Master Class: Native Instruments' Reaktor • Alesis Masterlink and 10 more reviews

Electronic Musician®

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September 2000

BUILD A MIC CABINET ON ANY BUDGET

THE USB CONNECTION

EDDIE KRAMER

A DAY IN THE LIFE

INTERTEC® /PRIMEDIA Publication

U S $5.95/Canada $6.95

09>

16 total channels • 4 buses
16 XDR™ mic preamps • 16 mono mic/line channels • 4 stereo aux returns • 6 aux sends per ch. • 3-band equalization w/swept midrange

1604-VLZ™ PRO

16 total channels • 4 buses • 10 XDR™ mic preamps • 8 mono mic/line channels 2 mic/stereo line channels • 2 stereo line channels • 4 stereo aux returns • 4 aux sends per ch. • 3-band equalization w/swept midrange on mono channels • 4-band fixed equalization on stereo channels • white sidewalls optional

1642-VLZ™ PRO

14 total channels • 2 buses + Alt 3-4 extra stereo bus • 8 XDR™ mic preamps • 8 mono mic/line channels • 4 stereo line channels • 2 stereo aux returns • 2 aux sends/ch. • 3-band EQ

1402-VLZ™ PRO

12 total channels • 2 buses + Alt 3-4 extra stereo bus • 4 XDR™ mic preamps • 4 mono mic/line channels • 4 stereo line channels • 2 stereo aux returns • 2 aux sends/ch. • 3-band EQ

1202-VLZ™ PRO

VLZ PROs have also won more industry awards

VLZ™ PRO Series with XDR™ mic preamps. Precise creative tools for serious artists.

If you're serious about your creative product, your equipment list should start with a really good mixer.

Our VLZ™ PRO Series has become the industry standard for compact mic/line mixers. They're used day-in and day-out by more professionals to create more albums, demos, movie and broadcast sound tracks, commercials and web casts than any other brand.

They mix and submix in most of the world's top recording studios (we know of one 1202-VLZ™ PRO that's actually *built into* the control surface of a $1,000,000 digital console). And VLZ™ PRO mixers are in more basement, garage and back-bedroom home studios than you can shake a patchcord at.

XDR™. The finest microphone preamplifier design ever built into a compact mixer.

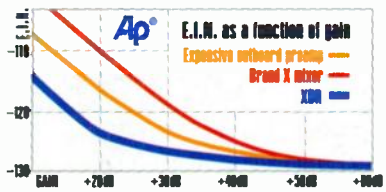
Because the preamps in mixers have long been considered a poor second to $1000 to $2000-per-channel outboard preamps, Greg and our Analog Engineering Department spent two years of meticulous experimentation creating a sonically comparable mic preamp circuit.

According to numerous cynical recording engineers, magazine reviewers and a lot of satisfied owners, we succeeded.

One reason is the advanced 2068 op-amps that are a foundation of the XDR design. They blow away our competitors' 4580 op-amps in terms of noise and distortion. Consider these real, measurable XDR™ (Extended Dynamic Range) microphone preamp specs:

- **0.0007% Total Harmonic Distortion**
- **0.0008% Intermodulation Distortion**
- **130dB total dynamic range to handle hot digital sources**
- **3Hz to 192kHz bandwidth**
- **Ultra-low mic E.I.N. at practical real-world gain levels**

By "practical" gain levels, we mean the +20 to +30dB normal operating range. The chart below compares E.I.N. for XDR™ ■, an Awesomely Expensive Outboard mic preamp ■ and a compact mixer ■ whose specs *claim* –129dBm E.I.N....but only at +60dB gain.



While XDR™ sonically rivals esoteric designs, it's no creampuff. We also built in protection against damage from shorts and "hot patching"...and the best RFI rejection of any compact mixer.

But don't just take our word for it...

Here are a few comments we gleaned from just *one week* of incoming VLZ™ PRO Series owner registration cards:

"Love the XDR mic preamps...clean and sweet!" C.H., Tampa FL

"A quality replacement for a far more expensive mixer brand." J.C., Arlington TX

"I was contemplating a couple of '----' outboard mic preamps ($2000+). The new XDR preamps let me make my next purchase a CD burner or an outboard processor instead." M.M., Miami FL

"Great product. XDR's are a great innovation and the value's unbeatable." J.K. Boise ID

"I hooked up my brand spankin' new AKG 3000 and all I can say is 'cool'." T.D., Waukesha WI

"I've been though numerous small consoles that were noisy. This one isn't, so it's a keeper!" J.F., Boca Raton FL

"Gorgeous preamps. Nice job, guys." J.C., Provo UT

"Nothing comes close to the quality/price." P.K., Spokane WA

"Excellent frequency response... excellent mic preamp. Worthy of our Neumann mics." C.M., Atascadero CA

"Killer mic preamps!" R.A., New York NY

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- New high-performance 2068 op-amps
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than any other competitive mixer line. These are just the awards we remembered to take photos of.

24 TRACK PERFECTION!

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iZ™ RADAR® . . . OWN AN ORIGINAL!

I N S I

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40 THE MUSICAL WORLD OF USB

Universal Serial Bus is one of the hottest buzzwords in both Mac and Windows computing, and devices equipped with this plug-and-play interface are rapidly taking over the market. Here's what the fuss is about, including a survey of USB-equipped MIDI interfaces, audio interfaces, and control surfaces.

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Native Instruments' *Reaktor* is one of the most powerful sound-design and sampling applications available. Our master synthesist offers advanced *Reaktor* tips and tricks for creating nearly any type of synthesis and processing routine you can think of.

By Len Sasso

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Cover: Illustration by Jean-Francois Podevin

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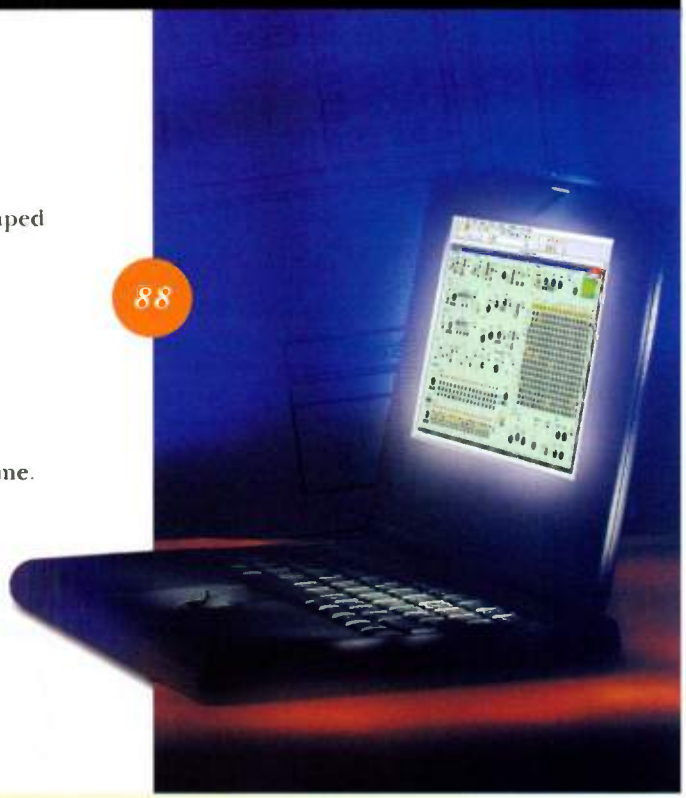

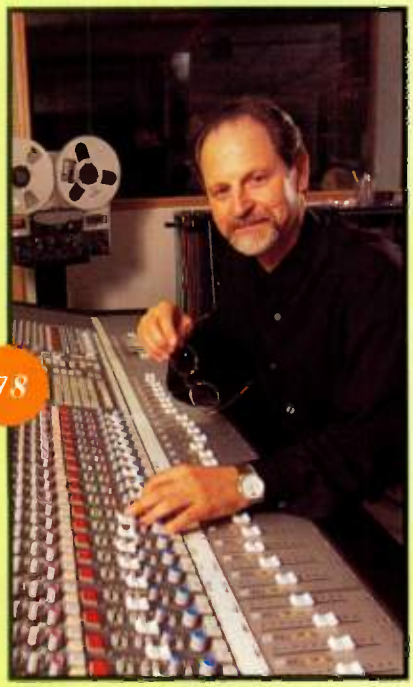

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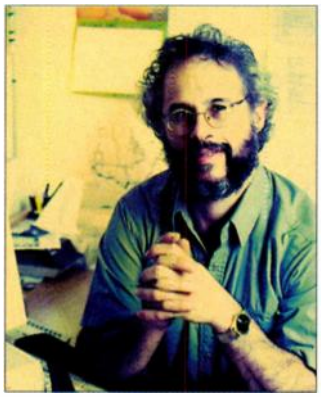
Electronic Musician®

Giving It All Away



ANTHONY PIDGEON

We musicians spend much of our lives honing our talent, knowing that the saying "Many are called, few are chosen" applies big-time to us. Few bands ever get out of the small club gigs they start in, and even fewer get signed to a reputable record label that can launch them into higher orbit. And even those who do get a label deal rarely make much money in the long term.

Of course, if money were our primary motivating factor, most of us would work in other businesses—such as editing magazines. We make music because we want to. On the other hand, if we give everything away, we are practically declaring that our music has no financial value.

Today, some people would indeed have us give all recorded music away for free. Some even outright steal music and offer it to the public using Napster, Gnutella, and other forms of technology. Of course, technology cuts both ways: the MP3 format and Napster, properly used, are great for marketing your music or even delivering an end product, if you don't mind making sonic compromises. Still, the fast-spreading, if specious, argument that "music should be free" has the big labels very concerned. Maybe independent musicians should be concerned, too, but not because of the majors' travails.

One could argue that the major labels have legally "stolen" the music they distribute, making it hard for most of us to sympathize with them. The system has often been compared to sharecropping: the big labels own the land, we grow the crops, we pay for most of the expenses, and they rake off the profits. There are always a few notable exceptions, but most musicians who get signed end up struggling, without even the rights to their work. The latest blow against freedom is the recent "work for hire" amendment to the Copyright Act, which effectively allows record companies to claim ownership of sound-recording rights forever.

So the idea of ripping off the big labels using the Internet has a certain Robin Hood appeal for many musicians as well as fans. And when Metallica, one of the few who have gotten wealthy from their records, objects to the piracy, it's easy to dismiss them as corporate counterrevolutionaries.

Whoa, not so fast there! What about the small, independent labels? Many indies do business on a shoestring. Now, thanks to the Internet, independent labels (including yours) have a fighting chance to reach a large audience without being beholden to the majors. You might even make more money than some "successful" acts make with the majors, after expenses. But technology cuts both ways again: piracy can screw the indies, too. Pirates aren't likely to discriminate between large and small labels. That's why the big labels are not the only ones who should be concerned.

Posting select songs or excerpts as downloadable MP3 files can be a very smart marketing move. Go for it. If you are just doing your music for fun and choose to give it away free, fine, that's your call. But the decision to donate our talents should be ours alone. If we musicians won't fight for the right to determine what we charge for and what we voluntarily give away—and that includes giving away our rights to the big labels—we might as well resign ourselves to sharecropping.

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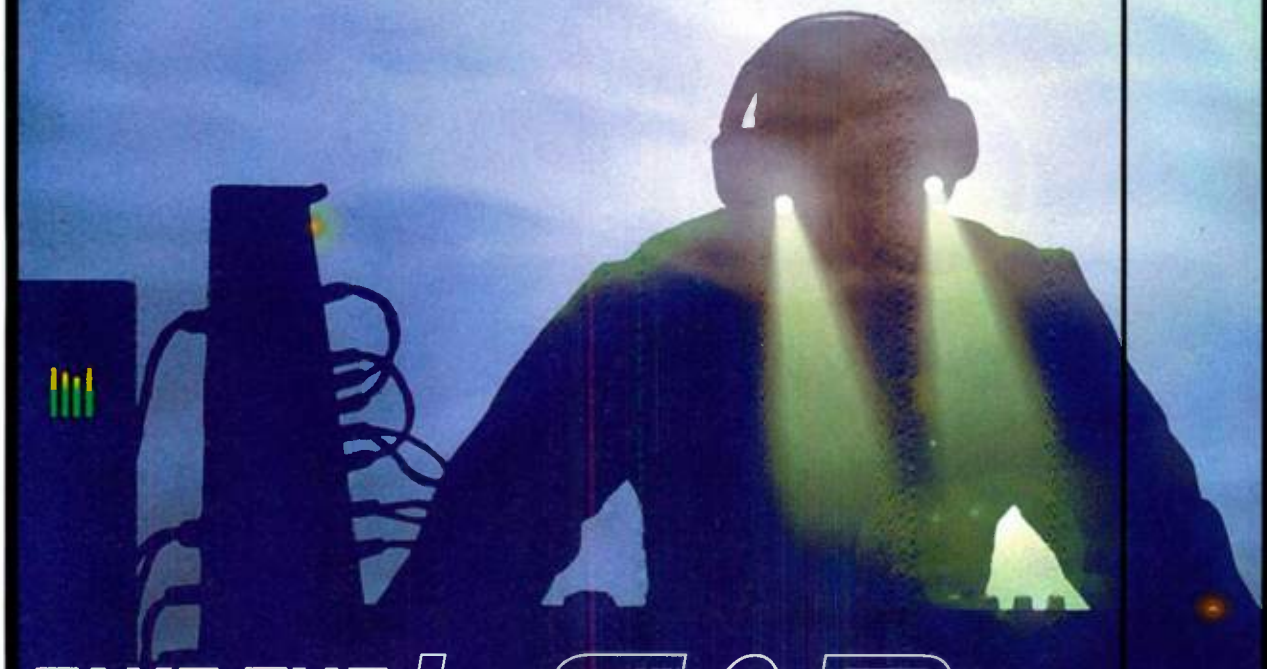

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products work, we had to go back to OS 8.6.

So don't feel bad, Steve. Your comments are well founded, and you are not alone.

Frank Serafine
Frank Serafine Studios
Venice, CA

NOT-SO-SIMPLE PLEASURES

I read Steve Oppenheimer's "Simple Pleasures" editorial with some amusement. Finally, someone closely connected to the bleeding edge of technology throwing up his arms in frustration like the rest of us ordinary musicians. I always wondered how the guys and gals doing the **EM** equipment reviews never had any problems with the gear. Now we catch a glimpse of reality.

I finally have *Cubase VST* running smoothly on a PC system with Windows 98, but ironing out all the quirks took months, and some days the program still pulls a few fast ones. Upgrade to Windows 2000? No way!

The funniest part of the article is when Steve asserts, "We can also be less dependent on computers." Are you kidding, Steve? You're editor of a magazine that pushes technology on a monthly basis—digital audio software, plug-ins, desktop home studios, software synths, etc., etc. I guess next month's issue will be called *4-Track Portastudio Musician?*

Less dependent on computers, indeed. My whole studio revolves around my computer, "thanks" to **EM**.

Daniel Stecko
via e-mail

Daniel—Remember that I also said I still loved the computer and would be right back to making music with it when it worked properly. Actually, I never stopped using my Mac G4 for non-MIDI computing. And despite all the headaches, I still think the G4 is a heck of a computer.

I hope you don't think the computer is the only technology in my studio! I use several keyboard synths and rack upon rack of synths, samplers, and signal processors. I have stereo analog and multitrack digital tape decks and a variety of commercial and custom-built MIDI controllers. I'd hardly compare that to a 4-track cassette rig.

So relax; I'm still way into this stuff. I just had a really, really bad time with it for a while.—Steve O.

ERROR LOG

July 2000, "Going Soft," p. 62: The number of envelopes available in *Retro AS-1* is limited only by your computer's CPU.

July 2000, "Tracking the Midnite Vultures," p. 91: The console in the background of the opening photo is by DDA, not Mackie.

June 2000, "Desktop Musician: New Chips on the Block," p. 98 and p. 100: *Pro Tools LE* software for Windows 98 and Mac OS is not optimized for Intel's Streaming SIMD Extensions and Apple's G4 Velocity Engine.

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

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WHAT'S NEW

By Marty Cutler

MICROBOARDS AUDIOWRITE PRO 8

Microboards' new AudioWrite Pro 8 ($499) is a stand-alone portable CD recorder for live (1×) recording. If you want the SCSI-based unit to double as a computer-based 8× CD burner, you just need burning software and a computer equipped with a SCSI port.

To this end, Microboards offers AudioWrite Pro 8 ($649), a suite of bundled software and some hardware. The Windows bundle includes Sonic Foundry's *CD Architect* and *Sound Forge XP*, along with Microboards' own *Hot Burn* and *Play Write* MP3 software. A PCI SCSI card and a stereo RCA audio cable are also included with the Windows package. The Macintosh bundle includes Adaptec's *Jam* and *Toast* software and a stereo RCA cable.

With both the PC and Mac versions, Microboards sweetens the pot with two blank CD-Rs to get you started. Microboards Technology; tel. (800) 646-8881 or (952) 556-1600; fax (952) 566-1620; e-mail sales@microboards.com; Web www.microboardsproaudio.com.

CLAVIA NORD LEAD 3

The Nord Lead 3 ($2,500) from Clavia is a hybrid synthesizer that melds analog modeling with 4-operator FM synthesis (two operators per oscillator) and has many other features that distinguish it from earlier models. The synth is 20-voice polyphonic and 4-part multitimbral. A new Unison mode offers thicker sounds, with up to ten detuned oscillators per voice. The user interface is now more intuitive, and the sound engine has been completely redesigned with new DSPs and upgraded DACs. The software can be upgraded via MIDI.

The synth features two separate oscillator groups, each with its own set of six different waveforms and a dedicated synched oscillator. The extra oscillator lets you create patches that have two separately synched waveforms per voice. The Sinus Modulation feature is a simplified form of FM synthesis, giving you real-time control of FM timbres through knobs.

You can configure the two available multimode filters in series or in parallel and can adjust the spread of the resonant peak. Along with the standard lowpass, highpass, and bandpass filters are several hybrid filters. The filter and amp each have ADSR envelope generators. An attack/decay envelope can control the shape of oscillator 2 or FM amount, or can be configured as a third LFO. A Global Vibrato feature adds uniform vibrato to all voices. You also can sync LFOs to MIDI Clock.

A Morph function allows a single source to continuously control up to 26 sound parameters that can be freely distributed among four Morph Groups, each hardwired to Velocity, Aftertouch, Modulation Wheel, and Expression Pedal; ranges of control are user-definable. A cut-and-paste function lets you transfer groups of parameters from one preset to another.

When you use any of the 28 knobs to alter parameters, changes are reflected on circular LED graphs. When you select a new sound, the LED shows the new settings, and during adjustment the knobs don't jump wildly to the new value. Armadillo Enterprises; tel. (727) 519-9669; fax (727) 519-9703; e-mail armadillo@packet.net; Web www.armadilloent.com.

CAKEWALK PYRO

Cakewalk's *Pyro* ($57) MP3-ripping and CD-burning software converts digital audio into MP3, WAV, or Windows Media files. The package includes a free graphics kit for designing and printing CD and jewel-case cover art.

Pyro supports disc-at-once and can export files to MP3 players such as the Diamond Rio. You can rip individual songs or a complete CD. *Pyro*'s Environmental Sound Processing technology lets you customize audio for different listening environments, including MP3 players, home and car stereo systems, and multimedia speakers. The program includes reverb, chorus, and 16-band EQ and supports DirectX plug-ins.

Pyro can sort and organize MP3, WAV, and other files by artist, title, song length, or file size. With the Digital Jukebox feature, you can create and play back playlists; multiple file formats are supported. System requirements are a Pentium II/200 MHz with 32 MB of RAM, Windows 95/98, and a CD-R drive for burning the discs. Cakewalk; tel. (888) CAKEWALK or (617) 441-7870; fax (617) 441-7887; e-mail sales@cakewalk.com; Web www.cakewalk.com.

TC WORKS SPARK MODULAR

TC Works' *Spark Modular* ($99; $49 for registered *Spark* users) is an analog-modeling synthesizer designed to run within the *Spark* digital audio editor, but it can be used within any VST host application. The package includes a VST version of TC Works' *FXmachine,* which enables you to call up the synth directly in your VST-compatible software.

The program allows you to design your synthesizer by freely connecting oscillator, filter, and amplifier modules—as many as your CPU horsepower permits. You can add other VST effects plug-ins within *Fxmachine* and even use other VST instruments as modules to build a composite synth.

You can modulate an oscillator's pulse width and add a suboscillator, an oscillator sync, ring modulation, and an LFO to shape your sound. The program's filter module provides a highpass filter, as well as a lowpass filter that has selectable slope and resonance. A dedicated ADSR filter envelope and an envelope follower are also included.

The amplifier module has its own ADSR envelope and a Drive feature that uses TC Works' SoftSat saturation simulation. The package also comes with a virtual MIDI keyboard offering a pitch-bend wheel and two assignable modulation wheels.

To run *Spark Modular,* you'll need a Power Mac G3/233 MHz running Mac OS 8.5 or later, 64 MB of RAM (128 MB is required with Mac OS 9), and either *Spark* 1.5 ($499) or *Spark XL* ($699). TC Works/TC Electronic (distributor); tel. (805) 373-1828; fax (805) 379-2648; e-mail us@tcworks.de; Web www.tcworks.de.

A.R.T. HPFX HEADPHONE MONITORING SYSTEM

A.R.T.'s HPFX Headphone Monitoring System ($359) offers onboard digital effects, so you can monitor with effects while sending a dry signal to your recording device.

The two mic inputs are routed to separate dry outputs that go to your external preamp, mixer, or computer audio interface. In this way, performers can hear themselves with as much signal processing as they desire without printing the effects to the recording. The HPFX has four independently adjustable headphone outputs, two microphone preamps for the monitors, and controls for adjusting the monitor level, mix, and effects levels.

The 16 available digital effects include delay, slapback, echo, and reverb, as well as modulation effects such as flange and chorus. Although the effects presets are primarily used for vocal sweetening and thickening, the Effects Blend and Parameter Adjust controls enable more extreme settings. Internal effects processing is 24-bit, and A/D/A conversion is 20-bit.

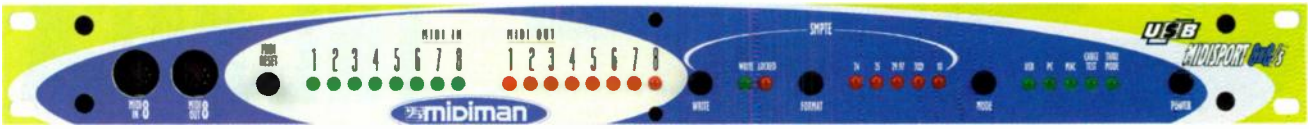
Connections are all balanced XLRs, except for the four ¼-inch headphone jacks. A 40 dBu pad is included. Mic gain is adjustable from unity to +56 dB. A.R.T. (Applied Research and Technology); tel. (716) 436-2720; fax (716) 436-3942; e-mail art@artroch.com; Web www.artroch.com.

MIDIMAN MIDISPORT 8X8/S

Midiman's Midisport 8×8/s 8-In, 8-Out MIDI interface for the Mac OS and Windows can be connected to a USB or serial port. The 1U rack-mount interface also serves as a stand-alone MIDI patch bay. A MIDI In and a MIDI Out light for each port indicate MIDI activity. The unit features a special MIDI cable-testing mode.

The interface can read and write 24, 25, 29.97, 30 drop, or 30 nondrop frame SMPTE Time Code. It can also convert Longitudinal Time Code into MIDI Time Code. The included software control panel allows you to set any SMPTE offset. For locking up to intermittent or weak SMPTE stripes, the Midisport can flywheel at any value from a single frame to forever (although the latter value may be difficult to substantiate). The Midisport can perform Jam Sync at all frame rates, and Midiman states that the unit can regenerate the most poorly recorded SMPTE stripes.

The Midisport 8×8 comes with a 6-foot USB cable and control-panel software for both Mac and PC platforms. Windows users will be happy to know that Midiman claims the unit has true Plug and Play compatibility; it requires no IRQ, I/O address, or DMA channel setup. Midiman; tel. (800) 969-6434 or (626) 445-2842; fax (626) 445-7564; e-mail info@midiman.net; Web www.midiman.net.



CLASH OF THE TRITONS

THE RACK

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- PLAYBACK SEQUENCER
- S/PDIF DIGITAL I/O
- OPTIONAL ADAT & mLAN DIGITAL I/O

IN THIS CORNER

THE UNDISPUTED CHAMPION

- AWESOME SOUND & FX
- GOLIATH SAMPLING POWER
- SENSATIONAL SEQUENCING
- DUAL POLYPHONIC ARPEGGIATORS
- USER-INSTALLABLE EXPANSION

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KORG

2000 EDITORS CHOICE

MIPA

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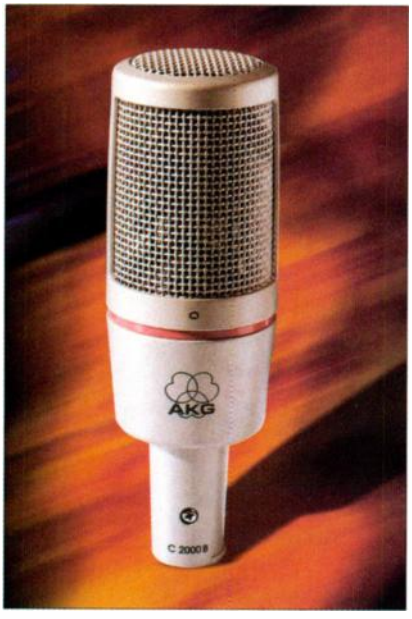
AKG C 2000 B

AKG's C 2000 B condenser microphone ($378) is equally at home in live performance and in personal studios. AKG claims that the C 2000 B combines the accuracy of a small-diaphragm condenser mic with the low noise associated with larger condensers. The mic features a switchable 10 dB pad, as well as a switchable low-cut filter of 6 dB/octave below 500 Hz to compensate for proximity-effect problems. Maximum SPL is rated at 140 dB (for 0.5% THD, without pad).

According to AKG, the small-diaphragm cardioid condenser mic boasts an extremely flat frequency response of 30 to 20,000 Hz (±2.5 dB). The mic has a subtle high-frequency boost between 8 and 12 kHz to add clarity and to compensate for loss of upper frequencies in distant-miking situations.

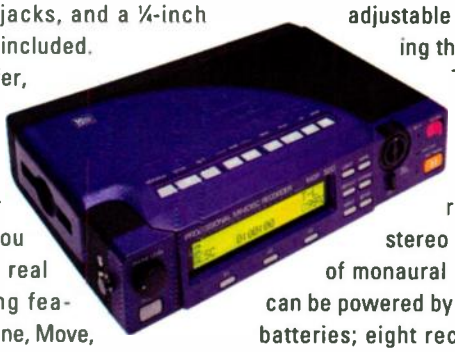


AKG also says that the C 2000 B features high sensitivity and low self-noise, thanks to the new design of the backplate electret diaphragm. The transformerless output stage helps to ensure low-end definition. Cosmetically, the C 2000 B is consistent with the design of the company's C 1000 S, C 3000 B, C 4000 B, and SolidTube microphones.

The C 2000 B mic uses 9 to 52V of universal phantom power and comes with an H 100 spidertype external shock-mount. AKG Acoustics U.S.; tel. (615) 360-0499; fax (615) 360-0275; e-mail akgusa@harman.com; Web www.akg-acoustics.com.

HHB PORTADISC

HHB's Portadisc ($1,545) portable MiniDisc recorder uses the most recent ATRAC compression algorithms to ensure better sound quality than what previous models offered. You get balanced XLR mic/line inputs and switchable phantom power. Analog line outputs are provided on RCA jacks, and a ¼-inch headphone jack is included.



For digital transfer, the Portadisc features both coaxial and optical S/PDIF. A USB computer interface allows you to transfer files in real time. Basic editing features (Divide, Combine, Move, and Erase) are built into the Portadisc and are accessible from a menu system with hardware function buttons. The unit is housed in a shockproof case and comes with a built-in speaker and microphone. The display is illuminated.

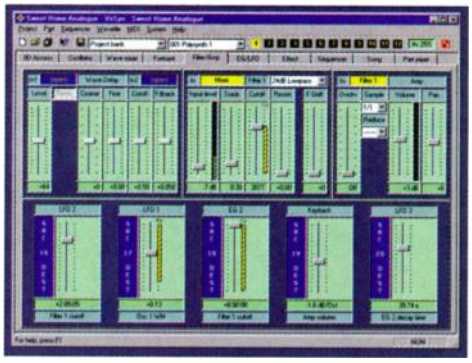
Location recording often requires working on the move, so the Portadisc's memory buffer prevents recording glitches caused by jarring. A 6-second prerecord buffer keeps the beginning of a take from being lopped off. The recorder features an automatic start function with an adjustable threshold for triggering the recording process. The onboard limiter can be stereo linked. Using a standard MD80 disc, you can record 80 minutes of stereo audio or 160 minutes of monaural audio. The Portadisc can be powered by standard AA alkaline batteries; eight rechargeable batteries are supplied, as is a universal 100/240V AC charger/adapter. HHB Communications USA; tel. (310) 319-1111; fax (310) 319-1311; e-mail sales@hhbusa.com; Web www.hhb.co.uk.

VIRSYN SOFTWARE VIRSYN

VirSyn ($299) is a software synthesizer that dishes up modular analog synthesis along with a few tricks not possible with modular hardware synths. With 21 sources and 81 destinations, almost every parameter can be modulated. You can assign each of the three oscillators to any of 64 waveforms. FM inputs let you modulate oscillators using other oscillators. A subharmonic oscillator can be coupled to the frequency of oscillator 1 to produce a pulse wave (with pulse width modulation available). A Multi oscillator has six independent oscillators that are independently detunable for broad chorusing effects. The three main oscillators, the Subharmonic oscillator, and the Multi oscillator can be used in parallel. Like many modular units, *VirSyn* provides a white/pink-noise generator. You can use physical modeling for plucked-string, woodwind, and formant-based sounds. The waveshaping module creates evolving harmonic content; the ring modulator can add a touch of inharmonicity.

The two multimode filters can be lowpass, highpass, bandpass, or band-reject, with 12, 18, or 24 dB slopes. You can overdrive the filters for raunchy sounds. Filter resonance can be set to self-oscillation, even without an input signal. You can also use the Formant filter with three bandpass/band-reject filters.

VirSyn is 12-part multitimbral. Its 12-track step sequencer can be synched to MIDI Clock, and individual tracks can be synched or run independently. You can select and transpose Patterns in real time using a MIDI keyboard. A separate Song Sequencer arranges patterns into song form.



Minimum system requirements for *VirSyn* are a Pentium II/200 MHz running Windows 95/98, 32 MB of RAM, and a DirectX-compatible sound card. VirSyn Software Synthesizer; tel. 49-72-4020-2956; fax 49-72-4020-2957; e-mail info@virsyn.com; Web www.virsyn.com.

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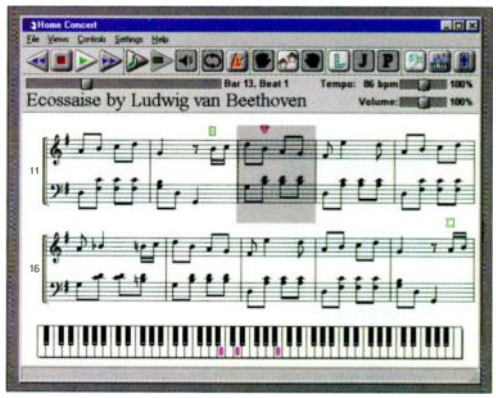
KEY CHANGES

BitHeadz has released playback-only versions of its *Retro AS-1* and *Unity Player* for the Macintosh. The release of Windows versions is anticipated before the end of the year . . . **Coda Music Technology** and **Net4music SA** have agreed to a strategic merger. The new company, **Net4Music, Inc.**, will feature online access to a large catalog of digital sheet music, music instruction, practice tools, and other content . . . **Minnetonka Audio Software** is now the distributor of the *Vincent Burel* DirectX and VST plug-ins. The company has also released a native version of *MXTrax* that supports ASIO and WAV drivers . . . **Music and More America** is now the U.S. distributor for the German manufacturer **Music and More**, whose products include the VF 11 (an 11-band vocoder) and the MB 33II (a TB 303–style synth-bass module) . . . **Fasoft**'s *n-track Studio* 2.14 adds support for both DirectX and VST plug-ins and instruments . . . **CreamWare** has released version 2.01 of its *Pulsar* software for the Windows and Macintosh platforms. The free update includes support for *Pulsar*'s *STS-300* and *STS-400* sampler plug-ins and provides a newly revised manual as well as a new series of *Modular2* patches . . . **Cakewalk** has released *Guitar Tracks* 2, which features a redesigned user interface . . . Version 1.50 of **Joerg Stelkens**'s *crusherX-Live* granular software synthesizer (see "Going Soft" in the July 2000 issue of **EM**) is now available at www.crusher-x.de . . . **Steinberg**'s *Cubase VST* Studio Pack bundles the company's new ST 24/96 digital audio interface with *Cubase VST* and *WaveLab*. **Liquid Audio** has released *Liquid Player* 5.0. New features include the ability to burn CDs directly from the application.

TIMEWARP TECHNOLOGIES HOME CONCERT 2000

TimeWarp Technologies' *Home Concert 2000* ($99) for Mac and Windows is designed to respond to your real-time performance when you're playing along with Standard MIDI Files. In Perform mode, it adjusts to follow your dynamics and tempo changes while you play the music onscreen.

According to the manufacturer, *Home Concert 2000* has a wide margin of tolerance for errors, and it can jump to another part of the score if you do. It even turns the "pages" as you play. In Learn mode, you can proceed at your own pace; the program waits for each note to be played before advancing the accompaniment.



For performances of a more improvisational nature, you can use Jam mode. Here you can set your initial tempo. The software cannot follow your tempo changes in Jam mode, but it can follow your playing dynamics.

The program offers the usual standard notation, piano roll, and onscreen keyboard. And if you have a Yamaha Disklavier, *Home Concert* can illustrate what it expects you to play by wiggling the next correct key. If you have a Yamaha CVP Clavinova, the program prompts you by flashing the guide lights.

Home Concert is compatible with any Standard MIDI File organized in logical beats and bars. Mac users need a 68020 processor, System 7.01, and 1.5 MB of free RAM. Windows users need a 486 DX2/66 MHz processor, Windows 95/98/2000, and 1.5 MB of free RAM. TimeWarp Technologies; tel. (508) 252-1074; fax (508) 252-1076; e-mail PianoBench@aol.com; Web www.timewarptech.com.

MUON ELECTRON

Muon Software's *Electron* analog-modeling synthesizer ($60) can be used with Windows-based *VST* 2.0–compatible host systems. (A Macintosh version is also anticipated.)

Processing for the three oscillators is 64-bit, with sawtooth, square, and pulse waves to play with. Pulse width is variable and can be modulated; the oscillators can be hard synched. The synth offers two independent resonant multimode filters that can be highpass, lowpass, bandpass, or band-reject. Filter configuration is flexible: if you arrange them in parallel, you can crossfade between the two. *Electron* also offers serial and dual filter modes.

The *Electron* synthesizer has two ADSR envelope generators. Two LFOs provide choices of sine, sawtooth, square, and triangle waveforms. The modulation destinations are numerous and include pitch, pulse width, envelope depth, and filter resonance. The modulation sources include Velocity, Aftertouch, Modulation Wheel, Pitch Bend, and several other continuous controllers. The program also comes with an onscreen X/Y controller that enables you to manipulate parameters in real time. To use *Electron*, you will need a Pentium II/400 MHz with 64 MB of RAM, Windows 95/98/98SE, and a *VST* 2.0–compatible host program. Muon Software; tel. 44-797-693-9752; e-mail service@muon-software.com; Web www.muonsoftware.com. ●

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By Roger Maycock

DOTDOTDOT.COM

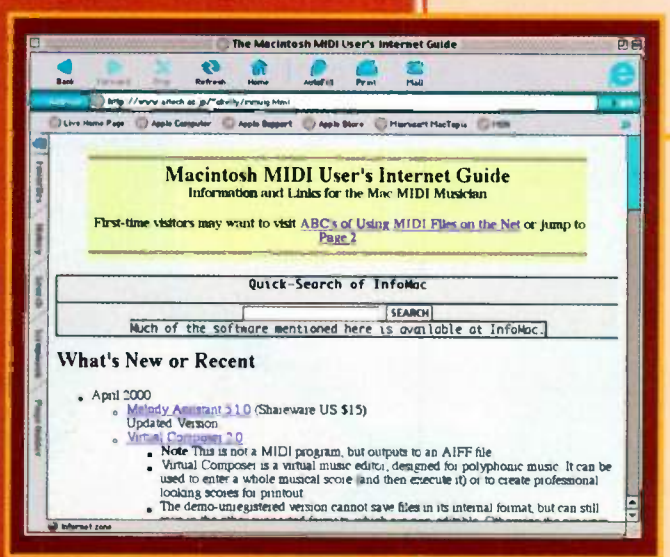
Music-Personnel is an online database (www.music-personnel.com) of musicians, composers, engineers, and others seeking collaborations or music-related employment. The interface is easy to use. From the drop-down menus, you specify the location, specialization, and musical genre that you're looking for. Click on Find, and the database delivers the search results. Musicians of all skill levels use the service, and the database is updated daily . . . **MusicSchoolSearch** (www.musicschoolsearch.com) helps high-school students, professional musicians, music educators, and guidance counselors locate college-level music and recording schools. The Web site searches by desired degree subject (jazz studies, technology/recording arts, and so forth), geographic location, program length, and student-body size. The result is a list of matching schools, along with their contact information . . . **Garageband.com**'s In the Studio With mentoring program (www.garageband.com) pairs aspiring musicians with music-industry leaders. Every day, a professional producer or engineer on the Web site's advisory board critiques a song created by a participating artist. After completing the program, artists are eligible for a chance to win a $250,000 recording contract. Advisory-board members include Sir George Martin, Joe Chiccarelli, Brian Eno, and George Massenburg, as well as a host of other luminaries in the industry. You can specify which board member you prefer to deal with when you sign up.

WEB SITE OF THE MONTH

Macintosh MIDI User's Internet Guide

If you use a Macintosh to create music, then you'll want to explore the Macintosh MIDI User's Internet Guide (www.aitech.ac.jp/~ckelly/mmuig.html). Offering a wealth of information and links, the guide helps you easily locate freeware, shareware, and other music-related software utilities. Items include MP3 players and rippers, archives of Standard MIDI Files, universal librarians, and music-composition software, as well as the latest updates for OMS (Open Music System), Apple's QuickTime, and Mark of the Unicorn's FreeMIDI.

The site specializes in helping you learn more about making music with your computer. It provides information about using MIDI with a Macintosh and gives you links to Web sites offering MIDI plug-ins, sequencers, and software synthesizers. Some interesting items include Robert Marsanyi's JavaMIDI, Tontata's *MIDIGraphy*, and a 4-track sequencer called *Fret Pet* that was created with guitarists in mind.



DOWNLOAD OF THE MONTH

Those of you with a penchant for the modular analog step sequencers of yesteryear will love Algorithmic Arts' *SoftStep* 1.3, available as a download (www.algoart.com). *SoftStep* drives MIDI synthesizers and sound cards in real time and also records Standard MIDI Files.

SoftStep comes in three levels of functionality. The free *SoftStep Basic* is a software emulation of a modular analog sequencer that lets you do what would be impossible with hardware. It offers 9 different sequencer modules and 22 support modules such as switches and clocks. You can use up to 99 copies of each module.

SoftStep LE ($39) and *SoftStep Pro* ($129), both of which require the purchase of upgrade licenses, have greater capabilities. Each level up delivers a wider range of algorithmic music tools.

SoftStep LE combines all the features of *SoftStep Basic* with algorithmic components such as math and logic functions, test-based switching, rhythm generators, and more-extensive MIDI-control options. *SoftStep Pro* supports numerous methods of generating algorithmic music, including fractal and chaos functions, image-to-music translation, and Markov chains and other probability functions. It also has tools for translating DNA-protein data into music.

System requirements are modest. *SoftStep* runs on Windows 95/98/2000 computers with a Pentium (or equivalent) processor. The application works with any MIDI-compatible sound card or interface. Algorithmic Arts recommends a graphics display of at least 1024 X 768 High Color (16-bit) or True Color resolution.

WEBCAST

Kerbango (www.kerbango.com) is a unique service that puts streaming audio from around the globe at your fingertips. Its searchable database of just about any type of programming that could interest you—including music, sports, entertainment, educational, and religious Webcasts—makes Kerbango a must-visit destination for the Web-surfing audio enthusiast.

The interface resembles a radio tuner with memory buttons for your favorite stations. You set up a station preset by selecting from categories, subcategories, and a list of specific stations. Each broadcast is categorized as On Demand, AM/FM Radio, or Internet Only and displays its program identity (VH-1 at Work, for example), online status, type of stream (you'll need *RealPlayer* or *Windows Media Player*), and signal strength (determined by the broadcaster's reliability and your available bandwidth). If a program's speed is in red, you'll need a fast connection such as cable or DSL.

You can listen to any Webcast, but to use presets you need to register. Because the broadcasts are transmitted by sources beyond Kerbango's control, signal quality varies. But the site offers myriad choices, and many stations sound as good as if you'd tuned them in on a stereo.

Any analog or digital input—24/96 mic/line/instrument, ADAT optical, S/PDIF, or USB—can provide the source for an audio channel. Mix and match source signals with total freedom—you can even mix signals with different sample rates. And since we know you've got lots of gear waiting for a home to plug into, we developed our unique multi-input electronically buffered channels, each of which can accept up to three analog input signals. Have three stereo synths? Plug 'em all into channels five and six. (We like to use channels seven and eight for plugging in multiple outboard effects processors. *Shazaam.*)

Whether you're making tracks with your computer or doing a solo gig, a little EQ can go a long way toward giving your sound a pro edge. Each EZbus channel gives you super responsive, totally musical EQ—four bands worth, with high and low shelving plus two fully-parametric bands. Of course, you can go overboard if you like, but be warned—the EZbus's exclusive AudioAlert™ system will let you know if you exceed maximum digital levels and point you to the offending channels. (Hey, you don't have to correct the problem—it's your right to make offensive sounds—so long as you don't still live at home.)

Store and recall up to 32 fully-programmable mixes. Create instantly recallable setups for solo recording into your computer, for multitracking with your MDM, for capturing your band's live performance, or for just about any specialized audio application you can think of. Recall them on the fly from the front panel, via foot switch, or using MIDI program change commands. Into really sophisticated dynamic mixes? All EZbus parameters are controllable via MIDI, so you can create fully automated mixes simply by recording your mix moves into your sequencer.

Realtime dynamics processing on every channel means never having to worry about clipping that perfect vocal take. Make your synths breathe with the Expander. Tame your, *ahem*, vintage (okay . . . old) gear with the Noise Gate. And since the full complement of dynamics processing is also available on the Main Mix bus, you can give your final masters a smooth, polished sound.

What could be easier than hot-plugging the EZbus into your computer's USB port and getting your musical ideas recorded *fast*? No PCI cards to install. No IRQs to configure. No DMA channels to mess with. Just plug it in and go. (Sorry, you still have to provide the creativity. But we'll make sure that when inspiration does strike, the hardware won't get in the way.)

EZbus™

Computer Audio Recording Interface
Software Control Surface
Stand-Alone Digital Mixer

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EZ Because you get to control your MIDI/audio sequencing software with its hardware controls.

EZ Because it comes complete with presets for controlling said software.

EZ Because you can slip it into a gig bag and run your whole live show with it.

EZ Because it lets you do amazingly sophisticated audio processing with zero hassle.

EZ Because it's got a ton of gozintas and gozoutas, and you've gotta ton of things that need gettininta and gettinouta.

bus Because once upon a time we took a Greyhound to see our Aunt in Cleveland. She was pretty far ahead of her time, having predicted the breakup of the Beatles, the birth (and death) of disco, and hanging onto her vinyl collection because she had a feeling that "some day people will use records and turntables differently than the way we do today."

bus Because an audio path is a bus, and the EZbus has a ton of 'em. Fully programmable ones, at that.

Specifications subject to change without notice.

A single button-push is all it takes to instantly transform the EZbus from an Audio Recording Interface into a Control Surface. Then operate your favorite MIDI and audio software using the EZbus's hardware controls—even scrub audio tracks with the data wheel! (Software dependent.) Customize the controls with you own command set, or use the convenient factory presets—support for major software programs is included. (Did we mention the ability to set and recall locate points?)

When is a Return more than a Return? When it's an EZbus Return, of course. In keeping with the EZbus design philosophy of ultra-flexible audio routing, the four Returns can accept audio from any EZbus analog or digital source. Those signals are then automatically routed to the Main Mix bus. So in addition to their traditional roles as effects Returns, the EZbus Returns provide you with four extra inputs to call on whenever you need them.

Want to create a separate control room mix? Need a stage monitor mix that's different from the one you're sending to the front-of-house console? Looking for a true four-bus setup for multitrack recording? The EZbus lets you route any signal from any source—analog or digital—to the Main or Alternate (or both) Mix buses, with full control over level, bus assignment, and in the case of the Main Mix, EQ and dynamics processing.

Two independent S/PDIF outputs? Stop the madness! But of course there are two—you'll need one to handle signals routed to your new digital effects processor, and one for sending the full mix to your trusty old DAT recorder. (Hey, analog diehards, don't worry—the Aux out jacks are perfectly fine for routing 24-bit/96kHz signals to your esoteric mastering gear. The Send jacks are as well. We're not about to tell you which ones to use.)

With four Sends, each configurable pre- or post-fader, you can easily create monitor and headphone mixes, patch into your outboard effects, and more. Sends can be routed to analog or digital outputs—even to USB—so interfacing with all your gear, old or new, is a snap.

You've just played your best gig ever. Thank goodness the performance was captured on your MDM by routing the individual EZbus channel outputs to it via a single optical cable. All you need to do now is mix the tracks to stereo (using the EZbus, naturally) and burn a CD to sell at your next show! (Yes, the optical outputs can also be used for Send and Mix signals. What, you think we'd limit you now?)

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WEB APP

Internet2

Internet2 is a consortium led by more than 170 universities working in conjunction with industry and government to develop and deploy advanced network applications for the next generation of the Internet. The new technologies are not a separate physical network and will not replace the current Internet. Just as earlier investments in academic and federal research networks brought about e-mail and the World Wide Web, the consortium's efforts are bringing together resources to develop new technologies that can be added to the existing Internet.

Internet2's primary goals are to create a more powerful network for the national research community, expedite a new set of Internet applications, and guarantee the rapid transfer of new network services and applications to the broader Internet community. In addition, Internet2 complements the government's Next Generation Internet initiative.

The consortium is developing and testing new technologies—such as IPv6 (Internet Protocol Version 6), the next-generation Internet protocol—that require Internet performance not possible today. Some of the applications for these new technologies include digital libraries, virtual laboratories, distance learning, and "tele-immersion," through which individuals in different locations can share a single virtual environment.

The development of tomorrow's Internet will not come cheap. Internet2 universities and corporate partners have had to install high-performance networking facilities and connect to a national Internet2 backbone network. The universities have committed more than $80 million per year in new investments for their campuses, and the corporate members more than $30 million. Much of this funding is in the form of competitively awarded grants from the National Science Foundation and other federal agencies participating in the Next Generation Internet initiative.

When will the general public begin reaping the benefits of all this research? Engineers are cautiously predicting real-world results within a year. For further information about the consortium and its plans, visit www.internet2.edu.

BAND ON THE WEB

Abby Straus

Growing up in Boston's Beacon Hill area, singer-songwriter Abby Straus spent much of her childhood surrounded by baroque music. What really struck a chord, however, were the sounds of James Brown and Little Richard, and before she realized it she was hooked on more-modern sounds. "My love of rock 'n' roll kicked into full swing at puberty," says Straus. "Just in time to hear Leslie West belt out 'Mississippi Queen.'"

Like countless musicians and songwriters who have come within an inch of a record deal only to watch it slip away, Straus is finding the Internet to be a terrific medium for aspiring artists. With a presence on numerous music sites (including Riffage, MP3.com, and her own www.abbystraus.com), Straus has developed an impressive following. Her current album, *The Road,* is an artful blend of rock, R&B, and jazz that combines her passion for performing with her fondness for studio recording. Many tracks convey the feel of a live gig, and Straus's studio savvy shines through without making the music sound contrived.

Upon moving to New York in 1984, Straus became interested in studio engineering. After learning the ropes on an 8-track system, she eventually graduated to a 24-track setup consisting of a D&R console and an MCI JH-24 multitrack. Now she tracks with four ADATs linked to an Oram BEQ-32. "Over the years, I've recorded and produced all kinds of acts. In the midst of all this engineering, I kept writing, and one day I decided it was time to make my own record. The result was *The Road.*"

Straus credits the Internet with her recent successes. "The Internet enables musicians to reach people all over the world, and you never know which one of those people might bring that lucky break," she says. "A music career can be a real crapshoot, but the Internet increases the odds of winning." ●

IN THE OLD DAYS it took a pile of gear, a trunk full of cables and an army of roadies to create a completely versatile synth system. **BUT NOW** Yamaha's Modular Synthesis Plug-In System lets you easily and inexpensively expand your rig without the need for bank loans or hernia belts. And unlike other companies' expansion boards that only add sounds, when you install a PLG card into a Yamaha S80, S30, CS6X or SW1000XG, you're adding an entirely new synthesizer – complete with state-of-the-art tone generation technologies, effects and extra polyphony. So get with today's world; infinitely expand your sonic universe with Yamaha synthesizers and the Modular Synthesis Plug-In System.

PLG150-AN
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PLG150-VL
Create ultra-realistic wind instrument sounds with physically modeled Virtual Acoustic tone generation. $199.95

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Add a variety of studio-quality harmony effects to your voice, from vocoder type sounds to four-part chordal harmonies, to inspire your songwriting. $169.95

PLG150-PF
Get over 130 impeccable samples from the world's best acoustic and electric pianos. $349.95

PLG150-DX
The same tone generation system as the legendary Yamaha DX7 is reborn in this 6-operator, 16-note poly synth board. $349.95

PLG100-XG
Add the exciting world of Yamaha XG and General MIDI compatibility to interact with thousands of Standard MIDI files. $249.95

All prices are manufacturer's suggested retail price. Yamaha synths have different plug-in capacities.

yamaha.com
yamahasynth.com

YAMAHA

PROFILE

By Matt Gallagher

Silent Groovy

Jazzhole is a collective of New York City session musicians led by keyboardist Warren Rosenstein, vocalist Marlon Saunders, and guitarist Jon Pondel. The group met while recording acid-jazz albums in the early '90s. Rosenstein says that Jazzhole's formation was atypical: "We made a two-song demo, got a deal [with Mesa/Blue Moon], and then became a band."

In 1999, the band established their own label and recorded their third release, *Blackburst* (Beave Music, 2000). "We're doing a better job than the labels have done for us in the past," Rosenstein comments. *Blackburst* is an album of old-school soul music with shades of trip-hop and electronica. "Several of us—particularly Marlon and myself—have a real affinity for '70s soul music," Rosenstein says. "We wanted to update that sound and, at the same time, get back to a songlike format with verses, choruses, and hooks."

Jazzhole records ambient soul music in a New York City apartment.

Unlike the band's first two albums, *Blackburst* (a reference to the term for digital silence) was produced entirely in Rosenstein's Greenwich Village studio apartment. "When we had a little bit of money, we decided to make the next record at home. For what we would have spent [on booking studio time], we could purchase the equipment, own it, and then make records forever," Rosenstein says. "I have all the equipment in my house, so we were able to indulge ourselves endlessly in terms of details. Even though we're doing it in a dinky, ratty, run-down apartment, the path from the singer to tape is world-class."

The band began the album by organizing existing demo tracks. "We had a bunch of songs on ADAT tapes, demos of things we had written in various stages," Rosenstein explains. "I bounced them back and forth on my two [Alesis] ADAT-XTs until everything lined up, and wound up with a one-hour multitrack tape.

"My dream was to make a seamless recording where all the songs segue into each other," he continues. "I got the idea to lay out the whole album in order on one very long piece of multitrack tape and then have people come in and just play over the transitions so that it would become almost one continuous piece of music. I figured out the transitions in my head and then put the next song on. The album was mixed in one pass from beginning to end. It's a great feeling to hit Record on the DAT machine, and then an hour later, your album's done."

Blackburst features Rosenstein's Fender Rhodes piano, E-mu Vintage Keys synth module, Alesis D4 drum module, and Akai S2800 sampler. Drum parts were sampled from DAT tapes of drummer Peter Mark and looped on a PC in Voyetra's *Sequencer Plus* software. "The thing that freaks most people out when they come into my studio is that I use a DOS-based sequencer," Rosenstein says. His home studio is rounded out by outboard effects processors, an Apogee AD-1000 digital converter, an API 512B mic preamp, and a Neumann TLM 193 condenser mic. "We have only one microphone, and we use it for everything," he adds. All the instruments and vocals went through a pair of Mackie CR1604-VLZ mixers.

The vocals, acoustic and electric bass, saxophone, flute, and French horn were overdubbed. "When other people come in to play, they hear the song in a somewhat finished state because all of these decisions have already been made. It's a lot easier for the players to respond to music so close to being finished," Rosenstein says. He also stresses quality performance over a meticulous recording process. "We want to move quickly, have fun, and not go for too much overkill on the fidelity end of things."

***Blackburst*/Jazzhole**

For more information about Jazzhole, contact Beave Music; e-mail beavemusic@aol.com; Web www.jazzhole.com.

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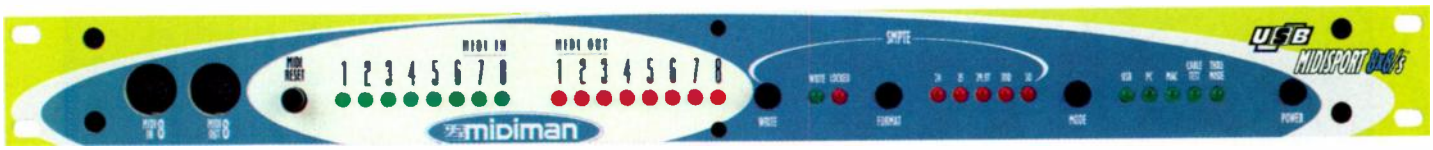

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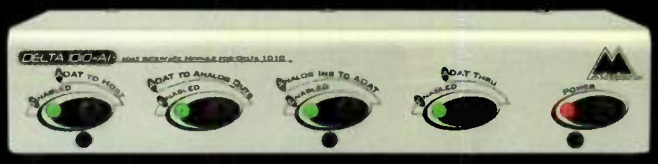

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VINTAGE PAGE

By Julian Colbeck

Each month, "Vintage Page" ranks classic electric and electronic keyboard instruments according to their current popularity, based primarily on sales and rentals in the used-instrument market. We note in parentheses the previous month's rankings for keyboards that remain hot items, enabling you to follow the changes in the market. Our estimated street prices are categorized according to the instrument's condition.

In the Spotlight:

Korg MS-20

Produced: 1978–1982
Made in: Japan
Designed by: Mr. Mieda, Mr. Mori
Number produced: 20,000
Synthesis system: analog, subtractive synthesis
Price new: $850
Today's prices: A=$1,200; B=$900; C=$500

For an analog mono synth, the Korg MS-20 has enjoyed an archetypally topsy-turvy ride during its 20-year history. Launched the same year as the Prophet-5, when all eyes and ears were on microprocessor control, program memory, and polyphony—none of which the MS-20 offers—this military-looking synth still enjoyed relative success due to its unusual patch-bay panel design and its interesting range of sonic possibilities. By the mid-1980s, of course, you would have been lucky to get a third of what you paid for an MS-20. In the heyday of polyphonic synths and keyboard workstations, the MS-20's busy, almost academic look was well out of fashion.

Now it's an entirely different matter. The MS-20's unique look and, to some extent, sound has propelled it to the top of the must-have tree in 2000. In fact, Korg is now leveraging mileage out of the MS-20 concept with its new MS-2000 and MS-2000R (reviewed in the August 2000 issue of **EM**).

Two things set the MS-20 apart. First is the patch bay, which lets you make custom patches (in the traditional sense of the term, using patch cords) so that you can, say, hook up pink noise as a modulation source and the like. Second, it offers several cool but rarely seen items, including sample-and-hold, ring modulator, footpedal filter control, and pitch-to-voltage control.

The bones of the MS-20 are two oscillators with independent waveforms and pitch control. There's good separation between the oscillators, and you get a nice range of control options, including a ring modulator, two envelope generators (EGs), and an LFO.

The resonant filter can be either lowpass or highpass (or even bandpass if you use the patch bay), with multiwaveform LFO or EG modulation. The filter has a 12 dB/octave slope, so it is by no means as fierce as a Minimoog filter. But thanks to the MS-20's creative modulation possibilities, producing effects such as wah-wah and filter vibrato is pretty straightforward. You also get portamento with a time/speed variable. The ring modulation and white/pink-noise features compensate for the less-than-steely filtering by adding bags of character to what could have been a thinnish timbre.

The two EGs offer further variety. EG1 is internally routed to the oscillators and features delay, attack, and release parameters. EG2 can be applied to the filter or amplifier and includes attack, decay, sustain, release, and hold.

The MS-20 employs an unusual hertz-to-volts (as opposed to volts-per-octave) paradigm. At one time, Korg made a converter interface to enable connection with synths using a more conventional approach.

In the past few years, the look and sound of the MS-20 has grown steadily more popular. Long admired by such technoboys as The Shamen and Aphex Twin, this synth has found more recent favor with the likes of Apollo Four Forty (for ghostly squeals on its live performances) and Portishead.

If you need an MS-20 owners' manual, one can be obtained at www.acrylnimbus.de/manual.

NATALIYA SERDIUK/KORG MS-20 COURTESY ROB RAYLE

Korg's MS-20 analog mono synth has several cool features, such as a ring modulator, sample-and-hold, footpedal filter control, and pitch-to-voltage control. But its most popular feature is its patch bay.

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THE LIST

1. **MS-20 (Korg)** Previous rank: 2. See "In the Spotlight."

2. **Juno-106 (Roland)** Previous rank: 3. This early single-oscillator-plus-suboscillator MIDI analog synth is simple to use and hugely popular. It has no arpeggiator, unlike the Juno-60 (see #4), which has a similar architecture. Easy to tweak, the Juno-106's 6-voice analog synth engine is good for thin but cool basses and washes.

A=$650; B=$550; C=$300

3. **Prophet-5 (Sequential Circuits)** Previous rank: 1. The world's first "serious" polyphonic synth offers microprocessor-controlled programmability and musician-friendly operating features.

A=$1,850; B=$1,200; C=$400

4. **Juno-60 (Roland)** Previous rank: 4. MIDI is available only as retrofit on this simple but powerful 6-voice analog synth, which has a luscious chorus and a dynamite arpeggiator.

A=$500; B=$450; C=$250

5. **TB-303 (Roland)** Previous rank: 6. A 1980s precursor to Roland's Groove products, the TB-303 defined the squeaky, squelchy, synth-bass sound of the 1990s dance revolution. It can be a pig to figure out, and it has no memory locations.

A=$1,000; B=$800; C=$550

6. **B-3 (Hammond)** Previous rank: 5. The granddaddy of rock organs, this tone-wheel instrument is large, expensive, and irreplaceable. It's strictly for grown-ups, not wannabes. The more compact A-100 has essentially the same guts as a B-3 and can cost considerably less ($2,000 to $3,000).

A=$5,000; B=$2,500; C=$1,500

7. **Stage 73 (Fender Rhodes)** Previous rank: 7. Fender's glassy-sounding electric piano was a staple sound of retro funk and jazz fusion. It has a wooden action based on hammer-struck metal tines. The Stage 73 is heavy and constantly needs minor repairs, but you can do most maintenance yourself. It's effectively a one-sound instrument; tonal variation is under the control of—help!—your fingers.

A=$650; B=$500; C=$250

8. **Wave 2.3 (PPG)** Previously unranked. Quirky polyphonic wavetable synth from Germany.

A=$1,000; B=$800; C=$450

9. **Memorymoog (Moog)** Previous rank: 9. A big, complex, and complex-sounding synthesizer, the Memorymoog was beset by troubles early in its career. A properly working unit is a rare and highly sought-after prize.

A=$2,500; B=$1,800; C=$700

10. **DX7 (Yamaha)** Previously unranked. Yamaha's first popular FM keyboard synth provided the definitive electronic sound of the mid-'80s and spawned a host of spin-off products. The polyphonic instrument sounds thinnish and has no effects to speak of, but it was a hot item in its day and remains a classic. Its digital sounds went deeply out of fashion for a while, but now there are signs of a comeback.

A=$350; B=$275; C=$175

Price Guide: The quoted prices reflect typical street prices you should expect to pay in U.S. dollars. The buy-in on vintage instruments, as with vintage cars, is just the beginning, though. Most of the original manufacturers are long gone, so maintenance and repairs are expensive.

A=like new; B=like, it's okay for its age; C=like hell

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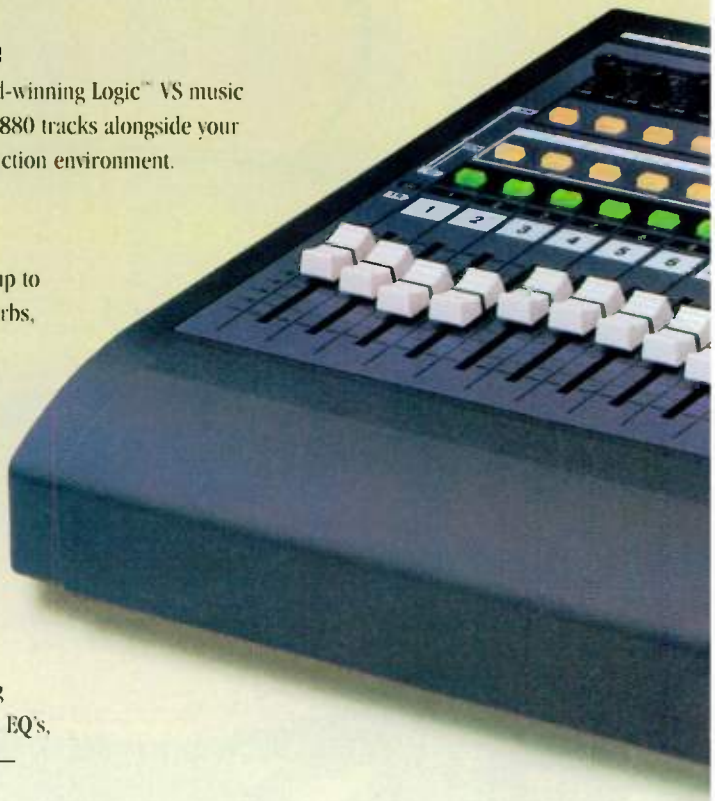

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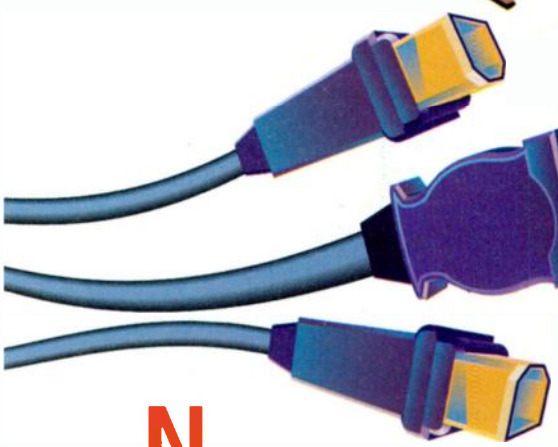

BY BRIAN SMITHERS

No, the "U" doesn't stand for Ubiquitous, but it might as well. Ever since it was introduced a few years ago, the Universal Serial Bus has lived up to its name, becoming standard equipment on both Macs and PCs. The music industry has embraced USB as a way to build devices with cross-platform compatibility and to reduce the reliance on what seems to be an ever-shrinking allotment of internal slots. • The past few months have seen a bumper crop of new and innovative USB devices, from simple MIDI and audio interfaces to elaborate digital audio workstation (DAW) hardware controllers and controller/interface hybrids. This critical mass of gear has inspired us to take a look at what's out there and see just how well the technology is living up to its promise. • To give you a bird's-eye view of the USB landscape, we've included a couple of tables that detail the variety of available products (see "USB MIDI Interfaces" and "USB Audio Interfaces"). Keep in mind that these lists are very fluid—some of the products may not have shipped as of press time, so specifications, prices, and driver status are subject to change. Be sure to check the manufacturers' Web sites for the latest USB developments.

THE LITTLE BUS THAT COULD

USB achieved buzzword status at about the same time as that other bus with the ever-so-catchy moniker "IEEE 1394." Both standards were portrayed in the computer press as the solution to all our connectivity hassles, and there was good reason for that kind of optimism. Both offer trim physical connectors that can fit on small computer cases and even the ultraslim profiles of modern notebooks; both let you hot-swap and daisy-chain devices; and both are capable of supplying a certain amount of power to connected devices. (If a device derives its power in this manner, it is said to be *bus-powered;* if it has a separate power supply and needs to be plugged into a wall outlet, it is said to be *self-powered.*)

USB became the bus of choice for low- to midbandwidth devices, such as mice, keyboards, scanners, and digital still cameras, whereas IEEE 1394 was reserved for more-demanding devices, such as external disk drives and digital video cameras. Many people assumed that the music industry would embrace 1394 for the next generation of MIDI and audio interfaces.

IEEE 1394 began life in the 1980s as Apple Computer's FireWire spec and was eventually adopted as an international standard by the Institute of Electrical and Electronics Engineers. Although it's found in many Macintosh computers, PC manufacturers have been slow to adopt the high-speed bus. Both platforms have widely incorporated USB, however, thanks in large part to its lower cost. Rather than freeze product development until the anointed bus of the future became clear, manufacturers of music hardware seized the opportunity to develop for the bus at hand.

With a potential bandwidth of 12 megabits per second (Mbps), USB provides a big enough pipeline to handle both audio and MIDI data even when a USB mouse and keyboard are plugged in. Developers began designing audio interfaces that took sensitive components out of the computer, and USB provides a simple plug-and-play connection for such devices.

MIDI INTERFACES

Prior to the advent of USB, MIDI interfaces were connected to computers in one of several ways. The most sophisticated devices, with multiple ports and synchronization capabilities, combined an internal card with an external unit (usually rack-mountable) that required its own power cord. Simpler MIDI interfaces could use standard parallel or serial connections, which provide much less bandwidth than the internal-card connections. These simpler interfaces also required external power in most cases. The parallel and serial interfaces were portable, and the PCI and serial devices had cross-platform potential, but each arrangement compromised either convenience or performance.

One look at current MIDI-interface ads might lead you to think that USB has completely replaced other types of connections, and that isn't far from the truth. This logic is immediately apparent, for example, in Midiman's Midisport line. Available in 1-In/1-Out, 2-In/2-Out, and 4-In/4-Out configurations, the Midisports are cute little boxes containing nothing more than a USB connector and several MIDI connectors. Powered directly from the USB bus, they require no wall-wart AC adapter. They come with drivers for both Macs and PCs and are extremely portable, making them perfect for laptop use. The Midisport interfaces demonstrate the full potential of USB hardware by combining simple connections, fast data transfer, and cross-platform capabilities while eliminating external power cords.

Rounding out the Midisport line is the 8×8/s, which (naturally) features eight MIDI Ins and eight MIDI Outs. It also provides SMPTE read/write capabilities and a serial-port connection, so it can be used with non-USB machines. When your computer is turned off, the 8×8/s functions as a stand-alone MIDI patch bay.

Mark of the Unicorn has embraced USB in its latest generation of MIDI interfaces, but the company has taken a different approach to the bus's advantages. Of course, MOTU's gear will work with PCs as well as with Macs (as soon as its Windows drivers are ready), and you don't have to open your computer to install the products. But in USB, MOTU has found the vehicle to implement its MIDI Time Stamping technology, which is said to facilitate extremely accurate timing.

By taking advantage of USB's ability to perform isochronous data transfers, MOTU can guarantee timing accuracy between its interfaces and your computer down to a fraction of a millisecond. (Isochronous communication bypasses data buffering and error-checking in favor of "on-time" delivery, and it reserves a portion of the bus bandwidth to ensure that it never has to wait for another device to get out of the way.)

MOTU's flagship product is the MIDI Timepiece AV, an 8-In/8-Out unit with comprehensive sync capabilities. It's a 1U rack-mountable design that can also function as a stand-alone MIDI patch bay. It can store up to 128 user-defined setups that can be recalled by MIDI Program Changes, and it has the rare ability to be programmed from its front-panel LCD. The MIDI Express XT is an 8×9 design with fewer sync options and fewer programmable setups. The Micro Express is essentially a 4-In/6-Out version of the XT.

Bringing up the rear of the pack in power—but leading the way in terms of portability and cuteness—is the FastLane, MOTU's simple 2-In/2-Out box that comes in a variety of iMac-inspired colors. It features a bypass mode that allows MIDI data to pass through if the computer is turned off.

All of MOTU's USB MIDI interfaces (except the FastLane) require their

FIG. 1: The Yamaha UX256 packs a lot of MIDI connectivity into a half-rackspace. In addition to its six dedicated MIDI Ins and Outs, it has two serial ports for connecting compatible synths.

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own power cord, and they are designed to be mixed and matched freely as your need for MIDI connectivity grows.

Other companies, ranging from industry icons such as Yamaha and Steinberg to a Korean startup called Ego Systems, are using USB for their MIDI interfaces. Yamaha's UX256 is a dual-platform, 6-In/6-Out unit that also has two serial ports to accommodate non-USB computers (see **Fig. 1**). It requires external power, and it comes with MIDI-routing/patch-bay software.

Steinberg's USB-2-MIDI, an inexpensive 2-In/2-Out interface, is a bus-powered, cross-platform USB poster child—and like MOTU's FastLane, it offers a bypass mode for passing MIDI data without benefit of a computer. Steinberg will soon be offering an 8-In/8-Out interface called the Midex 8 (see **Fig. 2**), a 1U rack-mountable unit that employs the new Steinberg technology Linear Time Base, which the company claims has submillisecond timing accuracy. The Midex 8 will ship with Mac and Windows drivers and is bus-powered (unless you use more than one, in which case external power is required).

Roland ED's UM-4/SMPU64 and UM-2/SMPU32 are simple, bus-powered 4×4 and 2×2 interfaces, respectively. Roland ED maintains a list of compatible USB host controller chips (which are found within the host computer) on its Web site, an apparent testimony to less-than-universal adherence to the published specification for these controllers. Emagic makes a compact device called the MT4 that provides two MIDI inputs and four MIDI outputs. It's bus-powered and can be used as a stand-alone MIDI patch bay, holding up to 32 patch configurations that are accessible via Program Changes.

AUDIO INTERFACES

Pushing audio through a USB connection has proven to be a bit of a challenge. The bus has plenty of bandwidth for several channels of uncompressed CD-quality audio, but support for this application at the operating-system level has been slow in coming. Windows 98 introduced significant support for USB audio, with further improvements in Windows 98 Second Edition. However, Apple experienced major delays in its development process; only with the release of Mac OS 9.0.4 in April did it really become possible to build cross-platform USB audio devices.

Roland ED and Opcode blazed the trail for USB audio devices, releasing their first interfaces in late 1998 and early 1999, respectively. Theirs were the only such devices available for months; in fact, the Roland ED UA-100's little sibling, the UA-30, was the only new product until this spring's crop of gear popped up. Some of Opcode's DATport and SONICport interfaces are still available, but they're currently out of production, and their development status is in limbo as a result of the Opcode/Gibson situation.

Software synthesizers are the canaries in the coal mine when it comes to latency.

Roland ED has continued production of its UA-100 and expanded the line. The UA-100 provides stereo, 16-bit, 44.1 kHz analog I/O, and an optical S/PDIF digital audio output for Windows machines. (Mac support is likely, but no release date has been set.) Audio connections include two ¼-inch microphone inputs, one of which can be used as a guitar input; a headphone output with volume knob; and stereo aux inputs and outputs. Two channels of MIDI I/O are also available. The UA-100 features a set of 24-bit effects ranging from amp simulation to reverb to vocal harmonization.

The UA-30 is a trimmed-down version of the UA-100, with reduced I/O and no effects. One advantage of this simplification is that the UA-30 doesn't need external power, making it better for portable use. With the release of Mac drivers in early May, the UA-30 became the first USB audio device to live up to its cross-platform promise. It provides stereo, line-level I/O at either 44.1 or 48 kHz on RCA connectors, plus S/PDIF optical and coaxial I/O, a ¼-inch mic/guitar input, and an ⅛-inch headphone output.

For several months, Ego Systems has been teasing the industry about a tiny box called the U24 that could have been the world's first 24-bit USB audio interface. Unfortunately, problems with a critical component forced the designers to scale their plans back to 16-bit audio. Still, with analog as well as S/PDIF coaxial and optical I/O in a package that's only 9 cm square, the U2A (as it's now known) is an interesting little box. The output signal is sent to all three outputs at all times, which means you can use the U2A to convert a coaxial signal to an optical signal, or vice versa.

Sound Devices is staking a claim in the high-end USB audio interface market with its new USBPre stereo interface. The device's balanced XLR inputs are individually adjustable for microphone-, instrument-, or line-level audio signals, and +48V phantom power is available for both inputs. Its headphone output can mix the computer audio output with a direct monitor of incoming audio to eliminate internal latency problems. And even with all this power, Sound Devices estimates that the bus-powered device will reduce a typical notebook's battery life by only 10 percent. The USBPre provides 20-bit audio input for applications that support high resolution, but its output is only 16-bit. Ruggedly designed for broadcast field recording, it is also compatible with popular music-production software.

The Swissonic USB Studio is a straightforward 16-bit, 44.1 kHz stereo audio interface in the body of a well-connected line mixer. It includes two

FIG. 2: Steinberg's stylish Midex 8, available soon, is a cross-platform 8-In/8-Out MIDI interface featuring Linear Time Base, which is Steinberg's method of ensuring extreme timing accuracy. The device can be bus-powered unless you daisy-chain multiple units.

For manufacturer information, please see Contact Sheet, p. 186.

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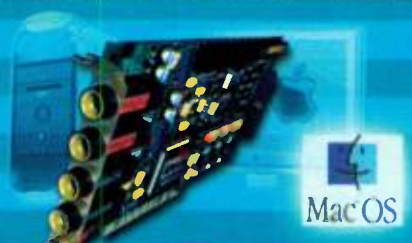

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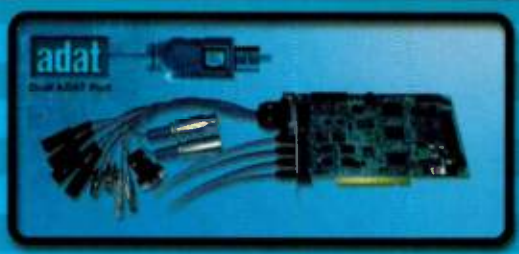

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FIG. 4: The SAC-2K from Radikal Technologies takes the notion of a control surface to a new extreme, with motorized faders, three status LCDs, transport controls, and more. It can also be used with editor/librarian software as a synth-programming surface.

DAW FRONT ENDS

The Winter 2000 NAMM show featured a couple of items that represent a whole new category of USB gear: the digital audio workstation front end. Roland ED's U-8 Digital Studio and Tascam's US-428 each include analog and digital audio I/O, MIDI I/O, and a panel of faders, knobs, and buttons for controlling your favorite software. The appeal of hardware controllers has been demonstrated previously in products such as the Peavey/Cakewalk StudioMix and the CM Automation Motor Mix, but the U-8 and US-428 go a step further by handling the audio I/O.

The U-8 uses 20-bit DACs and delivers full-duplex 16-bit, 44.1 kHz stereo audio in the Windows 98 environment. Connections include one unbalanced XLR mic input, two ¼-inch line inputs, one high-impedance ¼-inch guitar input, optical S/PDIF I/O, one MIDI In/Out pair, a stereo aux input and stereo analog output on RCA connectors, and a ¼-inch headphone output. It features more than 120 built-in 24-bit effects, including Roland Sound Space, guitar effects, reverb, chorus, noise gate, and speaker simulation.

The control surface includes eight channel faders and one master fader, a set of four knobs to control various mixer and effects parameters, a data wheel, and an assortment of other buttons and knobs to control everything from input level to transport and more.

The U-8 comes bundled with a custom version of either Cakewalk's *Home Studio* or Steinberg's *Cubasis VST* (buyer's choice). Currently, the U-8 is for Windows PCs only, but Mac drivers are in the works.

FIG. 3: The result of a partnership between Tascam and Frontier Design, the US-428 breaks new ground in USB audio interfaces by offering four inputs and two outputs at 24-bit resolution. As if that weren't enough, its control surface is designed to work as a front end for your favorite DAW or digital audio sequencer.

As of this writing, Tascam's US-428 (see **Fig. 3**) will deliver several significant firsts. For starters, it is the first USB audio interface to offer 24-bit audio, with sampling rates of 44.1 or 48 kHz. And although USB's limit is generally held to be six streams of 16-bit audio or four streams of 24-bit audio, Tascam, working in partnership with Frontier Design, has somehow managed to squeeze six 24-bit streams—four in and two out—through the pipeline.

For those of us interested in USB audio for its portable potential, this is a real breakthrough, as it makes the US-428 the only device capable of recording more than two channels into a laptop. (The Digigram VXpocket 440 PC Card, its only rival for this honor, was canceled at the last minute due to insurmountable engineering hurdles.) The Tascam US-428 trumps other notebook-compatible solutions by offering both higher resolution and more input channels.

The unit's control surface is modeled after Tascam's classic Portastudio, with a row of eight channel faders and a master fader, transport controls, data wheel, assignable buttons, and more. Two of its six balanced analog inputs are XLR, and two more are switchable to high-impedance guitar inputs. In addition to two analog outputs, it features S/PDIF I/O and 32 channels of MIDI I/O. *Cubasis VST* for the PC is currently shipping with the US-428; the Mac version should be available by the time you read this. Control templates for popular programs are in the works as well.

OTHER DEVICES

USB is also being used in other types of devices, such as the HHB Portadisc, a high-end portable MiniDisc recorder designed for broadcast use. It includes a USB connection for transferring recorded audio into a computer for editing. Akai has announced an optional USB board for its S5000/S6000

samplers. With the included software, you can transfer material from sampler to computer or from sampler to sampler, edit programs or multis, and move audio into your favorite audio editor for additional tweaking.

Radikal Technologies has announced the SAC-2K, a very sophisticated DAW front end with touch-sensitive, motorized 100 mm faders (see **Fig. 4**). In addition to transport controls, a jog/shuttle wheel, and a slew of buttons and knobs, it has three separate LCDs to help you keep track of settings as you adjust them. With editor/librarian software, the SAC-2K also becomes a synth-programming control surface.

For *Mixman Studio* fans, Spacetoys has designed the P-Mix, a controller that emulates the software's two-turntable display, with 16 sound-trigger buttons, 8 macro buttons, 4 parameter-control buttons, and more (see **Fig. 5**).

In addition to its USB MIDI- and audio-interface products, Roland ED distributes the SC-8850 and SC-8820 USB Sound Canvas synth modules and the PC-300U USB keyboard. Also, a small German company named Propagamma Kommunikation noticed the absence of ASIO drivers for many USB audio products and decided to write its own. The current version has been licensed by Swissonic for use with the USB Studio and is said to be compatible with Roland ED's UA-30 MIDI interface as well. A Mac update and a Windows version are planned for release this summer. Check it out at www.usb-audio.com.

TIME TO GET ON THE BUS?

Is USB living up to its promise? Is it right for you? The answer is a very enthusiastic "maybe." Yes, USB solves some problems, both for developers and end users, but it introduces several challenges of its own.

When one of the biggest vendors of USB music-production hardware deems it necessary to maintain a list of compatible USB host controller chips on its Web page, you know that some issues must be considered. On the other hand, nearly every manufacturer I spoke with is planning further USB development, which indicates the power of this interface.

FIG. 5: Life imitates art imitating life in the P-Mix, a hardware version of the *Mixman Studio* virtual-turntable interface. Not only can you control all of *Mixman*'s functions from the P-Mix, you can look cool doing it.

In any event, there are three basic issues with USB: latency, compatibility, and bandwidth.

Latency. According to some unwritten law, the term *USB* apparently can't be used in a sentence without the word *latency*. Some people fear that USB MIDI and audio devices will never achieve responsive musical timing. But tell that to MOTU, which claims sub-millisecond response for its USB MIDI interfaces. With several times the bandwidth and a faster interrupt time than traditional serial ports, USB is more than adequate for the task. So why the confusion?

First, achieving MOTU's stated low latency depends on using the latest version of *Digital Performer*, which communicates directly with the company's hardware. Second, some of the skepticism understandably comes from the makers of software synthesizers—the canaries in the coal mine when it comes to latency. Bear in mind that we're still in the first generation of USB drivers. You can expect things to improve after the hardware, software, and OS developers have had more time to work together.

With audio the jury is still out, but there's reason for optimism. Roland ED promises no more latency with software synths than what PCI audio cards exhibit, but as of this writing Tascam, Swissonic, and Ego Sys haven't done enough testing to give a definitive answer. So far, the developers are

USB MIDI Interfaces

Manufacturer	Model	I/O	Platform	Power	Other Features	Availability	Price
Emagic	AMT8	8×8	Mac	AC	stand-alone mode; serial port	now	$499
Emagic	MT4	2×4	Mac/Win	bus	stand-alone mode	now	$149
Emagic	Unitor8 MkII	8×8	Mac	AC	stand-alone mode; serial port; sync	now	$799
Midiman	Midisport 1×1	1×1	Mac/Win	bus		now	$79.95
Midiman	Midisport 2×2	2×2	Mac/Win	bus		now	$99.95
Midiman	Midisport 4×4	4×4	Mac/Win	bus		now	$199.95
Midiman	Midisport 8×8/s	8×8	Mac/Win	AC	sync; serial port	soon	$399
MOTU	FastLane	2×2	Mac	bus		now	$79
MOTU	Micro Express	4×6	Mac	AC	sync	now	$295
MOTU	MIDI Express XT	8×9	Mac	AC	sync	now	$395
MOTU	MIDI Timepiece AV	8×8	Mac	AC	sync	now	$595
Roland ED	UM-2/SMPU32	2×2	Mac/Win	bus		now	$118
Roland ED	UM-4/SMPU64	4×4	Mac/Win	bus		now	$228
Steinberg	USB-2-MIDI	2×2	Mac/Win	bus	bypass mode	now	$99
Steinberg	Midex 8	8×8	Mac/Win	bus		soon	$449
Yamaha	UX256	6×6	Mac/Win	AC	(2) serial ports	soon	$299

uniformly confident that audio latency will not be a problem. Still, I suggest a bit of caution in considering a USB audio interface if you depend on software synths in live performance. As far as recording is concerned, all the devices covered here feature input monitoring to eliminate internal latency problems when overdubbing.

Compatibility. There seems to be no problem getting software to recognize and respond to USB MIDI interfaces, as long as the manufacturer has written drivers for the operating system being used. As of this writing, MOTU was still working on its long-awaited Windows drivers. The delay is reportedly not due to any major technical obstacles, so perhaps PC users will have finally joined the USB MIDI party by the time you read this.

Audio compatibility is a work in progress, and now that several USB audio interfaces are out there, software developers will have an added incentive to work with the hardware folks to clear up any remaining problems. It wasn't an issue at all for developers of Mac software until OS 9.0.4 was released, and Windows developers had only the two Roland ED units to consider until recently.

Bandwidth. Bandwidth isn't a concern with MIDI. Every maker of USB MIDI interfaces touts the advantages of being able to add another interface or two as your needs expand. MOTU's gear is designed around a mix-and-match approach, and the company says you should be able to use several

USB Audio Interfaces

Manufacturer	Model	Resolution/ Sampling Rate	Analog I/O	S/PDIF I/O	MIDI I/O	Platform	Availability	Other Features	Price
Ego Systems	U2A	16-bit, 44.1 kHz	stereo unbalanced ¼"	optical; coaxial	none	Win	now		$299
Roland ED	UA-100	16-bit, 44.1 kHz	¼" mic; ¼" mic/guitar; stereo aux (RCA)/ stereo aux (RCA); headphone	optical out	2×2	Win	now	24-bit multi-effects	$448
Roland ED	UA-30	16-bit, 48 kHz	¼" mic/guitar; stereo line/ stereo line; ¼" headphone	optical; coaxial	none	Mac/Win	now	bus-powered	$298
Roland ED	U-8 Digital Studio	16-bit, 44.1 kHz	unbalanced XLR mic or ¼" mic/line; unbalanced ¼" line/guitar; stereo aux/stereo line; headphone	optical	1×1	Win	now	24-bit effects; hardware control surface	$648
Sound Devices	USBPre	20-bit, 48 kHz input; 16-bit, 48 kHz output	(2) XLR mic/line/ instrument/ aux/stereo record (RCA); stereo monitor (RCA); headphone; record	none	none	Mac/Win	soon	+48V phantom power; bus-powered	$625
Swissonic	USB Studio/ Studio D	16-bit, 44.1 kHz	(2) mic; (2) Hi-Z; (4) stereo line; stereo aux/ phono/monitor; headphone; record	optical; coaxial (Studio D only)	none	Mac/Win	now	switchable phantom power; individual input-level controls	$699/ $849
Tascam	US-428	24-bit, 48 kHz; 4-In/2-Out simultaneously	(2) balanced XLR; (2) balanced ¼" line; (2) balanced ¼" line/Hi-Z/ stereo unbalanced RCA line; headphone with separate volume control	coaxial	2×2	Mac/Win	soon	hardware control surface; application-specific control templates	$599

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of its 8×8 units at once without clogging the pipeline.

By contrast, nobody expects you to use multiple USB audio interfaces simultaneously. Well, almost nobody: Sound Devices claims that you can use more than one USBPre as long as each is on a different host controller. Check your computer's specifications carefully before trying this, because as a convenience many machines provide two USB connections on the same host. Nevertheless, audio interfaces consume enough bandwidth that you have to wonder whether your MIDI and audio interfaces will get along.

By all reports, there's no reason to worry. Even with all the control, audio, and MIDI data kicked back and forth by a complex device such as Roland ED's U-8, you have enough pipe left over for multiport MIDI interfaces, mice, and keyboards. The only manufacturer that has expressed some doubts about sharing the bus with other devices is Tascam—and given the fact that its US-428 exceeds the generally accepted audio limitations of USB, this is understandable. In Tascam's testing so far, an iMac's USB keyboard and mouse have not presented any problems, so there's apparently a bit of headroom.

The "U" in USB doesn't stand for Ubiquitous, but it might as well.

Beyond these three issues, the standard rules apply. What appears to be a problem with your shiny new USB device might be fixed by optimizing your system, checking your cables, and using the latest OS patches, audio drivers, and even video drivers. I've had extremely good luck with the handful of USB devices I've installed, but I've heard some tales of hellish installations. (Of course, the same can be said about any other category of computer gear.)

Check out the manufacturer's Web site for the latest word about specifications and compatibility before you buy. The USB Implementers' Forum (www.usb.org) limits the use of the official USB logo to devices that have passed its compliance testing, so keep that in mind when you shop for a new computer or USB device.

Use only high-quality cables, with the not-quite-square "A" connector on one end and the flat "B" connector on the other, and *never* use an extension cable. Before installing a new piece of USB gear, back up your entire system, taking special care to back up configuration files so that they can be restored in case of disaster. If this sounds familiar, it should. These procedures are standard with any kind of new gear, especially for those of us who habitually push our computers to their limits.

By the end of the year, you should see computers shipping with USB 2.0 ports, which will increase the maximum data-transfer rate to 480 Mbps. This rate exceeds the current IEEE 1394 maximum bandwidth by 20 percent (although that rate will soon reach 800 Mbps, followed shortly thereafter by 1.6 Gbps). USB 2.0 is fully backward-compatible and will continue to support hot-swapping.

A year from now, will you be pumping multichannel, high-resolution audio through your notebook's USB 2.0 port? Nobody's officially saying so yet, but the company representatives I spoke with are excited by the possibilities.

It's clear that USB is changing the landscape of desktop music hardware, and the trend is likely to continue. The whole idea of gear that can be used on both Windows and Mac platforms and moved from one system to another without requiring computer surgery is attractive for both consumers and developers.

Whether USB 2.0 will render IEEE 1394 moot, or vice versa, remains to be seen. Conventional wisdom has 1394 coming out on top, but USB has already defied the conventional wisdom. While we wait for the dust to settle, there's more than enough interesting USB gear to keep us busy.

Brian Smithers *is a musician and freelance writer living in Orlando, Florida. He can be reached through his Web site at http://members.aol.com/notebooks1.*

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Given the plenitude and diversity of mics—more than 500 models are available, with new ones appearing every year—choosing which ones to buy is no easy matter. Not surprisingly, we frequently get asked by readers which microphones are "best" for particular applications, as well as which are the best values. Of course, such decisions are rarely simple and clear-cut because they depend on such factors as what kind of recording you want to do, what preamps you will use, how much money you plan to spend now and later, and your personal taste.

Building a microphone collection (often referred to as a *cabinet*, *closet*, or *locker*) is a cumulative process. Typically, the owner starts with a handful of mics and adds to the collection from there. In that sense, the title of this article need not be taken literally: we aren't suggesting that you discard or trade in whatever mics you currently own and opt instead for one of the cabinets described here. Then again, if you're new to recording and you don't yet own any good-quality mics, you could very well take our suggestions literally.

Whether you're starting from scratch or building on your existing collection, we think you'll enjoy checking out our suggested mic cabinets. We've put together several possible cabinets at various prices, and we include details about the mics and some discussion of why we recommend them. Note that *recommend* is a key word here, as this article is very much an opinion piece. Both of us have years of "ears-on" experience with microphones in the studio and on stage, and we've been reviewing mics for **EM** for several years. We also have worked together on many critical microphone-comparison tests, often involving a half-dozen or more models—an experience that gives us a good vantage point.

Still, with so many mics on the market, we can't possibly be familiar with *all* of them. There are undoubtedly some great mics out there that we haven't worked with, and we certainly aren't going to recommend something if we haven't heard it. For the most part, then, the mics we've picked here are ones we either have encountered in reviews for **EM** or have used over the years in our studios.

Of course, people have divergent tastes when it comes to microphones, and the two of us don't always agree about what "flavors" of mic we prefer in various applications. Furthermore, we work in different types of studios and with different media. Myles Boisen works full-time as an engineer at his own commercial studio, Guerrilla Recording, where he records primarily to 1-inch analog tape. Brian Knave, on the other hand, works part-time (mostly evenings and weekends) in a much smaller personal studio and records primarily to Alesis ADAT. The sonic differences between digital and analog recording are sufficient to alter the perceived response of a given microphone—hence one factor in our individual preferences.

To take advantage of this diversity of opinion and give you a broader perspective, we made our mic selections independently of one another. And because your tastes and needs may differ from ours, we urge you to take our recommendations not as gospel but simply as well-considered opinions from two knowledgeable "insiders."

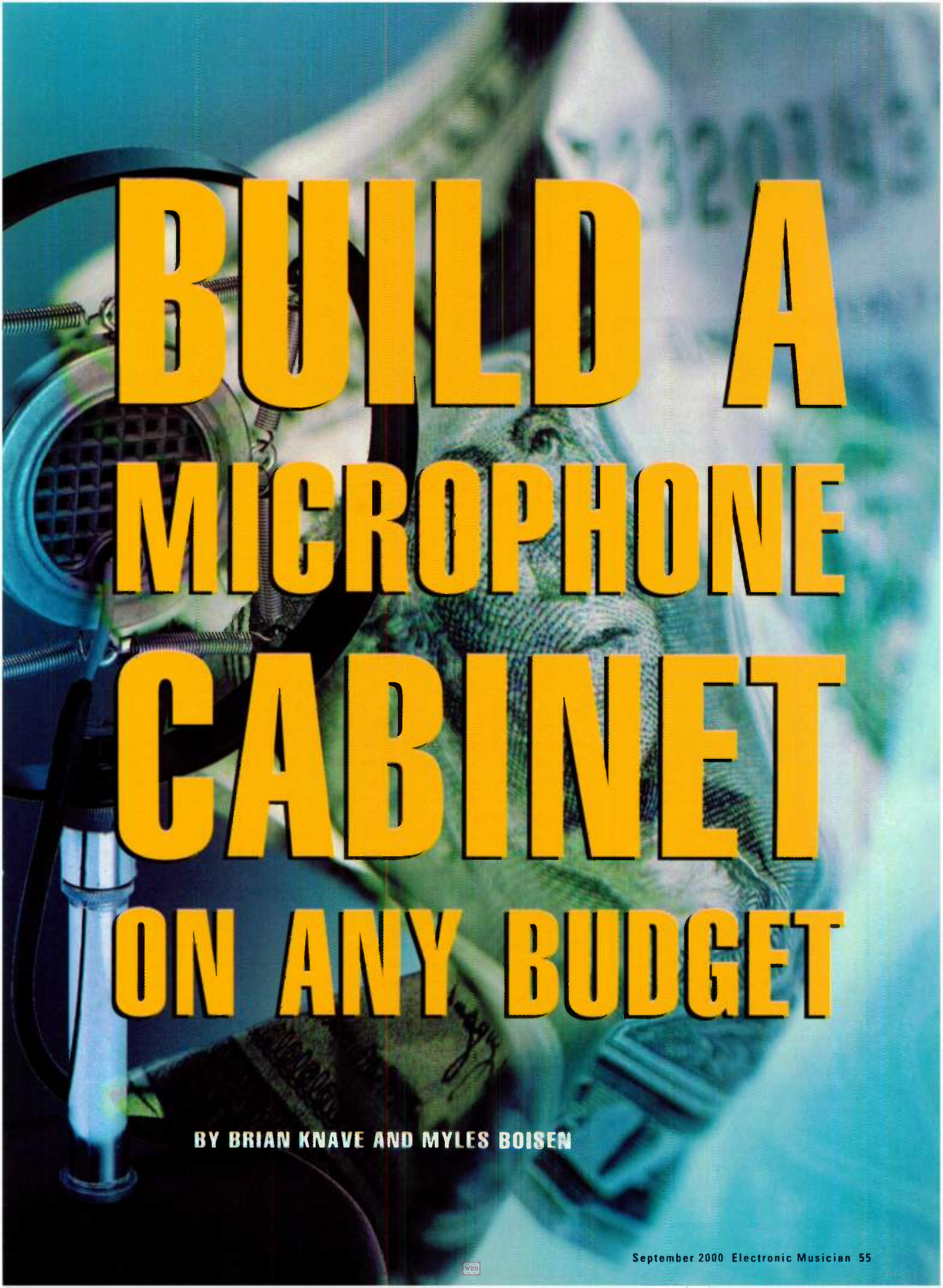
BREAKIN' IT DOWN

To accommodate different levels of involvement in recording, we've come up with three hypothetical mic cabinets, which we dubbed Bare Bones, Basic Coverage, and No Compromises. To address varying levels of monetary investment, we have further specified different price ranges: budget, midline, and deluxe for the Bare Bones and Basic Coverage cabinets, and midline and deluxe for the No Compromises cabinets.

By budget, we mean "as inexpensive as it gets." For the deluxe level, we are working under the assumption that money isn't an issue. The midline prices, which fall between those extremes, are probably the most applicable to the discriminating personal-studio recordist who is serious enough to budget a fair amount of money for high-quality gear but not at liberty to drain the family savings and go into hock to feed a nasty gear habit.

Obviously, the mic cabinet that is best for you is the one that gives you the results you want and covers all the applications you need covered. Everyone's needs are different. If, for example, you're a songwriter using a 4-track cassette recorder to produce demos for pitching to publishers, you can likely get by with fewer—and less costly—mics than could, say, an engineer producing CDs for indie labels. Likewise, the microphone needs of a sound designer may differ from those of a jingle producer.

Fortunately, the microphones in the cabinets suggested here are not fitted together like tumblers in a lock—any one of which, if changed, renders the lock useless. Rather, they can be mixed and matched to suit your fancy. Moreover, all of these mics (even the least expensive ones) can give good results with a variety of sources, and most will continue to be useful even if you someday reach the No Compromises deluxe level. Mic cabinets, like studios, are works in progress.



BUILD A MICROPHONE CABINET ON ANY BUDGET

BY BRIAN KNAVE AND MYLES BOISEN

Bare Bones Cabinet

We've defined the Bare Bones cabinet as one dynamic mic and one condenser mic—a spartan combination that's surprisingly powerful. Depending on which level you choose (budget, midline, or deluxe), this cabinet can handle the needs of: the sampling wizard; the small demo studio; radio, TV, and Web-audio producers; and MIDI producers requiring only a modicum of recorded audio. (See the sidebars "Twittering Bones" and "A MIDIot's Mic Picks" for profiles of two professionals' basic mic cabinets that are only slightly bigger than our Bare Bones picks.)

Indeed, as long as you don't mind the restriction of building your songs track by track (through overdubbing), a Bare Bones cabinet can cover lots of ground. For example, you can capture a surprisingly good drum-set sound by sticking the dynamic in the kick drum and positioning the condenser mic overhead. You could also stereo-mic a piano (dynamic on the low strings, condenser on the mids and highs) or an acoustic guitar (dynamic near the 12th fret, condenser pulled back a bit to hear the whole instrument), or you could do a 2-track pass of a guitar amp (dynamic mic up against the grille cloth, condenser several feet back to capture room sound).

The Bare Bones cabinet will also serve well for mono sources, whether you're tracking vocals, guitars, horns, or percussion. (For more ideas, see "Recording Musician: The Mini Mic Cabinet" in the April 1996 **EM**.)

BARE BONES

BUDGET ($400)

Myles Boisen

(1) Shure SM 57 ($146)
(1) Crown CM 700 ($289)

You really can't go wrong with the Shure SM 57 dynamic microphone—the perennial workhorse of the recording industry. Many top engineers swear by it for electric guitars, snare drum, vocals, and lots of other uses. The frequency response of this mic, though far from flat, is musical and seems ideally suited to the recording process, offering a midrange-rich sonic profile with just the right amount of cutting highs and low-end punch.

Even though there will always be limitations at the lower end of the condenser-mic spectrum, the affordable Crown CM 700 small-diaphragm condenser has earned a permanent place in my mic cabinet by virtue of its warm and pleasing sound. The CM 700 is not as bright as most of the competing models, but it does convey every bit of tone in a source and features a 2-position low-cut filter that helps get the mud out.

Like the Shure SM 57 dynamic, the CM 700 is a microphone that you may never "outgrow." I keep finding new uses for it, including resonator guitar and marimba.

BARE BONES

BUDGET ($400)

Brian Knave

(1) Shure SM 57 ($146)
(1) Audio-Technica AT3528 ($259)

I, too, recommend the SM 57 as a solid starting point for the Bare Bones cabinet—or for any mic cabinet, for that matter. Indeed, you would be hard-pressed to find a professional studio that doesn't have at least one SM 57 on hand, and big studios typically own a half-dozen or more. The particular *thonk* that this mic can capture from a snare drum has contributed to countless hit songs over the years, and, needless to say, the SM 57 is also a killer on stage ("SM," after all, stands for "stage mic"), whether you're miking vocals or guitar amps.

Two other inexpensive dynamics worth checking out are the AKG D 880 ($138), notable for its big lows and crisp highs, and the Electro-Voice N/D 267 ($140), which has a smooth, round sound characterized by enhanced low-mids that really help fatten up a thin or underconfident voice.

Budget condenser mics are a relatively new phenomenon, and the price threshold seems to get lower each year. For this Bare Bones cabinet, I recommend the Audio-Technica AT3528, a small-diaphragm cardioid condenser with an overall bright but (for the price) quite smooth sound. I have tested this mic on many sources and was impressed by its versatility and accuracy. It sounds nearly as good as some small-diaphragm

Shure's classic, ever-popular SM 57 dynamic mic is inexpensive, extremely reliable, and versatile.

For manufacturer information, please see Contact Sheet, p. 186.

The inexpensive Crown CM 700 small-diaphragm condenser mic provides a warm, pleasing sound that works well for many applications. Its 2-position low-cut filter is useful for cleaning up muddy sound.

condensers costing twice as much. The AKG C 1000S ($288) is another good budget condenser—if you don't mind going a bit over our target price. Though it can sound thin in certain applications, this mic is quite versatile, in part because it offers a battery-power option—a real boon for location recording.

If saving money is a key concern, be sure to watch for what is evidently the lowest-price condenser mic available: the new Rode NT3 ($199), a "medium-diaphragm" (¾-inch) model that has just begun shipping. I haven't yet tested the Rode in the studio, but I gave it a fair listen at the 2000 Winter NAMM show and was quite impressed. I remember the sound as being very clear and present, with sparkly highs and nice lows.

BARE BONES

MIDLINE ($700)

Myles Boisen

(1) Shure SM 57 ($146)
(1) AKG C 3000B ($520)

At this level, the Shure SM 57 dynamic microphone is still a must, and it leaves you free to spend a little more money on a condenser mic.

I'm very impressed with the improvements that AKG has made to its original C 3000, and the large-diaphragm C 3000B gets my vote as a good general-purpose condenser mic in this highly competitive price class. This upgraded model offers a fuller low end and smoother highs than its C 3000 predecessor, with the added advantage of a very hot output level.

Of course, you may prefer to choose a microphone based on its features or its response on a particular instrument. For example, the Oktava MK 012 condenser may be more suitable for a studio that records only solo acoustic guitar (more about this later). For such specialized uses, it is essential that you shop around. Fortunately, in this price range there is no shortage of models to choose from.

TWITTERING BONES

Think a handful of mics isn't sufficient to let you compete with the big guys? Well, check out Twittering Machine Productions (www.twittering.com), the brainchild of keyboardist and EM author Peter Drescher. A San Francisco–based operation, Twittering Machine provides music, sound effects, and voice-overs for multimedia software and the Internet. Drescher, whose list of clients includes Adobe, Beatnik, Sonicopia, Sprint PCS, AT&T, and WebTV, runs the whole show using just three mics:

(1) Neumann TLM 103
(1) Neumann KM 184
(1) Shure SM 58

"I've used these microphones to record a wide variety of audio," explains Drescher, "usually to DAT and then digitally transferred to Digidesign Pro Tools for editing and processing.

"The Neumann KM 184 is my main general-purpose mic. I've used it to record everything from dogs panting, dump trucks, and footsteps in snow to electric guitar, pan pipes, and African bells. The TLM 103 is terrific for voice-overs, and I've had some success using both Neumanns for stereo recordings of my Steinway piano. And even though I've used the SM 58 to record harmonica 'green-bullet style,' mostly I use it for hammering nails (just kidding!).

"Although some Neumann mics have been criticized for being too bright, the presence boost on the TLM 103 provides a clarity that works to my advantage, given that the end product is frequently 16/22 MPEG compressed audio files. I always figure it's best to start with the cleanest, clearest signal possible before decimating it for Internet delivery, in the same way that a drawing done in bold Magic Marker will fax better than a sepia-tone photograph. But truth be told, I also use Neumann mics in large part due to the justified prestige the name carries. Whenever a client asks me what kind of mics I use, I'm always proud to say, 'Neumanns, of course!'"

PETER DRESCHER

Multimedia-music producer Peter Drescher records African bells with his Neumann KM 184 small-diaphragm condenser mic.

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BARE BONES

MIDLINE ($700)

Brian Knave

(1) Audix OM-2 ($149)
(1) Audio-Technica 4033a/SM ($495)

For the dynamic mic in this cabinet, I've selected the remarkable Audix OM-2, an inexpensive handheld unit that I often prefer to the Shure SM 57 thanks to its more natural-sounding (that is, less "hyped") frequency response, and also because of its exceptional transient response. These qualities make the OM-2 an excellent low-cost choice for snare drum and toms. It also sounds great on guitar cabinets, vocals, and most other sources I've tried.

Although I, too, am impressed with the new AKG C 3000B, I'm recommending the Audio-Technica 4033a/SM, a cardioid-only condenser. Not only does it cost a bit less than the C 3000B, but it also comes with the very effective AT8441 shock-mount. In addition, the 4033 provides some useful extras, including an 80 Hz low-cut filter and a 10 dB pad, making it exceptionally versatile for a fixed-pattern condenser. This microphone, which already is fairly ubiquitous in both personal and commercial studios, has a big open sound with smooth lows, slightly attenuated mids, bright and very present highs, and excellent transient response. Its response seems tailor-made for many sources—including a wide range of vocalists, acoustic guitars, and percussion—and the mic is a good choice for drum overheads. And hey, we're still about $50 under budget, so you can afford some nice mic cables, too!

A MIDIOT'S MIC PICKS

Need more proof that a "bare bones" mic cabinet is enough to get you into the big leagues? Craig Stuart Garfinkle (www.midiotmusic.com) is a Los Angeles–based music producer and an Emmy-nominated composer for film, television shows, commercials, stage, and songs. A Pro Tools user, Garfinkle employs only four mics for his productions:

(1) Neumann TLM 170
(1) AKG C 414 B/ULS
(1) AKG C 1000
(1) Shure SM 57

"I describe myself as an in-the-trenches working composer—no longer a neophyte, but not a superstar," says Garfinkle. "My experience runs the gamut, from feature films to prime-time and network sitcom themes to animation scoring for Disney." Highlights of Garfinkle's career include *Mojave Moon* (a feature film starring Angelina Jolie), the theme and music for NBC's *The Jeff Foxworthy Show*, songs for Disney's movie *The Little Mermaid*, music for the *Dungeons and Dragons* games, and, in 1999, the Emmy-nominated score for public television's *Visions of Arizona*.

Currently, Garfinkle is composing a new musical identity for Warner Brothers Cable TV Network and a collection of musical identities for Hasbro's Fantasy Factory. "Also, look for the feature *The Best Man in Grass Creek*, to be released theatrically this fall, which includes some of my best scoring to date," adds Garfinkle.

"I learned what mic technique I know mostly by happenstance," he says. "I have a stable of brilliant musicians that I am lucky enough to work with—Frank Gambale and Gregg Leisz (guitar), Bobby Hurst (bass), Steve Tavaglione (saxophone, woodwinds), Steve Smith (drums, percussion), Sid Page (violin)—and I just ask them where I should put the mic based on the type of sound I want to get. After years of doing this, I've learned a lot."

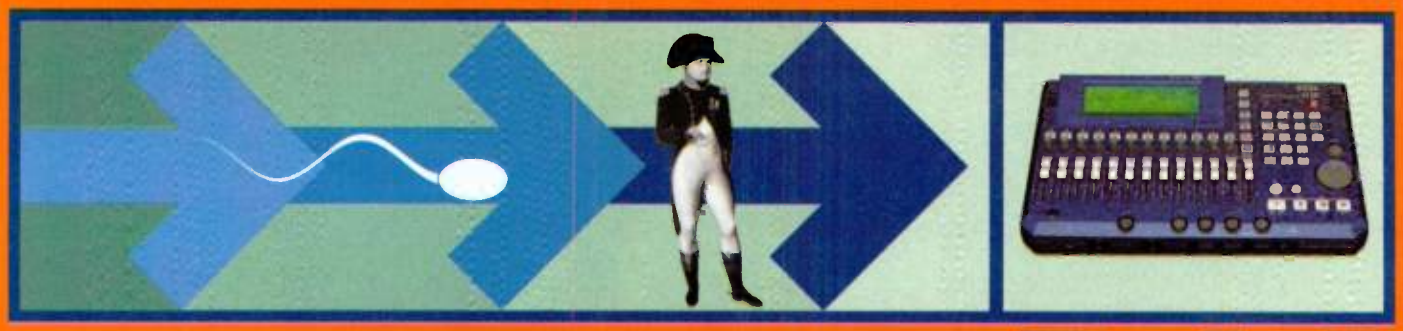
Garfinkle says he would love to have the luxury of searching for the "perfect" mic for every sound source and project, "but that just isn't the reality. The TLM 170 is a great vocal mic for just about any application. I use the C 414 as a backup if for some reason the 170 doesn't sound right for a given singer. I started using the SM 57 and C 1000 on electric guitars at the suggestion of Frank Gambale; he much prefers either mic to a large condenser, and often I'll use a blend of the two. The sound is brighter and more biting than that of the TLM 170 or C 414. For most acoustic guitars, however (especially nylon-string), I use the TLM 170 because its sound is warmer. For saxophone and woodwinds, it's a toss-up between the TLM 170 and the C 414. Likewise with percussion and violin: it all depends upon whether I want the sound to be warmer (TLM 170) or brighter (C 414).

"Due to crazy deadlines and the need to be able to instantly recall and edit mixes, I record almost exclusively to hard disk. Because of this, I have found that my Bellari RP 220 tube preamp is a necessity for introducing some warmth into the system. Otherwise, things come off sounding a little cold. If the budget allows, I like to track to 2-inch analog tape and then load the tracks onto a hard disk. That's the best of both worlds."

LUCY J. COLE

Composer Craig Stuart Garfinkle produces music for television and film. His mic cabinet consists of four mics.

Small, but effective



It's no surprise that something so small can accomplish so much. The D16 has all the capabilities of a full digital recording studio because it is one. It can record, mix, master and then burn your CD*. It can even emulate your favorite mics and amps to deliver a big studio sound in a compact unit. Sometimes smaller is better.

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KORG

BARE BONES

DELUXE ($3,500)

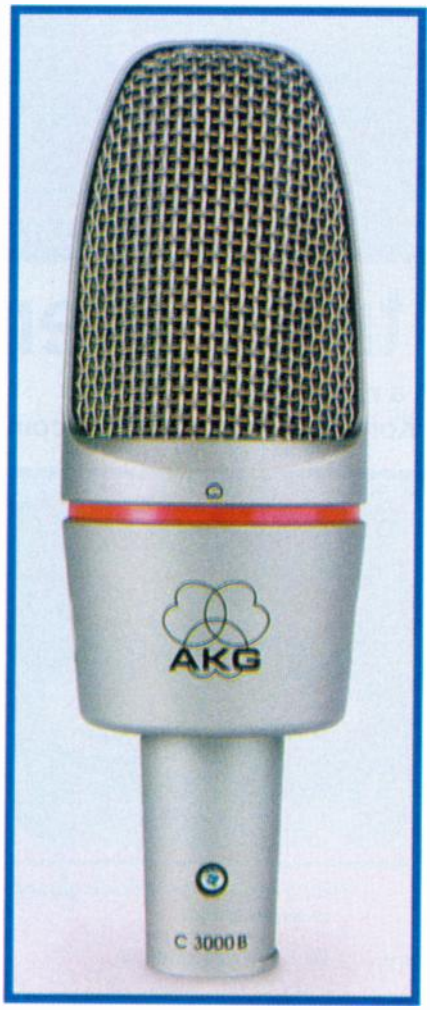
Myles Boisen

(1) Sennheiser MD 421 II ($485)
(1) Neumann U 87 AI/SET A ($3,010)

The Sennheiser MD 421 II is one of my favorite dynamic microphones. It has a defined, rich tone that works great on electric guitar and drums, and it features a useful onboard low-cut filter. The 421 is also a highly regarded voice-over mic that offers an instantly identifiable, radio-ready sound.

My choice for a deluxe, solid-state condenser mic has to be the venerable Neumann U 87, thanks to its clear, smooth, airy highs; exceptional low-end warmth; and ability to deliver a big sound at any distance. This multipattern mic is truly a rarity—even in the world of pricey transducers—for the way it can provide great results with almost any sound source. Indeed, as I have stated before (see "Recording Musician: Ten Mics I Swear By," in the April 1999 **EM**), if I had to pick only one mic to use for the rest of my life, I'd choose this one. Also, the U 87 will do its part to bring in business: brand-name recognition, whether justified or not, is an important marketing consideration for any studio that accepts outside clients. Best of all, the U 87 will make both you and your client smile when the session is over.

For this cabinet, I have specified the U 87 AI/SET A, which comes complete with a swivel mount, windscreen, and cable. After all, the mic won't do you much good if you have no way to mount it on a stand. However, the U 87 is also available without accessories for $2,825.



AKG's C 3000B is a significant improvement over the original C 3000, with a warmer sound, smoother highs, and a hotter output level.

BARE BONES

DELUXE ($3,500)

Brian Knave

(1) Sennheiser MD 421 II ($485)
(1) Neumann U 87 AI/SET A ($3,010)

Sound familiar? Well, as it turns out, this is the only cabinet for which Myles Boisen and I picked the very same mics—and in this case, his sentiments echo mine exactly, although I would point out that the MD 421 II is also a great vocal mic for certain "problem" singers.

However, if $3,500 is a bit steep for your Bare Bones budget, yet you want dearly to remain in the deluxe realm, consider combining the Shure Beta 58A ($332.50) with the Baltic Latvian Universal Electronics (BLUE) Mouse ($2,295). The Beta 58A is a very fine supercardioid dynamic with a bit more punch and sizzle than a regular SM 58 can muster. Not surprisingly, it works very nicely on snare drums and guitar amps, but it also is great to have around when the vocalist (typically a club singer) can't seem to get a good take without hand-holding the mic. It's a wonderful choice for trumpet, too.

The low-cost Audix OM-2 is surprisingly accurate, with an excellent transient response and a less "hyped" frequency response than that of most handheld dynamics. It's a good choice for snare drums, toms, guitar cabinets, and even vocals.

The BLUE Mouse is an exquisite mic both sonically and visually, and it's definitely in the same class as the Neumann U 87. A hand-built Class A discrete unit, the BLUE Mouse features a cool rotating capsule grille that makes positioning a cinch. This mic sounds beautiful, and like the U 87, it works splendidly on a variety of sounds. However, it provides only a fixed-cardioid polar pattern (its biggest limitation) and, by design, no onboard pads or filters.

For manufacturer information, please see Contact Sheet, p. 186.

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Although the Basic Coverage cabinet would obviously work for any Bare Bones application, we have tailored it specifically for bands seeking to record and release their own records using minimal gear. To that end, it contains just enough mics (five dynamics and three condensers) to allow full miking of a 5-piece drum kit—yet not for recording the whole band at once. In other words, overdubs are required. But if you don't mind building your songs instrument by instrument, the Basic Coverage cabinet should serve your needs.

We have a large-diaphragm dynamic for the kick drum, four other dynamics for close-miking the snare and up to three toms, and a pair of small-diaphragm condensers for overheads. That leaves one large-diaphragm condenser for use either as an ambient room mic or on hi-hats.

With all the mics positioned on the drums, you can then use DIs to record bass, keys, and dummy electric-guitar tracks—thereby laying down the basic tracks for a song or an album in one pass. Playing the core instruments together gives a lively, natural feel, and having everyone but the drummer use DIs helps isolate the drums, keeping those tracks pristine. Once the drum tracks are nailed, the other basic instruments can be retracked if necessary—at which point you'll have several cool mics at your disposal. After that, you can lay down the acoustic instruments, vocals, sweetening tracks, and so on.

BASIC COVERAGE

BUDGET ($2,000)

Myles Boisen

(1) Sennheiser E602 ($319)
(2) Sennheiser E604 ($249 each)
(2) Shure SM 57 ($146 each)
(2) Shure BG 4.1 ($275 each)
(1) AKG C 3000B ($520)

As I look at this list, I'm amazed by how much you can do with just eight microphones. With this setup (plus some talent and a lot of empty tracks), it's possible to get a thoroughly professional drum sound, then move the mics around and overdub a whole band to perfection.

The Sennheiser E602 is an amazing kick-drum mic that can turn any bass drum into a thundering arena-rock monster. It's also a viable choice for electric bass and other low-end sources.

Sennheiser's E604 is another technological wonder, adapted especially for use on toms but equally effective on electric guitar, organ, brass, and more. And if your drummer doesn't need four mics for snare and toms, try an E604 underneath the snare for some extra snap.

For drum overheads, a pair of small-diaphragm condensers is a must. The Crown CM 700 (mentioned earlier) would work, but for general use I've found the brighter response of the Shure BG 4.1 to be more suitable. Also, it runs on batteries, so it can double as a location-recording microphone for concerts, sampling, or environmental recording.

And if you're just doing drums, don't let that large-diaphragm condenser sit idle: try using it a bit outside the bass drum for a more realistic kick sound, or place it a few feet back from the kit to capture the live ambience of the entire drum set.

BASIC COVERAGE

BUDGET ($2,000)

Brian Knave

(1) beyerdynamic TG-X 50 ($249)
(1) Shure SM 57 ($146)
(3) Audix OM-2 ($149 each)
(2) Audio-Technica AT3528 ($259 each)
(1) Audio-Technica AT4047/SV ($695)

It's not easy putting together a cabinet of this size for only two grand. If you do the math, you'll see that we both came in slightly over budget, but we were close enough for practical purposes.

Again, I've enlisted the remarkably priced AT3528—only this time as a pair for drum overheads and other stereo applications. Also, I've stayed with the SM 57 for snare and the OM-2 pair for toms—a combination that I know works well because I've relied on it many times.

For the large-diaphragm dynamic, I've selected another low-cost favorite of mine, the beyerdynamic TG-X 50. This mic has amazing attack and a very natural sound overall. It's especially good on bass-guitar cabinets, but it makes a very punchy kick-drum mic, too, especially for jazz and other applications where realism is desired.

My pick for the large-diaphragm condenser at this price has to be Audio-Technica's new AT4047/SV, a lovely-sounding microphone specifically designed to have a vintage FET sound. What this means, at least to my ears, is an overall warmer sound than that produced by other solid-state mics in Audio-Technica's 4000 series, as well as smoother (though still very present) highs. Trust me: this mic does not sound like a budget model. In addition, the 4047 comes with a great shock-mount, and it provides both an 80 Hz low-cut filter and a 10 dB pad, making it a truly exceptional value.

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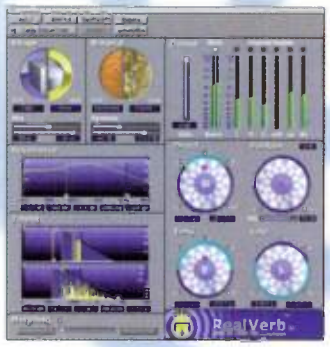

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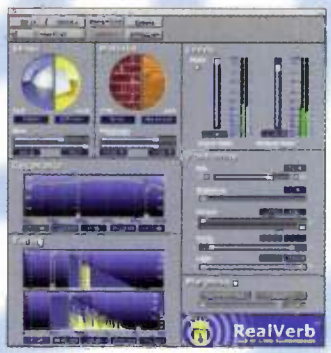

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BASIC COVERAGE

MIDLINE ($3,500)

Myles Boisen

(1) Shure SM 57 ($146)
(1) Electro-Voice N/D 468 ($278)
(1) Sennheiser E604 ($249)
(1) Sennheiser MD 421 II ($485)
(1) Sennheiser E602 ($319)
(2) Oktava MK 012 ($499.99 each)
(1) Neumann TLM 103 $995

At the midline level, you gain the ability to further refine your sounds by comparing different microphones on the same sources. For example, you can try out both the MD 421 II and the E602 on floor tom and kick drum and alternate the SM 57 and the N/D 468 (a compact supercardioid mic with a neat rotating capsule) on snare. The crisp highs and thick lower midrange of the N/D 468 make it my personal favorite for this crucial application.

I'm very enthusiastic about Oktava's MK 012, and the reason is simple: this small-diaphragm condenser microphone is a real bargain that sounds great on vocals, drums, percussion, acoustic guitar, piano, and many other sources. The MK 012 can cover most of the bases for a personal studio, whether you're recording voice-overs, singer-songwriter vocals, acoustic instruments, or samples.

For critical applications, a matched stereo pair is a necessity that is well worth the extra bucks. Matched pairs of Oktava MC 012 sets (which include interchangeable cardioid, omnidirectional, and hypercardioid capsules, as well as an insertable 10 dB pad) are, to my knowledge, sold only through an online retailer (www.sound-room.com). I recommend these products highly. Single (cardioid only) MK 012 mics available in stores can be matched by listening, but this process requires patience, a good stock of microphones on hand, considerable skill, and lots of luck. It is worth noting, however, that the MK 012s sold in stores are often priced far below the suggested retail. (Guitar Center, for example, frequently offers them for $149 each.)

In addition to the Oktava mics as the stereo pair, I'm recommending the Neumann TLM 103 as the large-diaphragm condenser in this category. It makes a great ambient drum-room mic, and it is a solid choice for vocals, acoustic instruments, percussion, electric guitar, and other sources.

This shopping list not only will set you up nicely, but it also comes in a few bucks under budget. I suggest you spend the surplus on business cards so you can recoup some of your investment!

BASIC COVERAGE

MIDLINE ($3,500)

Brian Knave

(1) Electro-Voice N/D 868 ($338)
(1) Audix D1 ($219)
(3) Audix D2 ($219 each)
(2) Earthworks SR77 ($599 each)
(1) BLUE Dragonfly ($1,095)

At this price point, I get to include one of my favorite kick-drum mics, the Electro-Voice N/D 868. This unit consistently provides a fat, round, warm, and solid thump, practically regardless of the drum. Also, it has exceptional off-axis rejection, making isolation a snap. Another contender here, though a tad more expensive, is the long-standing AKG D112 ($382).

You've probably noticed that I really like Audix dynamic mics; their superior transient response makes for a natural sound, which I like on drums. Here I'm promoting the D1 and D2 for snare and toms, respectively. With this budget, you can afford to forgo the handheld models and use mics that are more specifically designed for easy positioning around the kit. (Be sure to check out the sidebar "Drum-Mic Kits," which details drum-specific microphone packages from several manufacturers.)

My choice for small-diaphragm condensers—and here we're talking *very* small diaphragms—is the Earthworks SR77. This distinctive cardioid mic is a stunning performer, both in the studio and on stage, providing the extremely realistic sound that Earthworks is known for. I can hardly get through a session without using this mic. The SR77s are exceptional on acoustic guitars, percussion, drums (as overheads), and pretty much anywhere you want to capture the sound *as is*. The only drawback to Earthworks mics is their relatively high self-noise levels (a slight, airy hiss); however, this is usually easy enough to work around, especially in busy mixes.

Another great-sounding—and very quiet—small-diaphragm condenser I recommend highly is the MicroTech Gefell M300 ($495). In a recent comparison test (see "To Tell the Truth" in the March 2000 **EM**), this beautifully engineered mic was a consistent favorite in nearly all of the applications.

For this cabinet's large-diaphragm condenser, I could hardly decide between the Neumann TLM 103 and the

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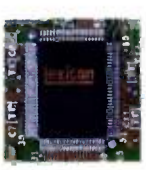

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BLUE Dragonfly. Both are amazing—equally quiet and first-rate in sound quality; either one will serve you well.

In the end, I picked the Dragonfly, if only because I find it a tad more forgiving on a broader range of instruments. For vocals alone (depending on the singer), I more often prefer the TLM 103, thanks to that distinctive Neumann presence boost. However, that same boost can sound a bit harsh on some sources (such as triangle or harmonica). The Dragonfly is a flatter-sounding mic, so if you're recording lots of acoustic instruments—guitars, pianos, drums, percussion—I think it's the way to go.

Then again, neither mic offers switchable polar patterns, attenuation pads, or low-cut filters. If you need the versatility afforded by these "extras," you might want to up your budget a bit and go for the AKG C 414 B/ULS ($1,258). This impressive mic has a smooth sound, nicely extended highs and lows, and great transient response. It's not only a great value but truly a classic that will do any mic cabinet proud.

The Sennheiser MD 421 II is a classic dynamic microphone with a defined, rich tone. It's great on drums, electric guitars, and vocals.

STARSTRUCK IN NASHVILLE

If you've ever done any work in major recording studios, you know that the microphone cabinets tend to be first-rate—and typically, they're huge. Indeed, a big selection of mouth-watering microphones can be a main attraction for producers, engineers, and artists alike.

ROBERT COOK

The Gallery is one of Starstruck Studios' two studios. Note the "floating floor" recording space, which can be miked ambiently, from around the cage, or even from below.

For an idea of what it takes to compete at this level, we could trot out any number of major studios' mic collections. But one thing you'd discover—especially with long-standing, established facilities—is that many of the mics they use are "vintage," which is to say, you couldn't just go to your local audio store and purchase one of them. This is less likely to be the case, however, with new studios.

Starstruck Studios (www.starstruckstudios.com), owned by country singer Reba McEntire, is one of Nashville's premier new recording facilities. Designed by Harris, Grant & Associates' studio-design team, Starstruck opened for business in 1996. In addition to its acoustics and design, it is noted for housing two studios with mirror-image control rooms, each equipped with identical gear.

So which mics would you buy for a world-class recording studio? You might want to strap on your drool bucket before perusing this stately list:

(1) AKG C 12
(2) AKG C 12 VR
(4) AKG C 414 B/TL II
(8) AKG C 414 B/ULS
(4) AKG C 3000
(12) AKG C 460B/CK 91
(4) AKG D 112
(12) AKG C 391 B
(2) AKG CK 93
(2) AKG C 24 (stereo)
(4) Audio-Technica AT4030
(4) Audio-Technica AT4050
(4) B & K 4007
(2) Coles 4038
(2) Electro-Voice RE20
(1) Neumann U 47 FET
(2) Neumann M 149
(3) Neumann M 269
(8) Neumann U 87
(4) Neumann TLM 170
(4) Neumann TLM 193
(8) Neumann KM 184
(1) Neumann SM 69 (stereo)
(12) Sennheiser MD 421
(12) Shure SM 57
(2) Sony C 800
(2) Sony C 800G
(2) Sanken CU-41
(2) Telefunken ELAM 251

For manufacturer information, please see Contact Sheet, p. 186.

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As you can see, the all-new THX® Approved LSR25P powered monitors are really taking off. That's because key industry professionals are discovering one very simple and indisputable fact: the LSR25P consistently outperforms any other monitor in its class. As a result, it's gaining popularity in all critical monitoring applications, from digital workstations and near field stereo to 5.1 mixing. In fact, the LSR25P is as comfortable on the road as it is on the meter bridge.

A talented musician, successful composer and recognized producer, Lenny White is considered one of music's real innovators. He's played with such greats as Miles Davis, Chick Corea and Stanley Clark, and has also collaborated on some of the most recognized and influential music of the past three decades, including the new CD *On the One*, with Sammy Peralta.

Every LSR25P incorporates JBL's revolutionary Linear Spatial Reference (LSR) performance characteristics, assuring a mix that sounds consistent from room to room. What's more, the two-way 5.25", bi-amplified LSR25P also features 150 watts of linear power as well as purpose-built transducers with JBL's most current thinking and designs. This last point has earned the entire LSR family of monitors continual critical acclaim for more than three years.

Sammy Peralta loves music. That pure and simple fact comes through strikingly clear as he sits at his keyboard tinkering with half-written tunes. Sammy's background includes work with talents including Tito Puente and Willie Bermudez. "I have to be careful because I can get so lost in the music, I sometimes forget I have a family that would like a little of my attention too."

One last point: Sammy Peralta's new CD ***On the One*** featuring Lenny White was mixed entirely with LSR monitors.

LSR.

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BASIC COVERAGE

DELUXE ($7,500)

Myles Boisen

(1) Shure SM 57 ($146)
(1) Electro-Voice N/D 468 ($278)
(1) Sennheiser E604 ($249)
(1) Sennheiser MD 421 II ($485)
(1) Sennheiser E602 ($319)
(2) Neumann KM 184
($1,458 for matched pair)
(1) Lawson L47MP ($1,995)

At the risk of getting boring and predictable, I've already scored my ideal dynamic drum-mic cabinet at the lower-budget level, and I'm sticking by those choices. These mics have always served me well, so my strategy here is to upgrade the condenser-mic section of my growing vault while still keeping a little dough stashed away in the bank.

For drum-overhead miking, I'm moving up to the highly regarded Neumann KM 184. Known for its low noise, crisp and detailed response, and full lows, this relative newcomer has already established itself as an industry standard. Additionally, it is available in specially matched stereo pairs.

In this category, however, I must give an honorable mention to my all-time favorite among small-diaphragm condensers: the Schoeps 221b, a vintage tube microphone with switchable cardioid and omnidirectional pickup patterns. Fortunately, these mics are

Neumann's versatile and very popular U 87 is a premium large-diaphragm condenser mic that delivers exceptional low-end warmth and clear, smooth highs.

still plentiful—you can get one for about $1,000—and are often available in pairs (though there's no guarantee they will be closely matched in response). The KM 184 and 221b are also excellent for many other stereo-miking applications, including acoustic guitar, piano, and percussion.

In the exalted large-diaphragm condenser microphone category, nothing says "deluxe" quite like the Lawson L47MP tube mic, which is plated in 24-carat gold. This microphone has become an indispensable tool in my studio ever since Brian Knave and I brought it in for an **EM** comparison test two years ago. It's my first choice for vocal, saxophone, and organ tracks, and it can do amazing things for hard-rocking electric guitar, acoustic guitar and bass, and room ambience. In addition to its lush and "tube-y" tone, the L47MP has a continuously variable pickup-pattern selector on the power supply that can be adjusted from the control room to produce dramatic changes in room sound and timbre.

BASIC COVERAGE

DELUXE ($7,500)

Brian Knave

(1) Electro-Voice N/D 868 ($338)
(1) Electro-Voice N/D 468 ($278)
(2) Sennheiser MD 421 II ($485 each)
(1) Electro-Voice RE20 ($748)
(1) Neumann U 87 AI/SET Z ($3,200)
(2) Earthworks QTC1 ($2,000 for matched pair)

Here's a cabinet that will rock almost any drummer's world—and then turn around and handle the rest of the band with aplomb, finesse, accuracy, and punch. Electro-Voice's awesome N/D 868 captures a thunderous kick, and its hip N/D 468 does thwack duty on the snare. The two rack toms are fully covered by the Sennheiser MD 421s, and the booming floor tom is tamed by Electro-Voice's RE20 (a versatile cardioid that's notable for not building up much proximity effect at close range—hence its favored status among radio announcers).

As overheads, you have a matched pair of the amazing Earthworks QTC1 single-point omnidirectional mics. The QTC1 is a strong contender for being the most accurate-sounding microphone on the planet, and it's definitely the least expensive in that rarefied category. The QTC1s are easy to use, too: keeping the 3-to-1 rule in mind, you can pretty much position them almost anywhere. On drums, I like them as a spaced pair, hunched close on either side of the kit, but they also work surprisingly well in XY and ORTF configurations. And just wait until you hear these mics on acoustic guitars, pianos, percussion, upright bass—in fact, just about anything you can think of.

You won't go wrong if you choose the Neumann U 87 as your large-diaphragm condenser. (The AI/SET Z is the fully loaded version, complete with premium shock-mount.) On the other hand, if you have a hankering for tube warmth instead, you might want to consider the Neumann M 147 ($1,995), which is a fixed-cardioid design (obviously less versatile than the U 87, but an impressive mic for what it does), or the Lawson L47MP ($1,995), which covers all the polar patterns and then some.

No Compromises Cabinet

The No Compromises cabinet is designed to accommodate virtually any recording task you could imagine, including tracking a large band all at once. In our estimation, such a feat requires a minimum of 16 microphones (nine dynamics and seven condensers): that should be enough to cover the drum set, the bass guitar, two electric guitars (or a single electric guitar if you want to double-mic), the stereo acoustic guitar or piano, and vocals.

The drum-set microphones consist of a large-diaphragm dynamic for the kick drum, five other dynamics for the snare drum and up to four toms, one small-diaphragm condenser for the hi-hats, and a matched pair of small-diaphragm condenser microphones for overheads. One large-diaphragm dynamic is also appropriated for the bass-guitar amp (to be used in conjunction with a DI track), and there are two dynamics—including one ribbon mic—for electric guitars.

In addition, a second matched pair of small-diaphragm condenser microphones can be used to stereo-mic an acoustic guitar, a piano, a percussion setup, or whatever. And you have a choice of large-diaphragm condensers (one solid-state and one tube mic) for vocals, room-miking, and miscellaneous sources.

Of course, these 16 microphones can be used in any number of other combinations. No matter how you use them, however, they will almost certainly allow you to record without compromises.

NO COMPROMISES

MIDLINE ($9,000)

Myles Boisen

(1) Sennheiser E602 ($319)
(1) beyerdynamic TG-X 50 ($249)
(1) Shure SM 57 ($146)
(1) Electro-Voice N/D 468 ($278)
(2) Sennheiser E604 ($249 each)
(2) Sennheiser MD 421 II ($485 each)
(1) Royer R-121 ($995)
(1) Crown CM 700 ($289)
(2) Oktava MK 012 ($499.99 each)
(2) Neumann KM 184 ($1,458 for matched pair)
(1) Neumann TLM 103 ($995)
(1) Lawson L47MP ($1,995)

No big surprises here, except that a beefier budget has allowed some expansion and different flavors in the dynamic-mic department. The beyerdynamic TG-X 50 sees a lot of duty at my studio when more attack and definition is needed from a kick drum, and it is also a favorite for rock bass-guitar tracks.

On electric guitar, I constantly pair the Royer R-121 ribbon mic with a Sennheiser MD 421. Sometimes I use both tracks in a mix, but more often than not, the warm personality of the Royer wins the guitarist's favor. The R-121 (or its British counterpart, the $1,195 Coles 4038 ribbon mic) is also excellent for acoustic bass, cello, brass instruments, hand drums, and a variety of other sources.

I've already covered the other mics listed here. The only change is the Crown CM 700, which is slated for hi-hats in this comprehensive cabinet.

NO COMPROMISES

MIDLINE ($9,000)

Brian Knave

(1) Electro-Voice N/D 868 ($338)
(1) beyerdynamic TG-X 50 ($249)
(1) Electro-Voice N/D 468 ($278)
(4) AKG C 418 ($329 each)
(1) Sennheiser MD 421 II ($485)
(1) Royer R-121 ($995)
(1) Crown CM 700 ($289)
(2) Earthworks SR77 ($1,300 for matched pair)
(2) MicroTech Gefell M300 ($495 each)
(1) AKG C 414 B/ULS ($1,258)
(1) Lawson L47MP ($1,995)

For this cabinet, I'm still using the N/D 868 and N/D 468 for kick and snare, respectively, but I've switched to AKG C 418 miniature condensers for the toms. These great-sounding little units come complete with convenient clips that clamp onto the rims of the drums for quick and easy setup. For hi-hat, I picked the Crown CM 700—not only because of its low price and great sound, but also because it offers a 2-position low-cut switch; with most hi-hats, I typically engage them both.

For a large-diaphragm dynamic microphone with a very natural sound and great attack, check out the beyerdynamic TG-X 50. Try it on bass-guitar cabinets and kick drums when you want a realistic sound.

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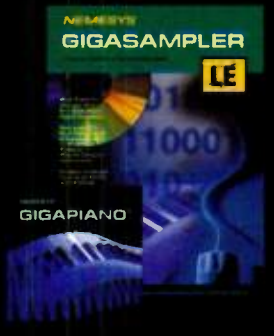

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Like Boisen, I chose both the Sennheiser MD 421 II dynamic and the Royer R-121 ribbon for miking electric-guitar amps. I also love the Royer on horns and percussion, and I find it indispensable for recording violin and any other potentially "scratchy" sources.

The Earthworks SR77 and the MicroTech Gefell M300 are my choices for small-diaphragm condensers in this category. Having both pairs really expands the sonic palette, as the two models, though both very accurate, have quite different "attitudes."

I took the same approach in the large-diaphragm department, going for maximum flexibility and range of sound by using both the multipattern, solid-state AKG C 414 and the multipattern Lawson L47MP tube mic.

If you don't mind spending a few extra dollars, a different multipattern tube microphone that would fill this cabinet out nicely is the CAD VX2 ($2,249). This smooth, gorgeous-sounding mic employs two tubes and provides three polar patterns (cardioid, omni, and figure-8) and two interchangeable capsules: the OS 125 (1.25-inch diameter), which has a big, warm sound; and the brighter-sounding OS 110 (1.1-inch). The VX2 also provides an 80 Hz low-cut filter and two attenuation pads.

Electro-Voice's RE20 cardioid condenser mic is a favorite among radio announcers because it doesn't exhibit a dramatic proximity effect. It's great on kick, toms, and horns.

DRUM-MIC KITS

Making the commitment to record drums in your personal studio is a big step, and often it requires a significant increase in the number and types of microphones in your cabinet. Some manufacturers simplify this task by offering cost-effective mic kits specially designed to accommodate drum recording. Here are several packages currently available, most of which include a handy carrying case:

AKG offers the Drummer's Ultimate Package ($996), which consists of one cardioid D 112 dynamic mic for the bass drum and a pair of hypercardioid C 418 condenser mics for snare drum and toms.

Audio-Technica's KitPak ($500) has four custom-engineered cardioid dynamic mics: two for snare/tom and two for kick/tom. It also includes a heavy-duty carrying case and drum-miking instructions.

Audix has packaged its four D-series hypercardioid dynamic microphones and ADX-50 prepolarized condenser mic in four different drum packs. The DP1 ($931) consists of one D2 for the toms, one D4 for the bass drum, and one ADX-50 for use as an overhead or hi-hat mic. The DP2 ($1,177) gives you one D1 for the snare, hi-hat, or cymbals; two D2s for the toms; and a D4 for the bass drum. The DP3 ($1,755) is the full-size kit: you get one D1 for the snare, two D2s for the toms, one D4 for the bass drum, and two ADX-50s for overheads. Finally, the DP4 ($1,506) offers one D1, two D2s, and two D4s (for bass drum or floor tom). Each package ships in an aluminum flight case.

Audix's DP3 drum-mic kit offers a complete set of mics for snare drum, toms, and bass drum, as well as a pair of overheads.

CAD is offering three complete packages with plastic carrying cases. The PDK3 ($249) includes two cardioid NDM10 dynamic mics for snare and toms, and one cardioid NDM11 dynamic mic for bass drum. The PDK5 ($449) gives you four NDM10s and one NDM11, whereas the PDK5C ($449) puts together two NDM10s, one NDM11, and two cardioid CM15 electret condensers. The CM15 is designed for use as an overhead, cymbal, hi-hat, or snare-drum microphone.

Sennheiser offers three drum packs. Each contains dynamic mics from the company's popular Evolution series and comes with a carrying case. The SET604A ($747.95) provides three cardioid E604s for snare drum and toms; the SET604B ($817.95) consists of two E604s and one cardioid E602 for bass drum. The SET604C ($1,066.95) gives you three E604s and one E602.

Shure recently unveiled its DMK57-52 Drum Mic Kit ($663), comprising three cardioid dynamic SM57 mics for snare drum and toms, one supercardioid dynamic Beta 52 for the bass drum, three A56D drum mounts, and a carrying case.

—Matt Gallagher

Throw Them For A Loop

DO something different with your groove that makes everyone take notice. With a Yamaha SU200 sampler, you can ***do much more with loops for far less.*** just $499 MSRP. Whether you're going to a DJ gig, creating dance remixes or just fooling around, the SU200 helps you do it with a style that demands attention. So visit a Yamaha Digital Musical Instrument dealer today and throw those tired old sounds for a loop.

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Not just a sampler, the SU200 makes a cool effects box, too. Plug in an audio source – like a mic, turntable or synth – and assign the signal to a digital effect or filter. Then use the pad to bring the sound in and out of your mix.

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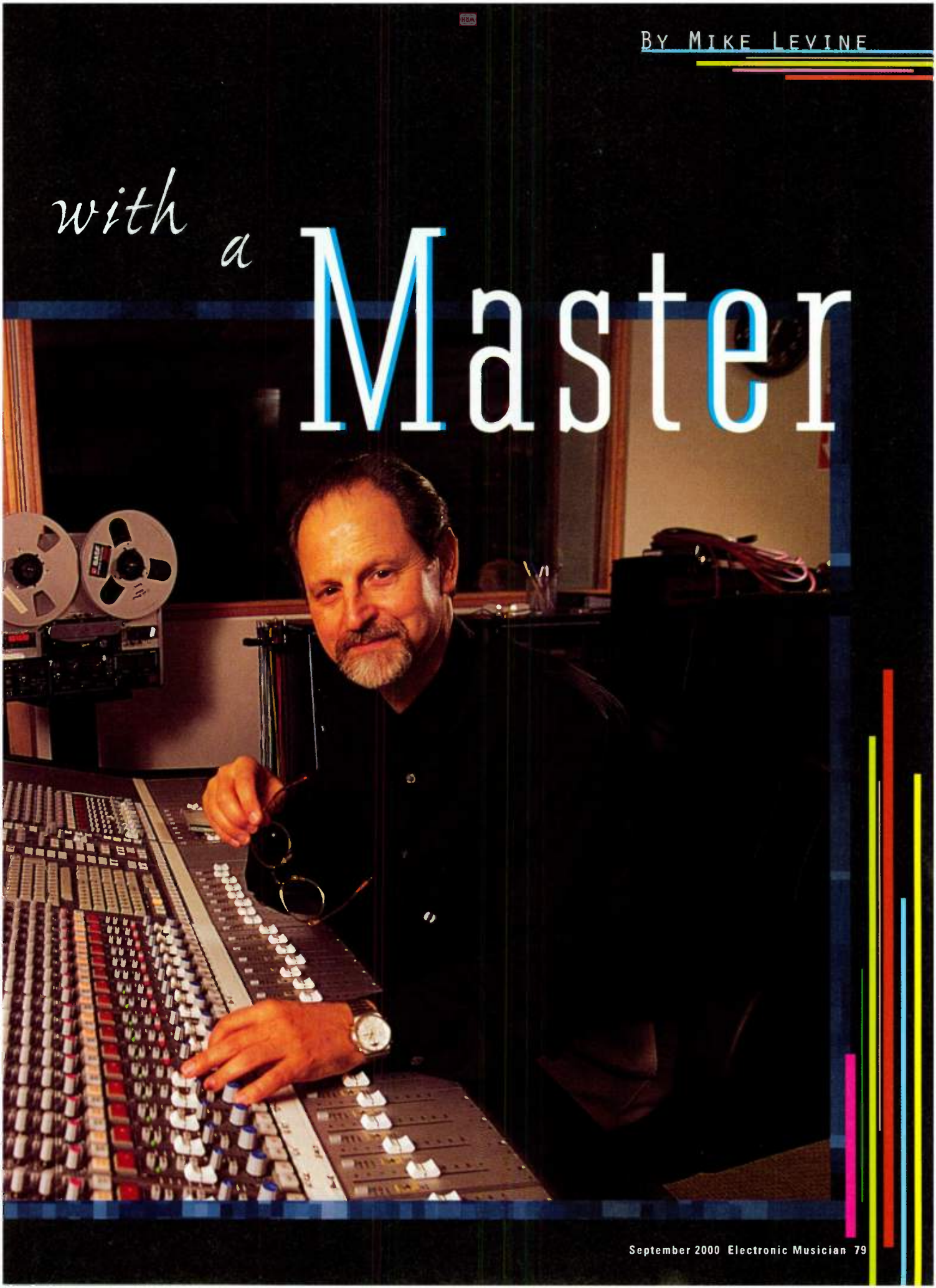
Mixing

On a cold Sunday afternoon in New York City, legendary engineer and producer Eddie Kramer walked into the "SSL Room" at the SAE Institute of Technology, a school of audio engineering and multimedia technology on West 40th Street. Kramer was there to demonstrate his mixing techniques to a group of student engineers (and one journalist) who were eagerly anticipating his appearance.

The South African–born Kramer is most famous for his work with Jimi Hendrix; he engineered some of the guitarist's classic albums, including *Are You Experienced?*, *Axis: Bold as Love*, and *Electric Ladyland*. (Kramer later was director of engineering at Electric Lady Studios, which he helped design.) The rest of his résumé is equally impressive and reads like a who's who of classic rock: Kramer was behind the console for five Led Zeppelin albums, including *Led Zeppelin II* and *Houses of the Holy*, and he also worked with the Rolling Stones, the Beatles, Traffic, Kiss, Peter Frampton, Joe Cocker, and David Bowie, to name a few.

By Mike Levine

with a Master



Mixing with a Master

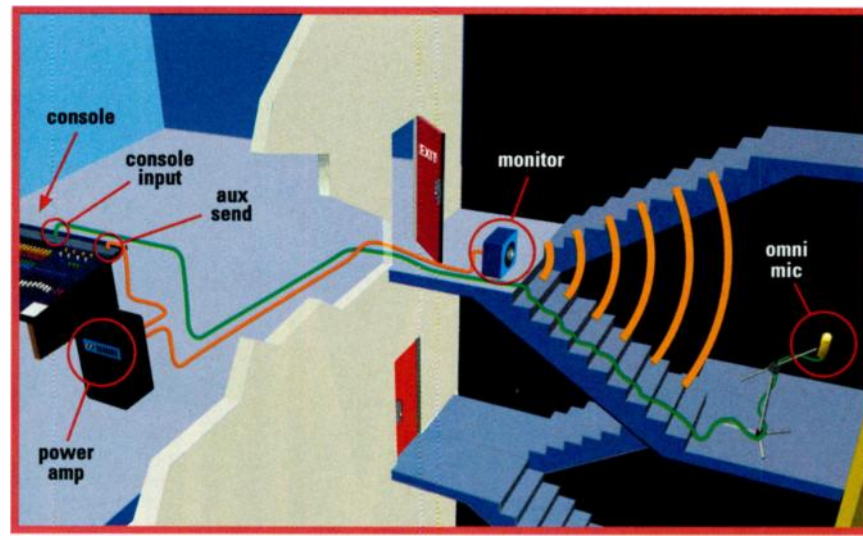


FIG. 2: Kramer created a reverb chamber in a concrete stairway by using a monitor and an omnidirectional microphone.

These days, in between producing new acts (he's currently producing an album with an all-girl punk rock band from Nashville called Fair Verona) and working on *The Other Side of the Glass*—a new book of photos from his classic sessions—Kramer gives lectures around the country on recording and production techniques. That Sunday afternoon he was wrapping up a four-day event at SAE. During the first three days, Kramer had given an opening-night lecture and conducted pre-production and tracking sessions for the students to observe. The band he produced and recorded for these sessions, the Coby Brown Group, was chosen based on its demo tape of "Please," a melodic pop-rocker.

DIGITAL CRITIQUE

During the lecture, Kramer—a staunch proponent of analog recording—pulled no punches in assessing current music technology. "The CD," he said, "is the biggest piece of crap ever invented. And why? It's 16-bit, and 16 bits are nothing. I can play you tapes that are 30 years old that will kick the ass of most digital tapes made today."

He talked about the sonic differences between analog and digital and about comparing the same material through both formats. "Hit a chord on a piano," he said, "and listen to the decay on a digital machine. It falls off very rapidly, and not in a nice way. You don't get that lovely soft decay like you do with analog. The other thing you don't get in digital is tape saturation. The only way to get tape saturation is with *tape!*"

Kramer then backed up his proclamations by pointing out what inevitably happens these days at major recording sessions. "Even if it's an all-digital session," he said, "what's the first thing the producer is going to do to make it sound better? He goes into the mic closet and pulls out a U-47 tube mic. In the rack are a Pultec tube equalizer and an LA-2A tube limiter. This is ironic. Here we are in the year 2000, and we're using 60-year-old technology to make the digital format sound good. Hello! This does not compute."

He expressed special disdain for the low quality of digital files downloaded from the Internet. "Look what's happening today. The kids are getting into Napster and MP3.com and downloading that stuff, and it sounds like garbage. But they don't care about quality as long as it's free."

Even with his strong views, Kramer concedes that digital technology has its useful aspects (especially when it comes to editing flexibility) and thinks that the best way to go is to use both formats. "A lot of producers," he said, "are recording 16-track 2-inch at 15 ips just to get the nice air, warmth, fatness, and a little bit of extra distortion and dumping it into Pro Tools, or into an Otari Radar—which is what I've been doing—and then proceeding from there. It's all valid. I use digital and I use analog, and I use them in a way that they complement each other."

Not surprisingly, though, Kramer chose to record the Coby Brown Group on an analog multitrack: a 24-track 2-inch Studer A827 running at 30 ips. He said he would have preferred 15 ips with Dolby SR—he likes the bottom-end response you get at 15—but the machine at SAE wasn't equipped with it.

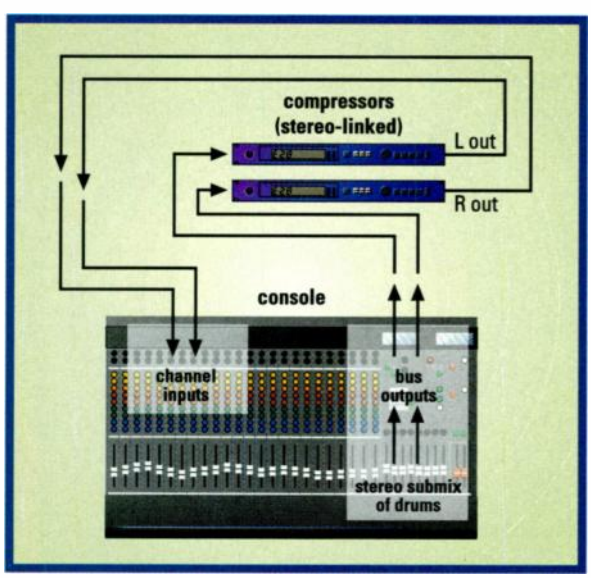


FIG. 1: Kramer submixed the drums, brought them through the console's bus outputs into a pair of compressors, and routed them back into two of the inputs. He could then easily mix the compressed and dry drum signals.

12:30 P.M.: FAST-FORWARD

After spending a bit of time chatting with the students, Kramer was ready to begin the mixing session. The console was a 32-input SSL 54000G+, and Kramer had firm opinions about it. "I don't like SSL consoles in general, except for the 9000," he said. "I prefer the sweet sound of the vintage Neve consoles."

This particular SSL had automation capability, but because the system was

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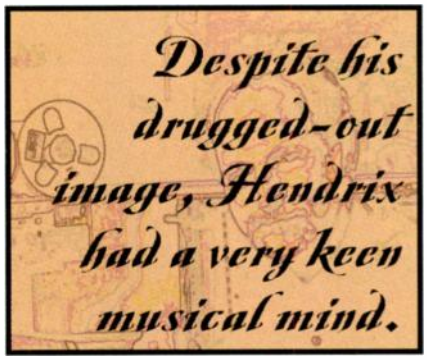
temporarily down, the mix had to be done manually. Kramer prepared the console by putting down white tape to the side of each fader so that he could mark levels as the mix progressed. He explained that when he does have automation available, he still marks all his levels just in case the system fails during the session. "I do it on every single session," he said. "Nine times out of ten, something is going to happen to the computer. It will snap back at you; your levels will all go crazy. You've got everything beautifully set up, and—bam!—the computer breaks down. If you have it marked, you can always restore your mix to a point very close to where you had it."

Kramer's mixes are usually very complex and require many passes on an automated system. Typically, he pushes up the levels of various elements, such as fills by the drums or bass, to exaggerate their emphasis and give the mix more energy. One of the secrets to his mixes is having a great deal of internal movement, in terms of levels as well as panning.

An even more unusual aspect of Kramer's technique is that he generally prints effects and EQ to tape during tracking. This is contrary to conventional wisdom—that tracks should be printed dry and effects and EQ experimented with during mixdown. "When I hear a piece of music for the first time," he explained, "I create in my 'mind's ear' the final product. I hear how it's eventually going to sound. And I go for that sound immediately and commit it to tape. If I have doubts, I'll print the reverb and the effects on separate tracks, just in case, and I can always mix them over later."

"Last week I was in Florida," he continued, "and I recorded the Gabe Dixon Band, which I discovered at a lecture at the University of Miami. I did 12 songs in two days; I mixed it in one day [on an SSL 9000 at the Hit Factory/Criteria in Miami]. All 12 songs. Think about it. How was that possible? One, the band was tight; two, they knew what they were doing; and three, I was able to get a good sound that stayed consistent throughout the session. I committed that sound to tape. The instruments were premixed to tape. Virtually all the effects were printed to tape. All I had to do was put the faders up, and it was mixed. But you really have to know what you're doing."

He used this same process during the tracking portion of his SAE workshop while recording "Please." So when it came time to mix, most of the tracks had already been equalized, and many already had reverb and/or compression.



Despite all the talk about recording techniques and equipment, Kramer stressed that the most important ingredient in music is the material itself. "The bottom line is songs," he said in his lecture, and he gave some advice to songwriters: "Forget the long intros. If the A&R guys don't get it in the first ten seconds, forget it. Keep it simple, keep it short, and keep it honest."

1:00 P.M.: TAKE IT TO THE LIMITER

A rack of vintage—and vintage-style—outboard gear was brought in for the session (the equipment had also been used for the earlier tracking session). Included in his rack were two Purple Audio MC76 limiters, two Urei 1176LN limiters, two Pultec EQP 1A equalizers, a Lexicon PCM 80 reverb, a dbx 160 A compressor, two Teltronix LA-2A Leveling Amplifiers, two Empirical Labs Distressors (compressors), and a GML Model 8200 stereo parametric EQ.

Kramer had just finished preparing the console and was ready to mix. He first brought up the drums, which were recorded onto nine tracks: kick, snare, hi-hat, stereo toms, stereo overhead, and stereo room. He panned them from the drummer's perspective, with the hi-hat on the left. After listening for a while, Kramer decided to add some compression to the kit in a rather unique way. First he submixed the drums and patched the output of that submix into the two Empirical Labs Distressors. He then brought the output of those compressors into the console through a pair of inputs; this allowed him to mix in the compressed drums with the unaffected ones (see **Fig. 1**). "It gives you the option, depending on how nuts you want to get," he explained. "You can have less of the original drums and more of the compressed sound. The idea is that you have a choice."

The next instrument brought in to the mix was the bass guitar, which was

DANIEL O'CONNELL

In his opening-night lecture, Eddie Kramer spoke about music technology and told anecdotes about his work with Jimi Hendrix, Led Zeppelin, and other classic rockers.

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Mixing with a Master

again.' And we played it about ten times. He said, 'Man, I gotta have that sound on everything.'"

Kramer spoke reverently about Hendrix and let the students in on some interesting inside observations. Despite his drugged-out public persona, for example, Hendrix was all business when he was recording. He had a keen musical mind and knew precisely what he was doing in the studio. "He knew before he walked in the studio exactly where each note was going," said Kramer. "He was so prepared. Every detail was in his mind. It was the antithesis of what you would think Jimi Hendrix is all about."

EBET ROBERTS

Eddie Kramer, in front of the SSL S4000G+ he used for the session.

2:00 P.M.: PRACTICE MAKES PERFECT

Anticipating more mix moves than he could handle himself, Kramer proceeded to enlist two students to help push faders. With the multitrack of "Please" playing back, Kramer and his student helpers rehearsed the mix a number of times.

While this was going on, we suddenly heard voices emanating from the Mackie HR-824 studio monitors. After a moment of confusion, it became clear that a group of people were ignoring the "Recording in Progress" signs and had walked into the fire stairway near the mic and monitor set up for the reverb effect. (That's one of the problems inherent in using a public space for a reverb chamber.) Luckily, they left quickly and didn't interfere with any actual takes of the mix.

2:30 P.M.: LET IT ROLL

Satisfied that the mix had been rehearsed sufficiently, Kramer turned his attention to the mixdown deck. Not surprisingly, he had opted to mix onto 2-track analog rather than to DAT, even though the only available 2-track machine was a well-worn ¼-inch Studer PR99 MKIII (see **Fig. 3**). "The idea is to go to analog tape and, once you've stored your mix on analog tape, then dump it across to DAT," he said. "Why just go to DAT? DAT is a horrible format. I'd much rather get the nice, fat, warm sound off the tape and *then* make a digital copy of it."

After testing out the 2-track deck, Kramer discovered that the tape was hitting the edge of the take-up reel as it rolled. An SAE technician was called in to fix the problem.

"Let's try a take," Kramer said, and the 2-track rolled while he and the students furiously made their mix moves. All went as planned—until they discovered on playback that the right and left signals had been accidentally reversed when they were patched into the 2-track. After repatching, another pass of the mix was recorded. In the middle of this take, Kramer turned the volume down considerably and monitored the rest of the mix at a low level. To gain even better sonic perspective, he switched between the Mackie HR-824s and a pair of Genelec 1038Bs on playback, listening at various volume levels. When asked about the problem of ear fatigue, Kramer said that a mixing session shouldn't be longer than 12 hours and that his preferred method was to listen at a relatively low volume on small monitors.

3:20 P.M.: FINE-TUNING

After Kramer finished listening to the playback of the latest mix, he decided that it could use some overall EQ tweaks. He patched the GML Model 8200 parametric equalizer into the stereo bus, explaining that he uses the GML in this fashion on most of his mixes. "I add a tiny bit of high end and a little bit of low end," he said. "Very subtle, maybe 1.5 to 2 dB of high end or 1.5 to 2 dB of low end. Just to put a little air in there and some *oomph* down below."

He continued to tweak the mix, adding chorus to the bass guitar in one section of the song. Pleased with his progress, he decided to go for a third take. After it was recorded successfully and he listened back, Kramer appeared satisfied that he'd gotten the result he was looking for. "This old ¼-inch machine still works," he remarked, and the session was over.

LESSONS LEARNED

Watching Kramer work and listening to his philosophy about recording were quite instructive. Most impressive was his absolute control over the process: he knows during pre-production what he wants a song to sound like in its final form, and he takes the necessary steps during the recording and mixing processes to make that concept a reality. He controls the process, rather than letting the process control him. And because he has so much experience and such a strong understanding of the technology, he's often able to ignore the conventional wisdom and still end up with a superior product.

Mike Levine *is an associate editor for* **EM** *and the editor of* Onstage, **EM***'s new live-performance magazine.* *He wishes to thank Eddie Kramer and the folks at SAE and Griffin Public Relations for their help and cooperation with this story.*

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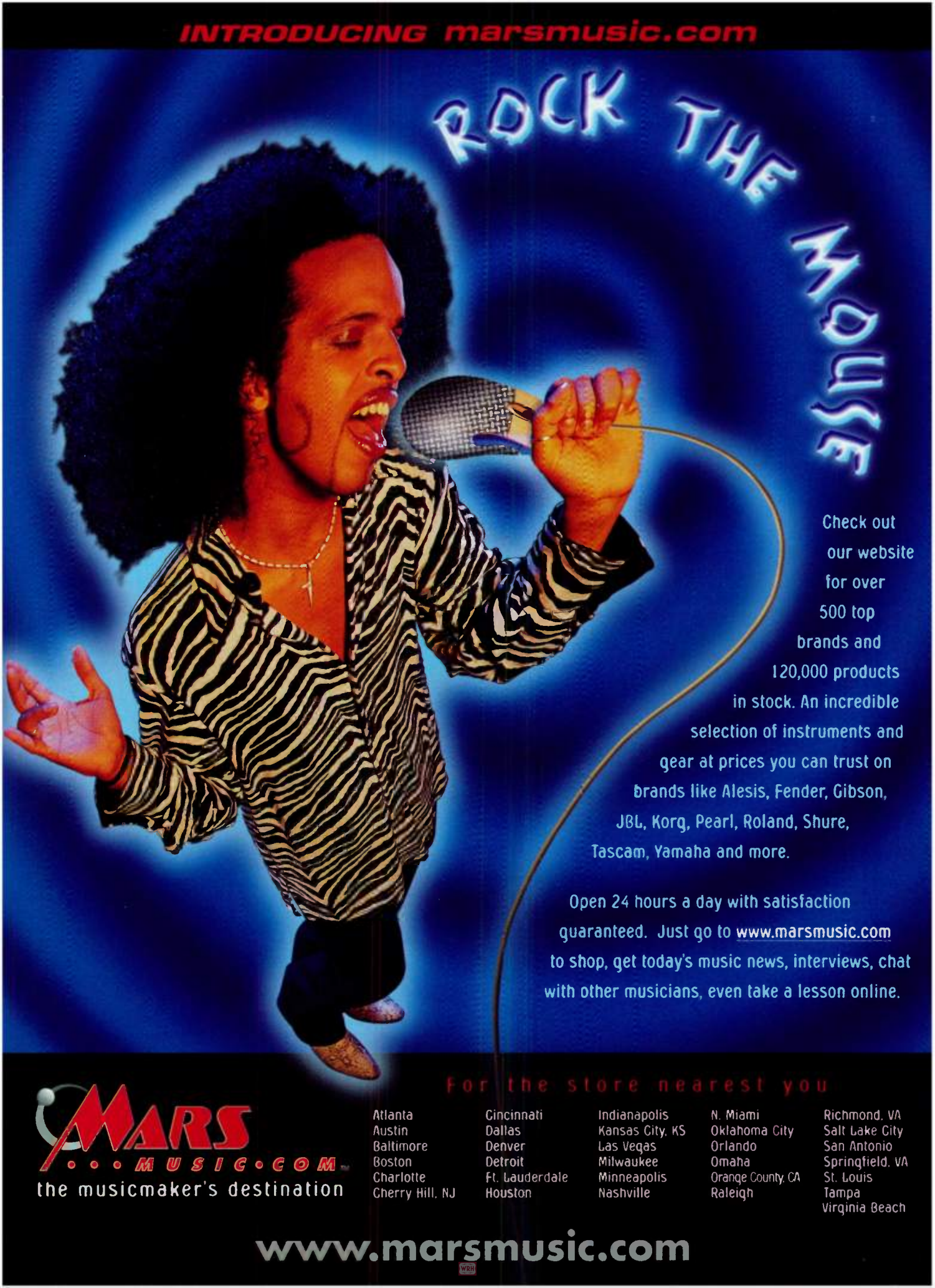

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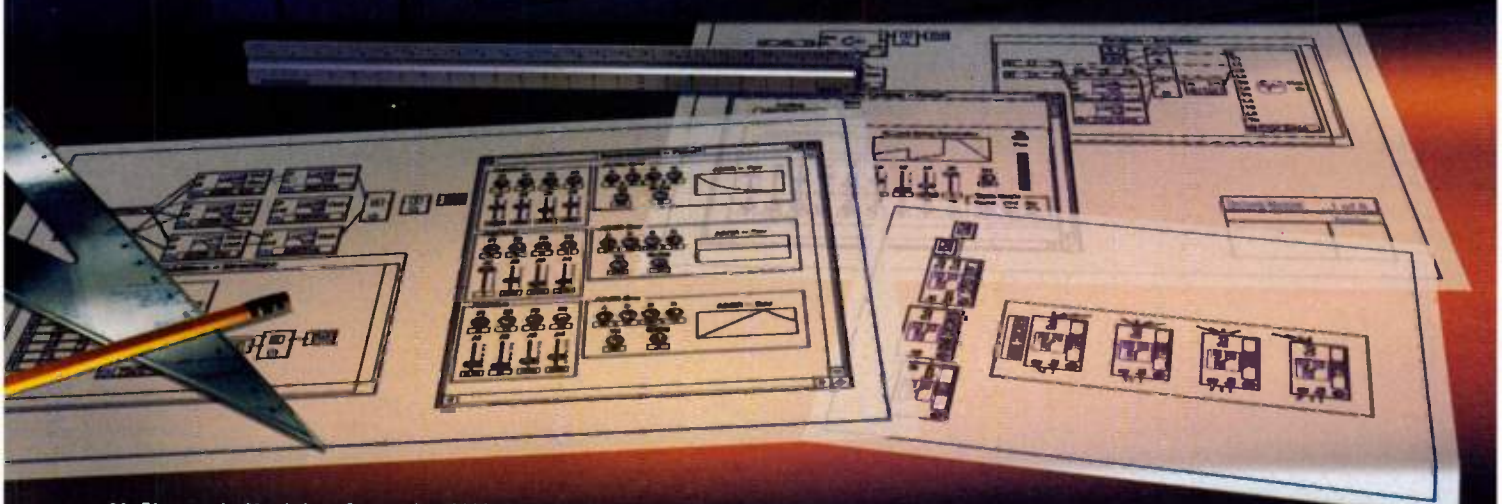
Master CLASS

BUILDING A

Native Instruments' *Reaktor* is one of the most powerful new programs to hit the scene in years. Combining a massive synthesis "toolkit" with a huge range of sampling and sample-processing options, this modular software can put an endless number of sounds at your disposal. But once you've purchased this extremely deep and complex program and given it 300 MB of your hard disk space, where do you go from there?

If you're a relative newcomer to *Reaktor*, some of the ideas presented in this "Master Class" should help you get the genie out of the bottle. If you're a seasoned (or singed) Reaktivist, I hope that you, too, will find some new ideas worth pursuing. If you've never touched *Reaktor*, I suggest you look at the sidebar "*Reaktor* Basics" before proceeding.

I'll discuss three *Reaktor* elements: understanding and modifying Ensembles from Reaktor's Premium Library, exploring *Reaktor*'s Macros and using them to build a versatile additive synthesizer, and developing a complete Ensemble from a basic idea.



REAKTOR

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By Len Sasso

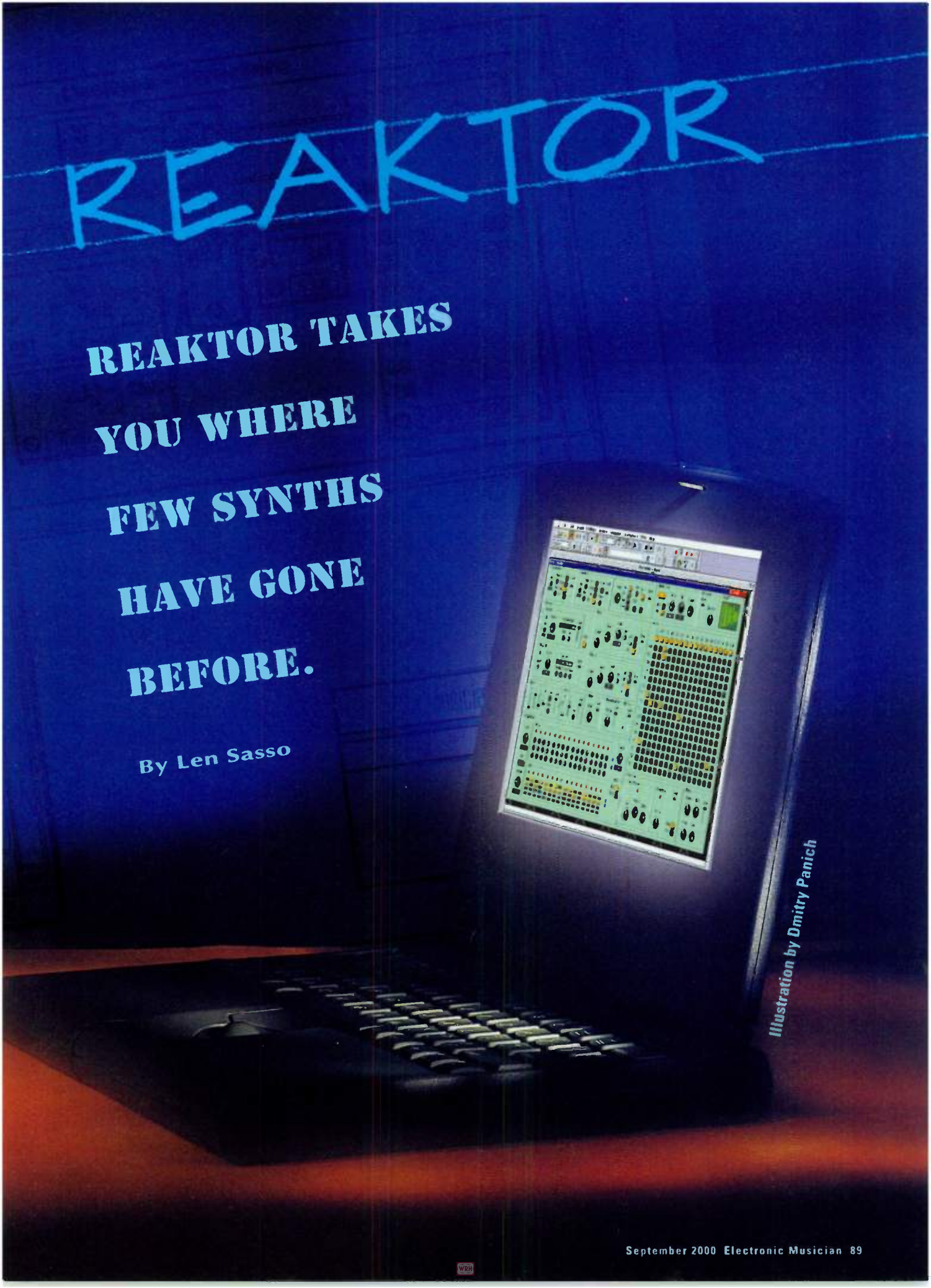
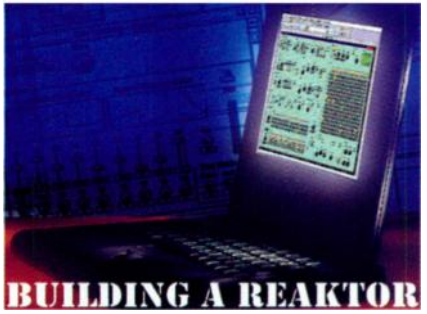


Illustration by Dmitry Panich



BUILDING A REAKTOR

DEVOLUTION OF AN ENSEMBLE

Reaktor comes with a wonderful library of preset Ensembles, and even more are available in various libraries at the Native Instruments Web site (www.native-instruments.com). Unfortunately, a first look at one of these beasts often produces a giant, audible "Huh?" In fact, it's not uncommon to have the same reaction to your own favorite constructions after a few weeks' absence. Here are some tips on how to approach a new Ensemble to figure out how it works.

Take a look at the NewsCool Ensemble from the NI Premium Library (see **Fig. 1**). The Premium Library is included with *Reaktor* 2.3, and its Ensembles are individually downloadable from the Native Instruments Web site. (See a short summary of the Library's offerings in the sidebar "*Reaktor*'s Premium Library.") If you don't have access to the Premium Library, you'll find versions of NewsCool on earlier *Reaktor* CD-ROMs as well as in the NI User Library, which also has a version with a built-in randomizer.

Before you start. First, make a copy of the Ensemble. If you're doing more than taking it for a quick spin, this precaution ensures that you can always get back to "ground zero" after you've intentionally or inadvertently saved some changes.

It's also a good idea to turn your monitor levels down and keep your thumb poised over the 0 key. The 0 key stops all *Reaktor* audio processing, immediately cutting off all sound output. Turning audio processing off also releases a lot of CPU power; when you're building or modifying an Ensemble, this can make things go more smoothly. Finally, check the system usage when audio processing is on. If necessary, you can save CPU cycles by lowering the sample rate.

Take it for a spin. If you have no idea what an Ensemble does, look first at its Control Panel. (This, *not* the Structure, is the place to start.) More than likely the Ensemble is a synthesizer, a sample player, a sequencer, or an audio processor. If it's a sequencer, you will need to start *Reaktor*'s clock in the toolbar; if it's an audio processor, you'll have to feed *Reaktor* some audio; and if it's a synth or sample player, you'll need to play your MIDI keyboard.

A look at the NewsCool Control Panel reveals sequencer, synth, filter, and delay

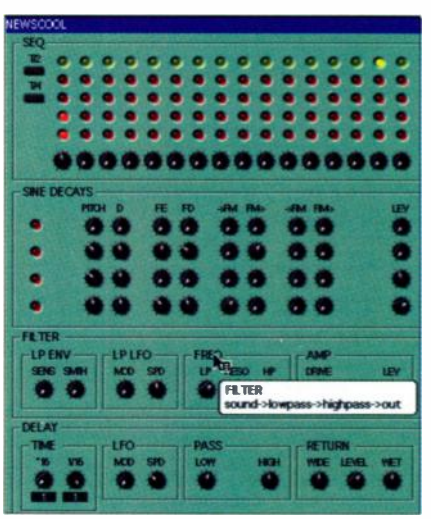


FIG. 1: A quick look at the NewsCool Ensemble's Control Panel reveals a sequencer, sine-tone synthesizer, filter, and delay effect. The pop-up hints provide useful information.

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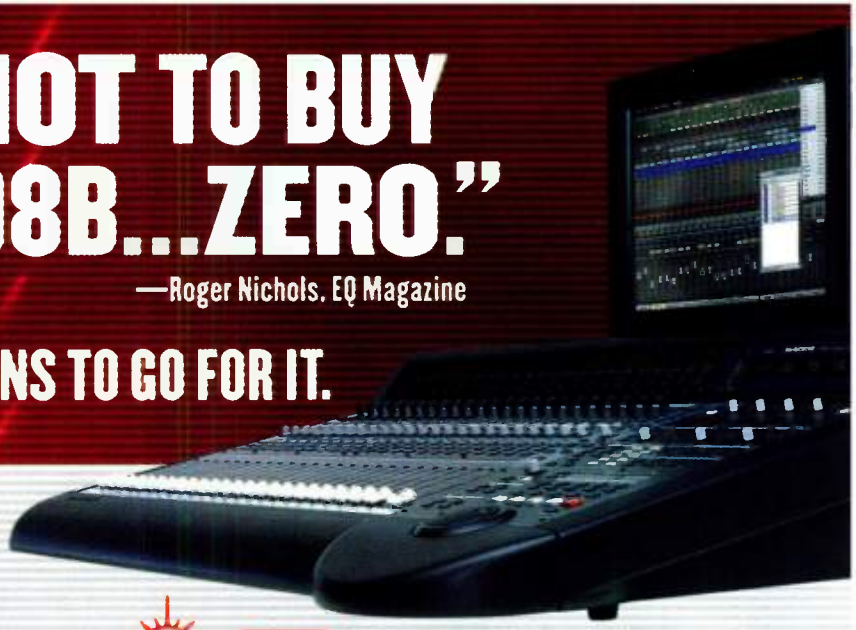

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Normally we don't name competitors in our ads. But in this case, Mix Magazine published the other nominees for the 1999 TEC Award for Outstanding Technical Achievement in Small Format Consoles: Allen & Heath's GS-3000, Digidesign's ProControl, Panasonic's WR-DA7, Spirit's Digital 328 and Yamaha's 01V. Thanks to all who helped us win this prestigious award.

BUILDING A REAKTOR

sections, arranged from top to bottom. The synth section (labeled "Sine Decays") contains four identical rows of controls representing four identical sine-wave synths. The sequencer section has four rows of red LEDs. When an LED is turned on, the corresponding synth is triggered at that stage of the sequence (that is, any stage of the sequence can trigger any or all of the synths). The output of the synths is processed by the filter, then by the delay line.

If Snapshots (*Reaktor*'s term for sets of parameter presets) are provided with an Ensemble, they could help you find out what the author intended—often they have indicative names. Look first for Snapshots on the Ensemble level, as these can be used to select Instrument Snapshots automatically. Otherwise, you'll need to select Snapshots for each individual Instrument in the Ensemble. The Snapshots in NewsCool are on the Instrument level, and the names are all anagrams of *evil* (undoubtedly indicating that this is one bad patch!).

Go for help. If you're having trouble figuring out some of the controls, turn on *Reaktor*'s Show Hints option. When you mouse over any object, whatever information the author provided about its properties will be displayed in a Help box. (Working the controls with the hints turned off is easier, however.) When you're building your own Ensembles, it's a good habit to fill in Help-box information as you go along; you'll be glad you did, and other users of your Ensembles will be grateful.

REAKTOR BASICS

Reaktor is a cross-platform (Mac and PC) software application for building synthesizers, samplers, sequencers, and audio effects. The devices you create are called *Ensembles*, which typically can be used stand-alone, in conjunction with other software, or as VST plug-ins.

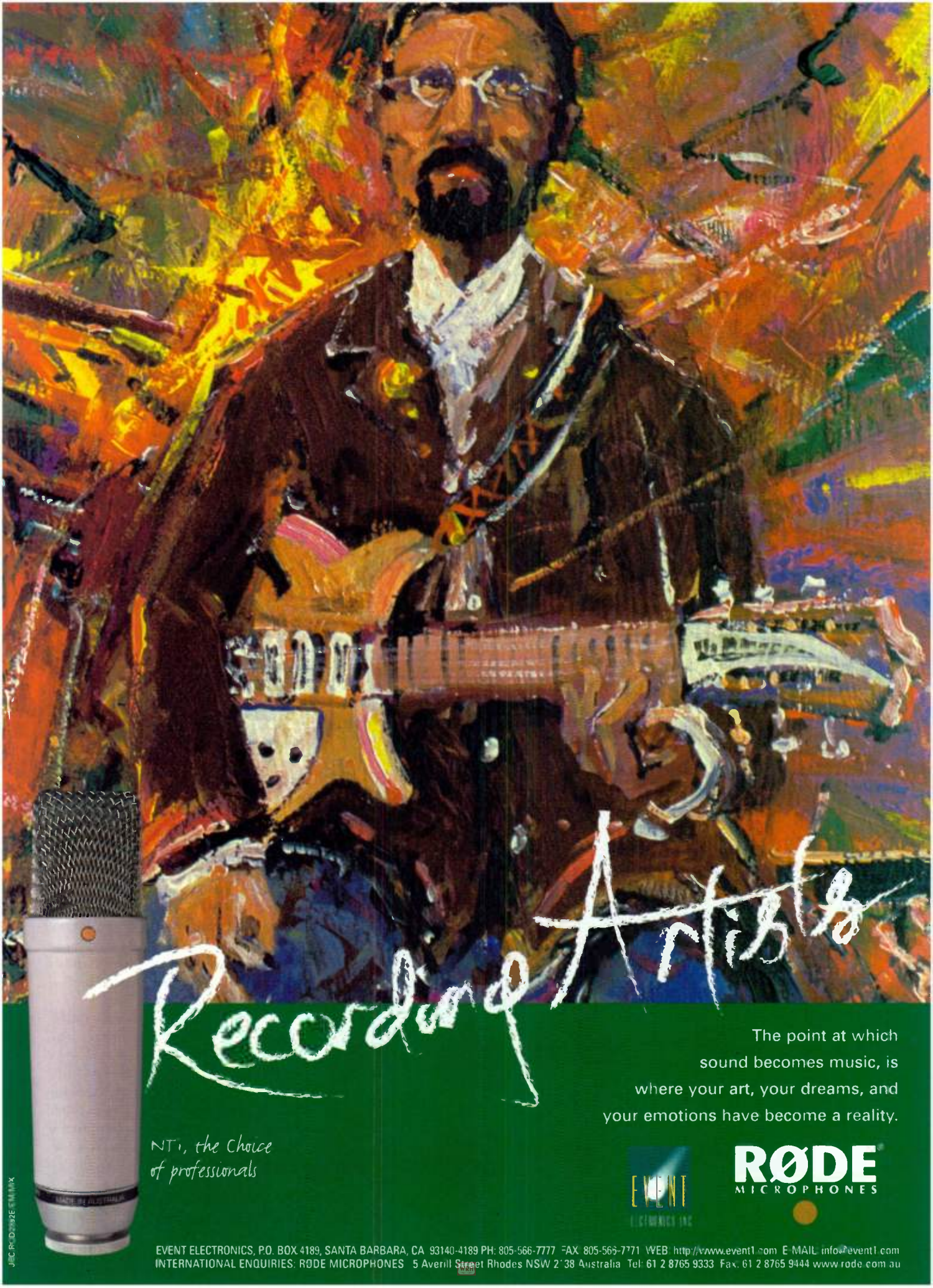
Reaktor uses a structural hierarchy at whose top level is the Ensemble. The Ensemble is the finished product—it's what you load into *Reaktor* or your VST host application. The next level of the hierarchy is the *Instrument*. Instruments cover a broad range of categories, from synthesizers to sequencers to effects. They have their own Control Panels and are typically fully operational. It's not uncommon to chain Instruments together for complex processing. For example, you might have an FM synthesizer, a sequencer, and several effects processors—all separate Instruments—all using the sequencer to play the synth, whose output is in turn processed by the effects. On the other hand, you would not usually make the oscillators, filters, and envelopes of a synth into separate Instruments; these elements are generally organized at the next level of hierarchy, which is called the *Macro*.

Macros typically serve the purpose that "modules" do in a modular synth—they are complete, functional units with their own controls, inputs, and outputs. Usually they reside inside an Instrument as the Instrument's building blocks. But Macros can be found anywhere—including inside other Macros—because they also have an organizational function. Anytime you want to eliminate a mess of "cables" and objects or create a structure you can easily duplicate, think Macro.

The lowest level of hierarchy is the *Module*. Modules are *Reaktor*'s basic building blocks. Oscillators, samplers, envelope generators, step sequencers, mixers, switches, logic and math processors, basic DSP effects—all are Modules. You can use Modules at any level of the hierarchy. You'll find them in Macros and Instruments, and even at the Ensemble level.

You can link *Reaktor* to other applications (such as your digital audio sequencer), and you can use *Reaktor* Ensembles as VST 2.0 Instruments or effects. *Reaktor* will also load and play Standard MIDI Files with sample-accurate synchronization. In addition, you can record *Reaktor*'s output to RAM, save it to disk, and never leave the digital domain.

For manufacturer information, please see Contact Sheet, p. 186.



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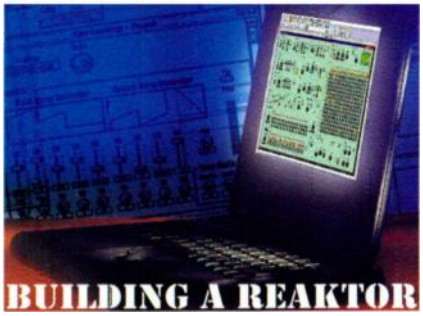


The toolbar's Compare button (the circular arrow next to the Snapshot's camera icon) is another source of help. After you've made control changes, you can click on the Compare button to get back to where you started. (Compare works individually for each Instrument in an Ensemble.)

Creating a "ground zero" Snapshot can also be useful. This amounts to setting everything to some neutral state so that you can isolate individual parts of the Instrument. For NewsCool, turn all the knobs (except filter LP cutoff and level) fully counterclockwise. Now activate one stage of the sequencer to trigger various combinations of the four synths, and fiddle with the synthesizer knobs to explore the sound structure.

Make it your own. Once you know how to use an Ensemble, you'll start to notice the things it *won't* do. This is the time to delve into the Structure, where you can often make some surprisingly simple changes.

For NewsCool, one obvious change is to replace some of the sine waves with another sound source. **Fig. 2** shows the NewsCool Structure with an inset for the Sine Decays Macro containing the four tone generators. Replacing one of the sine-wave oscillators with an FM sampler and another with noise using a resonant filter, for example, gives NewsCool a whole new life.

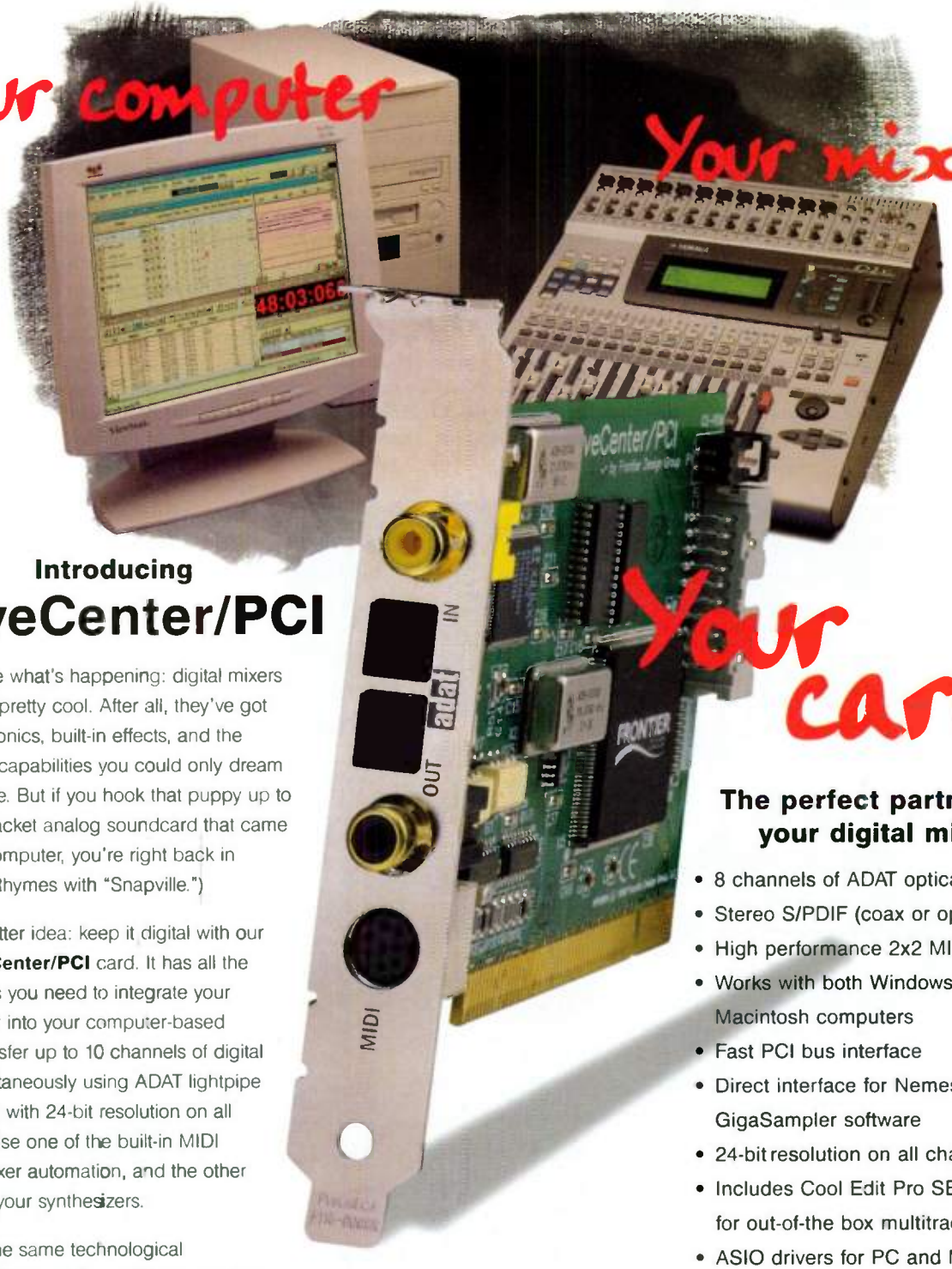
A MODULAR APPROACH

Though *Reaktor* has objects called Modules, the program is not a modular-synth emulator in the classic sense. You have to do a fair amount of construction to come up with what would count as a "module" in some other programs. The payback, however, is enormous flexibility: you can create any kind of custom module you can imagine—*you are the architect.* You can build modular objects at the Macro or Instrument level, but the Macro level is usually the best choice because you can then use the objects and display their controls at either the Instrument or the Ensemble level. (For more information on *Reaktor*'s structure, check out the sidebar "*Reaktor* Basics.")

The program comes with an extensive library of factory-preset Macros and Instruments, which you'll find in the Essentials folder. In the Users folder are other Macros and Instruments contributed by *Reaktor* users. These are good starting points for building your own Ensembles; familiarizing yourself with these collections will save you from having to reinvent the wheel each time you create a new Ensemble. But eventually you'll want to build your own custom collection. Here we'll look at creating a Macro from scratch, then combining it with other Macros for a completed Instrument—in this case, an additive synth.

Additive synthesis involves adding sine waves together to create the successive harmonics of a complex waveform. We'll use *Reaktor*'s Multi-Sine Oscillator Module as the basis for a Macro with controls for the number and level of each harmonic and a single output for the resulting waveform (that is, the sum of the individual harmonics).

Ground zero. Start by selecting New Ensemble from *Reaktor*'s File menu. Since



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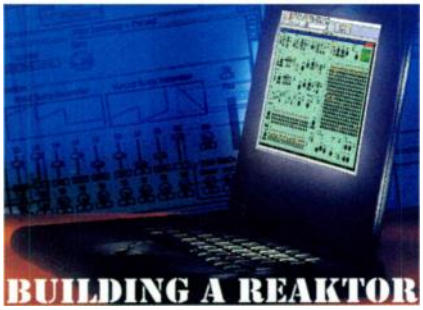

our goal is to build an additive-synth Instrument, the first thing we'll need is an empty Instrument—think of this as a box into which you put the various components you're going to hook up. Make the Ensemble Structure window active, and select Instrument from *Reaktor*'s Insert menu. When the Open dialog box appears, select the Instrument named "empty.ism" from the New folder of the Essentials Library's Instruments section. Next, open the Instrument's Structure window and insert an empty Macro by choosing Macros from the Insert menu and then selecting the "empty.mdl" Macro from the New folder of the Essentials Library's Macros section. (Because this is a process you'll repeat often, you may want to save this with the name "New" in the same folder as the *Reaktor* application. Then each time you choose New Ensemble from the File menu, the Ensemble will automatically include an empty Instrument and Macro.)

Open the empty Macro's structure by double-clicking on it—this is where we're going to create and connect the Modules that make up our basic additive oscillator. Select Multi-Sine from the Modules/Oscillator section of the Insert menu. This will place a Multi-Sine Oscillator Module inside the Macro.

Oscillator ins and outs. Along the right side of the Module you'll see five outputs—one for each of the four harmonics, and another for their combined output. Select Audio Out Port from the Modules/Terminal section of the Insert menu to create an output Module (labeled "Out"). Select Audio Mult 2 from the Modules/+,-,X,/ section of the Insert menu to create a multiplier for two audio signals. This will allow you to control the level of the output with an envelope. Finally, select Audio In Port from the Terminal section of the Insert menu to create an input for the envelope.

Drag these new Modules to the right side of the Multi-Sine Module and connect the Out output of the Multi-Sine Module to the top input of the Audio Mult 2 Module. Double-click on the Audio In Port Module and change its name to "Lvl." Next, "cable" the output of the Audio In Port Module

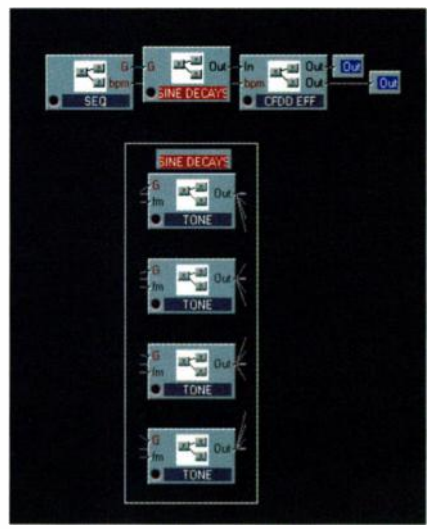

FIG. 2: The NewsCool Structure contains four identical sine-tone generators, each of which can be FM- and ring-modulated by the mix of the others. Replacing one of the sine-wave oscillators with a sampler or filtered-noise generator is a simple but effective modification.

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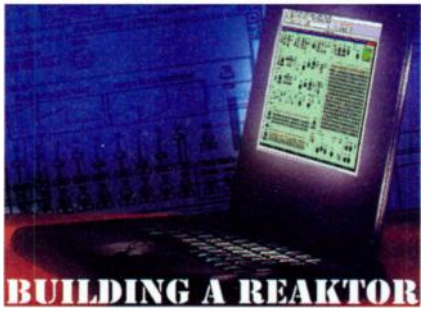


to the bottom input of Audio Mult 2 Module. Now connect the output of Audio Mult 2 to the input of Audio Out Port. This completes the output section.

Along the left side of the Multi-Sine Module you'll see nine inputs—four for the harmonic numbers of each of the harmonics, four for the amplitudes of each of the harmonics, and one at the top for overall pitch. From the Terminal section of the Insert menu, select Event In Port to create an input Module (labeled "In"). Drag this Module adjacent to the P input of the Multi-Sine Module and draw a cable connecting them. Because the input is for pitch, change its label to "P" by double-clicking on the input terminal.

If you now look at the Macro in the Instrument Structure window (up one level from where you've been working), you'll see that it has sprouted inputs labeled "Lvl" and "P" and an output labeled "Out." These correspond to the terminals you just created inside the Macro, and you'll use them to tell the Macro what pitch to play, to control its output with an envelope, and to get its output into the final mix.

Adding some controls. Among the additional things the Macro needs now are some controls for selecting the harmonic numbers and amplitudes. You could create these controls using the Insert menu, but there's an easier way. Open the context menu for each of the Multi-Sine Module's inputs by right-clicking on each in turn (control-clicking on the Mac) and selecting Create Control. (Most *Reaktor* objects have context menus that you can use for various functions such as naming, typing in comments, and controlling the object's behavior.)

You should now have eight Fader Modules with names matching the Multi-Sine Module's inputs. The matching-names feature is one advantage of creating the Fader Modules from the context menu. Another benefit is that the Fader Modules will automatically have appropriate range and step-size values. You can see these settings in each Fader Module's Properties window.

Double-click on a Fader Module to open its Properties window. Here you can enter a comment in the Info box, which will show up when you or another user mouses over the Fader Module in the Control Panel. You can also control the Fader's appearance in the Properties window. In the Panel Appearance section at the bottom of the window, choose Knob for the harmonic-number controls (it's the default), and Fader for the amplitude controls. Also, for each of the controls, check the Small Design and Visible in Instrument buttons and uncheck the Visible in Ensemble button.

To actually see the controls, you need to open the Instrument's Control Panel. (Remember that the Macro is inside an Instrument.) Go back to the Ensemble Structure window and double-click on the Instrument. You will see an outline of a box with the word "Macro" along its upper-left edge, and eight faders and knobs jumbled together. Rearrange the controls by click-dragging directly on their labels—F1, A1, and so on—until you have a configuration that you like. (Unfortunately, there's no way to format the screen automatically or see a grid against which you can place the controls.)

You now have a complete additive-oscillator Macro with inputs for pitch and envelope, an output for the mix of its four additive sine-wave components, and controls for each sine wave's harmonic number and amplitude. (At this point you should use the Macro's context menu to change its name to "Additive.")

Next we need an envelope.

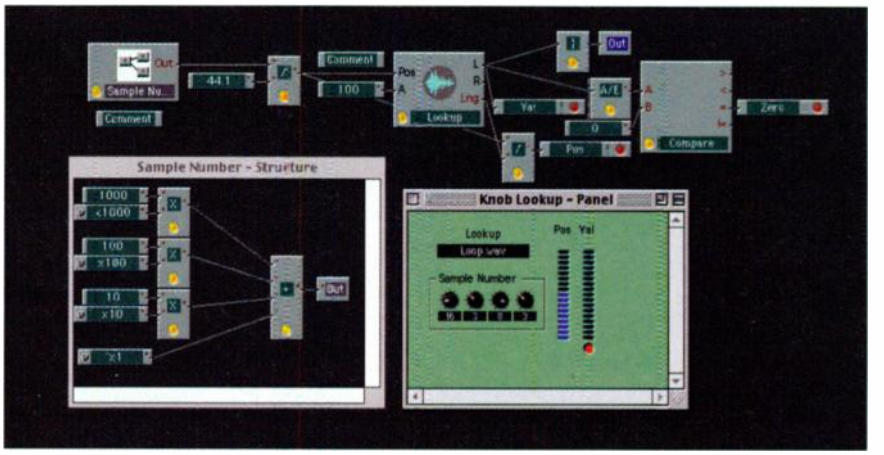


FIG. 4: The knobs in the Control Panel (lower right) of this Sample Lookup patch select the sample by number. They work as decimal digits using the Structure shown to their left. The meters show the sample position (Pos) and sample value (Val); the red lamp indicates zero-crossings.

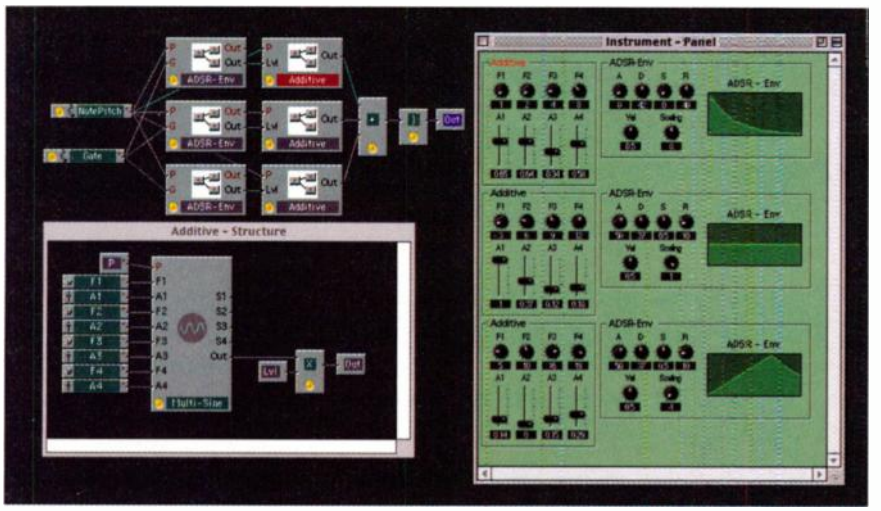


FIG. 3: This 12-harmonic additive synth is assembled from two simple Macros—a built-from-scratch Multi-Sine Oscillator Macro and an off-the-shelf ADSR-Env Macro from *Reaktor*'s included Essentials library.

For manufacturer information, please see Contact Sheet, p. 186.

Off-the-shelf envelopes. Instead of going through the step-by-step process of building an envelope Macro from scratch, save some time and use one supplied in the *Reaktor* 2.3 Essentials Library. With the Instrument Structure window active, select Macros from the Insert menu and find the folder labeled "Envelopes" in the Macros section of the Essentials Library. Select the ADSR–Envelope.mdl file to load this envelope Macro into the Instrument. (If you have an older version of *Reaktor,* you will find an envelope Macro with this name, but it functions differently from the new Macro. You should visit the Native Instruments download site for the new Essentials Library.)

The ADSR-Env Macro has inputs labeled "P" and "G" and both event (red) and audio (black) outputs labeled "Out." Cable the event output into the Lvl input of the additive Macro you just created. The P input is for applying keyboard scaling to the envelope's Attack, Decay, Sustain, and Release parameters. The G input is for gating the envelope.

To play the Instrument from a MIDI keyboard (or any other source of MIDI input), you need to get the MIDI note's pitch and gate information to the oscillator and envelope Macros. Select Note Pitch and Gate from the MIDI section of the Insert menu to create MIDI terminals for each. Connect the Note Pitch terminal to the P inputs of both the envelope and oscillator Macros and connect the Gate terminal to the G input of the envelope Macro.

Wrapping it up. An additive synth with four harmonics isn't really adequate, so let's beef it up. Select the oscillator and envelope Macros simultaneously, then copy them using the Edit menu or a key command. Next, create two copies by pasting two times. (Notice that the connection from the envelope output to the oscillator Lvl input is preserved.) Align these copies under the original so that the three envelope/oscillator Macro combinations form a column. Then connect the MIDI terminals to the two copies just as they are connected to the original—Note Pitch to all oscillator and envelope P inputs, and Gate to all envelope G inputs.

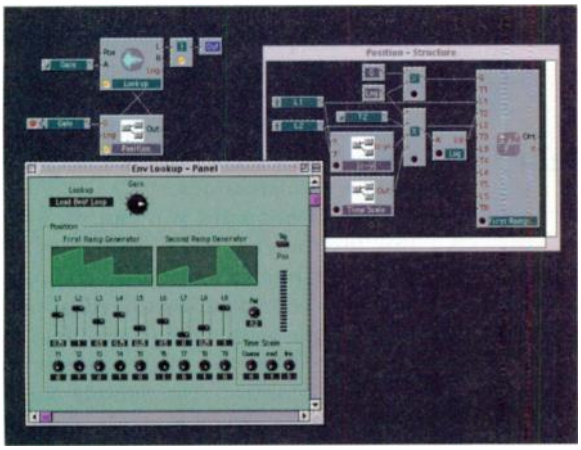


FIG. 5: The two ramp generators in this patch (lower left) select nine playback segments. Each segment can have its own direction and speed. The playback times and segment lengths are relative to the full sample length.

We now have 12 harmonics available, with a separate ADSR envelope for each group of four. We also have three separate outputs (one from each oscillator Macro) to combine. Select Audio Add 3 from the +,-,X,/ section of the Insert menu to create an adder for three audio signals. Cable the outputs of the three oscillator Macros into the three terminals on the left of the Audio Add 3 Module. They will now be combined at the single output of Audio Add 3, but we need to get this combined signal out of the Instrument.

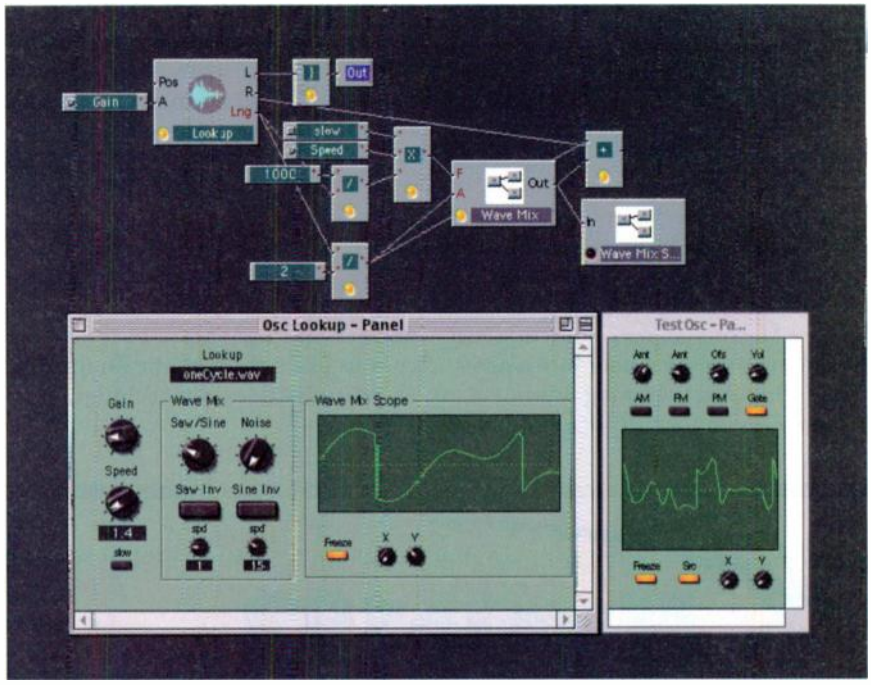


FIG. 6: Here a mix of sine and sawtooth waveforms with noise (lower left) sets the sample playback path. The sample output (lower right) can be used to modulate any synth parameter.

If you look in the Instruments Properties window—use the Instruments context menu—you'll see that it is set up for six voices. (This is the empty-Instrument default setting, but you can change it as you wish.) These voices need to be combined before they leave the Instrument, and this is done with an Audio Voice Combiner Module, found in the Auxiliary section of the Insert menu. Use the Terminal section to create an Audio Out Port, and cable the output of the Audio Voice Combiner into it. Now, cable the output of the Audio Add 3 Module into the Audio Voice Combiner Module. (Hang on, as we're nearly done.)

Well, not quite. If you look at the Instrument's Control Panel, you'll see that the three oscillator/envelope combos are overlapping a bit. You should straighten them out by selecting the Macros in oscillator/envelope pairs (click on the name of the Macro) and dragging them into alignment.

Select Show Ensemble from the View menu to look at the Ensemble Structure. You'll see that the Instrument you just built has sprouted an Out terminal. You need to connect this terminal to *Reaktor*'s Audio output to actually play the Instrument—but first set *Reaktor*'s sample rate in the toolbar to 22050 Hz to eliminate any risk of CPU overload. Now you're *really* done.

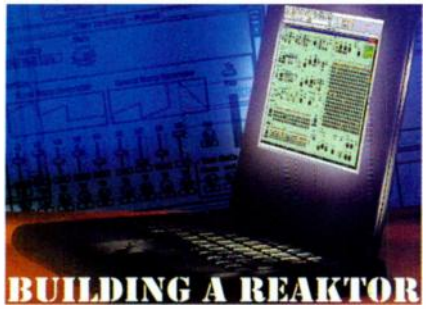


Fig. 3 shows the Control Panel and Structure for this Instrument. The inset at the lower left shows the Structure of the additive-oscillator Macro. You can use the Macro's context menu to save it as a Macro for use in other Instruments. Feel free to start jamming now!

EVOLUTION OF AN ENSEMBLE

Now that we've dissected a factory Ensemble and constructed an additive synth, let's build a complex Ensemble from scratch. This Ensemble will contain several sample-player Instruments with an unusual twist, and it will not be something you're likely to have hanging around the studio. Instead of simply playing a sample forward (or backward), the Instruments will use envelopes and oscillators to follow circuitous paths through the sample file. At subaudio rates this technique produces interesting control envelopes, and at audio rates it yields everything from unusual waveforms to mangled speech and beat loops.

The idea for this Ensemble started with a message on the *Reaktor* mailing list suggesting that samples often make interesting envelopes. (The mailing list is an excellent source of help, new ideas, and Ensembles—I highly recommend it. You can subscribe at Native Instruments' Web site.) You can download this Ensemble, as well as the other examples in this article, from the **EM** Web site (www.emusician.com).

All the Instruments in this Ensemble use *Reaktor*'s Sample Lookup Module, whose purpose is to provide the sample value at any position in time. Unlike *Reaktor*'s other sampler Modules, Sample Lookup holds only one sample, which is loaded using the Module's context menu (right-click if you have a PC; Control-click with a Mac). Its Properties dialog box is also limited—you can only select playback quality and choose whether to save the sample with the Module. If you select Poor as the playback quality, the Module will not interpolate between samples, which can result in a useful quantized effect when the sample is used as an envelope.

Position by knob. To understand how the Sample Lookup Module works, create a new Ensemble, open a new Instrument, and select the Sample Lookup Module from the Modules/Sampler menu. This allows you to set up controls for selecting any sample by number (for instance, for finding the value of the 423rd sample). **Fig. 4** shows the Control Panel and Structure of such an Instrument. The four knobs in the Sample Number section of the Control Panel let you select the sample by number, and the meters (marked "Pos" and "Val") indicate the sample position and value. The red lamp indicates zero-crossings.

There's not a lot you can do with this Instrument, but it illustrates an important point about *Reaktor* controls: although you sometimes need to perform a little arithmetic to get them to do exactly what you want, you end up with total control. The Sample Number knobs are a good example. Each of the knob values is multiplied by a power of ten to represent the digits of a five-digit number. The knobs are contained in a Macro (shown at the lower left of **Fig. 4**); this reduces clutter and provides

REAKTOR'S PREMIUM LIBRARY

Reaktor's Premium Library contains 25 painstakingly crafted Ensembles intended to give you a wide variety of synthesizers, samplers, drum machines, and sequencers, as well as an effects processor (called GeekFX). In addition to their eminent playability, they provide excellent examples on which to base your own Ensembles. Each Ensemble in the Premium Library has an associated MIDI file that you can load and play to demo the Ensemble. (If you keep the MIDI file in the same folder as the Ensemble, the file will load automatically, but you need to make sure that Play MIDI File is turned on in the Settings menu.) Here is a brief categorization of the Ensembles in the Premium Library.

Synthesizers. The Ensembles in this section range from the simple, low-CPU-cost 3-oSC to the behemoth Matrix Modular. For beautiful, ethereal sounds, try FritzFM or Uranus, and for a trip to another planet take a listen to Inhuman Logic. Other entrants in this category are ManyMoods (Minimoog emulation), Me2SalEM (Oberheim SEM emulation), and SH-2k (for techno and house music).

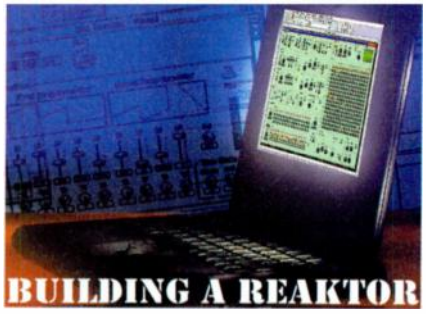
Sample players. This category includes sample players with extensive modulation capabilities, such as Cube-X and rAmpler; a waveset player (Nanowave); three variations on granular sample processing (Formantor, Plasma, and Triptonizer); and the loop-mangling RandomStepShifter.

Drum synths. Two of these Ensembles (Drumatik and Gonzzo) are playable drum kits, and the others are full-fledged drum machines. DSQ-32, SineBeats, and NewsCool (discussed in the first section of the main article) derive their drum sounds from sine-wave oscillators. DSQ-32 will be the most familiar, and as its name implies, it features a 32-step sequencer. New Primitive is a hybrid oscillator/sampler-based drum machine, and BeatBreaker rearranges beat loops.

Sequencers. There are two entrants in this category: Cyclane and 6-Pack. Cyclane is a hybrid sine wave–based drum machine and FM-synth note sequencer. 6-Pack features four separate but identical beat-loop players and two identical sequencers for playing short samples. It sounds simple, but don't overlook it.

the Control Panel box and label. To select samples by sample number rather than by time position, the output of the Macro is divided by 44.1, which converts milliseconds to sample numbers when you're using a 44.1 kHz sample rate.

As mentioned earlier, being able to control the sample's playback path with an envelope or oscillator opens up a variety of possibilities. Consider first what happens if you use a linear attack-decay envelope to control the sample



position—the attack portion will play the sample forward, and the decay portion will play it backward. The envelope amount will determine how much of the sample is played, and the attack and decay times will control the playback speed. Using an oscillator (LFO or audio rate) instead of an envelope generator, on the other hand, results in looped playback. With an oscillator, the waveform will control (and *change*) the playback direction, the amplitude will determine how much of the sample is played, and the frequency will set both the playback and loop speed. We'll create examples of both methods.

Position by envelope. Most of *Reaktor*'s envelope generators have logarithmic (start fast, end slow) decay and release segments. Although this can be interesting, the ramp generators—which *Reaktor* includes in its Envelopes category—make better candidates for sample lookup because they offer linear ramps, more segments, and individual break-point levels. **Fig. 5** shows the Structure, Control Panel, and Ramp Generator graphics for a sample-lookup Instrument using two 6-ramp generators linked to provide nine ramp segments and a release phase. (Not all of the ramp segments will provide actual control data.)

The ramp-generator Control Panel has independent level and time controls for each ramp. The level controls select positions within the sample, with values of 0 and 1 corresponding to the beginning and end of the sample, respectively. The time controls actually control the playback rate (or pitch) and are calibrated so that a setting of 1 always corresponds to the natural playback rate of the sample. Because the portion of the sample being played during any segment is the difference between the starting and ending levels, some arithmetic is required for the time knobs. This is performed by the T2 control, shown in the right-hand inset of **Fig. 5**. It sets the playback time for the segment as a fraction (between 0 and 1) of the natural playback time. The Macro labeled "|x-y|" calculates the length of the segment, and the T2 setting is scaled by this length.

Like the time controls, the Time Scale Macro affects the playback rate and has a range of 0.01 to 10,000 in steps of 0.01. It is used to simultaneously scale all the individual ramp times. The purpose of such a huge range is to accommodate both very short (for example, single-cycle) and very long (say, spoken-phrase and beat-loop) samples. A large time scale will cause a very short sample to work as an envelope; remember, this was the original goal. A nearly neutral time scale—say, between 0.25 and 5—will cause a very long sample to play back intelligibly; for example, a single ramp-up segment with a time and time scale of 1 will play back the sample normally. Very short time scales used with long samples produce audio-rate signals that are useful for amplitude- and frequency-modulation effects.

For any of this to be interesting, the output of the Sample Lookup Module has to be used for something. One

option, useful with long samples, is to simply play back the output directly. The ramp generator then sets a path forward and backward through various segments of the sample, each with its own playback speed. In **Fig. 5**, the sample is divided into quarters, which are played in reverse order. (*ReCycle*, anyone?) The other option is to use the output as a modulation source, which works well with either short or long samples.

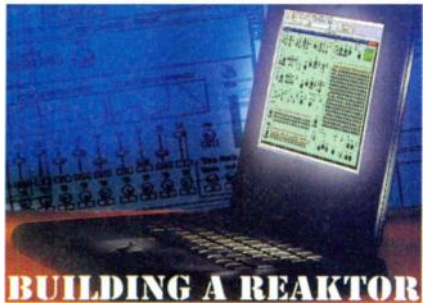
Position by oscillator. Oscillators also make excellent sample-lookup sources. For example, a simple sawtooth (ramp-up) will create a linear path running forward through the sample. (Keep in mind that although we think of an oscillator as putting out sounds or a control signal, what really comes out of a digital oscillator are numbers. When an oscillator is connected to the Sample Lookup Module's input, these numbers select the sample position.) If the numerical range of the oscillator's output runs from 0 to the sample length, then the entire sample in the Sample Lookup Module will be played. (As you'll see shortly, you can control this range with *Reaktor*'s math Modules.) If the duration of one sawtooth cycle of the oscillator is the same as the sample length, then the sample will play back at its natural speed. Although the sawtooth is the simplest example to understand, other waveforms provide more interesting results.

Fig. 6 shows an Instrument that combines sawtooth and sine waveforms with separate speed and inversion controls. As you can see on the little scope in the Control Panel, this can generate some interesting waveforms. Add a bit of noise to the mix, and you will get some very odd sample-playback paths. Try these paths with single-cycle or multicycle waveforms loaded into the Sample Lookup Module to produce new timbres. Then try mangling speech and loop samples.

Reaktor's oscillators are bipolar, and you need to adjust for this when using them for sample lookup. Their amplitude input (labeled "A" in the Wave Mix Macro at the top of **Fig. 6**) sets both the positive and negative limits of their output. To scroll through the entire sample, you need to set the oscillator amplitude to half the sample length, then add this same amount to its output. This causes the oscillator's output to range from 0 to the sample length. (The adjustment is the purpose of the /2 and + Modules in the Instrument Structure.) For the oscillator frequency, you start by dividing the sample length (in milliseconds) into 1,000 to get the natural playback frequency, then use the Speed and spd knobs to scale the frequency. This process makes all speeds proportional to the natural playback rate of the sample.

The panel on the right-hand side of **Fig. 6** shows a test oscillator with a built-in scope. It consists of a Sine FM Oscillator Module, a modulation input, and a small oscilloscope for monitoring either the incoming modulator signal or the oscillator output. The modulation input is where you connect the modulating signal, which will then be routed to either AM or FM modulation of the carrier oscillator. In the illustration, the Sample Lookup output is routed directly to the output—the scope shows the results. The figure depicts a single-cycle sample (bottom right) played back following the path shown in the Wave Mix Scope (bottom center). You can easily imagine the effect of using this path to control the test oscillator's frequency.

Putting it to work. In addition to providing an interesting source of



control-rate envelopes, envelope- and oscillator-generated sample-lookup paths produce a kaleidoscope of unique effects when used with speech, sound effects, and beat-loop samples. Of course, you may discover a completely different technique, and that is the beauty of *Reaktor:* you can build or download an Ensemble with one thing in mind and wind up with something entirely different.

The best way to put these Instruments to work is to import them into your own Ensembles. (First save them separately using the Save As command in their context menus.) For direct sample playback, they can do with a bit of filtering and effects processing. When using them as modulation sources, you may want to add an envelope for the modulation amount. Don't forget—you can use *Reaktor*'s built-in recorder to capture the result, which you can then load into the Sample Lookup Module and process again.

AKTION AND REAKTION

Reaktor provides a sometimes bewildering number of options, and often there are many paths to the same end. To avoid *Reaktor* meltdown, it helps to have a goal in mind and some idea of the steps to achieve it. On the other hand, doing something unintentionally can produce some of the most interesting and surprising results.

The fastest way to get into the action is to use and analyze the Ensembles that come with *Reaktor*, especially those in the Premium Library (see the sidebar "*Reaktor*'s Premium Library"). These Ensembles have been designed to cover a wide range of applications and are laid out and annotated for ease of use. They are also an excellent source of Macros and Instruments that you can reuse in your own Ensembles.

A good next step is to start building Macros and Instruments for synthesis methods you are already familiar with. If you're an FM enthusiast, begin by building some FM networks. If additive is your thing, use the examples in the "A Modular Approach" section as a springboard for building an additive synth. The same applies to filters, effects, sampling, sequencing, and the like—starting where you're comfortable is a big advantage.

Finally, there's nothing quite like pursuing some off-the-wall idea (as detailed in the section on sample lookup). This is where *Reaktor* really comes into its own. You're certain to wind up with something that no one else has ever seen or heard.

Reaktor is a tool of endless variety. Whether you stick with the factory examples, make your own modifications, or build Ensembles from scratch, your exploration will be rewarded with a unique kit of synthesis, sequencing, and audio-processing techniques. And when you come up with something really interesting, please let me know!

Len Sasso *writes and makes strange noises that occasionally offend the neighbors. He has published books about the Environments in Emagic's* Logic Audio, *U&I Software's* MetaSynth, *and the Clavia Nord Modular. For more information visit www.swiftkick.com or e-mail him at lsasso@swiftkick.com.*

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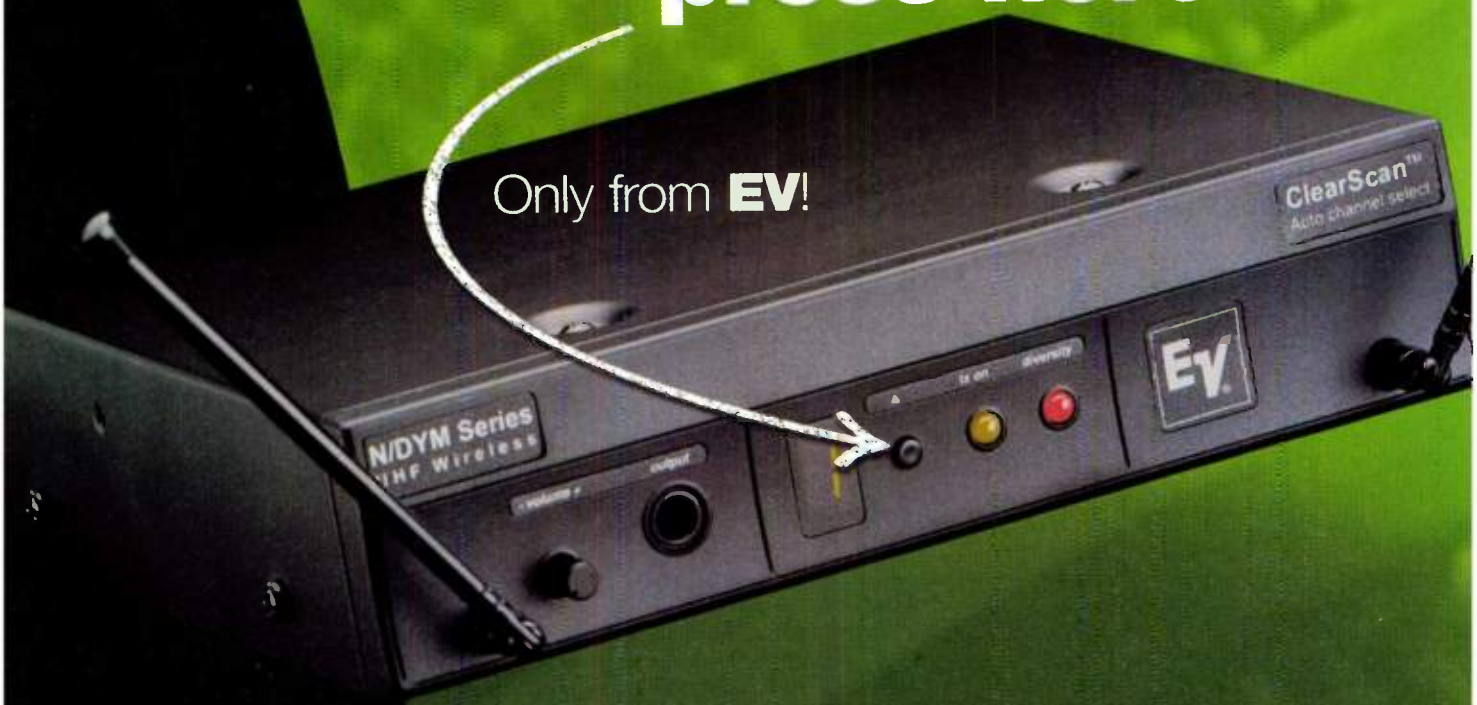

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Alternative Music Fonts

Custom fonts from the ivory tower to the speakeasy.

By Brian Smithers

Although traditional music notation uses a standardized set of markings and symbols, not all printed music looks the same. In fact, how your music looks in print makes a definite impression on those who see it, so why not avoid the generic look and add a bit more flair to your scores, parts, and lead sheets? Most notation software offers you tremendous control over the appearance of your printed music—you can choose line thickness, staff height, spacing, and much more—but the single biggest thing you can do to put a fresh face on your music is to use a different music font.

LINDA BIRCH

I'm not just talking about the typeface of the title. Some of the major notation programs allow you to use a different font for note heads, accidentals, articulations, and so on. Some even ship with alternative fonts. This month I'll take a look at what fonts are on the market and which programs support them.

Fonts are available for everything from "big note"–style music (with note names in the middle of the note heads) to choreography and handbell notation, so I'll cover only a sampling of the options. Don't assume that the features and symbols I mention are exclusive to the fonts I use as examples. Cross-referencing every marking in every font isn't terribly practical, so I simply discuss features in the order in which I noticed them.

DIFFERENT STROKES

Aside from vanity, why would anyone want to use something other than a program's default font? After all, a notation program is often promoted on the strength of its state-of-the-art "engraver-quality" typeface. Traditionally, however, the preferred look for printed music varies considerably according to how and where the music is used.

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IF YOU KNOW THE SCORE

Not everybody wants his or her music to look hand copied, though. You can replace *Finale*'s default engraver font with Klemm Music Technology's November, which the company describes as "warm and rich." The Klemm Web site displays an extreme close-up of a November character, showing Klemm's attention to minute details. The font incorporates fractal design and includes such extras as microtonal accidentals and baroque ornaments.

Klemm also offers *Medieval*, a *Finale* plug-in that enables notation of early music such as Gregorian chant. *Medieval* includes two fonts, Neuma and Neuma Symbol, along with two templates. The plug-in has a new palette with 12 graphics tools.

The designer of *Finale 2000*'s new Maestro font, Blake Hodgetts, also created a pair of accessory fonts. Fughetta provides rare and unusual markings, such as obscure accidentals, symbols for note clusters of various intervals, and alternative note-head shapes including equilateral triangles, semicircles, squares, and more. The next Fughetta update will add choreographic symbols. Toccata offers square and triangular fermatas, glissandos at various angles, and numerous other markings that are critical in academic contexts.

JazzFont has a particularly bold and aggressive look.

Another font designed for academic music notation is Sicilian Numerals, by Ronald Caltabiano. It presents figured-bass symbols in every conceivable arrangement to facilitate notation and analysis of Baroque music. Caltabiano also designed the Ghent Percussion font, a series of more than 90 pictographs depicting percussion instruments and techniques, and the Rehearsal fonts, which simplify the process of entering rehearsal numbers.

The award for most intriguing company name goes to the Really Loud Font Company. It offers an eclectic assortment of special-purpose fonts for the academic user. Odd-meter signatures, harp pedalings, microtonal accidentals—these fonts leave no stone unturned. There's even a font for inserting musical examples into regular text in a word processor.

STURM UND DRANG

Music notation is a tremendously complex craft with hundreds of symbols that need to be arranged according to sophisticated spacing rules. Designing a new music font is therefore a huge undertaking, and there aren't any real standards. To see just how far wrong a font could go, I tried using *Sibelius*'s Inkpen in *Finale*.

To be honest, the results weren't all that bad, although in an older version of *Finale* (3.0) some stems were way off. *Finale*, especially its more recent versions, makes changing default fonts easy (as does *Sibelius*). You can even change just the flags, accidentals, or other character subsets to another font (see **Fig. 2**).

After I chose Inkpen in *Finale*, the music immediately looked bolder, with fatter note heads and wider spacing. In fact, it looked a tiny bit too bold, so I changed the size from 24 points to 22. The most glaring error was that note stems didn't quite connect to note heads (see **Fig. 3**). I was able to fix this problem easily, however, with *Finale*'s Stem Connections dialog box.

Other problems were of a more cosmetic nature, but then that's the whole point, isn't it? For example, stems, barlines, beams, and other lines looked positively fragile next to the new note heads. These elements aren't determined by font selection, so to thicken them you must go into the program's settings. Ties didn't look quite right, so I changed tie thickness and vertical- and horizontal-attachment positioning.

Fortunately, in a full-featured notation program, all of these many elements are user definable. In fact, makers of alternative fonts often make available document templates that incorporate line thickness, attachment points, and other specifications that tell the program how to make the font look its best.

For handwritten-style fonts, these specifications can include thicker staff lines and barlines, thicker and sometimes longer ledger lines, and heftier slurs and crescendos. Time signatures and clefs often look more convincing

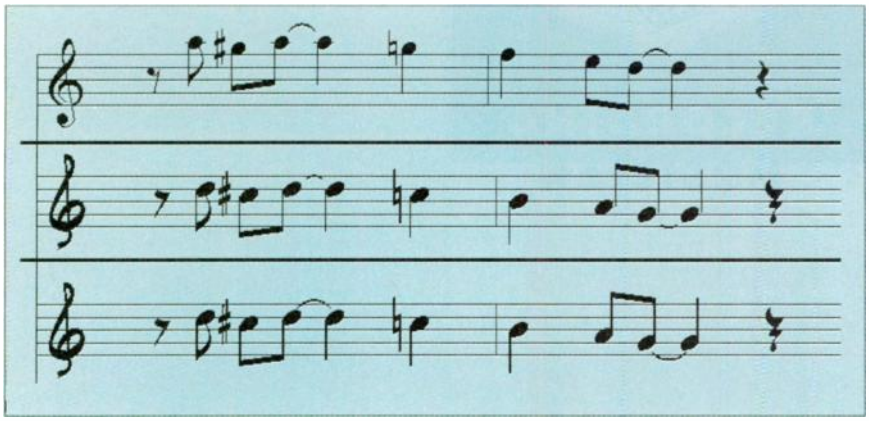

FIG. 3: The top line shows *Finale 98*'s default font, Petrucci. In the second line, Petrucci has been replaced by *Sibelius*'s Inkpen. Notice how the stems don't connect properly with the note heads. Changing the stem-connection parameters resulted in the corrected third line. I also thickened the stems and adjusted the tie settings for a more natural look. Third-party-font makers often include document templates that let you make these modifications.

when they're a couple of points larger than the rest of the symbols. More traditional fonts may need only minor spacing and alignment tweaks.

FINAL BAR

Unfortunately, support for third-party fonts is not yet universal. *Finale*, *Sibelius*, and the Windows version of Cakewalk's *Overture* allow you to select alternative fonts globally. Sincrosoft's *Opus* allows substitution on a character-by-character basis. Mark of the Unicorn's *Mosaic* and Passport's *Encore* currently don't support alternative fonts. Among entry-level notation software, only Coda's *Allegro 2000* and *PrintMusic 2000* have embraced the notion of third-party fonts, and their alternative-font support extends only to JazzFont.

Most aftermarket fonts are compatible with *Finale*, presumably due to the program's prominence in academia, publishing, film, and music recording. And because notation programs generally follow the same basic mappings, a font that is compatible with one program is likely to be compatible with others—give or take some fine-tuning.

For those of us with illegible handwriting, computer-based music notation is a godsend. Finally my music is sight-read accurately, without my having to explain what I really meant by that smudge-scratch-smear thingy in the third bar. Using an alternative font to create the illusion that I have hand-copying skills is truly the ultimate revenge. Whether you're after a personalized look or you need specialized symbols to convey your musical ideas, there's a font out there to suit your needs.

RECORDING MUSICIAN

String Fever

Capturing dulcet tones from hard-to-record strings.

By Myles Boisen

When I started recording in the late 1970s, it was not uncommon to see a violin or cello as part of a group, whether the music was progressive rock, jazz, or a folkie jam band. These days, most of the string players that come through my Guerrilla Recording studio are not members of a band, but are hired for a particular session and may play on only one or two songs.

When I get advance notice of such a session, I always stress the importance of bringing in musicians that own (or can borrow) good instruments, and that can play in tune and read music. In addition, I advise clients to have well-written charts ready and, ideally, to put in some rehearsal time with the musician in advance.

With this minimal groundwork, even a student-level string player can provide good results in a quick overdub session. But if there is no preparation, be ready to cool your heels for a few hours while the group rehearses, waffles, argues, and/or does take after awkward take before realizing that it has neither the right part nor the right player for the song.

STEPHEN RAMIREZ

FINICKY LOT

Most of the string players I know will freely admit that they and their peers have a reputation for being a bit, well, "high-strung." Therefore, any extra effort that you make to ensure their personal comfort in the studio may well figure into whether you get a good performance.

When the session day rolls around, be sure to have a sturdy music stand, a reliable tuner, good lighting, and a comfy armless chair on hand. Offer the most accurate, smooth-sounding headphones you have available, and start the monitoring level at about half of what your rock 'n' roll clients are accustomed to. Also, if you have more than one recording room available, ask the musician which room he or she would prefer to play in. (In most cases, string

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players will wisely choose the largest, woodiest, and most reverberant room you have—more on this later.) Be aware that the room needs to be kept at a stable, warm temperature for the benefit of both the instrument and the player's fingers.

SIZE MATTERS

Once all of these preliminary details have been taken care of and your performer is settled in, it's time to put on your engineering cap and review rule number one: as with most acoustic instruments, microphone technique and the contributions of room ambience are crucial components of a great string sound. Particularly with strings, the instrument must interact favorably with the room, and the mic has to capture the subtleties of that interaction without exaggerating any negative qualities such as bow noise or boomy lows.

It's no secret that strings sound best in a big, wood-paneled room, whether it's a concert hall, a parlor, or the barn out back. A small, dead, and/or boxy room will rarely make a string player happy—and an unhappy string player is surely not going to make you happy. So open up the room as much as possible and then spend a few moments in the space listening to the smoothing effect that the room reverberation contributes, especially in the high ranges of the string sound.

Bear in mind that the location of the instrument within the room is another important factor in the recorded sound. Positioning the player near a wall or reflective surface will produce more early reflections, brightness, and immediacy. This excited, short-decay ambience may also be the best way to get a good recorded sound out of a less-than-ideal room. But with this added character comes the possibility of phase cancellation and midrange coloration, resulting from sound waves that bounce off a nearby wall and arrive at the microphone with a short time delay. A softer, more neutral timbre is achieved by putting the player in the middle of the room and miking at a distance that nicely blends the direct tone of the instrument with the room's reflected sound.

FIG. 2: Violins are usually best miked from above. To minimize scratchiness, take care not to position the mic directly above the point where the bow makes contact with the strings.

FAVORED STATUS

To my ear, the best mic for recording any stringed instrument, regardless of style, is almost always a ribbon mic. My first choice from the Guerrilla vault is usually the Royer R-121 or Coles 4038 (both classic, bidirectional ribbon designs). But even the modestly priced beyerdynamic M 260, M 160 (see **Fig. 1**), or M 130, or the Oktava ML 19, can outperform prestigious tube condenser mics. The main reason for this is the ribbon mics' inherently soft and high-end response, which works perfectly to alleviate screechiness and bow noise in all members of the string family. Ribbon mics are also noted for their warm low end, and in this application they have a magical ability to "reach inside" an instrument and capture the woody tone. In addition, the bidirectional (or figure-8) pickup pattern of most ribbon mics seems to capture an ideal amount of lush room ambience.

In contrast to the ribbon mics' soft timbre, most condenser mics—even highly regarded tube models—pick up much more high-end "scratch" on bowed strings because of presence boosts and capsule resonances above 6 kHz. Of course, sometimes you need more high-end definition (or pattern control) in an ensemble situation, particularly on jazz bass. Additionally, in some situations the relatively low output of a ribbon microphone is a hindrance, particularly on viola. In these instances I would not hesitate to use a large-diaphragm condenser that is set, if possible, to an omnidirectional or subcardioid pickup pattern for a more natural, roomy tone.

With only one notable exception (a Neumann KM 140 used on a very nice viola), I have not found small-diaphragm condensers to be the best choices for close-miking strings. However, classical recordists generally favor small-diaphragm condensers for distant stereo-miking applications.

As for dynamic mics, models such as the AKG D 112 and the Sennheiser 421 and 441 can produce decent results on acoustic bass. But on the higher strings, dynamics don't offer the full frequency response or sensitivity required for adequate reproduction.

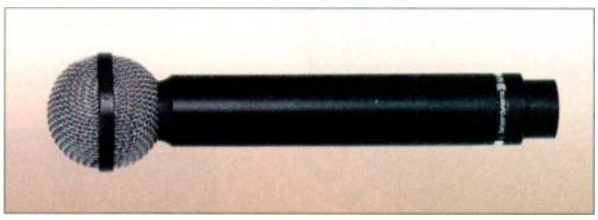

FIG. 1: Ribbon mics are always a good choice for recording strings. Shown is the beyerdynamic M 160 (a hypercardioid design), one of the more affordable models in this very small market.

RESULTS MAY VARY

Every stringed instrument sounds a little different, of course, due to a complex set of factors including its construction, age, and upkeep, as well as the current humidity and temperature. Also, the conventions of various musical styles place their own unique demands on both instrument and player. These variables make it hard to predict the best mic placement for a particular instrument. Nevertheless, here are some general guidelines, including tips that can be useful in dealing with any type of bowed string instrument.

DON'T SCRATCH HERE

Most violinists want to sound lively and bright but not scratchy. If the instrument doesn't have enough high

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Available from www.rastascan.com

The Baguette Quartette
***Rendez-Vous* (1998)**
"Jalousie" (a classic violin showcase)
"9 de Julio"
"Reine de Musette"
"Sous les Toits de Paris"
Available from www.well.com/user/baguette

Mark Growden
Downstairs Karaoke
(Wiggle Biscuit, 1998)
"Rain" (double-tracked bowed cello)
"Gates of Heaven" (pizz cello, bass)
"Squeaky P." (bass banjo, spike fiddle)
Available from www.wigglebiscuit.com

John Tchicai
Infinitesimal Flash
(Buzz Records, 1999)
"Melvin Truss"
"The Boat Is Ready"
"Og Her Ligger Vi Saa!"
(pizz or bowed bass blending acoustic and amplified sound on all of the selections)
Available from www.challenge.nl

overtones and "cutting power" at around 3 kHz, it may end up sounding like a viola. And if the instrument has too much high end on the recording, it can be nearly impossible to soften the edges without killing vital ranges of the upper harmonics. In other words, it's best to get the sound right at the mic rather than to count on being able to fix it later.

Start by miking the violin at least 1 foot above the top of the instrument (see **Fig. 2**). Remember that closer placement with a unidirectional mic yields more low-end (from the proximity effect) and high-end detail, whereas distant placement produces fewer lows, more room sound, and a better midrange blend of the violin's complex harmonics. The low string on the violin is tuned to G below middle C (196 Hz), so you don't need a mic with a big low end for this job.

If the tone of the violin seems thin, angle the mic toward the wide lower half of the instrument's body, by the performer's chin. If you need more highs and/or definition, orient the microphone above the neck of the violin and the narrow upper half of its body. In any case, it's best to avoid placing the microphone directly above the spot where the bow meets the strings, as this position is likely to emphasize bow sound, inhibit the violinist's movement, and/or result in the mic getting hit by the tip of the bow.

If your microphone sounds too scratchy from any position above the top, try miking the instrument from the side—or, as a last resort, from underneath. Though placement underneath will certainly diminish bow sound, be aware that it will also pick up a balance of frequencies that is very different from what the violinist is used to hearing.

Whatever approach you settle on, let the performer hear the first good pass, solicit his or her suggestions, and take advice about the recorded tones seriously. I've learned a lot about these instruments by relying on the players' expertise, figuring that good performers have spent many thousands of hours with their ears right next to the real thing! (By the way, these guidelines are also applicable to foreign stringed instruments, such as the Chinese erhu and the East Indian sarangi.)

OH, FIDDLE STICKS

The instruments may look the same, but the sound and attitude of the fiddle and the violin are a world apart. If you can't tell the difference between the two, ask yourself these questions: Is

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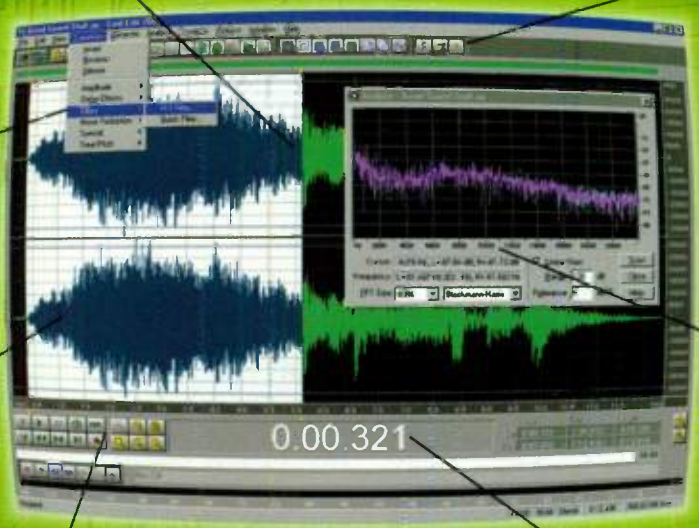

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there a banjo, mandolin, or steel-string guitar in the mix? Is the song about a woman, a truck, or the open road? Is the player drinking beer? If you answered yes to any of the above, you almost certainly have a fiddle on your hands.

The fiddle, a familiar component in numerous forms of American and international folk music, doesn't need much help to cut through the mix. Also, it is generally less dependent on room sound to complement its tone, relying instead on heavy, aggressively accented bowing to make a strong rhythmic statement. This is no background instrument, friends. Get in close for an extra measure of bow sound, and don't be afraid of a little high-end grit. Be warned, though, that fiddlers are more apt to want to stand and move around, especially when they're soloing (which is most of the time).

GETTING CLOSER

The viola is a bit larger than the violin and is similar in shape, with a low note of C3 (130 Hz), which is a fifth down in pitch from its more popular cousin. In the classical repertoire, the viola typically provides rich middle voicings in string quartets and symphonic works; it is not commonly regarded as a solo instrument. Even in the studio, it is usually heard in conjunction with the violin, either adding a lower harmony or doubling an octave down.

In principle, the viola can be miked the same way as the violin, with a few notable differences. Compared with the violin, the viola has a darker tonal character, is not traditionally played as aggressively, and does not "cut" as much. Therefore, positioning the mic closer to the instrument than you would with a violin is usually helpful (if not necessary). Closer miking will yield the multiple benefits of richer lows, a little extra bow sound to aid in mix definition, and a hotter level (which can be a substantial concern in itself). Proceed carefully, though: as you get closer to the top of the instrument, microphone placement becomes more critical because the mic will start to reject some resonant areas and lose the blend of overtones.

The need to mic a viola closely brings up another recording problem common to string players: audible breathing. In an isolated passage or solo, particularly with a relatively quiet instrument like the viola, the sharp intakes of breath (which unfortunately tend to occur during rests) can be very apparent in the final mix. Gating may help in some cases, but the only good solutions I've found are to mic from a different angle, such as from behind the performer's head, or to use a figure-8 or tight cardioid pattern with the null side of the mic oriented at the player's mouth and nostrils. Of course, adding high EQ or reverb in the mix only makes the problem worse, so you'll breathe easier if you deal with this issue in advance.

▼

Is the song about a woman, a truck, or the open road?

DEARLY BELOVED

The cello is one of the most beloved instruments. There's just something about its soothing sound and evocative, human quality that adds a blend of soul and class to any recording. And in the right hands, it can be a wonderfully expressive solo voice.

A world-class cello will have an abundance of desirable sonic qualities, including solid lows below 250 Hz; a rich, woody tone at 400 Hz; a smooth midrange; and clean, clear highs—all focused right in front of the bridge. That's the first spot I usually try, being careful to keep the microphone away from the f holes (because of the excessive low-end buildup that occurs there) and at least 6 inches from the top of the instrument. Moving the mic higher up the cello's neck increases the highs, detail, and proportion of bow sound, whereas lower placement in front of or slightly below the bridge enforces the fundamental tone and reduces scratchiness.

A mediocre cello can give the unwitting engineer all sorts of trouble, including scratchy highs, nasal-sounding midrange at around 800 Hz, uneven lows, and a basic lack of tone due to poor instrument quality and/or an improperly placed sound post. (The sound post is an internal wooden dowel that is wedged between the top and bottom surfaces of any stringed instrument. It must be adjusted properly so that the instrument can resonate evenly throughout its range.)

To get around one or more of these problems, microphone selection and experimenting with placement and distance are key. If you have exhausted those options, equalization can also be used to compensate for defects in an instrument. But a good instrument is surprisingly easy to mic once you find the sweet spot, and it will often yield good results with a large-diaphragm condenser mic as long as the lowest

BRIAN KNAVE

FIG. 3: To capture the wide range of tones produced by an upright bass, try a spaced pair of mismatched mics: one ribbon and one condenser. Here, a Coles 4038 ribbon mic records the resonant lows and mids while an AKG C 414 B/ULS condenser captures highs and adds "air." The bassist is George Cremaschi, a ubiquitous figure in the San Francisco Bay Area music scene.

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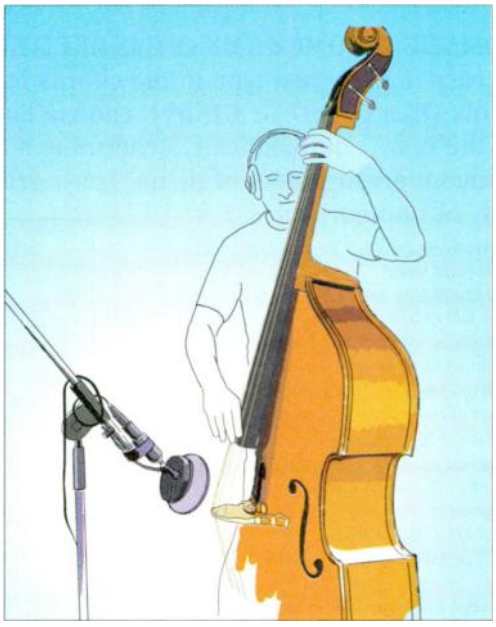

FIG. 4: A pop filter can serve as a good visual aid for an upright bassist who is having trouble staying on mic.

note (C2 at 65 Hz) is well represented and the highs are relatively smooth.

COVERING THE BASSES

Bowed bass can be approached in much the same way as cello by initially miking in front of the bridge and then carefully adjusting placement and distance to refine the balance of frequencies at the mic. Of course, for many forms of popular music, the bass is played with the fingers (pizzicato, or *pizz*, pronounced like *pits*), opening up a whole new world of challenges for the engineer.

The bottom note on this instrument is a low E at 41 Hz, and most good basses have no trouble projecting ample lows to the mic placed close in front of the strings, about 3 to 6 inches above the bridge. The problems I encounter most often with bass recording, even with professional players, are dull sound (or a lack of high-end detail) and booming notes in the low end.

Additional issues worth mentioning here include stereo miking, pickups and amplifiers, and fluctuating tone or level caused by player movement. Due to the size of the upright bass, a single mic may prove insufficient for capturing the "bigger picture" of the instrument's complex range of tones—especially if the instrumentation for the song is relatively sparse or if the bass is prominently featured. In this case, try a ribbon mic near the bridge and a condenser mic (preferably a large-diaphragm model) up above the instrument, aimed downward to pick up "air" and higher-end content from the strings (see **Fig. 3**). Remember to heed the three-to-one rule, and make sure the condenser mic is positioned so as not to pick up the musician's breathing. (For a more detailed discussion, see "Recording Musician: Recording Upright Bass" in the December 1997 issue of **EM**.)

Many jazz bass purists frown on using the sound of a pickup, whether routed through a direct box or an amplifier, in the studio. But moderate levels of direct or amp signal can help fill in the high end, stabilize mix level, and add note definition, especially on dense and up-tempo pizz numbers. If I'm taking a direct signal from the pickup, I'll usually roll off quite a bit of high end above 4 kHz, as this range is often unnatural in tone and particularly bothersome to bassists. (Subtractive high-end EQ, combined with a generous dose of reverb, can also work wonders on electric violin and cello tracks.)

After making all the adjustments needed to capture a good bass sound, you'll find that normal side-to-side or back-and-forth movements of the instrument—even as little as 2 inches—can change the balance of acoustic to amplified sound, and can even negate all of your careful miking refinements. Therefore, keep a "watchful ear" on your bassists and don't hesitate to remind them that the tone will suffer if they stray too far from the ideal mic position. A round pop filter is a good visual aid for keeping an animated player "in the zone" (see **Fig. 4**), and it will also help protect the mic from being hit with the bow.

THE FUTURE IS BRIGHT

In a future column, I will address techniques for recording multiple string ensembles (including classical quartets) and methods of combining live and sampled string tracks as well as esoteric bowed-sound sources ranging from guitars to gongs to blocks of Styrofoam. In the meantime, I hope you will have the opportunity to refine your recording chops on individual stringed instruments, using techniques detailed in this column and those you discover on your own. ●

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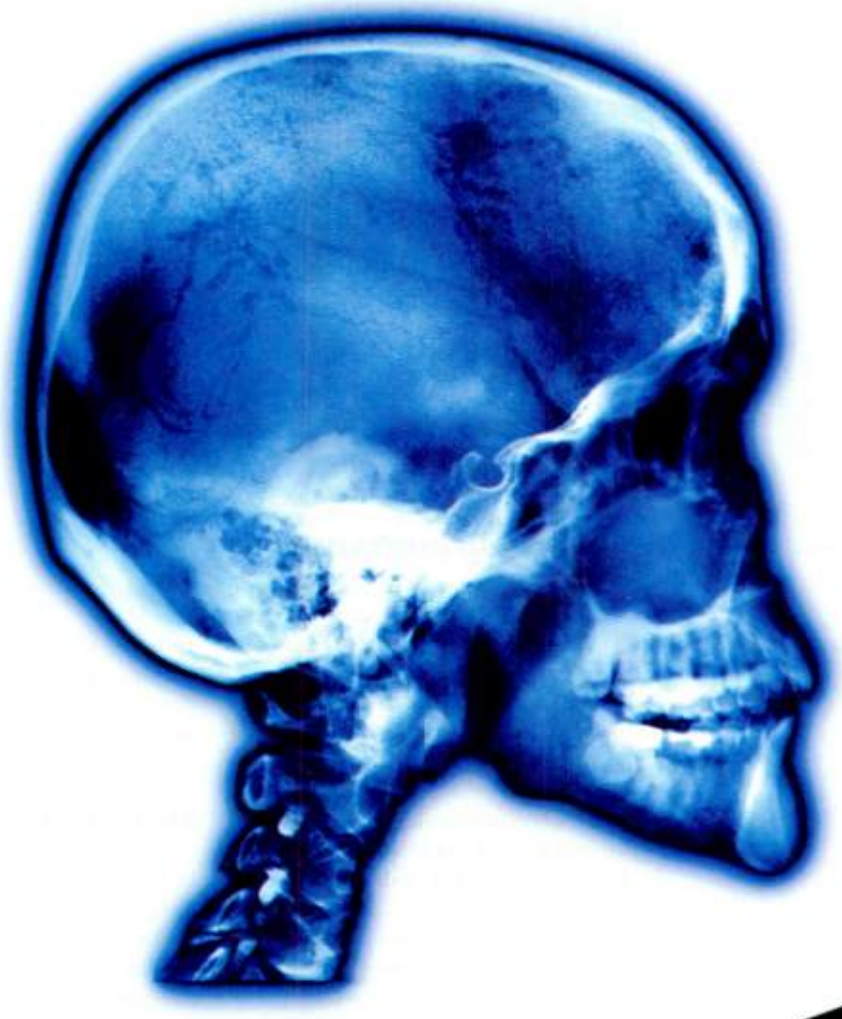

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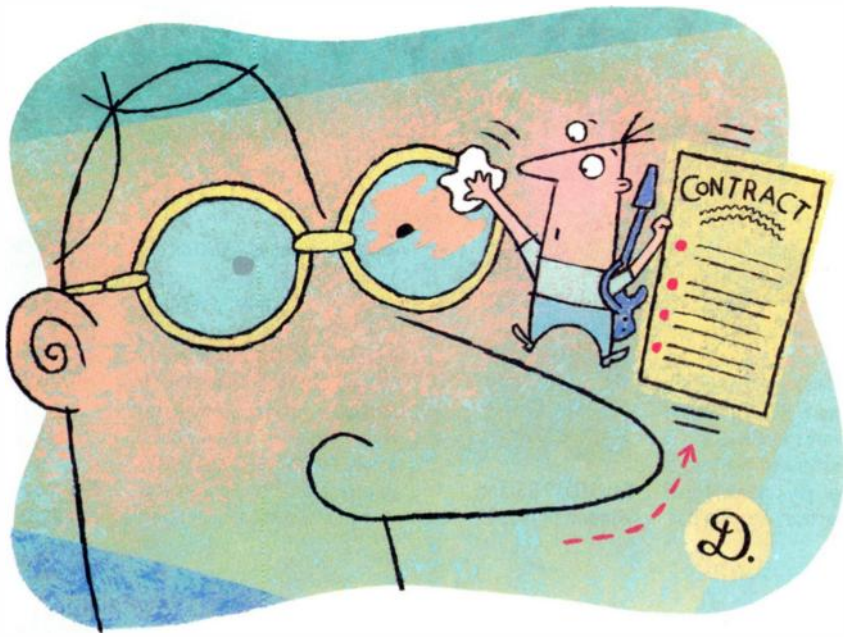
Such a Deal!

Make sure your spec deals are circumspect.

By Michael A. Aczon

News of our economic landscape's volatile nature is everywhere. Newspapers and television feature stories, charts, and graphs explaining the worldwide stock-market roller coaster that is being fueled by speculative investment. Even though investor speculation has received a lot of attention recently and may be a new concept to many of you, a similar situation has existed in the music industry for years in the form of speculative, or *spec*, artist deals.

Let's take a look at spec deals, the dangers they pose, and how to avoid some of the potential hazards when making these types of deals. Some of the players on various sides of spec deals have agreed to share their experiences with me.



JACK DESROCHER

SPEC DOES NOT MEAN FREE

The term *spec* is thrown around a lot by musicians, but often it is misunderstood. In a spec deal, a person or business—for example, a musician, recording studio, or producer—provides a service cheaply or for free while speculating that there will be a premium payoff in the future.

An example from an unrelated business might be helpful to understand the concept. In the home-building trade, sometimes a builder will construct a home on spec. In these cases, a developer buys the land and provides materials, while the builder provides the time and expertise to build the home on the property at a reduced cost. When the home is sold by the developer, the builder gets a share of the profit. Similarly, a studio, a session player, or a producer will provide services for a budding artist on the speculation that the artist will be the "next big thing" and be able to pay for the services at some future date.

POINTS OF VIEW

For many artists, it is a frustrating process to raise enough money to record demos or self-produced albums in a

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professional studio. The ever-ticking studio clock represents money that the starving artist just doesn't have. This frustration leads some musicians to feel that someone owes them a break, which couldn't be further from the truth. Spec deals aren't about getting something for nothing. Rather, they are a creative means of financing a project: the artist promises a good return on the speculators' investment of time and money.

Building a project studio is one way to avoid paying for professional studio time. But many artists don't want to invest the time and money required to build and learn how to use a project studio; they'd rather work on their chops. Also, a home studio doesn't alleviate the financial strains of paying for musicians and other professional services. "It's frustrating, really," an aspiring artist told me. "I don't want to invest all my money in equipment—and then spend the time learning how to use it all—instead of working to develop myself as a singer. When I rent a studio, though, it gets worse, because it always seems that just when I get into the flow of things, I've used up the studio time that I've paid for. It would be great to get a studio to spec me some recording time. They have clients with big-label budgets paying them big dollars to come in there. It would be nice to see someone give back to those of us trying to make it." Wishful thinking, indeed.

The Cleveland-based singer, songwriter, and saxophone player Laura Porter is a seasoned veteran who has a much more realistic take on spec deals. "I don't expect anything for free," she states frankly. "I'll be up front with a studio, an engineer, or a producer about the limits of my budget, and some have made arrangements with me, like paying in installments or quoting a flat fee instead of an hourly one.

BEN THOMPSON

Damo Music Work partners Dave Meyer (left) and Ben Thompson choose spec projects carefully. They have to be fairly certain that the project will either enhance their professional credibility or result in a sizable financial payoff.

"Early in my career, I used to promise studios and musicians back-end [future royalty] deals, but I found out that many of the studios didn't ever expect to see the back end, so they treated you differently, like you weren't ever going to make it. It helped me become more professional about my attitude and approach when arranging recording sessions and services. Besides, so many people are required to get you where you have to go in this business—if you keep giving away pieces of the pie, there'll be nothing left for you in the end. Artists have to know what the

A CAUTIONARY TALE OF A SPEC DEAL GONE AWRY

Sammy Speculator, an up-and-coming singer/songwriter working his way through the local club scene, was introduced to Patrick Producer, who had a number of major-label credits as a session musician and a handful of demo production gigs under his belt. Patrick impressed Sammy with his relationship with the owners and managers of the major studios in town, and he promised Sammy that "a deal could be worked out" with the studios if Patrick got to produce Sammy's demo.

They entered into a spec deal in which Patrick would pre-produce ten songs in his project studio; the best three would then be recorded and mixed in two days during "off hours" in one of the commercial studios. The studios provided their facilities at no cost up front, but the recording engineer who worked with them had to be paid $30 per hour. If Sammy got a deal from any major label as a result of any of the songs from the project, all of the studio time would have to be paid back at each of the studios' highest rates. Sammy also promised that Patrick would either (a) be the producer on Sammy's first record for a major label or (b) be paid several thousand dollars for producing the demo if not chosen to produce Sammy's record.

Patrick's studio had technical problems, so many sessions were either cut short or canceled altogether. When it came time to use the commercial facilities, questions arose about what "two days" meant, because the "off hours" were being pieced together a little at a time. Sammy's spec sessions stretched out over months and were never completed. Finally, in exasperation, Sammy went to an inexpensive studio recommended by another musician, where he recorded and mixed over a weekend six of the songs he had been working on with Patrick. An A&R person from a major label saw Sammy at a club, heard the "low rent" demo, and offered Sammy a $10,000 demo deal to work up some more material in exchange for the first right to sign Sammy. Along came Patrick and the major studio, claiming a piece of the demo deal advance to repay them for the spec time. Patrick also demanded that Sammy "make good" on his promise to have Patrick produce him or pay for the pre-production.

Between the original engineer costs, the out-of-pocket studio time, legal fees, and emotional aggravation, Patrick ended up paying much more for his "free" spec sessions than he would have paid if he (a) had done his homework to find a producer/studio situation that was a better fit for his budget and artistic goals or (b) had drafted a clear spec agreement with Patrick and the studio.

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*> H.D. Wells, Bromley, England, 1899**

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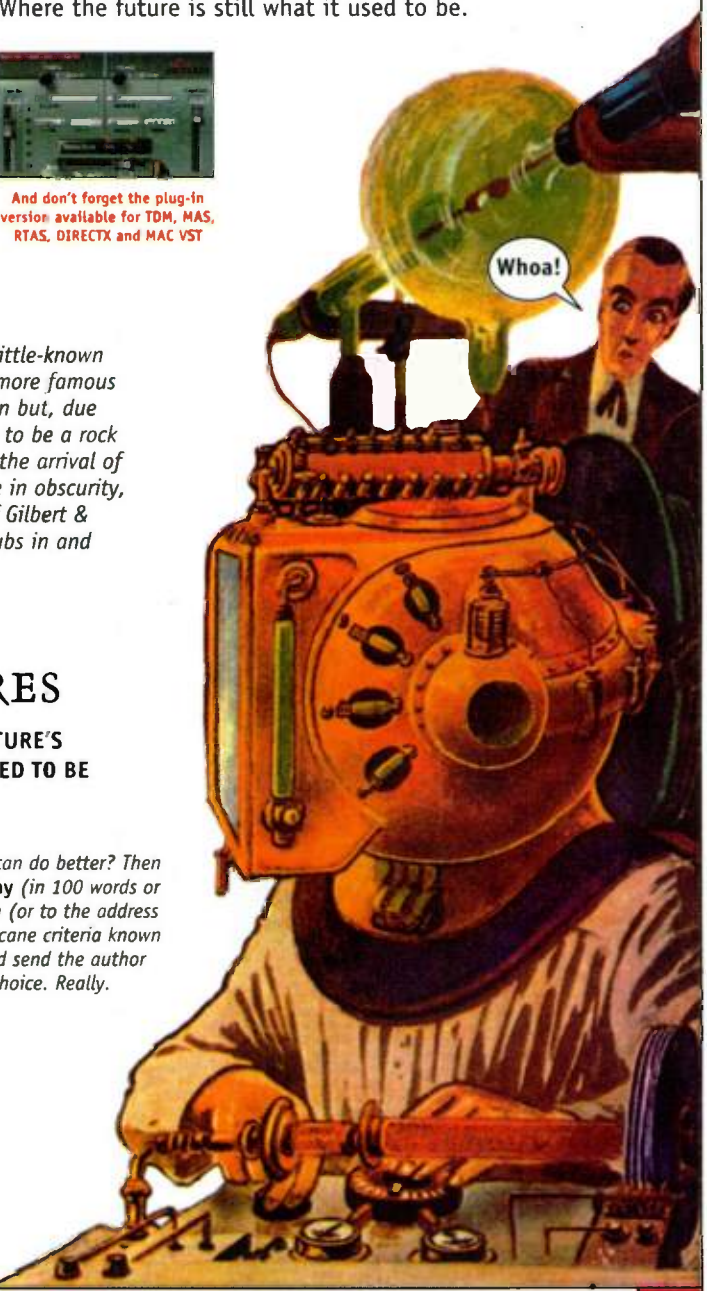

H.D. Wells, *H.G. Wells's little-known older brother, shared his more famous siblings's visionary acumen but, due largely to his futile desire to be a rock star fully 50 years before the arrival of rock, lived most of his life in obscurity, playing in a succession of Gilbert & Sullivan cover bands in pubs in and around Bromley.***

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eventual royalty pie is made up of and realize that there are not endless pieces that they can give away."

Ben Thompson and Dave Meyer, partners in Damo Music Work, a production company whose credits include work for movie soundtracks and for the pop divas En Vogue, as well as remixes for Montell Jordan, are often asked to make spec deals with clients ranging from unknown artists to major labels. I asked them for their view as producers and studio owners.

"Our involvement in a project, especially if it's on spec, will depend on what we think we'll get out of it," explains Thompson. "Sometimes, working with an already established artist or on a song that our industry contacts say will get a big promotional push is advantageous to our careers. This is a business of name association, so there are times when it's not even about the money—it's about being able to work with a great artist or song. Even an unknown artist who shows great potential can fit into our future plans. The bottom line is that anyone who specs their time has to believe in what they are doing artistically. If your plan looks strong enough for us to somehow gauge what it could be worth in the future, we might consider working on it. If the songs aren't there, there's really nothing we can do."

Thompson goes on to explain that artists need to understand that even producers and studio owners with big-time credits have bills to pay, so they can't always accept a deal based on the promise of a future payoff that might never occur. "We end up saying no to projects because there is no immediate payoff," he says. "Lots of times, this is taken the wrong way and feelings are hurt because artists interpret our not being able to wait for the back end as not believing in their artistry. We don't hire out our studio to the general public, but we know studio owners that do. Sometimes misunderstandings come up when a spec artist gets to record only during weird hours or is bumped for a paying project.

"Just because a producer has his own gear doesn't mean that an artist gets to use it for free, either. We know a guy with a studio who took months of time to do three complete albums on spec with no payment at all, and none of the artists got signed to a label. How can a place like that stay open?"

WHAT'S THE DEAL?

The more clearly you detail the terms of your spec deal, the more secure all parties will feel. Here are some major points to consider when drawing up a spec deal. (See the sidebar "A Cautionary Tale of a Spec Deal Gone Awry" for a look at what could happen if you don't clarify all terms of such a deal before you start a project.)

Agree on what services will be rendered. Are you getting studio time, engineering services, producer services, musician services, or some combination of these? Be clear with one another regarding what additional payments, if any, will be made for each service. Adds Thompson, "Even if we are providing our producer services to a record label on spec with its payment based on the acceptance of our work, we still require payment up front for the use of the studio. That's a cost we still have to pay for, even if it's our own studio." By all means, don't choose the wrong producer or engineer for a project just because you expect to get to use the studio for free. You could end up redoing your project later, losing precious time and energy.

Don't make a promise you can't keep. It's difficult to promise a producer or studio owner that you will use their services if and when you get signed to a record label, because the label will usually want to approve all elements of the recording process. Be realistic about your chances of going into a major record company with enough bargaining chips to demand that your "spec" team remain intact. Make fair provisions for paying for services if a label doesn't use your team.

Be very clear regarding the price you are willing to pay for services on the "back end." It is understandable for the party providing its services on spec to expect a premium for waiting to get paid. Why would anyone give away services or time if they are just going to make back the going rate? As Dave Meyer puts it, "My attitude is that I'm taking a gamble when I do something on spec. When I gamble, I don't just want to make my money back—I need to see much more. I'm gambling with my time, and the artist or label has to understand that my time is worth a lot to me." Educate yourself about the going rate for the services of studios, engineers, producers,

and musicians, and expect to pay a premium if you are promising a future payoff. If you are planning on giving away percentages of your deal, first understand how a record deal works (see "Working Musician: Dissecting a Deal" in the May 1995 issue of **EM**), and don't give away more than you will receive.

Specify the conditions under which you'll have to pay off on the spec arrangement. Does the project merely have to be accepted by the artist, or does it need to be signed to a major label? What if, for instance, you never sign to a major and instead release your project yourself or sign to an independent label? What if you record an entire album, and one of the tracks ends up being used in a major motion picture? Try to envision every scenario that might come up for using the recordings, and at least work out a payment plan in principle.

Put a limit on the length of the spec period. There's nothing like thinking that you've left a relationship far behind, only to have a studio or an engineer come back to you for payment of half your royalties after you've sold a couple of million records.

Put your deal in writing. If you feel that you can't do this on your own, hire an entertainment lawyer or other industry pro to help you clarify things. It's well worth the investment.

CASHING IN

Just like the stock market, every speculative deal has its ups and downs. By getting your artistic and business direction organized before asking others—including record labels—to speculate on your talent, you will dramatically increase your chances of getting them to invest in your talent. Carrying along extra baggage of unclear spec deals, on the other hand, can work against you. Labels are wary of signing an artist if it means buying out unwanted parties due to spec deals. Paying producers or studios for songs that won't end up being used on your releases is an extra cost that could be better spent on your recording budget or promotional efforts. Clarity is key when asking others to speculate on your career.

EM *contributor and weekend gardener* **Michael A. Aczon** *is speculating about whether he will have a good crop of tomatoes this summer.*

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ALESIS

MASTERLINK ML-9600

A versatile one-stop CD-mastering machine.

By Myles Boisen

If you had walked into your local music emporium two years ago and said you wanted a single unit that comprised a 24-bit hard-disk recorder with five hours of storage, basic premastering software, CD extraction, and a CD recorder with digital I/O for less than $2,000, they would have laughed you right out of the place. And if you had demanded 24-bit CD backup capabilities in the bargain, the men in the white coats would probably have arrived before you even got to the parking lot.

As happens so often in this age of the faster, cheaper, and smaller, yesterday's crazy dream is today's Alesis Masterlink ML-9600. The 2U rack-mount machine works similarly to a modular hard disk recorder in that it records audio files on a hard drive and allows you to apply DSP and organize tracks into multiple playlists for sequencing and downloading. You can even use files recorded at different sampling frequencies and bit rates in the same playlist, which can come in very handy. The internal 4.3 GB IDE holds over 5 hours and 10 minutes of 16-bit, 44.1 kHz stereo files or 95 minutes of 24-bit, 96 kHz files.

In addition to its main features, which I'll detail as we go along, the Masterlink has a secret weapon to increase its odds in battle: the ability to write 24-bit AIFF files to CD, using the ISO-9660 CD-ROM format. This means it is possible to store 24/96 audio on standard CD-Rs; transfer these files to Windows, Mac, or Unix systems; and use the same CDs for backup or audio playback. Of course, the 24-bit CDs only play back on the Masterlink, since no other CD recorder or player supports this format. The machine also plays 16-bit CDs, but you have the

The ML-9600 offers 24-bit hard disk recording at up to 96 kHz, editing software, a CD recorder, and digital I/O, all in one box, for $1,699.

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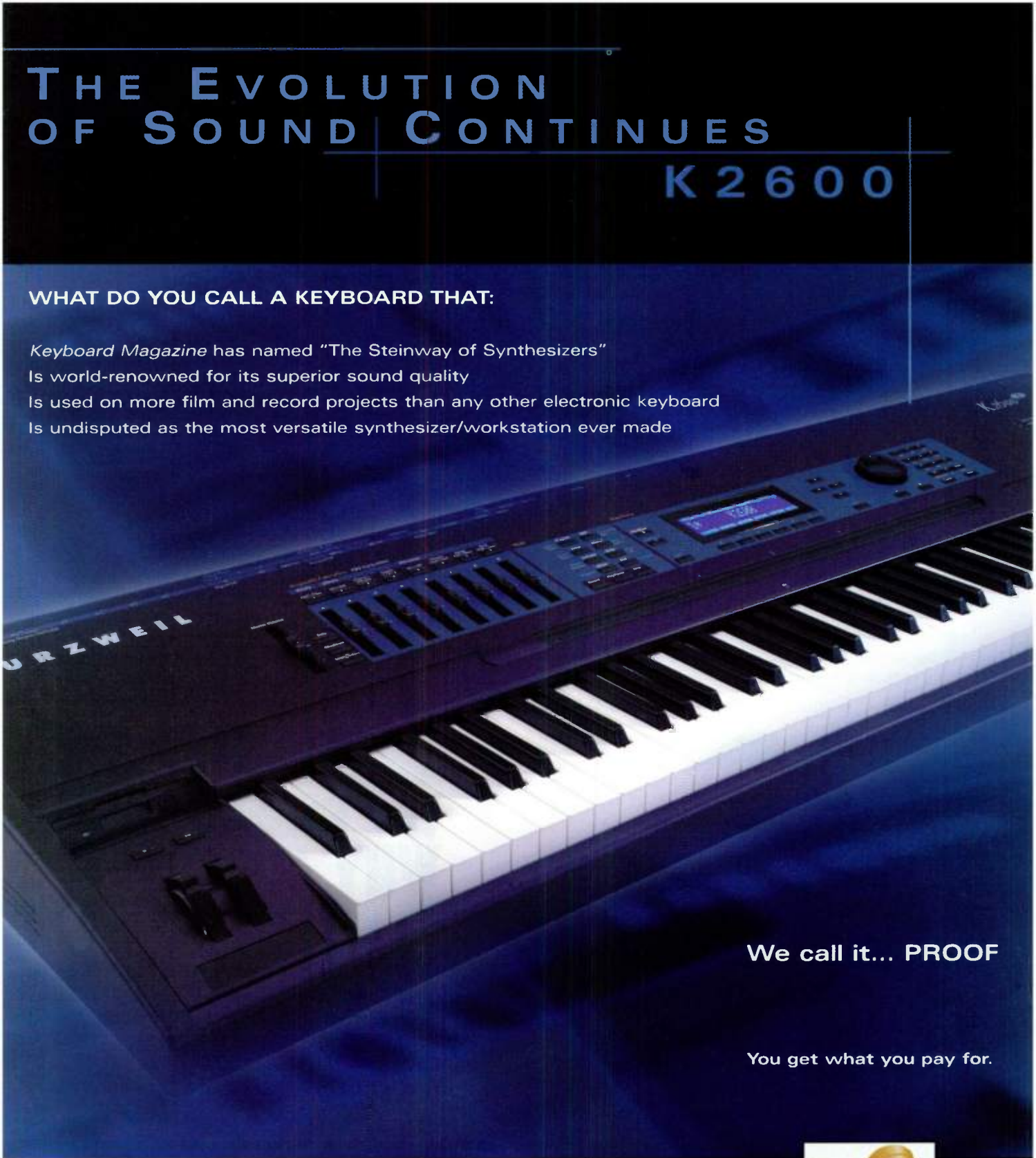

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GAZINTAS AND GAZOUTAS

All controls are located on the front panel, including standard CD functions, a power switch, various status indicator lights, rows of programming buttons, and a rectangular 1.75-inch-by-6-inch display. The internal hard drive is quieter than most hard drives I've encountered, a real plus for single-room studios. A headphone jack with a volume control is another bonus.

The rear panel (see **Fig. 1**) sports analog line-level inputs and outputs on RCA (–10 dBV) and XLR (+4 dBu) connectors. You also get stereo AES/EBU digital I/O on XLRs and stereo S/PDIF digital I/O on RCAs.

GETTING STARTED

After I perused the 42-page manual, it took only 15 minutes to unpack the carton, hook up the unit, navigate through a few windows, and press the Record button. Very impressive indeed! Alesis has packaged one blank CD-R, rack ears, and a remote control with the unit, so if you have cables, a monitoring system or headphones, and two AA batteries for the remote, you're set to go right out of the box.

FIG. 1: On the ML-9600's rear panel, you'll find a full range of analog and digital I/O.

For testing purposes, I followed the progress of a single song from mixdown to a finished master. I chose a big production number I've been working on at Guerrilla Recording for an upcoming release by Bay Area songwriter Mark Growden. The song, entitled "Devouring Time," is a dense concoction of martial drums, blaring trumpets, booming bass drum, crashing cymbals, gongs, and more. In short, it's a daunting challenge for any A/D converter or mastering system. Working directly from the analog multitrack master tape, I assembled a mix and prepared for my first test, a comparison of audio quality between the original master and the Masterlink at various bit rates and sampling frequencies.

For the initial round of comparisons, I mixed 16-bit, 48 kHz audio to DAT, using an Apogee PSX-100 for clocking and A/D conversion. I tested the Masterlink with its onboard converters set at 16-bit, 48 kHz analog in and at 24-bit, 96 kHz analog in. I also used the Apogee PSX-100 for clocking and A/D conversion set at 24-bit, 48 kHz. (The PSX-100 will not support the Masterlink's 88.2 or 96 kHz sampling rates.)

LIVE OR MASTERLINK?

After I conducted a brief blind listening test, subtle differences emerged between 16-bit sound using the Masterlink's self-clocked analog input and using

the digital input, which the PSX-100 clocked and converted. When I toggled the Masterlink input to analog in, the prominent bass drum in my mix diminished in size and impact, snare drum rolls and other transient details vanished into the background, and overall high-end clarity suffered.

It is important to point out that the Apogee PSX-100—a mastering-quality ADC/DAC with a low-jitter clock—is a converter only and retails for twice the cost of the ML-9600. The use of a dedicated outboard converter like the Apogee has become standard practice in many studios as a way to bring out the best in any digital storage format. Such a device can have a profound impact on overall sonic quality, yielding 16-bit results equal to or better than higher-resolution bit rate storage accomplished with average converters.

The lack of a shuttle wheel is a painful oversight.

Not surprisingly, I found that I got the best fidelity, compared to the analog multitrack master, using the Apogee PSX-100 as the master clock and converter, set at 24 bits, 48 kHz.

On playback, I noted an added hardness in the high end, as well as a diminution of reverb tails, which I attributed to the Masterlink's DAC section. A direct comparison of 24-bit, 48 kHz output through the Apogee's and ML-9600's converters confirmed this observation: I experienced an attenuation of low bass, scratchier highs, and a flattening of depth and dimension across the entire Masterlink mix.

To put this in perspective, the ML-9600 converters are audibly superior when compared with a midprice CD player. In further testing, the Masterlink's analog outputs also offered better resolution and depth than the converters in my studio DAT machine, although I preferred the timbre of the DAT, which had fuller lows and a smoother high end on an identical 16/48 mix.

The Masterlink's self-clocked 24/96 mix was a close second, exhibiting reasonable fidelity to the original master. The decrease in reverb and room sound was significant, as was a lessening of the bass drum's fundamental punch. This loss of detail, though subtle to most ears, is typical of the level of differences one observes when comparing standard DAT or CD recordings to a half-track, analog mix. When auditioning the 16/48 Masterlink mix, I noted additional harshness in the high end, even with the Apogee converter in the chain. Using the ML-9600 analog in (and internal clock) further collapsed the soundstage, diminished lows, and yielded the transient muffling noted earlier.

IN THE MACHINE

Once I had my mixes on the Masterlink's hard drive, I set out to explore the unit's processing options. Cropping (trimming sounds or silence from the beginning and the end of a track) is the only destructive editing feature onboard. This operation, like the related fade-in/fade-out function, is straightforward, taking less than a minute to audition, adjust, and double

check. The remote control offers a single button that makes cropping a snap, and I was pleased to find I could even adjust cropping while I was in an active DSP window.

There are no options for sample-accurate waveform editing, crossfades, random access, or markers within a track. Because the Masterlink lacks a shuttle wheel, you must do all scrolling within a track with the CD Scan (double-arrow) button, which took about 15 seconds to zip to the end of my 3-minute mix. A handy Track End feature instantly accesses the end of a long track and allows scrolling backward from that point.

In routing order, the DSP processing blocks in the Masterlink are track gain, compression, parametric EQ, limiting, fades, and normalizing. The manual explains all of these steps adequately but gives no warning for novice users about the potential hazards of applying multiple gain boosts through this chain. Inexperienced recordists may have to find out the hard way that you can't raise a track's gain, then add a ton of low-end shelving EQ, and finally pile on the limiting, without getting some overload distortion.

The well-equipped single-band compressor section allows peak or RMS detection; left, right, or summed channel keying; and multiple metering options. You get four soft-knee settings in addition to conventional threshold, ratio, hard-knee, attack, release, and makeup-gain settings. In practice, I found it difficult to get the compressor to function transparently without clamping down too much on the dynamics, even at minimal settings. But under average conditions, I heard no pumping or generation of unpleasant artifacts.

The controls for the three fully parametric EQ bands are effective, and it's easy to hear what you're doing. The sound of the EQ, though not particularly sweet in the high end, is acceptable. You can configure the high and low bands as shelving filters, and I was impressed to find that I could actually dial in heavy-handed amounts of low and high shelving on a 16-bit file without audible peak distortion.

The most tantalizing DSP function for mastering is the look-ahead peak limiter, a 3-stage level maximizer that combines limiting and automatic normalizing with an adjustable final output level. If you work in the compression-crazed environment of today's pop, alternative, and hip-hop music, you'll find plenty of uses (and abuses) for this program. The limiter works as expected, though during a unity-gain test at moderate levels (–4 dB threshold and output gain), I observed that it added some harshness to the high end of the trumpets and cymbals in the 24/96 mix.

A fourth normalizing DSP block automatically adjusts the overall track gain so that the highest peak reaches 0 dBFS. Since the unit provides a limiter, this block seems largely redundant. Because the upward scroll button and the Yes button are one and the same, it's easy to scroll through this feature too quickly and engage the Yes/No normalizing command by accident. But it took just a few moments to normalize my 3-minute song, and you can bypass the effect. In fact, an on/off bypass option is always available for the compression, EQ, limiting, and normalizing sections while the user is in the active DSP screen.

Masterlink ML-9600 Specifications

Analog I/O	(1 pr.) unbalanced RCA line level; (1 pr.) XLR
Digital I/O	(1 stereo pr.) RCA S/PDIF; (1 stereo pr.) XLR AES/EBU
A/D and D/A Converters	24-bit, 128× oversampling
Sampling Rate	44.1, 48, 88.2, 96 kHz
Record Resolution	16-, 20-, 24-bit
Hard Disk Capacity	4.3 GB IDE
Hard Disk Maximum	95 minutes at 24-bit, 96 kHz; 310 minutes at 16-bit, 44.1 kHz
Recording Time	
CD-R Drive	8× read, 4× write ATAPI
CD Read/Write Formats	Red Book, CD24
Frequency Response	20 Hz–20 kHz (44.1 or 48 kHz), 20 Hz–40 kHz (88.2 or 96 kHz)
Signal-to-Noise Ratio	113 dBA
THD+N	<0.002% at 1 kHz, –1 dBFS
Power Supply	Internal 90–240 VAC (40W maximum, 50/60 Hz)
Dimensions	2U rack-mount × 11" (D)
Weight	13.55 lbs.

BURNING AMBITION

At last, it was time to burn a CD. Following the step-by-step instructions in the manual, I hit a snag when I created a new playlist to resequence my CD program and then couldn't figure out how to move my preexisting audio files into it. The manual directed me to the wrong page number, and bumbling through various windows and button options proved fruitless. After careful reexamination of the 11-page playlist section, I finally found the answer I was after. The procedure, which involves lots of button pushing combined with scrolling through all the audio tracks, is strikingly counterintuitive and hard to remember, especially compared to the ease of operation I had experienced with the Masterlink thus far.

In addition, I discovered that the new playlist didn't reflect the nondestructive DSP changes I had made to my original tracks. There are positive and negative aspects to this design. Of course, re-creating or writing down and reapplying previous settings entails extra work. (According to Alesis, the upcoming version 2 firmware facilitates copying and pasting.) On the other hand, this makes it easy to devise and audition a variety of mastering processes on multiple clones of a mix while leaving the original audio file untouched.

However, unlike computer-based editing, Masterlink editing does not allow you to rename tracks so you can identify different versions of the same audio file when burning a 16-bit CD. So keep an old-fashioned notebook handy if you plan on getting clever with this sort of compound processing.

The Masterlink's 4× CD recorder took 20 minutes to burn a 17.5-minute program to a 16-bit, 44.1 kHz Red Book CD (including applying DSP, bit-rate reduction, and sample-rate conversion from 16/48 and 24/96 files). Tracks butted together seamlessly as intended, and sample-rate conversion quality was good.

The 24-bit CD had two 3-minute mixes on it and took 11 minutes to complete with no DSP. According to

For manufacturer information, please see Contact Sheet, p. 186.

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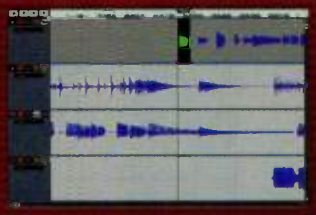

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FEATURES ■■■■■
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AUDIO QUALITY ■■■■
VALUE ■■■■■
1 2 3 4 5

PROS: Backs up to 24-bit CD. Nondestructive, easy-to-use DSP. Quiet operation. Remote control included. Large internal hard drive. A/D and D/A converters are superior-to-average stock DAT and CD converters. Ability to devise and audition a variety of mastering processes on multiple clones of a mix.

CONS: A/D and D/A converters exhibit some high-end harshness and loss of detail compared to source material and dedicated converters. Small interface window and 4-button control are limiting. No shuttle wheel. No digital/analog input selector switch.

the manual, a standard 650 MB CD-R holds a maximum of 19 minutes of 24/96 data and takes 36 minutes to burn. This means a backup of a full-length project will require at least three CD-Rs and 2 hours to complete. That's life in the high-resolution lane!

Alesis's CD24 format also displays track titles during playback on the Masterlink, a nifty feature. The new version 2 firmware allegedly will allow saving playlists to disc in the CD24 format and will add new options for looping, splitting tracks into two parts, copying audio files and DSP settings, and adding start and end access time offsets.

ROOM FOR IMPROVEMENT

After learning how to navigate the playlist assignments and name tracks, I found basic recording on the Masterlink generally quick and easy, as was maneuvering through screens and parameters. But the main 4-button array, where you do most of the scrolling and entering, seemed unnecessarily small and unergonomic. And it didn't take long for this grizzled computer-editing veteran to get frustrated with the necessity of alphanumeric scrolling, the absence of a shuttle wheel, and the limitations of a diminutive window interface. Mounting the device at eye level or in a sloping rack will greatly help you avoid fatigue.

Alesis obviously had to indulge in some cost-cutting measures to hit this low price point. The implementation of dual digital and analog inputs without any selector switching isn't just cheap, it's careless, and it is sure to cause customers some grief. The lack of a shuttle wheel is a painful oversight, as is the inability to adjust analog input gain in Record-Ready mode.

Considering that many novices will use the ML-9600, Alesis should put more emphasis on tutoring its customers about DSP decisions that will permanently affect their masters. The manual's inadequate coverage of vital topics such as gain staging, dithering, and digital-versus-analog input clocking does users a disservice, perpetuating the myth that you can manipulate and bounce around digital audio indefinitely without degradation.

In addition, the Alesis converters, though superior to those in DAT and CD players I tested, still couldn't quite capture all the intricacies of a complex analog master. Pairing the unit with an Apogee PSX-100 helped, but I had higher sonic expectations of a 24/96 stand-alone recorder. I'm not getting rid of my "infinite-bit" analog mixdown deck just yet!

FINAL THOUGHTS

The Masterlink delivers professional-sounding results, and I would expect it to appeal to a wide cross section of the audio world. Studios that already have computer-editing and CD-burning capabilities would be well advised to get hip to the Masterlink's potential for high bit-rate storage, 24-bit in-house reference copies, and premastering, especially when combined with an outboard A/D converter. And there's no question that the ML-9600 is a godsend for semipro studio owners and enterprising musicians who just want to produce competitive-sounding demos on a budget, without investing in racks of expensive gear.

This little unit packs a huge punch by offering beginning recordists enough hard drive space for several CDs, plenty of processing power, a logical interface, and elementary premastering tools, all in a very affordable package. ●

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PEAVEY

ROLAND ED

U-8 USB DIGITAL STUDIO (WIN)

Recording, sequencing, effects, and mixing via USB.

By Brian Smithers

Roland ED's U-8 USB Digital Studio taps the potential of the universal serial bus in more ways than any other device. It combines an audio interface, a MIDI interface, and a hardware control surface for digital audio–sequencing software, passing the data from all three to and from your computer through the USB port. The U-8 weighs less than 5 pounds and is about the size of a thick laptop, so it's a good companion for a USB-equipped notebook for traveling or remote recording.

With flexible analog-input options and digital I/O, the U-8 is certainly convenient, and Roland ED's inclusion of either Cakewalk's *Home Studio* 9 or Steinberg's *Cubasis VST* (your choice) makes the U-8 an interesting all-in-one starter package. Its novice-oriented features aren't perfect, but at least they don't get in the way of more seasoned users.

INS AND OUTS

In terms of audio, the U-8 is fundamentally a full-duplex stereo 16-bit, 44.1 kHz audio interface. It features 20-bit converters, but stores files in Windows at 16-bit resolution. Although Roland ED's documentation lists a Pentium II/300 MHz as a minimum system requirement for the U-8, I installed it on a Pentium II/266 MHz notebook without a hitch. I also successfully installed it on a Pentium III/450 MHz desktop computer.

On its left side panel, the U-8 has two unbalanced inputs, each of which is split into two options (see **Fig. 1**). Input A can be an XLR mic-level input or a ¼-inch TRS line-level input. The unbalanced inputs, however, pose a problem for microphones that require a balanced connection. Input B can be a ¼-inch TRS line-level input or a high-impedance ¼-inch guitar input. Input A's ¼-inch connector supersedes the XLR connector if you connect two devices. Similarly, input B's line-level ¼-inch supersedes the guitar input. The left side panel also provides a ¼-inch stereo headphone output, a pair of RCA aux inputs, and a pair of RCA main outputs.

A MIDI In and a MIDI Out port are located on the U-8's back panel, along with the optical S/PDIF connections. You can transfer 16-bit digital audio with or without SCMS. The power button and the USB, footswitch, and power-supply connections round out the back panel.

U-8
Minimum System Requirements
Pentium II/300 (400 recommended); 64 MB RAM; Windows 98/98SE; compatible USB host controller

The control surface presents one master fader and eight channel faders. Above each channel fader is a clear button that glows different colors to indicate track status. On the console's right side, you'll find a data wheel and transport, data-entry, and cursor buttons. The trim, Effects/Mixer, and EZ Recording control sections appear along the top. A headphone-volume control knob is to the left of the fader bank. One nice touch is that every connection on the side and back panels has a top-panel label, letting you see at a glance what's connected.

THE SOFT SIDE

The U-8 comes bundled with your choice of *Home Studio* 9 or *Cubasis VST*. Both bundles include Roland ED's *Virtual Sound Canvas* 3.0 software synth, and the *Cubasis* bundle also includes *WaveLab Lite*. I checked out each bundle, and while both are reasonably well integrated with the hardware, they interact with it in slightly different ways.

Cakewalk's support for the U-8 is implemented through its StudioWare technology. *Home Studio* provides a StudioWare panel that looks and functions exactly like the U-8. Move a fader on the hardware, and the software fader moves with it. If the StudioWare panel isn't open, the hardware doesn't communicate with *Home Studio*. *Cubasis* sometimes recognizes the hardware with the VST Mixer window closed, but for consistent response, I had to keep the window open.

The U-8 Mixer (see **Fig. 2**) is a mixer applet that controls everything from audio routing to effects parameters. You call it up by pressing the Mixer button on the U-8's control surface or by selecting it from the Tools menu in *Home Studio* or *Cubasis*. The Mixer wants to stay on top, and if you minimize it, the only way to maximize it again is with the little minimized title bar at the bottom of your screen.

In the Mixer's Record section you select from four different recording sources: instrument inputs (A and B);

Roland ED's U-8 USB Digital Studio combines digital audio I/O, a MIDI interface, onboard effects, and an 8-channel mixer in a single compact unit for PCs.

For manufacturer information, please see Contact Sheet, p. 186.

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aux input; master output, for creating a final mix; and effects return, for applying effects to existing tracks. If you select instrument inputs, you need to select them in the Input Inst channel strip. By clicking on the gold A+B button at the top of the strip, you can choose input A's Mic input, input B's Guitar input, both inputs as a stereo pair, or both inputs blended together as a mono input. Similarly, when you want to record from the aux inputs, you need to use the Input Aux strip's Aux+4 button to select from +4 dBu, –10 dBV, or digital inputs.

You can access the built-in hardware effects by clicking on the Mixer's Effect Window button, by pressing the control surface's Effects button, or by calling up the Effects Edit window through a menu in *Home Studio* or *Cubasis*. This window expands to a larger view (see **Fig. 3**) that provides controls for all effects parameter settings. Factory and user presets are available through the Patch Manager button.

EFFECTS

The U-8 features a decent selection of useful and good-sounding hardware effects, arranged in five multi-effect algorithms. These range from guitar-oriented settings to a "mastering" arrangement designed for finished mixes, and each "multi" setup offers a variety of interesting effects.

The usual time-based effects are well represented by phaser, chorus, delay, and reverb. The reverb offers hall, room, and plate settings, each with a reverb time of 0.1 to 38 sec. Additional reverb parameters include predelay and high-frequency damping, but the window offers no indication of the units of measure for these parameters. Predelay values range from 0 to 127, and high-frequency damping values from 0 to 15, but until you dig deep into the online documentation, you can only guess that the units are milliseconds and decibels, respectively.

FIG. 1: The U-8's left side panel offers two unbalanced audio inputs. Input A functions in mic- or line-level mode; input B in line-level or high-impedance guitar mode.

The Reverb section also has high- and low-tone, wet/dry mix, and level controls.

Other effects are similarly flexible, and with the 136 presets, finding the sound you're after doesn't take long. The Guitar algorithm includes sustain, distortion, auto wah, and speaker simulation, while the Vocal multi provides compression, simple de-essing, and equalization. The Lo-Fi Saturator in the Vocal multi can get a bit of street grit into your sound. One multi is devoted to Roland Sound Space, an effect designed to create the illusion of three-dimensional positioning. It's an intriguing effect that offers some potentially useful sounds, but I wasn't completely sold on the three-dimensional illusion.

Finally, the "mastering" multi combines an enhancer, an equalizer with high- and low-cut options and two fully parametric bands, a limiter, and a 2-band compressor. The compressor allows you to choose the crossover point separately for each channel and also lets you compress each band according to the level of its left channel, right channel, or a mix of the two. The compressor also provides control over threshold, ratio, attack, release, and makeup gain.

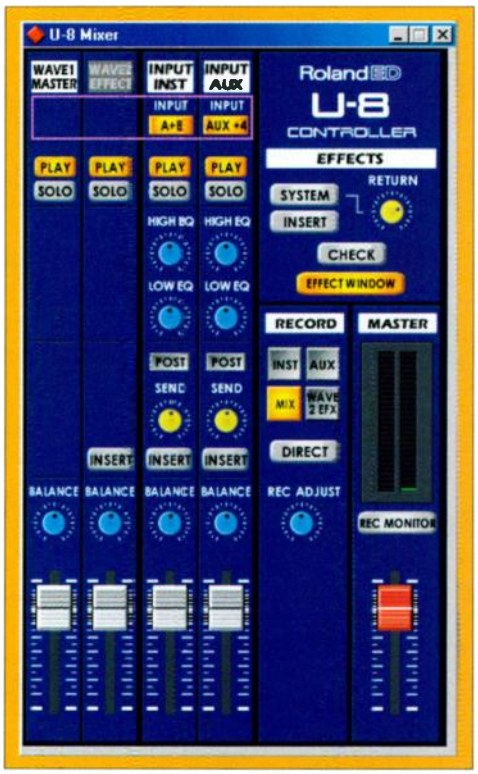

FIG. 2: The U-8 Mixer is a simple but powerful mixer applet that controls audio routing for the U-8. The Record buttons select the recording source; the Input buttons select input types. You can apply effects during recording or simply monitor them while you're recording dry.

You can record dry while monitoring with effects if, for example, you'd like to hear a bit of friendly reverb during tracking but you want to reserve the option to change the effect at mixdown. It's not immediately apparent, however, that the Direct button enables this type of recording. My only other quibble about the U-8's effects is the lack of bypass, compare, or "restore default settings" functions, which make tweaking easier.

TAKE IT EZ

The U-8 employs four wizards in its EZ Recording feature, initiated by dedicated buttons at the top of the control surface. The wizards behave a little differently depending on whether you're using *Home Studio* or *Cubasis*. Under *Home Studio*, the EZ Start wizard guides you through the process of opening a U-8 template. Because installation sets the U-8 template as the default template and the wizard won't run without the template's StudioWare panel, the wizard merely brings you back to where you started.

The next two buttons, Guitar/Inst and Mic, run slightly different versions of a more helpful wizard. An EZ Recording wizard takes you step-by-step through selecting inputs, arming a track, setting input sensitivity (trim), applying effects, and setting record levels. When the wizard exits, all you have to do to record is press the flashing Record button. One particularly nice touch is that the wizard's level meters are actually *Home Studio* console view meters, so not only do they respond the same, but you can also adjust them within a range of 24 to 90 dB.

The last wizard is EZ Mixdown, which leads you through the process of mixing down to an audio track or outboard recorder. Experienced *Home Studio* users would ordinarily reach for the Mixdown Audio/Bounce to Track(s) option, but selecting that would bypass the U-8's Effect Selection window.

Cubasis consolidates the wizards so that all four buttons bring up the same opening screen, from which the wizards branch out. This has the pleasant

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FIG. 3: In the Effects Edit window's Advanced Edit section, you control hardware effects in one of five multi-effect configurations. Clicking on the Patch Manager button takes you to the factory and user presets.

effect of bypassing the EZ Start wizard. From there the wizards follow the same process as they do under *Home Studio,* with one major exception: prior to initiating a wizard, you must select a track for recording and designate it as stereo if so desired. In *Cakewalk,* the wizard would arm a track for recording and set it to stereo input for you. Also, the *Cubasis* wizards don't provide input metering for setting record levels.

I suppose EZ Recording will come in handy for a novice trying to lay down some live guitar and vocal tracks, but the feature could use some refinement. EZ Start under *Home Studio* is likely to confuse more than it helps, and when *Cubasis* users get the same response from all four buttons, they'll think something's wrong. There's no wizard for recording from the aux inputs, and having to select a track before starting the wizard under *Cubasis* falls just short of being truly EZ. Another strange phenomenon is that when the U-8 Mixer is open, the *Home Studio* wizards don't respond to the U-8's EZ Recording buttons.

CONTROLLING THE ACTION

It's important to understand what the U-8's control surface does and doesn't do. It does do a good job of navigating dialog boxes, although it's sometimes hard to tell which cursor will get you where you want to go. Pressing the Window key scrolls through all open windows, and the Menu key opens the program menus. The transport controls are a real convenience, with the data wheel functioning as a speed-sensitive jog wheel. The control surface also has dedicated buttons for looping and for setting and jumping to markers.

The faders have a smooth action, but the response latency is frustrating if you don't adjust your software's buffer settings. Unfortunately, the faders can't write automation data, a function I would have ranked at the top of the feature list for a device like this. I hope updates from Cakewalk and Steinberg will address automation issues. As it is, you can use the faders to adjust levels in real time when you mix to file through the U-8, although the sluggish response makes this a less-than-optimum solution. Note also that the U-8 lacks pan pots.

Another frustration is that when you open the U-8 Mixer, its four white faders correspond not to hardware faders 1 through 4, but to 5 through 8. To compound the difficulties, opening the U-8 Mixer interferes with the fader assignments in *Home Studio*'s Console View and *Cubasis*'s VST Mixer.

The status buttons over each fader glow red for record-ready, green for solo, and amber for mute. Only solo can be set directly by pressing the button, however. Occasionally a button would get stuck in solo mode, and though I could change which channel was soloed, I couldn't get rid of that one last green light.

The Effects/Mixer Control section holds a button each for the mixer and effects. Under *Home Studio,* the Mixer button brings up the U-8 Mixer, but under *Cubasis,* it brings up the VST mixer. Next to the two buttons are four knobs for setting effects parameters. They control the virtual knobs in the currently highlighted region of the Effects window, and you can also assign them to four quick-access parameters.

Using the cursor keys to navigate the Advanced Edit window and the Effects knobs to set parameters is a convenient and efficient way to control the U-8's hardware effects. If it were up to me, however, I'd make the knobs relative instead of absolute, so that when you moved the cursor to a new set of virtual knobs, the hardware knobs would take

U-8 Specifications

Analog Inputs	(1) unbalanced XLR mic-level or unbalanced ¼" TRS line-level; (1) unbalanced ¼" TRS line-level or unbalanced ¼" Hi-Z guitar; (1 pr.) RCA aux
Analog Outputs	(1 pr.) RCA main; (1) stereo ¼" headphone
Digital I/O	(1 pr.) stereo S/PDIF optical
Resolution and Sample Rate	16-bit, 44.1 kHz
Frequency Response	20 Hz to 20 kHz (±1 dBm)
MIDI I/O	(1) In, (1) Out
Dimensions	15" (W) × 9.5" (D) × 3" (H)
Weight	4.2 lbs.

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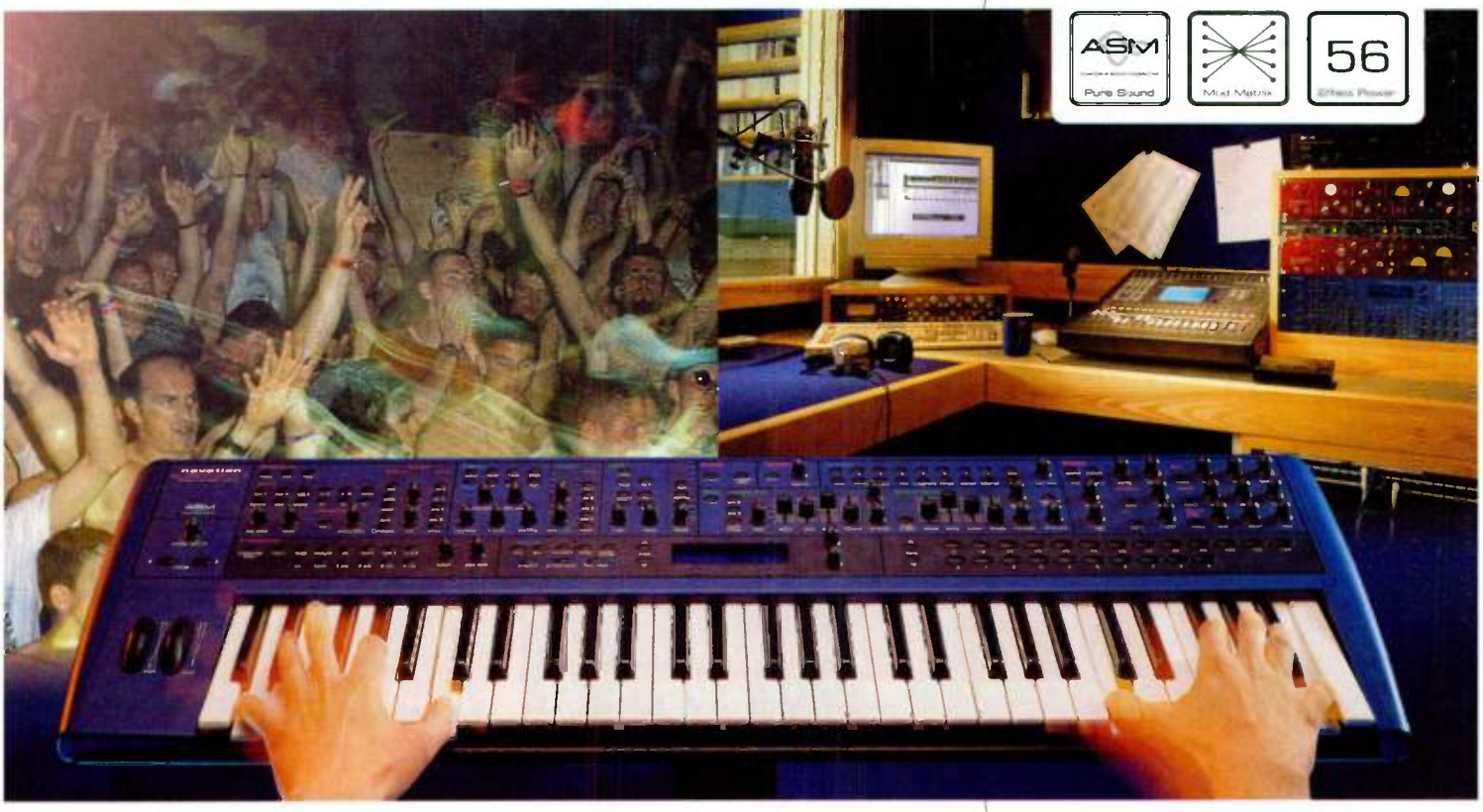

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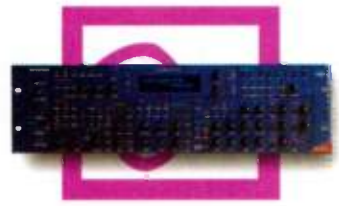

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U - 8

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1 2 3 4 5

PROS: Built-in multi-effects. Flexible audio I/O. Tactile control surface with faders, data wheel and buttons, and transport controls. Bundled digital audio–sequencing software. Simple USB connection. Portable. Headphone output with independent volume control.

CONS: Can't write automation data from hardware faders. Fader assignments can get jumbled when U-8 Mixer is open. EZ Recording features aren't quite there. Unbalanced XLR mic input.

on the virtual knobs' values. As it is, the parameter value jumps to the position of the hardware knob as soon as you start to turn it.

THE SUM OF ITS PARTS

The U-8 covers a lot of bases, from audio and MIDI I/O to effects and tactile control. I have mixed feelings about its EZ features, but you don't have to use them if you don't want to. Some things are a bit more complicated than they should be, such as the three mixers in *Home Studio* (the StudioWare panel, the U-8 Mixer, and the Console View).

The U-8's analog I/O sounds fine, and its effects are a big plus. The abundant online documentation makes good use of hyperlinks to avoid duplication, but finding the answers I wanted wasn't always easy. Roland ED does get bonus points, however, for including a detailed MIDI-implementation chart.

For anyone just starting off in desktop music, the U-8 provides a reasonably well integrated solution at a fair price. Advanced users with particular needs such as portability will also find plenty to like. The U-8's inability to write automation data is disappointing, but not necessarily a fatal flaw in view of its other features.

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B L U E

DRAGONFLY

This affordable, first-rate mic is a real head turner.

By Brian Knave

Baltic Latvian Universal Electronics (BLUE) received an **EM** Editors' Choice award earlier this year for its Blueberry mic, a large-diaphragm, cardioid-only condenser that impressed us with its bright, revealing sound and superlative build quality at a price that challenged the competition. So we were excited to learn that BLUE has released another large-diaphragm condenser at an even lower price.

At $1,095, the Dragonfly (the least expensive mic in the BLUE catalog) is an attractive deal for the discriminating personal-studio operator. BLUE sent me two Dragonflys (matched pairs can be special ordered—direct from BLUE only—complete with a cherry-wood storage box for $2,800), which not only allowed for stereo-miking, but also let me compare the sound of the mics to each other (they sounded virtually identical). BLUE also included two of its Cranberry mic cables ($44.95 each), which are the recommended cables for the Dragonfly. I worked the mics (and cables) hard for two months in more than a dozen applications, almost always with stellar results.

NOTES OF DISTINCTION

BLUE mics are distinctive on many levels, including the symbolic. Rather than being identified by a series of letters and numerals, as is common with other microphones, each BLUE mic has a name, and a name only. Moreover, the names are apt, making identification easy. For example, the BLUE Bottle mic looks like a bottle, and the Mouse resembles a mouse. But the Dragonfly, with its long, spindly "tail" and wing-like shock-mount, is perhaps the most aptly named in the line.

Like all BLUE mics, the Dragonfly is also distinctive in design and evidences first-rate workmanship in every detail. The narrow, rectangular, pressed-steel body is finished in an attractive rough-coat black enamel (the matched pairs are available in a custom green lacquer finish with gold trim) and topped with a light-bronze-colored, semicircular yoke that holds the spherical capsule/grille assembly in place. Uniquely, this sphere rotates within the yoke nearly 360 degrees in either direction, allowing for quick and easy positioning changes—before, during, or after positioning the mic and stand. This is a wonderful and very helpful innovation, and renders meaningless the terms *front address* and *side address*.

Like many other large-diaphragm condensers in its price range, the Dragonfly has a single, fixed-cardioid polar pattern, and does not provide a low-cut filter or attenuation pad. (Actually, none of the mics in the BLUE line provide filters or pads. This is by design, according to BLUE, because switches or extra circuits in the signal path degrade the signal. In addition, these features are commonly found in preamps and consoles.) The active side of the capsule is indicated by shiny chrome plating on the grille and support ring (in contrast to the duller bronze on the other side), making it easy to discern which way the capsule is pointed. This is another nice feature—capsule orientation is a detail that a surprising number of manufacturers do not effectively attend to on their side-address microphones.

Inside, the Dragonfly employs high-quality components and design. The heart of the mic is BLUE's single-membrane, factory-tuned capsule, which has a hand-built, 1-inch diaphragm sputtered with a mixture of pure gold and aluminum. The electronics are Class A and the mic has a transformerless output, meaning no integrated circuits (and thus less noise and coloration) in the signal path.

INTEGRATION INNOVATION

Another innovation is the Dragonfly's integral swivel/shock-mount. This attaches to the mic by two elastic cords, which fit into a groove on either end of the semicircular yoke on the top and, on the bottom, attach to a ring that encircles the rectangular body. Though easily removed (except for the ring, which is spot-welded to the body), the swivel/shock-mount is designed to remain attached to the mic—a fact made clear by the storage box, which is fitted with foam rubber cut precisely to accommodate the mic and shock-mount as a unit.

Functionally, the swivel/shock-mount is first-rate: it holds the mic securely

Want superb sound and versatility in a large-diaphragm condenser? The uniquely designed BLUE Dragonfly has an accurate and transparent sound, great presence, and excellent transient response, making it ideal for a large range of applications.

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Sound expensive? You'll be very pleasantly surprised–they're less than half the cost of competition that sounds this good. The MSP10 and SW10. Once again, Yamaha gives you more for less.

YAMAHA

and isolates it from shocks and rumble with a minimum of parts and fuss. Furthermore, being already attached to the microphone, it makes for a fast setup. (The lovely, well-written, and very helpful manual that comes with the Dragonfly makes the good point that it's easiest to attach the mic to a stand by turning the boom-stand arm or threaded end of the mic stand rather than by turning the mic itself.) I was especially impressed by the construction of the swivel assembly (the part that attaches to the mic stand), which is beefy yet elegant and provides a large, finger-friendly wing nut that locks the swivel securely in place with an easy twist.

My only misgiving—a very slight one—concerned the attachment of the elastic cords to the shock-mount: the small screw-clamps that secure the cords in back have sharp edges that rub against the cords at a steep angle. The cloth on the outside of the cords was slightly frayed at this juncture on both of the mics I reviewed, and I could foresee that in time they might wear through. But this is a trifling criticism (the cords would be easy enough to replace, after all) of what otherwise is an ingenious and seemingly foolproof design.

PROPER PROTECTION

Yet another BLUE innovation is the inclusion of two brass set screws, which protect the mic capsule during shipping. Condenser mics—no matter how well packaged—are easily damaged by rough handling. All it takes is one hard bump and the capsule can be knocked askew, often drastically impairing the sound. (I have known this to happen with condenser mics sent to **EM** for review.) So it's nice to see a manufacturer taking this into account and coming up with a simple yet effective solution.

When fully inserted, the set screws, located on the lower half of the Dragonfly's spherical grille, lock against the mic capsule, thereby stopping it from moving. Note that these set screws must be removed before the mic is used; however, they can easily be reinstalled prior to reshipping the mic.

The Dragonfly is further protected by a large (nearly shoe box–size) cardboard storage box. But if the phrase *cardboard box* suggests cheapness, let me rectify that impression: this is a sturdy, thoughtfully designed, and very attractive container with a true vintage vibe. (It reminds me of a camera box from the '50s.) Beautifully covered in blue linen, and embossed on top with a shiny silver "Blue" logo and the words "Baltic Latvian Universal Electronics," this classy container won't prove an embarrassment in your mic cabinet, even sitting next to a row of wood mic boxes. Inside, the cut foam is perfectly tailored to cradle and protect the mic, and is enhanced by a top layer of gray flocking (a feltlike material).

▼

It renders meaningless the terms *front address* and *side address*.

A DRUMMER THANG

I recorded dozens of tracks with the Dragonfly, including several for CDs currently under way, and it sounded great on almost every instrument I used it on. The overall sound is clear, open, accurate, and very present and detailed. Interestingly, the Dragonfly is flatter and less "hyped" sounding than many large-diaphragm condensers I have used—indeed, it's about as neutral sonically as it is distinctive visually. In addition, it is supremely quiet (self-noise is rated at 7 dB) and the transient response is exceptionally good. For all these reasons, the Dragonfly makes a very versatile instrument mic and a contender for first pick in many applications.

I loved the Dragonfly on percussion and drums. As a percussion mic, it is up there with the best, thanks to its accuracy and outstanding transient response. It proved an excellent choice not only for hand drums such as dumbeks, bongos, and congas, but also for sometimes difficult sources such as triangles, shakers, and rattles. On shakers, for example, some large-diaphragm condensers capture a "slushy" or loose sound due to low-mid boosts, and/or too bright or sharp a sound due to high-mid presence boosting. The Dragonfly does neither, but rather captures a tight, contained, and very natural sound.

Triangles, especially high-pitched ones, can also be a challenge—not just any large-diaphragm condenser can document those clicky, metallic transients and high-harmonic overtones without sounding grating and/or out of balance. But the Dragonfly excelled here as well. Moreover, when I compared the recorded track to the original source, I was very impressed by the near identical quality of the live and recorded triangle hits. Those particular tracks, by the way, were recorded direct to 20-bit ADAT XT through a Langevin Dual Vocal Combo mic preamp and monitored through Vergence A-20 reference monitors. I also tried the Dragonfly through several other mic preamps, including stock mixer preamps, and it sounded good through all of them.

Dragonfly Specifications

Element	externally polarized (DC bias) capacitor ("true" condenser)
Diaphragm	1", 6-micron-thick, gold and aluminum vapor-deposited Mylar
Polar Pattern	cardioid
Frequency Response	20 Hz–20 kHz (±2 dB)
Dynamic Range	76 dB
Sensitivity (@ 1 kHz into 1 kΩ)	21 mV/Pa
Signal-to-Noise Ratio	87 dBA
Self-Noise	7 dBA
Maximum SPL (for 0.5% THD)	132 dB
Dimensions	9.8" (H) × 2.5" (D)
Weight	1.39 lbs.

For manufacturer information, please see Contact Sheet, p. 186.

The pair of Dragonflys also excelled as drum overheads—in fact, I liked them in this application as much as any mics I've used. Admittedly, the bulkiness of the integral shock-mounts made it somewhat difficult—at least in my tiny room—to position the two Dragonflys close enough together for an XY stereo pair. (With a higher ceiling and beefier stands, the job would have been simpler.) Just the same, the stereo tracks sounded great: full, warm, well balanced, and not artificially bright (the downfall of some large-diaphragm condensers in this application), with wonderful transient response and excellent imaging.

STRING ME ALONG

The Dragonfly also sounded great on acoustic guitar, lap dulcimer, and piano. The rotating grille was especially handy on acoustic guitar: with the mic positioned near the 12th fret, it was a cinch rotating the grille to find the sweet spot. I also stereo-miked a few different acoustics (including a Martin D-28, Taylor 612-C, and Washburn D-10N) using the Dragonflys as a spaced pair, with the second mic positioned back a few feet from the guitar. Each time, I got great results.

What really turned my head, though, was how good the pair of Dragonflys sounded on piano. I took the mics to Sound Music Studios (in Oakland, California), owned by singer/songwriter/engineer Clare Hedin, and miked her 115-year-old Bechstein midsize grand. We positioned the mics in a fairly standard array, with one down low on the bass strings and the other a bit higher up covering the mids and highs. The resulting tracks were big, open, and gorgeous sounding: smooth and warm, yet very detailed, with a great balance of lows, mids, and highs and a realistic sense of the size of the piano.

Hedin, who typically uses a pair of small-diaphragm condensers to mic the piano, was also favorably impressed. She described the sound as "very beautiful: present and articulate, but in a soft, sophisticated way. The mics totally picked up the harmonics, producing a full, almost angelic sound." Hedin was so excited about the Dragonflys that she is considering investing in a matched pair for her piano. She remarked that she might still choose the "harder" sound of her small-diaphragm mics for certain rock-piano tracks, but she would prefer the softer, fuller sound of the Dragonflys for classical, jazz, or solo piano tracks.

I also got good results using the Dragonfly on electric guitar cabinet. Here, the sound was natural, articulate, and robust. Depending on the musical style, it may not be my first pick in this application—for example, on blues and rock tracks, I might prefer a tube condenser for the fatness and tube coloration it provides, or a handheld dynamic if I needed midrange accentuation—but the Dragonfly did a great job of capturing the amp as it sounded in the room.

STRAIGHT SHOOTER

Vocals, of course, are a primary application for large-diaphragm condensers, and the Dragonfly excels in this department as well. I recorded a variety of male and female singers, typically with excellent results. This microphone captures very accurate, articulate, and present-sounding vocal tracks with full, warm lows and airy highs. Rather than the usual presence boost starting at 5 kHz, the Dragonfly's top end is accentuated higher up, around 10 to 15 kHz. Generally, this makes for a flatter, more natural-sounding top end on vocals, with plenty of "air" still, but a slightly less seductive sound than some more hyped vocal mics may provide. (This is all a matter of taste and application, of course: sometimes those crispy highs are seductive sounding and appropriate to the track, and sometimes they aren't.)

On the low end, the Dragonfly is solid and tight, never boomy or "pillowy" sounding. I was especially impressed by the smoothness of this mic's proximity effect—the lows don't sound excessive or unnatural even if you kiss the grille. Rather, you get a subtle, very gradual bass enhancement as you move in on the mic. This, coupled with the Dragonfly's smooth off-axis response, allows singers to really work the mic.

The Dragonfly was quite complementary on Hedin, an alto/soprano with a clear, smooth voice. I also liked the mic on my own voice (I'm a soft tenor), and it sounded very good on a hoarse, tobacco-and-whiskey-tempered country baritone. However, it didn't prove ideal for every type of voice I recorded, especially the more sibilant ones. For example, on a bluesy alto/soprano with lots of bright grit in her

BLUE
Dragonfly large-diaphragm condenser microphone
$1,095

AUDIO QUALITY ■■■■■
VALUE ■■■■■
1 2 3 4 5

PROS: Innovative design and first-rate construction. Accurate, transparent sound reproduction. Superb presence and transient response. Class A electronics and transformerless output. Extremely quiet. Very versatile. Affordable. Unique and effective integral swivel/shock-mount. Nice storage box.

CONS: No low-cut filter, attenuation pad, or pattern control. Can sound sibilant on certain singers.

voice, the Dragonfly was too edgy sounding—in fact, the singer asked me to attenuate the highs in her headphones as we recorded the track. I cut a few decibels at 8 and 15 kHz (in the monitor mix only) to get a sound she was happy with, after which things went fine. Listening to the track on playback (without the EQ), we agreed that the highs were too prominent. Fortunately, the edginess was easily tempered with modest EQ tweaks and by squashing the track a bit with a tube compressor.

SHALL I COMPARE THEE?

To draw a closer bead on the Dragonfly's sonic predisposition (as well as to see how it stacked up against the competition), I compared the Dragonfly to a well-regarded, cardioid-only condenser in the same price range: the Neumann TLM 103. Overall, the Dragonfly sounded very similar to the TLM 103, but with less presence boosting in the 5 kHz region. On vocals, for example, the TLM 103 had that characteristic Neumann "sizzle"; the Dragonfly, in comparison, sounded flatter and "plainer." And while neither mic took well to a high-F diatonic harmonica (both sounded shrill in this application), the Dragonfly produced slightly smoother, more agreeable highs. (Admittedly, high harps are reedy and shrill sounding to begin with, and frequently hard to record with solid-state condensers—a tube mic is usually the better choice.) But again, in the bigger picture, the two mics sounded very similar and of equivalent quality, each capturing a tight, very present, and well-defined sound with good depth of field.

HIGH FLYER

In only ten years, Baltic Latvian Universal Electronics has established itself as one of the premier microphone builders in the world. But then, this is a company that pretty much started at the top: its flagship microphone, the Bottle, has an asking price of $4,500. Fortunately, with the Dragonfly, BLUE has brought its technological know-how and mic-building expertise within reach of the personal-studio buyer.

The Dragonfly is a stunning and unique microphone that sounds good enough to earn a spot in even the best-stocked mic cabinet, yet is versatile enough to be the recording backbone of the humblest personal studio. The sound is very open, present, transparent, and articulate, with warm, natural-sounding lows and airy highs. In addition, the Dragonfly is superquiet and has excellent transient response. Though a great choice for many vocals—especially when you want a clean, present, and relatively uncolored sound—this transducer really soars as an instrument mic. I loved the Dragonfly on drums, percussion, and piano; it also sounded exceptional on acoustic and electric guitars. Indeed, this mic proved so versatile that I wouldn't be daunted were I told I had to use it alone to record an entire album—and that's something I can't say about many microphones.

The Dragonfly is also a delight to use. The integral shock-mount makes for quick setup, and the unique rotating capsule/grille assembly makes placement and fine-tuning a breeze. Then there's the look and build: with its innovative design and superb construction, the Dragonfly is not only worthy of a design award, but it may very well inspire singers to new heights—as the Dragonfly manual points out, "vocalists love singing into unique and impressive mics." With the Dragonfly, BLUE has produced a real winner, and contributed greatly to the personal-studio recordist's quest for high-quality sound and hip style at an affordable price.

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CODA MUSIC TECHNOLOGY

PRINTMUSIC 2000 (MAC/WIN)

Professional-quality notation at a rock-bottom price.

By Scott R. Garrigus

Coda's *Finale* has long been one of the most powerful and flexible music-notation programs on the market. But many musicians don't need the kind of high-end capabilities that *Finale* offers, nor can they afford its comparatively high price tag. Coda therefore offers two scaled-down versions of *Finale: Allegro* for intermediate users and *PrintMusic* for beginners.

Don't let *PrintMusic*'s entry-level designation fool you. The program is based on the technology used in *Finale 2000*. In fact, *PrintMusic* and *Finale* share the same rendering engine, meaning you get the same professional-quality output with *PrintMusic* that you do with *Finale*. Because both programs have the same format, you can even share files between them.

PrintMusic differs from *Finale* mainly in its reduced number of features and more limited capabilities. For example, *Finale* supports an unlimited number of staffs, whereas *PrintMusic* can handle only 24. Still, *PrintMusic* offers plenty of power for an entry-level program, including support for up to four independent voices per staff and the ability to extract individual parts from the full score.

PrintMusic 2000
Minimum System Requirements
Mac: Power Mac; 16 MB RAM (32 MB recommended); OS 7.5; 20 MB hard drive space
PC: 486; 16 MB RAM (32 MB recommended); Windows 95/98/NT 4.0; 20 MB hard drive space

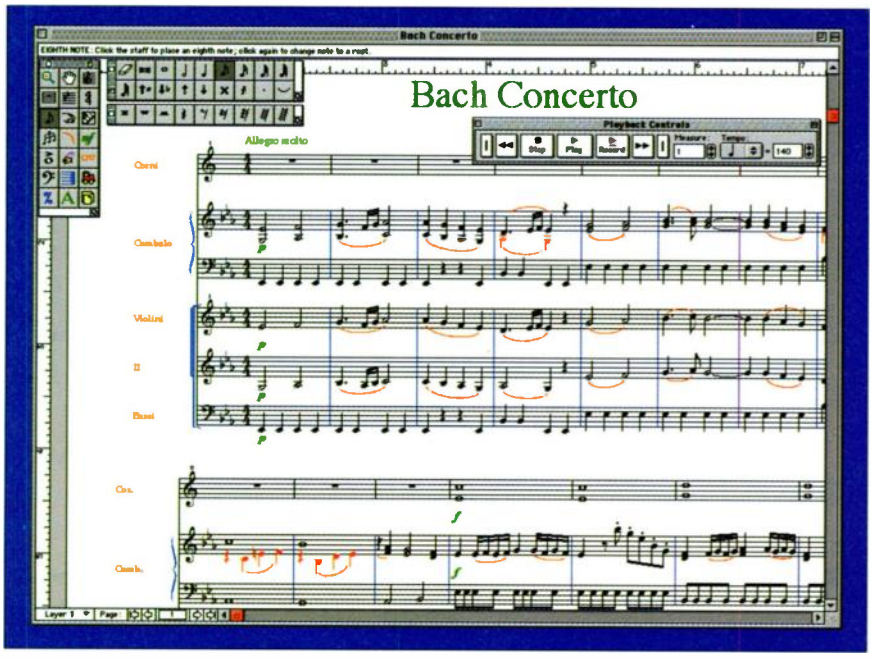
WYSIWYG AND WIZARDRY

From the start, *PrintMusic* aims to put you at ease. When you first launch the program, it displays the Document Setup wizard, which makes setting up your score as easy as can be. A dialog box asks you to enter the title and composer and select page size (from a wide variety of choices), orientation (portrait or landscape), and music font.

The wizard then asks you to choose the instruments for your score from seven categories: woodwinds, brass, percussion, plucked strings, keyboards, vocals, and strings. The instruments automatically appear in the score in proper "score order," although you can change the arrangement if you wish (see **Fig. 1**). When you click on Finish, the wizard constructs your score with the proper clef, transposition, and staff for each instrument. Of course, you can forgo the wizard and create your own score from scratch, or you can use one of the included templates for several types of ensembles: general, band, choral, church, and orchestral.

Once you've created your blank score, however, *PrintMusic* becomes a bit less intuitive. Because it offers many of the same features as *Finale*, it also shares some of the high-end program's complexity. Entering and editing music and other symbols can be a bit overwhelming at first, especially because the program presents you with 19 tools to work with. Instead of providing one tool for selecting, one tool for entry/editing, and so on, each part of a score must be edited with a different tool. Luckily, Coda provides plenty of help to get you up and running quickly, and once you get used to it, mastering *PrintMusic* isn't all that difficult.

Coda has gone out of its way to make learning and using the software as easy as possible. In addition to the usual context-sensitive help, the program includes a quick-reference card, an online manual, a tutorial booklet, a set of onscreen QuickStart movies, and more than 100 music samples. A printed manual would be useful, but the online documentation is comprehensive, and you can easily print it out if you need to. Some of the QuickStart video clips are a bit short, but overall they provide a great introduction to all of the software's major features. The tutorial booklet is excellent. It walks you through the program installation and seven tutorials with accompanying files. The music samples are also a nice touch.

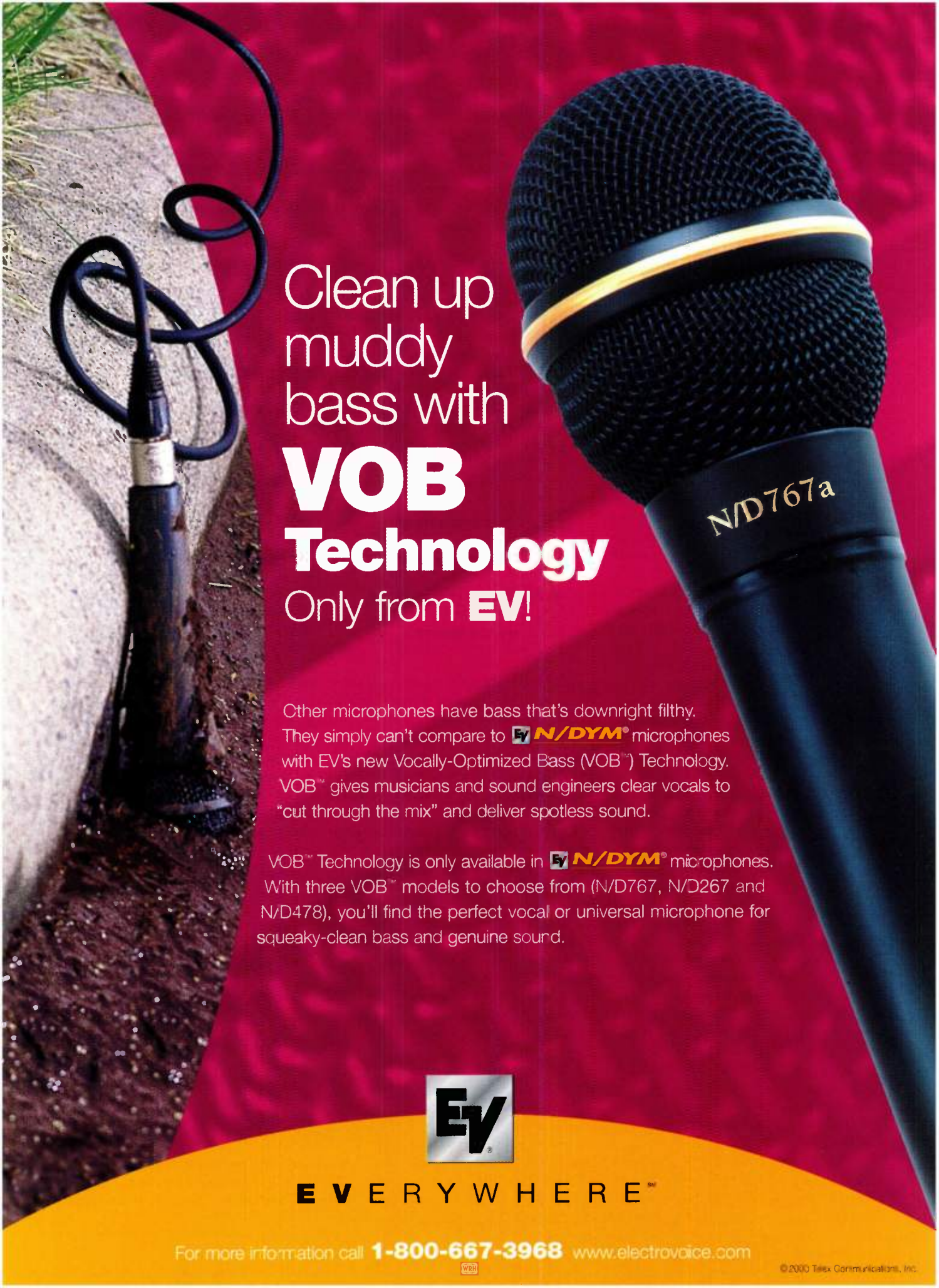


Coda's entry-level *PrintMusic* (shown here in the Mac version) boasts an array of high-end features derived from the company's popular *Finale* program.

MUSIC ENTRY AND EDITING

When entering notes and markings into *PrintMusic*, you can view the score in Page View or Scroll View. Page View lets you see and edit your score as if it were printed on paper; you navigate to

For manufacturer information, please see Contact Sheet, p. 186.



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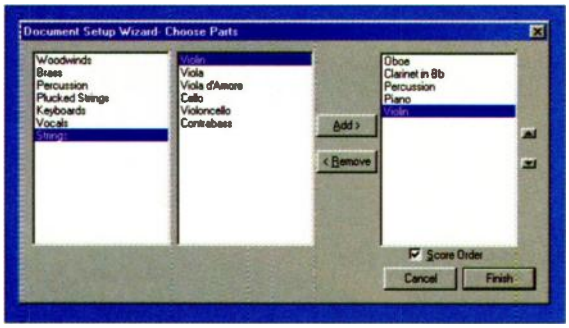

FIG. 1: *PrintMusic*'s Document Setup wizard makes creating the initial score layout a breeze. The score is constructed automatically with the correct clefs, transpositions, and staffs.

various pages with the page controls at the bottom of the main window. Scroll View is a linear display of your score that extends continuously to the right and/or left (as in most MIDI sequencers). You navigate the score by measure numbers instead of page numbers. It doesn't matter which view you use while editing your score, although some tools (such as the Layout tool) work only in Page View.

PrintMusic offers four ways to enter music into a score: Simple Entry, Speedy Entry, EasyScribe, and MIDI-file importing. As its name implies, Simple Entry is the easiest method, although it's also the slowest. You simply use the mouse to add notes and symbols to your score. Two palettes are provided: one with rests and another with note values (ranging from double whole note to 128th note). Additional selections include grace notes, dots, ties, and accidentals. You just select a note or symbol from one of the palettes and click on a staff to deposit it. As you add notes to a measure, *PrintMusic* automatically spaces the music. Unfortunately, Simple Entry is not particularly flexible when it comes to moving and editing notes, and it can be rather tedious.

Speedy Entry, on the other hand, is a faster and more accurate alternative that lets you enter notes using your MIDI keyboard in combination with your computer keyboard. You don't have to use your mouse at all. Speedy Entry is also more flexible in that it lets you place as many notes as you want anywhere within a measure instead of restricting you to proper beats and spacing.

Speedy Entry is a little more difficult than Simple Entry because you have to learn the computer-keyboard commands, but the quick-reference card helps with that. To add music, you click on a measure, which opens an editing frame around that measure (see **Fig. 2**). Displayed within the frame are an insertion bar (indicating where the note or rest will be placed) and a pitch crossbar (indicating the note's pitch). Completing your entry is then a simple matter of holding down a note on your MIDI keyboard while selecting a duration key on your computer keyboard. You can also hold down several notes at once to quickly enter chords. After you enter your notes, *PrintMusic* automatically moves the insertion bar to the next appropriate location in the measure (or to the next measure if you're at the end of the current one).

▼

The quality of *PrintMusic*'s printed output is excellent.

Editing notes is also quite easy with Speedy Entry. With the mouse, you simply drag a note to a new pitch or horizontal location, something you can't do with Simple Entry.

The quickest ways to enter music into a score, however, are by using EasyScribe and by importing a Standard MIDI File. The two are essentially the same: in each case, *PrintMusic* analyzes MIDI data and converts it into notation. The main difference between the methods is that a MIDI file is prerecorded, whereas with EasyScribe, you record your performance directly into *PrintMusic* in real time. *PrintMusic* can open Type 0 MIDI files, but then all of the imported data is placed on a single grand staff, which can result in a jumble of notes. Type 1 files (which retain separate tracks) are a much better choice for scores.

To record with EasyScribe, you simply select the EasyScribe tool and click on the measure into which you want to record notes. *PrintMusic* plays a countoff (you set the length) and continues with the user-configured MIDI metronome click. You can record into a single staff or spread your performance across two staffs with a user-specified split point.

As you play, *PrintMusic* automatically translates your performance into notation. To aid the translation, you can specify beforehand whether *PrintMusic* will tie notes across barlines, what the smallest note value in the performance will be, whether tuplets will be included, and whether syncopations should be tied. Carefully choosing the settings and following the beat yields very good results. *PrintMusic* faltered only on more complex pieces, and even then I could easily edit the mistakes.

MARKS OF DISTINCTION

In addition to notes, *PrintMusic* allows you to add a wide range of other symbols and markings to a score. Each type of marking has its own dedicated tool palette. The palettes include Staff, Key Signature, Time Signature, Clef, Measure, Tuplet, Smart Shape, Articulation, Expression, Repeat, Chord, Lyrics, and Text. Most are self-explanatory and similar to the tool palettes in other notation programs, but some offer particularly interesting features.

The Chord tool, for example, lets you add chord symbols to a score by simply playing chords on your MIDI keyboard.

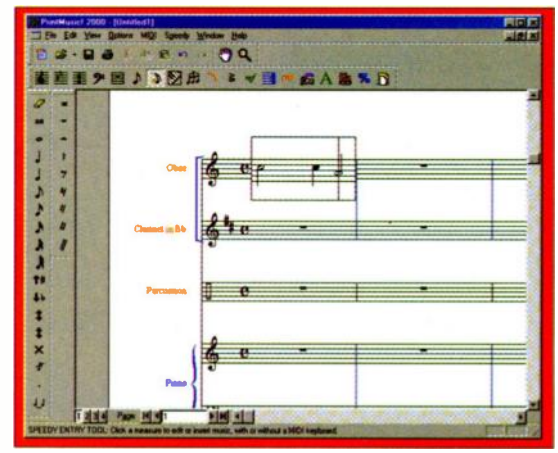

FIG. 2: Speedy Entry lets you quickly and accurately enter music with your MIDI and computer keyboards. You select notes on the MIDI keyboard and durations on the QWERTY keyboard.

OB•12

new SOunD nEw SYnth new SOunD nEw SYnth new SOunD nEw SYnth

sci-fi

lead

bass

ambient

auto licks

strings

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You just click above the note where you want to place a chord and play the chord. *PrintMusic* automatically identifies it and places the appropriate symbol in the score. The program can even insert guitar-fretboard grids with fingerings. What's more, if you transpose the music, the chord symbols (and the guitar fretboards) are transposed along with it. This is a very useful feature.

The Smart Shape tool is also quite interesting. With it you can add slurs, crescendo hairpins, brackets, dashed and solid lines, trills, glissandos, and 8va or 8vb markings to the score. These "intelligent" markings conform to changes in the music. For example, if you add more notes to a measure, causing it to lengthen, the Smart Shape lines in and around that measure will also lengthen to maintain the proper relationships. Some Smart Shape lines automatically orient themselves correctly according to the music, but slurs do not always arc in the proper direction.

MIDI PLAYBACK

Along with representing your score visually, *PrintMusic* can render the music via MIDI, so the program can double as a compositional tool. This part of the program, however, needs some improvement. For playback, *PrintMusic* provides transport controls much like the ones you would find in a MIDI sequencer: buttons for rewind, fast-forward, play, record, stop, and pause. These controls work as expected, but they sometimes get in the way; instead of residing in a dockable toolbar, they are in a floating palette. (You can, of course, minimize the palette or start playback by hitting the spacebar.) I was also disappointed that I couldn't switch from Page View to Scroll View during playback or make edits and instantly hear the changes. These features would make excellent additions for a future release. On the plus side, however, *PrintMusic*'s "auto spot-check" feature offers something akin to scrubbing; you can drag the cursor through the score in any direction to hear the notes.

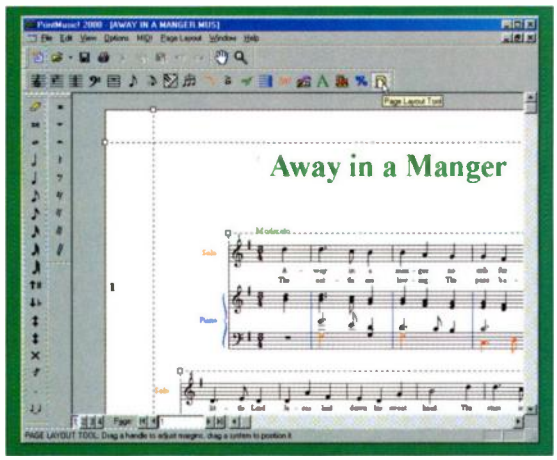

FIG. 3: The Page Layout tool allows you to adjust various score parameters, such as staff positions, spacing between systems, indentation, and page margins.

One thing that I especially like about *PrintMusic* is that all of a score's expression marks and some of the articulation marks have MIDI-playback equivalents. For example, if you add a staccato mark to a note, the note plays back with a shorter duration. But unlike *Allegro* and *Finale*, *PrintMusic* doesn't let you access the score's underlying MIDI data and alter the assigned values. For instance, you can't designate how short the staccato duration should be. *PrintMusic* does, however, allow you to create your own tempo expressions, and MIDI playback will follow repeat signs entered with the Repeat tool.

LAYOUT AND PRINTOUT

When it comes to laying out and printing your score, *PrintMusic* performs beautifully. With the Page Layout tool you can easily set the page margins, change the spacing between systems, indent systems, and so on (see **Fig. 3**). Rulers are included, marked in inches or centimeters. *PrintMusic* lacks a snap-to-grid feature, but for precise positioning, you can enter values numerically. The Resize tool allows you to change the size of anything on a page. The tool is ideal for many types of projects, from orchestral scores with small staffs to educational exercises with extra large notes.

Because *PrintMusic 2000* uses the same rendering technology as *Finale 2000*, the quality of the printed output is excellent. *PrintMusic* can print to just about any printer, PostScript compatible or not. In addition, the program uses *Finale*'s Maestro font, a new font designed by Coda that provides some of the best notation you'll ever see. And when you register your software, Coda lets you download its JazzFont set for free. These fonts give your scores a cool handwritten effect that really looks authentic. Kudos to Coda for providing this great bonus.

THE FINALE

PrintMusic provides more power than any other entry-level notation product I've seen. However, the program has its faults. The MIDI-playback features could be enhanced, and I would love to be able to switch views and perform edits while my score plays in the background. Using the program would also be a bit easier if there were fewer separate tools to contend with, and it would help if you could dock the playback controls out of the way.

Despite these minor gripes, *PrintMusic* boasts a wealth of features for an entry-level program, and perhaps even more important, it produces great-looking scores. If you're searching for an inexpensive notation program that can handle most common scoring tasks, it's well worth your while to check out *PrintMusic*. Download a demo version of the program at Coda's Web site, and give it a try.

Scott R. Garrigus *is the author of* Cakewalk Power!, *the first professional guide to Cakewalk's* Pro Audio, Guitar Studio, *and* Home Studio. *For more information, surf to www.garrigus.com.*

CODA MUSIC TECHNOLOGY
PrintMusic 2000 music-notation software
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FEATURES ■■■
DOCUMENTATION ■■■■
EASE OF USE ■■■
VALUE ■■■■
1 2 3 4 5

PROS: Great documentation. Excellent output quality. Very good transcription capability. Free JazzFont set. Good bang for the buck.

CONS: Too many separate editing tools and modes. Playback controls not dockable. No editing or view switching during playback. MIDI-playback settings are not user-definable.

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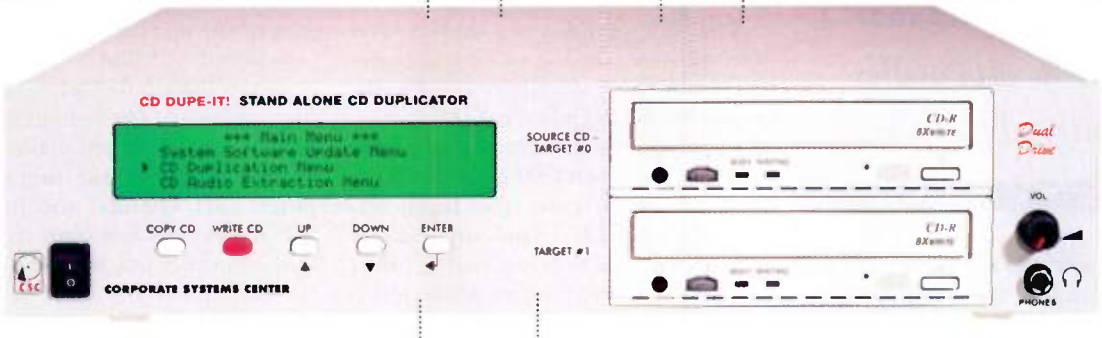

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D B X

386

An inexpensive tube preamp with oodles of digital features.

By Rob Shirak

Whether you are tracking vocals on digital tape, capturing an orchestral performance with a hard disk recorder, or cutting distorted guitar tracks on an analog deck, most signals require a preamp to boost the source signal to an operable level. The dbx 386 is designed for personal-studio owners who want a high-quality, 2-channel tube preamp coupled with loads of flexible analog and digital I/O. Considering the 386's generous feature set, the unit is surprisingly inexpensive and will likely find its way into many small recording studios and touring rigs.

IN CONTROL

Input into each of the 386's two preamps is controlled by a knob labeled "Drive." Up to 60 dB of gain is available for microphone signals, and a 30 dB range (±15 dB) is offered for line- and instrument-level signals. The unit's vacuum-tube stage is positioned *after* the preamp section.

Unlike some tube preamps, the dbx 386 does not provide separate input-gain and tube-drive controls; rather, the amount of tube coloration is linked directly to the Drive control. However, thanks to the unit's separate analog and digital output controls, you can saturate the tube stage more at the input and compensate for the increased level at the outputs.

Other front-panel controls for each channel of the preamp section include a 48V switch for phantom power, a 20 dB pad for the microphone input, a phase-inversion switch, and a 12 dB/octave low-cut filter for keeping out unwanted low-frequency rumble (see **Fig. 1**).

The 386 provides two output-level controls—one analog and one digital—and both types of outputs are simultaneously active (more on this later). Each channel of the preamp also has a single, 12-segment LED meter for monitoring output levels. (No input metering is available.) The output meter can be switched between analog (dBu) and digital (dBFS) scaling at the touch of a switch; the switch glows red for analog and green for digital readings.

One of the 386's strongest features is its panoply of inputs and outputs.

When metering stereo signals, it's important to set the meters so that each channel reads the same type of output.

Between the 386's two preamp control panels is a section labeled "dbx Type IV Conversion System." This section comprises five lighted button switches: Dither (SNR^2 or TPDF); Shape (noise-shaping curve); Sample Rate (44.1, 48, 88.2, or 96 kHz); Word Length (16, 20, or 24 bits); and Output Format (S/PDIF or AES/EBU). The Sample Rate switch is unlit for 44.1 kHz operation and uses yellow, red, and green lights to indicate other rates. The other four switches glow red or green to indicate their status.

I/O, SILVER!

One of the 386's strongest features is its panoply of inputs and outputs (see **Fig. 2**). Balanced analog inputs are available for microphone and line-level signals on the rear panel, and separate unbalanced instrument jacks are provided on the front. A Line Select switch determines whether the line-level inputs or the mic input is active.

Balanced XLR and ¼-inch analog outputs are simultaneously available on the rear panel. The ¼-inch outputs can also be used in an unbalanced configuration simply by inserting tip/sleeve plugs. Each channel also furnishes a TRS-insert jack for setting up an effects loop after the tube section and before the output section—ideal for patching in a compressor or EQ.

Both AES/EBU and S/PDIF digital outputs are provided. Although data is sent out both connectors at the same time, the proper formatting for both is determined by the Output Format switch on the front panel. In other words, if AES/EBU is chosen at the switch, then AES/EBU-format data will come out both the XLR and RCA coaxial connectors. Care must therefore be taken to properly match digital formats when connecting digital gear.

As mentioned earlier, each channel has separate pots for the analog and digital outputs, and the outputs are simultaneously active. This very cool feature makes it possible to feed up to three devices at a time from the 386's outputs: two analog devices and one digital. In addition, word-clock BNC input and output connectors on the rear panel allow synchronization with other digital gear.

AT ANY RATE

The sample rates and bit resolutions for the input A/D conversion and the digital outputs must be identical; they cannot be set independently. This does not present a problem, though, because the analog insert is placed directly after the tube stage, and the 386 has no digital input. Because there is only one conversion process (and no digital processing of

FIG. 1: The dbx 386 dual-channel analog tube preamp offers a truckload of features, including a pad, a low-cut filter, phantom power, and an instrument input for each channel. Among its major features are A/D converters that support two types of dither, two types of noise shaping, and up to 24-bit, 96 kHz conversion.

For manufacturer information, please see Contact Sheet, p. 186.

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in a Sea of DAW's

The SeaSound ***Solo EX*** is a surprisingly affordable, professional digital audio recording system that expands with your needs. When you plug into the ***Solo EX***, your music flows through new ***Tom Oberheim-designed*** analog input circuitry and into state-of-the-art ***24-bit, 96kHz*** digital converters. The result is audibly superior to any other way of getting your music into, and out of a computer. The ***Solo EX*** sounds so good, you'll remember why you wanted to start recording in the first place.

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In addition to ASIO 2, Sound Manager, Multimedia and DirectX drivers ***Solo EX*** comes with Steinberg's ***Cubasis VST*** and ***Sonic Foundry's Acid Rock.***

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Mike Lawson
Composer, Producer, Songwriter, Guitarist

Credits:
Publisher of Mix Books, product reviewer MIX, EM.
Recorded with: Merl Saunders, Bob Welch, Joe Louis Walker and others.

"The SeaSound ***SOLO EX*** is the foundation of my computer-based personal recording studio. The ***SOLO EX*** is elegantly designed with first-class components and is a breeze to use. With its incredibly clean custom mic-pre's and quality AD/DA converters, I'm able to plug guitars, basses and microphones straight into the ***Solo EX*** and get the true, warm sound of my mics and pickups. The preamps can really take a pounding without breaking up. The SeaSound ***SOLO EX*** rocks"!

Paul Chiten
Composer, Producer, Songwriter, Artist

Credits:
Dawson's Creek *Columbia/Tri-Star/Warner Brothers*
Coming To America *Paramount*
Witness *Paramount* ***and many others***

"The SeaSound ***SOLO EX*** gives me the quality and performance I need in working with digital audio. The convenient rack mount unit has features that are extremely accessible -Master, Control Room, and Headphone outputs. The mic preamps sound wonderful! The SeaSound ***SOLO EX*** is a great piece of gear."

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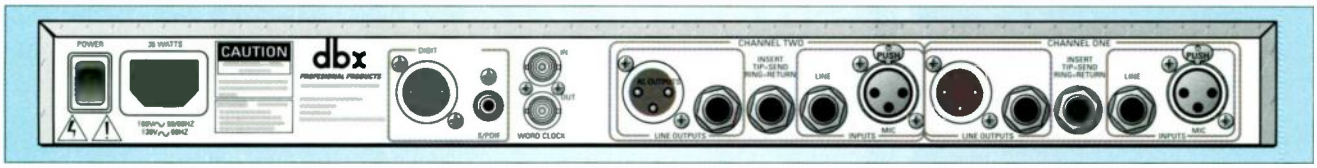

FIG. 2: The dbx 386's line and mic inputs are not simultaneously available, but the XLR and ¼-inch analog outputs are. The channel insert jack is after the tube section and before the output section—good for patching in a compressor or EQ. The XLR and RCA digital connectors can output both AES/EBU and S/PDIF.

the signal), independent resolutions for A/D conversion and output are unnecessary.

The best news is that the sample rate for the A/D conversion can be set with a front-panel control to 44.1, 48, 88.2, or 96 kHz, and the word length can be 16, 20, or 24 bit.

Building on the previous dbx Type I, Type II, and Type III technologies, the Type IV Conversion System is a proprietary process that, according to dbx, captures a much wider dynamic range in the more linear area (that is, the upper bits) of the A/D converter. Type IV is a single-step encoding process and is basically a sophisticated compressor that squeezes the upper dynamic range of the signal (and its peaks) into the upper bits of the digital word. This system allows better overall performance from the A/D converters and is said to emulate the natural compression effect of analog tape saturation.

Along with the Type IV Conversion System, two types of dithering and two types of noise shaping are available. Combined, they do wonders for cleaning up the sound of dynamic sources that either would clip the converters or would have to be turned down to the point that much of the material would be in the lower range of bit resolution.

A major benefit of the 386 is that the Type IV peak compression (along with some additional processing voodoo, kept secret by dbx) happens before the A/D conversion rather than after, allowing hotter levels to be encoded. With many digital peak limiters, including the growing assortment of software plug-ins and all-in-one mastering boxes, the processing happens after the signal has been captured digitally. Any material originally encoded at a lower-bit resolution (such as low-volume material) will never be higher in quality, even if it is turned up via compression. But with Type IV, the quieter material can be encoded at a higher-bit resolution by taming the peaks on the front end of the conversion process.

386 Specifications

Analog Inputs	rear: (2) balanced ¼-inch TRS line; (2) balanced XLR mic front: (2) unbalanced ¼-inch TS instrument
Analog Outputs	(2) balanced XLR line; (2) balanced ¼-inch TRS line
Digital Outputs	(1) XLR, stereo AES/EBU; (1) RCA, stereo S/PDIF
Other Ports	(2) ¼-inch TRS inserts; (2 pr.) BNC word clock in and out
Phantom Power	48V
Pad	20 dB
Low-cut Filter	12 dB/octave @ 75 Hz
Dither Type	SNR², TPDF
Noise Shape	shape 1 (mild); shape 2 (aggressive)
Drive Control Gain Range	line: ±15 dB; mic: 30–60 dB
Maximum Input Level	mic input: 11 dBu (no pad); line and instrument input: 21 dBu
Maximum Output Level	>21 dBu
A/D Conversion Type	dbx Type IV
Sampling Rates	96, 88.2, 48, or 44.1 kHz
Word Length	24, 20, or 16 bit
A/D Dynamic Range	107 dBA typical; 22 kHz bandwidth
Mic Input Noise	120 dBu typical
THD + Noise	0.35% at 1 kHz, 4 dBu out, 40 dB gain
Crosstalk	–80 dB typical, 20 Hz to 20 kHz
Power Supply	internal AC (IEC connector) with switch
Dimensions	1U rack-mount × 7.75" (D)
Weight	7.3 lbs.

MILD BUT WARMING

A wealth of features is welcome in most products, and the 386 is certainly rich in that department. But the bottom line for a preamp is its sound, and here the 386 comes up short.

The best part of the signal-processing circuitry is the tube section. In general, the 386's tube coloration is mild yet warm. Unlike the saturated tube sounds you get with a guitar amp, the 386 gives you a little blossoming, a modest tone coloration. It's pleasing and could be useful for a number of applications.

However, the preamp's overall sound is disappointing, even considering its reasonable price. I first tested the 386 on keyboards and vocals and noticed a thickened tone on keyboard sounds. On vocals, the sound was not well focused; it was sort of swirly, mushy, and phasey. The sound was similar from both the digital and analog outputs, so the converters apparently are not the source of the problem.

I attempted to record doubled acoustic guitar on several songs with the 386, with similar results. The guitarist—who is also a competent engineer—felt that the tone was "spongy" and lacked accurate transient response. In addition, the noise floor of the preamp was a bit higher than I like, though not as high as that of some low-cost tube preamps. We ended up recording through the Mackie console's internal solid-state preamps, which produced better results.

After our guitar date, we decided to test the 386's transient response by recording some percussion instruments

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

PROS: Tube coloration is user controllable. Flexible analog and digital I/O and routing. Provides TRS inserts on each channel. Accommodates practically all currently popular sample rates and word lengths up to 24-bit, 96 kHz. Type IV Conversion System allows greater signal-to-noise during encoding. Several types of dither and noise shaping are provided. Affordable.
CONS: Preamp sound quality is mediocre at best. Digital converters are of midlevel quality.

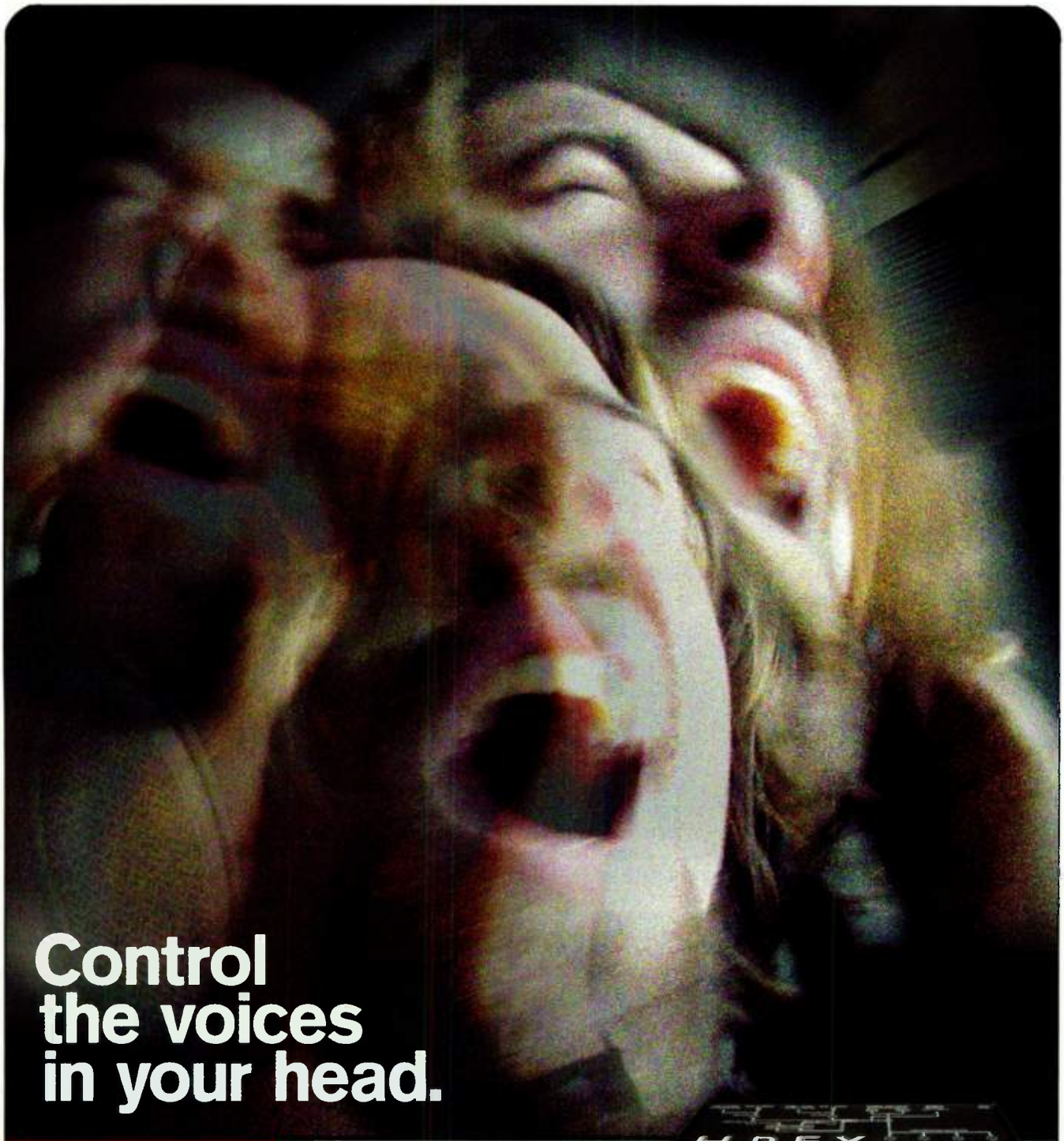
that were lying around the studio. Sure enough, the claves, tambourines, and bongos lacked a real sense of punch and attack, regardless of the settings. The claves' sound was especially compromised. We captured an acceptable bongo tone, but the 386 didn't maintain any of the percussion instruments' crisp attacks.

REAL DEAL

The most surprising thing about the dbx 386 is its low price. Considering that the unit is dual-channel, has tubes, includes decent converters, and sports a wide variety of high-resolution I/O, the features rating has to be high.

I can't recommend the dbx 386 as your main or only preamp. But you might make good use of it in situations in which a crisp attack and sharp focus are not crucial—especially if you want to add some nice, easygoing tube warmth.

Producer/composer and keyboardist **Rob Shirak** *has recorded and performed with many artists, including Burt Bacharach, Elvis Costello, 'N Sync, Gloria Estefan, Garth Brooks, Faith Hill, Dionne Warwick, Whitney Houston, Stevie Wonder, Sheryl Crow, Wynonna, and Chrissie Hynde.*



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SOUND QUEST/AUREALITY

INFINITY 1.0 (WIN)/BUILDING BLOCKS 2.1 (WIN)

Build customized music applications with object-oriented MIDI toolkits.

By Peter Hamlin

Sometimes I imagine coming home at night to an empty house and discovering all my MIDI instruments jamming together. The idea isn't really that far-fetched: software tools like Sound Quest's *Infinity* and AuReality's *Building Blocks*, combined with a modest computer-and-MIDI setup, let you create sophisticated and customized automatic "music machines" that become interesting and useful very quickly.

Using algorithms to generate musical information is not a new idea. In fact, such algorithmic composition is one of the earliest uses of general-purpose computers. But the visual tools offered in *Infinity* and *Building Blocks* make the technique much more accessible and enjoyable to explore.

Infinity 1.0, described by its creators as a "graphic real-time control language," arrives on CD-ROM with a compact yet thorough printed manual. *Building Blocks* 2.1, the latest version of a similar but somewhat smaller-scale program that has been around for a few years, introduces many new features and offers significantly improved performance over that of previous releases. You can order *Building Blocks* through the Internet; you will receive it as an e-mail attachment within a day or so after you place your order. Although *Infinity* and *Building Blocks* are quite similar in many ways, each has its unique strengths and features.

Infinity
Minimum System Requirements
Pentium/66; 8 MB RAM; Windows 95/98/NT 4.0/2000

WHAT'S THE OBJECT?

Both programs provide a work space on which you place functional components and interconnect them to achieve the results you want. (*Building Blocks* calls these Modules, and *Infinity* refers to them as Objects.) Some components let you get data into the work space from your MIDI keyboard, mouse, or computer keyboard, and you can then employ a random number generator, to name a couple of typical possibilities. Other components process the data: you can create a chord from each note in a riff—perhaps with a slight time delay—or constrain notes in a pattern to fit in a scale. And of course some Objects or Modules send the data back to a synthesizer so you can hear the results. *Building Blocks* calls the completed design network a Structure; in *Infinity* it's known as a Patch.

You can use these programs for just about anything imaginable that can be done with MIDI data—customized MIDI arpeggiators and echo effects, various kinds of MIDI event filters and processors, experiments with automated compositional structures, specialized drumming machines, or even ear-training exercises. You can create hypnotic and constantly changing background music, innovative compositional processes, and interactive "intelligent" electronic orchestras. Or you can develop simple, practical control functions for your studio.

IT'S A SETUP

I found that both programs were easy to set up, both located all my MIDI devices, and both made it easy to establish default ports and other settings. *Building Blocks* has a sequencerlike tape transport with a tempo setting, and you click on the Play button to activate a Structure you've created. *Infinity* has no similar tape transport, although you could easily set up a timer to regulate tempo.

Both programs offer contextual help and tutorials. In general, the help is clear and consistently organized. *Infinity* employs a standard Windows help system; *Building Blocks*' HTML-based help is less convenient because it requires you to load your Web browser and doesn't provide a search function.

I recommend that you spend time getting acquainted with each Object or Module, one by one, before you start building Patches or Structures of any complexity. Also look over the numerous examples each program offers. You will need to be comfortable with MIDI—what Velocity values are, how controllers work, how MIDI channels are organized, and the like—to get the most out of *Infinity* or *Building Blocks*.

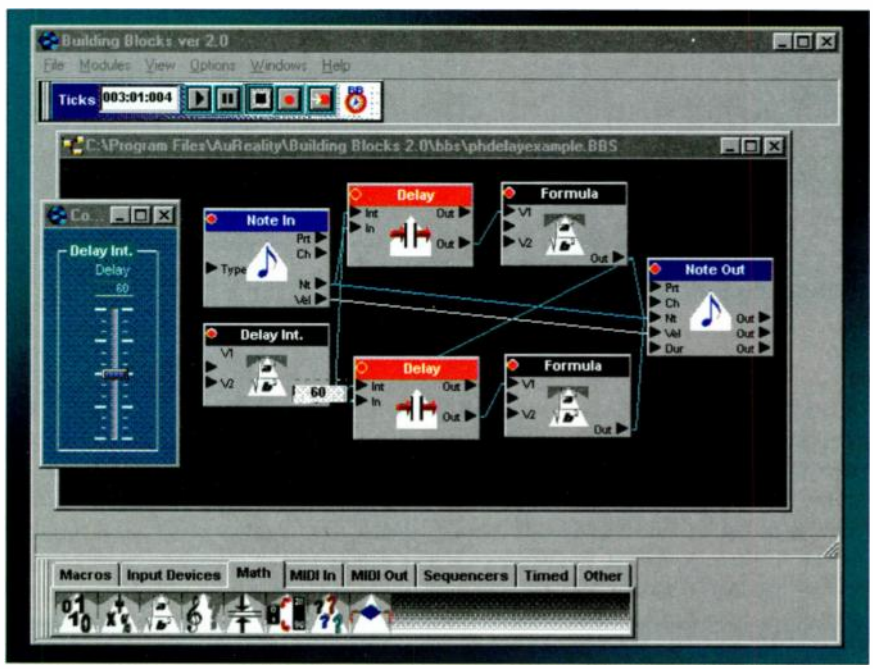
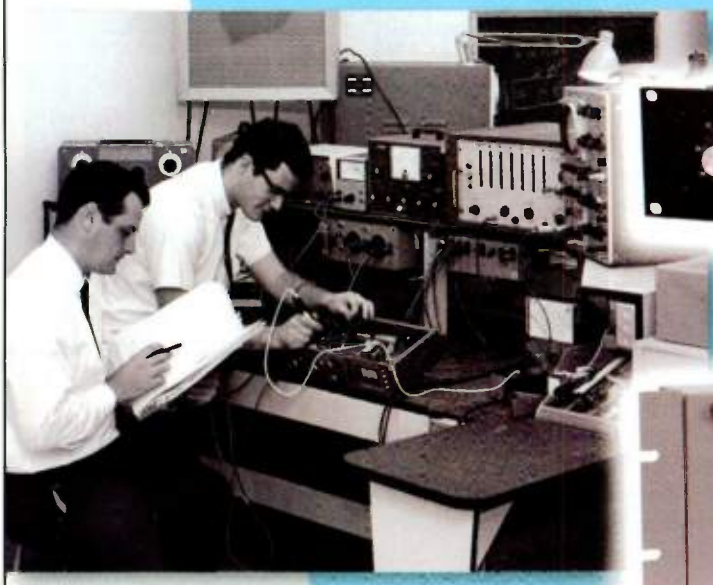


FIG. 1: A simple 2-note delay circuit in *Building Blocks* reads in the MIDI notes, delays them, adds a fifth and a ninth (7 and 14 semitones, respectively), and sends the results to an output.

For manufacturer information, please see Contact Sheet, p. 186.

Authentic Analog



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Teletronix LA-2A Leveling Amplifier

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MAKE ME A PALETTE

Both programs organize Objects or Modules by category and make them available in a hierarchical menu. The categories include math functions, timing functions, and input and output functions (see each manufacturer's Web site for a complete list of components). *Infinity* gives you the option of either seeing a huge palette containing all Objects or just viewing single-category palettes; you can also place commonly used Objects on the program's main toolbar. *Building Blocks*, with its smaller number of categories and Modules, offers a tabbed palette always located at the bottom of the screen—a handy feature.

Infinity's Objects tend to be simpler and more abstract than the Modules in *Building Blocks*, and as a rule you'll use more components to accomplish a task in *Infinity* than in *Building Blocks*. For example, with *Infinity* you use one Object to select the port from which to get MIDI data, and another Object to receive a note value from your synthesizer; a third Object might filter out Note Off messages. In *Building Blocks*, a single Note In Module allows you to select the port and choose whether to send just Note On, just Note Off, or both.

Say you want to build a simple application that follows every note played on the MIDI keyboard with two notes a fifth and a ninth above the original, with a prescribed delay. *Building Blocks* has Modules to read the notes in, delay and alter the pitch, and then send the results to an output (see **Fig. 1**); you use a Control Panel slider to set the delay. Near the top of the screen is the tape transport that controls the program, and at the bottom is the collection of Modules. You can follow the flow of the signal from left to right.

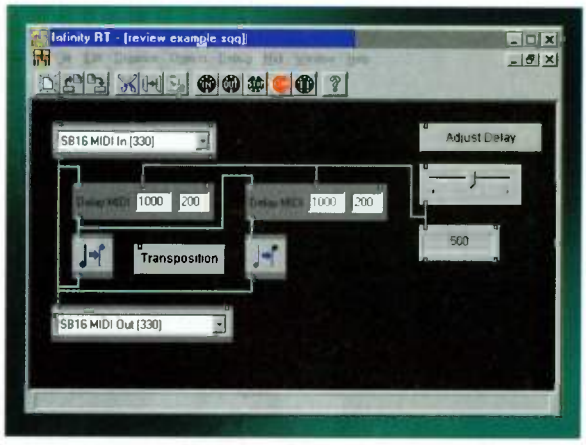

FIG. 2: A delay circuit in *Infinity* includes a Comment Object (Adjust Delay), which identifies the Slider Object that sets the delay value; and a Monitor Object, which shows that the user has chosen 500 ms as the delay time.

CREATING CAKEWALK MFX PLUG-INS WITH *INFINITY*

Cakewalk MFX (MIDI effects) plug-ins are surprisingly easy to build in *Infinity*, and the program's documentation explains the process very well. An installation of *Infinity* should include the Infinity MFX option automatically, assuming you have a copy of one of these Cakewalk programs: *Pro Audio* 8.0 or higher, *Home Studio* 8.0 or higher, and *Guitar Studio* 2.0 or higher.

FIG. A: You can use *Infinity* to build Cakewalk MFX plug-ins. In this example, notes progress from Cakewalk Event In (on the right) to the MIDI Processors, which transpose them and alter their Velocity. The MIDI In Note Object then parses the data to add 7 semitones. Finally, the MIDI message is reassembled in the MIDI Out Note Object and returned to the sequencer's control.

To create an MFX plug-in, you first create a sequence in your software, then select any number of tracks and open up a Console window. Right-click in the area at the top of the track console on which you want to create MIDI effects—that is, the space above the controls where effects are displayed—and select Infinity MFX on the submenu that appears. (You should find the process so far familiar; it's the same as selecting the built-in Cakewalk FX.) This action inserts an empty MFX Patch into the circuit, and an *Infinity* work space will come up.

Now let's create a MIDI effect that echoes every note in the designated track with a delay of 30 ticks, a decrease in Velocity of 50 percent, and a change in pitch of 7 semitones.

In the *Infinity* work space, you can create Patches that read and process data recorded in your sequencer tracks. **Fig. A** shows what such a Patch looks like. On the left, a Cakewalk Event In Object and a Cakewalk Event Out Object are connected; this setup simply plays back each note of your sequence without any changes.

On the right, a second Cakewalk Event In Object gets sent to Processor Objects that delay the note and adjust its Velocity. A MIDI In Note Object splits out the MIDI note information, so you can add 7 to the pitch number using a math Object. All the MIDI data then returns to a MIDI Out Note, where it is reassembled into a MIDI message and forwarded to another Cakewalk Event Out Object. Once you've created this effect, you could apply it to any tracks of your sequence. The Patch operates in real time while the sequence is playing.

The program works with Steinberg *Cubase VST* in a similar way. I purposely selected a very basic effect for demonstration, but *Infinity*'s flexibility and your imagination could take you far beyond this simple example. You can amplify the power of *Infinity* significantly by combining it with all of the sophisticated tools that live in your sequencer.

ONE STOP SHOP!

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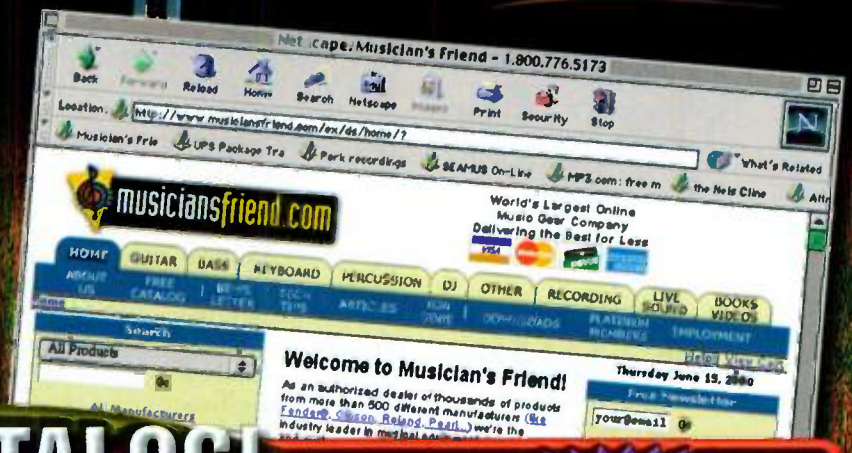

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Refer to this code: 120-0007

WRH

Infinity performs the task in a similar way: a MIDI port receives MIDI data that it sends directly to an output port but also routes to two delay lines (see **Fig. 2**; note that the signal flows from top to bottom). Two MIDI Processor Objects, shown by the icons with the notehead and blue arrows, handle transposition. (A MIDI Processor is a versatile Object that you can program to perform a wide range of operations on MIDI messages.) A slider controls the delay time. Note *Infinity*'s use of Comment Objects (Adjust Delay and Transposition)—you'll find these text labels useful for keeping track of a Patch's elements.

MODULES ON STEROIDS

Although some components of *Building Blocks* and *Infinity* are fairly simple (for instance, "add two numbers together"), others are quite elaborate, almost like complete programs in themselves. *Building Blocks* has Echo and Arpeggiator Modules, ready to use right out of the box. Other extremely useful Modules include the Bias Clock, which allows random variations in a timing pattern and can serve many musically interesting uses. The program also provides Drummer, Normal Sequencer, Pattern Sequencer, and Phrase Modules, all with varied means of recording and playing back notes.

Infinity comes with a full-fledged multitrack sequencer, complete with conductor track, piano-roll views, track views, editing features, and more. You could create your own special-purpose sequencer with this Object, or use it within a larger Patch for any number of sophisticated functions—all easily controlled with user-installed buttons or by signals generated elsewhere in the Patch or from other MIDI instruments. You could even create polyrhythmic pieces by simultaneously playing several sequencer Objects, each with its own tempo map. (Most sequencers, including those in the Cakewalk line, by contrast have only one tempo map that regulates all tracks at once.) I also expect that user-created Object libraries will be available soon; in fact, *Infinity*'s Other menu category provides a place for third-party objects.

Infinity's Sub Patch and Disc Patch Objects let you easily create customized and reusable Objects of your own. *Building Blocks* has a similar component called a Macro Module. With these features, you can encapsulate complex functions into single custom Objects or Modules of your own design that you can reuse elsewhere within a Patch or Structure—or even in different programs—increasing the power and clarity of your designs.

TOOLS FOR CONTROL FREAKS

Infinity includes a large number of control Objects such as buttons, sliders, monitors, and LED indicators. It is extremely helpful to insert these items into a Patch to allow interactive changes in values (through a slider, say) or to indicate that a timer or a MIDI output is working correctly. You could, for example, place LED Objects along a circuit to observe the transfer of data at several points.

Building Blocks now features a Control Panel that lets you create input controls for any Module that has at least one input. Although the program lacks similar monitoring features for its outputs, you can view the value an Object is outputting by simply placing the mouse over that Object or double-clicking on a Module to bring up an enlarged panel that displays changing input and output values in real time.

Infinity, reflecting its complexity and resemblance to a computer language, provides several different data types: Int (integer), Float (floating point), Symbol, MIDI event, SysX event, List

SOUND QUEST
Infinity 1.0 (Win)
MIDI control language
$299
upgrade $149

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

PROS: Huge supply of MIDI programming Objects. Supports playback of graphics and sound files. Customized reusable Objects are easy to create. Integrates well with *Player* editor/librarian. Can create Cakewalk MFX and Steinberg *Cubase VST* plug-ins.
CONS: Relatively expensive. Requires careful mouse aim to move Objects and make connections.

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(a listing of more than one number so that you can work with, say, multiple-byte MIDI messages as single units), Message (any combination of data types), and Hit (a trigger event). The program helps you keep track of all these data types by color-coding the "patch cords" of each, and it won't allow

▼

You can use these programs for just about anything imaginable.

connections between incompatible data categories. (Note, for example, that the blue connectors shown in **Fig. 2** represent MIDI messages, while gray connectors indicate numerical data.)

INFINITY AND BEYOND

Infinity offers several unique and quite powerful features. Among these is a collection of graphics Objects: you can actually have the program draw simple designs in real time in response to MIDI or other data. The graphics performance is a bit sluggish, but the possibilities are intriguing. For instance, you could use these Objects to create images that change in response to your music, interactive ear-training tools that respond to user input, or colorful visual MIDI monitors.

Infinity also supports playback of audio and video clips, and although you can play only one clip at a time, it's still a useful option. A particularly wild and wonderful feature is the ability to create Cakewalk MFX (MIDI effects) and Steinberg *Cubase VST* plug-ins—a significant extension of *Infinity*'s functionality. (See the sidebar "Creating Cakewalk MFX Plug-Ins with *Infinity*.") Also, you can load and send *MIDI Quest* files directly to your synthesizer. (*MIDI Quest* is Sound Quest's universal patch editor/librarian. The company reports that communications between *Infinity* and *MIDI Quest* will become even more integrated with the release of *MIDI Quest* 8.0, which features a sophisticated new command set, automation of operations, and the ability to edit *MIDI Quest* windows from within *Infinity*.)

With *Building Blocks*, you can easily record the output of your Structure as a Standard MIDI File. First, you simply click the Record button instead of Play, and once you've stopped recording you just save the data as a MIDI file. Recording the MIDI-file data is not quite as straightforward with *Infinity*, because you first have to create a Sequencer Object and then record your music into it. However, the sequencer can also record all of the program's command and control messages, so you can actually create a sequence that, besides playing MIDI data, executes various *Infinity* commands at specific times in a song.

Other people can play your *Infinity* Patches using the free *Infinity Player*, an essential if your files include audio, video, or graphics. (*Player* is not available for download, but *Infinity* users can freely distribute it along with their Patches.) Of course, you can easily save the Patches themselves in their native formats in both programs.

ROOM FOR IMPROVEMENT

Building Blocks and *Infinity* are impressive performers, but they're not perfect. I wish both programs made it easier to move multiple patch cords; I often found myself wanting to move a group of patch cords from one input or output to another, or to insert an Object or a Module into a circuit, but both programs require that you remove and then reconnect patch cords one at a time. *Infinity* does let you substitute one Object for another, automatically replacing appropriate connectors if

AUREALITY
Building Blocks 2.1 (Win) modular MIDI toolkit
$59.95

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

PROS: Good value. Modules are powerful and flexible. Can do a lot with relatively simple Structures.
CONS: HTML help system has weak search abilities and requires a Web browser.

Building Blocks
Minimum System Requirements
Pentium/100; 8 MB RAM; Windows 95/98/NT; Web browser (for using the help system)

possible. More automated features like this would be helpful. I would also love to see "monitor" Modules added to *Building Blocks* for observing outputs—or at least have the option to create output-monitoring options in the Control Panel.

A small operational annoyance with *Infinity* is that you must aim the mouse on a minuscule area of an Object to move it or make a connection. I did get used to doing this, but it still felt like a bad day at a video target-shooting parlor. Similarly, when I connected cables to inputs in *Building Blocks*, I had to aim the cursor a little low to hit the target.

I also wish that *Infinity* had a better way to organize its huge number of Objects: the small palettes for each of the 13 categories quickly clutter your screen, and you can't resize or close them with the mouse (although you can go through a menu to do so). In addition, the program has a huge and comprehensive palette, organized alphabetically, but it is too large and undifferentiated to be of much use. You can add frequently used items to the toolbar, but only as many as will fit in one row; the option of a user-customized palette, divided into categories, would be wonderful.

I really like *Infinity*'s "smart cords" feature, which automatically routes patch cords in neat square angles within the work space (as shown in **Fig. 2**). But I'd prefer that the cords *stay* smart when you move Objects! As the program works now, once you start moving your neatly wired Objects, you quickly end up with a scary-looking screen because the cords no longer line up.

Here's a pie-in-the-sky wish: wouldn't it be wonderful if *Infinity Player* could run in Java? That way, any Patches you create could function on any platform, as well as on the Web. It may not be technically feasible (especially considering that the program makes direct use of Windows routines), but if it could implement Java support, *Infinity* would be *the* MIDI toolkit to own.

LAST WORDS

If you want to take control of MIDI, customize your studio, process music data in imaginative ways, explore algorithmic composition, or create interesting rhythms and sound structures, *Building Blocks* and *Infinity* will be welcome additions to your studio. Try the demos and see which program suits your style. In my opinion, *Building Blocks* is almost too cheap *not* to buy, especially given all that it can do. On the other hand, the much pricier *Infinity* offers many tempting features, including the ability to create Cakewalk MFX and *Cubase VST* plug-ins; audio, video, and graphics support; and an interface with the *MIDI Quest* editor/librarian. With its serious programming power, *Infinity* is an important new tool for electronic musicians.

Peter Hamlin *is a composer who teaches at Saint Olaf College and is a member of the electronic-music improv band Data Stream.*

MACKIE DESIGNS

1604-VLZ PRO

Mackie reinvents the compact 16-channel mixer.

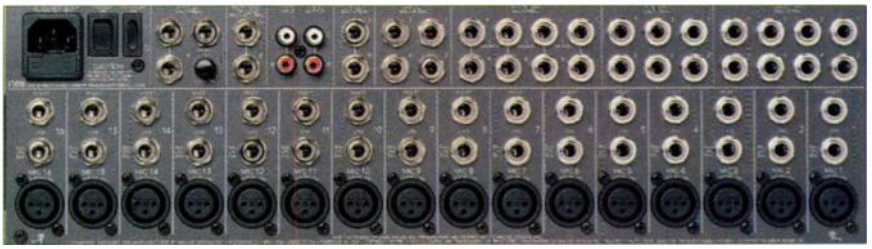


FIG. 1: The 1604-VLZ Pro offers 16 XLR inputs with phantom power, TRS inputs, stereo RCA tape inputs and outputs, and direct outs on channels 1 through 8.

By Robert DeFord

When I'm feeling frustrated with my work, it's usually my creativity, not my equipment, that is lacking in some way. This knowledge gives me strength; I can ignore the hype that surrounds product introductions and keep my wallet securely in my pocket. For example, I have been happily using my trusty Mackie CR-1604 mixer for the past seven years. Unfortunately, that long and peaceful interlude came to an abrupt end when **EM** asked me to review the new Mackie 1604-VLZ Pro mixer.

Unlike my old CR-1604, the 1604-VLZ Pro provides balanced XLR mic inputs with phantom power on all 16 channels. (A switch on the rear panel globally controls the phantom power.) It also has balanced/unbalanced TRS inputs for all 16 channels. These inputs share the circuitry (but not phantom power) with the mic inputs, which makes the 1604-VLZ highly adaptable to a variety of studio setups and input sources (see **Fig. 1**). For example, my Kyma sound-design workstation (like most gear with electronically balanced outputs) could be damaged if it were plugged into a phantom-powered input. That's not a problem with the 1604-VLZ Pro: I just plug the Kyma into the TRS inputs. The mixer also offers a handy set of stereo tape-in and tape-out RCA jacks for a CD player, tape deck, or DAT recorder.

The possibilities inherent in the 1604-VLZ's design are just about endless.

This mixer can take virtually any signal you throw at it. Acceptable signals range from instrument levels as low as –50 dB to line levels of –10 dBV and +4 dBu. The trim controls provide 60 dB of gain on each of the 16 channels, and the knobs are along the top row of the channel strips, so you can get to them without reaching behind the unit. Moreover, the knobs are nice and big with clear, easy-to-read markings. And as with the original CR-1604 mixer, all of the input and output connections are housed in a "convertible pod" unit that rotates forward for tabletop use and back for rackmount use (a set of rack ears comes with the mixer).

Mackie's 1604-VLZ Pro 16-channel mic/line mixer with premium XDR microphone preamplifiers is at home in both live-recording and personal-studio settings.

A SOUND APPROACH

As a sound sculptor, I often capture natural sounds to use as raw-input waveforms for a variety of synthesis techniques. However, I can't always provide the strong input signals that my old CR-1604 likes to receive. (Just try getting your pet bird to hop up and sing directly into your microphone, or getting a cat to purr at the same volume as a saxophone.) So I was eager to see how well the 1604-VLZ's new Extended Dynamic Range (XDR) mic preamps would perform. I tested the mixer with my little quartz metronome, which has a great *tock* sound that could make an excellent base waveform for some granular synthesis.

I placed an AKG C 1000S microphone about five feet from the metronome. With this arrangement, the mic would pick up a little reverb from the room along with the *tock*. I connected the mic to channel 1 of the mixer and ran a cable from the TRS direct output of channel 1 to the Kyma's input. (Channels 1 through 8 on the 1604-VLZ Pro have direct outs that are post-trim, post-EQ, postfader, and postmute.) I ran the Kyma's output into channels 3 and 4 and monitored the main left/right bus with my headphones. (By the way, the mixer has both stereo control-room and headphone outputs in addition to its main outs.)

Before I sampled the metronome, I

For manufacturer information, please see Contact Sheet, p. 186.

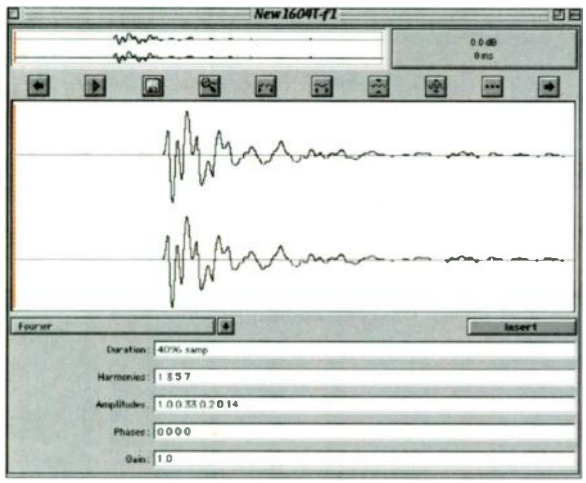


FIG. 2: Here a single *tock* from a quartz metronome is sampled with a Kyma sound-design workstation through the 1604-VLZ Pro.

used the mixer's EQ section (as I often do) to modify the sound, and I was pleasantly surprised by the control it offered. The 1604-VLZ's 3-band, midsweep equalization section includes a Low Cut switch that reduces bass frequencies below 75 Hz at a rate of 18 dB per octave. When used with the Low EQ knob, the Low Cut switch lets you safely increase frequencies at around 80 Hz by up to 15 dB without adding a bunch of subsonic noise to the mix. Because this frequency corresponds to the punch in bass guitars, kick drums, and fat synthesizer patches, the Low EQ section has great sound-shaping potential.

The two-knob Midrange EQ, with its fixed bandwidth of 1½ octaves, is also very useful. The Mid knob sets the amount of boost or cut to up to 15 dB, and the Frequency knob sweeps the center frequency from 100 Hz to 8 kHz. I was quite pleased by the control that this section gave me over midrange musical sounds. The Hi EQ knob provides up to 15 dB of boost or cut at 12 kHz—just the right frequency to make my sampled cymbals sound hotter—and it adds an overall clarity to my sound sculptures.

Once I had the *tock* properly equalized, I sampled it, and the results amazed me. As you can tell from the dead-flat baseline to the left of the main pulse in **Fig. 2**, the 1604-VLZ recorded virtually no noise. The main pulse rises rapidly and is very clean. The room reverberations to the right of the main pulse smoothly decay into total silence. Sweet, natural reverb like this is hard to duplicate electronically.

STUDIO STUDIES

I spent two weeks recording a lot of samples with the 1604-VLZ Pro and created a small sound sculpture using my sequencer. Typically I use anywhere from 12 to 20 virtual sequencer tracks to create and store MIDI events for a sculpture. In a sound-sculpting environment, the mixer's main job is to mix the signals from various MIDI-controlled electronic sound-making devices and processors cobbled together to create a sound palette.

In this regard, the 1604-VLZ is a wonderful tool. Its Constant Loudness pan controls and precision 60 mm faders enable you to create an extraordinarily detailed and clear stereo image. It can handle a wide variety of signals and allows you to record the results flawlessly to a DAT or hard disk recorder. But I still had a big unanswered question: how well would it work in a conventional multitrack recording studio?

To find an answer, I visited Joe Doria, a voice-over and sound-effects specialist who has a 1604-VLZ Pro in his modest home studio. Doria has good ears, knows a lot about recording techniques, and has owned his 1604-VLZ Pro long enough to have given it a good workout.

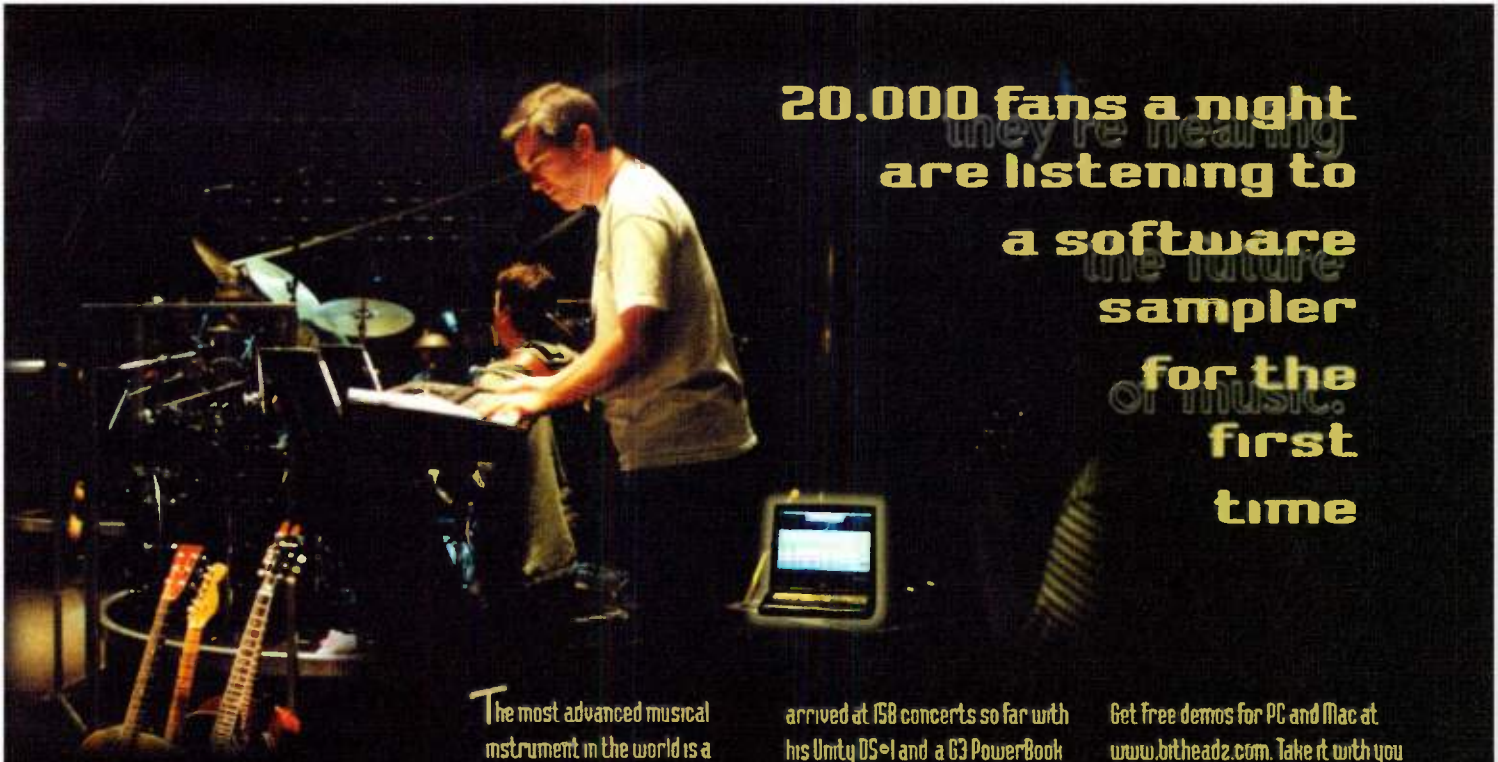
We used a Midiman Delta 1010 PCI hard disk recording system at the front end to feed eight tracks into Sonic Foundry's *Vegas Pro* multitrack program. The 1604-VLZ's direct outs are very handy in this configuration, and we ran six of them directly into the Delta.

Because the 1604-VLZ Pro is a 4-bus mixer, you can route signals in a number of ways to accommodate different recording situations. For example, you might use channels 1 through 6 for sound sources such as vocals, guitars, and synths (see **Fig. 3**). These signals pass through the channel-strip controls, which can feed the signals into the mixer's output section or out through the direct outs.

In our setup, Doria and I patched

1604-VLZ Pro Specifications

Input Channels	(16); 0–60 dB gain
Subgroups	(4) with left and right
Inputs	(16) high-headroom balanced XLR mic; (2) RCA tape
Outputs	(2) Main, ¼" balanced TRS; (8) Channel Direct (ch. 1–8), ¼" balanced TRS; (4) Subgroup Direct, ¼" balanced TRS; (2) RCA tape; (1) ¼" stereo headphones; (2) ¼" balanced TRS control room
Channel Inserts	(16) ¼" balanced TRS
Channel Aux Sends	(6) ¼" balanced TRS
Channel Aux Returns	(4) ¼" stereo TRS
Channel EQ	3-band active; High shelf ±15 dB @ 12 kHz; Mid peak ±15 dB, sweep 100 Hz–8 kHz; Low shelf ±15 dB @ 80 Hz; Low Cut Filter 18 dB/octave, –3 dB @ 75 Hz
Faders	(16) channel; (4) subgroup; (1) stereo main; all 60 mm, logarithmic-taper
LEDs	Channel: Signal Activity/Solo; Overload/Mute; Master: (1) Solo; (1) phantom power
Phantom Power	Globally switchable (on XLR inputs only)
Frequency Response (Mic in to any out)	20 Hz–60 kHz (+0/–1 dB) 10 Hz–100 kHz (+0/–3 dB)
Total Harmonic Distortion	<0.0007% (1 kHz @ 14 dBu)
Noise	–84 dBu (main mix fader and channel faders at unity)
Channel Crosstalk	84 dBu (1 kHz relative to 0 dBu)
Dimensions	Rotopod up: 11U rack-mount × 6.6" (H); Rotopod down: 8U rack-mount × 9.3" (H)
Weight	20 lbs.



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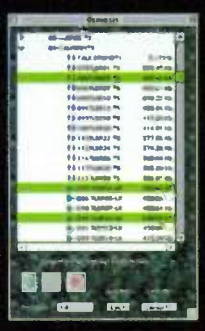

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from the channel direct-out jacks to inputs 1 through 6 of the hard disk recorder. We still had ten other input channels to work with, so we used channels 7 through 12 on the mixer for six drum-set microphones. Using one of the channel-strip switches, we routed these channels to sub outs 1 and 2 (you can just as easily switch them to sub outs 3 and 4 or the main L/R bus). Then we patched sub outs 1 and 2 to inputs 7 and 8 of the hard disk recorder. With this configuration, we ended up with a mix of the six drum mics going to tracks 7 and 8 on the recorder.

The possibilities inherent in the 1604-VLZ's design are just about endless. The eight direct outs and four submix buses provide great flexibility, which complements the exceptional performance of the XDR microphone preamps. Further reinforcing my favorable first impression are numerous little engineering details: LEDs for signal activity (–20 dB), solo, and overload on every channel; the big, bright-red Solo LED in the main section; the control-room monitoring section; the stereo RCA connections and front-panel level controls for tape- or CD-player input; the versatile output section; and the built-in power supply. The mixer's solid-steel chassis and overall construction quality also impressed me; like the original CR-1604, the 1604-VLZ Pro is built like a tank.

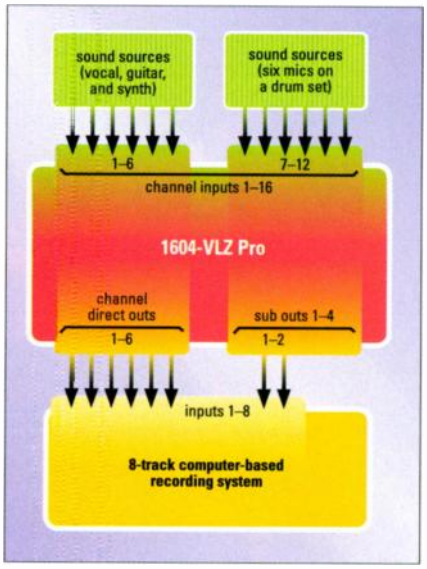


FIG. 3: This shows one of the many 1604-VLZ Pro configurations used in Joe Doria's home studio. Having eight direct outs and four sub outs lets you configure the mixer readily to meet a wide variety of recording challenges.

THE BOTTOM LINE

Mackie has crammed a lot of mixer into an 8U rack-mountable chassis, and has enhanced the mixer's appeal and versatility with thoughtful design and careful mechanical engineering. Everything from the sealed rotary controls to the front-panel BNC lamp socket illustrates the company's attention to detail.

What's more, the 1604-VLZ comes with a great manual. It's a gem for beginners and a handy reference for old pros. Not only can you find information quickly, but it's written with just enough humor to make you want to read it.

In short, the 1604-VLZ Pro can help you produce excellent work. No mixer anywhere near this price range has mic preamps superior to the Mackie XDR preamps. If you have a "lone monk" home studio, as I do, you can use the 1604-VLZ Pro to mix a wide variety of off-the-wall sound sources and create recordings that will satisfy the most discriminating audiophile.

If you have a more conventional home studio, you can please any client or record your own group's demo tape or CD with a quality that may just rival that of demos produced on high-end studio consoles. And if you make 8-track hard disk recordings, you'll smile every time you step into your studio, because the 1604-VLZ Pro is a perfect fit for your needs.

Robert DeFord *creates sound sculptures and electronic fantasies. Special thanks to Joe Doria, owner of Log Cabin Studio, for his help with this review.*

MACKIE DESIGNS
1604-VLZ Pro 16-channel mixer
$1,249

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

PROS: Outstanding audio quality. Flexible I/O capabilities. Rugged construction. Well-designed user interface. Excellent and entertaining documentation.
CONS: None.

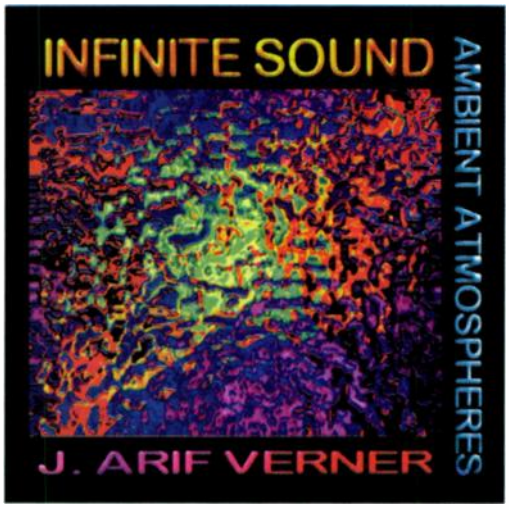
QUICK PICKS

DISCOVERY FIRM

Infinite Sound: Ambient Atmospheres

By Julian Colbeck

Infinite Sound: Ambient Atmospheres, indeed. J. Arif Verner has a good ear not only for sample-CD titles, but also for his music, which twists, turns, loops, and gloops throughout this 1-hour-plus aural cyclorama.



The *Infinite Sound: Ambient Atmospheres* sample CD from Discovery Firm features otherworldly sounds and spacey effects to fire your imagination.

The contents of this audio CD ($99.95) are divided into four categories: Vignettes (samples less than 1 minute in length); Motifs (samples more than 1 minute in length); Construction Set (component parts of a complete piece of music); and Multisamples (sounds and effects at different pitches).

Noises From Afar

In a broad sense, we're talking about outer-space noises, synthy textures, sounds, rhythms, and effects that have no equivalent within traditional-instrument confines. Frankly, if people used synthesizers in the way that they were originally designed to be used, there would be no need for this kind of product. But we don't, so there is.

The disc's recording quality is top-notch—not a harsh reverb or a jittery sample within earshot. The titles in the Vignettes categories say it all: Star Shooter, Cosmic Yawn, Radio Robot, and Brain Chatter, which leads me to wonder if Verner programmed (or at the very least, named) patches for Korg in a past life; if not, a career awaits. The samples are clearly timed and well documented in the clean, informative CD booklet, which indicates pitch and key information where relevant.

The Rhythms subsection of the Vignettes category features many infectious and original grooves; Navaka Soul and the twangy, 7-part Modulation collection are my favorites. Two other subsections, Processed Guitars and MIDI Guitar Synth, feature delightfully unguitarlike noises and effects, from the scampering Les Paw (I told you that Verner was good at titles) to the Beatles-esque backward guitar of Inverse. A standout in MIDI Guitar Synth is City Strut, which resembles Steve Hackett's "Clocks." While most self-respecting guitarists with a decent stompbox could probably produce similar material, most keyboardists cannot, so this is valuable fare.

Motif Extractions

The longer Motifs, similar in style to the Vignettes, would make excellent loops for exhibitions, Web sites, and multimedia presentations. You could simply use them as backdrops that could perhaps pique your own creativity.

Longer still, Construction Set comprises six parts of a miniature Verner composition, Animal Sleep, that the composer recommends you reassemble or dissect as you wish. The distinction between this set of whizzes, whooshes, and rattles and any other on the CD is a little hard to figure out, but as ever, detail and delicacy abound.

Lastly, the Multisamples offer different pitches of a groove or texture. Some intervals are as wide as octaves (Bubbles); others are just a third or fourth apart, allowing you to build up a useful sample patch.

Jumping-Off Points

Track 99, Oxymoron—the final sample on this generously lengthy disc—left me wondering how far Verner was keeping his tongue in his cheek. A fossilized-on-CD collection of constantly evolving sounds is indeed a contradiction in terms, and Verner does implore you to use these sound images as starting points—"question marks left to be answered," he says.

Infinite Sound: Ambient Atmospheres is neat in both senses of the word. The documentation is concise yet adequate, and the recording quality is faultless throughout. Well done, Discovery Firm. Thank you for bringing us this beguiling and creative collection.

Overall EM Rating (1 through 5): 4.5

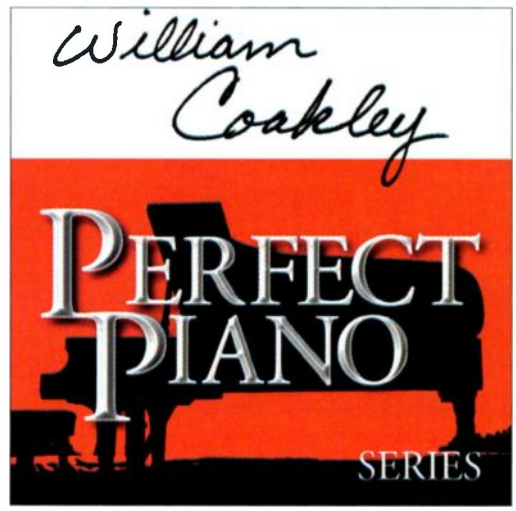
WILLIAM COAKLEY SOUND DESIGN

Perfect Piano Series, vol. 3

By Jeff Burger

Capturing the acoustic piano in all its complexity is perhaps the toughest challenge facing today's sampling technology. Add subjectivity to the mix and you have one difficult beast. William Coakley's *Perfect Piano Series,* vol. 3 CD-ROM ($399; available for E-mu E4, Akai S5000, SampleCell II, and all Kurzweil formats) is currently one of the finest offerings in this difficult genre. I reviewed the E4 version.

Volume 1 (reviewed in the May 1997 issue of **EM**) sampled a 1986 Steinway D in a concert environment. The data from that product went into the popular Ensoniq ZR-76 synthesizer and subsequently the ZR expansion boards for the



William Coakley's *Perfect Piano Series,* vol. 3, sample CD-ROM offers pristine new 24-bit samples of the same 1986 Steinway D grand piano he sampled for vol. 1.

For manufacturer information, please see Contact Sheet, p. 186.

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E-mu Proteus 2000. Coakley's vol. 2 focused instead on a 10-foot 2-inch Fazioli, an Italian-made piano. With vol. 3, Coakley revisits the 1986 Steinway D, but this time he used a new arsenal of 24-bit recording gear, including Apogee AD-8000 converters, a Focusrite Red 1 preamp (along with Amek and Earthworks preamps), and a gaggle of premium microphones. The results are Coakley's best work to date.

Selective, Secretive Sampling

Coakley is secretive about some of his techniques, but essentially he tracks using an array of microphones in various combinations and positions, then selects the most satisfactory configuration. He culled the four banks on vol. 3 from 25 sample sets. Coakley feels that the real quality comes from the programming phase rather than from the sampling phase, however: whereas his sampling sessions lasted about two weeks, the programming to optimize the results for various sampler formats took a year and a half!

Most of Coakley's competitors provide various load sizes consisting of different sample intervals, lengths, loops, and velocity layers. Coakley's approach, by contrast, is simply to get the best-sounding pianos. He goes for a natural sample, with loops kicking in long after the player would have released the keys in the course of the average piano passage (about 5 seconds on the bass end). At that point, the loop and its low sustain are noticeable on single notes, but the loop will still add harmonic warmth when masked by the presence of multiple notes. Coakley also manages to get great dynamics out of just two velocity layers, with the break point typically occurring around Velocity values of 100 to 110.

Bank on It

In keeping with Coakley's bare-bones philosophy, each bank has only a handful of presets. These consist largely of EQ tweaks designed to ensure that the sounds will work well both alone and in various mix situations. There's no fluff—such as fake honky-tonk pianos—and there's little guesswork.

The 81 MB Enhanced bank benefits from Coakley's improved sampling setup and sets a new standard in quality. Its warm, round sound definitely evokes a Steinway and makes for a nice solo piano. The Enhanced Plus bank, at 72 MB, is a welcome effort, with more control in the lower velocity ranges and an optimized response for the various controllers on the market. My favorite, the 60 MB Sennheiser bank, incorporates the same basic setup as the Enhanced bank, but Coakley recorded it using Sennheiser MKH 80 condenser mics. The results are a bit thinner and more percussive (a cross between a Steinway D and a Yamaha C7), allowing this bank to sit better in a mix.

The Enhanced, Enhanced Plus, and Sennheiser banks all employ two velocity layers. The 26 MB Bounce bank, on the other hand, consists of a single layer resulting from the mix of six different tracks. The effect is more like that of a rock 'n' roll piano that really stands out in a mix. The EQ applied on the Bounce bank rolls off some of the bass, which makes it ideal for situations in which left-hand piano and bass guitar might otherwise compete for the same frequency range.

Customer Service

Coakley provides a personal touch that is rare in the digital age. With few exceptions, he sells the CDs direct and made to order. For the most part, there is no documentation. This is partly because little is needed, but mostly because Coakley welcomes the opportunity to walk each customer through the critical yet individual process of optimizing controller velocity curves and bank/preset choices.

Beyond the MP3 samples on his Web site, Coakley advises potential buyers that "if they like what they hear on the ZR, they'll love the *Perfect Piano Series*. Besides, I'm the only piano sample developer that sells his own work and dares to answer his own phone." From my experience with the E-mu E4 version, Coakley's phone is likely ringing with compliments rather than complaints.

Overall EM Rating (1 through 5): 4.5

EAST WEST

Percussive Adventures

By David Rubin

East West's *Percussive Adventures* ($399.95) is a rare treat: a four-disc sample collection in Akai and audio formats that is thoughtfully conceived, well performed, carefully produced, and thoroughly documented. The brainchild of film and TV composer Christopher Page, *Percussive Adventures* offers 95 multilayered percussion-oriented beds that are intended

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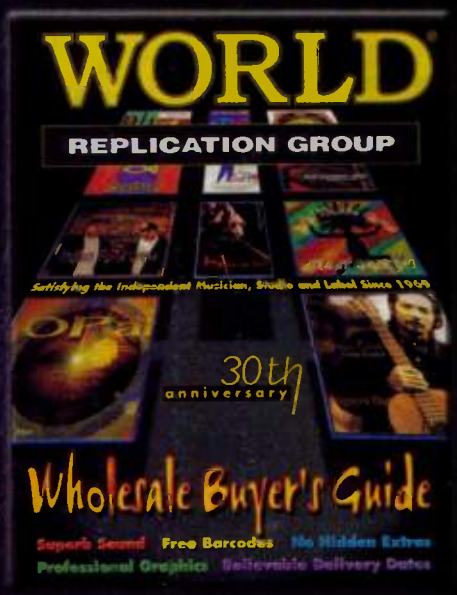

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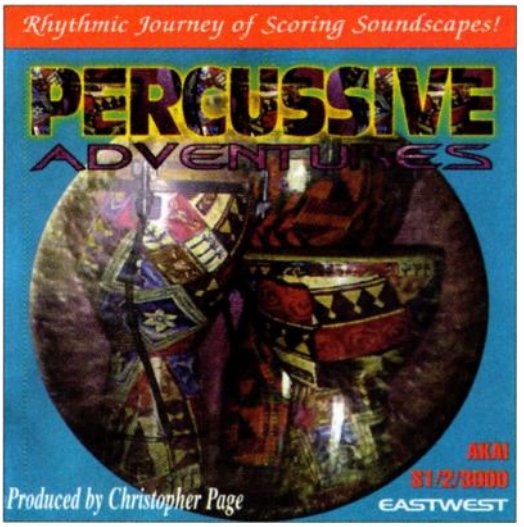
specifically for film, video, and multimedia composers. If you're looking for a standard assortment of drum-set grooves to use in your next hip-hop or funk project, this is definitely *not* the place to look. *Percussive Adventures* offers an array of richly crafted soundscapes that showcase the creative skills of percussion wizards Kim Edmundson, Tony Humecke, Jorge Patrono, and Kurt Wortman.

Some tracks are only a few seconds long, but most of them range from about 20 to 45 seconds, so you can easily generate extended beds without using too many loops. Many tracks include long reverb tails at the end that have a smooth, natural-sounding finish. Moods range from somber and portentous to light and humorous; tension levels go from new-age mellow to high-tech, high-anxiety.



The *Percussive Adventures* collection from East West comes in a four-disc set combining an audio CD with three Akai CD-ROMs. It also comes as a two-disc audio-CD set. Both sets offer an impressive and well-produced collection of atmospheric percussion beds ideally suited to film and TV scoring projects.

Most of the disc set's tracks appear in the Chase/Sneak/Tension/Mystery & Suspense category, whose 64 tracks offer atmospheric, evocative beds that conjure up dark moods of foreboding danger or dramatic tension and suspense. They're so effective, you may break into a cold sweat just listening to them.

These selections feature a colorful assortment of timpani, tablas, bongos, congas, snares, toms, and kick drums along with bowls, cymbals, gongs, waterphones, shakers, and various percussion "toys." Synthesized sounds and samples provide additional color.

Movie Magic

Percussive Adventures excels at capturing the cinematic ambience that most of us have come to expect in film scores. In fact, it uses the names of famous movies to identify tracks and help you focus on each mood and style—a clever device. For example, Independence Day features a full complement of tom-toms and tablas producing a powerful, driving, rhythmic pulse with accents that are perfect for a high-energy chase scene. The Fugitive offers another kind of fast-moving pulse, this time with a Korg Wavedrum and high-pitched metallic effects. Patriot Games combines rapid, breathy percussion with tambourine and echoing accents. And the creepy Alien track emanates an ominous low pulse with heavy reverb, chord clusters, high percussive accents, and blasts of steam. A surprising collection of sounds—including an eerie bowed gong and a processed ocarina—contributes unusual colors and textures to the other tracks as well.

Most of the selections are packed with creative potential and may give you the perfect tool for breaking through a stubborn case of composer's block. If you already know what you want, *Percussive Adventures* can provide a solid and appropriately atmospheric foundation on which to build your orchestrations. Just add melodies, riffs, or harmonic accents and you're well on your way.

The remaining categories include Ethnic (16 tracks that suggest locales such as Asia, Africa, and South America), Military & Special Ops (8 tracks emphasizing snare and bass drum parts), and Comedic & Cartoons (7 tracks with lots of boings, splats, whistles, and other funny sounds). At the end of the CD, two additional tracks contain handy percussive accents and an assortment of wonderful echo trails.

Getting Organized

From an organizational standpoint, the *Percussive Adventures* set is a pleasure to work with. The first disc is an audio CD that includes all of the multilayered tracks in the collection. The second disc provides the same tracks in Akai S1000/2000/3000 format. The audio CD allows you to audition the various tracks with your CD player, so you don't have to load tracks into your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sampler just to listen to them. This saves production time and energy, and lets you import tracks directly from the audio CD into an audio-editing program for processing or layering.

The third and fourth discs include the individual layers and solo samples from each track (in Akai format), so you can add elements to the original track or build your own versions by juggling parts from one or more tracks. A click track is provided (on MIDI note 96), letting you easily synchronize layers and samples when necessary.

A Good Book

The documentation is exemplary: each track listing includes a brief description, along with the track's duration in seconds and the tempo its bpm. Film and video composers will appreciate that the tempos are also listed in frames per beat (at frame rates of 24, 25, and 30 fps). In addition, the last two Akai CD-ROMs list each sample's size in megabytes and indicate the multisample key ranges.

If you don't have an Akai sampler, you can purchase *Percussive Adventures* as a two-disc set of audio CDs ($149.95), with the complete tracks on the first disc and many of the individual parts on the second. In either format, this is a well-produced and valuable resource for adding some compelling drama (or comedy) to scores.

Overall EM Rating (1 through 5): 5

TC WORKS

TC Native Bundle 2.0 (Mac/Win)

By Scott R. Garrigus

Since it was first released, TC Works' *TC Native Bundle* (reviewed in the June 1999 issue of **EM**) has not changed a bit, and that's not a bad thing. Version 2.0 offers the three excellent-sounding plug-ins that made the first version popular with musicians: the wonderful *TC Native Reverb* (reverb), *EQ Works* (equalization), and *DeX* (compression). The plug-ins are available in VST, MAS, and DirectX formats.

Added Value

One important new addition to the package is *TC Native L*, a single-band limiter/maximizer with a reduction meter and controls for threshold, attack, hold, and release. Like the other plug-ins in this bundle, it has peak meters for input and output levels, stereo controls, ROM presets, and Compare options. And also like the other plug-ins, *TC Native L* has no bypass button; you have to bypass it from within the host application.

TC Native L includes TC Works' automatic makeup gain technology, which lets you easily achieve very hot levels without clipping. This makes *TC Native L* a nice mastering tool. It also comes with a histogram tool that gives you an accurate view of the amount of processing you apply to a signal. A histogram can show you the frequency levels in a file before and after processing. It also lets you compare frequency levels before and after—the difference between input and output—so that you can precisely control the amount of processing you apply. You can switch the histogram's scale between –96 to 0 dB and –24 to 0 dB.

TC Works has changed the cumbersome, key-based copy-protection scheme present in previous versions of the bundle: version 2.01 (now shipping) employs a more user-friendly "challenge-response" system, which simply asks you to type in the appropriate code.

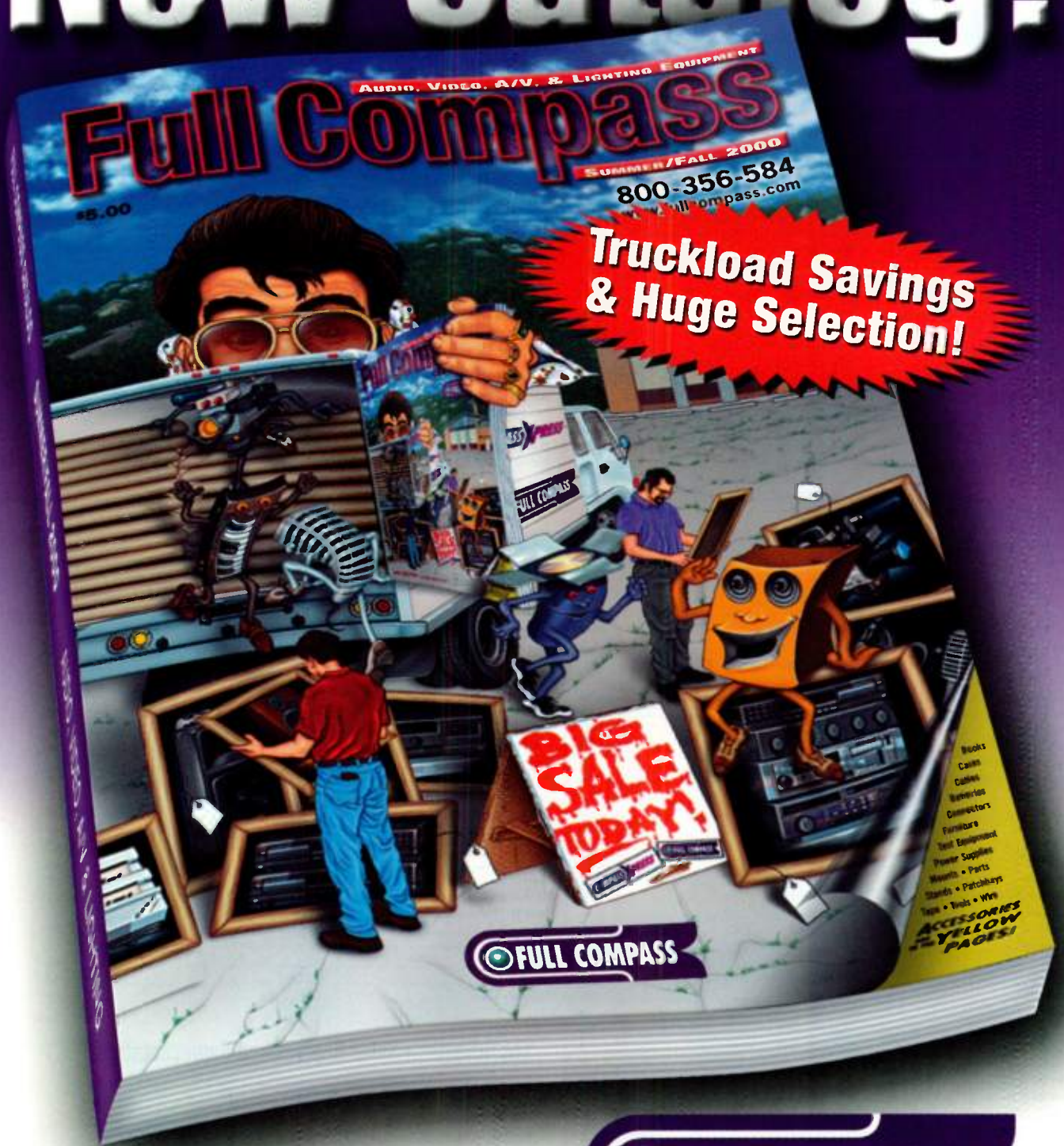
Nice Price

The most remarkable thing about *TC Native Bundle* 2.0 is that TC Works has lowered its price from $599 to $499. (Version 2.0 or later is available as a free upgrade for registered owners of version 1.0.) Because of its excellent audio quality, the addition of *TC Native L*, and the reduction in price, *TC Native Bundle* 2.0 is a product that is well worth the investment. ●

Overall EM Rating (1 through 5): 4

TC Works' *TC Native Bundle* 2.0 retains the three plug-ins found in version 1.0 and adds *TC Native L*, a single-band limiter with automatic makeup gain and a histogram tool.

New Catalog!



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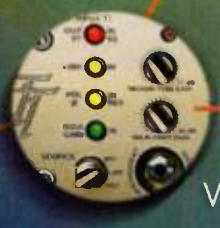

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William Coakley Sound Design tel. (800) 742-6625 or (561) 582-7709; fax (561) 547-8205; e-mail info@williamcoakley.com; Web www.williamcoakley.com

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DIGITAL MULTI-TRACK RECORDERS

TASCAM MX-2424 24-Bit 24-Track Hard Disk Recorder

Co-designed by TASCAM and TimeLine Inc., the MX-2424 is an affordable 24-bit, 24-track hard disk recorder that also has the editing power of a digital audio workstation. A 9GB internal hard drive comes standard as well as a SCSI Wide port that supports external LVD (Low Voltage Drives) hard drives from up to 40 feet away. An optional analog and several digital I/O cards are available so the MX-2424 can be configured to suit your work environment. SMPTE synchronization, Word Clock, MIDI Time Code and MIDI Machine Control are all built in for seamless integration into any studio.

- Records 24 tracks of 24-bit audio at 44.1 or 48 kHz, or 12 tracks at 88.2 or 96 kHz. Up to 24 tracks can be recorded simultaneously using any combination of digital and analog I/O
- Supplied 9GB internal drive allows 45 minutes of audio across all 24 tracks
- Wide SCSI port on the back panel allows you to add multiple drives. A front 5-1/2" bay available for installing an additional drive, or an approved DVD-RAM drive for back-up.
- ViewNet MX, a Java-based software suite for Mac and PC offers DAW style editing of audio regions, dedicated system set-up screens that make set-up quicker and easier and track load screens that make virtual track management a snap. Connects to a computer via a standard Ethernet line.
- Can record to Mac (SDII) or PC (.WAV) formatted drives, allowing later export to the computer. The Open TL format allows compatible software to recognize virtual tracks without have to load, reposition and trim each digital file.

Transport Controls-

- Jog/scrub wheel
- MIDI In, Out, and Thru ports are built-in for MIDI Machine Control.

Editing-

- Built-in editing capabilities include cut, copy, paste, split and ripple or overwrite
- 100 levels of undo
- Supports destructive loop recording and non-destructive loop recording which continuously records new takes without erasing the previous version.

Build-In Synchronization-

- TBUS protocol can sample accurately lock 32 machines together for 384 tracks at 96kHz, or 768 tracks at 48kHz.
- Can generate or chase SMPTE timecode or MIDI Time Code.
- Word Clock In, Out, and Thru ports

I/O Options-

- Optional analog and digital cards all provide 24 channels of I/O. There is one slot for analog and one for digital.
- IF-TD24- T/DIF module
- IF-AD24- ADAT Lightpipe module
- IF-AE24- AES/EBU module
- IF- AN24- A-D, D-A I/O module with DB-25 connectors

Software Updates-

- System updates are made available through a front panel Smart Card slot or via computer directly from the TASCAM web site.

DA-78HR Modular Digital Multitrack

The DA-78HR is the first true 24-bit tape-based 8-track modular digital multitrack recorder. Based on the DTRS (Digital Tape Recording System) it provides up to 108 minutes of pristine 24-bit or 16-bit digital audio on a single 120 Hi-8 video tape. Designed for project and commercial recording studios as well as video post and field production, the DA-78HR offers a host of standard features including built-in SMPTE Time Code Reader/Generator, MIDI Time Code synchronization and a digital mixer with pan and level controls. A coaxial S/PDIF digital I/O allows pre-mixed digital bouncing within a single unit, or externally to another recorder or even a DAT or CD recorder. Up to 16 DTRS machines can be synchronized together for simultaneous, sample accurate control of 128 tracks of digital audio.

Features-

- Selectable 16 bit or 24 bit High Resolution audio
- 24 bit A/D and D/A converters
- >104dB Dynamic range
- 20Hz - 20kHz frequency response ± .5dB
- 1 hr. 48 min. recording time on a single 120 tape
- On-Board SMPTE synchronizer - chase or generate timecode
- On-Board support for MIDI Machine Control
- Internal digital mixer with level and pan for internal bouncing, or for quick mixes
- Track slip from -200 to +7200 samples
- Expandable up to 128 tracks (16 machines)
- Word Sync In/Out/Thru
- Analog output on DB25 balanced or RCA unbalanced
- Digital output on TDIF or 2 channels of S/PDIF

CD RECORDERS & DUPLICATORS

MICROBOARDS StartREC Digital Audio Editing/ CD Duplication System

The Microboards StartREC is the first digital audio editing system combined with a multidrive CD recordable duplication system for professionals. Audio is recorded to the internal 6.2 GB IDE hard drive using analog or digital inputs. Sample rate conversion is automatic. Tracks can be edited and sequenced using the StartREC's user friendly interface and up to 4 CDs can be recorded simultaneously. StartREC is the ideal solution for studio recording, mastering, post production or any pro audio environment requiring digital audio editing and short run CD-R duplication.

Features–

- 2X, 4X, or 8X recording speeds
- 6.2GB IDE hard drive
- Editing functions include move, divide, combine or delete audio tracks, add or drop any index or sub index, and create track fade in or fade out
- Coaxial SP/DIF or AES/EBU digital input plus optical S/PDIF I/O
- XLR balanced and RCA Line inputs and outputs
- Automatic sample rate conversion from 32 and 48kHz
- Automatic CD Format Detection feature and user friendly interface provide one touch button operation
- Front panel trim pot and LCD display provide accurate input signal and time lapse metering
- SCMS (Serial Copy Management System) is supported, regardless of the source disc copy protection status
- **StartREC Models Include:** ST2000 (2) 8x writers, ST3000 (3) 8x writers and ST4000 (4) 8x writers

DIGITAL MIXERS

Roland VM Basic 72 Digital Mixing System

The all digital Roland V-Mixing System, when fully expanded, is capable of mixing up to 94 channels with 16 stereo (32 mono) onboard multi-effects including COSM Speaker Modeling. Utilizing a separate-component design, comprised of the VM-C7200 console and VM-7200 rackmount processor, allows the V-Mixing System to be configured to suit your needs. Navigation is made easy via a friendly user interface, FlexBus and EZ routing capabilities as well as a large informative LCD and ultra-fast short cut keys.

Features-

- 94 channels of digital automated mixing (fully expanded)
- Up to 48 channels of ADAT/Tascam T-DIF digital audio I/O with optional expansion boards and interfaces
- Separate console/processor design
- Quiet motorized faders, transport controls, total recall of all parameters including input gain, onboard mixer dynamic automation and scene memory
- 24 fader groups, dual-channel delays, 4-band parametric channel EQ + channel HPF
- FlexBus and "virtual patchbay" for unparalleled routing flexibility
- Up to 16 stereo (or 32 mono) multi-effects processors using optional VS8F-2 Effects Expansion Boards (2 stereo effects processors standard)
- COSM Speaker Modeling and Mic Simulation technology
- 5.1 Surround mixing capabilities
- EZ Routing allows mixer settings to be saved as templates
- Realtime Spectrum Analyzer checks room acoustics in conjunction with noise generator and oscillator
- Digital cables between processor and mixer can be up to 100 meters long- ideal for live sound reinforcement.

Options-

- **VS8F-2 Effects Expansion Board** -- Provides 2 stereo effects processors including COSM Speaker Modeling. Up to 3 additional boards can be user-installed into the VM-7200 processor, for 8 stereo or 16 mono effects per processor.
- **VM-24E I/O Expansion Board** -- Offers 3 R-Bus I/Os on a single board. Each R-Bus I/O provides 8-in/8-out 24-bit digital I/O, totalling 24 I/O per expansion board.
- **DIF-AT Interface Box for ADAT/Tascam** -- Converts signals between R-Bus (VM-24E expansion board required) and ADAT/Tascam T-DIF. Handles 8-in/8-out digital audio. 1/3 rackmount size.
- **VM-24C Cascade Kit** -- Connects two VM-Series processor units. Using two VM-7200 processors cascaded and fully expanded with R-Bus I/O, 94 channels of audio processing are available.

EFFECTS PROCESSING

Lexicon MPX-500 24-Bit Dual Channel Effects Processor

The MPX 500 is a true stereo 24-bit dual-channel processor and like the MPX100 is powered by Lexicon's proprietary Lexichip and offers dual-channel processing. However, the MPX 500 offers even greater control over effects parameters, has digital inputs and outputs as well as a large graphics display.

- 240 presets with classic, true stereo reverb programs as well as Tremolo, Rotary, Chorus, Flange, Pitch, Detune, 5.5 second Delay and Echo
- Balanced analog and S/PDIF digital I/O
- 4 dedicated front panel knobs allow adjustment of effect parameters. Easy Learn mode allows MIDI patching of front panel controls.
- Tempo-controlled delays lock to Tap or MIDI clock

t.c. electronic M-One Dual Effects Processor

The M-One allows two reverbs or other effects to be run simultaneously, without compromising sound quality. The intuitive yet sophisticated interface gives you instant control of all vital parameters and allows you to create awesome effects programs quickly and easily.

- 20 incredible TC effects including, Reverb, Chorus, Tremolo, Pitch, Delay and Dynamics
- Analog-style user interface
- 100 Factory/100 User presets
- Dual-Engine design
- 24 bit A/D-D/A converters
- S/PDIF digital I/O, 44.1-48kHz
- Balanced 1/4" Jacks - Dual I/O
- 24 bit internal processing

D-Two Multitap Rhythm Delay

Based on the Classic TC2290 Delay, the D-Two is the first unit that allows rhythm patterns to be tapped in directly or quantized to a specific tempo and subdivision.

- Multitap Rhythm Delay
- Absolute Repeat Control
- Up to 10 seconds of Delay
- 50 Factory/100 User presets
- 24 bit A/D-D/A converters
- S/PDIF digital I/O, 44.1-48kHz
- Balanced 1/4" Jacks - Dual I/O
- 24 bit internal processing

MICROPHONES

B&H is proud to announce that we are now dealers for RØDE microphones and all other Event products.

RØDE NT-2 Condenser Mic

The RØDE NT2 is a large diaphragm true condenser studio mic that features both cardioid and omnidirectional polar patterns. The NT-2 offers superb sonic detail with a vintage flavor for vocal and instrument miking . Like all RØDE mics the NT-2 is hand-assembled in Australia and is available at a breakthrough price.

Features

- Dual pressure gradient transducer
- Large diaphragm (1") capsule with gold-sputtered membranes
- Low noise, transformerless circuitry
- Omni and cardioid polar patterns
- High pass filter switch
- -10dB pad switch
- 20Hz-20kHz frequency response
- 135dB Max SPL
- Gold plated output connector
- Gold plated internal head pins
- Shockmount, Flight Case, and Pop Filter included

SHURE KSM-32SL Cardioid Condenser Mic

The reviews are raving about Shure's new "classic" microphone. The KSM32 features Class A, transformerless preamplifier circuitry, low self-noise and increased dynamic range, all necessary for critical studio recording. It has a 15 dB attenuation switch for handling high SPLs, making it suitable for a variety of sound sources including vocals, acoustic instruments, ensembles and overhead miking of drums and percussion. For studios, the **KSM32/SL** has a light champagne finish and includes an aluminum carrying case, shock and swivel mounts and a velvet pouch. For live applications, the **KSM32/CG** has a charcoal grey finish and includes a swivel mount and padded zipper bag.

- **Frequency response 20Hz - 20kHz**

AKG C4000B Electret Condenser Mic

This new mic from AKG is a multi-polar pattern condenser microphone using a unique electret dual large diaphragm transducer. It is based on the AKG Solid Tube design, except that the tube has been replaced by a transistorized impedance converter/ preamp.The transformerless output stage offers the C4000B exceptional low frequency response.

FEATURES-

- Electret Dual Large Diaphragm Transducer (1st of its kind)
- Cardioid, hypercardioid & omnidirectional polar patterns
- High Sensitivity
- Extremely low self-noise
- Bass cut filter & Pad switches
- Requires 12, 24 or 48 V phantom power
- Includes H-100 shockmount and wind/pop screen
- **Frequency response 20Hz to 20kHz**

GT Electronics AM-61 Cardioid Tube

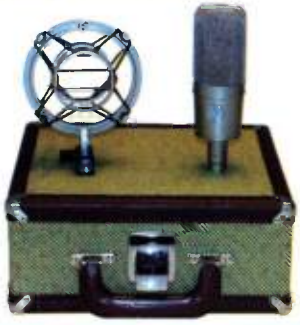
The GT Electronics AM61 offers classic tube performance in a fixed cardioid, large diaphragm condenser mic. An outstanding addition to any project studio or large commercial recording facility seeking rich, warm tube sounds and unsurpassed value.

- Groove Tubes military-spec GT5840M vacuum tube preamplifier
- Large-diameter, super-thin 3 micron gold evaporated Mylar diaphragm
- Fixed cardioid polar pattern response
- Switchable -10dB attenuation pad and 80Hz low frequency roll-off filter
- Includes hard-shell case, shock mount, hard mount, 6-pin cable and external power supply
- **Frequency response 20Hz - 20kHz**

• **ALSO AVAILABLE** AM-62 multipattern tube condenser mic

audio-technica. AT4047SV Cardioid Condenser Mic

The AT4047 is the latest 40 Series large diaphragm condenser mic from Audio Technica. It has the low self noise, wide dynamic range and high sound pressure level capacity demanded by recording studios and sound reinforcement professionals.



- Side address cardioid condenser microphone for professional recording and critical applications in broadcast and live sound
- Low self noise, wide dynamic range and high SPL
- Switchable 80Hz Hi Pass Filter and 10dB pad
- **Includes** AT8449/SV shockmount
- **Also Includes a limited edition tweed flight case while supplies last!**

STUDIO MONITORS

VERGENCE A-20 Studio Reference Monitor System

Incorporating a pair of 2-way, acoustic suspension monitors and external, system-specific 250 watt per side control amplifier, the A-20 provides a precise, neutral studio reference monitoring system for project, commercial and post production studios. The A-20's control amplifier adapts to any production environment by offering control over monitoring depth (from near to far field), wall proximity and even input sensitivity while the speakers magnetic shielding allows seamless integration into today's computer based studios.

- Type Modular, self-powered near/mid/far-field monitor.
- 48Hz - 20kHz frequency response @ 1M
- Peak Acoustic Output 117dB SPL (100ms pink noise at 1M).
- XLR outputs from power amp to speakers
- Matched impedance output cables included.
- -6dB LF Cutoff 40Hz
- 5 position wall proximity control
- 5 position listening proximity control between near, mid and far-field monitoring
- Power, Overload, SPL Output, Line VAC and Output device temperature display.

Amplifier

- Amplifier Power 250W (continuous rms/ch), 400W (100ms peak).
- XLR, TRS input connectors
- Headphone output
- 5-position input sensitivity switch with settings

Speakers

- 2-way acoustic suspension with a 6.5-inch treated paper woofer and a 1-inch aluminum dome tweeter
- Fully magnetically Shielded with an 18-inch recommended working distance

EVENT ELECTRONICS PS-5 Bi-Amplified Project Studio Monitors

The PS-5s are small format, full-range, non-fatiguing project studio monitors that give you the same precise, accurate sound as the highly acclaimed 20/20 series studio monitors. The use of custom driver components, complimentary crossover and bi-amplified power design provides a wide dynamic range with excellent transient response and low intermodulation distortion.

FEATURES-

- 5-1/4-inch magnetically shielded mineral-filled polypropylene cone with 1-inch diameter high-temperature voice coil and damped rubber surround LF Driver
- Magnetically shielded 25mm diameter ferrofluid-cooled natural silk dome neodymium HF Driver
- 70 watt continuous LF and 30 watt continuous HF amplification per side
- XLR-balanced and 1/4-inch (balanced or unbalanced) inputs
- 52Hz-19kHz frequency response ±3dB
- 2.6kHz, active second order crossover
- Built-in RF interference, output current limiting, over temperature, turn-on transient, subsonic filter, internal fuse protection
- Combination Power On/Clip LED indicator
- 5/8" vinyl-laminated MDF cabinet

KRK V-6 Bi-Amplified Near Field Studio Monitors

These bi-amped studio monitors from KRK supply 90 watts of clean power. Their 6-inch woofer & 1-inch silk dome tweeter ensure consistency from top to bottom with crystal clear highs and a solid bass response.

FEATURES-

- 58Hz - 22kHz frequency response
- 1-inch silk dome tweeter and 6-inch long stroke, polyvinyl woofer
- 30 Watt HF & 60 Watt LF amplification
- Magnetically shielded
- Variable system gain +6dB -30dB
- Neutrik XLR/1/4" TRS combo connector

Also Available- V-8

- 1-inch Silk Dome tweeter and 8-inch Woven Kevlar woofer
- 47Hz - 23kHz frequency response
- 60 Watt high frequency and 120 Watt low frequency amplification
- HF adjust +1dB, Flat, -1dB
- LF adjust -3dB at 45, 50 and 65 Hz

Hafler TRM-6 Bi-Amplified Near Field Studio Monitors

Offering honest, consistent sound from top to bottom, the TRM-6 bi-amplified studio monitors are the ideal reference monitors for any recording environment whether tracking, mixing or mastering. Supported by Hafler's legendary amplifier technology that provides a wide and accurate sound field, in width, height and also depth.

FEATURES-

- 33 Watt HF & 50 Watt LF amplification
- 1-inch soft dome tweeter and 6.5-inch polypropylene woofer
- 55Hz - 21kHz Response
- Magnetically Shielded
- Electronically and Acoustically Matched

Also Available- TRM-8

- 1-inch soft dome tweeter and 8-inch polypropylene woofer
- 45Hz - 21kHz frequency response ±2dB
- 75 Watt HF, 150 Watt LF amplification

ALL ITEMS ARE COMPLETE WITH ALL ACCESSORIES AS SUPPLIED BY MANUFACTURER

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COMPUTER BASED DIGITAL AUDIO SYSTEMS

MOTU AUDIO Hard Disk Recording Systems

The MOTU Audio System is a PCI based hard recording solution for the Mac and PC platforms. At the heart of the system is the PCI-324 PCI card that can connect up to three audio interfaces and allows up to 72 channels of simultaneous I/O. Audio interfaces are available with a wide range of I/O configurations including multiple analog I/O with the latest 24-bit A/D/A converters and/or multi channel digital I/O such as ADAT optical and TDIF I/O as well as standard S/PDIF and AES/EBU I/O. Each interface can be purchased separately or with a PCI-324 card allowing you to build a system to suit your needs. Includes drivers for all of today's hottest audio software and AudioDesk, multitrack recording and editing software for the Mac.

THEY ALL FEATURE– • Mac OS and Windows compatible • Includes software drivers for compatibility with all of today's popular audio software plus AudioDesk, MOTU's sample-accurate audio workstation software for Mac OS • Host computer determines the number of tracks that the software can record and play simultaneously, as well as the amount of real-time effects processing it can support • Front panel display metering for all inputs and outputs • **AudioDesk Audio Workstation Software** for Mac OS features 24-bit recording, multi-channel waveform editing, automated virtual mixing, graphic editing of ramp automation, real-time effects plug-ins with 32-bit floating point processing, crossfades, support for third-party audio plug-ins (in the MOTU Audio System and Adobe Premiere formats), background processing of file-based operations, sample-accurate editing and placement of audio, and more

2408 mkII FEATURES– • 7 banks of 8 channel I/O: 1 bank of analog, 3 banks of ADAT optical, 3 banks of Tascam TDIF, plus stereo S/PDIF • Custom VLSI chip for amazing I/O capabilities • • Format conversion between ADAT and DA-88 • 8x 24-bit 1/4" balanced analog I/Os • 24-bit internal data bus for full 24-bit recording via digital inputs • Standard S/PDIF I/O for digital plus an additional S/PDIF I/O for the main mix • Sample-accurate synchronization with ADATs and DA88s via an ADAT SYNC IN and RS422

1224 FEATURES– • 24-bit analog audio interface • State-of-the-art 24-bit A/D/A • Simultaneously record and play back 8 channels of balanced (TRS) +4 dB audio • 24-bit balanced +4 XLR main outputs • Stereo AES/EBU I/O • Word clock in/out • Dynamic range of 116 dB (A-weighted) • Front panel displays six-segment metering for all inputs and outputs • Headphone jack with volume knob

308 Features– • 8 channels of coaxial S/PDIF using 4 RCA input and 4 RCA output connectors • 8 channels of optical S/PDIF using 4 toslink input and 4 toslink output connectors • 8 channels of AES/EBU using 4 XLR male and 4 XLR female connectors • Word Clock I/O allows the 308 to synchronize with digital audio environments

24i Features– • 24 high quality, 24-bit analog inputs • Balanced 1/4" analog outputs • Optical and coaxial S/PDIF outputs • Front panel headphone output with level control • Word Clock I/O • Connect up to three 24i rack I/Os to a PCI-324 audio card for a total of 72 inputs and six outs

digidesign A Division of Avid Technology, Inc

DIGI001 Digital Audio Workstation For Mac And PC

A completely integrated digital recording, mixing and editing environment for the Mac and PC, the DIGI-001 offers a 24-bit multi I/O breakout interface along with Pro Tools LE software— based on Digidesign's world renowned ProTools software. The DIGI-001 interface features 18 simultaneous I/Os made up of 8 analog inputs and outputs— two of the inputs are full featured mic preamps with phantom power, and digital I/O including standard S/PDIF as well as an ADAT optical interface that can also be used as a S/PDIF I/O. ProTools LE supports 24 tracks of 16 or 24-bit audio and 128 MIDI tracks and also features RealTime AudioSuite (RTAS) effects plug-ins. For ease of use, MIDI and audio are editable within the same environment and all mixing parameters including effects processing can be fully automated.

FEATURES–
- 18 simultaneous, 24-bit ins and outs with support for 44.1 and 48 kHz sample rates
- 20Hz - 22kHz freq. response ± 0.5 dB
- 2 channel XLR mic/1/4" line inputs with -26 dB pad, 48v phantom power, gain knob, and HP Filter at 60Hz
- 6 ch. line inputs (1/4") TRS balanced/ unbalanced w/ software controlled gain
- +4dB balanced 1/4-inch Main outputs
- Balanced 1/4" monitor outs with front panel gain knob
- 1/4-inch unbalanced line outputs channels 3-8
- Headphone output with independent gain control knob
- 2 channel S/PDIF coaxial digital I/O
- 8 channel ADAT optical I/O can also be used as 2 channel optical S/PDIF

Pro Tools LE
- Supports 24 tracks of 16 or 24-bit audio and 128 sequenced MIDI tracks
- Sample-accurate simultaneous editing of audio & MIDI
- Real-time digital mixing capabilities include recall of all mixing parameters, support for edit and mix groups and complete automation of all volume, panning, mutes and plug-ins
- Route and mix outboard gear in realtime
- MP3 and RealAudio G2 file support (Mac)
- Two plug-in platforms offer multiple options for effects processing— Real-Time AudioSuite (RTAS) is a host-based architecture that allows an effect to change and be dynamically automated in realtime as the audio plays back. —AudioSuite is a file-based format, that renders a new file with the processed sound.
- Bundled RTAS plug-ins include, 1 and 4-band EQ, Dynamics II- compressor, limiter, gate and expander/gate, Mod Delay - short, slap, medium, and long delays with modulation capabilities for chorus or flange effects and dither. AudioSuite plug-ins include Time Compression/Expansion, Pitch Shift, Normalize, Reverse.

MIDI Functions
- MIDI functions include graphic controller editing, piano roll display, up to 128 MIDI tracks and editing options like quantization, transpose, split notes, change velocity and change duration.
- MIDI data can be edited on the fly

SOFTWARE

Also available with MOTU's award-winning Digital Performer audio sequencer software package

Digital Performer 2.7 MIDI/AUDIO Software for Mac

Digital Performer is an integrated multitrack digital audio and MIDI sequencing program packed with advanced tools for a wide variety of audio applications. Sample accurate editing, loop based audio capture, realtime DSP effects and the best MIDI timing/resolution available insures unlimited creative potential.

FEATURES-
- Includes over 50 real-time MIDI and audio effects plug-ins • POLAR window - which provides interactive audio loop recording • 24-bit recording and editing • 32-bit native effects processing - incredible sounding EQ and other FX • 64-bit MasterWorks Limiter and Multiband Compressor plug-ins included • Sample-accurate - the most reliable waveform editing and tightest sync you can get • Samplers window - drag & drop samples between your Mac and your Sampler • PureDSP stereo pitch-shifting and time-stretching • Unlimited audio tracks, real-time editing, full automation and remote control • QuickTime digital video support

NEW FEATURES-
- Full Plug-In FX automation and increased 3rd party Plug-in support
- Drum Editor
- **Adjustable Display Resolution** from 2 to 10,000 PPQ. Tick values up to four decimal places can be set allowing 1000 times greater editing resolution. For example, if you are used to editing MIDI data at 480 PPQ, you can set your edit resolution to 480,000 for 1000 times more precision.
- **MIDI Time Stamping** (MTS) which exists in MOTU's rack-mountable USB MIDI interfaces, delivers MIDI data from Digital Performer to MIDI devices as accurately as a third of a millisecond for every single MIDI event.

TC WORKS ULTIMATE SOFTWARE MACHINES SPARK 1.5 2-Track Editing For Mac

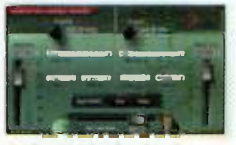
Spark is professional 2-track audio editing software for the Power Macintosh that provides fast access to files and powerful processing tools. Supports files up to 24-bit/96kHz and has batch processing. VST plug-in support, as well as MP3 file export built-in. Audio can be extracted from a Quicktime movie, edited and then exported along with the video to a new file. Bundled with Adaptec's Toast so you can burn your audio directly to CD.

- Browser View- File database, audio editor and play list all in one easy to use display with movable border lines- Eliminates the need for surfing several windows to access and edit files
- Wave Editor- Perform off-line editing, processing, and create markers and non-destructive regions
- Supports AIFF, Sound Designer, WAV and QuickTime file formats
- DSP Processing Includes- Normalize, Reverse, Fades, Crossfades, and Sample Rate conversion and realtime **Time Stretching**
- VST Plug-In compatible
- Supports file swapping with most major samplers and any sampler that supports SMDI • Batch Processing
- Bundled with Adaptec's Toast Pro you can burn your audio on CD
- Extract audio from a quicktime movie for editing and then export the audio along with the video into a new file
- **SPARK 1.5** supports MP3 audio authoring for the web directly from the file menu.

AMM-1 Microphone Modeler

ANTARES

The AMM-1 Microphone Modeler uses patented technology to create precise digital models of a wide variety of microphones, from historical classics to modern exotics and even industry-standard workhorses. Simply tell the Microphone Modeler what microphone you are actually using and what microphone you'd like it to sound like. It's as simple as that. Available as a plug-in for the TDM and MAS environments, with DirectX and Mac VST not far behind.



FEATURES–
- Proprietary DSP-based acoustic modeling allows any reasonable quality microphone to sound like any of a wide variety of high-end studio mics • Models reproduce the effects of windscreens, low-cut filters, pattern-dependent frequency response and proximity effects • Create hybrid mics that combine the bass response of one mic with the treble response of another • Add a model of classic tube saturation distortion • Use during mixdown to change the mic on an already recorded track • Incredibly simple to use - simply select the mic you're using and the mic you want it to sound like • Includes an extensive collection of digital models of historical classics, modern exotics, and industry-standard workhorses • Additional models can be downloaded from the Antares web site

WAVES Pro-FX Bundle Plug-ins For Mac or PC

The latest Bundle from Waves has some of the coolest sound design plug-ins available for the Mac and Windows platforms.

SuperTap - Six taps of mono or true stereo delay (up to Six seconds) • Global LFO modulation • 2 feedback modes • Q10 style filtering for each tap • rotation (stereo panning) • Delays are adjustable in milliseconds and note values • Tap out delay times or patterns using the Tap Pad

MetaFlanger - Vintage tape-flanging, phaser-emulation, and special effects • True dual-delay flanging sounds • Wet signal include filters so you can flange or phase just part of the signal • Factory presets of vintage emulations (Mutron, MXR, Itchycoo Park) and more.

MondoMod - AM, FM, and Rotation (stereo panning) modulators • Gentle wandering guitar solo panning or bizarre destructive effects • Single LFO drives all modulators with independent phase offsets between the modulator signals

UltraPitch - Formant-corrected pitch shifter with 6-voices • Excellent gender-bending • Independent stereo panning and delay • Animator delay-randomizer. Set the pitchshift by musical intervals (with 5 cent resolution) • Manual formant mapping as well as presets that perfectly match instrumental formant responses • Creates huge and thick stereo chorusing, doubling, parallel harmonies, excellent vocal slap spread effects, and much more

Enigma - Mysterious and innovative. Enigma combines a complex notch filter, short delay feedback loops and modulation to create distinctive sound design effects.

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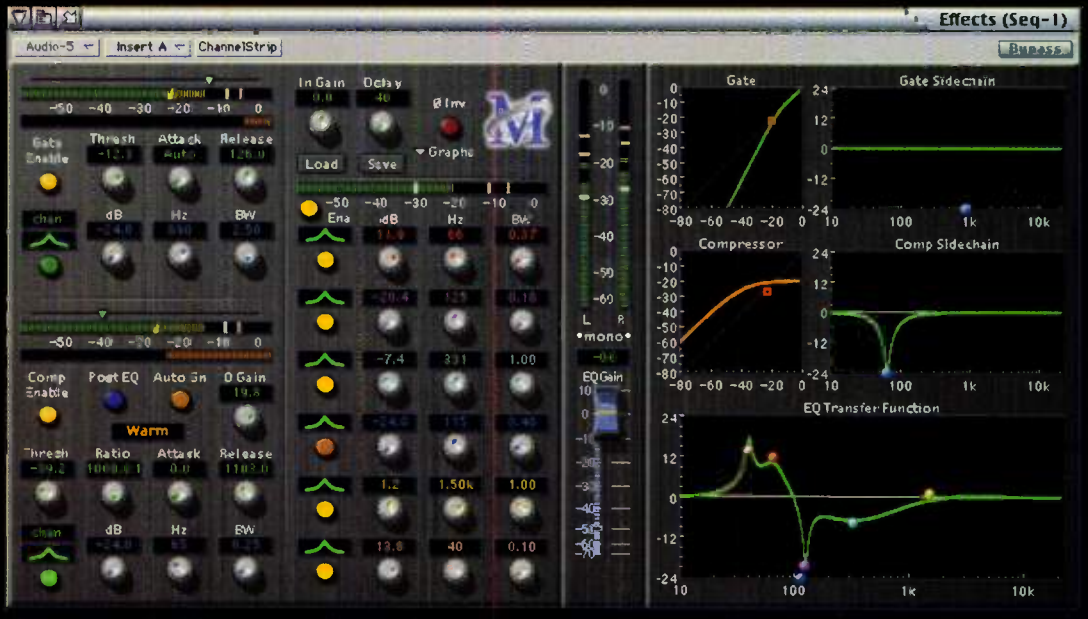

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FINAL MIX

By Larry the O

My Back Pages/Don't Look Back

Is it vain to review your own past work? Is it no more than clutching at past glory days? Mmm, could be. I've known and read of many creative musicians and artists who never listen to their old albums or view their own works, and I can appreciate the momentum gathered by hurtling ever forward in time and personal development. Unfettered by pressures to duplicate what has already been done, the artist's evolution can veer in any new direction that catches his or her ear. Sometimes it is driven by developing a genuine dislike for a sound favored earlier. The evolution of many musical pioneers is marked by such restlessness.

I have always supported the idea of pioneering, but I feel a little differently about hearing my old work. I can't say I listen to everything I've recorded; some things should never survive on tape. But the body of work I've built includes many good projects of which I'm proud to have been a part.

A few times a year, I'll pull out a recording or video I've worked on and put it on. And what do I hear? Well, of course, I hear every flaw and clam in the thing. That's the toughest part for me, frankly, but all I can do with that is swear I'll nail that stuff the next time around. (Here you see me trying hard to cheerily apply my philosophy of "pragmatic perfectionism.")

Beyond that, however, I hear a snapshot of my creative world captured in a few minutes. Earlier influences jump out at me, tricky maneuvers that worked pop up in memory as they fly by, and sometimes unrealized ideas come back to me, perhaps to finally be brought to fruition. We each establish our own personal traditions, our own musical roots. I enjoy staying in touch with mine because of the perspective I get seeing the continuity of my own inspiration.

The way I look at it, some elements of past work are simply trappings of the time or whatever the specific project was, but well-expressed creative ideas are like insights. They make up the mystery and grandeur that can be produced with sound and music and retain both their potency over time and their richness for further exploration. (Cloaking a good musical idea in different trappings holds as many possibilities as recasting a period theater piece in a different historical and cultural period.) The type of creative ideas an artist has defines the core of his or her style.

By this point, I may have convinced you that I am indeed rationalizing a distinctly unhealthy attachment to past projects. Mmm, could be. My work keeps me pretty close to the state of the art in tools, and I work a lot on interactive products, so I don't feel stuck in the past. But I admit to *drawing* on the past. The understanding I gain of my own creative direction serves as a foundation on which further evolution can be built.

After all is said and done about the creative benefit I draw from my past work, there is also the simple fact that I did many of these projects because I liked what we were doing, and I often still do. Some of this stuff actually came off better than I remembered it. Checking out things I made in years past strengthens me, gives me enjoyment, and fires my inspiration to continue hurtling forward.

Would I say it's a better way to go than leaving earlier work behind?

No.

Will I laugh the next time I see that video where I throw myself backward off the drum throne at the end of the song?

Mmm, could be.

Larry the O *provides music and audio services with his company, Toys in the Attic, and is a sound designer for LucasArts Entertainment.*

STEVE CURL

The MX-2424 Revolution Has Begun!

There have been only a handful of truly revolutionary products created for the art of recording audio. These products have made a huge impact on the way people capture music and sound, and changed the definition of the recording environment forever.

The **TASCAM MX-2424**™ by TimeLine is a highly advanced hard disk recorder that represents a new standard in affordable professional recording equipment. Just a few years ago, the capabilities that the **MX-2424** offers – 24 tracks of uncompressed 24-bit audio, with incredible onboard creative tools – could only be achieved at a price that was totally prohibitive to most recordists. But with the **MX-2424**, those high-end results are achievable in nearly every recording environment from the personal studio to the highest echelons of commercial facilities.

The **MX-2424** offers all the advantages of advanced nonlinear recording: sophisticated editing capabilities, instantaneous random access to all points in a recording and audio fidelity that soars above the highest standards of professional recording. But unlike most computer-based recording systems, the **MX-2424** is a dedicated tool for audio production that easily integrates into any studio setting, and offers a familiar interface that allows you to accomplish your best creative work without getting hung up in the details. Plus, with thousands of **MX-2424s** being used around the world, it's quickly becoming the most popular 24-track recorder ever made.
If you're looking for the new standard in full-featured multitrack recorders, it's here today: the **MX-2424**.

MX-2424 Overview

- 24-tracks of 24-bit hard disk recording right out of the box with internal 9.1 GB hard drive
- Extend recording times with external hard drives and backup/deliver with tape drives and DVD-RAM
- Extensive audio editing tools that can all be accessed from the front panel as well as via included ViewNet MX™ computer-based graphic user interfacing
- True single sample-accurate multi-machine synchronization of up to 32 MX-2424s without any need for external sync devices
- File format and drive compatibility to transfer to popular Mac and PC DAW applications
- Front panel 5.25" drive bay and rear panel wide SCSI port for adding additional hard drives, removable drives, or other backup devices
- Included 2-channel AES/EBU and S/PDIF I/O for direct connection of digital devices; optional I/O module for 24-channels of 24-bit analog, TDIF, ADAT® or multichannel AES/EBU interfacing with input sample rate conversion
- Built-in synchronization tools: SMPTE, Word Clock, MIDI Machine control, MIDI Time Code
- 999 virtual tracks for alternate takes and comps
- Special high sampling rate mode for up to 12 tracks at 96kHz*

** With software update scheduled for late 2000.*

Nonlinear editing...

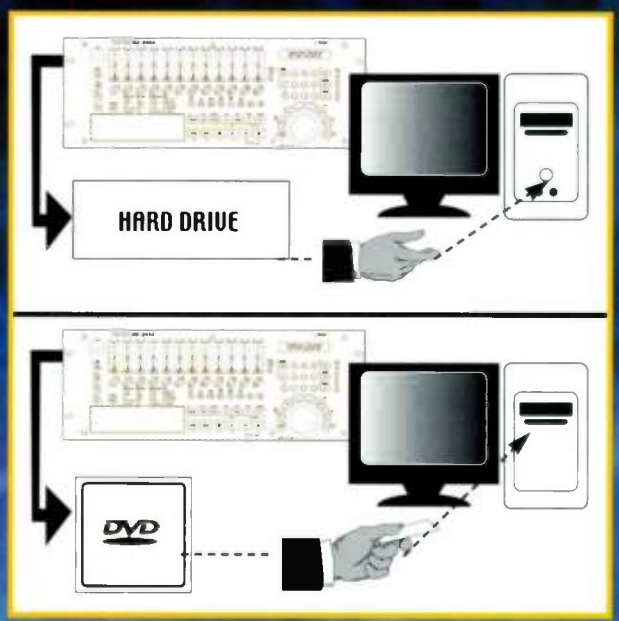
take control from the front panel or onscreen

The MX-2424 won't box you into one style of audio editing. It's your choice: editing functions are available right from the front panel, and can also be accessed with the ViewNet MX™ software for Mac and Windows that's included with the MX-2424. All of the cool editing tricks you want in a hard disk recorder are available on the MX-2424...you can Cut, Copy, Clear, Paste, Insert, Open, Undo and Redo to your heart's delight. You don't need an extra monitor, mouse and keyboard to make your recorder fully functional. Also, to keep your tracking and editing sessions quick, efficient and fun, the MX-2424 offers controls for rehearse modes and precise looping functions from the front panel and ViewNet MX™.

Integration into every studio...

complete compatibility with other systems

Another advantage of the MX-2424's SCSI-based drive system is its compatibility with other recording systems and software. You can literally take a drive from the MX-2424, hook it up to your computer and access the audio data in popular DAW applications like Digidesign's Pro Tools™ or MOTU's Digital Performer™. Also, since the MX-2424 records with Sound Designer II audio files, the files will be time-stamped so they can be imported to these DAW systems at their original SMPTE location with true sample accuracy. Other hard disk recorders may not provide this degree of accuracy and ease of use.

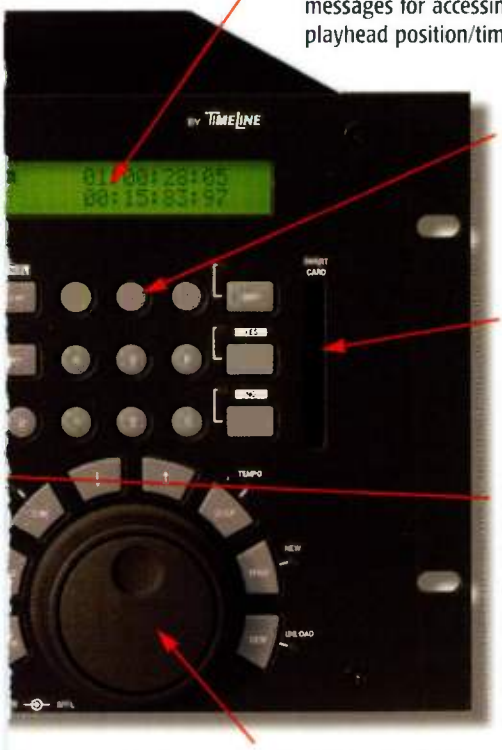


TASCAM...

take advantage of our experience

There's another aspect that's important to keep in mind. TASCAM has been making professional analog and digital multitrack recorders for 26 years as well as hard disk recorders for four years. TASCAM's Emmy-winning MMR-8 recorder, in fact, is the world's leading hard disk system for working with sound on feature films. The MX-2424 takes advantage of the experience of both TASCAM and TimeLine, and is an excellent representation of our heritage of award-winning recording products. You may think twice about building your studio around a system that doesn't offer this important factor.

audio quality, easy studio
rue single sample-accurate sync



LCD Display
All the news you need...2x20 display that shows various operator and system messages for accessing menus and playhead position/time code values.

Numeric Keys
Directly enters numeric values such as time code, memory locations and other data.

TL Media Slot
For updating the MX-2424's operating system (MX-OS™).

Edit Keys: Cut, Copy, Clear, Paste, Insert, Open, Undo and Redo, etc.
Comprehensive audio track editing tools.

l Transport Keys: , Loop, Locate, To, In, Out
for specialized transport ns (such as Auto Punch) e in recording/mixing as synchronization to al sources.

Jog/Scrub Wheel and Special Function Keys: Scrub/Shuttle, Nudge/Capture Event, Trim, Inc/Dec, Setup/Tempo, Project/New, View/Unload
For precise analog-feel transport control as well as control of menu settings and special functions. Yes, it scrubs audio just like tape.

Affordable, professional hard disk recording...
short and long term

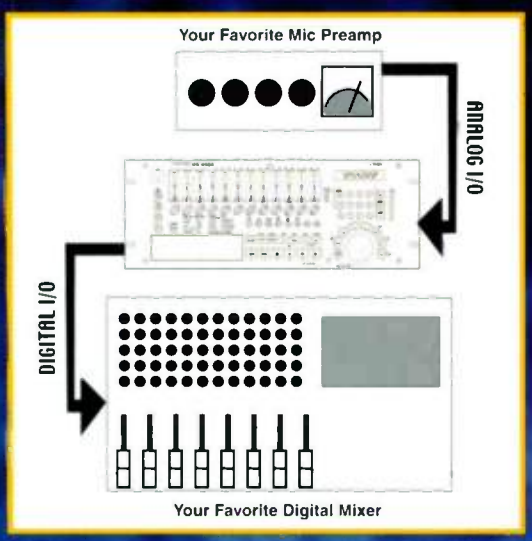
By offering 24 tracks of high resolution audio at the same price as eight-track digital machines from a few years ago, the MX-2424 is already known as an incredibly affordable recorder. But we've taken steps to ensure that your long-term cost of ownership is as great a value as that of the recorder itself.

Each of the multichannel interface modules for the MX-2424 offer 24 interfacing channels...makes sense on a 24-channel recorder, huh? Remember, if you're looking at their cost versus 8-channel interfaces, you have to multiply by three to get an apples-to-apples comparison.

But the biggest cost difference is what happens after you've owned the MX-2424 for awhile. Instead of buying a new hard drive every time you want to clear audio off the internal hard disk, just use inexpensive DVD-RAM discs or Travan tapes. The chart below shows what happens when you need to archive ten full-length projects.

Media	Cost of Drive	Media / 10 Projects	Total Cost
90•Minute Hard Drive	$349	10 Drives	$3490
TASCAM DVD-RAM	$575	1 Drive + 36 Discs	$1835

As you can see from the chart above, media like DVD-RAM presents a significant cost advantage over hard drives as your only backup solution. TASCAM has several solutions for backing up the audio data on your hard disk.



Comprehensive, flexible audio interfacing...
simultaneous analog and digital I/O that support 96kHz recording

The MX-2424 offers a better variety of audio interfacing options than any other recorder in its class. All of the MX-2424 I/O options offer a full 24 channels of interfacing, and you can choose between 24-bit analog, and digital interfacing protocols such as TDIF, ADAT Optical and AES/EBU. But that's only half the story...on the MX-2424, you can use both the analog and digital interfaces simultaneously, for maximum flexibility. Using this versatile routing, you could record through the MX-2424's analog converters and monitor via a digital console. Other hard disk recorders may limit you to choosing either analog or digital if you want to access all 24 channels. Also, all MX-2424 I/O cards support 96kHz sampling rates. Make sure the recorder you choose has this capability from day one.

The MX-2424's simultaneous digital and analog I/O capabilities allow you to create setups like the one above, in which audio is recorded through the MX-2424's very high quality analog converters and monitored on a digital console.

SHIPPING!
Since April 2000!

MX-2424

Hard Disk Recorder/Editor

Record 24 tracks of 24-bit audio. Edit from the front panel or on your computer. Interface with your DAW system. Backup to your favorite media. Make records. Be famous. Have fun.

TASCAM®

a whole world of recording

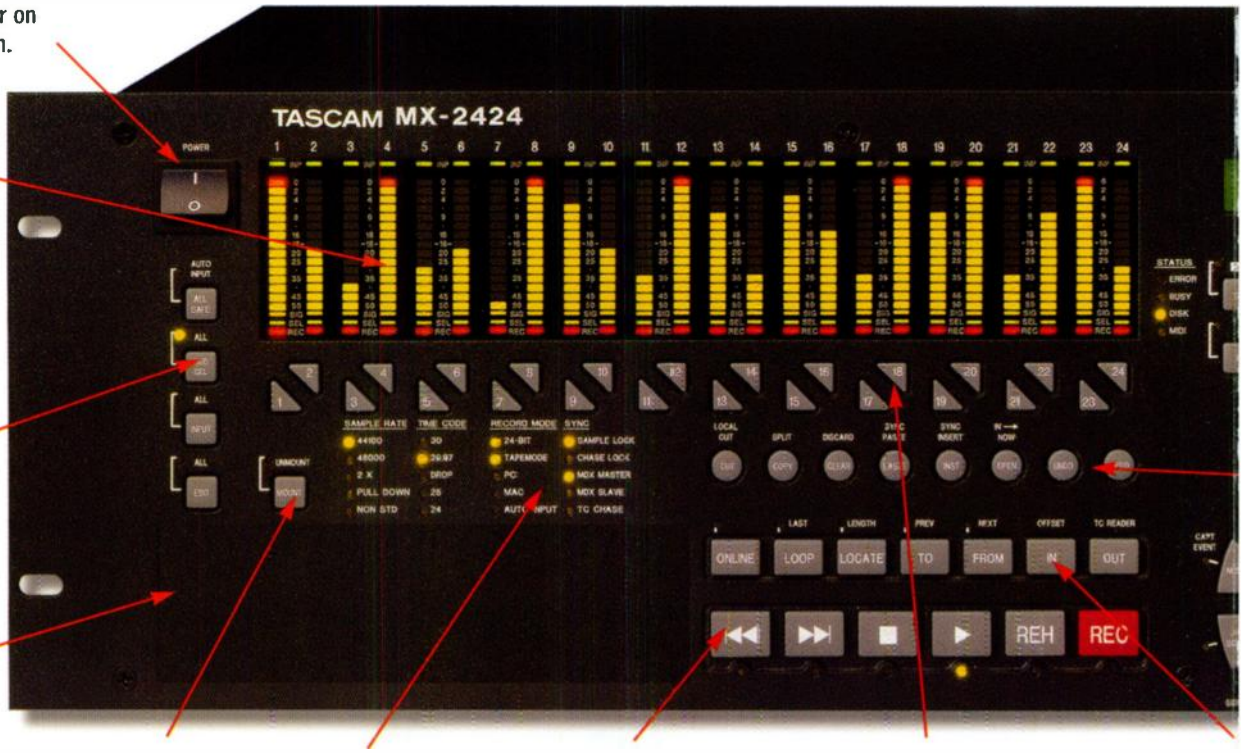
Get the MX-2424 advantage! 24-bit integration, secure backup media, t and comprehensive editing power.

Power Switch
Turns power on and off. Duh.

Track Level Meters/Status Indicators
Shows input/recorded levels, indicates input status, record ready status, edit-selected tracks and peak levels.

Track Function Keys
Chooses the function to be applied by Track Selection Keys.

Front Panel Expansion Bay
Allows installation of an additional standard 5 1/4" SCSI device to supplement the included hard drive of the MX-2424.



Mount/Unmount Button
Mounts and unmounts any drives that are connected to the SCSI bus (internal, front panel bay or rear panel SCSI bus.

LED Configuration Matrix
Indicates status of sample rate, time code, record modes and synchronization selections.

Main Transport Keys: Rewind, Fast Forward, Stop, Play, Rehearse, Record
Familiar tape-style transport controls, plus rehearse function.

Track Selection Keys
Used to select individual tracks for functions indicated by Track Function keys.

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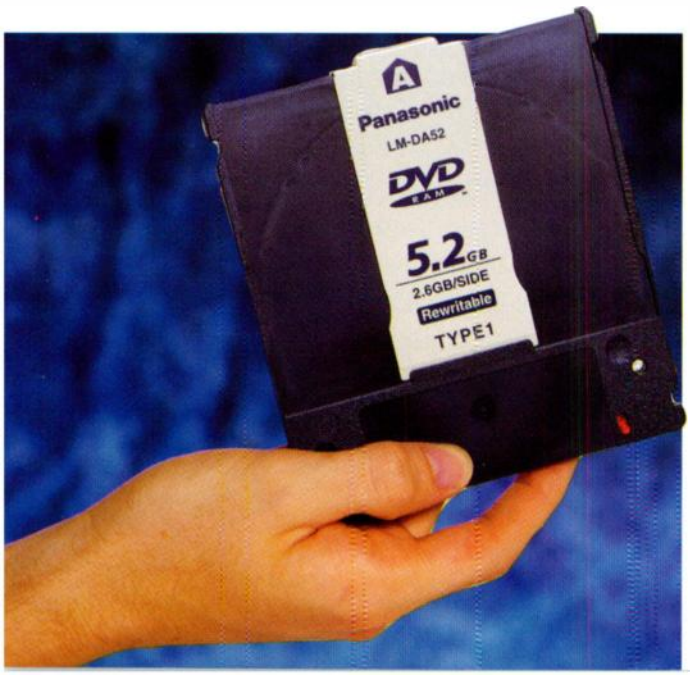


Back up files and extend recording time...keep your audio secure.

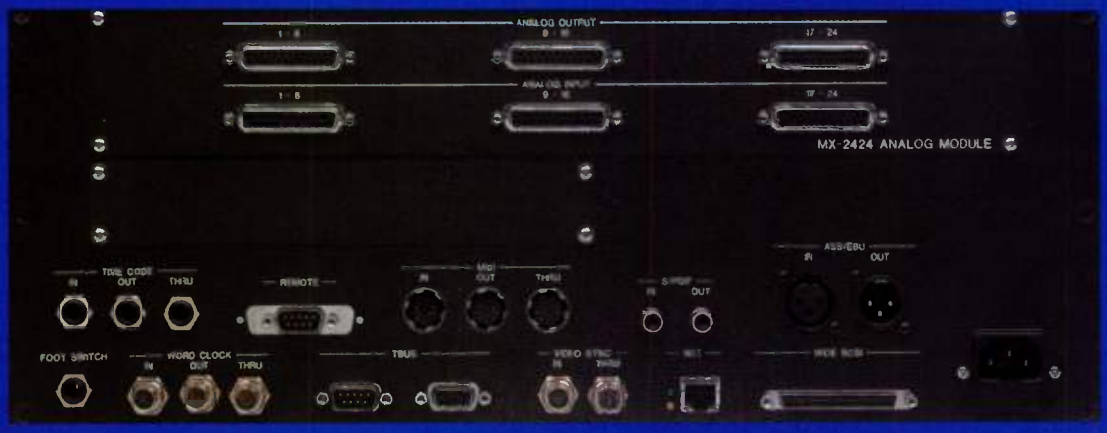
The MX-2424's high-speed Ultra II LVD SCSI port on the rear panel allows you to record to external SCSI drives or back up your projects to external media like DVD-RAM drives, Travan tape drives or other hard drives.

Why do you need to backup your files? Because hard drives can be vulnerable, as anyone who's ever had a computer drive crash will undoubtedly tell you. Even the world's sturdiest drives, like our Quantum Atlas V drives that are rated to handle 300Gs of impact, are susceptible to losing an album's worth of material from an accidental drop on a studio floor. That's why we give you backup options that are hardier than hard drives. Plus, the MX-2424's DVD-RAM discs and data backup tapes can be easily mailed around the world for collaborating on projects or sending them out for mastering.

Also, the MX-2424's SCSI drive allows you to extend recording time. If you run out of space on the internal drive, you don't need to download the audio right away. Simply connect another drive and hit record... six devices can be connected at once.

MX-2424

Hard Disk Recorder/Editor



** NOTE: This photo includes one of the MX-2424's optional interfacing modules installed. Each interface that is optional for the MX-2424 is noted with an asterisk.*

Foot Switch input for standard momentary switch or Alesis LRC (1/4" TRS connector); Time Code In, Out and Thru for SMPTE synchronization (balanced 1/4" TRS connectors); Word Clock In, Out and Thru (BNC connectors); IF-AN24* analog/digital/analog module (DB-25 pin connectors), IF-TD24* TDIF, IF-AD24* ADAT and IF-AE24* AES/EBU modules also available; Connector for RC-2424 remote control surface (9-pin connector); TL-Bus In and Out for single sample accurate multi-machine synchronization (9-pin connector); MIDI In, Out and Thru for MTC and MMC (5-pin DIN connectors); Video Sync In and Thru for locking to blackburst or color bars (BNC connectors); stereo S/PDIF digital input and output (coaxial connector); Ethernet Jack for computer interfacing (RJ-45 connector); Fast/Wide Ultra 2 SCSI interface for external storage devices (68-pin connector); stereo AES/EBU digital input and output (XLR connectors); IEC power cable input for switching power supply.

Audio Specifications

Analog I/O Capacity:
(6) D-Sub 25F connectors, 8 input or 8 output channels per connector. 24 in/out channels total.

AES/EBU I/O Capacity:
(3) D-Sub 25F connectors, 8 input and 8 output channels per connector. 24 in/out channels total.

TDIF I/O Capacity:
(3) D-Sub 25F connectors, 8 input and 8 output channels per connector. 24 in/out channels total.

ADAT I/O Capacity:
(3) ADAT Optical connector pairs, 8 input or 8 output channels per connector. 24 in/out channels total.

Quantization:
24 bits, A/D and D/A

Sample Rate:
38.5kHz to 54 kHz with 24 I/O channels; 96kHz with 12 I/O channels

Analog Input & Output Level:
+4dBu balanced, +22dBu ±1dBu clip, not adjustable

Analog Frequency Response:
20Hz-20kHz, ±0.2dB

Digital Frequency Response:
20Hz-20kHz, ±0dB

Headroom:
18dB above nominal input level

Analog Input Impedance:
10kΩ balanced

Analog Output Impedance:
<75Ω balanced THD+N (Through):
<0.004% @ 1kHz @ clip level -0.5dB

THD+N (A/D):
<0.001% typical @ 1kHz
@ clip level -0.5dB

THD+N (D/A):
<0.003% typical @ 1kHz
@ clip level -0.5dB

Dynamic Range (Through):
>106dB (20Hz-22kHz, A-wtg.)

Dynamic Range (A/D):
109dB typical (20Hz-22kHz, A-wtg.)

Dynamic Range (D/A):
111dB typical (20Hz-22kHz, A-wtg.)

Signal-to-Noise Ratio (Through):
>106dB (10Hz-22kHz, A-wtg.)

Crosstalk (Through):
<-95dB between any channels (20Hz-20kHz)

Digital Option THD+N (Through or Record, linear):
Adds no distortion to source material

AES/EBU Option Sample Rate Conversion:
0.33 to 3 input range to internal sample rate, with 12kHz minimum to 108kHz maximum external input frequency. Defeatable on all 24 channels simultaneously.

AES/EBU THD+N (through w/SRC):
<0.003% typical @ 1kHz
@ clip level -0.5dB

System Specifications

Sample Length, Recording:
16-bit linear or
24-bit linear

Sample Length, Internal:
24-bit

Standard Audio I/O:
(1) AES/EBU input on F XLR,
(1) AES/EBU Output on M XLR,
(1) S/PDIF Input on F coaxial
(1) S/PDIF on F coaxial
Defeatable input SR convert

Timing Reference Sources:
Internal, Internal Varispeed, Follow time code in, Video (either NTSC or PAL), AES/EBU, S/PDIF digital clock input, Word clock input, TL-Bus

Internal Sample Rates (in Hz):
44056, 44100, 44144, 47952, 48000, 48048, 88112, 88200, 88288, 95904, 96000, 96096

External Sample Rates:
38.5kHz - 108kHz
(via external sync input)

Time Code Type and Rate:
30 NDF, 30 DF, 25 (PAL Default), 29.97 (NTSC Default), 29.97 DF

Nominal Operating Temperature:
41°-95° Fahrenheit (5°-35° Centigrade)

Relative Operational Humidity:
30%-90% (non-condensing)

Autoswitching Power Supply:
Nominal: 100-240VAC, 1.5-0.8A, 150W, 50/60Hz; Absolute Minimum/Maximum: 85-264VAC, 50/60 Hz

Analog Input/Output Voltage:
9.75VRMS Maximum

MX-2424 Dimensions:
19" wide x 17.5" deep x 7" high (48.28cm x 44.45cm x 17.78cm), 4U rackmount

MX-2424 Weight:
Approximately 31 lbs (14kg) with all optional cards installed

RC-2424 Dimensions:
15" wide x 8" deep x 2" high (20.32cm x 38.1cm x 5.08cm)

RC-2424 Weight:
3.38 lbs (1.5kg)

Like most technological products, the MX-2424 will continue to take advantage of updated features and capabilities. For the most up-to-date information on the MX-2424, visit www.tascam.com often.

TASCAM/TEAC America, Inc.
7733 Telegraph Road
Montebello, CA 90640
www.tascam.com

TASCAM
a whole world of recording

PCI-324

72-channel Cross-platform PCI Audio Card

introducing the 2408 mk II

Why is the enhanced 2408mkII now even better?

- Balanced/unbalanced 1/4-inch analog I/O.
  The 2408mkII has quarter-inch TRS analog jacks (8 in / 8 out), with +4 or -10dB level inputs, so you can easily connect everything in your studio directly to your computer: synths, samplers, effects units — you can even plug in your guitar without an amp and use dozens of included 32-bit software plug-ins for fuzz, chorus, echos, and hundreds of other real-time effects.
- 24-bit converters.
  The 2408mkII's new 24-bit converters deliver incredible audio quality: 105dB S/N (A-weighted). Your audio will definitely be ready for prime-time.
- Front panel volume knob for the main outs.
  Connect your studio monitors directly to the 2408mkII main outputs, mix everything inside your computer — and there's still a volume knob for you to grab when the phone rings.

And the mkII has all the original 2408 features at the same great price, including:

- 24 simultaneous inputs/outputs expandable to 72.
  The 2408mkII has way more I/O than any other single-rack space system, and it's ready to expand as your needs grow with our entire line of affordable audio interfaces, including the new 24i with 24 analog inputs in 1 rack space.
- Tons of 24-bit ADAT optical and Tascam TDIF digital I/O.
  If you have an ADAT, Tascam tape deck, or digital mixer, the 2408mkII is by far your best choice for digital I/O with your computer.
- Sample-accurate sync.
  The 2408mkII has a wide range of professional synchronization features.
- Broad compatibility will all major audio software.
  Use your favorite Mac or PC audio software with your favorite plug-ins, or use the included AudioDesk workstation software, a complete virtual studio.

MOTU

Hard disk recording

Mac OS Windows

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