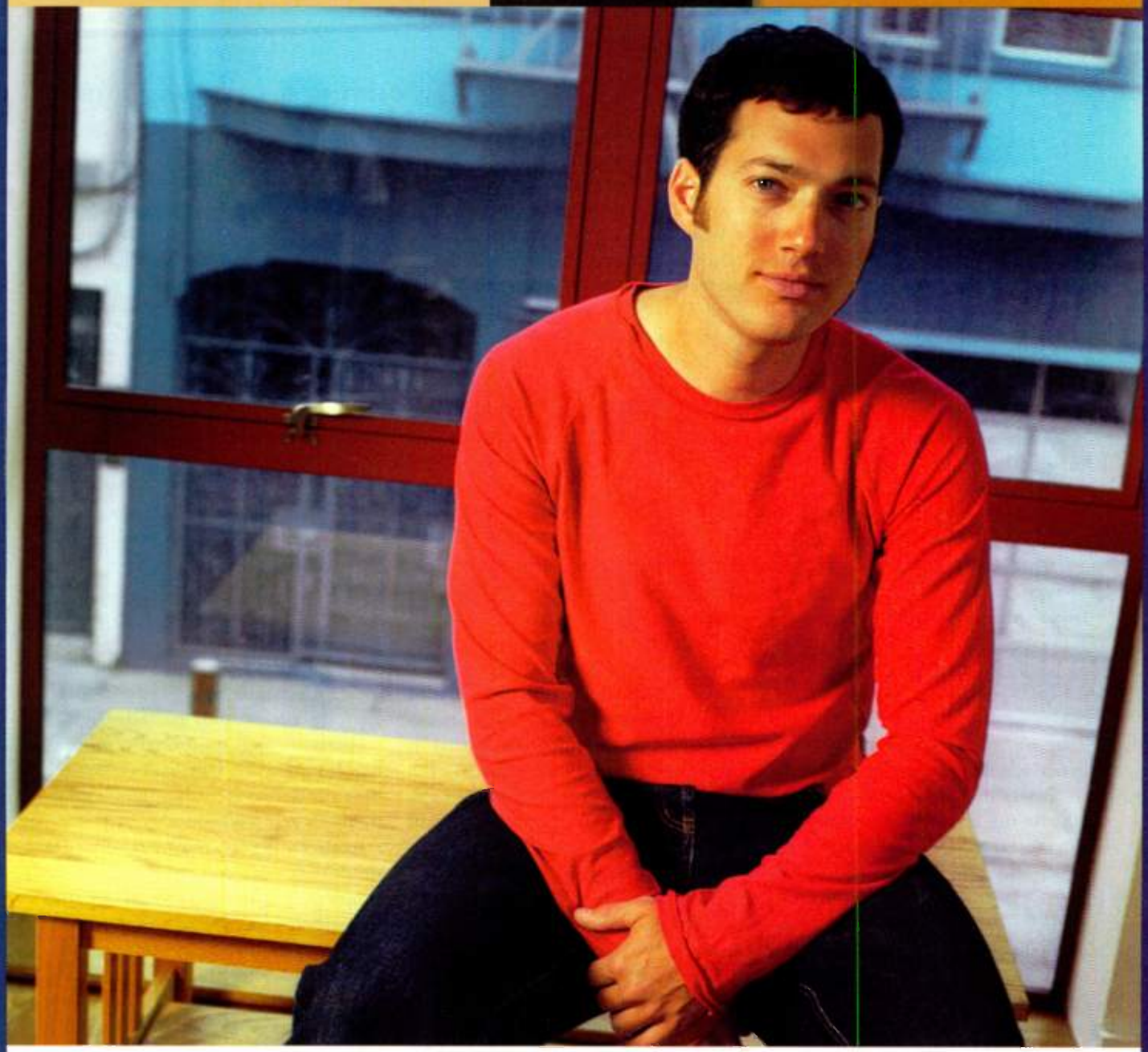
A6 ANDROMEDA REAL ANALOG SYNTH



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IN FACT IT'S PRACTICALLY A LIFESTYLE – A PASSION THAT BROUGHT HIM TO THE A6 Andromeda. Why? It has 16 real analog voices, each with two oscillators, two sub-oscillators, 2-pole multimode and 4-pole lowpass filters. An arpeggiator, a step sequencer, a ribbon controller, and an incredibly flexible modulation engine. Plus smart background tuning, CV inputs, and superb effects. In short, Andromeda is the most powerful analog synth ever made, so it's no surprise that Alex connects with its deep control and uncompromising, true-blue sound. Anything else is like, well . . . a whole other language.

For complete specs and a manual visit www.alesis.com/andromeda, or call 310-821-5000 for a product line brochure.

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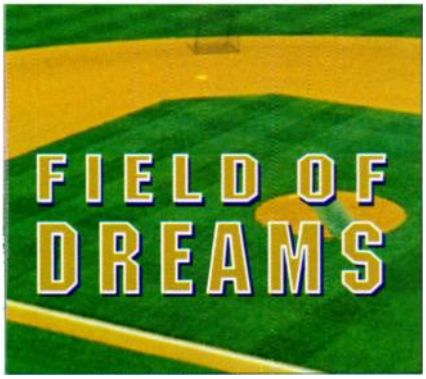

If you cut your teeth on cassette multitrackers, for example, the layout and features of a PDS will be familiar. If you've used tape-based modular digital multitracks, such as the Alesis ADAT or Tascam DA-88, an M-HDR may feel similar.

If you are apprehensive about using computers, consider whether you want to challenge yourself with a DAW. If you buy wisely and have a good support system, you might be able to conquer your fears and get into a computer-based system.

Do you plan to expand? Perhaps today you need only the ability to record and play back two tracks simultaneously. Even so, if you intend to record a full band or work with surround audio in the future, you should look for a system that has that capability now or consider an expandable system.

How is the support? Certainly you won't want to base your judgment of a recording system on the manual, but it doesn't hurt to know what's in store for you support-wise. The more complex the hard-disk recorder is, the more documentation you will need. That is especially true of a system that combines products from different manufacturers, because it's likely that at some point you will need to troubleshoot a problem.

If you don't already have a sense, find out how the manufacturer is in terms of support. A good place to begin is by checking user groups and polling friends and acquaintances that know the system you're considering. If a certain manufacturer has a reputation for terrible support, think hard about sinking your money into its products.

What do you think you want? "Often a customer has a gut-level preference about what they want, and often it's correct," says Nika Aldrich, senior sales engineer at Sweetwater Sound. "We follow his lead unless it really doesn't make sense for his application."

It's good to keep an open mind about your options, but it's just as important to follow your instincts. If you prefer the look and feel of an M-HDR to the DAW and PDS, and it still makes sense after you've answered the questions I've mentioned so far, it may just be the system you're looking for.

What's your budget? Although it seems as though budgetary questions should be asked early on in the process, it can be helpful to wait until the answers to other questions are sorted out first: the perspective you get by looking at the product features in all price ranges will often help you make the best choice.

For example, even though you saved up for a particular PDS, you might find that you absolutely need a feature, such as motorized faders or a touch screen, that is available only on a more expensive model. Once you isolate your budget, you narrow down the solutions.

Have you done your homework? Although you can get an overall gestalt of a recorder's features from the manufacturer's Web site and magazine ads, you should dig much deeper into what a product really offers. It's not uncommon for features initially advertised in a product to be only partially implemented at first. Additionally, phrases like "as many as" may lead you to believe the device records or mixes more tracks than it really does.

Begin your research by reading **EM** product reviews and checking out Internet user groups. Try to find people that already use the recorders you're interested in. If you can find someone, get his or her feedback on the device and see if they'll give you a demo. Although you can get a demo from a salesperson in a music store, hands-on time with a recorder in a studio environment is far more revealing and is worth the effort.

By now you should have a good idea of what you need—and don't need—in a hard-disk recorder. With that information in hand, let's look at how the different recorder formats compare to each other, using our list of questions as our guide.

CHECK YOUR ANSWERS

As the singer-songwriter, you should know right away that an M-HDR is more than you need. Furthermore, getting a DAW will require a computer purchase in addition to the DAW software. In this case, a PDS with a built-in CD burner may be the best solution because it's portable, it's relatively inexpensive, and its feature set matches your needs.

In the band scenario, graduating from a cassette multitracker to a PDS makes sense in terms of recording style, but there will be some redundancy in gear. A wiser choice might be an M-HDR that complements the studio gear you have or a multichannel interface and complementary software for one of the laptops.

FIG. 5: A DAW interface such as Digidesign's Pro Tools 192 I/O gives you a wide variety of options for connectivity. To save space on the rear panel, DB25 connectors are used for AES/EBU, TDIF, and analog I/O.

DAW IN THE FAMILY

The computer-based DAW combines a hardware audio interface with a personal-computer-based software front

World Radio History

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RESTORATION SETS THE STANDARD

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-Wendy Carlos (composer and synthesist: Switched-On Bach, Sonic Seasonings, Clockwork Orange, The Shining, Tron, Tales of Heaven and Hell)

FILM & TELEVISION

The interface is highly intuitive, allowing me to achieve beautiful results on a very short learning curve. X-click has become a staple for optical track restoration. We have used most, if not all, of the Restoration package on "Shot in the Dark", "The Misfits", "Pink Panther Strikes Again", "The Alamo", "Paths of Glory", and "The Killing". For optical, vinyl, and magnetic cleanup and restoration I have not seen a more a powerful tool. The Restoration package, along with other Waves tools we achieve the best possible final results."

- Brian Slack, Chief Engineer and Technologist, Widget Post Production

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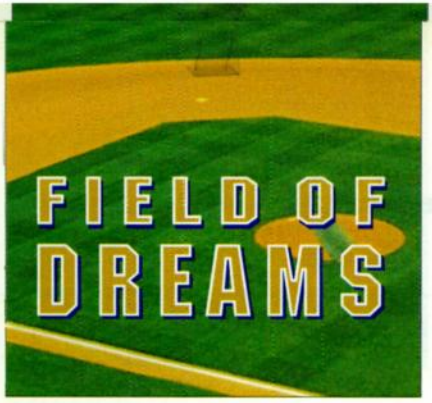

off-the-shelf computer by adding a quieter studio-friendly fan (see Fig. 6). A turnkey system takes much of the guesswork out of setting up a DAW, but be prepared to pay more than you would if you were to configure it yourself. For some, the convenience is worth the added expense.

The choice of computer platform—Mac or PC—needs to be made. In terms of market share, the Windows operating system dominates and opens the door to a greater variety of inexpensive software and hardware options. For pro-audio purposes, however, the playing field quickly levels out between the two platforms.

Sticking with the platform that you're already familiar with means you'll have an easier time getting your music system up and running. But it's worthwhile to check out the recording systems available for the other platform, because many popular programs are available for only one platform. For example, MOTU Digital Performer is Mac only, and Cakewalk Sonar is Windows only.

The audio interface you choose is also determined by the kinds of work you do. Your choice should be influenced by your answers to the questions about audio quality, the final destination of your audio, the number and types of inputs you need, the kinds of instruments you will record, and to what level you need MIDI. The computer and interface you choose will also be an influence on your choice of bus system, which may be SCSI, USB, or FireWire, for example (see Fig. 7).

FIG. 7: The Tascam US-224 DAW controller is an example of a USB interface that is bundled with a lite version of a popular music application—in this case, Steinberg Cubasis.

Many interfaces are bundled with a lite version of a well-known digital audio sequencer. One strategy is to determine what you need from an interface, find the products that fit your needs, and see what apps are bundled with them. The software manufacturer is hoping you'll upgrade to the full version: because the upgrade price is cheaper than the off-the-shelf version, that is often an economical way to go. Many musicians find that the lite version of a program is all they ever need.

If you want a more powerful system but don't want the hassle of matching a handful of third-party components, consider choosing one manufacturer—such as Digidesign, Emagic, MOTU, or Steinberg—and sticking with its product line. Among the benefits of using the products of one manufacturer are tighter audio and MIDI timing. Although this isn't the cheapest way to go, you can be sure that all of the products are fully compatible.

If you already know which application and plug-ins you want to use, but need to find the computer, make sure the computer's specs match the software requirements. Of special importance are processor speed and RAM amount. If you're using a computer you already have, there are products for bolstering your ability to process audio, such as TC Works PowerCore and Mackie UAD-1.

The DAW clearly leads other hard-disk recorders in editing capabilities. The ability to view multiple files graphically on a large screen and use the mouse to alter data is one of the biggest advantages a DAW has over the other hard-disk formats. Although there are products in the PDS and M-HDR formats that offer the ability to work with a VGA monitor and mouse, the DAW still gives you a deeper level of editing.

Latency is an issue with many DAWs. The time delays are caused not only by drivers, effects processing, or A/D and D/A conversion, but also by qualities inherent to USB and FireWire. Most systems can be tweaked to get latency times to a workable minimum in high-bandwidth situations. As manufacturers improve their products, latency times will continue to drop. (See "Square One: Better Latent? Never!" in the June 2002 issue). Latency is an issue that PDS and M-HDR users won't have to deal with.

FIG. 6: A turnkey DAW puts the software you want into a rackmountable package. The Carillon system includes a fan that's quieter than most PCs.

PORTABLE DIGITAL STUDIO

The name says it all: a PDS is a portable studio, complete with mixer, preamps, and effects. It's the perfect choice if you want an all-in-one recorder that you can take almost anywhere.

Besides portability, the main selling point of this format is simplicity. Unlike a DAW, the PDS has a software engine written specifically for recording music, and the device comes ready to use: there's no need to match components or worry about software conflicts. If you want to upgrade the operating system at a later date, it's a straightforward process compared with upgrading a computer's operating system and troubleshooting the rest of your DAW.

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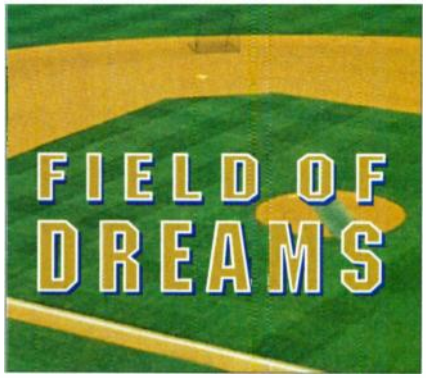

The new PDS user should be prepared to spend time getting to know the interface and learning the various functions of each button, knob, slider, and menu. If you do a bit of research, you'll quickly learn that certain products are more intuitive and ergonomically designed than others. Find the ones that are user-friendly, because the easier it is to get around on your PDS, the more fun you'll have using it.

A PDS can tackle an assortment of basic multitrack-recording projects, assuming you have the right number of simultaneous record tracks and the right kinds of inputs for the job. Every PDS will record at least two tracks simultaneously, but you can choose a model that records 4, 8, 12, 16, or—in the case of the Roland VS-1880—18 tracks at a time (at a data resolution of 16 bits, 44.1 kHz). In addition to regular tracks, PDSs offer virtual tracks, and some even allow you to add several channels of streaming digital audio into your mix.

As you inspect the I/O options of a PDS, remember that you'll be living with them for as long as you keep the recorder. The trick is to get the right combination of balanced and unbalanced ¼-inch jacks; phantom-powered XLR jacks; and digital I/O, such as USB, optical and coaxial S/PDIF, or Lightpipe. The I/O you settle on will determine the gear that you can interface with and will influence other gear-related purchases.

FIG. 8: The Roland VS-2480CD's stellar feature set includes the ability to connect a mouse, ASCII keyboard, and VGA monitor for DAW-style editing.

As I mentioned earlier, some PDSs include internal sounds and offer limited sequencing and looping capabilities. These features are useful as a compositional aid, but if you need a full-featured sequencer, you'll have to connect your PDS to a computer or keyboard workstation. In that case, look for a PDS that has the MIDI implementation that suits your needs, such as the ability to send *and* receive MTC and MMC. This is also important if you want to record dynamic automation using a sequencer or coordinate your PDS with a digital mixer or DAW. Sync capabilities are crucial if you plan to create music for picture. Note that many, but not all, PDSs support the standard frame rates.

If you plan to collaborate with others, make sure you can save, import, and export files in a common file format, such as WAV. The ability to import common file types will also allow you to load instruments and construction kits from sample CDs.

Although the PDS is weaker than the DAW in terms of editing power, it is quickly catching up. Many machines offer waveform displays that improve the editing capabilities of the unit. If you want more than a backlit LCD to work on and you have the budget, Roland's VS-2480CD allows you to add a mouse and VGA monitor so you can edit more the way you would on a DAW (see **Fig. 8**).

In terms of recording resolution, 24-bit word lengths are becoming increasingly common, and sampling rates up to 96 kHz have begun to appear. Even the inexpensive units have 18-bit or greater A/D/A converters, which is useful even if you record at 16 bits. Just remember that your track count may be reduced when you record at higher bit and sampling rates.

The Akai DPS24 is a 24-track hard-disk recorder that includes a 46-channel, 20-bus digital mixer with touch-sensitive motorized faders.

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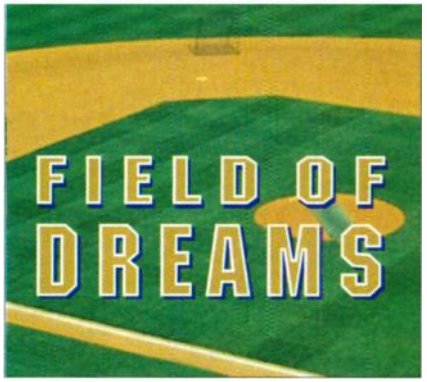

The ability to customize your data-backup scheme depends on the PDS you choose. Some recorders have drive bays that allow you to swap hard disks or add a CD-RW drive; some have built-in CD drives and a SCSI port; others may have only a Zip drive. Determine the amount of data you'll create with your PDS and make sure you can get enough storage to match.

Of special note are a pair of handheld 4-track recorders that take the PDS format to a new level of portability. The Korg ToneWorks PXR4 and the Tascam Pocketstudio 5 technically are not hard-disk recorders, because they record to SmartMedia and CompactFlash cards, respectively (see **Fig. 9**). However, each offers a built-in microphone, analog and digital I/O, rhythm tracks, and programmable effects. Data compression is used on both recorders: MPEG-1 Audio Layer 2 on the PXR4 and MP3 on the Pocketstudio 5. For the musician looking for the ultimate in portability, these two items are worth further investigation. For a more in-depth look at portable digital studios, see "The Incredible Shrinking Studio" in the July 2001 issue.

ROBBIE FORLIN

FIG. 9: The Korg ToneWorks PXR4 and Tascam Pocketstudio 5 offer the ultimate in portability. These diminutive devices record to SmartMedia and CompactFlash cards, respectively.

I WANT MY M-HDR

Large-scale multitrack recording is the M-HDR's strongest suit. These rackmountable machines offer fewer bells and whistles than a DAW or PDS but are designed to be as easy to use as a tape recorder (see **Fig. 10**). And although M-HDRs are often larger than PDSs or laptop computers, they *are* portable.

Like the PDS, the M-HDR's operating system and interface are designed for audio recording, giving them high points for stability. And like the PDS, the M-HDR is not as powerful as the DAW in terms of editing. But unlike either the DAW or PDS, the M-HDR can handle professional-level multitracking jobs, in which quantity and quality are of major importance. If you want to split 24 channels off of a club's front-of-house mixer and run them into a recorder, an M-HDR is for you.

M-HDRs offer plenty of interfacing options. Most recorders give you a choice of I/O cards that cover the major digital interchange formats, such as Lightpipe, TDIF, AES/EBU, and S/PDIF. To save space on the rear panel of the M-HDR, the card may have a DB25 jack requiring a cable that breaks out to the individual connectors at the other end. (Remember to add these kinds of cables to your budget when you're doing price comparisons.) The Alesis ADAT HD24 differs in terms of I/O because it comes standard with 24 channels of analog I/O (on balanced ¼-inch TRS connectors) and 24 channels of digital I/O (on three Lightpipe connectors).

Although M-HDRs support high-resolution recording, the implementation differs from product to product. For example, the iZ Technologies Radar 24 has optional analog I/O cards that let you record at 96 and 192 kHz sampling rates. With the Mackie HDR24/96, on the other hand, analog I/O is not available for recording and playing 96 kHz tracks: you have to use AES/EBU or TDIF I/O. As with the PDSs, if you use sampling rates above 48 kHz, you reduce your track count.

M-HDRs offer a variety of storage options, allowing you to choose a compatible, qualified drive from a list of recommendations. Some drives are designed for real-time recording and playback, while others are purely for data backup. Some M-HDRs also offer

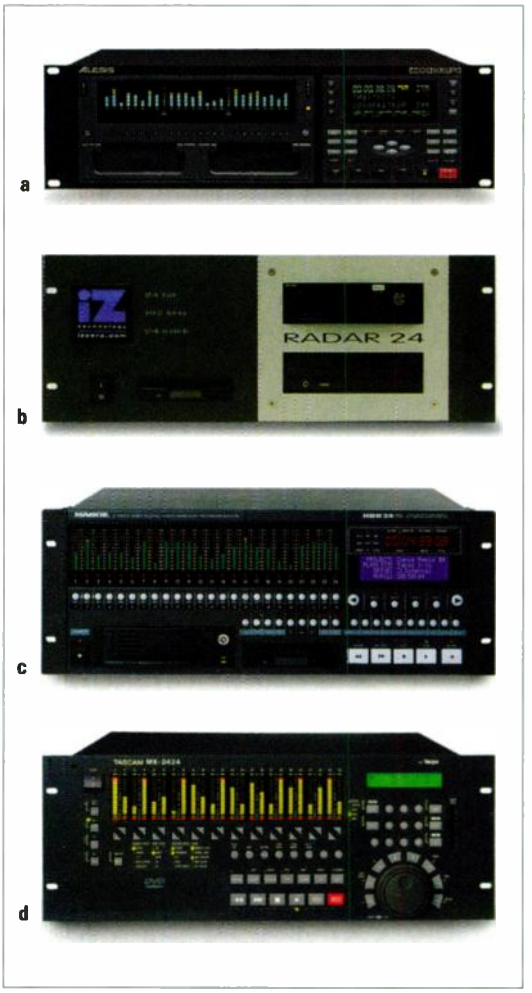

FIG. 10: Modular hard-disk recorders are designed with simplicity and sound quality in mind. Examples include the Alesis ADAT HD24 (a), the iZ Technology Radar 24 (b), the Mackie HDR24/96 (c), and the Tascam MX-2424 (d).

World Radio History

Ethernet connections that let you use the recorder as an FTP server to copy files to a computer. The implementation of this feature differs between products, and setting it up is one of the trickiest aspects of an M-HDR. This is where you'll want to know how good a manufacturer's manual and tech support are.

Most M-HDRS support pro-level clocking and sync functions, so interfacing with other recording systems is always an option. If 24 tracks aren't enough, check to see if a pair of the products you like can be locked together, and find out which connectors it takes.

In commercial studios, noisy devices are usually tucked away in machine rooms and controlled remotely from the control room. However, in personal studios where space is an issue, fan noise can be a problem. If you're sensitive to ambient machine noise, the level of fan noise in a recorder is another factor you'll want to consider.

Although it records to a SmartMedia card, the DigiTech GNX3 Guitar Workstation is a floor-unit guitar processor that includes an 8-track digital recorder. The GNX3 has looping capabilities and the ability to punch in and out, making it well suited for songwriting. It records WAV files, and you can use the SmartMedia card to transfer your tracks to and from a computer. The GNX3 comes bundled with Cakewalk Guitar Tracks 2.0 (Win) and Pyro 1.5 (Win), and DigiTech's GenEdit (Mac/Win) editor/librarian.

MUSICIAN, RECORD THYSELF

Although the descriptions I've given here merely scratch the surface of each format's merits, you should now have a clearer sense of the features you want and the devices that can deliver them. Trust your intuition. If one kind of interface seems more inviting than another, investigate it further.

Try to get hands-on time with the products you're interested in, away from a sales environment. The members of user groups are often more than happy to answer questions about the system they use, and it's likely that one of them lives near you.

The bottom line is that a combination of self-evaluation and product research will quickly lead you through the tangle of products and options. Only after you've narrowed down your options to one or two hard-disk recorders should you even think about getting that credit card out.

Gino Robair *is an associate editor at* **EM.** *He would like to thank David Battino, Marty Cutler, Steve Kirk, Brian Knave, Jor Van Gelder, Nika Aldrich and Adam Cohen of Sweetwater Sound, and Larry the O for their contributions to this article.*

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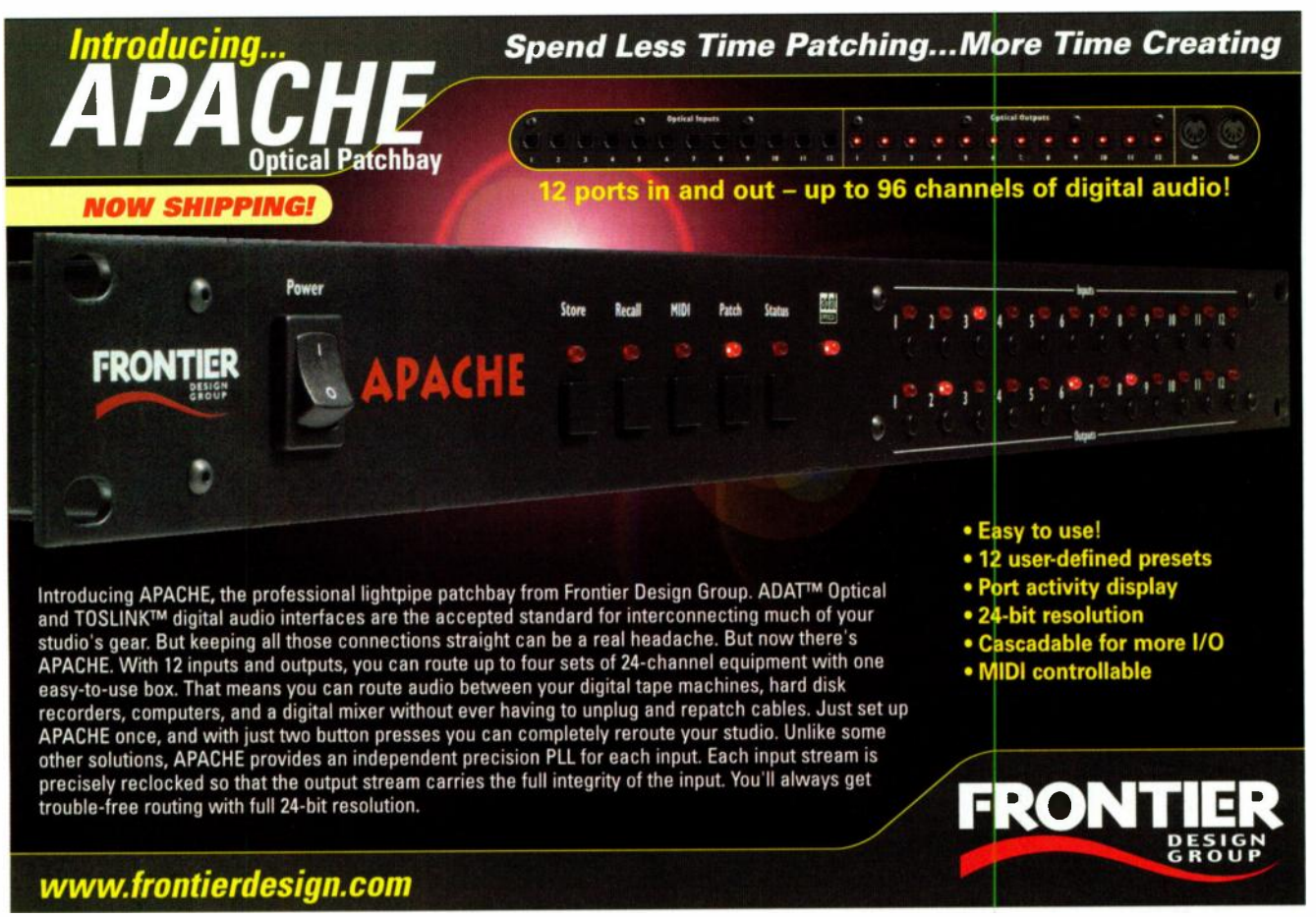

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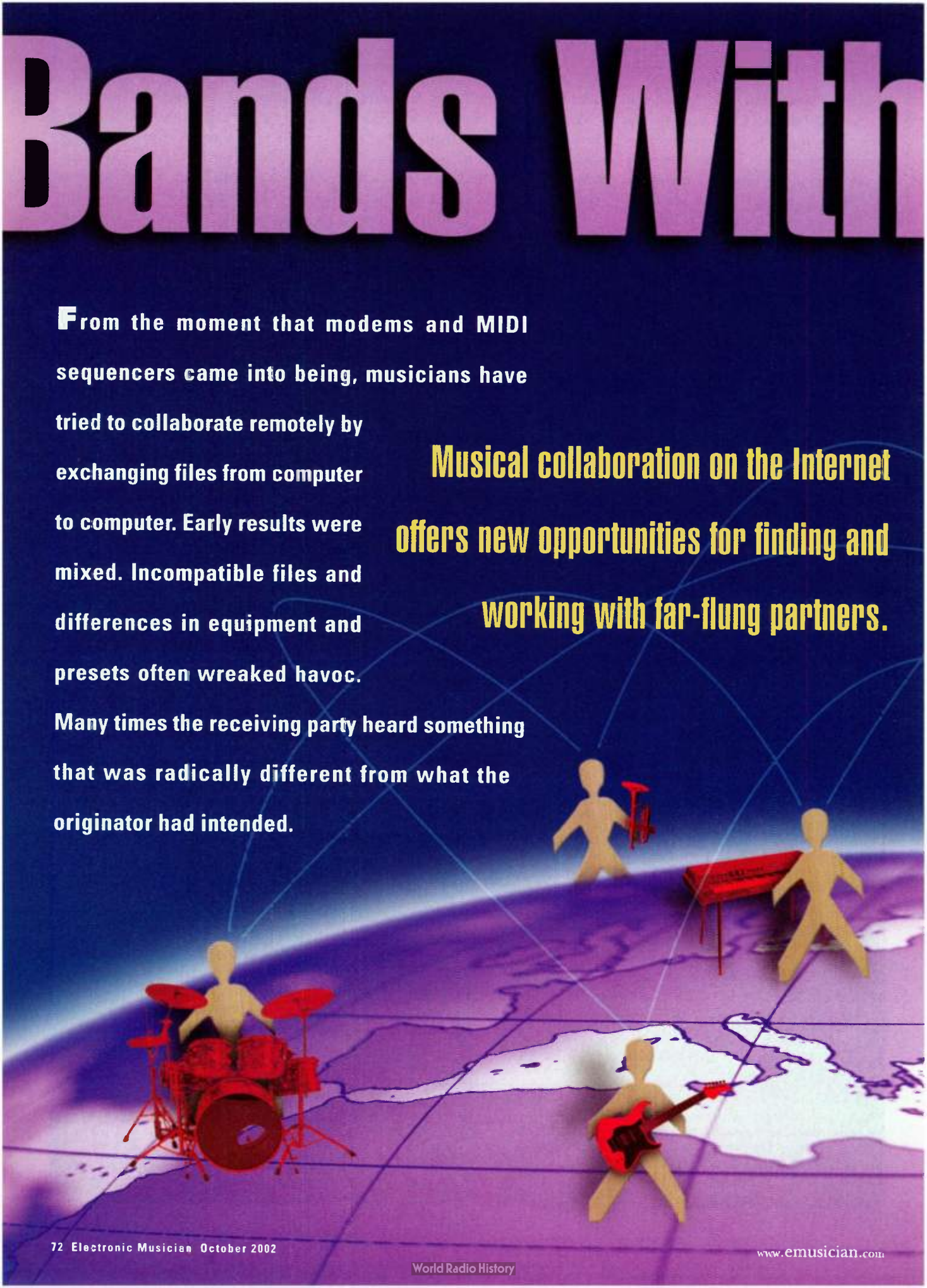
Bands With

From the moment that modems and MIDI sequencers came into being, musicians have tried to collaborate remotely by exchanging files from computer to computer. Early results were mixed. Incompatible files and differences in equipment and presets often wreaked havoc. Many times the receiving party heard something that was radically different from what the originator had intended.

Musical collaboration on the Internet offers new opportunities for finding and working with far-flung partners.



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out Borders

By Gary S. Hall

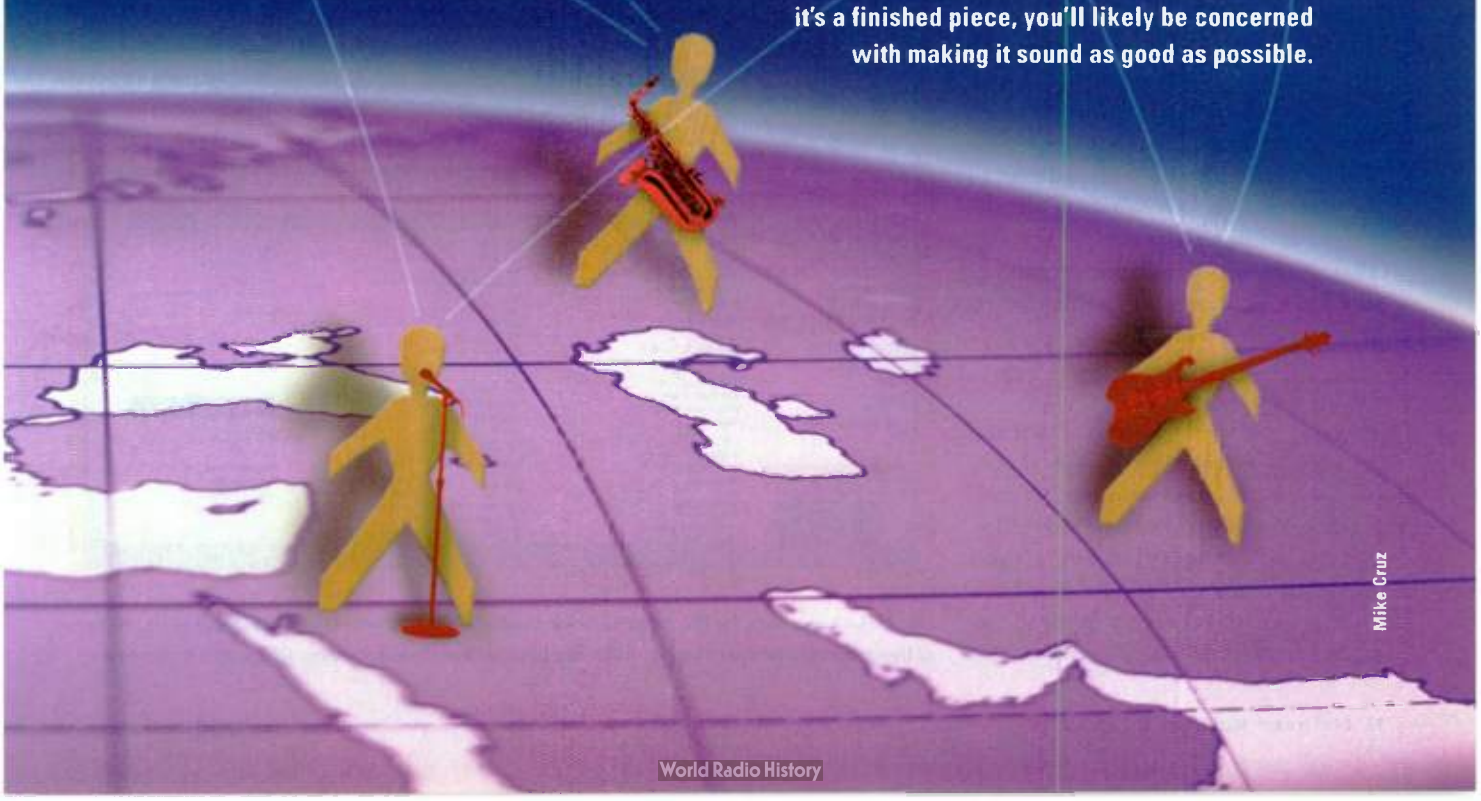
Today, high-speed connections, advances in digital-audio-compression technology, enhancements to the MIDI spec, and new Internet-based services have brought remote collaboration into the mainstream. It is now quite feasible for two guitar players living across the country or across the globe from each other to work on a song together; musicians can even conduct open auditions for bass players, drummers, and singers to round out a far-flung "band." Audio and MIDI workstation users can conduct massive multitrack sessions with contributors around the world while maintaining the highest possible standard of audio fidelity and professional production.

So is everything in the world of remote collaboration glorious? Is the process so simple that your mother could do it? Not yet. For all the progress in the area, there are still many ways that an online collaborative project can go wrong, and there are still a variety of constraints to deal with. If you're interested in working with remote partners, it pays to carefully investigate the issues and possible pitfalls and to learn about the dedicated tools and services that are available.

BEST OF INTENTIONS

Your intentions make a tremendous difference when creating music with others on the Internet. If you're simply writing music together, you can often tolerate a certain amount of lost fidelity and some differences in instrument sounds. That flexibility lets you use lower-density data, including Standard MIDI Files (SMFs) and audio with lossy compression (such as MP3) to greatly speed the data transfer.

On the other hand, if you're trying to create a finished audio production such as a CD release, you'll need to make sure that the audio fidelity is preserved and that all members hear the piece as intended. There may be exceptions if the music is to be delivered with lower fidelity; but in general, if it's a finished piece, you'll likely be concerned with making it sound as good as possible.



Mike Cruz

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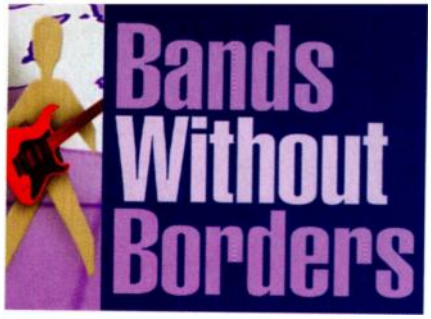

That can be tough, because the best guarantee for ensuring audio fidelity and retaining original instrument sounds is to use full-resolution uncompressed audio throughout, and that imposes the highest burden on bandwidth and upload and download time. The goal determines the methodology, and that, in turn, governs the selection of tools.

TAKING AIM

Exchanging different kinds of audio and music data files over the Internet is easier than ever. E-mail and FTP services are readily available, and with a little effort, it's even possible to set up a dedicated Web site with provisions for posting and downloading large files.

There are a number of things to take into account when planning a musical collaboration. Understanding the issues can help smooth the path and clarify whether it makes sense to use a dedicated service provider to help in storage and project management.

The major challenges in exchanging music and audio files are deciding what kinds of data will be exchanged, keeping the transfer times acceptable, and ensuring that the files remain compatible between parties. You must also make sure that the playback is the same (or close enough) at both ends and that the projects stay in sync so that everyone involved is looking at the same thing. All of those issues are solvable, but not trivial. The last point, in particular, requires ongoing management.

FILE TYPES

There are three kinds of data that you are likely to exchange in a musical project over the Internet: audio files (compressed or uncompressed), MIDI files, and digital-audio-workstation (DAW) and MIDI-sequencer session files. Each option has advantages and disadvantages for particular applications, and each carries its own set of compatibility issues.

Audio data files are generally the most compatible, with most audio applications accepting a range for Mac and Windows native file types. Some holes still exist, though, and file conversion may be necessary. Be sure to test with small files before you commit to a full-scale project using different audio-file types.

In some cases, file headers can be corrupted during transfer between servers. The classic case involves Macintosh files that lose their resource fork when posted to a non-Mac server. To avoid that problem, transfer audio files as StuffIt or WinZip archives. The design of those archive file formats ensures that audio data, resource forks, and any other critical metadata are received correctly.

Using audio data also ensures that the receiving party hears "exactly" (taking into account the monitoring system) what the sender intended. Audio data can be of extremely high fidelity (24 bits at 96 kHz is now common) as long as you're willing to deal with significant transfer times.

The biggest drawback to collaborating with uncompressed audio files is, of course, their bulk. Full-length files, especially multichannel files, can require an hour or more to download. With common asymmetrical home connections, the upload time may be considerably worse. Raw audio files also convey little of the production information often needed for collaboration.

Audio-data compression can greatly reduce the issues of bulk. However, common lossy compression schemes such as MP3 reduce fidelity substantially. For songwriting and composition, that may not be an issue. MP3's universality, even for musicians not versed in recording or electronic-music techniques, is attractive.

Lossless or near-lossless audio-compression schemes, such as MLP or DTS, can reduce file size and transfer times, but not nearly to the same extent as lossy compression. Moreover, the encoders

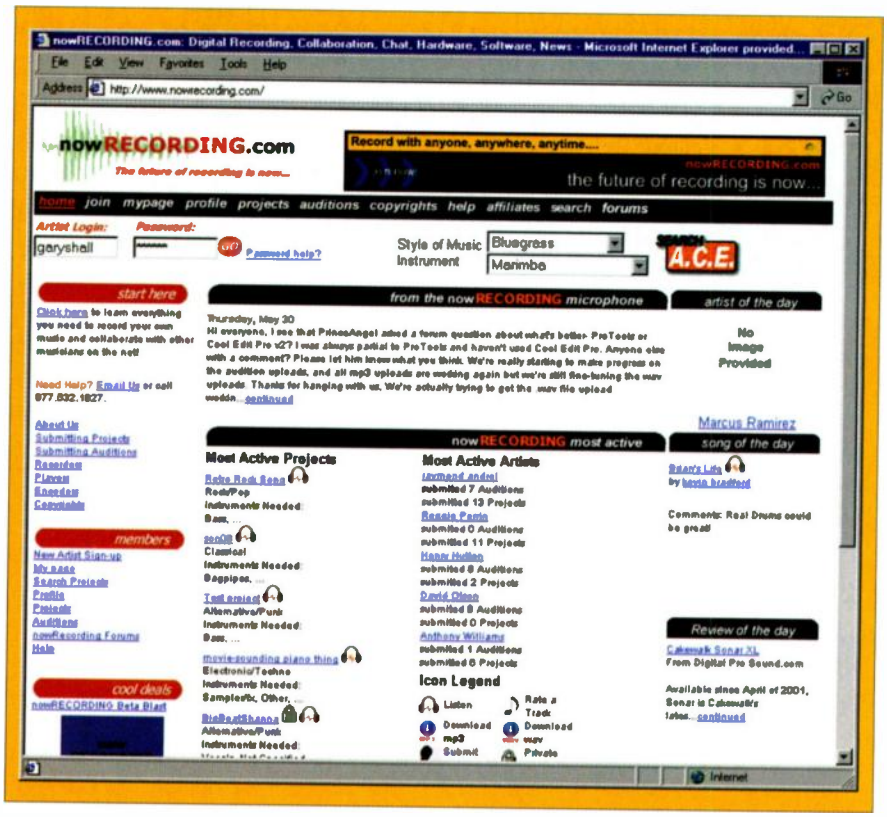

FIG. 1: The home page for the free site nowRecording provides convenient ways to find the current active projects and contributors. Additional features include recording tips and industry news.

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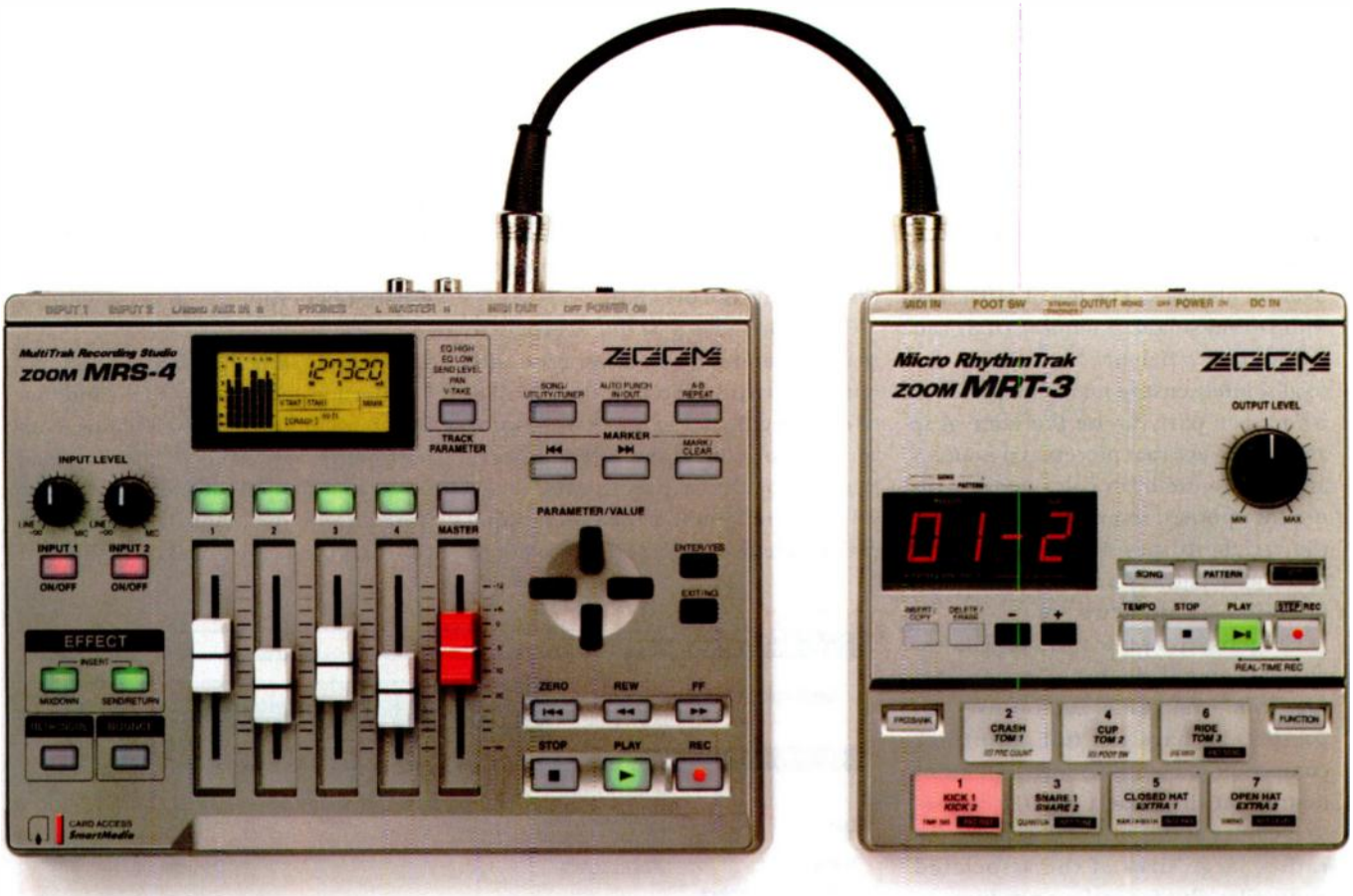
The only thing analog about this recording studio is the price.



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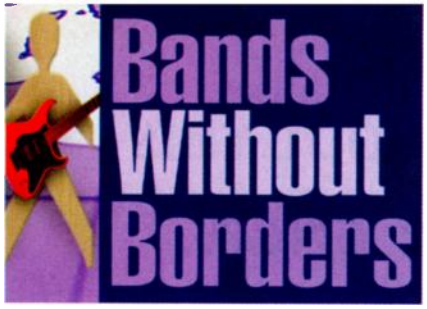

are expensive. Net-based audio-collaboration services sometimes include lossless compression to speed project updating.

Working with SMFs has its own set of challenges. The data size can be compact, but you must often contend with a wide range of variability in what the originating and the receiving parties hear on playback. The use of MIDI files with Downloadable Samples (DLS) can reduce that variability, but the only way to absolutely ensure matching playback is for each party to use the same gear and make sure that presets and samples are synchronized. For collaborative writing (as opposed to music production), the variability may not be a problem, and the data-transfer speed can make MIDI files an attractive option.

The most complete form of data exchange comes from using session data files from compatible audio DAWs. All parties can have the full multitrack composition, complete with mix information, at the same time. Of course, that comes at the cost of accepting the rather large sizes of the associated audio files. But for serious production, it really is the way to go.

Best results are obtained by using identical workstation applications at all sites. File interchange between different brands of workstations remains an inexact science. If you are going to try to work with different workstations at different sites, be sure to test to assess the real compatibility of files exported from one system to another. If your sequences include MIDI information, you'll face the same issues as for pure MIDI data, and you'll need to make sure that the hardware and software synths that play the data back are identical or close to it. DLS can be helpful in that area.

More sophisticated online collaboration tools work exclusively with DAW session data. That requires that the DAW itself be tailored to the use of the service. Rocket Network is gaining support for its service with the leading workstation manufacturers, but the support is still far from universal.

STAYING TOGETHER

For collaborative projects of any substantial complexity, the biggest problem is in making sure that everyone is on the same page. Some collaborations consist of a project initiator who posts an original track and accepts parts from other individuals in a single round of contributions. In that case, version control is fairly easy because the contributors see only the original.

Once you move past that scenario to real back-and-forth collaboration with multiple parties, you face the problem of ensuring that everyone has the same version. For self-administered projects, that has to be an active process.

In general, audio-production applications are not equipped to update by accepting only the changes in a project, so it's usually necessary to load a complete session file. For audio-based projects, especially multichannel, that can mean inordinate amounts of uploading and downloading. In some cases, an individual track can be exported and imported into the receiver's project, but that approach is rife with opportunities for miscommunication. If a mismatch between the versions in use at different sites isn't caught right away, the problems can snowball. Collaborative facilitation services, such as Rocket Network, are helpful in that area, and it's probably their greatest benefit.

CONNECTION TYPES

Connection speeds vary widely, and that affects what you can do. Dial-up connections of 56 or even 28 kbps can load substantial amounts of data, but if you're working with uncompressed audio, the time factors can quickly get out of

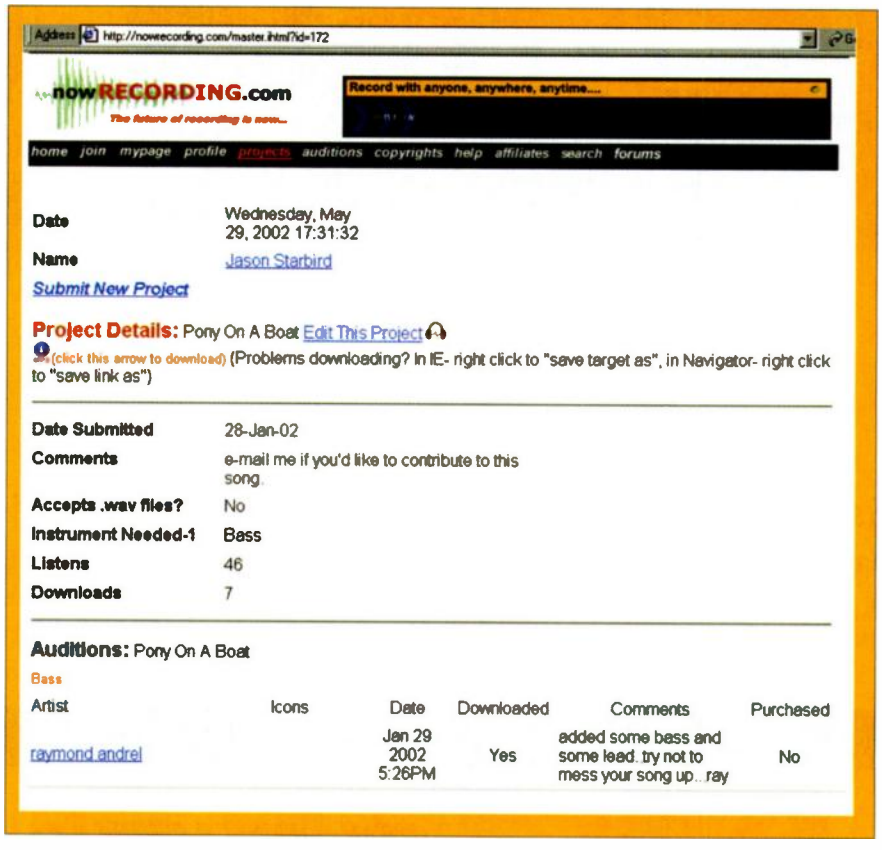

FIG. 2: NowRecording allows for searching of projects by genre and instruments needed. The Project page displays the creation date and activity and allows for downloading of the current version in MP3 format.

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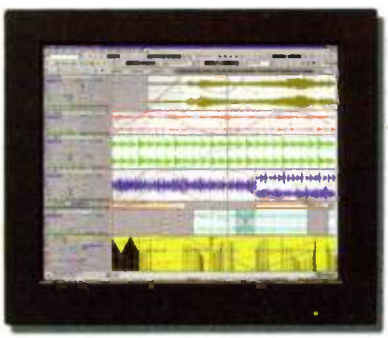

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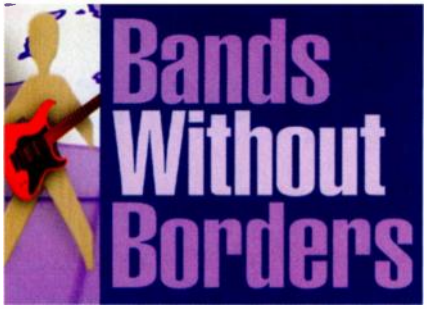

hand. For reference, a single 3-minute track at CD resolution takes at least 38 minutes to download at 56 kbps. Multiply that for stereo or multiple channels, and you can see that a dial-up connection may require a rather leisurely production schedule.

MP3s are more manageable but still take several minutes at best to download a full-length track or song. Pure MIDI transmits much more quickly, and MIDI with DLS offers an in-between option.

With cable-modem and DSL connections, MP3s download quickly, and even uncompressed audio is practical if not speedy. The biggest issue with these consumer-type high-speed connections is that they are asymmetrical, with substantially slower speed for uploading than for downloading. You might get your audio file in 2 minutes, but posting your new version would more likely take 20 minutes.

Although home connections may provide downloading rates of several megabits per second and uploading rates of about 1 Mbps, many businesses, including professional recording studios, use T3 lines offering around 44 Mbps in both directions. They make high-resolution audio production on a collaborative basis quite straightforward, especially when coupled with a service such as Rocket Network. On university campuses, speeds of 100 Mbps to the dorm rooms are now common.

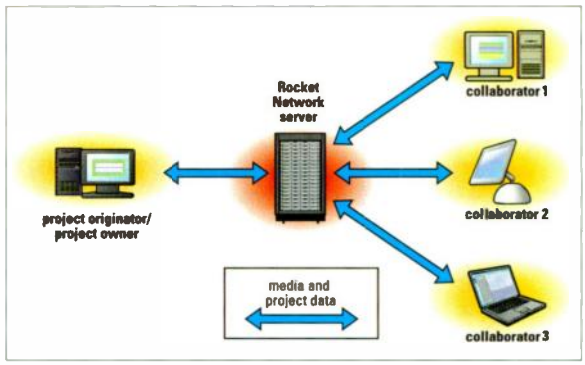

FIG. 4: The Rocket Network service works by maintaining the master version of the project, along with all media data, on its own servers. The local versions of the project used by each collaborator are updated automatically, with only new media elements uploaded and downloaded to minimize transfer times.

REAL-TIME JAMMING

As constituted, the Internet has little control over timing, and timing is critical for music and digital audio. Streaming works because chunks of data, arriving at uneven intervals, are buffered and then played out as a steady stream. That entails substantial latency that kills interaction at the rates needed for musical jamming. For the time being, Internet-based musical collaboration is a post-and-respond affair, though the interval between the two events can get down to seconds depending on the work.

Other types of connections, including ISDN and Virtual Private Networks, achieve more predictable results, but latency remains an issue. EdNet (www.ednet.com), for example, is an ISDN-based professional service that has been in business for a number of years. The costs of these high-speed connections are generally out of reach for personal music production but are justified in some professional situations.

Because of the technical hurdles, real-time jamming is simply not in the cards at the moment. However, Internet2 is an active initiative that promises increased bandwidth, mechanisms to reduce latency, and guaranteed timing. There are many technical and infrastructure problems to be solved, but some authorities predict that within five years, audio jamming on the Internet will be a practical option. Visit www.internet2.edu for more information on these developments.

FIG. 3: Tonos includes an MP3-based collaboration service along with various music-business services.

MP3-BASED COLLABORATION

Two Web sites, nowRecording (www.nowrecording.com) and Tonos (www.tonos.com), offer services to facilitate collaborative composition and songwriting through the use of MP3 files. NowRecording is a free site that focuses exclusively on musical collaboration. Tonos is subscription based but also offers music-business services. Of the two sites, nowRecording offers the better interface for identifying and auditioning projects.

NowRecording uses a community model in which projects are posted openly to solicit parts from other members. You can also search the membership list and invite specific players into a project. When you first visit the nowRecording home page, you can simply browse the site or search for current projects according to the genre and the requested instrumentation (see **Fig. 1**).

Once you have joined as a member (it's free and easy), you can download any project's MP3 file for audition (see **Fig. 2**), create projects of your own, and audition for any project that you've downloaded by posting your proposed part as an MP3 file at 128 kbps or higher.

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The owner of the project can listen to your part and decide whether to add it to the project, posting a new "mix" as parts are included.

It's a simple concept, equally suitable for electronically oriented musicians, traditional players, songwriters, and vocalists. The members are enthusiastic and active, and the musical quality of the projects, while variable, is fairly high.

According to site cofounder Henry Hutton, nowRecording came into being when his Raleigh, North Carolina, band broke up, and he and his partners found themselves holding a 40-song book with no one to record them. They decided to post their tunes on the Web and solicit contributions. A strong response convinced them that this was an idea whose time had come. "We may eventually offer advanced services for pay," Hutton says, "but for now we are just having a blast being in the front lines of the revolution in online musical collaboration."

Based as it is on MP3 lossy compression and a highly public user model, nowRecording is better suited to demos and songwriting than to serious production. Of course, nothing prevents users from taking their projects to other venues and continuing the effort with other tools. The site has identified and addressed a need, and the community spirit is infectious. (NowRecording has recently added several new features, including private projects, uncompressed file uploading and downloading, and track-for-hire services.)

One suggestion for the members, though, is to post their projects at higher MP3 bit rates. In my view, 128 kbps is just adequate, and some postings are hard to listen to. The improved sound is well worth the increased download time at 192 kbps or higher. I'd also like to see the site add provisions for including chord and lyric charts with a project.

The Tonos Studio section of the Tonos Web site offers services similar to those of nowRecording (see **Fig. 3**). However, it's more difficult to sort through projects on the site to determine which are active and worth considering. You have to jump through all the hoops of actually joining a project before you can even find out if it is still active. The site charges a subscription fee of $11.98 per month, but that includes other music-business services.

ROCKET NETWORK

The big dog in audio and music collaboration services is Rocket Network (www.rocketnetwork.com), and it is truly one of a kind. Started as ResRocket in the early 1990s, Rocket Network began life as a free service focused on MIDI-based collaboration. Over the years, its founders and engineers have developed a keen appreciation for the real issues of serious production-based collaboration on the Internet. The company has evolved into a decidedly commercial venture with funding from the likes of Avid Technologies and Vulcan Ventures.

Rocket Network focuses on meeting the needs of professional productions in which time is money and savings in production and travel add up quickly. At the same time, the company makes a strong effort to satisfy the needs of individual producers of more limited means.

Rather than sell its services directly to the end-user, Rocket relies on partners referred to as Studio Centers. A number of these are in operation, including one managed by **EM**'s parent company, Primedia. It's accessible from the **EM** Web site as netStudio. (See the sidebar "Rocket Launchpads" for a list of other Studio Centers.)

To use Rocket Network, you must have a workstation or sequencer program tailored to work with the company's technologies. So far Digidesign Pro Tools 5.2 (Mac version), Emagic Logic Platinum, and Steinberg Cubase VST and Cubasis offer direct support for RocketPower, the name for the end-user component of the service. Partnerships with Euphonix, Mark of the Unicorn, SADiE, Tascam, and WaveFrame have also been announced, but

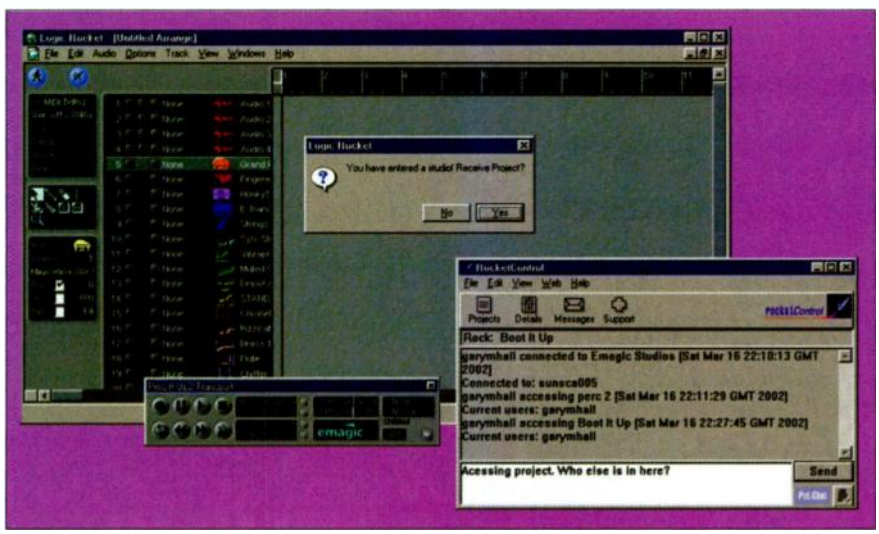

FIG. 5: With a Rocket-enabled application such as Pro Tools, Logic, or Cubase, you can log on to the Rocket Network server and download public sessions or private sessions that you have been invited to by the creator.

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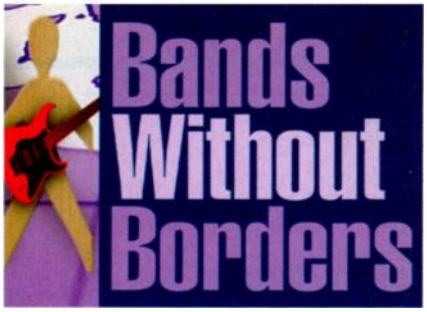

the products have not yet been released.

Rocket Network maintains several large data centers to hold projects and media data for its customers. In a Rocket Network project, the master version of the project is maintained on the company's server while local copies are maintained on the computer of each project team member. Changes made by any member of the project are mirrored to the other users (see **Fig. 4**).

Audio data can be uploaded to the server automatically and loaded to other collaborators at full source quality or using lossless or lossy data compression to minimize transfer time. Thus, team members have a complete copy of the project with all the media data locally on their system at all times, yet with the assurance that their version precisely reflects the master project.

If you're the end-user, the biggest limitation you face with Rocket Network is that you must use an audio-workstation application that supports the network. Emagic and Steinberg have free versions of their software (Logic Rocket on Mac or Windows and Cubasis In-Wired for Windows, respectively) that support RocketPower. Within the family of Rocket-enabled products, exchange of session files is supported, but to what extent is up to the development partner. Logic, Cubase, and Cubasis users are reported to be able to exchange data fairly freely.

The process of using Rocket Network starts with establishing an account at the Web site of a Rocket Studio Center. If you are already using a Rocket-enabled workstation connected to the Internet, you can sign up by selecting Rocket Network from the application's File menu. That launches the RocketPower log-in screen, where you can open a new account or log in under an existing screen name. Rocket has three levels of user accounts: a Private account is required to initiate and maintain a project; Pro-User accounts allow you to audition and contribute to projects maintained by others; and Free User accounts let users experiment with Public Sessions.

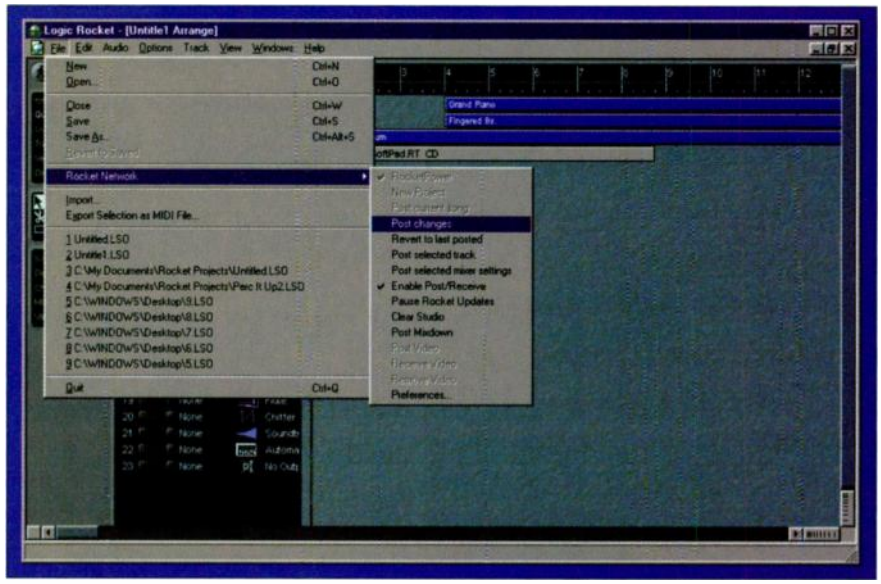

FIG. 6: The Rocket Network server maintains the master project. When you add tracks or make other changes, those changes can be posted. Audio parts are uploaded using lossless compression to speed the transfer without loss of audio quality. Other users in the session are immediately notified, and the data is downloaded automatically to their open project.

Once logged in at the Private level, you can create a new project (see **Fig. 5**). When creating a project, you also define who the other collaborators are and what their level of access is—from listen-only to full read, write, create, and delete.

Having established the project, you then define Sessions within the project. In general, a Rocket Session corresponds to one document on your workstation. Once you establish the Session, you can start the work by posting the Session document from your workstation using a drop-down menu in the workstation application (see **Fig. 6**). When you do that, the complete document, including all audio media files, is uploaded to the Rocket Network server. The Session document and all its source files are then transferred directly to any other Session members who are logged on. Members who log on later will load the current version of the Session at that time.

With the current Session document open on each of their workstations, members of a project can make changes locally and then use the Rocket Network drop-down menu to post the changes. When an updated version is posted, the Rocket Network server compares the new version of the document to the master version and uploads only those media elements that are new or changed, using a lossless, near-lossless, or audition (lossy) compression level as defined by the project's owner or administrator. The server's master copy of the project is updated to reflect the changes, and all project members are automatically sent updates, again downloading just the media elements that are needed.

The Rocket Network menu also provides for posting of MP3, WAV, or AIFF audio files, called Mixdowns. These files can be used in the early stages of a project to develop ideas or as actual proposed mixes as the project progresses. The system includes real-time messaging, mail, and bulletin-board services that can keep all members in contact for the duration of a project.

In use, Rocket does seem a bit magical, with new parts evidently appearing by themselves and all collaborators in constant and easy contact with each other. When using MIDI data rather

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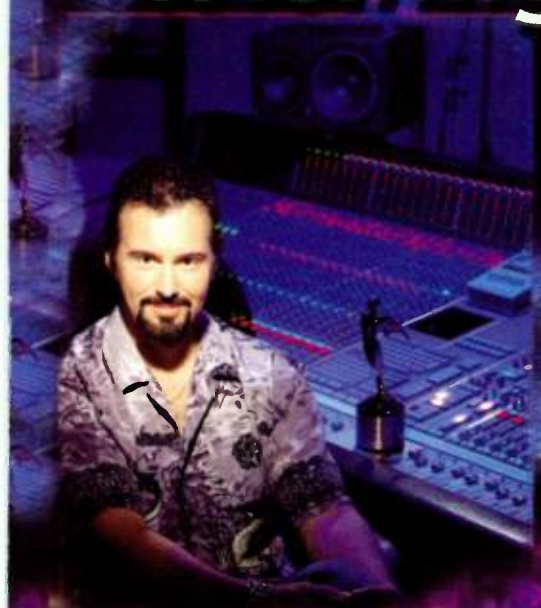

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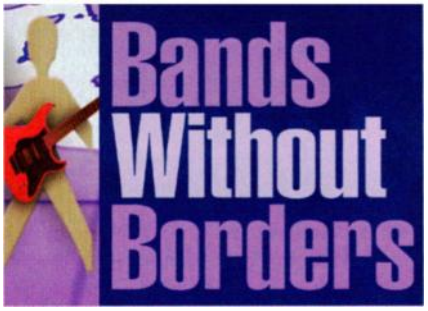

than digital audio, the effect is especially striking, because new parts can show up almost instantly.

Part of the Rocket interface is maintained as a Web site, with screens to list, create, and delete projects, Sessions, and Mixdowns. Account holders can access the site while logged on to a Session or at any time from a Web browser (see **Fig. 7**).

Rocket Network has done a good job of identifying and addressing the difficult issues of version control and transfer time. The system is pretty robust and scales well to any level of fidelity and project size needed. Compatibility issues are resolved primarily through the restriction of requiring Rocket-enabled applications, which is a reasonable trade for the benefit.

It is true that there is no free lunch, but you can sometimes get a few snacks. That's the case with Rocket Network. Each Rocket Studio Center offers a free account level that allows access to "public" projects posted on that center's site. At the free-account level, you cannot create projects or join the projects of other Rocket members; public projects are created only by the Studio Center and offer an opportunity to check out the system.

As mentioned before, Rocket offers three membership categories. Prices vary from one Studio Center to another, so the following rates are approximate. Pro User accounts cost a one-time fee of $29.95 and allow for unlimited participation in existing projects (at the behest and permission of project owners).

At the level of Private user, you can create and administer projects of your own. Pricing for Private-level accounts covers a wide range, from a pay-as-you-go plan to $10 to $1,200 a month, depending on the amount of storage space and data transfer provided. As with cell-phone plans, there are provisions for additional charges if you exceed the storage or transfer limits of your plan.

A matrix of plans and pricing is provided at the Studio Center, and it's not hard to see how much data storage and transfer come with each option. The difficult part is understanding what you can actually do with any amount of either. For example, at the DigiStudio Studio Center maintained by Digidesign, $10 per month gives you 50 MB of storage and 300 MB of data transfer per month, whereas the top-of-the-range plan offers 10 GB of storage and

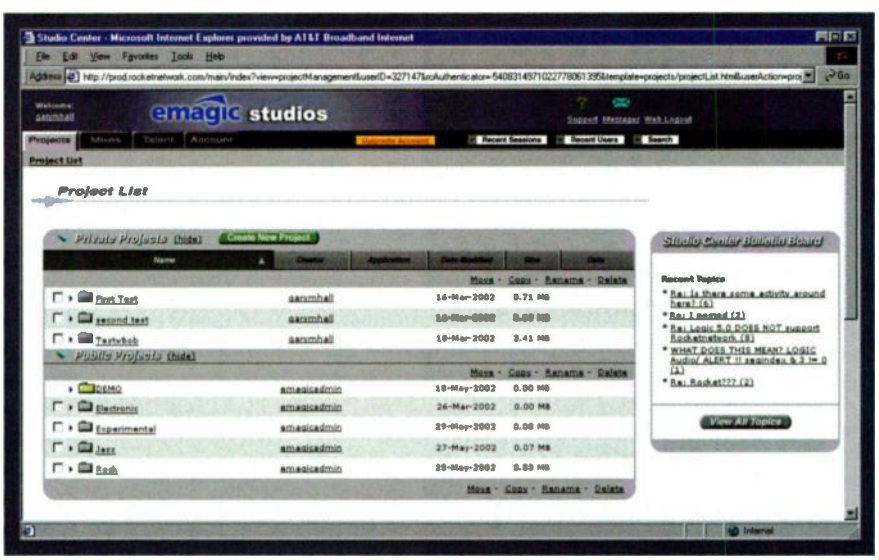

FIG. 7: The Rocket Studio Center host provides access to a Web-based interface for browsing and managing projects, including Session and Mixdown information.

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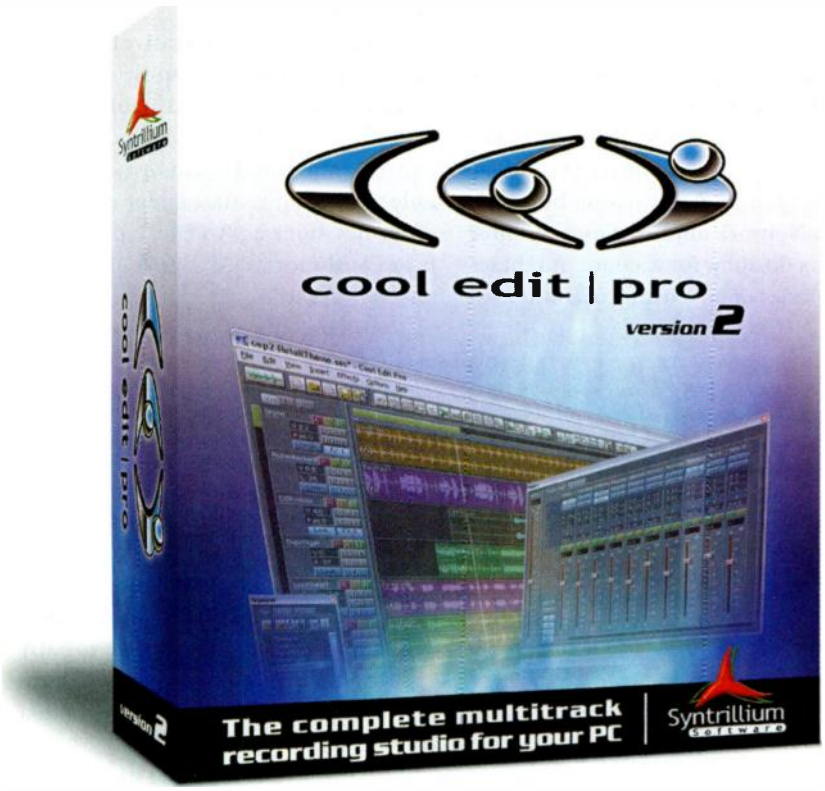

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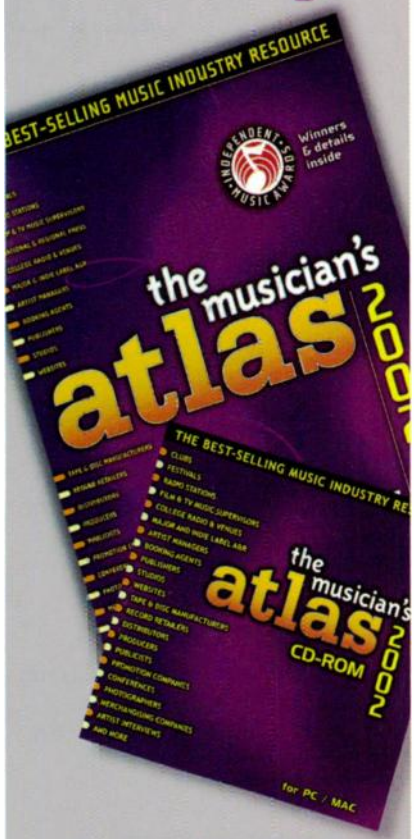

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WHAT'S AHEAD?

Making music collaboratively on the Internet offers much potential for artistic satisfaction and professional benefits, although it's necessary to consider the pitfalls and options available. For tomorrow, expect to see facilitators such as Rocket Network in more and more DAWs and hardware-based workstations. The same ideas will be increasingly applied to video production as well. In all likelihood, community-based services such as nowRecording will also expand, with more options for active collaboration.

Ongoing developments on the Internet will eventually bring another big bump in bandwidth. If the Internet2 initiative gathers momentum, you may see greatly reduced latency. Real-time jamming on the Net could become a reality.

If you're new to the idea of collaborating online or have worked only with individual partners on a roll-your-own basis, take a look at nowRecording and Rocket Network. Some exciting territory awaits you, and the time is ripe for exploration.

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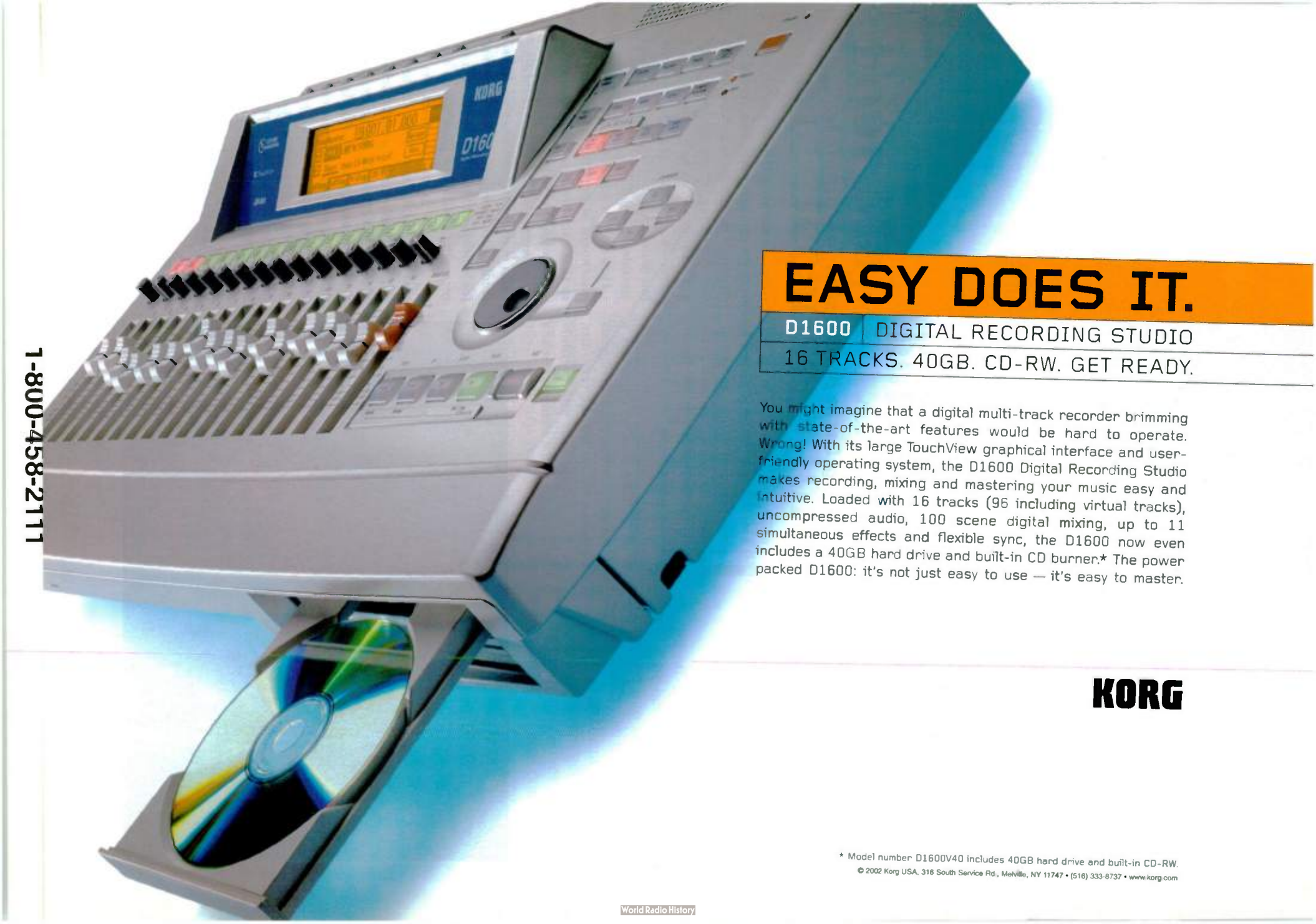

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the limitations of the space (or spaces), and time constraints on setup. Does the situation call for a traditional sound, which typically includes a lot of ambience (room sound)? Or would it be better to go for a more controlled studio sound in which everything is isolated and close-miked? The latter approach may be best for a band with more of a pop feel, but how far you are able to go with it depends on the gear, facilities, and time available. The traditional, more blended sound remains a classic and usually makes the most sense if resources are limited.

Assuming the music allows for it, you can also overdub the instruments one at a time—usually the simpler, more economical approach, at least for the small personal studio. But, of course, that method doesn't permit the same level of musical communication that can occur among members of an ensemble performing together. Many of the same recording techniques still apply, though.

BALANCING ACT

Challenges you will face recording a percussion group at once include microphone bleed (sound from one instrument entering another instrument's mic), different sound sources competing for the same frequency ranges, and phase problems resulting from using multiple mics. These variables should influence your choice of microphones, how you position them, and how you deal with the sounds in the mix.

When recording multiple instruments in a single space, mic bleed can be controlled by a combination of two techniques: strategic use of directional mics, and arrangement of physical barriers such as gobos. Generally, the more of one technique you use, the less you need of the other.

One problem with gobos is that they can obscure line of sight between musicians—often a critical element for ensembles. Here is where careful positioning of unidirectional mics—cardioid, supercardioid, and hypercardioid—can save the day. If possible, take a look at the mic's polar-response plot to see where its null points fall (see Fig. 1). More importantly, listen carefully to familiarize yourself with each mic's rejection characteristics. That can further help you determine which mic to assign to which instrument.

Microphone type must also be taken into account. Condenser mics are usually more sensitive and capture more detail, but they also pick up more room sound. Dynamics, on the other hand, typically provide better off-axis rejection, and thus are desirable when you need tighter, more focused sounds. Either type of transducer can usually be made to work, though—what matters more is how you position the mic.

The basic strategy for minimizing bleed using directional mics is to set up each mic so it "hears" primarily one instrument and its rejection zone is "aimed" at any other miked instruments in the same space (see Fig. 2). Note, too, that, in general, the closer the mic is to the source, the less it will hear the rest of the space. Then again, when using directional mics, bass boosting from the proximity effect must also be taken into account—some instruments can sound boomy, bass heavy, or otherwise unnatural when miked too close. Hence the "considerable skill" I mentioned in my opening paragraph—balancing all of these sometimes-divergent, sometimes-convergent elements is not something that can be learned in a fortnight.

Finally, keep in mind that mic bleed isn't necessarily a bad thing. In fact, it can sometimes contribute positively to a sense of space and thus realism in a recording.

CROWD CONTROL

Cressman observes that many Latin-music producers tend to push for a hyped high end, making the mix brighter and brighter with each added instrument. He advises recognizing the frequency emphasis of each element and working to put everything together so the instruments don't compete for the same frequency strata. In short, make sure everything has its own place in the mix. EQ applied during mixdown can help, but be careful to differentiate between EQ and level problems—an instrument can sound too bright and cutting simply because it is too loud in the mix.

No matter what precautions you take, any time you use multiple mics on a sound source or group of sources, some phase problems are likely to sneak in. The three-to-one rule, which states that the distance between two mics should be at least three times the mic-to-source distance, is always good to keep in mind when positioning multiple mics (for more information, see "Recording Musician: Avoiding Phase Cancellation" in the July 1997 EM). However, some percussion setups are so tightly arranged that it can be difficult to follow that rule.

Theakston has a remedy for hard-to-avoid phase problems: EQ. For example, try rolling off the highs on a mic that's capturing primarily low-end sounds and cutting the lows on a mic set to pick up higher-frequency information. "That will help clean up any phase mess that happens in the overlapping frequency bands," explains Theakston, "making the signals much easier to manage in the final mix."

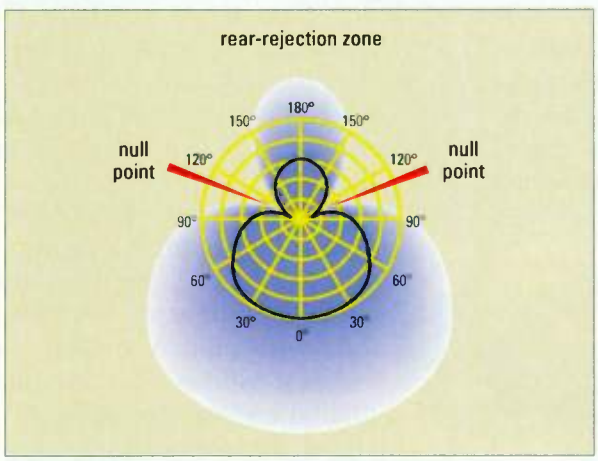

FIG. 1: In this typical polar plot for a unidirectional (supercardioid) pattern, the null points—where rejection is greatest—fall at 120 degrees on either side. The lobe between the null points doesn't extend far, though, so rejection is good across the rear of the mic.

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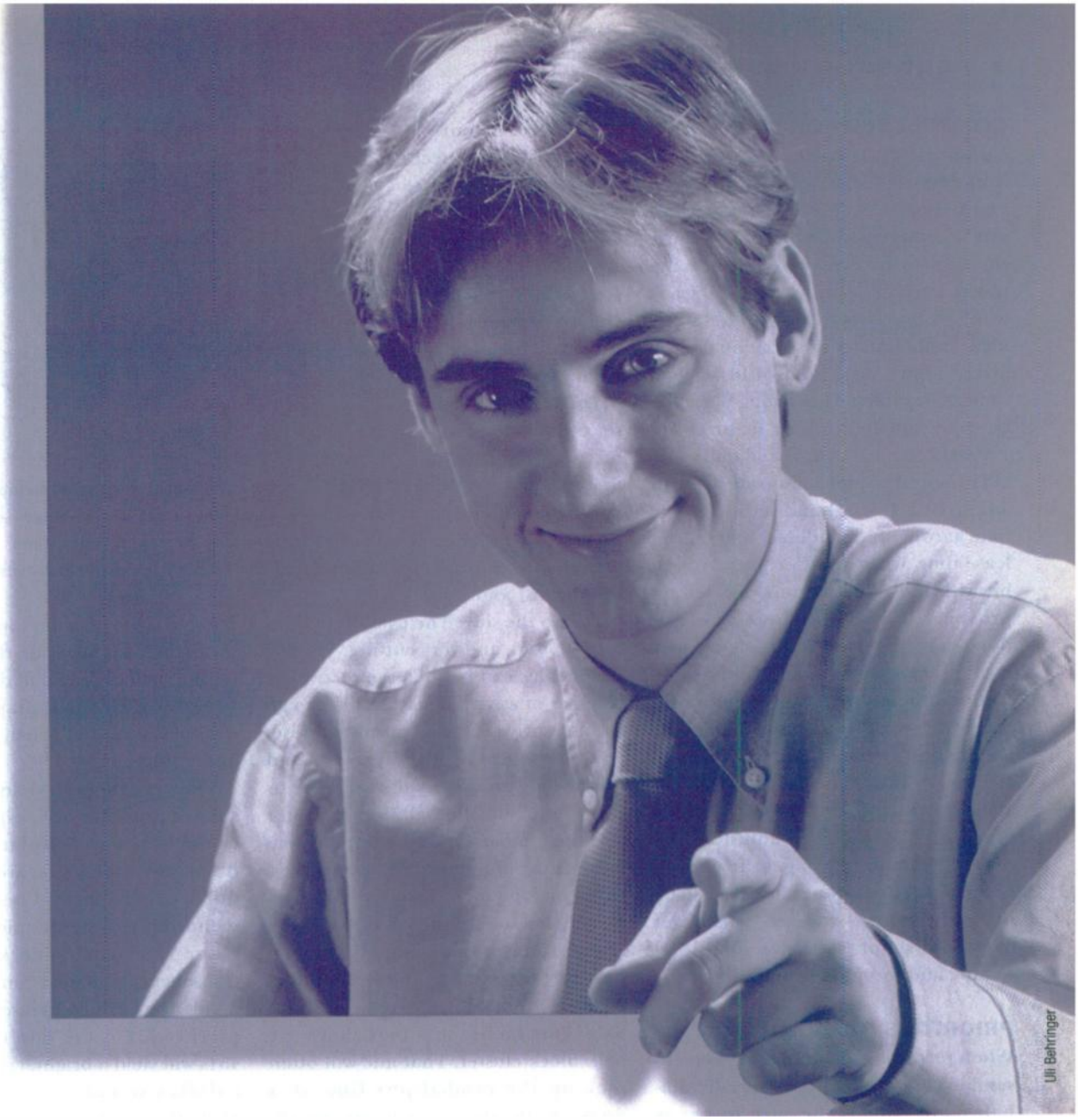

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COMPRESSED FOR TIME

Compression is handy for bringing sound sources forward. However, some engineers, such as Cressman, prefer not to compress while tracking because the effects are irreversible once the tracks are laid down. Others will track with gentle compression to help elements stand out. "You're essentially creating focus, as you would with a camera," explains Theakston. "That can be especially helpful for featured instruments such as congas and timbales."

Theakston recommends starting with a ratio of 2:1 or 3:1 and setting attack time at roughly 30 milliseconds and release time at 200 milliseconds. Work a bit with the settings until you get approximately 3 dB of compression. But don't set the attack too fast—on percussion instruments, the leading-edge transient needs to get through or else the sound won't be natural. To increase sustain and resonance of, say, a conga, try lengthening the release time to somewhere between 200 milliseconds and 1 second and then adjusting the makeup gain until you get the desired result. For ancillary percussion—shakers and the like—you can usually get away with simply setting a good level to tape and foregoing compression.

PRIORITIES STRAIGHT

When recording a Latin-percussion ensemble, the priorities are usually timbales and congas. Be sure to get as clean a track as possible for these lead instruments, either by providing some isolation with gobos or by putting the players in separate rooms.

If you're recording the whole group in the same room, use directional mics as previously described, letting room dynamics and proximity of other musicians determine optimal setup. On the other hand, if you're overdubbing one instrument at a time, try changing the distance between mic(s) and source for each track. That technique can add a nice sense of spatial dimension when the tracks are mixed together. Another way to enhance the realism of separately overdubbed tracks is to use a distant or ambient mic in addition to the closer mic(s) trained on the instrument(s).

Now let's look at techniques and mic choices specific to recording common Latin-percussion instruments. I'll start with the "lead" instruments and work outward to more peripheral ones.

Timbales. Typically a set of timbales consists of two single-headed drums, a woodblock, and two cowbells (one "mambo" and one "cha-cha") mounted between the drums, and a cymbal off to the side. The overall sound is bright, loud, and very cutting.

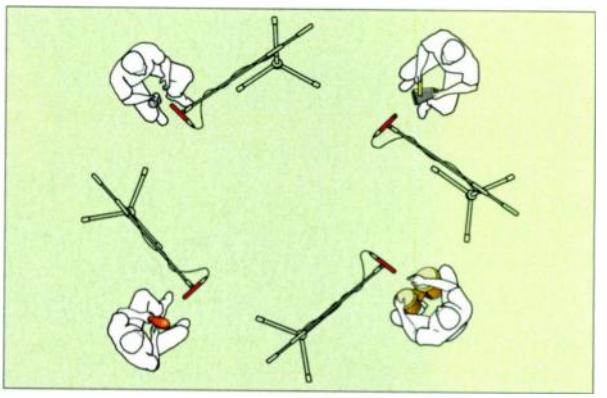

FIG. 2: Location is everything: when using multiple microphones in a single space, you can minimize bleed—sometimes to a remarkable degree—by taking advantage of the natural rear-rejection characteristics of directional mics.

Timbales can be miked effectively a number of ways. Theakston likes to go for a tightly focused sound by close-miking the drums with dynamics and positioning an overhead condenser or two to pick up the bell/block cluster and the cymbal. On the drums he generally uses Sennheiser MD 421s placed three or four inches from each drum and angled toward the head (see Fig. 3). He positions a small-diaphragm condenser (such as an Audio-Technica AT4051, Neumann KM 184, or Shure SM81) six inches to a foot above the bell/block cluster. That mic will often pick up the cymbal just fine; if it doesn't, position a second small-diaphragm condenser to pick up the cymbal. Theakston recommends using a highpass filter to roll off the low end on the condenser mic(s) so the low-midrange frequency content from the drums won't be in phase competition with the bells, block, and cymbal.

Cressman usually takes a similar approach, but with condensers on the drums rather than dynamics. The two condenser mics—he favors Neumann KM 84s for this application, but similar small-diaphragm condensers will also work—are positioned further back, about a foot away from the outside of the two drums, and angled down slightly (about ten degrees in relation to the plane of the drumheads) toward the heads. These two mics capture a good balance of drum tone and *cascara* part (the characteristic rhythm played on the shell of the small timbale), while the overhead small-diaphragm condenser(s) pick up the bell/block cluster and cymbal.

Stereo-miking can yield excellent results on timbales, too, especially if the timbales are well isolated from the other instruments or are being overdubbed individually. Cressman recommends using a stereo mic, such as the Shure VP88 (a mid-side, self-matrixing transducer), or a near-coincident or coincident pair of condensers positioned overhead. For the latter setup, AKG 451s will yield a bright, crisp sound; for a darker sound, try Shure KSM32s. Place the mic pair about 18 inches to two feet above the bell/block cluster. If the mics are positioned too close to the drums, you'll pick up too much cowbell sound, so work with the distance until the levels of the bells and drums are in balance.

"This approach gives you a full, honest, phase-accurate picture of the instrument along with some natural room sound," says Cressman. "The beauty of it is that you don't have to handcraft the overall sound of the instrument later—which is what you end up having to do if you mic each element separately."

Another effective way to record timbales in stereo is with a spaced pair of condensers. Place the mics at overhead height, about two feet in front and

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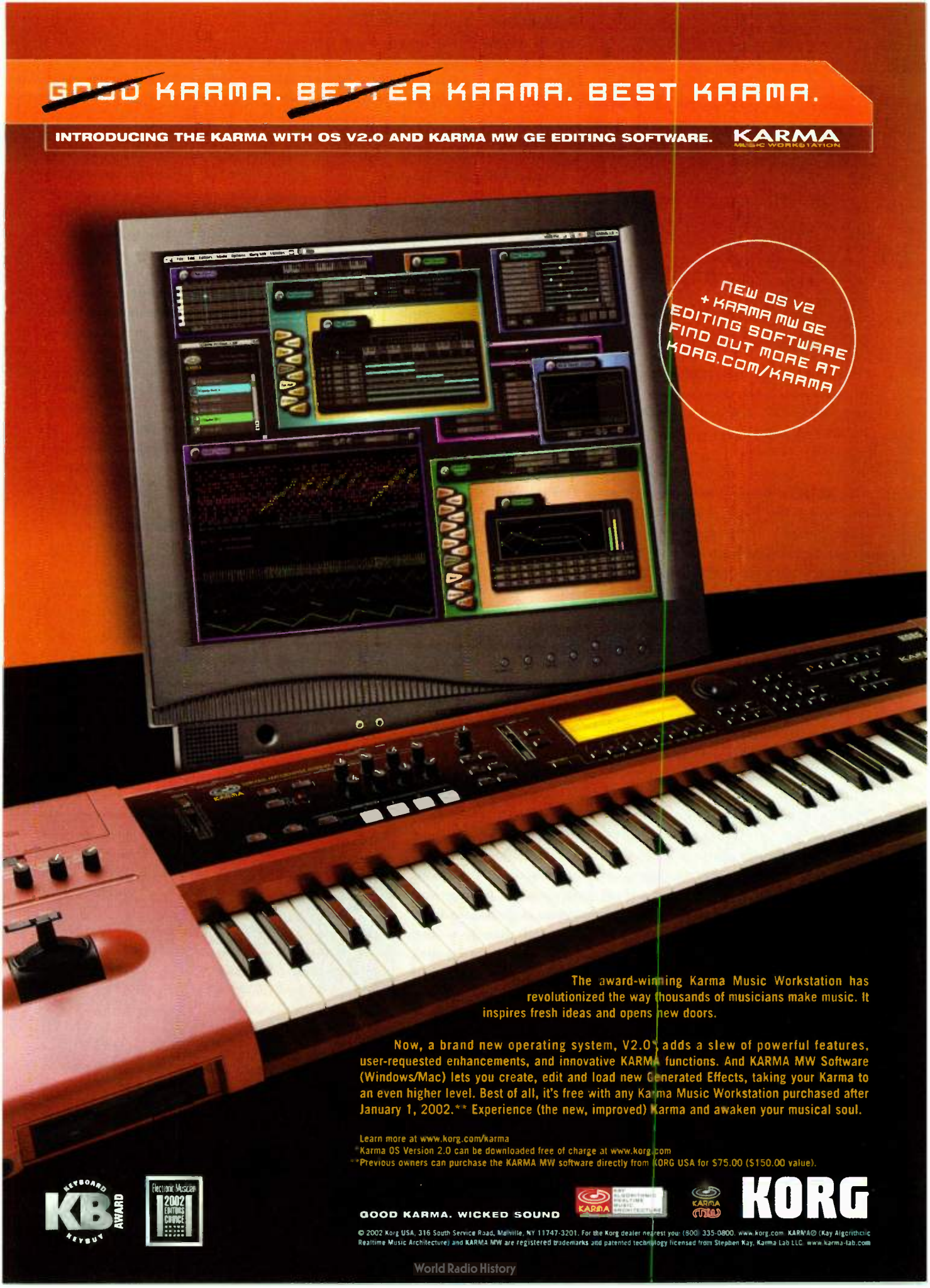
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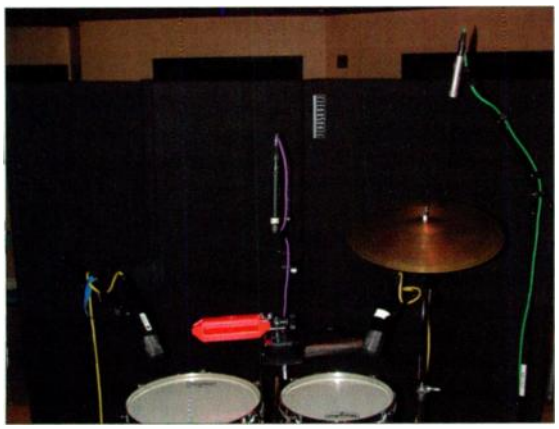

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FIG. 3: This timbalito setup is miked with two dynamics and two condensers: a Sennheiser MD 421 on each drum, an Audio-Technica AT4051 over the bell/block cluster, and a Neumann KM 184 over the cymbal.

three feet apart as a starting point, and play with the positioning and pickup patterns to get the best sound. A cardioid pattern will give you a tighter sound, whereas an omni or figure-8 will capture more room reflections and diffusion, resulting in a more live sound. Cressman has had success with a spaced pair of omnidirectional Neumann KM 183s positioned about three feet apart and 12 to 18 inches from the front of each drum. You can also get great results with large-diaphragm condensers (for example, Shure KSM32s, Neumann U 87s, or AKG C 414 B-ULSs).

Of course, timbales don't have to be stereo-miked—you can also get great results from a single well-positioned microphone. Given that musical styles featuring timbales (salsa, son, timba, and others) often involve a dozen or more instruments, making for rather busy mixes, you may find that a mono image will suffice. Position a quality large-diaphragm condenser, such as a Neumann U 87, in front and above, pointing down at the timbales. Cardioid is the appropriate pattern if you need rear rejection, but if not, be sure to audition the figure-8 and omni patterns as well—the additional room sound can be enticing. For a different, somewhat more vintage sound, try a ribbon mic—I've gotten great results using a Coles 4038.

Congas. Congas are single-headed hand drums commonly played in sets of two or three. Directional dynamic mics are commonly used for their superior off-axis rejection but are favored also for their tonal characteristics. The old standby Shure SM57, for example, has a meaty midrange that adds oomph and a presence peak that enhances slaps and pops. Another popular choice is the Sennheiser MD 421. Position the mic three to four inches from the head, angled toward the center of the skin so as to pick up both the drum's fundamental tone and hand and finger articulations.

If the *conguero* (the conga player) is using four or five drums and there's sufficient isolation, mini clip-on condensers such as the Shure Beta 98 or Audix Micro-D can reduce mic-stand clutter and provide a crisp, detailed sound. "The challenge when miking a multiconga setup is getting all the tones to speak evenly," says Cressman. "If you're getting too much bleed from adjacent drums, you may need to use some EQ to tone down the fundamental tone of an off-axis drum."

If bleed isn't a problem, small-diaphragm cardioid condensers such as Neumann KM 184s, Audio-Technica AT4051s, and Oktava MC012s are excellent choices for miking congas. For an even more natural sound—one without boosted lows from the proximity effect—use a small-diaphragm omni such as the Neumann KM 183.

To increase low-end punch and resonance, position a floor mic beneath the drum (in addition to the close mic on the head). If the conguero is seated and has the drums resting on the floor and tilted back (a standard position), place a large-diaphragm condenser six inches to a foot away and aimed toward the section of floor beneath the drum. This will catch the lows from the drum cavity reflecting off the floor. Theakston likes using a darker-sounding condenser such as Shure's KSM32 for this application. He advises rolling off the top end above 4 kHz to reduce overlapping frequencies and any phase problems between the top and bottom mics. (You should also try reversing polarity on one of the two mics and listening to the results.)

If the congas are stand mounted, try placing a dynamic mic—the MD 421 is a good choice—three or four inches beneath the drum, aimed up inside the cavity. Reverse the polarity on this bottom mic and audition the combined sound—it will likely be better, as the two mics on the drum are aimed more or less toward one another. To increase low-frequency sustain, add some gentle compression on the low mic.

Bongos. The bongos consist of two small hand drums, the *embra* (large) and *macho* (small). The pair is typically played either suspended between the knees or supported on a stand. Often, a single mic, either a dynamic or a small-diaphragm condenser, is sufficient to capture both drums. Place the mic about four or so inches above and between the drums, positioned to capture

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FIG. 4: Using two microphones on shekere enhances the distinction between the instrument's high and low timbres, allowing for more tonal (and spatial) control in the mix. Here, a Neumann KM 184 is positioned to pick up primarily bead slaps and finger taps and a Shure KSM32 is set up to capture the low boom coming from the mouth of the gourd.

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a balance of the macho and the embra. "There's a certain amount of depth on the embra side that you want to make sure to capture," says Cressman. "Balance that strong fundamental with the slap on the macho side, making sure that the slap has a good tone also."

If you're doing an overdub session and want a brighter, more sparkly bongo sound, record in a live-sounding room to take advantage of room reflections. Theakston generally reaches for an SM57 or KM 184. To increase ambience, he recommends using a large-diaphragm condenser, such as a Neumann TLM 103, positioned about six inches back from the heads.

Shekere. Despite its simple appearance, the shekere—essentially a hollow gourd enveloped in a beaded net—is a sonically complex instrument. A deep tone emanates from the mouth of the gourd, the net rattles against the sides of the instrument, and the player's fingers tap the base of the gourd, making for three ranges of timbres.

To capture a blend of these sounds with a single mic, Cressman suggests using a condenser—large- or small-diaphragm—positioned at about shoulder height and a foot or so in front of the player. However, if the shekere is to be prominently featured in the mix, you may desire more individual control of the low and high sounds. Use two mics in that case: a large-diaphragm condenser on one end, positioned to capture the low note from the gourd's mouth, and a small-diaphragm condenser on the other end, aimed to pick up the finger taps and bead slaps (see **Fig. 4**). Be sure to experiment with reversing the polarity on one of the mics so you can determine what arrangement yields the best sound.

Cowbell. Latin-style cowbell patterns project both a high-frequency transient from the closed end of the bell and a lower, more open (though still muted) tone from the mouth of the bell. The high part usually cuts well through a mix, but the fundamental can get lost. The SM57 and MD 421 are again good candidates—either can readily handle the SPLs, and their focused directionality can help to tighten up the sound.

Among condensers, Theakston favors the KSM32, again for its characteristic darker tone. But as Cressman points out, "pretty much any mic can work, as long as you position it well." Indeed, he once, by necessity, used an AKG D112 (commonly regarded as a kick-drum mic) for this application—and it worked well on the low bell he was recording, thanks to the mic's abundant lows and high-end presence boost.

In general, though, Cressman prefers miking cowbell with a small-diaphragm condenser, such as an Oktava MC012 or a Neumann KM 84. He recommends placing the mic approximately a foot in front of the player, positioned slightly below the mouth of the bell and angled upward (see **Fig. 5**). That puts the back part of the bell farther away from the mic, which helps to balance the disparate levels of the two tones. "The idea is to make sure you get enough of the fundamental note and not too much high-end clank," explains Cressman. Remember, too, that players tend to move around when they play, so make sure the microphone is far enough back that they're not moving off-mic.

Claves. Claves are loud! Theakston often overdubs the clave track to ensure that the sound doesn't bleed into other mics. But keep the aesthetic of the musical piece in mind. If you want a tighter sound, control room reflections by baffling off the area where the claves are being played. If you're going for a more open, Buena Vista Social Club kind of vibe, then let in the reflections.

Though many different mics will work for claves, Theakston recommends using a cardioid condenser, either large- or small-diaphragm. In a pinch, an SM57 will also work. Both Theakston and Cressman advise against limiting because claves are all about that transient attack. Find a level that works without overloading and track the instrument straight.

BRIAN KNAVE

FIG. 5: When miking Latin cowbell, the trick is to find a balance between the high note (played on top of the bell with the tip or butt of the stick) and the low (played on the open edge of the bell with the shoulder of the stick). Note that the mic is angled to avoid aiming directly on-axis into the mouth of the bell.

PERCUSSION TABLE

Other idiophones found in Latin-music ensembles include guiro, maracas, cabasa, shakers, and triangle. If the percussionist is playing these instruments in a room with other musicians, Theakston and Cressman recommend miking with a small-diaphragm condenser, because those are more focused than large-diaphragm condensers. In general, position the mic a foot or so away from the player to allow for a fairly broad pickup zone—you don't want to limit the percussionist's range of movement.

With overdubs for maracas, cabasa, guiro, or shaker, avoid miking the instrument too closely—some air around the sound is usually a good thing. Theakston recommends setting up a stereo coincident pair of large-diaphragm condensers (or a dedicated stereo mic) about two to three feet in front of the player in a good-sounding, fairly live room. That way you capture a nice balance of the direct instrument sound and some room sound.

Karen Stackpole *is a recording engineer and percussionist who teaches Sound Arts at Ex'pression Center for New Media. Muchas gracias to Jeff Cressman and Scott Theakston.*

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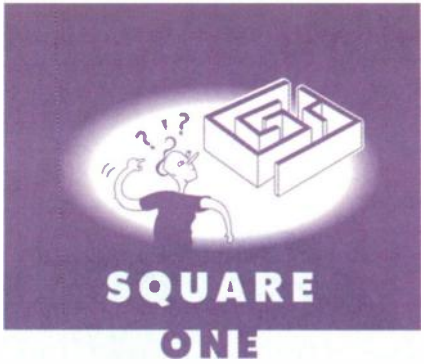
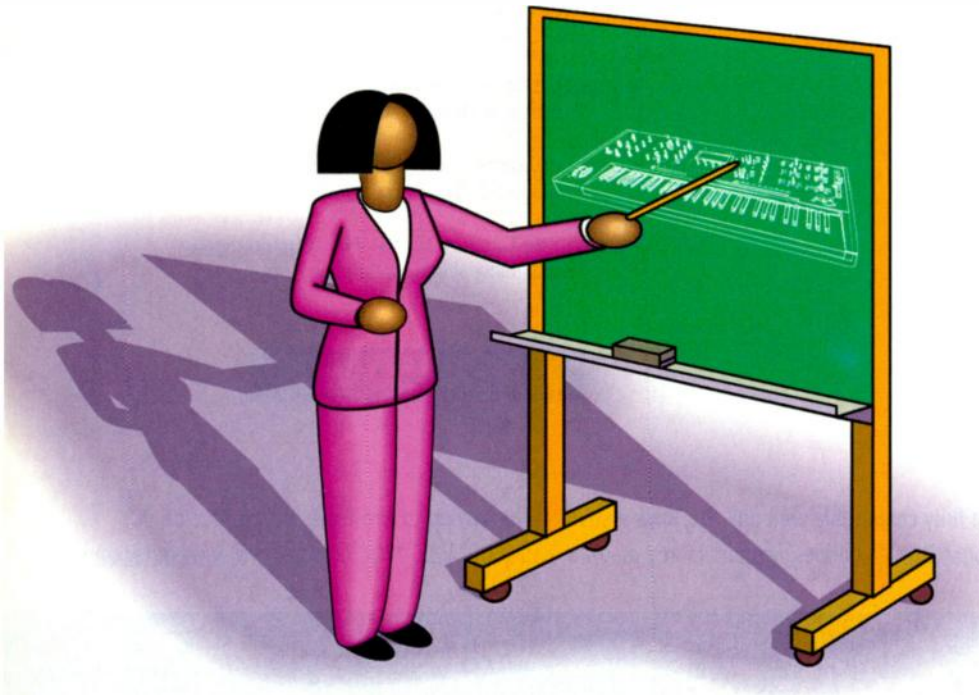


Synth Programming 101

Learn how to tweak your brand-new synth.

By Len Sasso

Most synthesizers and samplers these days come with hundreds of preset sounds. When combined with the vast number of user-created preset banks floating around the Internet and the array of expansion cards available for many hardware models, you may wonder why anyone would bother to learn how to program one of these beasts. The answer, of course, is originality, and it's a lot simpler than you might think to tweak your way to new sounds that will set off your next masterpiece.



In this article, I'll take an operational approach to synthesizer programming by exploring the quickest route to customizing factory presets. Our starting point will be the General MIDI (GM) sound set, which contains 128 sounds covering all of the basic categories. Most synths and many samplers contain a bank conforming to the GM standard. But if that doesn't include your model, you can still follow along, because everything I cover here will apply in almost any context.

One thing you will definitely need is a programmable instrument of some sort. That can be a hardware or software synthesizer or sampler of just about any design. If you only have a preset synth (such as the Yamaha CBX-K1XG), you may still be able to get some mileage out of it if it allows MIDI or built-in controllers to alter basic preset parameters. I'll refer to that option as we go along.

GETTING UNDER THE HOOD

The first thing you need to do—which is also often the biggest hurdle to overcome—is to learn how to get into your module's patch or program editor and find the various settings you want to

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working with a preset-only synth, MIDI Control Change messages 72, 73, and 80 can often be used to control the release, attack, and decay times.) Audio Example 1 uses four sounds derived from a piano program by modifying only the amplitude envelope.

Modern synths, especially software ones, often extend the basic ADSR concept in two ways: they provide more stages and they offer control over the shape of each ramp. With the exception of the Organ, the envelopes pictured in Fig. 1 all have curved ramps, which best match the behavior of acoustic instruments.

Many synths allow MIDI Note Velocity to affect both the envelope levels and times. That allows you to play much more expressively using your MIDI keyboard. With piano sounds, for example, having the attack level (or the overall envelope level) and the decay time increase for higher Velocities gives a more realistic keyboard feel.

LESS IS MORE

In the early days of synthesis, a synthesizer's sound was characterized by filters more than anything else. With the much-expanded sound palette of today's models, the filter may be slightly less important, but it is still a key element in sound design.

Synthesizer filters are characterized by how they affect different parts of the frequency spectrum. *Lowpass* filters (like the treble control on your stereo) reduce the level of higher frequencies while leaving lower frequencies unchanged. *Highpass* filters do the opposite, and *bandpass* and *band-reject* filters reduce the level of frequencies inside or outside of a frequency band. Lowpass filters are the most common, and if your synth has only one type of filter, that is what it will be. However, it's not unusual for a synth to have a filter that is switchable among the four modes just mentioned, or even to have several filters of different types that can be arranged in *series* (operating successively) or *parallel* (operating simultaneously).

The filter setting over which you will always have control is the *cutoff frequency*. For lowpass and highpass filters, that is the frequency at which the signal level is reduced by half. For bandpass and band-reject filters, it is the center of the band. For lowpass and highpass filters, there is usually a *resonance* setting as well. That determines how much the signal is boosted (if at all) just before the cutoff frequency. Bandpass and band-reject filters sometimes have a *Q* setting that controls the width of the affected band. (If you're working with a preset-only synth, MIDI Controller numbers 71 and 74 can often be used to control the resonance and cutoff.) **Fig. 2** illustrates the four common filter shapes and the effect of resonance.

Fixed settings for filter cutoff and resonance allow you to color the sound much as you would with tone controls

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or a graphic equalizer. However, things don't become interesting (and synthy) until you start changing those settings in real time. The most common tool for that job is an envelope. Usually there is an envelope dedicated to the filter with settings identical to those previously discussed for the amplitude envelope. Audio Example 2 adds resonant-filter enveloping and other modulation (more on that later) to the sounds in Example 1.

A filter's effect varies with the pitch of the sound being filtered. For that reason, you will usually find a setting called *keyboard tracking* or *pitch tracking* in the filter section of your synth. It determines how much the filter cutoff frequency is affected by the pitches being played. The keyboard-tracking range can typically be varied from zero (no tracking) to two (cutoff increases twice as fast as pitch). On some synths, it can also be inverted, causing the cutoff frequency to move down as the pitch moves up.

Keyboard tracking may not seem like a big deal, but with careful adjusting it can add life to a dead sound or it can smooth a raspy, too-bright sound. It is also useful for very-high-resonance filter effects in which you actually hear a tone at the filter's cutoff frequency. For an example, listen to GM preset 122, which produces a keyboard-tracking whistling effect using noise as a sound source.

IN THE BEGINNING

So far, we've looked at envelopes and filters for controlling the contour and frequency content of a sound. That, of course, assumes we have a sound to control. For that, your synth will have one or more sound generators, most likely referred to as *oscillators, tone generators,* or *wave generators.* The output of the sound generators might be mixed and processed by a single filter and amplifier (with a single set of envelopes), or they might each have their own signal path including filters, envelopes, and amplifiers. In the latter case, each signal path will probably claim a note from your overall note count. (For details, see the sidebar "Notes, Layers, and Channels.")

Oscillators work in one of two ways: they generate "synthetic" waveforms, or they play samples. (Although a bit of an oversimplification, that covers most of the bases.) In either case, you can select the waveform or sample to be played. In the case of oscillators that generate waveforms, you'll have fewer initial choices, but you'll have settings with names like *symmetry, pulse width,* and *sync* that give you additional control of the sound. In the case of sample players, you'll typically have a large selection (in the hundreds) of sounds, but fewer ways to manipulate them. Let's start with waveforms.

THE SHAPE OF THINGS

Fig. 3 shows three standard oscillator waveforms on the left (sine, triangle, and square) and the result of modifying their symmetry (sine and triangle) or pulse width (square) on the right. Changing a waveform's symmetry or pulse width alters its harmonic content,

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REVIEWS

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TASCAM

DM-24

The desktop digital mixer grows more powerful and less expensive.

By Larry the O

Although digital audio workstations and standalone digital mixers both offer advantages, there are several good reasons to use a standalone digital mixer instead of mixing entirely with a mouse in a DAW program. By offering the obvious benefits of real faders and knobs, easy monitoring with negligible latency, and hardware control of DAWs, modern digital mixers grant the kind of tactile mixing that mouse jockeys only dream of. Most digital mixers also furnish EQ and compression on every channel without taxing your CPU or increasing latency and memory consumption as plug-ins do.

Such advantages are well illustrated by Tascam's latest offering, the DM-24, which is positively stuffed with goodies that modern studios need. Tascam was not the first or even the second company to plunge into the small-format digital-mixer market, but its entries have steadily gained popularity.

The DM-24 features a potential 36 analog and 24 digital inputs, TDIF and ADAT Lightpipe I/O, 96 kHz operation, surround mixing, onboard effects by TC Works and Antares, extensive machine-control capabilities, and sophisticated

FIG. 1: Overflowing with useful features, the Tascam DM-24 advances the state of personal-studio mixers as it brings down the expense. Note that all analog inputs and outputs are located at the top of the front panel.

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($249), with eight channels of ADAT Lightpipe and an ADAT sync connector. Also available are the IF-AE/DM ($299), with eight AES/EBU I/O channels; the IF-AN/DM ($499), for eight additional channels of analog I/O; and the IF-CS/DM ($299), which allows two DM-24s to be cascaded.

Another option is the MU-24 ($949) meter bridge. Although the metering in the DM-24's onboard display is usable, it's so small that I strongly recommend budgeting for the MU-24 when you figure the cost of the mixer. The onscreen channel metering and the pair of 12-LED ladders that monitor stereo output are adequate in a pinch, though. The MU-24's meters don't line up directly above the corresponding channel strips, so you can't check levels with a quick glance; you must look at the legends.

SCRATCHING THE SURFACE

The mixing surface contains 16 channel strips, each with a 100 mm motorized, touch-sensitive fader; an LED that indicates automation status or level overload (with programmable source and OL level); and Mute, Select, and Record Enable buttons. (The Record Enable buttons function only when the DM-24 is used for machine control.) To solo a channel, you must press the latching Solo button, which turns the channel mute buttons into channel solo buttons. Soloing is a frequent task, and I found that scheme awkward.

Four stepped, infinite rotary encoders above the faders allow you to adjust EQ or aux send parameters for a selected channel. Surrounding each encoder is a ring of 11 LEDs that indicate the parameter's value. Sometimes an encoder uses multiple LEDs; for instance, the Q pot uses a spread of LEDs to give a visual indication of bandwidth. I really love that approach, because it provides an immediate and intuitive read on several parameters simultaneously.

There are more possible parameter values than LEDs, however, so you need to look at the LCD to read exact values. What bothered me more than that was the fact that the encoders default to large value increments, such as 1.5 dB steps in EQ gain. You can obtain finer increments (such as 0.5 dB EQ gain steps) either by holding down the 2ND F key while turning an encoder or by changing a preference from Coarse to One Step in the setup options. It would be more useful if One Step were the default setting, as its functionality isn't at all obvious. In fact, I initially thought the DM-24 was incapable of fine parameter increments.

Four more encoders, called Pods, are soft controls you can use to edit the contents of the main display in conjunction with the four buttons just above them. The Screen Mode buttons, located to the right of the display, give you access to a function set that includes EQ, dynamics, effects, and I/O mapping. Those buttons also serve for numeric entry.

You navigate through the main display

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The DM-24's machine-control capabilities are unusually comprehensive for a mixer in its price range, but given how many recorders Tascam has manufactured, perhaps that shouldn't be surprising. In addition to transport controls, various buttons control recorder-input monitoring, auto-punching, and automation modes. Accessing the machine-control buttons is extremely quick and easy. Combined with the Record Enable buttons on the channel strips, those controls enable truly professional-level speed in sessions; you rarely need to move away from the mixer except to access outboard processors.

As you might expect, Tascam supports its entire DA-series of multitrack tape transports, as well as the MX-2424 hard-disk recorder. That support includes the ability to edit the recorders' setup parameters and to control open- and closed-loop devices such as pro-level videotape recorders and time-code DAT recorders. If another mixer in the DM-24's price range has its level of machine control, I sure haven't seen it. Kudos to Tascam for the thoroughness of the implementation.

I/O DIVERSITY

Each of the DM-24's 32 channels features four bands of fully parametric EQ and a compressor, and the first 16 channels have an expander/gate. Six aux buses feed either the internal effects or four assignable sends, and the eight mix buses feed the TDIF, ADAT, or option slot outputs. You can insert three stereo compressors into any three pairs of aux, mix, or master L/R buses.

Analog outputs for the mix buses are available only if an analog I/O option card is installed in one of the slots. Unless your surround monitoring system happens to have digital inputs, you'll need the option card if you want to feed a surround monitoring system.

Each of the 32 channels can receive a signal from either an input or a return. Inputs are chosen from the analog mic/line inputs, stereo digital inputs, assignable returns, or internal effects returns. Returns for the 32 channels are from the TDIF or ADAT connectors or one of the option cards. (With the software version I reviewed, channels 25 through 32 receive their signals from inputs only, not returns; according to Tascam, that will be changed in version 2.)

The assignment scheme's inability to arbitrarily map buses or direct outs to outputs made it difficult to route things as flexibly as I wanted, causing me some inconvenience in session. In the end, I made a number of snapshots that changed nothing other than routing of the outputs, the inputs, or both. According to Tascam, version 2 will allow you to map any return to any channel.

ONBOARD EFFECTS

Most of the time, you'll probably use at least two aux send buses to route signals to the DM-24's two onboard effects processors. They provide a selection of Tascam effects, including guitar compressor, distortion, compressor, exciter, de-esser, phaser, delay, chorus, pitch shifter, and flanger. Tascam has also licensed reverb algorithms from TC Works, as well as Microphone Modeler and Speaker Simulator from Antares. You can use the two processors independently or in series. The selection of presets is substantial.

The Tascam effects, while serviceable, are not high quality. The TC reverb can sound quite good, but I had to search

DM-24 Specifications

Faders	(17) 100 mm stroke, motor-driven, touch-sensitive
EQ	(32) 4-band parametric
Sampling Rates	44.1, 48, 88.2, 96 kHz
Sampling Resolution	24-bit
Analog Inputs	(16) balanced XLR mic; (16) balanced ¼" TRS line; (4) balanced ¼" TRS returns; (2) RCA 2-track returns
Phantom Power	+48V, switchable in blocks of (4) channels
Analog Outputs	(2) balanced XLR mains; (2) balanced ¼" TRS monitors; (2) RCA studio monitors; (4) balanced ¼" TRS sends; (2) ¼" stereo headphone
Analog Inserts	(16) ¼" TRS channel inserts; (4) ¼" TRS assignable inserts; (2) ¼" TRS L/R inserts
Coaxial Digital I/O	(2) XLR in; (2) XLR out; (2) RCA in; (2) RCA out; all switchable from AES/EBU to S/PDIF
TDIF I/O	(24) channels; (3) 25-pin D-sub; 24-bit word length
ADAT I/O	(8) channels; (2) Lightpipe optical connectors; 24-bit word length
Word Sync I/O	(1) BNC in; (1) BNC out/thru
MIDI I/O	In, Out, Thru/MTC Out
Additional I/O	(1) SMPTE RCA in; (1) ¼" footswitch in; (1) DTRS remote 25-pin D-sub out; (1) meter bridge 25-pin D-sub out; (1) RS-422 9-pin D-sub; (1) GPI 9-pin D-sub; (1) IEC AC
Effects Processors	(2) stereo, 24-bit multi-effects (mic modeling, speaker modeling, reverb, chorus, delay, distortion, compressor, guitar compressor, phaser, pitch shifter, flanger, de-esser, exciter)
Dynamics Processors	(16) gate/expanders for channels 1–16; (32) compressors for channels 1–32; (6) compressors assignable to aux sends, bus masters, and stereo outputs
Frequency Response	20 Hz–20 kHz, +0.5 dB, –1.5 dB or better
Total Harmonic Distortion	<0.013%
Noise	–68 dB or less
Displays	(1) 320 × 240-pixel backlit LCD; (2) 12-segment LED meters
Power	internal 120/230/240 VAC
Dimensions	22.9" (W) × 7.8" (H) × 25.9" (D)
Weight	45.1 lb.

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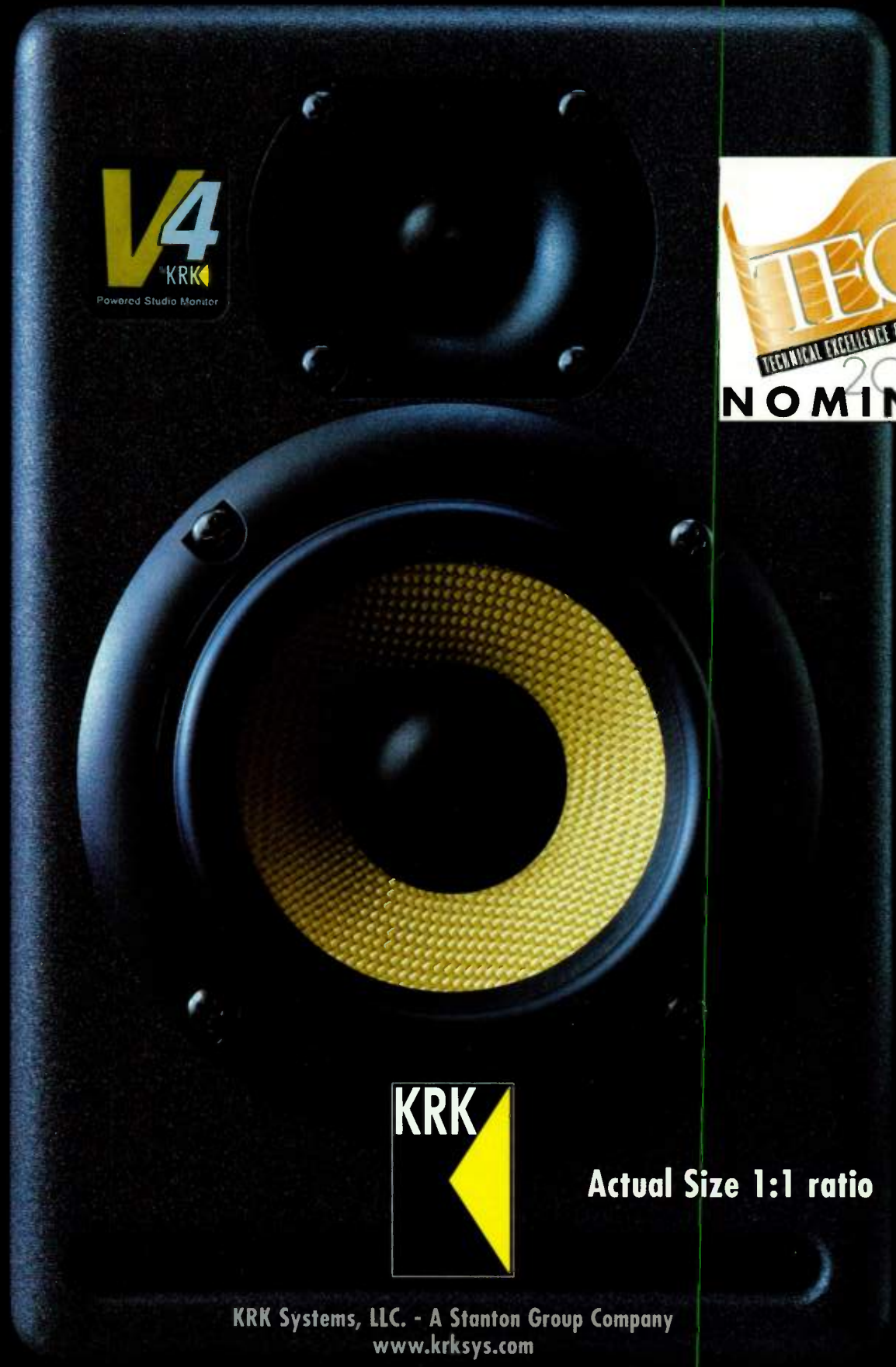

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is its limited memory; you can store only seven mixes. I didn't use the automation enough to get a feel for how quickly a single mix's memory fills up, but I tend to use a lot more than seven mixes for a song because I save a version after almost every tricky move. In addition, there's no list or offline automation editing, so moving a mute that's only slightly off in time might require numerous attempts.

SURROUND TOWN

The DM-24 is capable of surround mixing, but it has some familiar limitations you might expect in a small-format mixer. Surround mixing burns a lot of routing resources, in terms of both buses and panning. Generally, the surround mix buses are derived from the regular group mix buses, the aux buses, or both. The DM-24 takes the group mix approach and supports stereo, quad, LCRS, and 5.1. For each of the surround modes, you can choose from several output-channel orders. Because the buses carry the surround mix, you can easily route them to the TDIF and Lightpipe ports, but if you want to monitor from the DM-24, you'll need an analog I/O card in one of the option slots.

Surround panning uses the two-knob method (left/right [L/R] and forward/back [F/B]), so dynamic surround panning is not the DM-24's strong suit. Version 2 should greatly improve the surround panning, offering improvements that include circle and square patterns, but there is no provision for a joystick or other physical *x-y* controller. The panning controls include both L/R and F/B divergence controls (which the manual describes without naming). Feeding any kind of surround reverb or effect would be difficult, but the assignable sends might get you most of the way there. None of the onboard effects are tailored for surround.

MIDI GRITTY

In addition to sending MIDI Machine Control (MMC) data, the DM-24 can send and receive Program Changes, CCs, and SysEx data. You can set the faders to send the same CC over all 16 MIDI channels, and the Pods can send several different CCs over a single channel. The Control Change Table screen allows detailed mapping of any fader, pan control, or mute button to send and receive any controller number on any MIDI channel.

The DM-24 uses MIDI to install operating system upgrades, by means of playing Standard MIDI Files (SMFs) into the mixer. I used that capability to upgrade from version 1.1, which was installed in the mixer when I received it, to version 1.6, which I downloaded from Tascam's Web site.

Upgrading proved more troublesome than I expected when I read in the manual, "The ONLY Mac application Tascam supports for upgrading the DM-24 via MIDI is MIDIGraphy version 1.4.3." Unfortunately, MIDIGraphy is an old shareware program that doesn't directly support USB. When I couldn't get MIDIGraphy to work without at least installing OMS, Tascam assured me that I could use Digital Performer to play the upgrade SMFs. That was also problematic, because I had to keep slowing the tempo for the data to load correctly. Through trial and error, I finally succeeded with a tempo just over 50 bpm.

TRANSFIXED IN THE MIX

I spent time both tracking and mixing on the DM-24. One thing is certain: this box is absolutely packed to overflowing with features. The DM-24 has so many attributes that I haven't even mentioned standard features such as fader and mute groups, but they're in there. The DM-24 sounds great, too. The mic preamps are clean and quiet, the A/D/A converters sound fine, and the EQ and dynamics do the job (I got a great kick-drum compressor going).

The faders are great and I like the Pods, but the user interface has a few rough edges. For example, although the placement of the machine-control and automation controls offer outstanding functionality, the scrub wheel and cursor keys simply miss the boat. Despite having many more hits than misses, the DM-24 carries that "good news/bad news" theme throughout its design. It has great automation features, but it's lacking in memory and automation-editing capabilities. It handles surround mixing, but with limited dynamic movement. Fortunately, the version 2 software should address the most egregious problems.

Some downsides, including fewer analog inputs at high sampling rates, will make certain applications a struggle. Others, such as the lack of mic/line switching, are simply idiosyncrasies to which you can grow accustomed.

The scales are definitely tipped to one side, however: the good far outweighs the bad. The wealth of digital I/O, the excellence of the machine-control and automation features, and the touch-sensitive faders are enough to earn the DM-24 a place in many studios.

Considering all the DM-24's meat-and-potatoes functions, extras such as high-sampling-rate operation, price, and small footprint, it's obvious that Tascam continues to have a strong talent for combining functionality and affordability. That's an attractive formula indeed.

Larry the O *thought he was leaving a message on an answering machine but is, in fact, painting polka dots on a freight train in Bulgaria.*

PRODUCT SUMMARY

Tascam
DM-24
digital mixer
$2,999

FEATURES	4.0
EASE OF USE	3.0
AUDIO QUALITY	3.5
VALUE	4.0

RATING PRODUCTS FROM 1 TO 5

PROS: Large feature set. Excellent automation and machine-control implementations. Touch-sensitive faders. High-sampling-rate and surround capabilities. Onboard effects.

CONS: A few awkward user-interface choices. Very limited analog I/O in HR mode. Mediocre Tascam effects.

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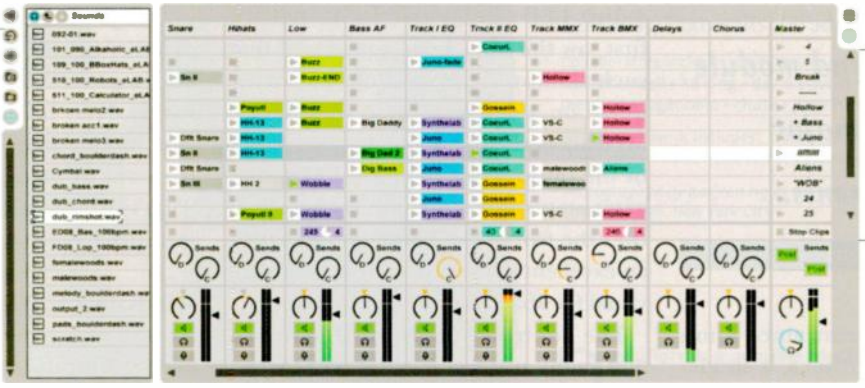

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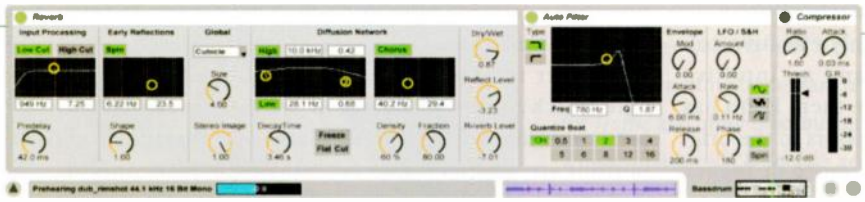
Drag and drop effects without stopping the music. Chain Live's built-in high-impact FX (including one of the finest reverbs you'll ever hear) and VST plug-ins in each track, the master and up to four send channels.



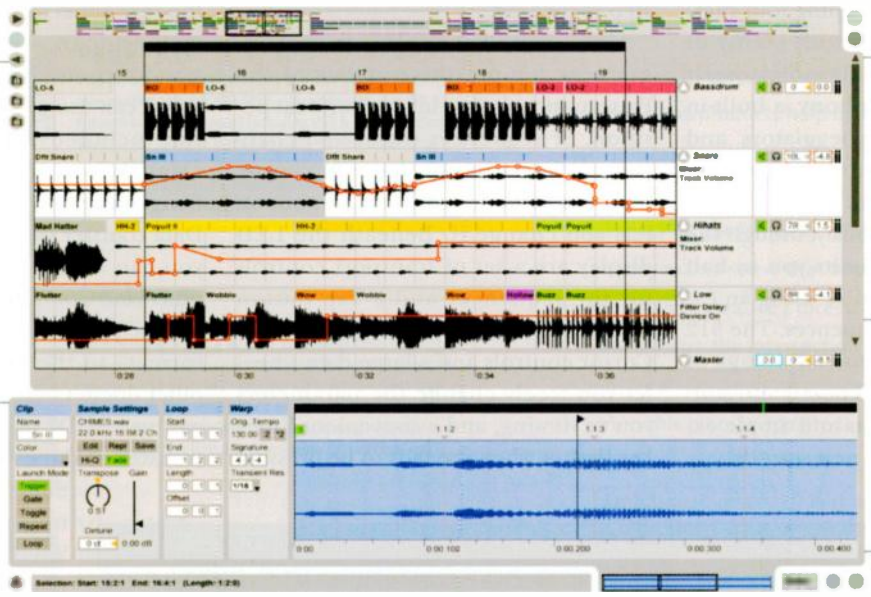
Real Time control

All mixer and FX parameters can be fully automated and operated using any MIDI controller.

live. sequencing instrument

Time Warping

Bring together audio from any source. All clips will automatically play with the project tempo—even long pieces with tempo changes. You can even scale the tempo of each clip relative to the project tempo, and it always stays in sync.



Say goodbye to your hardware sampler

With Live your hard disk size determines how many samples you can access in Real Time. Launch samples of any size via mouse, QWERTY or MIDI keyboard. Count on flawless performance since everything streams direct from disk.

Live records it all

Live records all your actions, including all automation of the mixer and FX, and displays them in a classic timeline arranger. Everything can be post-edited in detail later.

Launch Modes

Not all clips are played equally, so Live offers more launch modes than any other software. Trigger, Gate, Toggle, Repeat, and Loop. Tell your clip when to start and stop, to play once, to play forever, to stutter, and more.

Tweak with a Capital T

You've never heard audio get so stretched and turned inside out and still play in time. Until Live.

"Every now and then a program redefines what music is all about - like Sound Designer, Acid or Reason. Live is that kind of program. Its ability to record your performance for later editing bridges the gap between stage and studio." ***Craig Anderton***

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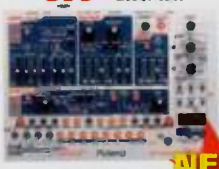

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interface does. Instead, I had to use up limited MIDI connections and run multiple cables to the Proteus.

PLAYING AROUND

The Proteus 2500 has a nice scheme for locating and playing sounds. An individual sound is called a Preset, and you can scroll through Presets by number. By repositioning the cursor in the LCD display, you can also scroll to different MIDI channels, banks, or Preset Groups (a Preset Group represents a category of instruments, such as horns or keyboards). Move the cursor to the Preset name to scroll through the Presets within a Group. As soon as I figured out the scheme, I could get to any type of sound within seconds.

Proteus Presets are organized as four factory-programmed banks in ROM and four user banks in RAM; the RAM and ROM banks are identical when you first take the unit out of the box. If you install additional sounds using Expansion ROMs, those Presets will appear in new Preset banks.

A good collection of instruments is included, and all of the bases are covered to some degree. An abundance of percussion instruments and scads of electric and acoustic bass Presets supplement a nice set of synthesizer sounds. If you're into urban or techno music, you'll find plenty to work with. The collection of acoustic-instrument emulations is much less extensive. I had some difficulty finding string sounds that suited my music, and I wasn't at all impressed with the quality of the grand pianos.

Fortunately, some of those deficiencies can be addressed with Proteus Expansion ROMs. I checked E-mu's Web site and found several available, with sounds ranging from orchestral instruments to analog synthesizers; one even contains William Coakley's Perfect Piano. The Proteus 2500 has three expansion slots, and the built-in sounds occupy a fourth slot. According to E-mu, nothing prevents you from replacing the built-in sounds with a fourth expansion module. In total, you can load up the Proteus 2500 with 128 MB of sounds.

PATTERN RECOGNITION

The Proteus 2500 has a powerful sequencer that's capable of pattern-based and linear sequencing. You can record in real time or step time, or use grid-mode recording. Grid mode, which is available only when recording Patterns, is similar to the drum machines of days gone by.

Each Pattern can have as many as 16 tracks and can be as many as 32 bars long. You can record multichannel sequences into each track. Most sequence-editing features deal with track data; they don't necessarily let you restrict your edits to specific MIDI channels, though you can edit individual events.

A variety of tools are available to perform the basic editing operations you'd expect in any modern sequencer. You can edit individual notes and alter many events at the same time. You can quantize, thin, transpose, erase, and insert. If you want nice graphical tools for editing, though, you'll want to use your computer's sequencer instead.

You can cut or copy tracks (or portions of them), and you can merge with existing data when you paste. You might want to use multichannel tracks for track bouncing or mixdown; once your individual parts sound right, you can paste them into a single track to free up other tracks for additional recordings.

The Proteus 2500 provides 32 MIDI channels, and you can assign each track in a Pattern to send data to either the internal sounds or the external MIDI ports. The Proteus 2500's ability to play on 64 simultaneous MIDI channels (thanks to multichannel tracks) is an impressive feat for any sound module's sequencer. You can also sync the Proteus to external sequencers using MIDI Clock and Song Position Pointer messages.

You build Songs by stringing Patterns together. An additional Song Track is suitable for laying down an improvised solo for the entire length of a Song. Like the tracks in Patterns, the Song Track can record multiple MIDI channels. I was able to record two separate parts in two separate passes. The Song editing tools are similar to those for Patterns; most edits are applied to the entire track or a selected portion. Aside from individual events, there's no way to restrict edits to specific MIDI channels.

Pattern-based sequencers are usually

Proteus 2500 Specifications

Sound Engine	sample playback
Data Encoding	44.1 kHz, 16-bit linear
Polyphony	(128) notes
Multitimbral Parts	32
Presets	(512) ROM; (512) RAM
Waveform ROM	32 MB, expandable to 128 MB using (3) additional expansion slots
Sequencer	(16) MIDI channels per track; (16) tracks and (1) Song track per Pattern; (1,024) Patterns; (512) Songs; (384) ppqn
Arpeggiators	(32) simultaneous; (300) ROM Patterns; (100) RAM Patterns
Effects	(2) 24-bit processors; (44) reverb and delay effects; (32) chorus, flange, distortion, and delay effects
Audio Outputs	(6) unbalanced ¼" TS; (1) coaxial S/PDIF; (1) ¼" stereo headphone
MIDI Ports	(1) In, (2) Out
Additional Connectors	(1) USB; (2) ¼" footswitch
Displays	2 × 24–character LCD; 4-digit LED
Dimensions	4U × 8.75" (D)
Weight	20 lb. (shipping weight)

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too restrictive for my style of writing. I was initially disappointed to see only one track for linear recording, but I grew to appreciate the Proteus 2500's approach to sequencing. Because Patterns can be as long as 32 bars, I could record an entire song section into one Pattern. That helped me avoid the sterile and repetitive-sounding music that I've created with other pattern-based sequencers.

WHO DO WE ARPEGGIATE?

If you like arpeggiators, you will love the Proteus 2500. You can run as many as 32 arpeggiators at the same time, all synced to the same clock source. You can either use arpeggiator settings saved within each Preset or you can ignore the Preset settings and use a master arpeggiator.

The highly configurable arpeggiators let you choose Up, Down, Up/Down, or Random modes or choose from three modes that are based on note order. You can specify any note length as short as 32nd notes (including dotted and triplet values) with fixed or variable Velocities. The Gate Time parameter lets you create staccato- or legato-sounding arpeggios and everything in between. Additional settings control the arpeggio's total duration, and Extension settings let you specify a range of notes outside of the ones you play. You can also specify a range of keys where arpeggiation can occur. By telling the Proteus to arpeggiate only the notes above middle C, for instance, I could sustain chords with my left hand while playing arpeggios with my right.

Pre- and Post-Delay settings allow you to play without arpeggiation before and after the arpeggio plays. For example, it's easy to tell an arpeggiator to sustain a chord for two beats, arpeggiate for two beats, and then return to the sustained chord for four beats. Recycle mode makes the cycle repeat, and Latch mode lets you take your hands off the keyboard until you're ready to make it stop.

Pattern mode is available for arpeggios that are more complex. In Pattern mode, you can create up to 100 arpeggiator Patterns or use one of the 300 ready-made Patterns in ROM. Arpeggiator Patterns can have as many as 32 steps, and each step can have its own Velocity, length, and number of repetitions. You specify each note as an offset from the note that you play. You can also indicate whether a step is a rest or a tied note.

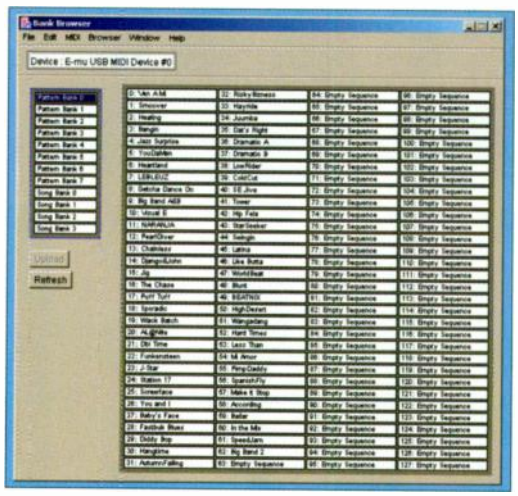

FIG. 3: E-Loader is a software application for exchanging Proteus 2500 Patterns and Songs with a host computer. E-Loader is also essential for upgrading the Proteus's operating system.

When you play additional notes while a Pattern-mode arpeggio is playing, the new notes are added to the pattern already in progress. I was concerned that playing new notes might start new patterns of their own (which might clash with the patterns in progress). Instead, I was able to build some nice arpeggiating harmonies one note at a time.

RIGHTEOUS RIFFS

More than 400 Riffs are programmed into the Proteus 2500's ROM. You can assign one Riff to each Preset, so you can try out sounds by simply pressing the Audition button. Audition mode stays on until you turn it off, allowing you to hear something interesting from each Preset as you scroll through them. Riffs are categorized by instrument type, so if you're building a brass sound, for example, you can easily select a Riff appropriate for brass (such as a fanfare). Unfortunately, you can't create or edit Riffs.

In Beats mode, 27 special Riffs contain layered rhythm loops (or grooves, if you will). You switch the layers (called Parts) in and out with the same buttons you use for note triggers and track muting. You can also use a MIDI keyboard, which might have the added advantage of providing volume control (using Key Velocity) for each Beats-mode Part.

Each Beats Riff provides a main groove, an alternate groove, four fills, and four instrument parts. Pressing the trigger buttons lets you choose from the different grooves and bring the various instruments in and out. I could even combine the main groove's bass drum Part with the alternate groove's snare and hi-hat.

Although you can't edit each Part's rhythms, you have considerable control over how they play. You can transpose each Part and adjust its Velocity response. (Because Beats Parts are typically drum kits, transposition changes the instrument that plays). You can assign Parts to groups and trigger them all with one key. You can even use MIDI Control Change (CC) messages to control Velocity, transposition, and the number of Parts that play.

Several Presets are programmed to take advantage of Beats Riffs. I typically record rhythm parts from scratch, but I still had fun

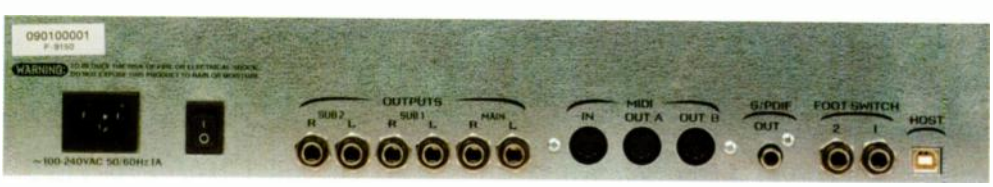

FIG. 2: The Proteus 2500's rear panel provides six analog outputs, one S/PDIF output, one MIDI In and two MIDI Out ports, two footswitch jacks, and a USB port.

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● PROTEUS 2500

things that apply to the Preset as a whole (such as Effect Send levels).

Modulation sources include all that you'd expect, such as Velocity, keyboard tracking, envelope generators, and LFOs. Sources include the 16 front-panel controller knobs, which you can map to specific MIDI CC numbers—especially handy when you're sequencing. For a bit of randomness, you can use white and pink noise as modulation sources. Specialized modulation processors, such as DC offsets, flip-flops, diodes, and lag processors, process incoming signals in several interesting ways. You can also sum multiple modulation sources.

In addition to all the modulation destinations you'd expect (such as filter frequency and amplitude), there are some that are more esoteric. For example, you can modulate the parameters of other modulators (such as the EGs and LFOs). You can also control sample start times, looping, and retriggering (anyone up for expressive solo leads?).

EFFECTIVE PROCESSING

The Proteus 2500 has two stereo effects processors that you can program as part of each Preset. If you're playing more than one Preset at a time, you choose between the settings from a particular Preset or the master settings in a global menu. Effects Processor A contains reverb and delay effects, and Processor B implements chorusing, flanging, distortion, and delay algorithms. Although effects are limited to one algorithm per processor, four Effect Sends help you get the most from what you have. You can either specify the Effect Send level for each of the 32 MIDI channels or revert to the send levels saved in the Preset on each MIDI channel.

The effects sound as good as or better than those of other synths in the Proteus 2500's price range. The reverbs and choruses are smooth. The distortion algorithms don't really crank my tractor, but they never do in a synth-based effects processor. Missing from the lineup are effects such as phasers, rotary speakers, and sonic enhancements (in the vein of Aphex's Aural Exciter or BBE's Sonic Maximizer).

LONG LIVE THE PROTEUS!

The Proteus 2500 is a remarkably flexible instrument. If you're a sound designer, it offers almost any tool you could hope for in a sample-playback instrument. If you're a songwriter, its 16-track sequencer is great for developing ideas. If you're a live performer, the Proteus provides 32 arpeggiators and 27 Beats-mode Presets to play with.

The Proteus sounded great in my studio; I heard no self-noise or other artifacts. It is well supported on E-mu's Web site, and its documentation is extensive. The user manual lacks organization in places, but it still taught me everything I needed to know about using the module. Make no mistake: the Proteus 2500 is one awesome box.

Allan Metts *is an Atlanta-based musician who is also a software and systems designer, and a consultant.*

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BEHRINGER

DDX3216

The entry-level digital console isn't entry-level anymore.

By Nick Batzdorf

It's hard to describe Behringer's new DDX3216 digital mixer without sounding like an infomercial. What if I told you that this board lists for $1,999 and has a potential 32 simultaneously available inputs, 4 internal effects processors, full dynamic and snapshot automation, and a total of 17 ALPS 100 mm motorized faders? That's not enough? Then what if I threw in a total of 6 D/A converters, 12 mic/line inputs and 4 line inputs, and parametric EQ and dynamics on every channel? What, you want more? Okay, how about 16-stage LED meters next to each fader and 17 Channel Control lighted rotary encoders?

The DDX3216 is that kind of product. It's not that those features are revolutionary—it's that you get them all on a mixer that costs less than $2,000. The features just keep piling up: 24-bit conversion, SMPTE time-code input, MIDI Time Code (MTC) input and output (the unit can generate MTC), word-clock in and out, and even a PC Card slot for storing settings and mixes. Clearly, Behringer has done a championship job in the features-per-dollar category (actually, make that features-per-euro—the company is German).

JUDGING BY THE COVER

The 24-bit, 44.1 or 48 kHz DDX3216 is a relatively small and narrow mixer (with the included rack ears, the unit is 19 inches wide by 22.5 inches deep), with an angled top panel that rises gently to a horizontal jack field at the back (see **Fig. 1**). Though aesthetically it may be more pleasing to have all cables out of sight at the rear, the top-panel location is more convenient—and mandatory if the mixer is racked.

Despite its size, this little board provides close to the same number of ins and outs as many larger digital mixers. Though its panel is busy and its faders appear to be close together, there's plenty of room for normal-size fingers to get at all the controls, and the faders don't feel cramped.

Speaking of faders, they are one of the first things you notice about the DDX3216. They feel every bit as good as the motorized faders on some higher-end digital mixers, and they're considerably quieter than many. Motorized faders tend to chatter loudly when they're paired or grouped with others; these barely peep. However, you don't want to push down on the faders too hard, or they'll bottom out. They're not touch sensitive, either, which means they can't automatically "feel" when you're punching in replacement fader-automation moves. Still, if they were spaced farther apart and had larger finger pads, the faders would feel perfectly at home on a digital console costing more than twice as much.

The LCDs on most midpriced digital mixers are two times the size of the DDX3216's, which means you're going to be doing some window-hopping. But the menus are well organized, the graphics are clear, and the six knobs and four buttons dedicated to screen navigation let you move around pretty quickly. Also, the LED meters next to the channels take the place of the on-screen meters on other digital mixers, saving screen real estate and making it unnecessary for Behringer to offer a meter bridge.

The DDX3216 has much in common with other digital mixers, so those people who have worked with other units should be able to find their way around this board pretty easily with only a cursory read of the manual. The unit's faders are layered into banks, with the topmost row of buttons determining the active layer (channels 1 through 16, 17 through 32, bus outs, or sends). Below that, in the switch matrix, buttons determine what the Channel Control rotary encoders (one per channel) adjust: pans, send levels to one of the four auxes, or levels to one of the four effects processors. Each knob is encircled by 12 lighted "spokes" to indicate its approximate position. Actual resolutions, however, are much finer than those indicated by positions of the spoke lights.

Individual channel settings—routing, EQ, gating, compression, and delay (which is available only on analog channels 1 through 16)—are accessed by a

FIG. 1: The new Behringer DDX3216 is an affordable, 32-channel digital mixer featuring 32-bit processing, 24-bit converters, 16 buses, 8 aux sends, 100 mm motorized faders, 4 effects processors, 4-band parametric EQ, variable-knee compression, dynamic and snapshot automation, comprehensive synchronization and I/O (including digital I/O–card options), and many other useful goodies.

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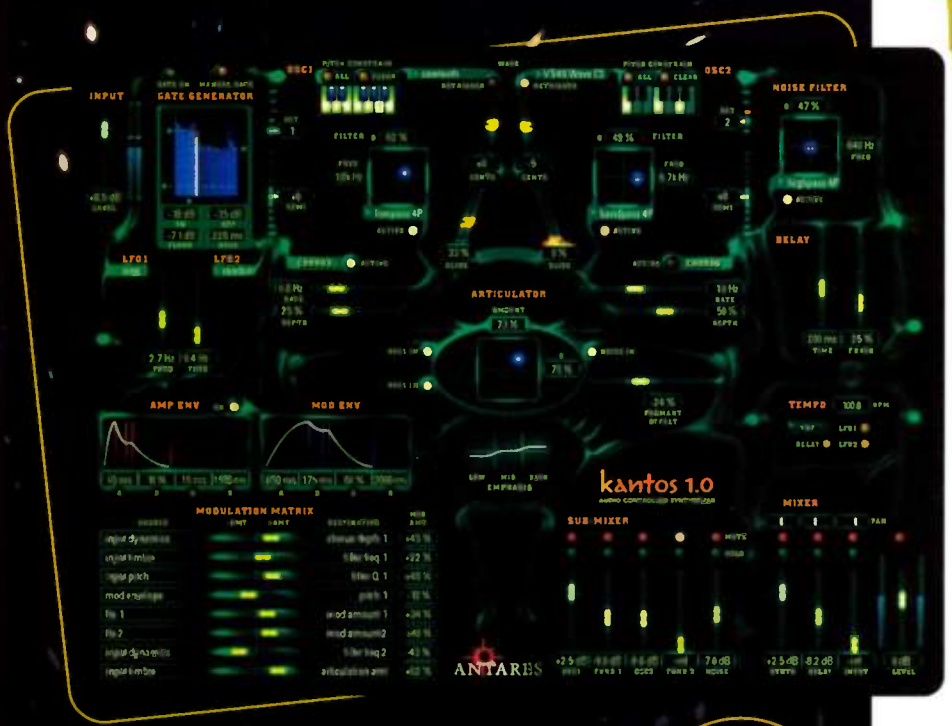

From the company that revolutionized vocal intonation processing comes kantos 1.0, a software-based synthesizer that finally liberates you from the tyranny of MIDI, keyboards, controllers or, in fact, anything that stands between you and the music you hear in your mind.

kantos 1.0 is controlled by audio. Any pitched monophonic audio.* Like your voice. Or a musical instrument. Live, in real time. kantos 1.0 analyzes incoming audio and instantaneously extracts pitch, dynamics, harmonic content and formant characteristics. This information is then used to control the kantos 1.0 sound engine. In ways never before possible with a conventional MIDI synth.

To learn more about kantos 1.0, visit our website at www.antarestech.com for audio demos, guided tours and more. Whether you are looking for an alternative to traditional controllers, or are looking to produce electronic music with a level of sonic innovation and dynamic expression that's simply not otherwise possible, kantos 1.0 will, quite literally, change the way you make music.

*Actually, kantos 1.0 can also respond to unpitched or polyphonic input. While the output isn't always predictable, it's rarely less than interesting. And particularly with rhythmic input, you can get extremely dynamic (and sometimes downright surprising) results.

KANTOS 1.0 WILL INITIALLY BE AVAILABLE IN MAS, RTAS (MAC) AND VST (MAC) FORMATS, WITH DIRECTX FOLLOWING NOT TOO FAR BEHIND. CHECK OUR WEBSITE FOR DETAILS.

TIMBRAL ARTICULATOR

The heart of kantos 1.0. The articulator takes the harmonic and formant information from the input signal and dynamically applies it to the synthesized signal. It can reproduce the input's characteristics with uncanny accuracy or warp them into a universe of mutant forms.

WAVETABLE OSCILLATORS

Each wavetable oscillator includes its own independent multimode resonant filter and chorus generator. Additional wavetables will be available from our website. Or create your own with pretty much any sample editor.

GATE GENERATOR

The Gate Generator gives you control over the triggering and duration of the envelopes as well as retriggering the oscillators' wavetables. Also included is a variable-threshold noise gate to help clean up any annoying background noise in the control audio.

ANTARES

WHERE THE FUTURE'S STILL WHAT IT USED TO BE

1.0

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shared set of buttons. As with all digital consoles, the Select button you push determines which channel is to be operated on.

In short, the designers did a good job of making this mixer's interface easy to navigate, and the display tells you what to push whenever there's any question. That operation could be streamlined with some shortcuts, though. On the Panasonic DA7, for example, hitting Select and Mute at the same time snaps a fader to unity gain, and simultaneously pushing the Select buttons on two adjacent channels pairs them. However, on the DDX3216, you can zero master fader and aux or effects sends by pushing down on encoder knobs next to the display.

Fortunately, the board's operating software is in flash memory, so it can be updated as improvements arrive. Updates can be downloaded from the Behringer Web site. Unfortunately, though, the DDX3216 File Exchange software—a file librarian for this and other kinds of bulk mixer data—is available for Windows only, not Macintosh. You can also do updates through the PC Card slot, so one work-around is to find a Windows machine with a PC Card writer.

The DDX3216 stores as many as 128 snapshot files, which reflect the state of the board (except, of course, for analog settings such as control-room and headphone levels) at any time. You can choose which parameters are to be recalled from stored snapshots—a nice feature. However, the board can hold only one dynamically automated mix at a time in its battery-backed memory—you don't lose the mix when you power down—so to store multiple mixes, you definitely need to use the DDX3216 File Exchange software, PC flash memory, or a device that stores bulk MIDI dumps.

The DDX3216 gets warm with use, but it didn't get hot or start acting strangely after I left it on for 48 hours straight. It has a fan on one side—something to consider in rackmounted installations—but fortunately, the fan is quiet, and that's coming from someone who's sensitive to fan noise.

My only quibble about the board's ergonomics is that your head must often hover over the middle of the panel—that's the only way to see the Channel Control encoders if they're at 12 o'clock. You must also get close to the button matrix at the upper left to read the black-on-silver labeling. Plan on putting the board where you can belly right up to it, especially at first, when you're learning your way around.

CONVERSION EXPERIENCE

In order for the DDX3216 to reach its full 24- or 32-input by 16-bus potential, one or both of its two rear-panel slots must be outfitted with optional digital I/O cards. Behringer offers 16-channel ADAT and TDIF cards and 8-channel AES/EBU cards (see **Fig. 2**). You can assign inputs and outputs in blocks of eight, mixing and matching to suit your needs. No analog card is available, but you can always connect additional A/D converters to the digital cards if you need more analog inputs.

FIG. 2: In the DDX3216's rear panel, digital I/O–card slots (lower right) are fitted with the optional 8-channel AES/EBU and 16-channel ADAT cards.

I worked with a stock unit, which has just the analog I/O and a stereo S/PDIF digital I/O pair and no digital I/O cards. Unlike the cards' digital inputs, the S/PDIF input is asynchronous, meaning that it will accept a range of sampling rates and convert them to the board's current operating rate. That handy feature solves the common problem of having to switch digital-clock sources when monitoring DAT machines.

The 16 analog inputs consist of 12 mic/line channels and 4 line-level channels, all mono and all balanced; there are no aux returns for external effects. (It's typical for budget and mid-priced digital mixers to have a short supply of A/D/A converters as a way of keeping costs under control.)

Inputs 1 through 12 provide pre-A/D-converter, unbalanced insert send/returns and 20 dB attenuation pads. Phantom power for condenser mics is available in two groups of six inputs. These channels have both XLR mic and ¼-inch TRS line-level inputs in parallel. But, of course, they're not active simultaneously—anything plugged in to the line input takes precedence.

The mic preamps provide 60 dB of gain—enough oomph to work with anything from low-output ribbon mics on up. Inputs 13 through 16 have ¼-inch inputs only (accommodating line-level signals from –20 to +20 dBV) and no inserts.

The only analog outputs not on the top panel are on the rear: two Control Room, four assignable Multi Outputs (all on balanced ¼-inch TRS jacks), and the main XLR balanced L/R outs. Other than the XLR jack for SMPTE time-code input, all the other rear-panel connections are digital: S/PDIF in and out, RS232 serial port for connection to a PC, word-clock in and out, and MIDI In, Out, and Thru.

In addition to sending and receiving MIDI Time Code, the DDX3216 can transmit its automation moves as continuous controllers that can be recorded to an external sequencer. Snapshots of the state of the device can be switched with program changes, and other settings such as EQ and dynamics can also

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their movements are scaled, meaning that their levels change by the same percentage when moved. So channels that start off higher travel a greater distance when you slide any fader in the group.

Before affordable digital mixers came along just a few years ago, group muting was a feature found only on expensive boards. Not only does the DDX3216 provide group muting, but it also lets you set up groups with channels in the same or opposite on/off states. That is useful for comparing two sets of channels—one set gets muted, whereas the other is active.

The DDX3216 lets you store libraries of EQ, gate, and compression settings. You can save as many as 127 of each, a feature that's useful if you regularly record certain instruments using the same recording chains. (It would be nice if that kind of list wrapped around, by the way—scrolling to No. 127 takes a long time.)

Rather than a standard in/out switch, the DDX3216 provides an A/B edit/compare switch for most of the channel and effects settings. Even though it often clicks between settings, it's a useful feature.

Four overlapping bands of fully parametric EQ, with a boost/cut range of 18 dB, are available on each of the 32 channels. The Q (bandwidth) range is 0.1 to 10—from very surgical to very broad.

You can also switch the upper and lower bands to low-cut, high-cut, or shelving types of EQ. Shelves are for overall "make it brighter, bassier, duller, or less boomy" adjustments—the type of EQ you find at the high and low bands on most consoles—and the cut filters simply roll off everything below the cutoff frequency.

▼

You're going to be doing some window hopping.

The compressors and the gates can be keyed from channels 1 through 24 (but not 25 through 32, for some reason), a welcome feature that is lacking on digital boards of similar price and size. All the standard gating and compression parameters are there, including a nice bonus: variable-knee compression. That lets you dial in how gradual the onset of compression is as the signal approaches threshold.

Channel delay is a standard feature on digital mixers, but the DDX3216's delays also feature a wet/dry level control and feedback. Thus, in addition to using it to compensate for things such as mic positioning, you can use channel delay as an effect. The maximum delay time is 300 ms, with minimum settings in the single-sample range. Thoughtfully, delay times are displayed in samples, milliseconds, and musical values; it's too bad, though,

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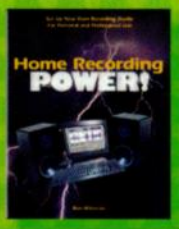

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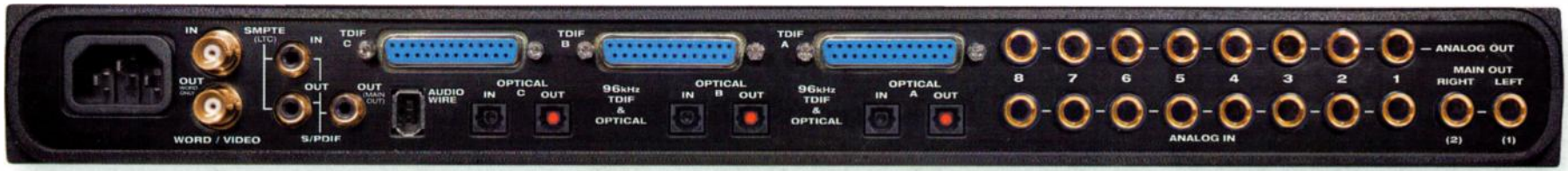

mk3 feature highlights

- **PCI-424 card** — connect up to four interfaces. Capable of delivering 96 channels of input and output at 96kHz.
- **CueMix DSP™** — a new DSP-driven digital mixing and monitoring matrix with the same near-zero latency performance as today's latest digital mixers. Connect all your gear, including live synths and outboard effects processors, and then monitor and mix everything with your 2408 system—and do it all without a mixer in your studio. Located on the PCI-424 card, CueMix DSP works across all connected MOTU interfaces with no drain on your computer.

- **Legacy I/O support** — connect any MOTU PCI interface, including the 2408, 2408mkII, 1296, 1224, 24i and 308. Mix and match as you please.
- **Video sync** — resolves directly to video with fast lock-up and sub-frame accuracy (no sync box needed).
- **SMPTE sync/generator** — resolve your entire system to SMPTE time code with fast lock-up and sub-frame accuracy (no SMPTE synchronizer needed).
- **Software-switchable input levels** — choose +4dB or -10dB operation separately for each analog input pair.
- **Support for 96kHz ADAT optical** digital I/O (S/MUX) and 96kHz Tascam TDIF digital I/O.

Basic features

- **Expandable 24-bit 96kHz audio interface** for Macintosh and Windows with 24 channels of simultaneous input and output.
- **8 TRS +4dB analog outputs** — perfect for surround.
- **8 TRS analog inputs** with switchable input levels.
- **Separate TRS main outs** and front-panel headphone jack, each with independent volume control.
- **24 channels of 24-bit ADAT optical** input/output (three banks) with sample-accurate ADAT SYNC. Supports up to 12 channels of 96kHz optical.
- **24 channels of 24-bit Tascam TDIF** digital I/O (three banks). Supports 12 channels of 96kHz TDIF.
- **24-bit S/PDIF** digital input/output up to 96 kHz.
- **Word clock** in and out; SMPTE (LTC) in and out; video sync input; sample-accurate ADAT sync input.
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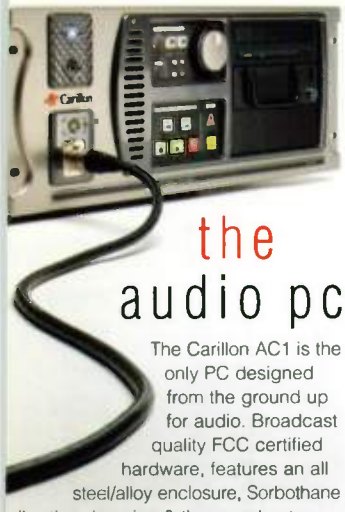

the audio pc

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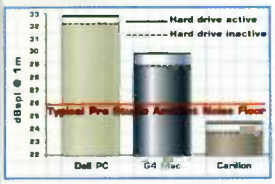

NOISE LEVEL HEAD TO HEAD
Anechoic chamber test (Southampton University's Institute of Sound & Vibrational Research)

Mike Hedges *Producer: U2, Phil Collins, Manics, Travis etc.*

"The Carillon AC-1 is silent, robust and portable. I can keep it switched on in the control room without even thinking about fan noise."

Chis Nutall *Sound Designer: AIR Studios (with Tim Vine-Lott)*

"The AC-1 is really fast and it doesn't crash. It's also extremely quiet. I'm now using it for all my DSP work"

Ivor Taylor *Technical Director: Grand Central Post.*

"Since installation the Carillon has sat there and worked 24 hours a day, 7 days a week without faltering."

Mark Knopfler's Celtic and American influences spirited him towards Nashville and a famous association with Chet Atkins in the early 90s. He's worked in the town regularly since, and early on, top producer/engineer Chuck Ainlay was recommended.

Albums for the likes of Lyle Lovett had already earned Ainlay a fine reputation and having produced each Knopfler album from Golden Heart onwards, he is now a vital element of the artist's sound on record.

Always an early adopter of leading edge technology, Ainlay is also one of the world's leading surround mixers. This was an important factor in his choice of the 96 kHz Nuendo platform - that and Nuendo's "32 bit floating point operation which means processing and plug-ins don't degrade the sound quality".

For the follow-up to Knopfler's acclaimed Sailing to Philadelphia, Ainlay specified a Nuendo loaded Carillon AC-1 2GHz Pentium 4 PC system with two Nuendo 9652 audio cards and three Nuendo 8 I/O 96 kHz 24 bit converters. A striped RAID 0 array with four 73GB SCSI drives provides ultra fast high bandwidth drive access and a 60 GB removable IDE is used for transfer and back up. AES/EBU connections come by way of Nuendo's DD8 format converter and a Midex 8 and Houston enhance MIDI and hands-on control respectively.

Chuck Ainlay's' AC-1 specification

- Intel P4 2 GHz • Win. XP Pro
- 1 GB 400MHz RDRAM
- 20 GB system drive & 60 GB drive in removable caddy. (EIDE Seagate Barracuda Softsonics)
- 4x 73 GB Seagate Cheetah Ultra 160 SCSI drives in RAID 0 array
- Neovo 18" LCDs & Matrox G550 dual head 32MB video card
- 2 x Nuendo 9652 audio cards
- 3 x Nuendo 8 I/O 96kHz AD/DA converters
- Nuendo DD8 format converter
- Steinberg Houston controller
- Steinberg Midex 8
- Rosendahl Nanosync
- Steinberg Nuendo Software
- Nuendo Surround Edition
- TC Works Surround Reverb
- Steinberg GRM Tools 1&2
- Steinberg Plug Ins: Desser, LM4, Magneto, Mastering Edition, TLA EQ, Voice Machine & The Grand
- Native Instruments B4

"The system runs like a dream and despite having to cope with massive audio files, operates at near zero latency. And I love details like the custom keys - even though I'm using Nuendo all the time, they're a boon."

"The Carillon computer rocks! The hardware is beautifully designed and barely audible. It's also really well configured - working with upwards of 50 tracks of 24/96 in Nuendo, the processor is just ticking over"

Chuck Ainlay
Producer/Engineer

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World Radio History

By Larry the O

Hangin' with My Homilies

Clichés like "words to live by," "truer words were never spoken," and "you said a mouthful" are used to affirm the veracity of something just said. Clichés though they may be, statements that can summarize a situation so completely that every fiber resonates with the ring of truth are powerful. Life is complicated, and we can use as many guideposts as we can find.

Often, summaries that are this effective become clichés themselves, as will almost anything that is repeated widely and frequently. But sometimes expressions like "a penny saved is a penny earned" or (to continue the monetary theme) "penny wise and pound foolish" don't adequately ring the bell of truth for a situation at hand. When that happens, creativity jumps in and new homilies are devised that do the job. Many wonderful regional expressions, such as the Southern "that dog won't hunt," undoubtedly came about this way.

For years I've invented my own homilies, some of which I'd like to share in hopes that they might make sense to some of you in a way that transcends the analytical and tickles the wisdom bone.

"Most things in life fall into one of two categories: either they would be funny if they weren't so darned tragic or they would be tragic if they weren't so darned funny." In our business, it's not at all unusual to see people operate in such mind-numbingly stupid ways that it's impossible to decide whether to laugh or cry about it. The most interesting part of that for me is deciding which category an event belongs in.

"The price of 'free' is hassle." This is an offshoot of "you get what you pay for," but one much needed in our world. If someone works cheaply or for free as a favor, there will be a cost, even if isn't monetary. If a person doesn't do a job the way you wanted, how much room do you have to complain if it was done for free? Maybe someone agrees to loan you a vital piece of equipment but you must drive 150 miles to pick it up between 3:00 and 3:30 Wednesday afternoon. Whenever you're offered something free, be prepared to pay for it in one way or another.

"Even if you get what you pay for, it's not a bargain if you can't afford it." How often have you been tempted by a good value that is beyond your means? The fact is, it matters not how much of a steal it is if it's more than you can pay.

"Drummers and bass players are Siamese twins joined at the beat." And if they're not they should be.

"A person has control over nothing in his or her life, only varying degrees of influence." When you think that the way *anything* in your life will turn out is entirely yours to determine, the universe will manifest a way to show you otherwise. By acknowledging from the get-go that there's only so much you can do to bring about a particular outcome, you'll be frustrated a lot less often and be less likely to be caught at a disadvantage.

"The technician's first creed is 'take no one's word for it.' The technician's second creed is 'when all else fails, try violence.'" The first creed applies widely, the second deals only with gear. Amusingly, when it comes to hardware, the second creed is often literally true.

"Half of every story is food." I never quite understood the profundity of this, but I uttered it, and a close friend immediately seized on it as having great meaning. Not that I would argue the point—I'm just not sure I fully understand it. Such is the nature of wisdom, I guess.

Finally, the homily that probably best describes my view of the bizarre and sometimes downright perverse world in which I dwell: "Given what passes for 'normal' in this society, I'm very glad to be considered 'weird.'" I mean, really! People playing life-or-death polo on the highways, treating people that serve them (whether in restaurants, studios, or elsewhere) as objects unworthy of basic human respect and consideration. . . . I could go on but, for better or worse, I'm out of space.

Hmm. "For better or worse, I'm out of space." . . . Does that have the ring of . . . naaaah. ❁

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STEVE CURL

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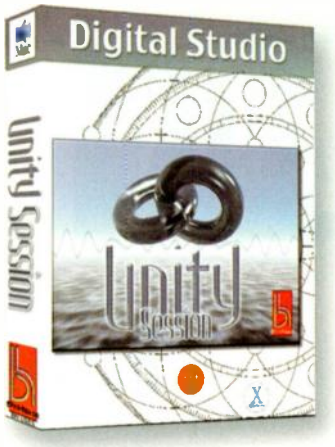

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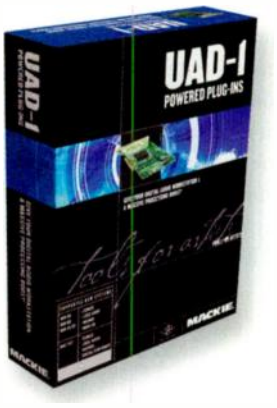
Mackie UAD-1 Powered Plug-ins

UAD-1 is a PCI card that allows you to run dozens of sophisticated effects plug-ins inside Digital Performer without bringing your Mac to its knees. What's the secret? A custom-built, monster DSP. It's like adding an extra $20,000 worth of effects gear to the dozens of native plug-ins included with DP. UAD-1 ships with this growing list of powered plug-ins:



Real Verb Pro
The most flexible, natural sounding reverb available. Design your own rooms, down to the smallest detail.

Pultec Program EQ
Stunningly realistic recreation of this classic analog EQ. Dangerous amounts of boost with musical results.

1176LN Limiting Amplifier
Another analog classic reborn inside Digital Performer. Apply liberally with host CPU cycles to burn.

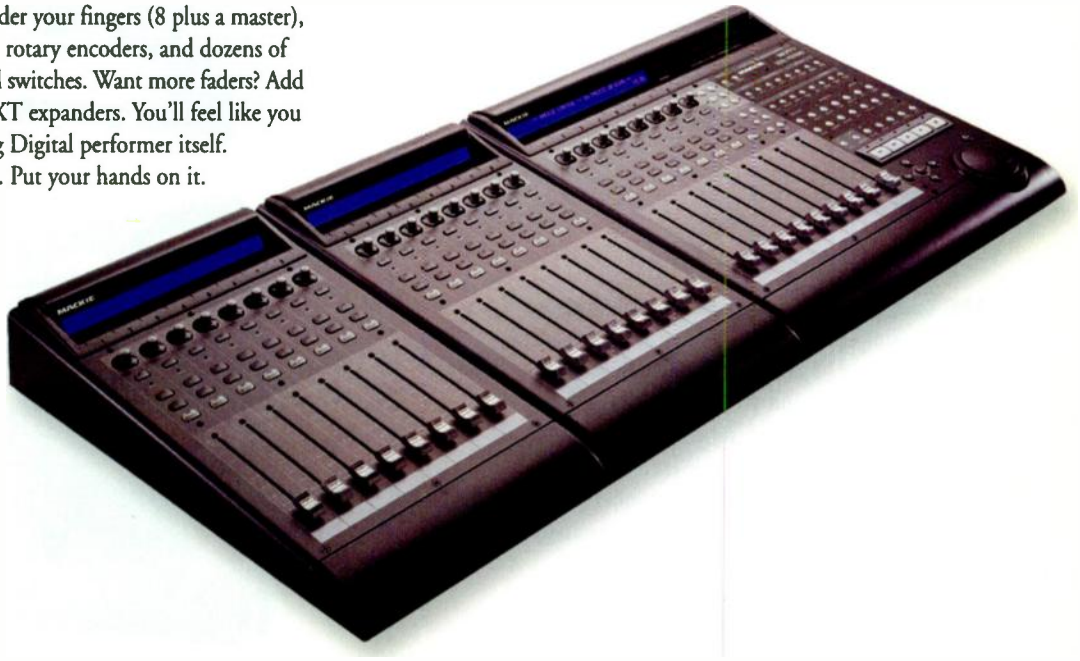
Teletronix LA-2A Leveling Amplifier
This beauty defines "vintage audio gear". If you want warm, authentic analog in your DP mixes, this is it.

Nigel
A complete palette of guitar tones combined with every effect a guitar player could possibly ever need.

CS-1 Channel Strip
Whopping punch on a single DP plug-in insert: EQ, compression, delay and reverb all in one plug-in.

Mackie Control for DP3

Designed in direct collaboration between Mackie and MOTU, the new Mackie Control automated control surface puts nine touch-sensitive Penny & Giles automated faders under your fingers (8 plus a master), 8 motion-sensitive rotary encoders, and dozens of custom-programmed switches. Want more faders? Add 8-channel Control XT expanders. You'll feel like you are touching Digital performer itself.
Go ahead. Put your hands on it.



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Antares kantos 1.0

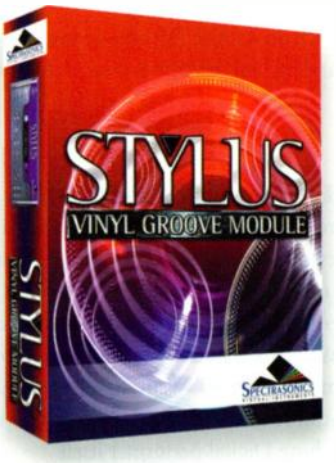
The company that gave you AutoTune, the holy grail of pitch correction, now brings you kantos: the world's first audio controlled synthesizer. Use your voice (or any other monophonic source) to play, shape, warp, bend, convolve or otherwise control the powerful kantos synthesis engine in ways you never thought possible. Or feed it rhythmic loops for truly mind-bending results. And you can play kantos directly into Digital Performer. This changes everything.

Waves Native 3.5

Waves, the most sought-after plug-ins for Digital Performer, have just undergone the most sweeping performance enhancements ever in Version 3.5. Enjoy support for DP3's fully symmetric multiprocessing, sample-accurate automation, 96kHz operation, and optimizations that allow you to run dozens more Waves plug-ins simultaneously. Available in various-sized bundles at numerous price points, including the Platinum Native bundle (shown). With 25 plug-ins, it's an amazing value and covers the full spectrum of audio tools. Waves 3.5 is native processing in full glory.

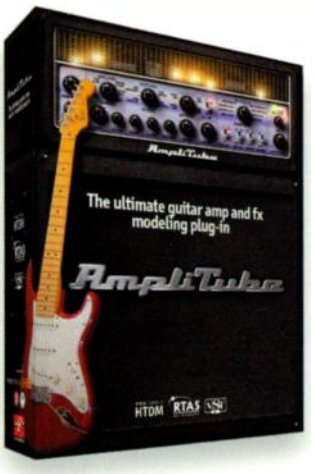
Spectrasonics Stylus

Stylus™ is a breakthrough native virtual plug-in instrument for Digital Performer from renowned developer Spectrasonics that integrates a massive 3GB arsenal of incredible Groove Control™ activated loops and unique drum sounds, with a powerful user interface for shaping and creating your own grooves. Features all NEW sounds, over 1,000 new remix grooves by acclaimed producer Eric Persing, elastic Tempo, Pitch, Pattern and Feel with Groove Control, killer live percussion loops, thousands of cutting-edge drum samples and real-time jamming with Groove Menus.



IK Multimedia Amplitube

Amplitube is simply the best guitar amp and FX modeling plug-in ever made. 1,260 possible combinations, mic emulation, 200 presets and 10 different stomp, amp and rack effects. Amplitube sounds superb on guitar — and just about everything. Amplitube delivers the largest arsenal of guitar tones ever to your Digital Performer mix. Play it live or use it post. Now just plug in your inspiration...



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The MOTU 2408mk3 recording system with DSP-driven mixing and monitoring opens a world of new possibilities for your MOTU native desktop recording studio.

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MOTU Digital Performer 3.1

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The New MOTU 2408mk3

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Radikal SAC 2.2

Completely redesigned. Smoother faders. Higher resolution encoders. Dozens of enhancements made specifically for DP3. The Radikal Technologies Software Assignable Controller gives you automated, touch-sensitive mixing. The ultimate hands-on experience for Digital Performer.

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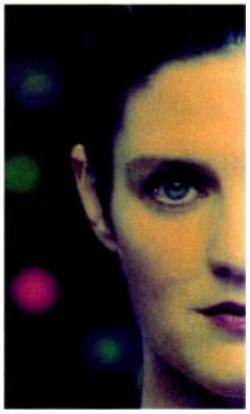

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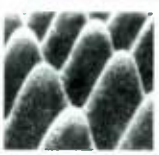

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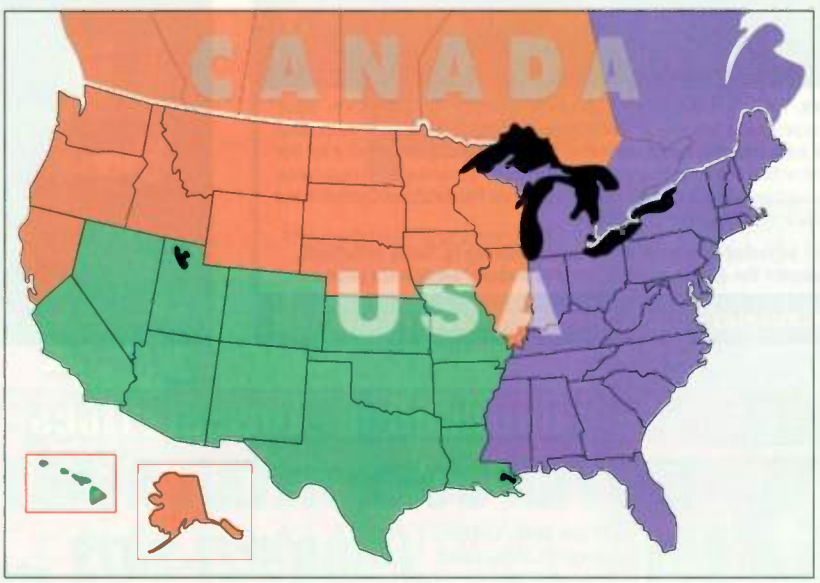

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Twisted Peer

Twisted Textures definitely owes a stylistic debt to Spectrasonics' *Distorted Reality*, one of the pioneers of the ambient/drone sample-CD genre. That's a good thing—the sounds here are certainly worthy of that legacy.

The audio CD helpfully includes start, end, and loop-point information for all samples. Because most of these sounds have prominent center frequencies, I wish that they'd included pitch or key information as well.

Film and multimedia composers as well as sound designers are clearly the prime targets of *Twisted Textures*, and they'll find it to be an audio gold mine. Don't assume, however, that the collection is aimed only at the Hollywood set; anyone who uses drones and ambient beds will find lots of material that they can put to immediate use.

Overall EM Rating (1 through 5): 4

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HAL LEONARD

The Boss Book

By Gino Robair

I'm a sucker for gear books—the more vintage and exotic, the better—even if I don't own the items covered. Originally written in Japanese under Boss's auspices but published in English, *The Boss Book* ($19.95) is part product brochure, part historical account, and part gear porn.

When I received my copy, I wondered what I would find interesting in a book about the ubiquitous little stompboxes that are still being manufactured by the millions. Boss has made over 6 million of the DS-1 distortion pedal alone—just how many secrets could there be in such a popular product line?

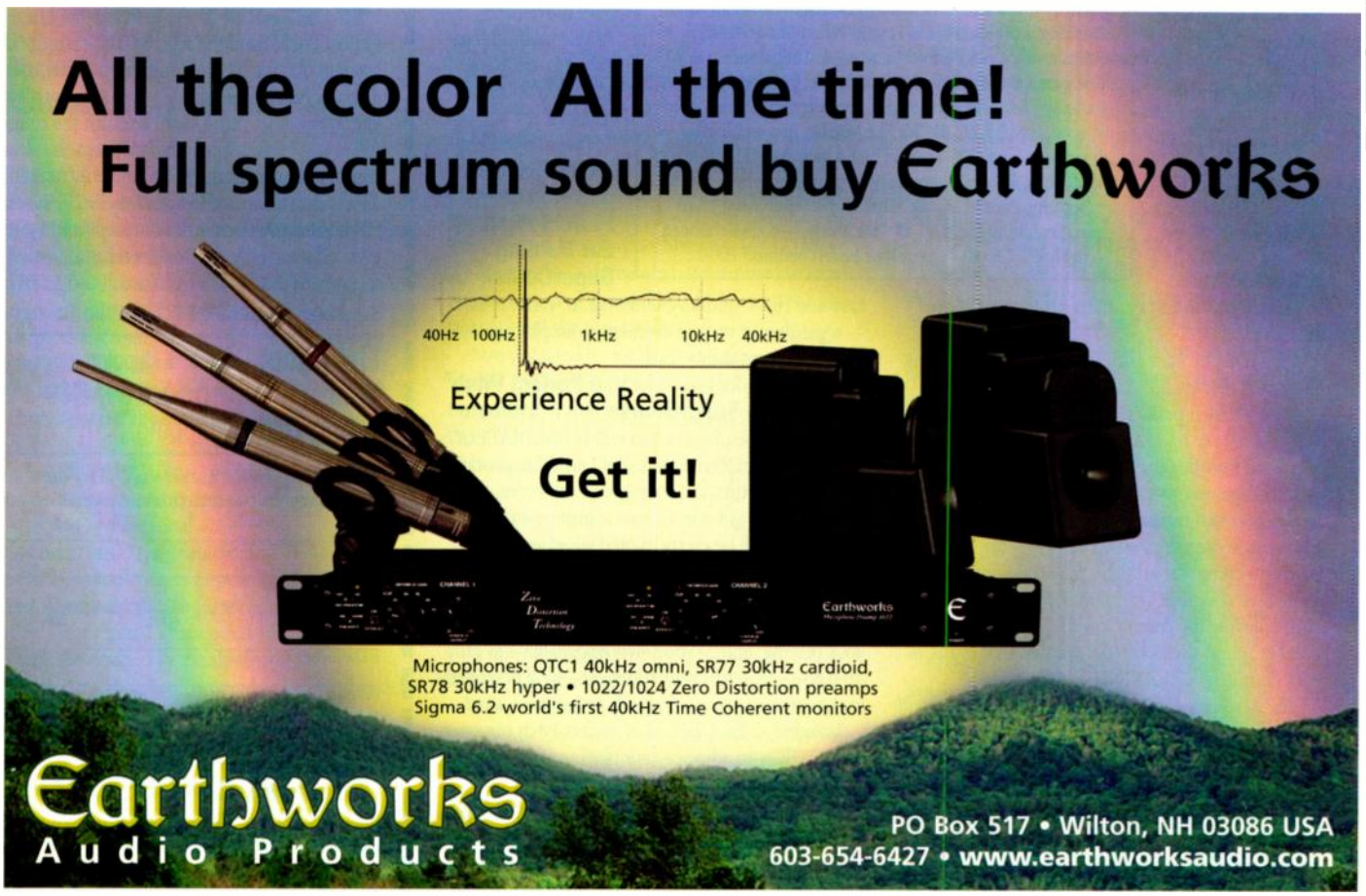
From Bee Baa to Bee Gee

As far as books for collectors and enthusiasts go, *The Boss Book* seems thin at 122 pages. But don't let its size fool you: Boss spared little expense on this project. The pages are thick and glossy, and color photos and graphics abound. That's especially satisfying because most of the pedals are color coded by function.

The Boss Book begins with an overview of the product line, organized by effect type. The function of each pedal is described, accompanied by a few specs and the dates of availability. This section also includes Roland effects that preceded the Boss line, such as the Jet Phaser and a pair of early fuzzboxes called the Bee Baa and the Bee Gee.

Next up is a side-by-side waveform comparison of 20 distortion boxes. The examples include a brief analysis of each waveform, discussion of how it sounds, and visual representations that show each waveshape and the effect that certain settings have. This is one of my favorite parts of this book, but we're only up to page 46!

Next come the "Relationship Atlas for All 20 Distortion Models," the "Distortion Character Distribution Diagram," the "Character Analysis Table for All 20 Models," and the



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sound, it removes much of the kick's punch.

Second, the hats that had been chopped from the middle of a phrase had excessive low-end ambience, presumably left over from a kick on a previous beat. That makes the sounds fairly useless, at least as conventional hats.

Third, dynamics are naturally limited to whatever was present in the source material. Sometimes there are soft and loud snares, for instance, and sometimes there are not. You can forget about Velocity switches, too; all samples are laid out across the keyboard, one per key.

Finally, the documentation contains no mention of where the source material came from, and it makes no claims of being "copyright free." The samples are all single-hit (except for one full loop, in the Kit numbered 252–256), but some might still be recognizable because of effects or other unique sonic characteristics. Would that put a commercial project in jeopardy of copyright infringement? I don't know. Would I want to risk it? Probably not.

Look Up My Number

Major Issue No. 2 is the complete lack of useful documentation. The careful reader will have noticed that all of the program names cited in this review are in the form of "Kit (number)." That's exactly what the CD booklet offers, as well as the sample files themselves: Kit 1 through Kit 569—no descriptive names, no genre titles, nothing except a number to help you find or remember a specific Program. Furthermore, after six pages of useless numeric names, the booklet offers eight pages of ads for other sample CDs from Best Service.

Overall, I was disappointed by *Dance Mega Drum-Kits*. It does offer some good sounds, but their usefulness is far outweighed by negative considerations.

Packaged as two discs in audio and Akai S1000 formats, Best Service *Dance Mega Drum-Kits* contains approximately 5,000 drum samples.

Overall EM Rating (1 through 5): 1.5
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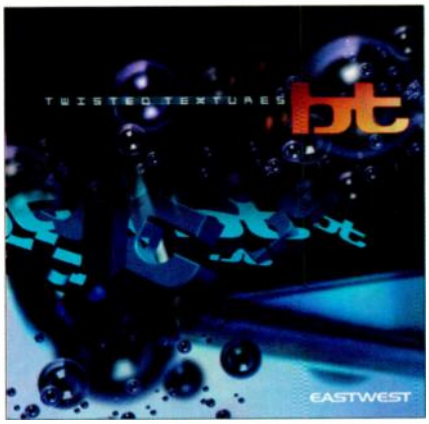
EASTWEST

Twisted Textures

By Dan Phillips



Acclaimed sound designer and musician BT offers a thematic collection of imaginative, animated sounds in EastWest's *Twisted Textures*.

Brian Transeau, better known as BT, has been making a lot of noise (literally) as an electronica artist and film composer double-trouble wonder boy. With *Twisted Textures*, he opens up a goodly portion of his private sample library to the world. The collection is available from EastWest as two audio CDs ($129.95), three CDs in Akai S3000 format ($299.95), or two CD-ROMs in Gigasampler format ($299.95). I reviewed the audio-CD set.

Twisted Textures is a collection of pads, ambient beds, and drones, organized into 13 groups. With the exception of the Ethnical group, the sounds and groups aren't described in musical terms. Instead, each is categorized by its intended emotional or dramatic effect, in the manner of a music supervisor communicating with a film composer.

Mini Moods

The group names serve as helpful guides to the sounds: Disturbed/Frantic, Ethnical, Fear/Terror, Happiness/Accomplishment, Hate/Anger/Rage, Hope/Beauty, Impending/Lurking, Nostalgia, Peaceful/Meditative, Space/Earth/Technology, Strength, Supernatural/Cosmic Presence, and Wonderment.

Some of the individual sound descriptions are simple and straightforward, such as "anxious and afraid" and "hopeful, very secure in outcome." Others are more florid and poetic, often describing very particular scenes or turns of plot; examples include "fear while meditating," "first time experiencing ego death transformation," and "being reminded of a dark hour similar to present situation." The descriptions may seem overly specific, but I think they would be helpful to a film composer or sound designer who needs a quick inspirational jolt.

The sounds are fantastic and varied: low, throbbing drones; peaceful, heavenly chords; distant distortion and deep, hollow pads; glassy ambiences; ominous breathing; East Indian–flavored sonic beds; and so on. Some of my favorites are Heaven Fits Sky, a 21st-century update of the final chord from the Beatles' "A Day in the Life"; the hollow, spacious drone of Spiritual; and the ominous, sinking buzzing of The Fuzzy Falls.

Frontier combines pure temple bells, rain, and several insect calls with a peaceful pad—a self-contained background for any Asian-tinged mystical scene. Bow Star uses excessive delays and reverb to transform abstract distorted guitar riffs into a disturbing, shadowy atmosphere. Cyanide Rumbler creates a bumpy horror-movie texture from gritty distortion and from swirling white noise through resonant filters.

Darkstar offers a low, pulsing noise with higher whistles, reminiscent of a large and barren space. The Baby in Space is simple but classic, with a combination of high, breathy noise and deep, subsonic sounds, with a mild burbling underneath. A Moment in Trust features glassy, chorused reversed guitars over a full, mellow pad, creating a beautifully warm effect. There are many variations on extended but fairly static drones—either uplifting, as in Octipi II, or with ominous overtones, as in Pliable Space.

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Quick Picks

WIZOO

Platinum24 Electronic Drums

By Dan Phillips

Wizoo's *Platinum24 Electronic Drums* offers a simple concept that is executed almost flawlessly. This relatively inexpensive CD-ROM ($99.95 for Akai S1000, EXS-24, Halion, or Gigasampler formats) takes sounds from Roland's venerable TR-808 and TR-909 drum machines, adds a dash of distortion and a splash of reverb, and hands them to musicians on a silver platter. I tested the sounds on my E-mu E6400 Ultra sampler.

Both the 808 and 909 are presented in several variations, many of which represent kits treated with different amounts of distortion. The 808 kits include Clean and Drive, as well as a Soft kit that is friendly for ballads and layering. For the 909, you get kits named Clean, Drive, Distorted, Tiny, and Noisy—think of them as the five dwarves of electro.

Switch Hitter

I was surprised and pleased to discover that the hits are all multisampled. For instance, the snares in the 909 Clean kit offer three basic tones, each with six different samples in a Velocity switch. The Velocity switches sometimes capture dramatic changes in tone, such as the sound of sweeping a snare's filter cutoff. Other samples provide more subtle variations, just right for capturing the slightly random changes of these primarily analog drum machines.

The sounds are worthy of the attention to detail. The Clean programs are crisp, punchy, and noise free. I also like the Drive programs. The 909 Drive includes just the right amount of grit, and the kick in 808 Drive has the thick, buzzy tone of a half-blown woofer—perfect. I do wish for a clean 808 kick with an extralong decay; none of the samples quite produce that familiar, endless sine-wave boom.

The One After 909

There are also a few genre-inspired kits that have samples such as Club, Goa, Techno, Hip-Hop, Fusion, and Synth, as well as programs with reversed samples and special effects. The Synth kit is particularly cool, with a solid, zaplike kick and juicy noise-burst hats, and the Hip-Hop kit is deep and meaty. I would have liked to have samples from other classic Roland drum machines, such as the CR-78 and TR-606; for those, you'll have to look elsewhere.

All of the 808 and 909 kits are completely dry. Separate reverb-only programs offer samples of "clean" 808 and 909 hits with just reverb and no dry signal at all. According to the liner notes, the reverbs are from the studio-standard Lexicon 480L; they certainly sound great, including several lengths of hall, gated reverb, and the classic Brick Wall program.

Wizoo's *Platinum24 Electronic Drums* captures many of the sonic variations of Roland's vintage TR-808 and TR-909 drum machines.

The Grand Wizoo

To use the reverb-only programs, you simply layer them with the dry programs and adjust the volume balance to suit. This works well for all but the most distorted dry kits; the "clean" reverb on "dirty" signal caused too much cognitive dissonance for my taste.

Platinum24 Electronic Drums delivers a near-encyclopedic rendering of the 808 and 909 (although I wish it had that extralong 808 kick). Documentation is accurate and complete, if not especially colorful. Its simple but clear concept is crafted with precision, resulting in an eminently useful product at a reasonable price. Who can argue with that?

Overall EM Rating (1 through 5): 3.5

Wizoo GmbH; tel. 49-421-701-870; e-mail info@wizoo.com; Web www.wizoo.com

BEST SERVICE

Dance Mega Drum-Kits

By Dan Phillips

The exuberant cover of *Dance Mega Drum-Kits* ($99.95) boasts that it's "the ultimative dance drum collection." Linguistic concerns aside, its promise of 569 kits with 1,500 kicks, 1,500 snares, 1,000 hi-hats, and 1,000 percussion hits led me to be hopeful. With so much material, some of it is bound to be useful, right? Sadly, the collection's many flaws overwhelm any numeric advantages.

The package includes two discs—an Akai S1000 CD-ROM and an audio CD—each with the complete set of sounds. I appreciated the inclusion of the audio CD because it's great for quickly auditioning sounds—and many sounds there are. The collection offers acoustic and electronic drums in a broad range of styles, from rough and gritty to crisp and clean. The kicks are my favorites; Kit 74's deep, beefy TR-808 kick literally rattles the walls, and Kit 441 features a thick, blatty, semidistorted TR-909 kick—good stuff!

I was initially surprised that many of the kick samples also include a layered hi-hat, but that quickly clued me in to Major Issue No. 1: in spite of the collection's title, you aren't getting "kits" at all. Instead, the sounds are sliced drum loops. In other words, the sound designers started with recordings of drumbeats, and then cut up the recordings to make each hit into a separate sample. Another disappointment was that, unlike many rhythm-slice libraries, MIDI files for re-creating the original patterns are not included.

Let Me Count the Ways

Using sliced drum loops in place of full kits can be problematic for a number of reasons. First, most of the kick and snare samples also include hats, which is inconvenient at best; it also makes certain patterns impossible to program (such as steady 8th-note hats with 16th-note accents from the kick alone). A few of the kicks are also offered in versions with the high end removed by filtering; although that helps isolate the kick

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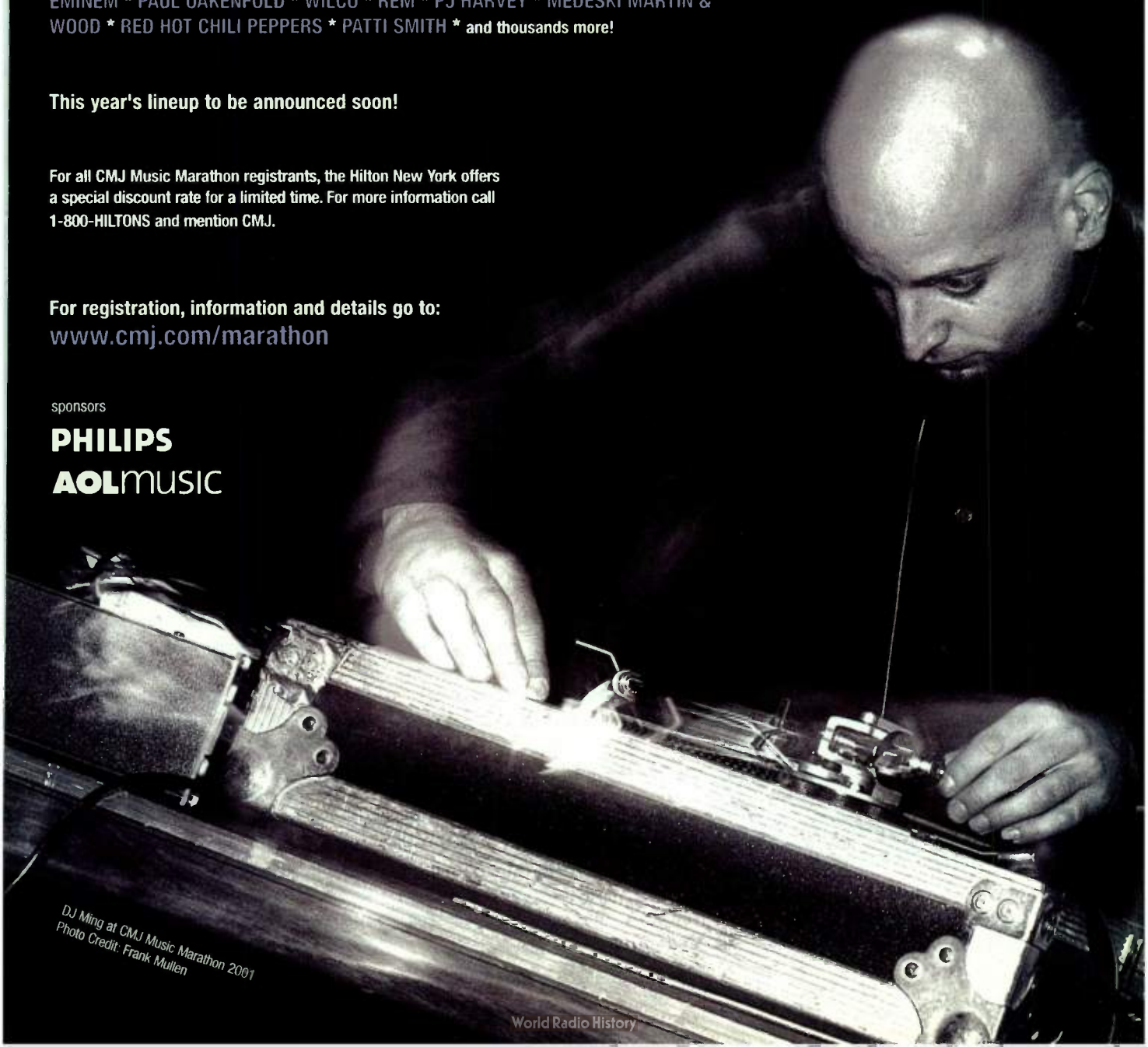

DJ Ming at CMJ Music Marathon 2001
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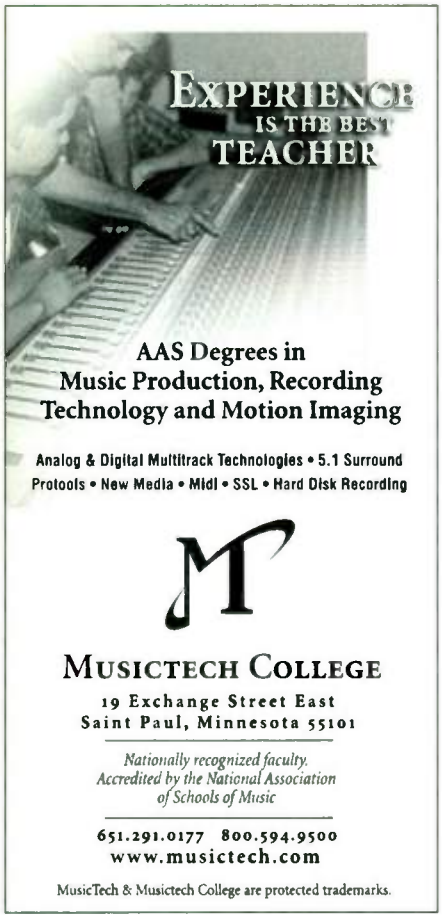

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NT4 and NT5 Specifications

Element	externally polarized, DC bias capacitor ("true" condenser)
Diaphragm	½", 6µm, gold-vapor-deposited Mylar
Polar Pattern	cardioid
Stereo Capsule Arrangement (NT4 only)	90° XY (coincident pair)
Frequency Response	20 Hz–20 kHz (+2.5 dB/–8 dB)
Dynamic Range	>128 dB
Signal-to-Noise Ratio	78 dB
Self-Noise	16 dBA
Maximum Sound-Pressure Level	143 dB
Power	48V, 24V, or 12V phantom (9V battery option for NT4)
Dimensions	NT4: 9.13" (L) × 1.26" (D) NT5: 4.65" (L) × 0.79" (D)
Weight	NT4: 1.06 lb. NT5: 0.22 lb.

NT4 captured on the drums, and the caps handled the huge dynamic range—from pianissimo to mezzoforte—without a hitch.

In addition to being easier and quicker to set up than the NT5s, the NT4 really came into its own with stereo ensemble recordings—that is, with the mic positioned ten or more feet back from the players. When recording the aforementioned amplified instrumental ensemble at the small club in San Francisco, I placed the NT4 about 14 feet in front of the stage, elevated on a balcony, and pointing down at the group. From that position, the NT4 still picked up appreciable low end from the bass player, and the highs were detailed enough to reveal subtleties in the fairly dense room mix.

To get a better sense of the Røde's sonic performance in that setting, I compared them with my AKG C 3000 B pair—the mics I typically use for direct-to-DAT recordings. The C 3000 B is a large-diaphragm mic, so the test wasn't exactly apples to apples; still, it was useful to hear the differences. As before, the Røde mics sounded darker—the AKG C 3000 Bs have a definite presence boost. Even so, both the NT4 and the NT5s sounded natural, and they did an exceptional job of picking up richness and subtle nuance from the instruments and their ambient reflections.

LOW RØDE, HIGH RØDE

With the new NT4 and NT5 microphones, Røde has not only come up with a couple of great-sounding and affordable mics, but it has also contributed nicely to the art of stereo recording. At only $899 for the NT4 and $599 for the matched pair of NT5s, these mics should appeal to budget-conscious studio owners and location recordists alike.

Sonically, both mics performed admirably, even holding their ground against comparable models costing twice the money. Though in comparison they sounded darker and less sparkly in the highs (a quality some readers will view as a minus, others as a plus), the Røde mics captured plenty of detail—enough to impress a group of pro engineers who took a listen out of curiosity. In addition, the mics were quiet and smooth sounding, and the capsules were well matched on both models.

For those who want the quick setup and error-free stereo capture afforded by a dedicated stereo mic, the NT4 is the way to go. It is especially well suited for 2-track concert recording and as a drum overhead (though less so for close-miking apps, due to the fixed 90-degree angle of the caps). Those who prefer, as I do, the positioning flexibility afforded by a pair of small-diaphragm mics can opt for the NT5s. Thankfully, Røde lets us have it both ways. ❀

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guitar, trumpet, and saxophones at a small club in San Francisco; and a large jazz ensemble featuring piano, violin, saxophone, flute, upright bass, drums, and Chinese erhu at Yoshi's jazz club in Oakland, California. I also used the NT4 as a drum-set overhead for an extremely dynamic player on a multitrack live recording of a jazz trio at a 19th-century church in Tiburon, California.

For the studio tests, I was assisted by fellow sound-arts instructor Steve Orlando. Working in Ex'pression Center for New Media's SSL room, we used the NT4 and the NT5s as drum overheads for a recording of a Latin jazz ensemble; as room mics; and on acoustic guitar. I also put the mics through several tests at my personal studio.

Other gear used for the tests included Daking 52270 mic preamps, a Langevin Dual Vocal Combo preamp, a Focusrite Green Series dual mic pre, a Mackie 1202-VLZ, an Allen & Heath 16:2 console, and an SSL 6000E Series desk. Results were recorded to DAT (Panasonic SV3800 and Tascam DA-P1), ADAT, Tascam DA98, and CD-R.

Both mics were easy to use and performed well, exhibiting a relatively even frequency response and quiet operation. I checked the mics' self-noise, which is rated 16 dBA, against a comparable condenser in my cabinet, the small-diaphragm Oktava MC012. The Røde mics were significantly quieter than the Oktavas.

The capsules of the single NT4 and the pair of NT5s proved sonically well matched. Moreover, the capsules in the pair of NT5s were from the same production run and even had consecutive serial numbers.

FIG. 2: The Røde NT5 is a small-diaphragm condenser that comes packaged as a matched pair and uses the same cardioid capsule as the Røde NT4 stereo mic. These affordable mics are well matched and have a smooth, natural sound.

ACOUSTIC DUTIES

During drum-overhead testing in the SSL studio, Orlando put up the NT5s alongside his personal favorite for that application, a pair of Neumann KM 184s. Admittedly, that was not a fair comparison with regard to price, given that a single KM 184 costs more than the pair of NT5s. Still, the NT5s fared well. The Røde mics were sonically a bit darker and not quite as full sounding as the Neumanns, but we were really impressed by the quality of the sound. The NT5's frequency-response chart shows a relatively flat response (±2.5 dB) up to around 14 kHz, at which point it begins to roll off, dropping approximately 8 dB by 20 kHz. That seemed in keeping with the relatively darker quality of the highs as compared to the Neumann KM 184.

To compensate, we applied approximately 3 dB of shelving boost at 10 kHz. After that simple EQ adjustment, it became a challenge to determine which mics were which in the mix—the sound quality of the Røde mics was that good.

FIXED INCOME

Both of the Røde models also sounded rich and detailed on an acoustic guitar miked close. I preferred the NT5s in that instance, because of the positioning flexibility afforded by using separate mics—the stereo image captured by the NT4 can sound overly wide in close-miking applications. For example, with the mic positioned a few inches back and directly facing the 12th-fret area of the acoustic guitar—which effectively aimed one cap at the lower fretboard and the other at the sound hole—we noticed a "hole-in-the-middle" effect. That is no deficiency of the NT4, but rather it is the inevitable limitation resulting from the fixed 90-degree angle of the mic's caps—think of it as a trade-off for the convenience, ease of use, and guaranteed phase-distortion-free (and thus mono-compatible) performance of the NT4. That said, you can easily tighten up the stereo image after the fact by panning the two channels closer together.

Any sense of a hole in the stereo image diminishes as you pull the mic back from the source, so overall the NT4 is better suited to miking from a distance. The mic worked well as a drum overhead when positioned a few feet above the drummer. (Then again, that's an application for which engineers often want a wide stereo spread.) I was impressed by the detail that the

PRODUCT SUMMARY

Røde
NT4 and NT5
stereo and mono small-diaphragm
condenser microphones
NT4: $899
NT5: $599 (matched pair)

FEATURES	3.5
EASE OF USE	4.5
AUDIO QUALITY	4.0
VALUE	4.5

RATING PRODUCTS FROM 1 TO 5

PROS: Smooth, natural, detailed sound. Good low-end pickup. Capsules well matched. Affordable. Easy to use. NT4 can operate on 9V battery (up to 400 hours per battery). Durable stand adapter. Nice carrying case. Excellent as drum overheads. Rich and detailed on acoustic guitar.

CONS: Sharp roll-off of frequencies above 14 kHz results in relatively dark-sounding high end (which might also be construed as a "Pro," by the way). Fixed 90-degree angle of capsules makes NT4 less well suited for stereo close-miking applications.

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RØDE

NT4 AND NT5

Two affordable new paths to stereo recording.

By Karen Stackpole

As a location-recording engineer specializing in stereo recording, I'm always interested in checking out new options for capturing stereo images. My ears perked up when I heard that Røde recently introduced two affordable new microphones designed specifically for stereo-miking applications: the NT4 (see **Fig. 1**), an unusual-looking stereo mic, and the NT5 (see **Fig. 2**), a small-diaphragm condenser packaged in matched pairs. Along with my enthusiasm for stereo recording, I also have a fondness for strange-looking mics, so I jumped at the chance to test these new transducers from Down Under.

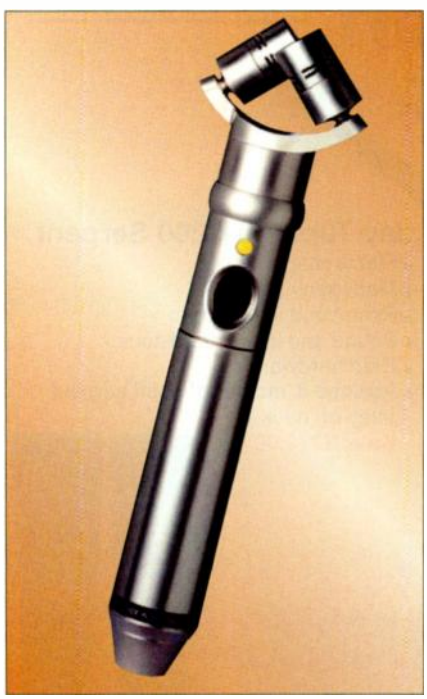

FIG. 1: Taking its place among only a handful of stereo condenser mics presently available, the distinctive-looking Røde NT4 is sure to find favor with budget 2-track concert recordists, especially given that it can be powered for up to 400 hours by a single 9V battery.

CLONE POOL

For this review, I received a single NT4 and a matched pair of NT5s. Both models have the same externally polarized ("true" condenser) capsule style. Two rows of narrow ports around the top of the cap help achieve its cardioid-only polar pattern. The gold-sputtered, half-inch diaphragm glints through an orderly array of small round holes at the address end of the mic, which is veiled by a finely woven mesh screen.

Both the NT4 and the NT5 are housed in heavy-duty, cast-metal bodies sporting a classy, satin-nickel finish and Røde's signature gold dot. The two mics share the same frequency-response characteristics, as well as a respectable maximum SPL of 143 dB, a dynamic range of 128 dB, and transformerless output circuitry. Neither mic provides an attenuation pad or highpass filter. A thin black label encircles the base of each mic, indicating manufacturer, model, and serial numbers.

Both models come in custom, hard-plastic carrying cases embossed with the Røde logo. The cases are secured with sliding plastic latches and fitted with form-cut foam interiors. The NT4 package includes the RM3 stand adapter; the WS4 wind shield; a custom, 5-pin, female-to-2-XLR-male stereo cable; and a 10-foot, 5-pin-to-⅛-inch-stereo-plug cable. The pair of matched NT5s comes with two RM5 stand adapters and two WS5 foam-rubber wind shields. The stand adapters are made of flexible, durable plastic and incorporate metal threading—a touch of quality that's nice to see, considering that some major mic manufacturers now use plastic threading on their stand adapters.

ABBOTT AND COSTELLO

The NT4 is a dedicated stereo mic fitted with two capsules permanently positioned as an XY coincident pair. A curved piece of metal on the top of the mic acts as a stereo bar to support the two caps, which are fixed at a 90-degree angle.

The NT4 is a bit of a Frankenstein creation, borrowing its body from the previously introduced Røde NT3 and sharing its capsule design with the NT5. The result is a mic that looks about as odd as a duck-billed platypus. The body is a beefy cylinder that tapers at the bottom. A rounded, internally threaded ring near the top of the mic allows access to the electronics inside. The NT4 can be powered either by a 9V battery or via phantom power (48V, 24V, or 12V). The bottom half of the mic screws off to reveal the battery compartment. Naturally, powering the mic by 48V phantom power yields the best results.

An oval window in the upper half of the body recesses the mic's on/off switch, protecting it from accidental bumps. The window also contains a red LED that indicates battery life. As long as the battery is good, the LED lights during power up and then shuts off; if the LED remains on after power up, it indicates that a new battery is needed. According to Røde, one 9V battery grants up to 400 hours of operation—a feature likely to make the mic popular among concert "tapers" whose recorders do not provide phantom power.

The NT5 is a pencil-type, small-diaphragm, mono condenser mic offered in matched pairs only; as of this writing, you cannot purchase a single NT5. This mic requires phantom power (48V, 24V, or 12V); there is no battery-power option.

RØDE TEST

I tested both mic models live and in the studio. The live performances were recorded in stereo direct to DAT. The groups I recorded and the venues I recorded at included an ensemble comprised of vocals, cello, sarod, gongs, and percussion at a small Buddhist church in San Francisco; a trio with clarinet, tenor sax, and shakahachi flute at a midsize, cement-floored venue; a classical cellist at an art gallery with hardwood floors and a high ceiling; a nine-piece ensemble composed of drums, congas, timbales, bass, keyboards, electric guitar, pedal-steel

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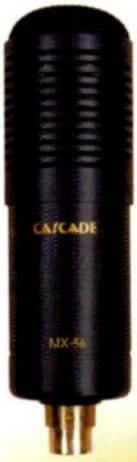

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- Diaphragm: 1" 24K gold-sputtered
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advantages, though, such as displaying drum names in addition to pitches or note numbers and allowing you to rearrange the drums vertically without regard for note number. Graphically, it's about as appealing as a spreadsheet except for the notes themselves, which display as little triangles with Velocity "ladders." A paintbrush tool lets you paint in predefined rhythmic patterns to make drum programming even easier. A large number of patterns are provided, and making your own patterns is as simple as saving a MIDI file with named markers to the pattern's folder.

GOODIES GALORE

Rounding out the XL extras are two 64-bit mastering plug-ins from Sonic Timeworks: Equalizer and Compressor X (see **Fig. 4**). Equalizer is an 8-band parametric EQ with a 30-band spectrum analyzer. It features low-cut and high-cut filters with variable resonance and six fully parametric bands, two of which can be changed to shelving filters. You can choose between clean and vintage algorithms to suit your taste and needs. Equalizer's Graphic mode features a grab-it-and-go EQ curve superimposed over the spectrum analyzer, making tweaking a snap. I found it useful for making natural-sounding adjustments of the general or surgical kind on classical music. Crank up the resonance on the high-cut filter, though, and you can do wonderfully rude things to a sound.

Compressor X is a straightforward plug-in with all the tools you need to manage dynamics effectively. It can be set to respond to peak or RMS levels, and in addition to the usual threshold, attack, decay, and ratio controls, it offers a choice of hard or soft knee. Makeup gain as high as 30 dB is available, and by using the Wall feature (a limiter), you can ensure that your outputs don't clip. As befits a compressor intended for mastering, it can provide a good deal of gain reduction while remaining inconspicuous.

Sonar now natively supports a variety of hardware control surfaces, and profiles (plug-ins, actually) are included for the Tascam US-428, CM Labs MotorMix, and generic controllers. (At press time, Cakewalk had just posted a plug-in for the Radikal SAC-2K and an update to the MotorMix and US-428 plug-ins, so be sure to check the Web site for the latest developments.) The generic-device plug-in includes presets covering the Kenton Control Freak, JL-Cooper FaderMaster, Peavey PC 1600, and more. You can also program presets for your particular device. The editor includes a MIDI Learn mode that saves you from drudging through controller numbers and hexadecimal code.

Probably the biggest criticism I can level at Sonar 2.0 is that you still can't use a DXi as a metronome output. Also, whenever the CPU gags and shuts down the audio engine, you must restart it manually, though you can eliminate the problem by adjusting a setting in your aud.ini file. If you think those are pretty minor gripes, you're right. Sonar XL 2.0 doesn't disappoint.

UP AND DOING

For users of previous versions of Sonar or Cakewalk Pro Audio, version 2.0 is a must-have upgrade. In addition to the feature improvements cited above, Sonar 2.0 seems to be much more stable and robust than its predecessor. For example, two USB audio interfaces I reviewed previously had trouble with version 1.3, but both are solid with 2.0. Cakewalk confirms that stability and compatibility improvements were key components of the upgrade.

If you're looking for a user-friendly program that combines serious audio recording and editing with everything-but-the-kitchen-sink MIDI-sequencing capabilities and groove-oriented loop manipulation, check out the Sonar demo available on Cakewalk's Web site. Whether I use Sonar for remote audio recording and editing on my laptop or as a composition and production tool in my studio, it helps me work efficiently and make good-sounding music. In the end, that's what it's all about.

Brian Smithers *is Course Director of Audio Workstations at Full Sail Real World Education in Winter Park, Florida.*

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The New ADK Studio Twin Packs have arrived!

At first I yawned at what I thought was just another way to synchronize a bunch of loops, but it gets more interesting. If you have an entire loop assigned to a single pad, the pad Editor displays blocks for each slice in the loop. Each block can be individually transposed up or down as much as two octaves, made louder or softer, or panned. You can replace any slice by dragging and dropping a replacement slice onto its block, even if the slice is from a different loop. Drum replacement doesn't get any easier than that.

Things got even better when I dragged each slice to a different pad. When you drop the slices on the pad name in the pad Editor, the slices retain their relative timings. Each pad now represents a loop containing one note/slice in its original position, so if you trigger all 16 pads at once, the notes will play back exactly like the original loop. "Big deal!" I thought, until I started muting and unmuting individual notes, deconstructing the loop, and then building it back up gradually. Because the pads can be triggered by MIDI notes, you can record and edit the mutes until you have something more interesting than the usual loop track. Each pad can also be assigned to its own audio output, allowing you to mix and process slices independently in Sonar's mixer.

FIG. 4: The Sonic Timeworks Equalizer and Compressor X plug-ins are a welcome addition to the Sonar arsenal. Although they use 64-bit internal resolution, they are fairly easy on the CPU.

If you then disable looping for all pads, each pad will trigger its respective slice immediately, turning the loop into a playable drum kit. That's great, but it would be fantastic if the pads mapped Velocity to volume.

There are tools that can pitch-shift individual slices of a loop, tools that let you deconstruct loops by cutting them up, and samplers for assembling a drum kit out of single hits, but Cyclone manages to put it all together in a package that feels like a musical instrument. Now all I need is Akai's MPD16 pad controller to play it.

DR IN THE HOUSE

FXpansion's DR-008 drum synth/sampler is another winner in Sonar XL's expanded arsenal. It supports as many as eight stereo outputs into Sonar and has extensive automation capabilities. Each of its 96 pads can be assigned to play any 1 of 4 sampler modules, 11 analog-modeling synth modules, or 5 "drum-deploy modules," which process MIDI information in various ways.

The four samplers range from a single-layer module to one with up to 128-way Velocity switching. The synth modules deliberately lean toward sounds in the style of Roland's classic TR-808 and TR-909 drum machines and are great for a variety of dance styles. The drum-deploy modules are used to map and process incoming MIDI data to the other pads for effects ranging from flams and rolls to an 8-track-by-16-step sequencer with variable swing that naturally syncs with Sonar's tempo. Each step-sequencer module holds only one pattern, but with 96 pads available, you can build a number of different modules and trigger them with MIDI notes from Sonar.

The DR-008 is a lot of fun to play, but beneath its engaging exterior is some heavy horsepower for drum programming. Currently, it can import LM-4 kits, and FXpansion plans to offer conversion wizards for other formats.

While I'm on the subject of drums, Sonar's new drum maps are a great example of better living through technology. For starters, custom drum maps allow you to remap MIDI note numbers so no matter which synthesizer you're playing, your kick and snare will always be in the same place on the keyboard. Better still, you can build a custom drum kit that triggers multiple devices from a single MIDI track. Use the kick from one synth, the snare from another, the hi-hat from a virtual instrument, and the tambourine from a sampler, map them all to whatever keys are most comfortable for you to play, and you've got the ultimate MIDI drum kit.

The drum editor offers a convenient graphical representation of any MIDI track that is assigned to a drum map. It's the drum equivalent of a piano-roll view—in fact, you open it by selecting Piano Roll view. It has some distinct

PRODUCT SUMMARY

Cakewalk
Sonar XL 2.0
digital audio sequencer
$599

FEATURES	4.5
EASE OF USE	4.5
DOCUMENTATION	4.0
VALUE	4.0

RATING PRODUCTS FROM 1 TO 5

PROS: Comprehensive audio and MIDI recording and editing features. Includes loop-construction tools and innovative groove sampler. ReWire 2.0 support. Enhanced DirectX virtual-instrument support. Improved file management. Native support for hardware control surfaces. High-quality DirectX effects included. Real-time MIDI effects. Low-latency WDM kernel-streaming support. Drum editor with custom multiport drum maps.

CONS: Cyclone DXi doesn't map Velocity to volume and needs better documentation. Can't use virtual instruments for metronome.

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Aardvark Pro Q10
Direct Pro Q10 is a computer based digital multi track recording solution from Aardvark. Powerful DSP-based virtual mixing software eliminates the need for an external out-board mixer.

Aardvark

Zoom MRS-1044CD Digital Multitrack
The MRS-1044 is a digital multi track workstation, featuring 10 audio tracks, a programmable stereo drum track and a programmable bass track and built-in CD burner.

ZOOM

Roland VS2480CD 24 Track
The VS-2480 is the first self-contained recording workstation to offer 24-track/24-bit digital recording with 64-channel digital mixing, onboard effects processing, CD burner & 80 gig drive.

Roland

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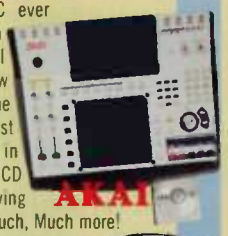

AKAI

Korg D1600 V40
The Korg D1600/V40 is a 16-track digital recorder with a 2x8 CD burner and 40GB HD, that packs recording, mixing, and final CD mastering into a professional quality all-in-one unit.

KORG WITH 40 GB HD & 2X8X CD BURNER

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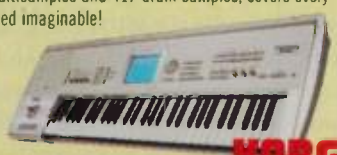
ALESIS

Korg Triton Studio Pro X 88-Key Workstation
The TRITON STUDIO Pro X features Korg's HI (Hyper Integrated) synthesis system and best PCM sounds. Its high-capacity 48 Mbyte PCM ROM, with 429 multisamples and 417 drum samples, covers every need imaginable!



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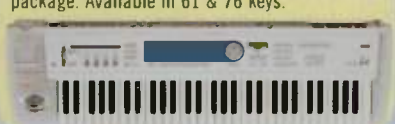
Korg Triton LE Synthesizer
The TRITON LE Music Workstation distills all the best features of its namesake into a streamlined, cost-effective package. Available in 61 & 76 keys.



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AVALON DESIGN

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PreSonus

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Mind Print DTC Preamp
MindPrint DTC 2-Channel Dual Tube Preamp w/48 volts phantom power and more!

Mark of the Unicorn 896
Mark of the Unicorn, Inc

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GENELEC

Sonar 2XL Audio/Sequencing Software (PC)
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Steinberg Nuendo
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with a project to a new folder to ensure you have everything.

For the traditionalists, Sonar still offers the Bundle, a single file that contains all of a project's audio as well as its MIDI data. It's undeniably convenient to have a whole project in a single file—until that file somehow becomes corrupted, and you realize the hazards of putting all your eggs in the one proverbial basket. (My usual triple-redundant backup scheme didn't seem so excessive when that happened to me!)

ALL WIRED UP

The big news for most folks is Sonar's support for ReWire 2.0. The ability to connect every output of a complex Propellerhead Reason song to a separate Sonar mixer channel is enough to make me a bit giddy. You can connect only one instance of a ReWire application, but you can use more than one ReWire application simultaneously if your CPU can handle it. Each ReWire application is limited to 16 devices or instruments.

ReWire makes it possible to apply Sonar's audio effects to Reason's outputs and to automate those effects. Additionally, you can route MIDI notes and controllers to the ReWire application's instruments, effectively automating filter sweeps and other tweaks. That opens up such possibilities as using Sonar's real-time MIDI effects to arpeggiate Reason's Subtractor synth. You can't send Program and Bank Change messages to a ReWire application, however.

Transport controls between Sonar and the Rewire application are linked, so if you have Propellerhead ReBirth connected, for example, its patterns will start, stop, and play in sync with Sonar. If you change the tempo in one, the other will follow. Now recording a guitar lead over a ReBirth arrangement is a snap, and all of Sonar's tools for editing, mixing, and mastering the results are at your disposal.

One Sonar 2.0 enhancement whose utility is easy to overlook is the Synth Rack (see Fig. 2). It might not look like much, but opening your DXi and ReWire instruments from the Synth Rack offers two main advantages. First, the Synth Rack will automatically create audio and MIDI tracks for the virtual instrument, saving you a number of mouse clicks. Second, when you open an instrument from within the Synth Rack, you can enable multiple audio outputs if the synth supports them. Open Reason that way, and you will end up with 63 audio tracks—a stereo main and 62 mono outputs.

FIG. 2: The unassuming Synth Rack does more than just give you a central location for calling up your DXi control panels. If you launch DirectX and ReWire instruments from the Synth Rack instead of as plug-ins on an audio track, you can take advantage of the instruments' new multioutput capabilities.

Plug-in automation takes a step forward as well. Audio Simulation's Dream Station virtual analog synth, for example, now sends MIDI Control Change messages when you change settings, enabling you to record and then play back any sort of knob-twiddling you might want to perform. Five of the excellent Power Technology DSP-FX plug-ins (which are included in both versions of Sonar 2.0) are fully automatable as well, as are the Sonic Timeworks EQ and Compressor X. You can write automation from the effects' onscreen controls or draw it in the Track View as vector-based envelopes. All automation can be edited from the Track View.

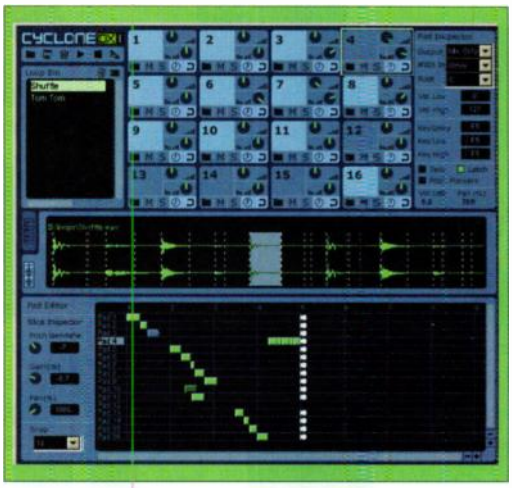

FIG. 3: The new Cyclone DXi groove sampler was a pleasant surprise. It's a great tool for manipulating loops in ways that make them sound less like loops. Here, the slices of the loop have been mapped across the pads, and their pitch, gain, and pan have been manipulated while their time relationship has been preserved. MIDI notes are used to mute and unmute the various pads to create new variations on the loop.

ZERO TO HERO

I don't recall ever changing my opinion more quickly than I did in the first hour I spent with the Cyclone groove sampler (see Fig. 3). If its original documentation had been better, I might have changed my mind a lot earlier. Fortunately, a plug-in update from Cakewalk included some feature and documentation improvements.

Loop-based production has never appealed to me much, but Cyclone offers such useful ways to manipulate a loop that it's hard to resist. It presents you with 16 pads that allow you to use MIDI notes or mouse clicks to trigger all or part of an Acid-style loop or groove clip. Below the pads you can select either a keyboard display showing the key mappings of the pads or a waveform display showing the selected loop sliced into its rhythmic components. At the bottom of the screen is a pad Editor whose 16 linear tracks correspond to the 16 pads.

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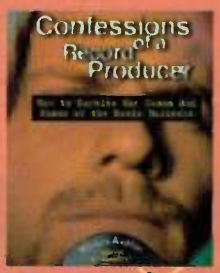

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NO HANDS

The DDX3216's onboard automation sequencer is easy to learn and use; you just enable the automation parameters you want to record and go. With the notable exception of "offline" event editing, all the standard features are there: a trim mode that lets you change the overall level of a fader that has rides written already, a programmable fader-return time or write-to-end option, and so forth.

Motorized boards that don't have touch-sensitive faders use one of two methods to sense when you're punching in automation overwrites. The first is some sort of "clutch" button or footpedal that disengages the fader from the motor while it is being depressed. The other, used on the DDX3216, simply senses the resistance when you move a fader; you punch out by stopping the machine supplying time code or hitting Stop (or some other button).

Some people find the resistance-sensing method a bit harder to use, so it would be nice if both types were available. Also, the Undo function isn't at the top level in the display. Given that many of a $2,000 mixer's users are likely to be new to all this, it should probably have been more accessible. But it's great that the DDX3216 provides two levels of undo.

UPPING THE ANTE

Anyone considering a digital mixer near this price range is advised to take a serious look at the Behringer DDX3216. An automated console of this quality, with its potential 32 inputs and 20 outputs, is already appealing, but the 4 high-quality effects processors put the DDX3216 over the top. The entry-level to the world of digital consoles is now quite a bit higher—and that's saying a lot, considering it was none too shabby even before the DDX3216 came along.

Nick Batzdorf *writes articles and music in Los Angeles. He was the editor of another industry magazine for a decade but is now kicking back and enjoying the freelance easy life of hot tubs, jets, parties, and Florida swampland sales.*

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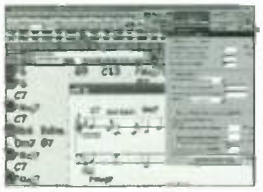

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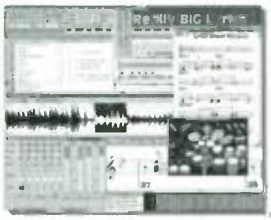

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THE ROCK SAXOPHONIST
Multimedia Instrumental Program

Fully featured professional music program containing studio recordings of great Rock 'n' Roll saxophone music. Hot session players perform great sounding Rock music, while you learn the riffs and tricks! Seamlessly integrated MultiTrack audio, MIDI, chord symbols, and music notation and chord progressions.

THE JAZZ SAXOPHONIST
Multimedia Instrumental Program

Listen to hot session players perform great sounding Jazz music, while you learn the riffs and tricks! This interactive program has great "chops" – nearly an hour of hot Jazz plus tips and techniques. Seamlessly integrated MultiTrack audio, MIDI, chord symbols, and music notation for your sound card equipped PC.

THE BLUES GUITARIST
Multimedia Guitar Program

Professional fully featured music program containing studio recordings of great electric Blues guitar music. Listen to hot session players perform great sounding Blues music, while you learn the riffs, licks and tricks! This interactive program has great "chops"– nearly an hour of hot Blues plus tips and techniques..

THE BACH CHORALES
Volumes 1 & 2
Multimedia Vocal Program

Inspiring performances of J.S. Bach's famous four-part Chorales by a professional choral ensemble, complete with a detailed multimedia history of the composer's life and times. On-screen notation, lyrics and chord progressions in perfect time with the singers.

THE ROCK GUITARIST
Multimedia Guitar Program

Listen to hot session players perform great sounding Rock music while you learn the riffs, licks and tricks! Multimedia features give you the ability to mute or solo any audio track independently and study or play the part yourself. On-screen notation, tablature and chord progressions scrolls by with the band.

THE BARBERSHOP QUARTET
Volumes 1 & 2
Multimedia Vocal Program

All-time favorite Barbershop songs and an interactive multimedia history of barbershop singing in America. Made with the assistance of **SPEBSQSA** (Society for the Preservation and Encouragement of Barbershop Quartet Singing in America).

THE SOR STUDIES FOR CLASSICAL GUITAR
Multimedia Guitar Program

Superb professional classical guitar performances of all 121 of Fernando Sor's celebrated studies for guitar (Opus 6, 29, 31, 35, 44, and 60 complete). This interactive program contains hours of music on 3 CD-ROMs **PLUS** complete Sor biography, historical timeline, and more powerful multimedia features.

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that delay is available only on the analog channels.

EFFECTIVE NOW

The DDX3216 is powered by four Analog Devices SHARC processors, which means that its engine packs a kick like a mule. That's part of the reason the overall quality of the effects is so high.

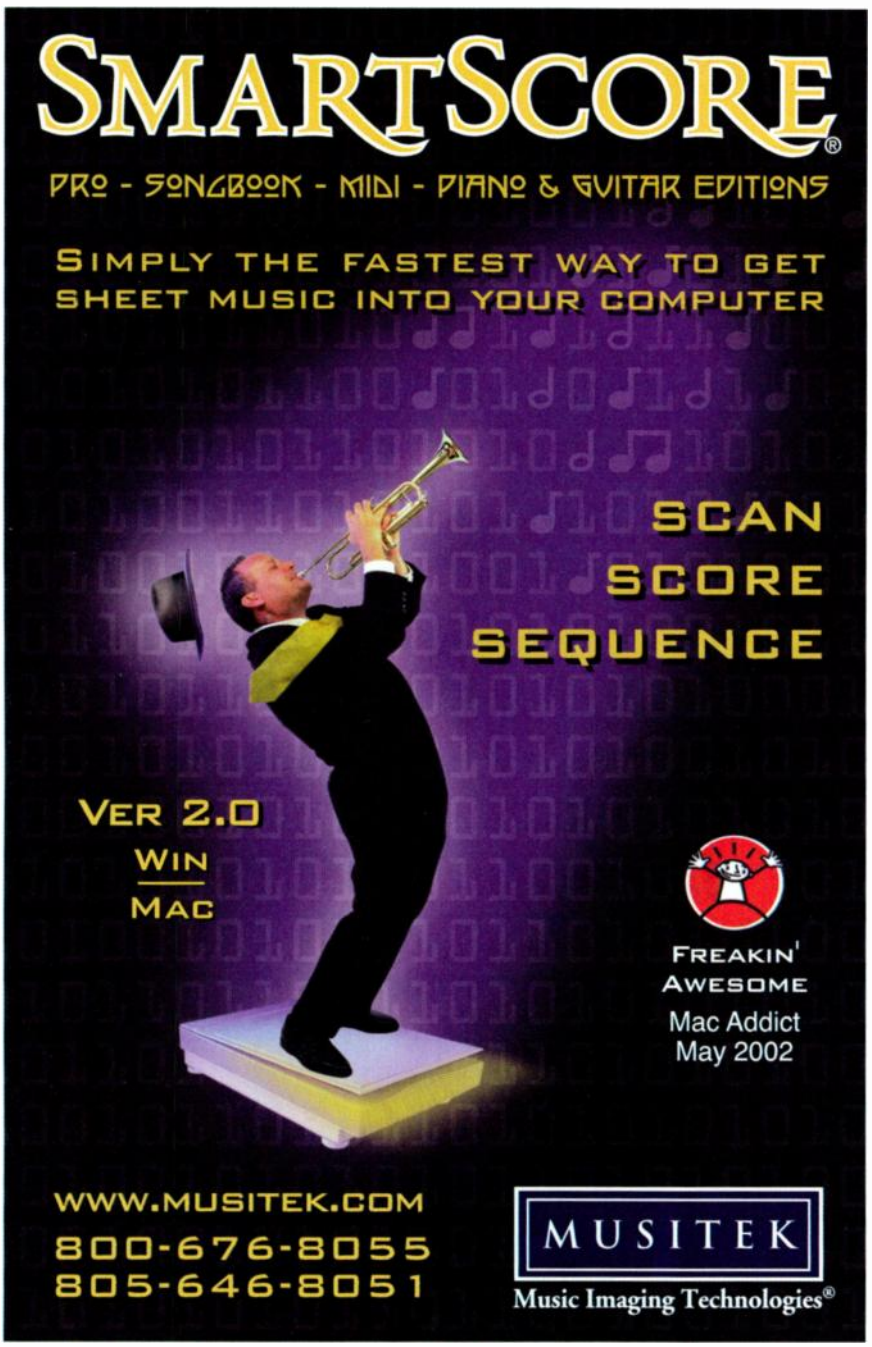
Most of the effects are mono in/stereo out, and most have eight adjustable parameters—plenty to let you customize the programs. You can even automate parameter changes, which is a feature that's become particularly important in certain contemporary-music styles.

The effects collection includes various reverbs (including a simulated spring reverb), delays and delay-modulation effects (flange, chorus, and so on), pitch shifting, an enhancer, and ring modulation. It also includes a couple of effects that are very much du jour: LoFi (bit-reduction grunge) and an auto-filter. Unlike the effects processors added almost casually to some digital boards, this selection really adds value to the mixer. You could easily produce credible mixes using just this board.

DIGITAL DETAILS

At and above 10 dB below nominal, the DDX3216's fader resolution is in approximately 0.2 dB steps, which is good for a budget digital mixer. Below –10, the resolution goes down to 1 dB, which is adequate. Yet I didn't hear any zippering on fades, so it's possible the board interpolates between positions internally.

The board's panning resolution is in 60 steps—fine enough to avoid zippering during sweeps and plenty for setting up relationships between instruments in the stereo field. Other features, such as word-clock I/O and selectable noise-shaped dither on the digital outputs, show that Behringer didn't gloss over important details.



PRODUCT SUMMARY

Behringer
DDX3216
digital mixer
$1,999

FEATURES	4.0
EASE OF USE	4.5
AUDIO QUALITY	3.5
VALUE	5.0

RATING PRODUCTS FROM 1 TO 5

PROS: Big feature set, including EQ/gate/compression on all inputs, channel delay on analog inputs, and lighted, multifunction rotary knobs on all channels. Pleasing anc easy-to-use interface. Nice-quality motorized faders. Four good internal effects processors. Solid dynamic and snapshot automation.

CONS: File Exchange software is for Windows only. No MIDI fader layer. No offline event-list automation editing.

Manufacturer

Behringer U.S.A.
tel. (425) 673-1807
e-mail support@behringer.com
Web www.behringer.com or
www.ddx3216.com

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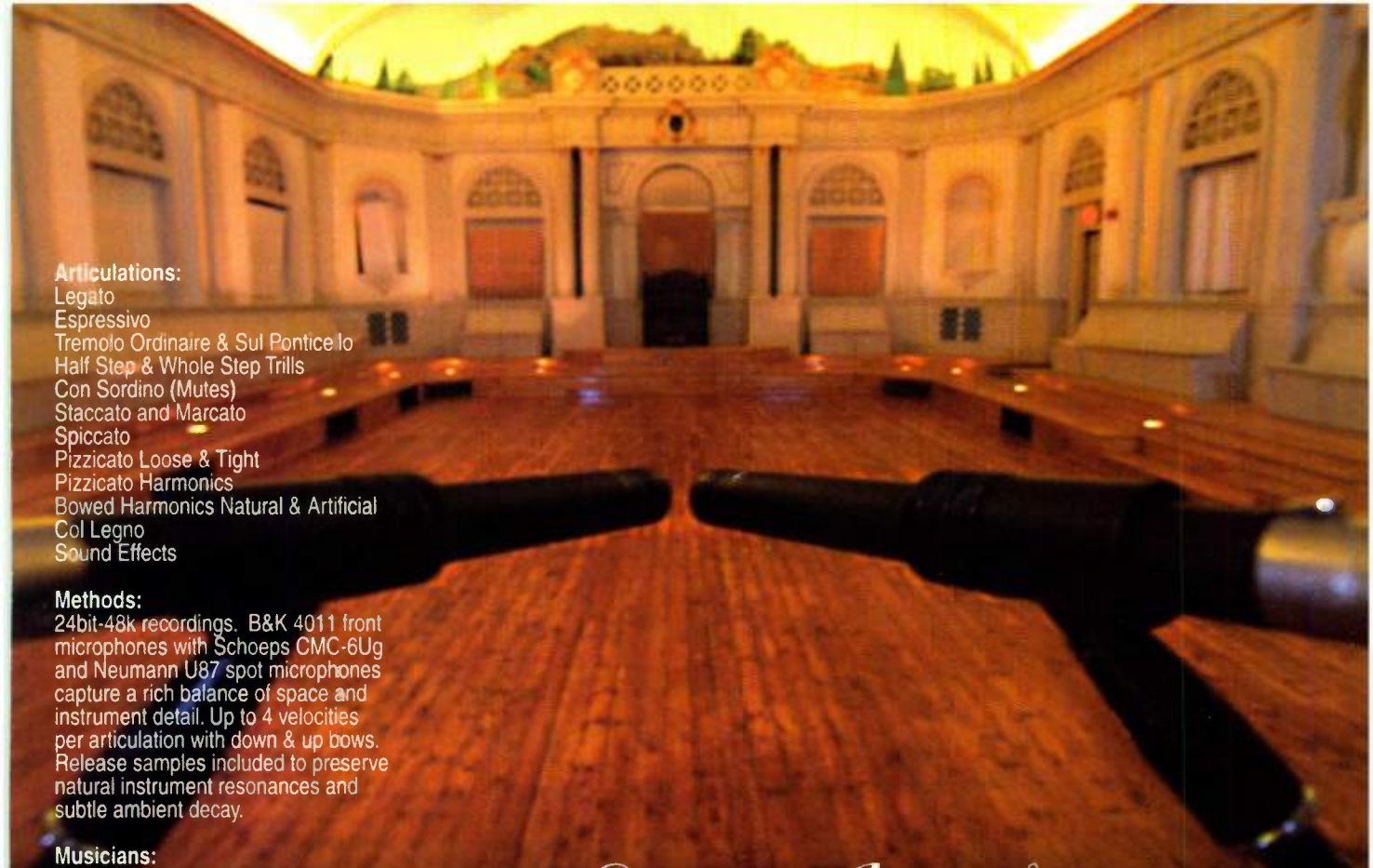

Articulations:
Legato
Espressivo
Tremolo Ordinaire & Sul Ponticello
Half Step & Whole Step Trills
Con Sordino (Mutes)
Staccato and Marcato
Spiccato
Pizzicato Loose & Tight
Pizzicato Harmonics
Bowed Harmonics Natural & Artificial
Col Legno
Sound Effects

Methods:
24bit-48k recordings. B&K 4011 front microphones with Schoeps CMC-6Ug and Neumann U87 spot microphones capture a rich balance of space and instrument detail. Up to 4 velocities per articulation with down & up bows. Release samples included to preserve natural instrument resonances and subtle ambient decay.

Musicians:
Sections include 1st Violins, 2nd Violins, Violas, Cellos & Basses. Unparalleled musicianship, technical proficiency and beautiful sounding instruments from members of the Boston Pops and Boston Ballet Orchestras.

Availability:
Full release in Gigasampler format. CD or DVD Box Set. Complete Documentation. Please call or visit website for details and demos.

Recording Notes:
Recorded by 2001 Emmy award winning engineer Antonio Oliart and RIAA award winning engineer John Bono at Sonic Temple Studios, Roslindale, MA. (pictured) Programming done exclusively in-house. Designed for the utmost in expressiveness and playability; a joy to create with.

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