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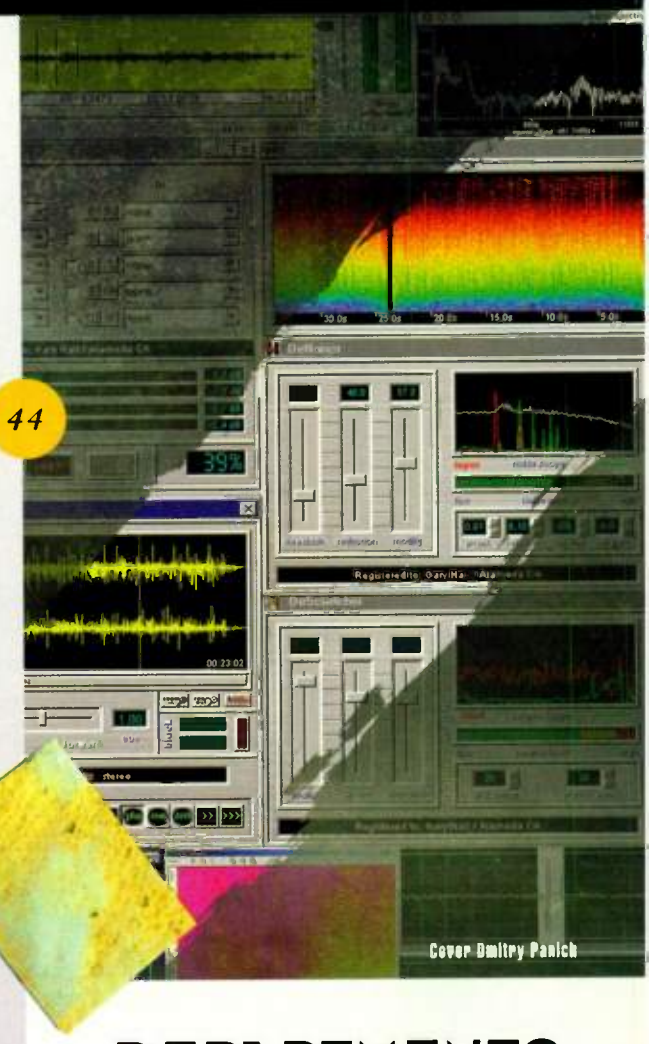

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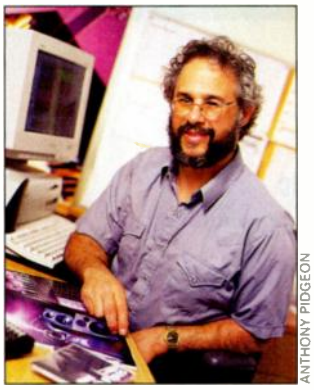
Life Is Change


ANTHONY PIDGEON

I feel very fortunate that, for the most part, the **EM** editorial staff has remained stable over the past few years. You can always rely on the work of Brian Knave, Dennis Miller, Gino Robair, David Rubin, Geary Yelton, Matt Gallagher, and the rest of the crew. However, we've had a few editorial-staff changes lately, and I'd like to bring you up to date on them.

I have been remiss in not announcing this first change sooner, and I apologize for that. At the end of last year, after we completed work on our February 2003 issue, assistant editor Marty Cutler left our staff and moved back to his hometown of Brooklyn, New York. Marty currently is teaching recording technology in New York City and is happily working on a variety of musical projects, including playing banjo with some top-notch local pickers.

Fortunately, Marty continues to write for **EM.** In fact, he is currently putting the finishing touches on a very cool Master Class feature on advanced MIDI tips and tricks, which we expect to publish in our August issue. Marty also remains on our staff box as a contributing editor, where he joins a team that includes familiar names such as Michael Cooper, Mary Cosola, Larry the O, George Petersen, Rob Shrock, and Scott Wilkinson. So although we miss seeing Marty's smiling face here in the office, his written contributions to *Electronic Musician* (and, sadly, his bad puns) continue.

Another big change is the departure of Senior Associate Editor Brian Knave. Brian has been with **EM** almost eight years, which is longer than any current editor except me. He has assigned and edited the "Recording Musician" column from its inception, written and edited countless reviews and features on recording techniques, and has played a significant behind-the-scenes role in planning product roundups and reviews.

As with Marty, Brian is moving out of state, but he is moving a lot farther away. The Knave of Arts is planning to open a new project studio in Salvador da Bahia, Brazil, where he will continue his musical career. Brian is unique, and we'll miss him immeasurably. Our August issue will be his last as an **EM** staff editor, but he has assured me that once he settles into his new life in the southern hemisphere, he intends to write for us at least occasionally. I plan to hold him to that.

The good news is less dramatic, but it's mighty pleasing. First of all, Senior Copy Editor Anne Smith is out of action for a few months. That's good news? Yes indeed: Anne is absent because she recently had her first child, Kate, and she is enjoying maternity leave. In the meanwhile, copy editor extraordinaire Marla Miyashiro, who has helped us on a freelance basis in the past, has stepped in to help Managing Editor Patty Hammond handle the proofing and copyediting chores. Marla is simply the best in town, one of the few people we know who could maintain our quality standards, and we're very lucky to have her.

Finally, I am delighted to announce that we've promoted Gino Robair to the position of senior editor. This promotion recognizes the exceptionally high-level work Gino has been doing for quite awhile. In addition to his extensive writing and editing work, Gino heads up our Reviews section, writes our e-mail newsletters, helps me with many aspects of issue planning, and much more. Congratulations, GR!

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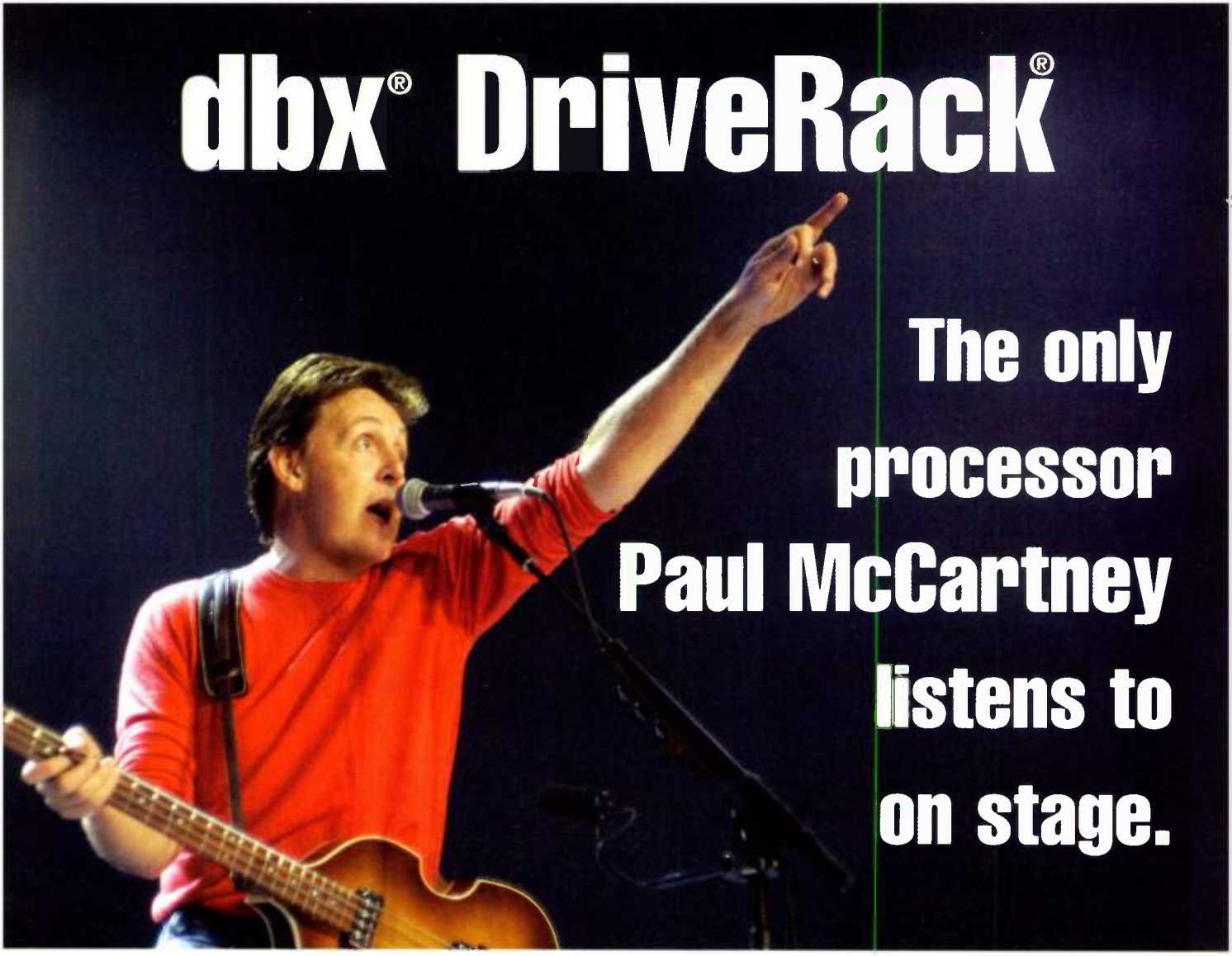

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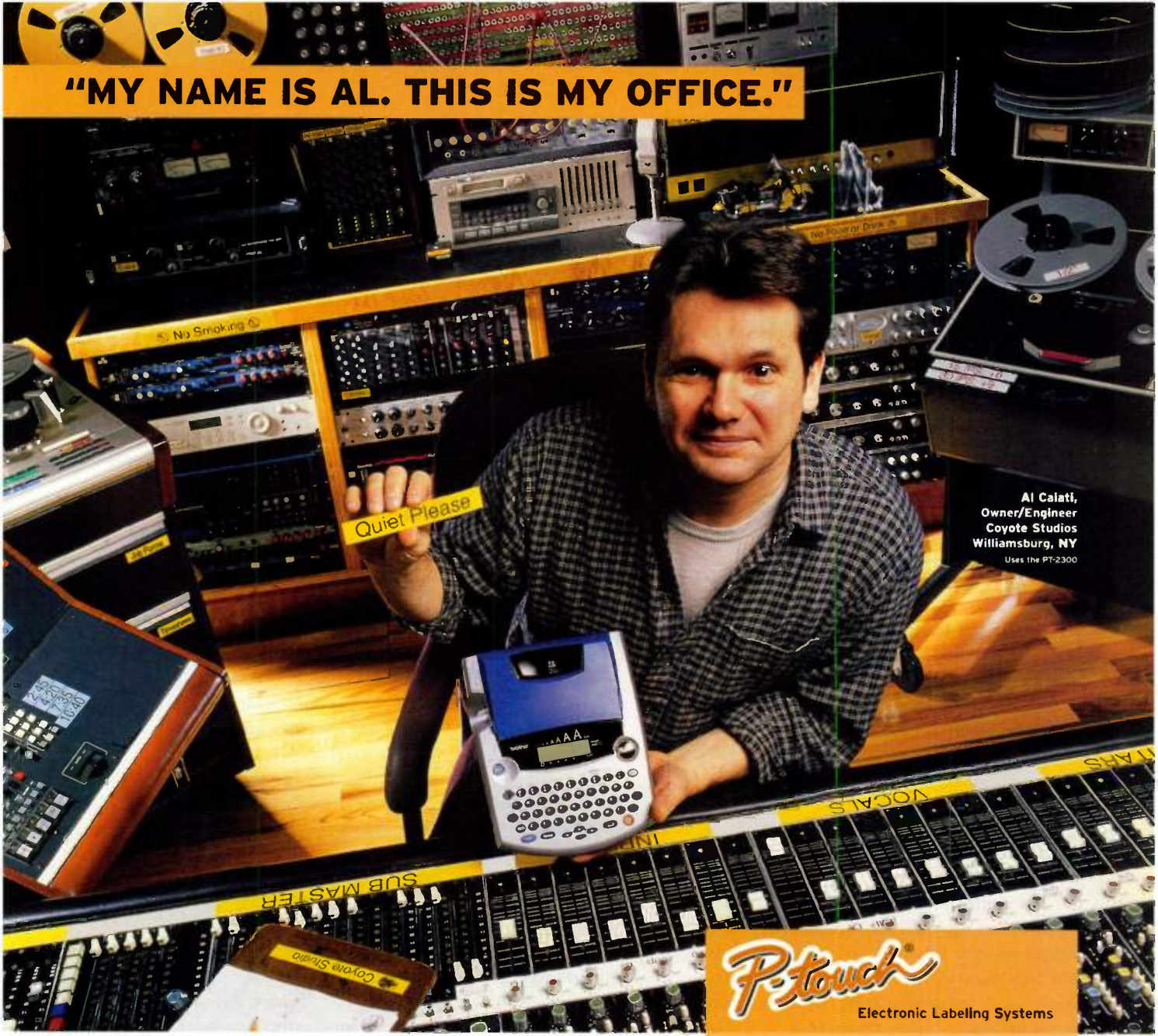

Al Caiati,
Owner/Engineer
Coyote Studios
Williamsburg, NY
Uses the PT-2300

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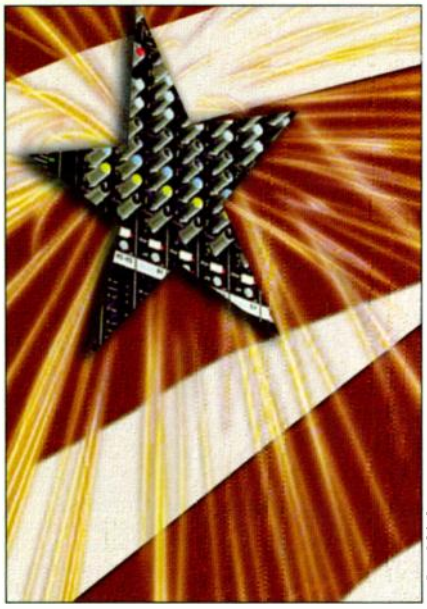

MAE LAROBIS

MIDI BEACH PARTY

I just read over **EM**'s roundup of USB MIDI keyboard controllers ("Surfin' USB," September 2002). It was quite informative, although it didn't touch on a subject that interests a few of us: if we take our little USB rig to the beach, how many batteries will we need? Your article mentions that USB provides 5 VDC, but how much juice will the controllers draw, and by how much will an attached MIDI controller compromise battery life? I understand that this question is relative and depends on a number of factors, but it would be nice to have a rough idea.

Chris Engel
via e-mail

M-Audio product manager Robb Mason replies: Chris—When estimating a MIDI controller's drain of a laptop battery, there are many variables. For example, I have a basic, generic laptop computer that I use for work. The two-hour battery life is reduced to about 30 minutes with an Oxygen 8, but with my VPR Matrix it lasts for almost 90 minutes.

The numbers also change depending on the applications. For example, Propellerhead Reason will run longer with soft synths than it will with samplers. Ableton Live will always kill the battery quicker than Reason because it is constantly hitting the hard disk. Hitting the CD drive is more costly than hitting the hard drive, being short on RAM is costly, and so on.

Another problem we have run into is the amount of voltage that a USB port actually supplies. While USB is said to provide 5 volts of power, in some cases it provides as little as 3.5 volts. So once again we have another scenario that varies, and the battery life really depends on the laptop manufacturer. Regardless of the voltage, the Oxygen 8, for example, will work because its voltage drain is pretty minimal. But as for determining a specific amount of time, there are too many variables for a reasonable testing environment.

DVD OR NOT DVD

Thank you for doing an excellent article on DVD burning ("DVD Creation," May 2003). I recently bought a Mac with a DVD burner and am just beginning to delve into the world of DVD production. Your article couldn't have come at a better time, and it has helped me understand a technology that seemed very complicated at first. Thanks for explaining all of the technical terms associated with DVD production and for getting me started.

While doing your research, did you form any opinions as to which DVD format will prevail in the future? My Mac uses a Pioneer DVR-104 DVD burner and the DVD-R/RW format. I notice that many DVD burners use the DVD+R/+RW format.

Jim Rosand
via e-mail

Jim—Thank you for your note. The answer to your question for the moment is "all of the above." Rather than settle on a single format, a number of manufacturers are making combination drives that include more than one of the current competing formats. For example, the Sony DRU-500A writes DVD-R/RW and DVD+R/RW, as well as CD-R and RW. LG Electronics, on the other hand, has announced the GMA-4020B, which writes DVD-RW/-R/-RAM and CD-RW/-R, a specific collection of formats dubbed "multisystem" by the DVD Forum (proponents of the DVD "-" format).

However, all of these formats may become moot sooner than we think. Blu-ray is a forthcoming format that can hold nearly six times as much information as current DVDs, because it packs bits more densely. (There's no word about whether existing formats will be supported by Blu-ray hardware). And yet another high-capacity format—one that uses lower-bit-rate encoding—is being proposed by the DVD Forum itself.

So your best bet is simply to use the DVD-R/RW drive in your system; it is easily as compatible with as many set-top players as any other current format. Then sit back and watch the format wars that are sure to evolve in the coming years.—Dennis Miller

IF YOU BUILD, WILL THEY COME?

I have a home studio, and I try constantly to improve it. I'm a classical guitarist who rarely records more than two or three tracks at a time. When tracking, I bypass my digital mixer and go straight from my mic preamp to my Fostex D2424 hard-disk recorder, using my favorite outboard A/D converters. The digital outputs of the D2424 are connected to the mixer so I can take advantage of the mixer's DSP, scene memory, and so on. I guess I'm doing what lots of people are doing.

I would like to upgrade to a 24-bit, 96 kHz digital mixer. However, manufacturers of digital mixers have yet to address two issues that concern many potential buyers. First of all, why pay for dozens of average quality mic pres that I will always bypass? Second, why

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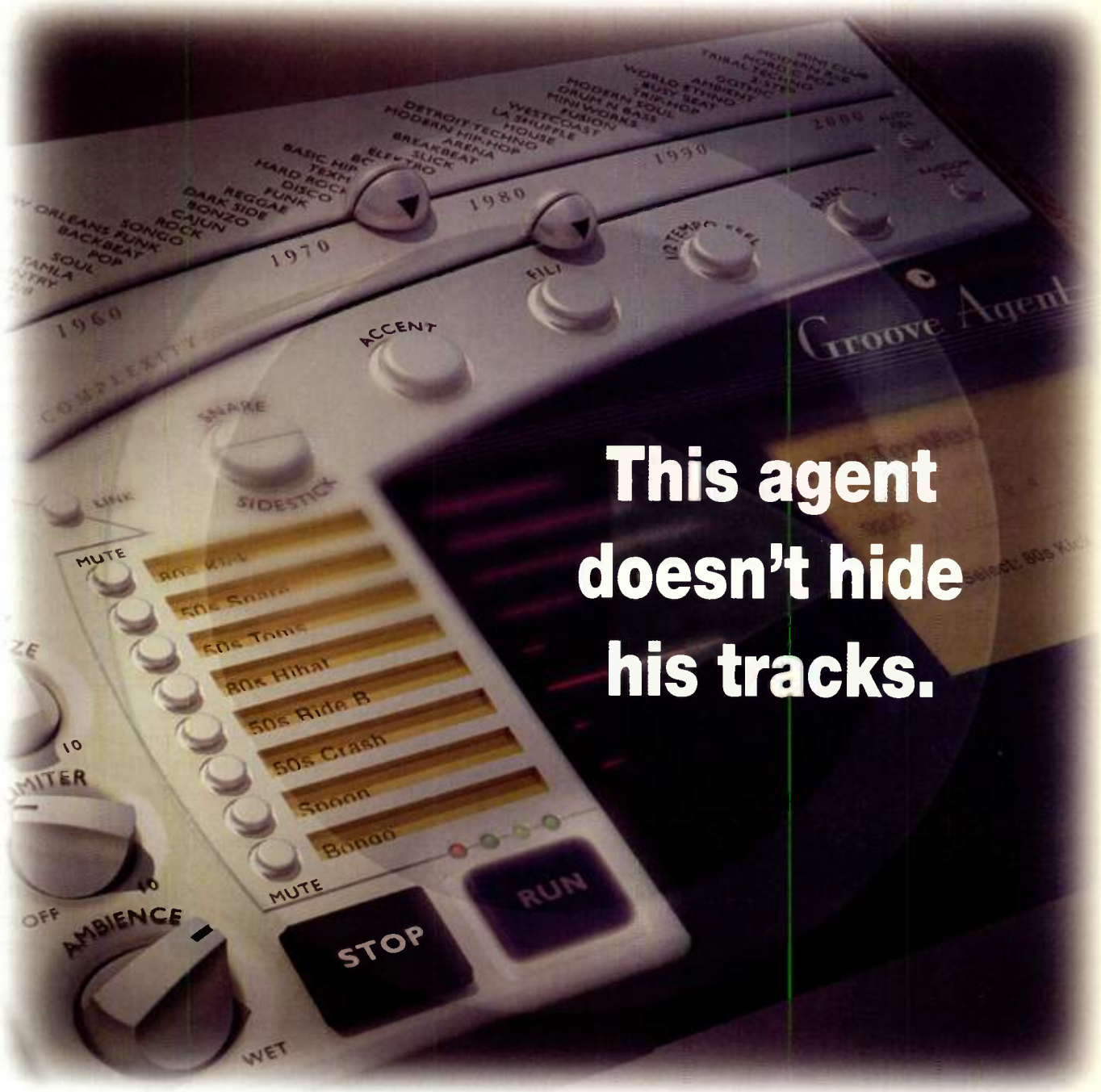

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pay for dozens of average-quality A/D and D/A converters that I will never use? Why won't any major manufacturer build a high-quality digital mixer that has only digital inputs and the best possible DSP and D/A converters? That would probably result in lower retail (and manufacturing) prices, coupled with an improved sonic quality. I don't think such a mixer would be a niche product. Or am I wrong?

Massimo Santantonio
Rome, Italy

Massimo—Most folks who currently buy digital mixers appear to want a complete product, with preamps and converters. In addition, standalone digital mixers are not a hot-selling item right now because there are a lot of good alternatives, which makes it harder to market specialized models. Although your proposed mixer would certainly appeal to some folks, you are talking about a subset of a limited market, which sounds like a fair definition of "niche." Still, you aren't the only one who would be interested in a digital board without an analog front end.

ORGANIZING PRINCIPLE

Why did Nick Peck, in his article about managing a sound-effects collection ("Finders Keepers," April 2003) fail to mention the best and the cheapest method there is for organizing all of your sounds: Apple's free iTunes.

For commercial libraries, I wrote a quick AppleScript for renaming the CD tracks in iTunes from a FileMaker database. For my original sounds, I name the tracks with the project name as the "Album." You can rip the CD tracks into AIFF, WAV, or MP3 files.

This method keeps all of your sounds automatically organized on the drive. Better yet, iTunes has an incredible database-search function. Just type in a search term, and iTunes automatically collates all relevant files. You can audition the files right in the iTunes window, make a new playlist, and drop in the ones you like. Then go into your new playlist and drag the files anywhere you want in the Finder.

Six years ago, when faced with an increasing number of SFX files, I wrote a little MacPerl program to do all of this for me. It took me about two seconds to realize that Apple had done a better job than I ever could have.

Jeremy Lee
via e-mail

Author Nick Peck replies: Jeremy—Thanks for your input. Everyone has their own way of doing things. The reason I don't use iTunes for this type of thing is because its categories are limited and oriented toward music, not sound design. I built my system before iTunes existed, and FileMaker offers a good deal of flexibility. The other systems mentioned are good products that are specific to sound design.

ONCE MORE, WITH FEELING

I always like reading Larry the O's "Final Mix" column, and read his March 2003 column ("You Got to Carry the LOD") with enjoyment. It recalls one important thought that runs through the back of my mind whenever I read **EM**: the most critical element in any recording is the performance. When the chemistry is right and passion and inspiration flow during a session, you'll almost always capture something that will move and please the listener, regardless of technical issues. This idea sounds basic and simple, but getting that passion and inspiration to appear on command and endure for the length of a song while recording is a little like coaxing a deer into the open while holding a gun. For whatever reason, passion and inspiration are timid creatures when the recording lights are on.

I often find that my best-written songs are not my best-recorded ones. I think that's because my expectations are higher when recording my favorite songs, which subtly adds a little pressure during the recording session and makes all the difference. Often, the "throw-away" number turns out the best because the musicians are more relaxed during the recording.

Of course, it's ideal to have everything—a great performance and great gear, mixing, and editing. But if I had to choose between listening to a fuzzy 2-track cassette recording of a great performance by my band and an expensive but less inspired studio recording, I think you know what I'd choose.

Bern Solnik
Bethesda, Maryland

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FRONT PANEL

Download of the Month *By Adam Borcherdt*

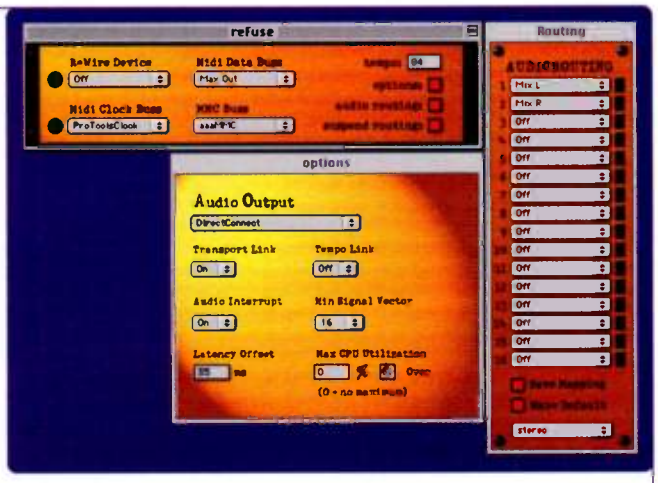
If you'd like to use Digidesign Pro Tools and Propellerhead Reason together, you should know about reFuse (Mac, $29), an application that translates audio and timing data between the two programs. With reFuse, Pro Tools can record audio directly from Reason as the two programs run in synchronization. Currently, reFuse is available for Mac OS 8.1 through 9.2.2, but not OS X or Windows.

Using ReWire, Reason sends audio and transport-control signals to reFuse, which in turn routes audio to Pro Tools through Direct-Connect. MIDI Clock and MIDI Machine Control (MMC), running on IAC busses in OMS 2.3.8, take care of transport linking between Pro Tools and reFuse.

The software has a simple, functional appearance that accommodates its easy-to-use features. After reading reFuse's setup instructions, I quickly had a session up and running on the first try. The programs must be launched in a particular order—Pro Tools, reFuse, and then Reason. Reverse the order to quit the applications.

Depending on your system's capabilities, reFuse can route as many as 16 discrete audio channels. My computer, a Power Mac G4/800 with 768 MB of RAM and a Digidesign 001, could run a 16-channel mix. However, I experienced a few crashes, especially when stopping and starting. You can also record real-time MIDI controller data from Reason on a MIDI track in Pro Tools using a separate IAC bus.

I really like being able to record discrete drum and instrument parts from Reason, simulating a live recording session. I can also use my plug-ins to sweeten Reason's instrument sounds. And now I can record guitar parts while jamming along with Reason tracks. I discovered only one drawback: looping in Reason doesn't work.



The reFuse Web site offers detailed information about program features such as latency offset, tempo linking, and CPU demand. Answers to the questions that I had were already listed in the FAQ section. ReFuse runs on any Mac that can run Pro Tools. reFuse Software; e-mail sales@refusesoftware.com; Web www.refusesoftware.com.

Key Changes *By Marty Cutler*

Defective Records Software (www.defectiverecords.com) is shipping VSTi Host version 3.01X for Mac OS X, in addition to version 3.11 for Mac OS 9. The program opens VST instruments without a sequencer program, and offers VSTi capabilities to DAWs that lack native support for VST 2.0 . . . **TC Applied Technologies**, a subsidiary of TC Electronic (www.tcelectronic.com), has introduced its Dice II chip set. According to TC, the Dice II handles all standard pro audio I/O formats, including as many as 96 FireWire audio channels at a 96 kHz sample rate, as well as ADAT reception and transmission with S/MUX support for 96 kHz audio . . . **Wave Arts** (www.wavearts.com) has added plug-in support for MOTU's MAS and VST platforms in OS X. Supported products include the company's latest plug-ins—WaveSurround Pro, MasterVerb, and TrackPlug (a channel-strip plug-in with a compressor, gate, and 64-bit 10-band EQ) . . . **Scarbee** (www.scarbee.com) has combined its *J-Slap* and *J-Fingered* electric bass collections in a four-CD set called *J-Slap'n Fingered* for Steinberg's HALion software sampler. According to Scarbee, the set takes full advantage of HALion's programming capabilities, including modulation-wheel switching between fingered and slapped samples. A version for NI Kontakt will soon follow . . . The entire professional line of products from **TerraTec** (www.terratec.net) is now marketed under the brand name TerraTec Producer. Additionally, its EWS line of products, including the Mic 2 preamp and audio interface, will now be marketed under the Phase brand name.

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Cool Tip of the Month

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

Fuzzy Loops in Cubase

In today's production environment, drum-loop options seem literally endless. If you've ever set out to build a tune that's based on drum loops or have wanted to add a loop to enhance an existing percussion track, you probably found a tremendous variety of pristine loops at your disposal. Despite all the cool stuff available, though, sometimes what you find isn't what you need. In this month's tip, I'll explain how to use a multiband distortion plug-in to fuzz up a drum loop.

If you use Steinberg Cubase SX, you have a jewel of a plug-in called QuadraFuzz. Applying QuadraFuzz processing to a drum loop can add an unusual effect. One cool aspect of a multiband processor such as QuadraFuzz is that you can slam the kick and the snare in their respective frequency bands and, if desired, leave the hi-hat clean. In this example, I won't distort the hi-hat in a drum loop, but I'll apply various degrees of distortion to the low, low-mid, and high-mid bands to impart a sound that is unique to an otherwise sterile drum loop.

1. Insert the QuadraFuzz plug-in on the drum-loop track.
2. Click on the Edit button to access the distortion processor's controls in the Edit window.
3. Click on the Solo button, then select the high band in the frequency-band display. Increase the gain and adjust its band to identify the hi-hat's frequency range.
4. Once you narrow in on the hi-hat, reduce the signal level hitting the distortion stage. You might need to increase the high band's output volume.
5. To zero in on the kick and snare, adjust the other bands in a similar fashion, and then increase the gain to taste.

—Steve Albanese

Be sure to check out the streaming movie tutorial of this procedure. Log on to www.emusician.com/cooltip to take part in this online adventure. Also, if you dare, take the quiz to review what you've learned!

TIPS

Sonic Foundry Tricks

From Sound Forge to Acid to Vegas, Sonic Foundry makes a number of popular products for Windows. Here are a few short tips that apply to all of the Sonic Foundry line.

Set your preferences on the first use and close/reopen the app. When you first configure or change one or more settings in the Preferences menu in a Sonic Foundry application, the settings don't take effect until you close and then reopen the program. Although Sonic Foundry software has a reputation for being very stable, you might still run into a jam and have a program close prematurely; if that happens, you'll have to reconfigure the application, which can be a time-consuming process. To avoid that, always close then immediately reopen a program, especially if you have a lot of custom settings. That will ensure that your preferences are set, even if you have problems down the line.

Know your Temp folder. If something goes awry, knowing the location of your Temp folder can be a lifesaver (or at least a project saver). You can count on finding backups of recent projects there in case you ever need to recover them. It's also useful to know how much space is left in your Temp folder, which is the default location for any new recordings you make.

Micro-adjust parameters. Almost all the controls in Sonic Foundry applications allow you to fine-tune them by holding down the Ctrl key as you move the control by using the mouse wheel or dragging. You can also double-click on a slider or a knob to have it jump to its default location, which in many cases is the value zero.

—Rick Hoefling, Sonic Foundry

Grooving with Sidechains

Central to many dynamics processors—compressors, expanders, limiters, and gates—is a circuit known as a voltage-controlled amplifier (VCA). Normally, the VCA is controlled by the signal going into the processor's audio input. The VCA kicks in and begins to attenuate the signal once the incoming signal crosses the threshold level that you set on the device. However, many processors allow you to control the VCA

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Rev Up

By Marty Cutler

Propellerhead Software

With version 2.5, Propellerhead Reason (Mac/Win, $399) adds a number of processors to its virtual rack. The update is free to registered owners of version 2.0.

RV7000 is a high-quality stereo reverb that offers nine algorithms, each with as many as seven adjustable parameters. The RV7000's EQ section provides parametric EQ and a low-shelving filter for fine-tuning the reverb sound. You can apply the RV7000's gate to any reverb algorithm and trigger it with MIDI or Reason's control-voltage (CV).

The new BV512 Digital Vocoder offers from 4 to 512 bands of vocoding. It can also double as an automated graphic equalizer. UN-16 Unison duplicates the function of the Unison button found on some synths by emulating the effect of 4, 8, or 16 detuned voices playing the same sound.

Reason's Scream 4 Sound Destruction Unit features ten types of distortion and a ±18 dB, 3-band equalizer. Scream 4's Body Section is similar to a speaker simulator, providing five basic Body types and separate controls for Body Resonance and Body Scale. The Auto function is an amplitude-respondent envelope follower that controls the scale parameter to create dynamic effects.

Spider Audio, an audio-routing utility, lets you merge and process multiple audio signals with the same insert effect. In addition, it can split an instrument's output into four signals and send them to four different effect processors. Similarly, Spider CV offers flexible modulation and control routing by splitting and merging virtual control-voltage (CV) and gate signals. The merge function comes with individual attenuators for each input and the split function also inverts one of the CV outputs.

Reason requires a 233 MHz Pentium II with 64 MB of RAM and Windows 98, ME, 2000, or XP. On the Mac, you'll need at least a 166 MHz Power Mac 604, 128 MB of RAM, and Mac OS 9 or OS X 10.1. Propellerhead Software/M-Audio (distributor); tel. (800) 969-6434 or (626) 445-2842; e-mail info@propellerheads.se; Web www.propellerheads.se.

Yowstar

Yowstar has released version 2.0 of its loop-mixing virtual instrument Girl (Mac, $99). Registered users can upgrade for free and download an OS X beta version at Yowstar's Web site. This major update includes a redesigned user interface, surround-sound mixer, improved session management and MIDI control, new live-recording features, support for MIDI Clock and tapped tempo sync, transport control from MIDI sequencers, support for Cycling '74's Pluggo plug-ins, support for VST instruments, and enhanced efficiency.

Surround mode lets you mix audio from the program's loop modules in 3 to 16 channels with multichannel soundcards. Girl 2.0 supports ReWire, VST, and DirectConnect for sending multichannel audio to other applications. Automated panning on each channel

TIPS

with an external signal using the sidechain (also known as a detector, key, control, or trigger) input. Sidechain-based processing allows you to get sophisticated results from otherwise mundane processing chores.

For example, let's look at a typical noise-gate application: silencing unwanted artifacts, such as amplifier hum, from an electric bass track. Normally, the gate's VCA is controlled by level changes in the bass signal itself: when the bassist stops playing, the input signal falls below the set threshold, and the VCA lowers the level of the unwanted audio.

But if you send a kick-drum track to the sidechain input on the device processing the bass, the level of the kick drum will control the VCA. That allows the kick drum to ride the level of the bass, which can result in a tighter groove between the two instruments.

Keep in mind that sidechain signals are not fed to the processor's outputs. They simply control the amount, as well as the timing, of the processing. You will need to feed the kick-drum signal to your mixer in order to hear it.

—Gino Robair

By the Numbers

If you're a Mac user making the switch from OS 9 to OS X, you'll soon discover that working with audio I/O is a whole new ballgame. Apple's built-in Core Audio interface now runs the show and serves as a central clearinghouse for establishing input and output

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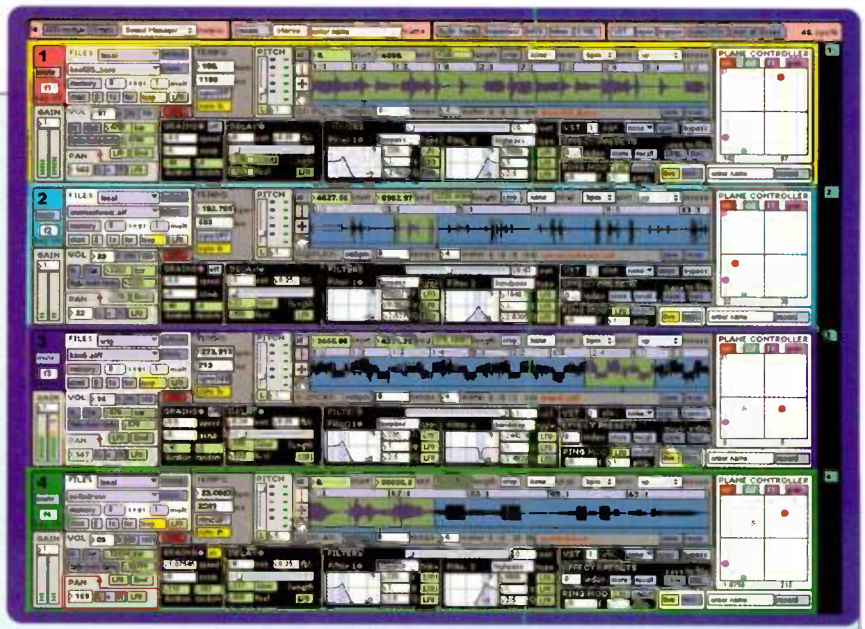
provides constant motion in surround environments. Girl can record a single multitrack file for additional editing and mixing in other audio applications.

Sounds are automatically segmented into pieces of equal length, which you can trigger using the Mac or MIDI keyboard or with Girl's sequencers. You can record Girl's audio output to a stereo or multitrack file or direct it to other audio programs with ReWire, DirectConnect, or VST. Girl requires a 266 MHz PPC with Mac OS 8.5 or Mac OS X 10.2, QuickTime 4.0, and 65 MB of RAM. Yowstar; tel. (510) 654-5966; e-mail girl@yowstar.com; Web www.yowstar.com.



Native Instruments

The virtual instrument Absynth 2.0 (Mac/Win, $299; $99 upgrade) now combines synthesis and sampling. The Patch window lets you combine the synth's sampling, granular synthesis, subtractive, wavetable, FM, AM, ring-modulation, and waveshaping synthesis capabilities. Each voice offers six synthesis oscillators or three sampling oscillators, four filters, three ring modulators, and a waveshaping distortion function. You can draw waveforms by hand and sketch harmonic levels. A new contextual menu offers waveforms, envelopes, and entire oscillator channels, enabling convenient and quick construction of complex, evolving sounds.

Absynth's envelopes can control most synthesis, sampling, and effect parameters, and each envelope can contain up to 68 breakpoints. Envelopes can lock to the tempo, and you can dynamically control envelopes with MIDI Control Change messages. Variable-speed LFOs can modulate envelopes and offer graphic displays of the LFOs in action. A new Link mode lets you chain envelopes together and scale their time, amplitude, and slope to create dynamically detuned chords, phasing filters, and more.

According to Native instruments, Absynth's newly revised DSP core runs more efficiently and offers sounds with greater warmth and sparkle. Absynth 2.0 runs completely in stereo, with envelopes providing dynamic panning for individual oscillators. Several new filter models are available, including 2- and 4-pole lowpass filters and a multiple-pole, all-pass filter for phasing and resonant effects.

Plug-In operation of Absynth has been greatly enhanced. Each instantiation of Absynth can open its own bank, and the Absynth Engine no longer needs to run in the background. Absynth requires a 500 MHz Pentium III, 256 MB of RAM, and Windows 98SE, ME, 2000, or XP. Mac users need at least a G3/400, Mac OS 9.1 or 10.2, and 256 MB of RAM. Native Instruments USA; tel. (866) 556-6487; e-mail info@native-instruments.com; Web www.native-instruments.com.

assignments between your audio software and hardware. However, in OS X's current version (10.2.6, as of this writing), most OS X audio applications present the physical inputs and outputs on your audio hardware as a generic list of numbers (Input 1, Input 2, and so forth). That could be confusing if you're using a multiple-format audio interface like MOTU's 828, which offers S/PDIF and ADAT ports as well as analog I/O.

If you open the hardware-setup window in many audio programs, you won't see the S/PDIF or ADAT inputs and outputs listed by type. You'll just see inputs and outputs listed by number. In the case of the 828, channels 1 through 8 are the analog channels. If the optical bank is enabled for the 8-channel ADAT format, channels 9 through 16 are the ADAT channels, and 17 and 18 are the S/PDIF channels. If the optical bank is set to Toslink, channels 9 and 10 are Toslink, and channels 11 and 12 are S/PDIF. If the optical bank is disabled, channels 9 and 10 are S/PDIF. Other audio interfaces will likely have a similar scheme, depending on what audio formats they supply. You just need to know which numbers correspond to which ins and outs.

Digital Performer 4 displays 828 (and 896) inputs and outputs by name (for example "ADAT 1–2" or "S/PDIF") because Digital Performer 4 and MOTU's FireWire Audio Driver support Core Audio's concept of audio-stream names. Any other audio application that supports Core Audio's stream naming will also display 828/896 inputs and outputs by name.

—David Rubin

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WHAT'S NEW

By Geary Yelton

▲ MACKIE CONTROL C4

The C4 ($1,099) is Mackie's latest addition to its line of dedicated control surfaces and its first product expressly designed to control virtual instruments and effects. With four banks of eight assignable knobs and four backlit LCDs, the C4 offers a hardware-based, analog-style user interface for controlling plug-ins and standalone software.

The C4 gives you simultaneous access to 32 parameters, and function buttons let you select which parameters are shown in the displays. In a DAW, the C4 can also control faders and pan settings for 32 channels, either independently or in conjunction with the Mackie Control or Control Extenders. Mackie Designs; tel. (800) 898-3211 or (425) 487-4333; e-mail sales@mackie.com; Web www.mackie.com.

▶ STUDIO PROJECTS LSD2

PMI Audio has begun shipping the first stereo microphone from Studio Projects, the LSD2 ($999.99). Containing two 1.06-inch twin-diaphragm capsules in a plated brass housing with a brass wire-mesh grille, the mic is designed for such diverse applications as recording instrumental ensembles, choirs, drum sets, and voice-overs. Its design allows you to adjust the stereo image by rotating the upper capsule horizontally a full 270 degrees relative to the lower capsule. The close proximity of the two capsules prevents phase cancellation caused by time delays, resulting in improved mono compatibility. Each capsule is coupled with an independent low-noise amplifier.

In addition, each capsule has a three-way switch that enables a –10 dB pad and highpass filter, and a three-way switch that selects one of three polar patterns: omni, cardioid, or figure-8. The switches, in combination with the rotating capsule, allow you to customize the microphone's response to fit a number of stereo recording applications. The LSD2 includes a dedicated 7-pin-XLR-to-dual-3-pin-XLR cable, a foam windscreen, a shockmount, and a carrying case. Studio Projects/PMI Audio Group (distributor); tel. (877) 563-6335; e-mail sales@pmiaudio.com; Web www.studioprojectsusa.com.

▼ EMAGIC LOGIC 6

As expected since last summer's surprise acquisition of Emagic by Apple Computer, Logic Platinum 6 (Mac, $949) is the first version of the popular DAW developed exclusively for Mac OS 9 and OS X. Perhaps the most significant new feature is the Arrange window's Freeze button, which reduces CPU load by recording processor-hungry tracks to disk. You can freeze tracks that contain software instruments and effects and later unfreeze them for further editing. In addition, freezing lets you play songs on slower machines than were required to record them.

Logic Platinum's new Project Manager links all the media files used in a project, and all versions of Logic 6—including Logic Gold 6 ($649) and Logic Audio 6 ($299)—make it easier for you to archive and transport entire projects. To minimize switching between the Mixer and Arrange windows, the Arrange Channel Strip lets you change a mix without leaving the Arrange window. A new Track EQ offers four fully parametric bands of equalization. Logic Platinum 6 can accept video input from DV cameras as well as stream DV-formatted QuickTime movies over FireWire.

Additional enhancements include improved automation, 32 channel groups, more DSP functions in the Arrange window, and better time-stretching and pitch-shifting. Some features are available only in OS X, such as the new Setup Assistant, an interactive question-and-answer session that configures Logic 6 to your needs and specifications.

Minimum system requirements for all versions of Logic 6 are a Mac PPC 604/250 MHz for OS 9.1 or a G3/266 MHz for OS X 10.2.1; 128 MB of RAM; a USB port; and a CD-ROM drive. Emagic USA; tel. (530) 477-1051; e-mail emagic@emagicusa.com; Web www.emagic.de.

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YELLOW TOOLS CULTURE

Culture (Mac/Win, $399) is the first in a series of Modular Virtual Instruments (MVIs) from German soundware developer Yellow Tools. Packaged on two DVDs containing almost 9 GB of data, the massive sample collection comprises drums and percussion instruments from around the world. Culture's range of orchestral, ethnic, and industrial percussion instruments includes nearly everything from trash cans to timpani: orchestral snares, bongos, chimes, gongs, shakers, tambourines, and a variety of cymbals are at your fingertips, as well as more exotic percussion such as balafon, darabukas, kenkeni, sangban, tamdrums, and udus.

Many instruments are sampled in tremendous detail, providing a variety of playing techniques with as many as 16 Velocity splits per note for each hand. For example, one conga set comprises more than a thousand individual samples. Culture's user interface lets you edit single notes or entire multisampled instruments.

Integrated with the sound library is the MVI audio engine, a plug-in for RTAS- (Mac OS 9 only) and VST-compatible programs for Windows, OS 9, and OS X. Audio Unit, RTAS for OS X, and MAS support is also planned. A demo version is available for download.

Mac users will need a G4/400 MHz running OS 9.2.2 or OS X 10.2.3, and Windows users will need a 400 MHz Pentium, Celeron, or Athlon computer running Windows 98, 2000, ME, or XP. Also required are 256 MB of RAM, 10 GB of free disk space, and a DVD drive. Yellow Tools/EastWest (distributor); tel. (800) 833-8339 or (310) 271-6969; e-mail sales@eastwestsounds.com; Web www.soundsonline.com.

BOSS BR-864

The BR-864 8-Track Digital Studio ($595) is one of Boss's latest multitrack recorders. In addition to 8 primary tracks with EQ, it offers 64 virtual tracks, a USB interface, and onboard effects. Weighing less than 4 pounds, the battery-powered BR-864 records to standard CompactFlash cards as large as 1 GB; a 128 MB card comes with the unit. The BR-864's USB port lets you transfer WAV and AIFF files to and from a computer, as well as archive and back up song data. Once in your computer, recordings can be edited in detail or burned to CD-R.

With a high-impedance input, an onboard tuner, and a COSM-based effects processor, the BR-864 is optimized for recording electric guitar. A selection of guitar-amp models and effects, such as wah and scale-intelligent pitch-shifting, extend the guitarist's timbral palette. A Bass Simulator effect lets you record realistic bass parts with your electric guitar. A Phrase Trainer function slows down recorded tracks, making it easier to pick out parts and learn new riffs.

The BR-864 can record as many as 64 tracks and play back any 8 tracks simultaneously. In addition, a fully programmable stereo drum-machine function called the Rhythm Guide lets you import drum samples and enter your own patterns without consuming any audio tracks.

The BR-864's I/O capabilities include a built-in microphone, an XLR and a ¼-inch mic input, two RCA line inputs, two RCA line outputs, and an optical S/PDIF output. Roland Corp. U.S.; tel. (323) 890-3700; Web www.rolandus.com or www.boss.com.

FXPANSION VST-AU ADAPTER

London-based software maker FXpansion has introduced an essential solution for Mac OS X users whose audio programs lack VST compatibility. VST-to-AudioUnit Adapter (Mac, $75) is a plug-in wrapper that allows Audio Unit (AU)-compatible programs, such as Emagic Logic 6 and BIAS Peak 4, to run OS X–compatible VST 2.0 instruments and effects as if they were native plug-ins. Now those users can use products from Steinberg, TC Works, Prosoniq, Waldorf, reFX, and other VST plug-in developers that have updated their products for OS X compatibility.

After you've installed VST-AU Adapter, you can convert VST plug-ins to virtual AU plug-ins. According to FXpansion, efficient coding ensures remarkably low processor overhead. Because low-latency operation is Audio Unit's primary benefit, VST plug-ins might actually require less horsepower than in a native VST environment.

VST-AU Adapter requires at least a Power Mac G3/266 MHz, 128 MB of RAM, and Mac OS X 10.2. FXpansion Audio UK; tel. 44-0-7808-157-967; e-mail info@fxpansion.com; Web www.fxpansion.com.

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Samplitude 7 now comes with POW-r, a high-quality dither algorithm. Developed and patented by the POW-r Consortium, it reduces word lengths of 20, 24 or 32 bits to the standardized 16 bit CD format with a high degree of perceptible signal dynamics and low noise level.

Comprehensive Editing Functions

Samplitude offers a huge range of professional editing functions. Recorded samples can be arranged in any way, cut, and be reworked into soft crossfades. Dozens of tools are available. Precision volume and pan envelopes that can be automated while remaining true to the original sample round off the tool pallet. Of course, editing is performed virtually – and therefore non-destructive – so that every parameter can at any time be altered without losing valuable material.

Unique Object-Oriented Editing

As an enhancement to the traditional concept of mixer-supported editing of complete tracks, all versions offer countless possibilities for direct real-time sample editing. Recorded audio tracks can thus be cut into as many objects as you wish. Every object can be edited with individual fades and effects, such as Equalizer, Timestretching, Pitchshifting or plugins. Samplitude also offers Aux-Sends on the object level, the well-known linearphase mastering effects, and a widely variable signal flow.

First Class Effect Setups

From mixing to mastering, all production needs are met: Award-winning equalizers, various dynamic processors, Timestretching, Pitchshifting, Reverb and Delay, plus the high-end mastering effects: Multi-tape compressor, Multi-band stereo enhancer, FFT filter with over 30,000 bands, Amp Simulator, Vocoder, room simulator with folding principle, Denoiser (utilizing the noiseprint method) and DeHisser for real-time noise reduction. Besides routing possibilities for all effects that allow a freely configurable signal flow, these possibilities are not only available to the object level, but also in each mixer channel.

Further features: Improved solo effects, unlimited routable busses and Aux-send busses, VST and DirectX plugin support, flexible routing of all integrated and plugin object effects and mixer channel effects.

Burning CDs

It couldn't be easier: Red Book-compatible audio CDs can be burned on-the-fly from the arrangement, without having to take any destructive intermediary steps. The continuously updated support makes sure that even the latest models burn perfectly with Samplitude.

Track Speed and Stable Playback

Intelligent cache management means that the harddisk installed will be used to its fullest capacity – confining to history the old problem of too few tracks while producing with 24 bit/96 kHz. Stable playback: Arrangement playback has priority over all other operations such as opening menus. No more crashing or bumping playbacks!

2 GB File Breakthrough

The Windows WAV file size limit of 2 GB is history. Now you can record up to 2 billion stereo samples. That means 10 hours of sounds in just one file with 44,1 or 48 kHz. Complete radio broadcasts can now be recorded in one take.

Further Features

- Easier handling: Work area presets offer interface clarity whereby only the pallet of the function being used currently is displayed
- 5.1 Surround capability (only Samplitude Pro /Sequoia)
- Midi and VST* instruments (Samplitude Pro/Sequoia)
- Support of all audio and internet file formats, such as Broadcast WAV, MP3, OGG Vorbis and WMA
- Visualizer: optimal metering with highly precise and size-variable peakmeter and spectroscope
- Total control via configurable shortcuts: Samplitude is renowned for its flexibility and effective functionality. For almost every command there's an individually configurable shortcut available (only Samplitude Pro /Sequoia)
- Support of all important driver models: ASIO*, WDM, MME
- Outstanding helpful user community.

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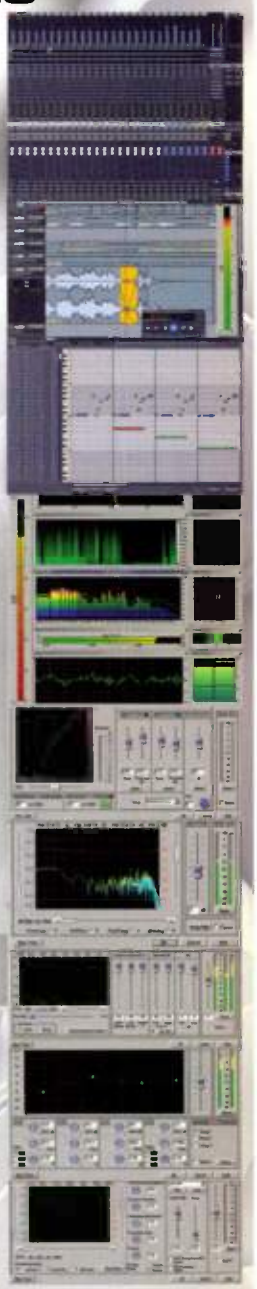

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▶ MOTU DIGITAL PERFORMER 4

Mark of the Unicorn has released its much-anticipated DAW for Mac OS X, Digital Performer 4 (DP4) (Mac, $795; upgrade from previous versions, $149; competitive upgrade, $395). DP4 supports OS X's Core Audio and CoreMIDI features, such as interapplication MIDI, MIDI Time Stamping, XML instrument patch lists and drum-note names, multiple audio interfaces from different manufacturers, and Apple's Audio MIDI Setup utility. DP4 can share its patch lists with any OS X application that supports CoreMIDI XML. It can also record and play back hundreds of MIDI tracks to and from any other CoreMIDI-compatible program.

MOTU has improved DP4's menu organization and added a Project menu to consolidate project-related commands. A new Freeze Tracks feature offers processor-conservation benefits by recording CPU-intensive tracks to disk. With ReWire 2.0 support, you can easily record MIDI tracks using virtual instruments from applications such as Propellerhead Reason. QuickScribe, DP4's notation-transcription engine, offers several significant enhancements, including a new Arrangement palette and the ability to edit a score's appearance without affecting playback. The Arrangement palette provides symbols such as codas, del segno, endings, and repeat bar lines. The playback cursor now follows the flow of a condensed score, including codas, repeats, and endings.

Support for Audio Unit plug-ins and for Pro Tools|HD and TDM hardware will be available soon as a free update. DP4 requires at least a Power Mac G3/266, Mac OS X 10.2, and 256 MB of RAM. Mark of the Unicorn (MOTU); tel. (617) 576-2760; e-mail info@motu.com; Web www.motu.com.

▶ TASCAM US-122

The latest USB audio-and-MIDI interface from Tascam is the US-122 (Mac/Win, $269). Like its predecessors, the US-428 and US-224, the US-122 was developed in cooperation with the Frontier Design Group. Notable features include MIDI In and Out ports, two phantom-powered XLR mic inputs, a stereo headphone output, and a pair of ¼-inch inserts for outboard processing. You can switch the interface's two line-level analog inputs on balanced ¼-inch TRS jacks to accommodate high-impedance guitar levels. The MIDI ports not only allow you to use the US-122 with synthesizers and samplers, but also provide a means for synchronizing and automating other MIDI devices.

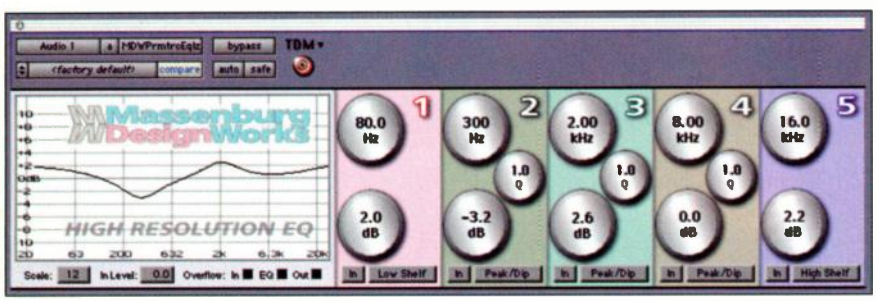
The US-122 draws its power from the USB port, optimizing its usefulness for recording with a laptop computer. Tascam provides drivers for ASIO, WDM, GSIF, and Core Audio applications. The US-122 is packaged with Tascam's virtual sampler GigaStudio 24 (Win) and Steinberg's entry-level DAW program Cubasis (Mac/Win).

For a PC, the US-122 requires at least a Pentium/200 MHz running Windows 98SE, 2000, ME, or XP. For a Mac, it needs at minimum a G3/266 MHz and OS 8.6 or OS X 10.2.3. Both platforms should have 64 MB of RAM, 4 MB of free disk space, and a USB port. Tascam; tel. (323) 726-0303; Web www.tascam.com.

▼ MASSENBURG HIGH-RESOLUTION EQ

The Massenburg DesignWorks High-Resolution EQ plug-in (Mac, $795) was designed exclusively for Digidesign Pro Tools|HD by recording-studio authority George Massenburg. The 5-band parametric equalizer emulates the constant-shape reciprocal filter curves of the George Massenburg Laboratories GML 8200 EQ and lets you select a wide range of frequency bands, from 10 Hz to 41 kHz.

The Massenburg DesignWorks High-Resolution EQ supports sampling rates as high as 96 kHz. When operating at 44.1 or 48 kHz, the plug-in processes audio at twice the sampling rate. This feature minimizes noise and artifacts and increases headroom and dynamic range by means of a method called Double Precision 48-bit processing.



The Massenburg DesignWorks High-Resolution EQ requires a Mac-based Pro Tools|HD system, Mac OS 9 or OS X 10.2.3, and an iLok Smart Key. Massenburg DesignWorks/Digidesign (distributor); tel. (800) 333-2137 or (650) 731-6300; e-mail prodinfo@digidesign.com; Web www.digidesign.com. ●

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By Scott Wilkinson

Swarm to the Music

A new approach to computer improvisation has musicians buzzing.

One of my favorite genres to play is free-form jazz, in which all members of a group improvise simultaneously, responding to each other's musical ideas as they occur in real time. You might think that this form of music would be an unlikely candidate for algorithmic computer generation, but Tim Blackwell, a British computer scientist and jazz musician, felt it presented just the challenge he needed to complete his masters thesis at University College London. Blackwell was inspired by the similarities he observed between free-jazz performances and flocks of birds or swarms of insects.

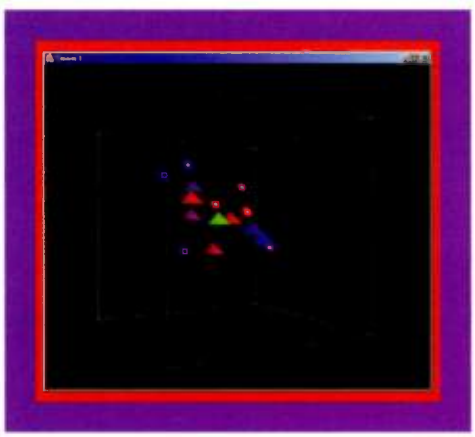
Among the most important characteristics of flocks and swarms is their ability to self-organize; for example, they often retain a persistent shape, and they can change direction almost instantly. Each member is attracted to the group's center of mass, but they invariably manage to avoid colliding with their neighbors. This self-organization is remarkably similar to the musical structures that emerge out of spontaneous improvisation among the members of a free-jazz ensemble, each of whom listens to what the others are doing and responds in real time while trying to avoid musical "collisions."

Using Java on a 1.3 GHz Pentium-based computer, Blackwell has written a program called Swarm Music that applies models of swarming and flocking behavior to MIDI Note On/Off events in what he calls Music Space. Like physical space, any point in Music Space is defined by three variables; but instead of spatial coordinates *x*, *y*, and *z*, points in Music Space are defined by their MIDI note number, Velocity, and the amount of time since the start of the last event, which he calls *pulse*. Each note typically ends shortly before its subsequent note begins (although that can be overridden), and all notes are depicted graphically on the computer screen as particles in a real-time animation of Music Space (see **Fig. 1**).

After the user specifies various parameters, such as initial key center and preferred scales, a performance begins with a few randomly generated notes, up to five of which constitute a swarm. Subsequent notes are then generated within the Music Space according to the swarming model and user settings, and the MIDI data associated with each note is sent to a synthesizer. In the latest versions of the software, two or three swarms can be implemented simultaneously. Blackwell has found that swarms with many events sound sluggish, with lots of repeated notes, and too many swarms can tax the processing capabilities of the computer.

In addition to generating music autonomously, the software can interact with a human musician who plays a MIDI controller or an acoustic instrument into a microphone connected to the computer's MIDI or audio interface. In the case of an audio input, the software's event-capture routine uses pulse-height analysis to determine when a musical event, such as a single note or chord, has started or stopped, then passes the signal through a Fast Fourier Transform to determine its "location" in Music Space. Surprisingly, the latency of this process is very low, allowing real-time interaction between the human and computer. Of course, MIDI input is much easier to deal with computationally.

One primary concept embodied in the software is called a *target:* a point in Music Space toward which the individual notes of a swarm gravitate. One target is the swarm's center of mass, and others are provided by human input. The swarm follows the targets, resulting in a surprisingly coherent musical structure (for some examples, go to www.timblackwell.com). Swarm Music represents a unique synthesis of biological and musical modeling that could lead the way to a new era of computer-based improvisation.



COURTESY TIM BLACKWELL

FIG. 1: In this screen shot of Music Space, the spheres are members of the swarm, the green cone is the swarm's center-of-mass target, and the other cones are targets input by a human musician.

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PROFILE

By Gino Robair

Analog in My Soul

Olivier Gerber puts the Smoo back in Smooth.

My main instruments are modular analog synthesizers," says Olivier Gerber, who, under the name Smoo, released *Traffic in My Soul* (Neuronium, 2002). "Working with them is really fun. And because I create all the sounds myself, they give me the flexibility I need. " Based in Zürich, Switzerland, Gerber cut his teeth creating drum loops and producing house music for various European labels. Inspired by the recordings of Enigma, Nor Elle, and Snap!, as well as the downtempo and ambient underground tracks he hears in clubs, Gerber's extraordinary programming skills give life to his moody, soulful songs. His expert use of rhythm and timbre combine contemporary European dance sounds with dreamy textures reminiscent of Vangelis, Tangerine Dream, and even *Echoes*-era Pink Floyd.

When he began working on *Traffic in My Soul*, Gerber ordered a Wiard synthesizer, which plays a major sonic role on the album. "It was inspiring for me to work with a synthesizer as sophisticated as the Wiard," he says. "But my other modulars are very important to me as well, and I often combine different synth brands in a patch." The modules he uses are by Analogue Solutions, Analogue Systems, Blacet, Doepfer, and Technosaurus.

"I am a filter and phaser freak," Gerber continues. "I have 11 modular filters and every filter has its strengths. For example, the Technosaurus Selector filter sounds round and can go extremely deep. My Doepfer Wasp filter sounds strange, but it's perfect for certain things. The Wiard Omni filter is a more neutral filter, but my favorite."

One of the first things you notice about *Traffic in My Soul* is its timbral diversity of the percussion. Gerber says he created about 80 percent of the drum sounds using his modules. "When I make drum sounds with the modular synths, I record everything digitally and sample them with Steinberg HALion," he says. "It's easy to program all kinds of different snares or bass drums, but to program good claps is much harder. I used the Blacet Dark Star Chaos module for some of the claps, and the random-voltage output on the Wiard VCO for others."

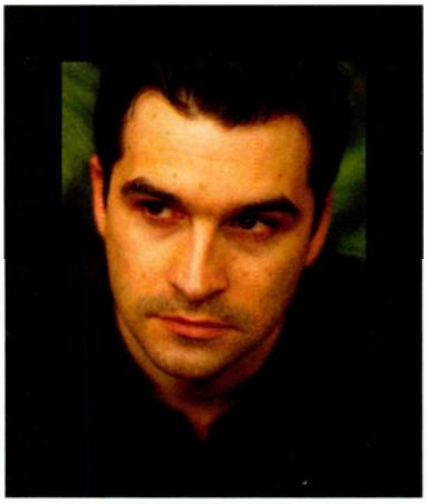
"I love the envelopes from the Blacet EG1 2070 module," he continues. "To get really snappy envelopes, I feed back the decay phase on the Blacet module. That technique is also possible with the Wiard Envelator. The envelopes don't have to be extremely fast for percussion, but they should have a nice, controllable, exponential decay."

Gerber played many of the sequenced parts using a MIDI keyboard, and he relied on his Latronic Notron MK II sequencer for the rest. To translate the MIDI sequences into the necessary control-voltage and gate signals, Gerber used a Doepfer MCV24 MIDI-to-CV converter.

"I used very controlled and planned patches," says Gerber. "For example, the Wiard VCOs can be modulated with linear FM, so I created big FM patches. Linear FM on analog modulars sounds warmer, rounder, and more lively than digital FM."

As an example, Gerber points to the opening sequences on his CD's title track, which uses arpeggiated plucked sounds through the Omni filter in highpass mode. "I could listen to such a sequence for a long time, and it never gets boring. That is what my kind of sound programming is all about."

For more information, visit Smoo online (www.smoosound.com) or contact Valley-Entertainment (www.valley-entertainment.com), the US distributor of Neuronium (www.neuronium.com).



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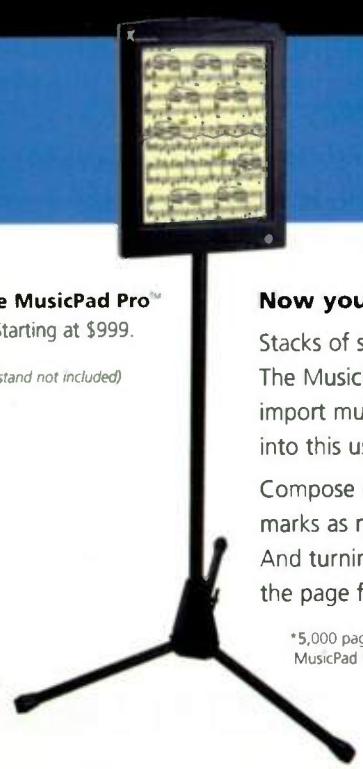

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Reasonable Advice

FIG 1: In addition to sending note data, Matrix Sequencers can be used to automate controls such as filter cutoff and volume. Here, Matrix 1 is sending note data to the Subtractor synth and modulating its filter-cutoff frequency, while Matrix 2 is controlling the Subtractor's amplitude.

Tips and tricks for expanding the limits of Propellerhead Reason.

By Kent Carmical

Most people would agree that Propellerhead Reason is a revolutionary product. By putting powerful and great-sounding music-making tools in the hands of the masses, Propellerhead has redefined laptop techno.

The possibilities for experimentation in Reason are huge, and it's unlikely that you are using everything that the program offers. In this article, we'll explore various techniques that will extend your Reason know-how. You'll also find some creative ideas in the sidebar "Even More Reason Tips," including some that refer to the newest version, Reason 2.5, which should be out about the time you read this. If you don't yet own the program, you can grab a demo off of Propellerhead's Web site (www.propellerheads.se). You can also find Reason files for several of the tricks described in this article at the EM Web site.

EM WEB CLIPS

YOUR MATRIX SEQUENCER

Sometimes, a bit of blind experimentation can yield fantastic results—especially when you're using the Matrix Pattern Sequencers. Start with a Subtractor module that has a good lead-synth patch. Create a Matrix Pattern Sequencer, and then tab to the back panel and be sure that the Matrix is set to Unipolar mode. Notice that the Note CV Out of the Matrix is patched by default to the CV Input of the Sequencer Control section of the Subtractor. Tab back to the front panel and press the Run button, then create a synth line in the Matrix Pattern window and experiment with different gate values at the bottom of the Matrix display.

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Reasonable Advice

Now you're ready to launch the Refill Packer and create your Refill. Select the main folder you created containing your patch and sample folders. Then specify where you want your newly created Refill to be saved. Select Create Refill and watch the magic happen. In a few short moments you will be able to share your patches and samples with the world.

DR:REX DECKS THE WRECKS

You can quickly create complementary percussion grooves that borrow the feel of an existing Dr:rex loop by using the Slice Gate Output from Dr:rex to trigger individual percussion sounds in a Redrum drum module. That is especially useful when the Dr:rex file has a feel that is difficult to duplicate with Redrum's pattern sequencer or if the Dr:rex loop is simple and therefore needs a more complex rhythmic accompaniment.

Load a Mixer if one is not created by default, then create a Dr:rex module and load a simple loop that doesn't sound too busy. Next, add a Redrum module and patch the Slice Gate Output from the Dr:rex to the Gate In of one of the Redrum sounds (say, for example, a hi-hat). Start Dr:rex, and lower its fader on the Mixer.

Notice that the Redrum hi-hat is triggered on every slice of the REX file (see Fig. 3). That gets old quickly, so patch the LFO Out (try different LFO waveforms and rates) from Dr:rex to the Pitch CV In on the hi-hat to add a little variety until you've created a slick, totally locked-in hi-hat groove. For even more sonic variation, patch-in an effect like a flanger or reverb and mix-in the original Dr:rex loop to taste. Don't stop with the hi-hat, either; a snare drum sounds equally sweet when modulated this way.

You can also use the Sync-LFO function on Dr:rex to trigger a bass sound from a Subtractor synth. Dial up a good bass sound on your Subtractor module and patch the Slice Gate Output from Dr:rex to the Sequencer Control Gate In on the Subtractor. Also patch the LFO Out on Dr:rex to the Subtractor's OSC Pitch In. Enable the Sync button for the LFO on Dr:rex, then set the Sync-LFO rate to 3/16 (or, for a classic analog-sequencer effect, try a setting of 5/4). Experiment with lowering the OSC Pitch Modulation Input level on the back of the Subtractor until you get a smooth pitch modulation. Try increasing the release on the amplitude envelope and raise the filter resonance on the Subtractor if you want to add a psychotic element to the patch.

ANALOG DRUM MADNESS

Although the Redrum module has some great-sounding electro-style drums, you're pretty limited when it comes to tweaking the module's sounds. You can overcome that somewhat by using the Factory Sound Bank drum and percussion patches and editing them with Malström and Subtractor. Here's a way to use the Redrum Pattern Sequencer Gate outs to trigger a bunch of Subtractor or Malström modules, each loaded with drum patches.

First, create a Redrum module. Next, create a Subtractor or Malström module and load a bass-drum patch from the Factory Sound Bank. On the back of the Redrum, patch the Gate Out from channel 1 to the Gate jack on the Sequencer Control section on the back of the Subtractor module, then flip to the front panel. Press the Run button on the Redrum (channel 1 is selected by default), and program a kick pattern on its Pattern Sequencer. You should hear the Redrum sequencer triggering the bass-drum patch that you loaded.

Repeat this procedure for any other drum sounds that you want to include in your pattern—you can trigger up to ten Subtractor or Malström modules per Redrum Sequencer. You now have the full editing facilities provided by these synth modules for heavy drum-sound manipulation. To add even more variety, experiment with patching a Matrix Pattern

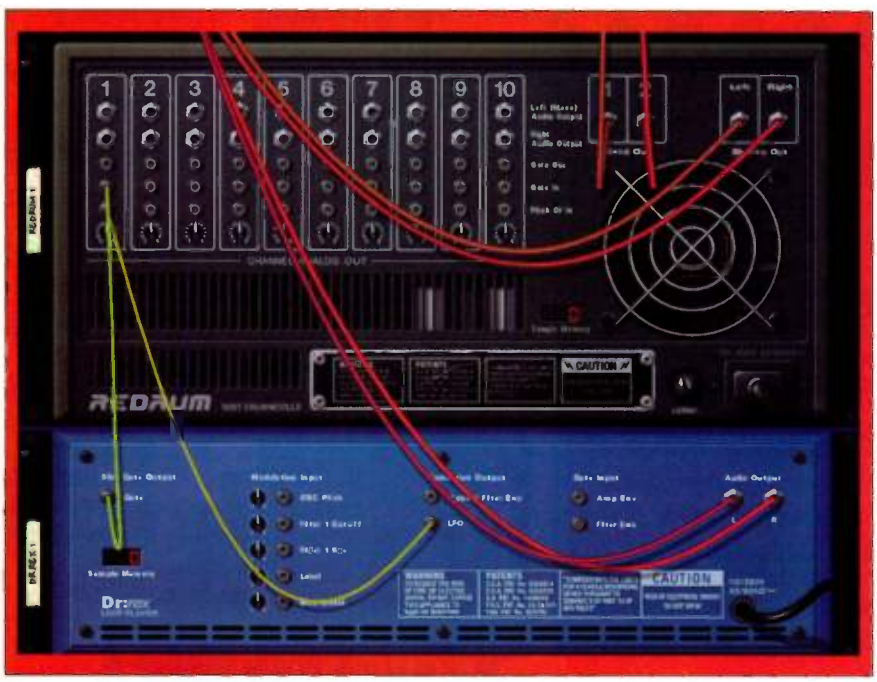

FIG. 3: You can use the Slice Gate Output on a Dr:rex module to hijack the REX loop's feel and give it to Redrum sounds. The green patch cable is taking gate information from Dr:rex's Slice Gate Output and using it to trigger a hi-hat sound on channel 1 of Redrum. The result will be a hi-hat that follows each slice of a REX loop. The yellow patch cable is using the LFO output from Dr:rex to modulate the pitch of the hi-hat sound for added variety.

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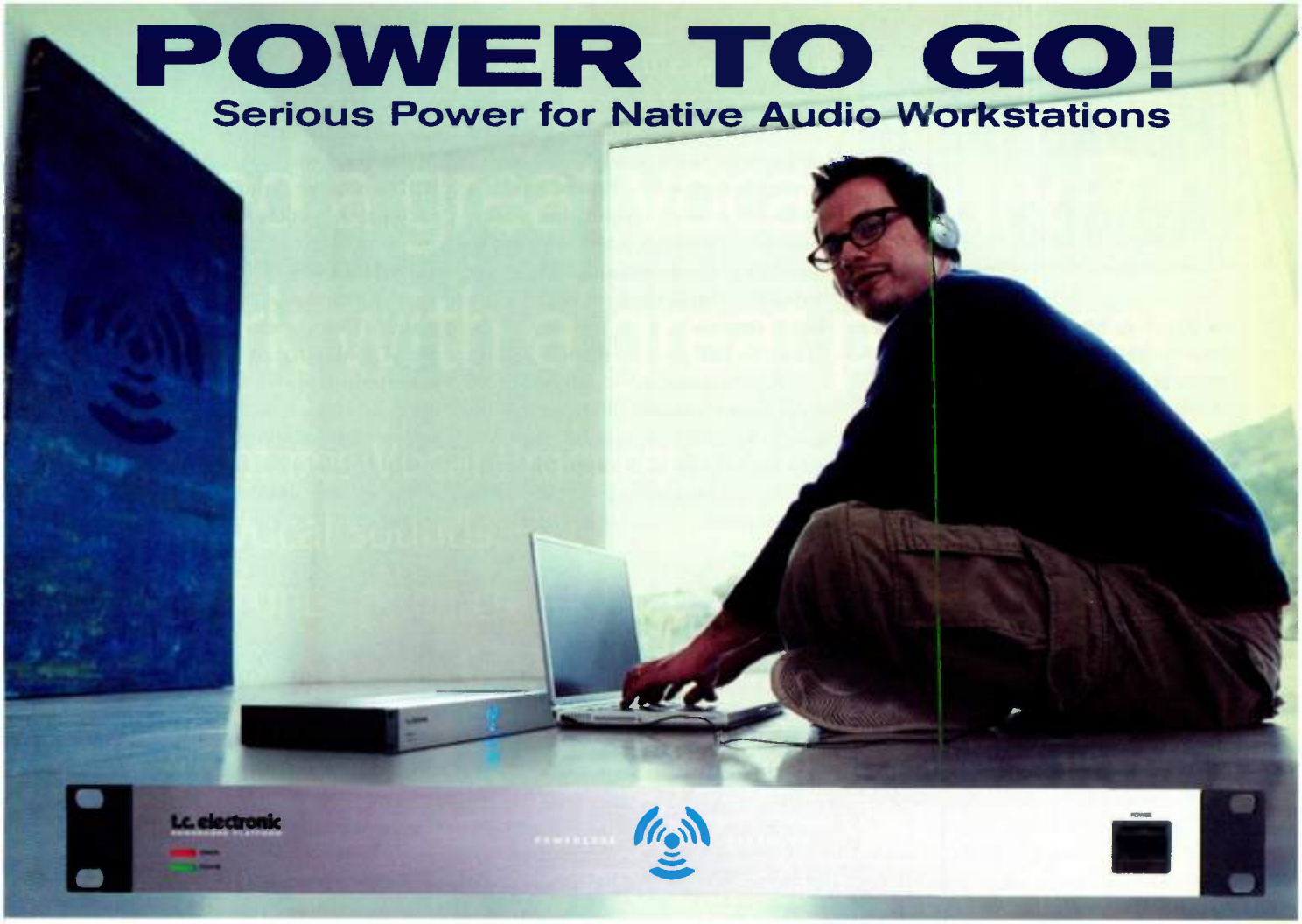

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Reasonable Advice

FIG. 4: Reason's 14:2 Mixer module resembles the Mackie 1604 in operation and appearance.

because it is most noticeable when out of tune with the bass. Solo the kick and the Subtractor bass line. Adjust the Pitch knob on the Redrum kick track so that the pitch of the kick is in unison with the root of your bass line. You'll have a simpler time doing this if you flatten the pitch of the kick, and then dial it up to match the bass. That's because you can hear a flat pitch more easily than a sharp one relative to the note you are tuning to. Slowing down the overall tempo of the track can also aid in hitting the mark.

Although less crucial than with tuning the kick, the snare and other percussion elements can also benefit from that process. To get even more sophisticated with this technique, tune the snare and hi-hat to complementary intervals (like thirds and sixths) of the bass.

This trick is only slightly more involved when applied to a Dr:rex drum loop. Solo the bass line and the Dr:rex loop. Use the Octave and Fine Tune knobs on Dr:rex to find the root note of the bass line. If the loop requires tuning that is so extreme that the loop slices start sounding aliased or exhibit other artifacts, use the transposition keyboard on Dr:rex to transpose the loop to a complementary interval of the bass line's root note. As with the previous example, using intervals like thirds and fifths is a safe bet for working with the entire track, whereas sevenths and ninths can sometimes give a jazzy, "outside" vibe to the loop.

NO INPUT TRIM, NO PROBLEM

Reason's auto-gain-matching abilities keep levels under control for basic exploration, but headroom can get pretty thin once you fill your mixer full of huge bass and big beats rocking the block. The 14:2 Mixer doesn't include any input gain, so how can you optimize signal level for the inputs of the various modules? The look of the 14:2 Mixer is reminiscent of a Mackie 1604 (see Fig. 4), which made me wonder if some of the procedures for optimizing a 1604 for unity-gain operation could be applied to Reason's mixer. It turns out they can be, with the various module-output gain controls operating in lieu of mixer input trims.

Start by setting the master fader on the 14:2 to the maximum. Solo the first channel of the mixer and set its fader to the maximum also. Keep your eye on the Clip Indicator in the lower-left corner of the Transport window. If the Clip Indicator is lit, go to the module on that mixer channel and adjust its output level until it no longer lights up. If the Clip Indicator is not lit, crank up the module's output level until the Clip Indicator does light up, then back the module's output gain down again until the light goes out. Now bring the channel fader on the mixer back down between 90 and 100.

Repeat the procedure for each of the mixer channels that is active. When you have finished, remember to bring the master fader on the mixer down to around 100. The input gain for each track is now optimized, and you can achieve maximum levels before clipping. By setting the channel and master faders to between 90 and 100, you've given yourself some room to compensate for inserts and radical EQ settings.

PSEUDO DUB-DELAY EFFECTS

You can create crazy yet controlled delay effects by using CV control to modulate the Pan and Feedback settings of a DDL-1 delay module. Select the Mixer and create a DDL-1 connected to the mixer's send. Connect the Mod B Output from a Malström module to the feedback input on the DDL-1. Crank the level pot for the delay's feedback input to the maximum. Create a Redrum drum module and load a Dub Kit, and then use the channel send connected to the DDL-1 on the mixer to bring in the delay effect. Adjust the send level so that the wet signal is as close as possible to the volume of the original signal. Set the delay's feedback level about halfway and experiment with a delay time of between 30 and 70 ms. Longer delays produce dreamy, dublike effects, while shorter times give a junglelike, drum-and-bass vibe. Although it's worth trying different waveforms in the Malström Mod B section, the random waveforms provide the most dramatic results.

If you want a more controlled effect, enable the Sync button on Mod B. However, if you leave Sync disabled and adjust the Rate control and Modulator speed by ear, you'll get the most interesting results.

One of Reason's beauties is that it begs you to experiment—in fact, that is how most really cool sounds have come to me. If a module has an input, patch another module's output to it. Wonder what it would sound like if you patch ten flangers in a series? Go ahead and try. Want to hear the results of modulating every available parameter that a module has? Go for it! Don't let anyone tell you that you can't. Oh yes, and save often.

Kent Carmical *is one half of the production/performance duo Apologetic. You can find the group's work at www.apolgeticmusic.com. He wishes to thank Kevin Walt from M-Audio and DJ Atomix for their help in preparing this bit.*

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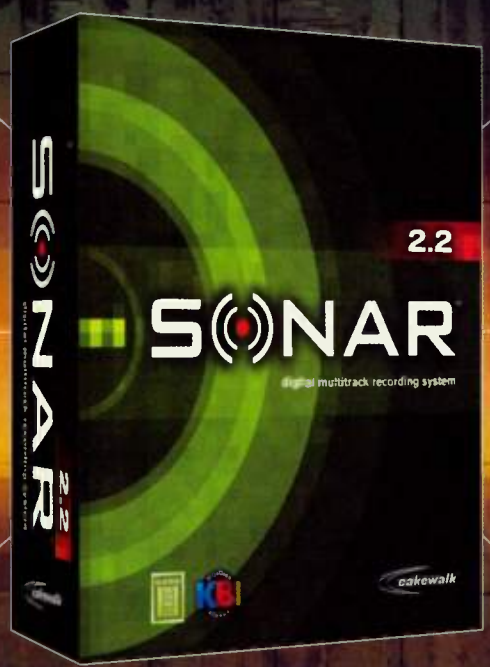

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NOI BUSTERS

By Gary S. Hall
and
Oliver Masciarotte

Not so long ago, if your audio recording was damaged or imperfect, you just had to live with it. The dog ate the tape! The record's scratched! The cable was bad! That hum goes from one end of the recording to the other! Whaddaya want *me* to do about it?

Starting in the late '80s, however, tools began to appear that let audio technicians remove record scratches, hum, and tape hiss from recordings, and even let them reconstruct waveforms across fairly large gaps. At first, such exotic capabilities were available only as pricey custom services, but by the '90s, they began to show up in a growing number of recording studios. Today, a great many products are available at nearly every price point, running native on Macs and PCs as well as on high-powered custom hardware.

Although it's now relatively simple to give a scratchy vinyl record or hissy tape a quick cleanup, doing a job that will satisfy critical audiophiles is still not that easy. Repairing heavily damaged recordings and cleaning up such things as noise contamination on location film and video recordings remains a black art. In this article, we'll illuminate the techniques and tools of audio restoration and help you develop skills to amaze your friends and satisfy the pickiest of clients.

VINTAGE ANALOG TO DIGITAL

The process of restoration always begins with the best possible transfer. Audio restoration conforms to the GIGO philosophy: garbage in, garbage out. The more time you spend on getting a high-fidelity transfer from the original medium through analog to digital audio, the better the quality will be in the end.

Because most restoration jobs start with an analog source, such as a phonograph record, analog tape, or optical film track, time should be taken to clean the original thoroughly, without removing the signal or worsening the noise. If the material is worth your time and effort, you may want to hire a specialist to do the transfer. If, however, you like to live life to the fullest or you're financially challenged, go ahead and do the transfer yourself.

Illustration by Dmitry Panich

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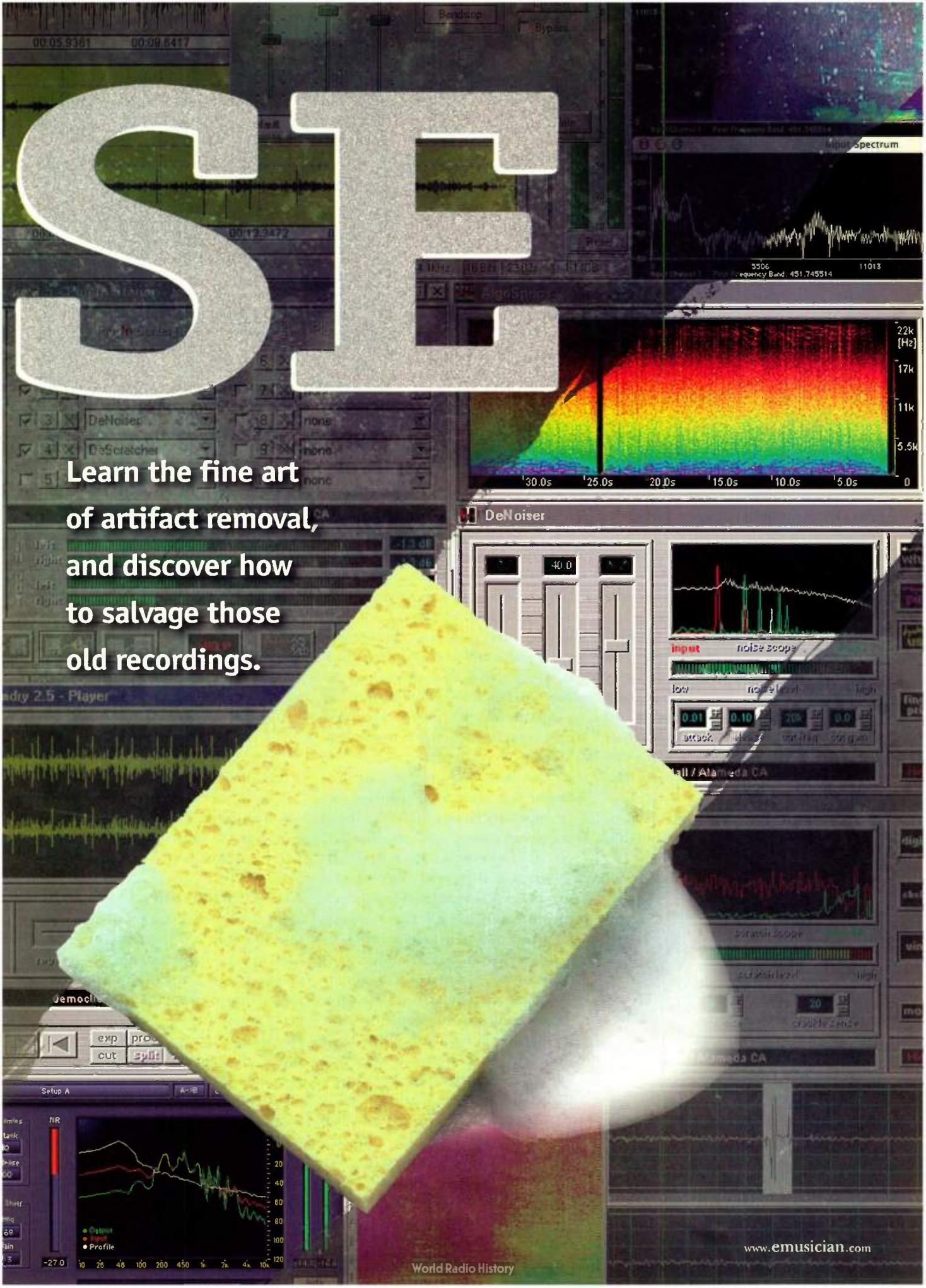
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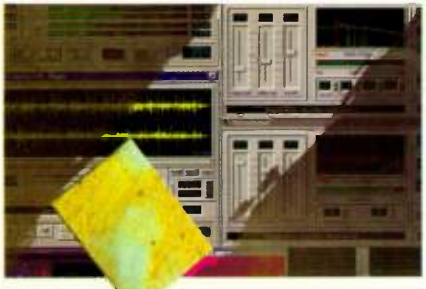

NOISE BUSTERS

Parker Dinkins, president of MasterDigital in New Orleans, stresses how important the initial transfer is, especially "stylus selection, disk cleaning, and azimuth adjustment, because everything following the transfer will be affected by those initial efforts. You wouldn't record Pavarotti with a crappy crystal lapel mic, but it's amazing how many people fail to understand the significance of matching styli or adjusting azimuth during the initial transfer." MasterDigital typically does more than 120 restoration jobs a year, and when we talked to Dinkins, he had just spent almost an hour declicking less than 90 seconds of material, saying, "I wanted it to be perfect for my client."

If the original is on vinyl and the budget allows it, find a record-cleaning machine in your area. These devices, such as the one from Keith Monks (available from Digital Audio Restoration; www.audio-restoration.com), look like oversize turntables, but in place of a tonearm and pickup, there's a cleaning fluid applicator, scrubbing brush, and a vacuum inlet to mop up the dirty leftovers (see Fig. 1).

For budget jobs, you can use the manual approach: the good old velvet-pile record-cleaning brush and fluid. For cleaning fluid, a tiny amount of mild detergent and distilled water works wonders. Just be sure to rinse the record with more distilled water and dry it well. For seemingly terminal cases, some people are successful playing a cleaned disk wetted with distilled water or Armor All.

Be careful, though: if the record is an odd size, color, or weight or smells different from an average record (we're serious!), you may have an acetate or transcription recording and should proceed with caution. These one-off shellac disks or "lacquers" have a record surface composed of a very soft compound and cannot tolerate even slight abuse or harsh cleaners. In addition, remember that vinyl is an elastic material. Each time you play a record, you deform the groove walls. If you play a record repeatedly within a 24-hour period, the plastic doesn't have an opportunity to "relax" or flow back to its original shape, resulting in permanent damage.

Once the record surface is clean, the next task is to find a stylus that provides the best signal while reducing surface noise. Styli shapes fall into three general categories: conical, elliptical, and line contact. Each type contacts a different part of the groove's sidewall and produces a different sound. The tracking force and antiskate adjustment also have an impact on the transcription quality. You may want to experiment, or, if you have the budget, just hire someone who has the equipment and the expertise to do your audio justice.

For analog tape, very gently thread up the reel after aligning the repro chain (see the sidebar "Proper Alignment"). Run the tape at slow speed, bypassing the heads, guides, and idlers if possible, and check for splices, tape shed, or adhesion problems. Repair any sticky or broken splices, and if the tape is shedding, remove the reel right away and bake the tape to dehydrate and restore the binder before attempting a transfer (see the sidebar "Easy-Bake Oven").

COURTESY GRAHAM NEWTON, DIGITAL AUDIO RESTORATION

FIG. 1: The legendary Keith Monks Record Cleaning Machine.

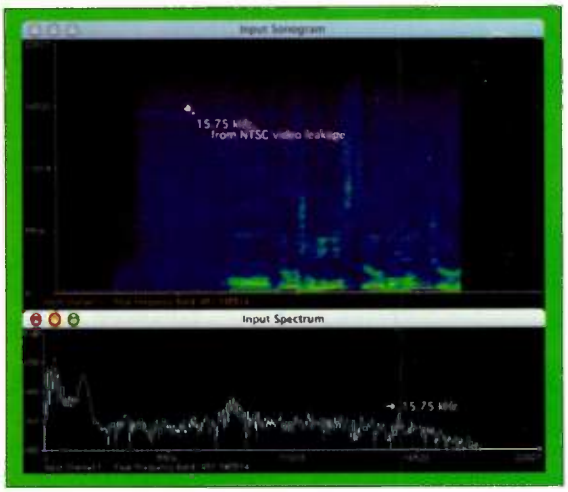

FIG. 2: A sonogram, such as this static (bottom) and dynamic (top) view taken from SoundHack, can help isolate contaminating components, in this case a video subcarrier at 15.75 kHz.

THE FIVE-STEP PLAN

Now that the hard part's over, we can go on to the digital restoration process. It consists of five steps:

1. Analyze the material to determine the problems.
2. Reduce fixed-frequency noise.
3. Reduce impulse noise.
4. Reduce crackle and distortion.
5. Reduce broadband noise.

Let's take each step in turn.

AUDIO ANALYSIS

You can't fix what you aren't aware of, so restoration starts with investigation. That means critical listening, logging, taking notes, and then performing various measurements of frequency versus amplitude over time. The investigation serves to tell you what you're up against before you go to the next step. Analysis tools range in sophistication from real-time or non-real-time analyzers and freeware (such as Tom Erbe's SoundHack) to comprehensive measurement packages (such as Metric Halo's SpectraFoo) and the sophisticated tools included

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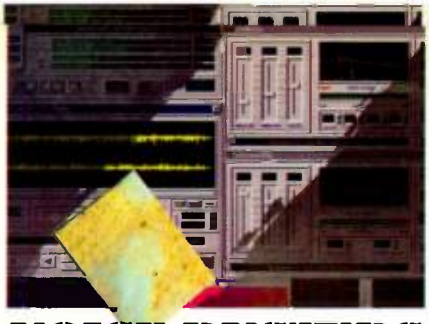

NOISE BUSTERS

important snare drum hit. We've found that some click detectors can be set so aggressively that they remove the entire signal.

Once the clicks have been detected and removed, they must be replaced with new samples. Declick algorithms range in sophistication from simple interpolators (that stretch and blend good samples over the offending region) to more clever versions. One very simple declicker that works with stereo playback of mono phonograph records simply picks the better of two channels in real time, assuming that pops and clicks don't usually occur in both channels simultaneously.

The most sophisticated declickers use spectral interpolation. They analyze the phase and frequency of the good audio sections on either side of the impulse (areas referred to as "wings" or "handles"). Then they generate a set of samples to seamlessly bridge the area of the click. Depending on the source signal, this type of interpolation can sometimes be used to fill quite large gaps, such as those caused by an intermittent cable.

Declicking is best done in stages. Remove the longest-duration clicks first, then shorter ones, then the smallest clicks perceptible as individual events. Andy Smith, sales and support specialist for DARTech (www.dartpro.com), says, "It's often a good idea to use multiple passes to get the most from your click removal tool. You'll discover that finding a good one-size-fits-all setting for click/pop removal will often not produce the same results as focusing on specific kinds of clicks. For that reason, we recommend that you use at least two passes with any click removal tool."

Usually, automatic declicking does not identify every single click. In those instances, manual declicking tools are essential (see **Fig. 3**). The general approach is to zoom in tightly on the waveform of the offending impulse, framing it with the system's selection tools. Then choose Remove or an equivalent command. Although it's tedious when there are many clicks, you'll get a lot of satisfaction in seeing individual glitches disappear before your eyes and ears.

Many impulse noise reducers provide a Difference mode that lets you listen to the material being removed. Christoph M. Musialik, president of Algorithmix (www.algorithmix.com), suggests, "For the best results, use your own ears in combination with the Difference feature. Switch between the original input signal and the input/output difference (the part of the signal taken out by the descratching algorithms). This difference signal normally should not contain any parts of the original signal that you want to preserve."

When reducing impulse noise, beware of the Pencil. Most edit systems have a tool to "redraw" a waveform and seemingly erase a pop or click. That usually isn't a good choice because the Pencil is operating in the amplitude domain, whereas repairs should be performed in the frequency domain.

FIG. 5: Waves Restoration Bundle consists of four high-performance VST or TDM plug-ins, including multiband notch filtering and broadband denoising.

CRACKLE AND DISTORTION

Once the larger pops, clicks, ticks, and zipper noises are removed, you may be able to reduce continuous crackle and distortion. These are the toughest contaminants to remove. Crackle consists of impulsive changes so close together that they can't be identified individually or even distinguished from the signal in many cases. It's really a form of signal distortion.

The other common type of distortion is clipping (overloading), which is usually the result of one of two mechanisms: poor gain staging (as in a mic preamp) or groove-wall damage and surface noise on a phonograph record. Digital clipping occurs when a signal peak exceeds the binary range of the A/D converter or the internal signal processing.

Decrackling and clip removal tools are not as commonly found as declicking and broadband denoising, but they should be considered a critical part of a serious restoration tool set. **Fig. 4** shows Syntrillium Cool Edit Pro's clip-restoration tool in action.

THE ANTINOYZ BOYZ

The final component in a complete restorer's arsenal is a broadband noise reduction tool. Think of a broadband denoiser as a large number of bandpass filters, each followed by a downward expander. Most denoisers use a learning mode that is key to their operation. You provide a small section of the noise uncontaminated by the signal, and the denoiser "learns" what is noise and what is not. It then determines where to set the thresholds for all the expanders.

Once the "noise print" has been taken, the audio source is passed through myriad bandpass filters (2,048 bands is common), each with its corresponding "gate." If the audio signal in a given band falls below the threshold determined by the noise print, it's assumed that only noise is present, and that band is reduced by an amount determined by the operator. The sum of all the bands equals the original signal minus the noise.

The user interfaces for denoising tools come in many configurations. A traditional approach, pioneered by

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NOISE BUSTERS

Sonic Solutions in the mid-'80s, is employed in Waves' X-Noise implementation (see Fig. 5), while a streamlined, 2-knob approach is used in BIAS SoundSoap (see Fig. 6).

After acquiring the noise print, you're free to mess with the controls until an acceptable result is obtained. Your ears are the most important factor. If the noise is not uniform, you may want to try two passes, the first to reduce high-frequency noise and the second to reduce noise in the midband.

Wideband noise is present to some extent in all recordings, and, as the Bard might say, therein lies the rub. Too much reduction will step on the high end, causing the material to sound dull or woolly. Subjectively, removing high-frequency noise often seems to dull down the program, even if there was no high-frequency content present in the original. Also, excessive or misadjusted denoising introduces a characteristic "watery" or synthetic sound. So, think about the destination for the material and your audience's expectations.

If you're new to this, try generating a pink- or white-spectrum noise file, and then with your available tools, become familiar with the look and sound of pure noise. I used the $25 Cacophony from Richard F. Bannister (www.bannister.org) to generate my test file, but Black Cat Systems' Audio Toolbox (www.blackcatsystems.com) and other utilities also provide that function. For a low-tech approach, record some interchannel noise from the FM radio band or check audio test CDs, which often have noise tracks that you can digitally transfer.

FIG. 6: BIAS SoundSoap provides a simple and intuitive interface for broadband noise reduction and hum removal.

Once you've trounced all over the audio with these DSP denizens, you may want to apply some tasteful EQ or enhancement to what's left. In the final analysis, it really comes down to expectations. Some clients expect pristine results from severely damaged sources, and others know that GIGO controls our destiny: garbage in really does equal garbage out!

Now that we've looked at the overall process of restoration, let's take a look at the tools that are available.

RESTORATION HARDWARE AND SOFTWARE

A few years ago, if you wanted to do any kind of serious audio restoration, you had to shell out tens of thousands of dollars for dedicated hardware and software. But the landscape has changed. Whether you're doing delicate professional restoration for finicky clients, transferring your personal audio library to CD or MP3, or cleaning up problems with tracks to be used as production elements, there are now a great many tools that you can put to work.

With so many offerings, selecting the right tool can be difficult; you'll find a lot of overlap in functions and interface design. Price range certainly can give you a place to start. Products from the Big Three—Sonic Solutions (www.sonicstudio.com), Cedar Audio (www.cedar-audio.com), and Cube-Tec (www.cube-tec.com)—all have a long history in the professional restoration field and are still priced in the four- and five-figure ranges. Moreover, they require a lot of experience and training to get results that justify the price. Any of those products make sense only if you have a large contract in hand, are seriously hanging out the shingle as a high-end restoration shop, or are lucky enough to work in a facility that already has them. Likewise, if you're doing paid work for a client, it probably doesn't make sense to use low-priced tools designed for consumers.

On the other hand, if you're doing real work but don't have a mint to spend, you'll find a rich selection in the range from just under $100 up to $300. The good news is that these products are genuinely impressive in what they can deliver. The bad news is that you have to figure out which one to use.

For most of us, the computer platform

GETTING THE LOWDOWN

In the audio world, we often generalize when we discuss the audio passband, that 20 Hz to 20 kHz range of frequencies that some of us can actually hear. However, as engineers, we should really be concerned with a much wider range of frequencies: from subsonics to ultrasonics. Subsonics, frequencies too low to hear, range from 20 Hz down to 0 Hz. Another name for 0 Hz is DC (direct current), because zero cycles per second implies that the signal polarity never changes.

Analog audio is AC (alternating current), but a DC signal—also called DC offset—can creep into a recording by various means, such as a badly matched phantom-power circuit or a cheaply made A/D converter. DC offset robs you of dynamic range and heats up your woofer's voice coil, so it's best to get rid of it early on in the restoration process. Most audio-restoration systems include a high-pass filter with a very low cutoff frequency to remove DC offset.

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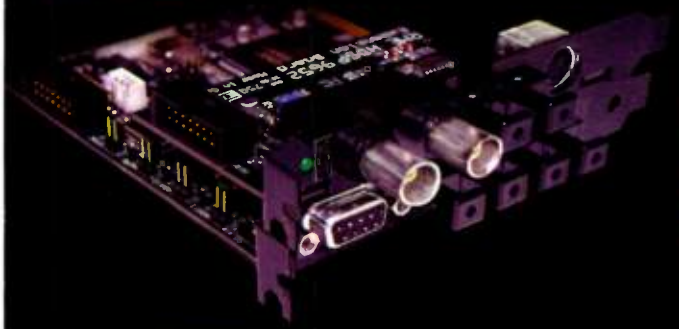

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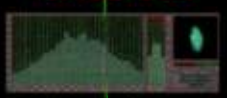

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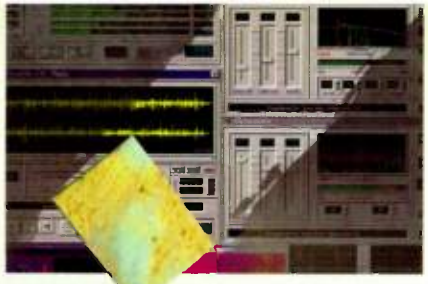

is an important factor to consider, so you can eliminate some entries right away. There's no use looking at DirectX plug-ins if you're on a Mac. Beyond that, you should consider the trade-off of control versus efficiency and ease of use. Recent entries in the restoration tool market have emphasized simplification of user controls. Others retain more parameters to allow for more detailed adjustments. Getting the most out of these programs requires an investment of time as well, especially when it comes to restoring anything beyond the spectrum of easy LP and low-end analog-tape transfers.

At the far end, you can find a number of low-priced shareware and freeware products as well as some inexpensive shrink-wrapped products aimed at the consumer. If you'd like to try out some restoration work without a big commitment, this is the obvious way to start. Even if you're a professional, you should check out what's cheap or free. You never know when you'll come across a true gem or a tool that meets a specific need. The usual caveats for such products apply: be wary of viruses, and don't expect a lot of tech support.

FIG. 7: The NoNoise Declicking module, as implemented for Pro Tools TDM or AudioSuite, provides automatic identification and removal of impulse noise artifacts.

THE GUNS OF NAVARONE

Full-time restoration professionals still depend on expensive dedicated tools. The original big gun for audio restoration is NoNoise from Sonic Solutions (see Fig. 7), which grew out of original research at George Lucas's DroidWorks in the '80s. When DroidWorks was dissolved, some of the key staff went on to found Sonic Solutions. For several years, Sonic Solutions offered its then-unique processing only as a service for hire. The push to rerelease vinyl recordings on CD, along with the demand for new releases from deceased artists, created a land-office business.

The demand for Sonic Solutions' services soon outgrew the capacity of its single facility. At the same time, the digital audio workstation revolution was beginning to pick up steam, and the high-resolution processing employed in Sonic Solutions' proprietary system proved to be perfect for high-end mastering. The company decided that the time was right to introduce its process and underlying technology as an end-user product. The result was the Sonic System, with its premier processing option, the NoNoise suite.

NoNoise established the classic set of audio-restoration tools: Declicking, Decrackling, Broadband Denoising, and Complex Filtering (which often shows up as Hum Removal). Most of the newer restoration tool sets encapsulate this group in one way or another. While the NoNoise tool set is no longer unique, the Sonic Solutions implementation is still widely considered to be the benchmark against which other tools are compared.

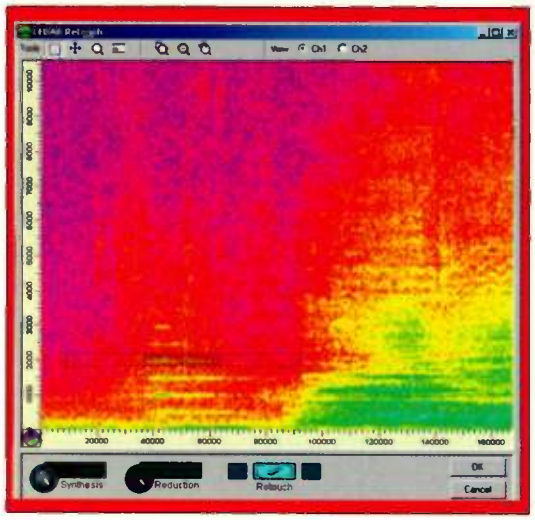

FIG. 8: Cedar Audio's Retouch plug-in for the SADiE series of digital audio workstations is the first to offer frequency-specific waveform interpolation in a practical format.

While Sonic Solutions and Digidesign have competed fiercely for years, Sonic Solutions now offers NoNoise as a set of plug-ins for TDM and AudioSuite. Sonic Solutions itself has become more closely identified with DVD authoring than with audio and has spun out a separate company, Sonic Studio, which is carrying on the development and marketing of the Sonic System workstations and NoNoise processing tools.

Success breeds competition, and once the NoNoise processing became established, the next supplier of restoration tools to appear was Cedar Audio. In contrast to Sonic Solutions, Cedar Audio started with a strong focus on hardware boxes for real-time denoising and declicking. That focus continues today, and Cedar Audio enjoys a very strong presence in broadcast, thanks to its low-latency and highly reliable hardware boxes.

Cedar Audio has also spun its tool set into several plug-ins for Windows and TDM and offers dedicated versions for the high-end workstation from Studio Audio Digital Equipment (SADiE). The Cedar Audio tools for SADiE consist of eight plug-ins that run on any version

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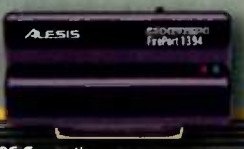

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NOISE BUSTERS

of the SADiE hardware. Seven of the eight are more or less standard restoration processes, such as automatic declicking, denoising, and so forth, but the Retouch plug-in breaks new ground (see Fig. 8).

The Retouch tool provides a view of audio as a two-and-a-half-dimensional space, in which time and frequency are the horizontal and vertical axes, respectively, and color is used to indicate amplitude. Some other systems provide a similar sort of display, but Retouch goes further by providing real-time controls for scaling the contrast of the color/amplitude component. By adjusting the controls while observing the display, you can obtain a remarkably clear view that isolates individual sounds and their harmonics.

Once you have identified an offending artifact or noise (along with its harmonics), Retouch lets you draw rectangles on the screen that represent regions of time and frequency. You can enclose the duration and frequency of each component of the noise that you want to remove, and enclose adjacent "handle" areas before and after the noise to be used for interpolation. Retouch interpolates the waveform across the duration of each box just as in manual declicking, except that the processing is restricted to the frequency ranges defined by the vertical dimension of each box. You can select 0 to 100 percent interpolation and adjust the attenuation of the affected area.

In contrast to any other restoration tool, Retouch excels at the removal of individual anomalous noises, such as telephones ringing or cars driving by—situations that were previously used to demonstrate just what audio-restoration tools could *not* do! Retouch truly represents a new type of restoration technology, one that for the time being Cedar Audio and SADiE have to themselves.

The current reigning monarch of sheer audio-processing power is the AudioCube from German company Cube-Tec (distributed in North America by Sascom; www.sascom.com). The AudioCube features truly massive processing at sampling rates up to 384 kHz.

Tools that run on the AudioCube are called Virtual Precision Instruments (VPIs) to distinguish them from mere plug-ins. Files are stored in a 32-bit floating-point format for dramatically superior dynamic range. The AudioCube offers a total of 16 24-bit, 192 kHz VPIs, 20 if you include analytical tools.

According to the distributor, there are several restoration functions you can perform with VPIs on the AudioCube that cannot be done on any other system. For example, you can remove a noise floor that modulates over time, or remove motor noise (including that from the zoom motor) from camcorder files. The AudioCube has some major fans, including some of the most demanding restoration facilities around.

Between the rarefied world of the three big guns and the broad range of tools selling for less than $300, the pickings are rather slim. Waves Restoration Bundle offers a suite of four high-powered tools that follow the classic set of multifiltering for removal of hum and other constant noises, declicking, decrackling, and broadband noise reduction. They're offered as VST plug-ins for Mac or Windows ($1,200; www.waves.com) or in TDM format for Pro Tools ($2,400). The user interfaces provide a high level of detailed control, with graphical readouts to help guide the process (see Fig. 5).

If you are a Pro Tools user, NoNoise for Pro Tools (TDM or AudioSuite, $1,995) is also an option. It's relatively new on the market, and it's not yet clear how the Pro Tools version of this classic compares with its older (and costlier) predecessor. Digidesign also offers the single-purpose DINR broadband noise reducer ($995; www.digidesign.com) for use on all Pro Tools systems.

PROPER ALIGNMENT

If you still have an analog tape machine, you probably already know about alignment tapes. Created under controlled conditions, these costly recordings provide reference levels of fluxivity or magnetization that are used to adjust or "align" the reproduce electronics or "repro chain." After adjusting the mechanical path through the tape transport, repro alignment is followed by record alignment, the final step in analog tape-machine setup. If you're going to transfer vintage recordings from analog tape, you must make sure your machine is aligned for its best possible performance. Magnetic Reference Laboratory (www.flash.net/~mrltapes) and Standard Tape Labs are the two most common vendors of alignment tapes.

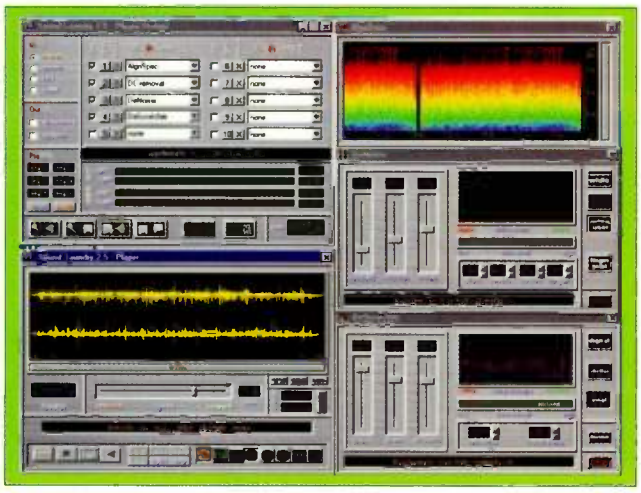

FIG. 9: Algorithmix Sound Laundry uses a unique interface to provide real-time analysis, denoising, and declicking.

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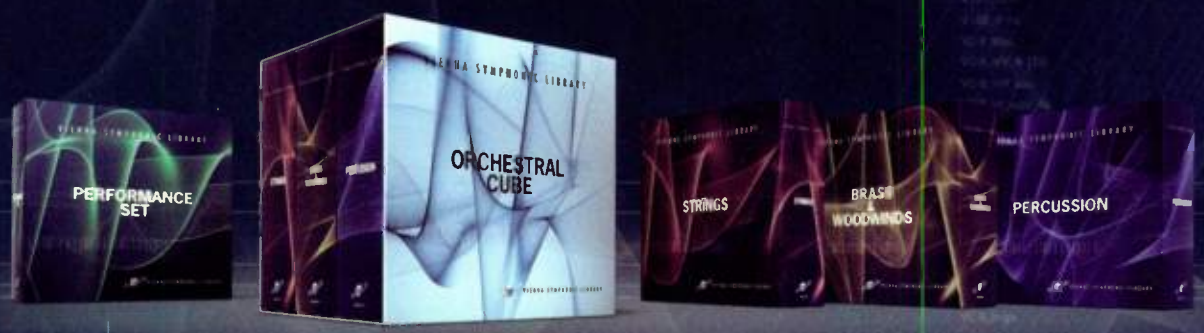

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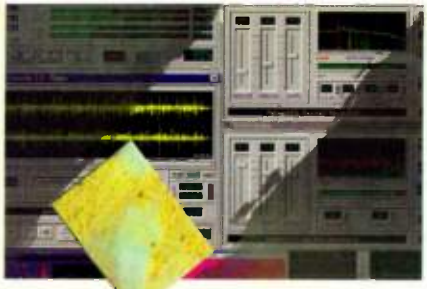

NOISE BUSTERS

THE BROAD MIDDLE

Most of the products that lie in the $99 to $299 range run in native mode on the Mac or PC. While native applications generally cost less than those requiring specialized hardware, the processes are necessarily limited by the horsepower of the computer that they run on. In the case of the complex processes used for restoration, that can translate into slower operation and/or lower resolution and audio quality. Different manufacturers, however, distribute the trade-offs in different ways, and today's ultrafast CPUs make true high-end processing at least a possibility on a personal computer.

Products in this price range fall into three broad groups that parallel the higher-priced systems. First, there are standalone programs that focus more or less exclusively on restoration tasks. Then there are digital audio workstations that include restoration processes among their standard tool set. Finally, there are plug-ins that can be used with any compatible host application. A few products straddle categories by running in either standalone or plug-in mode.

The standalone programs in this range are characterized by real-time operation—playing a file or accepting stereo input while processing and relaying the results directly to a monitor output and/or file capture function. There's a trade-off, however, in performing such processing without hardware acceleration: you have to accept the limitations of the host's processing speed. On the other hand, you can often achieve an acceptable result quickly by playing with the controls. It certainly provides an education in the effects of different parameters.

Most of the lower-cost standalone programs also use a simplified user interface. At first glance, Sound Laundry from Algorithmix is the exception (see Fig. 9). It offers an unusual structure consisting of a plug-in "shell" for Windows that hosts proprietary plug-ins (standard DirectX versions are in beta). Sound Laundry provides two kinds of signal analyzer, DC offset removal, a rumble filter, declicker, denoiser, and EQ. Its file playback and recording are also handled by pop-up modules, providing a distinctly different approach. Once you get used to it, though, the system proves to be powerful, and the results are quite good. The full Sound Laundry program sells for $299, with lighter versions available for $199 and $99.

This year's award for a fun user interface for denoising goes to BIAS SoundSoap (Mac OS X or Windows XP; www.bias-inc.com; see Fig. 6). SoundSoap performs broadband denoising and hum removal but not declicking. Although it offers fewer features than

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some other products, you have to love its innovative approach to control, its cheerful look, and its friendly $99 price. SoundSoap also runs in plug-in mode under VST or DirectX.

Arboretum Systems (www.arboretum.com) weighs in with several options, the most ambitious of which is Ray Gun Pro for OS X ($149). Ray Gun Pro offers click removal, hum and rumble filters, broadband denoising, and audio enhancement, all in real time. The user interface is pretty basic, with slider controls under multiple tabs. The only thing I don't care for about this arrangement is that I can get to only one set of controls at a time. Standard Ray Gun offers a much simpler set of controls, runs in standalone or plug-in mode (VST, AudioSuite, Premiere, RTAS, DirectX), and is available for OS 9, OS X, or Windows platforms at prices from $99 to $119, depending on the version. The company also offers Restoration-NR as a Windows DirectX plug-in for $199.

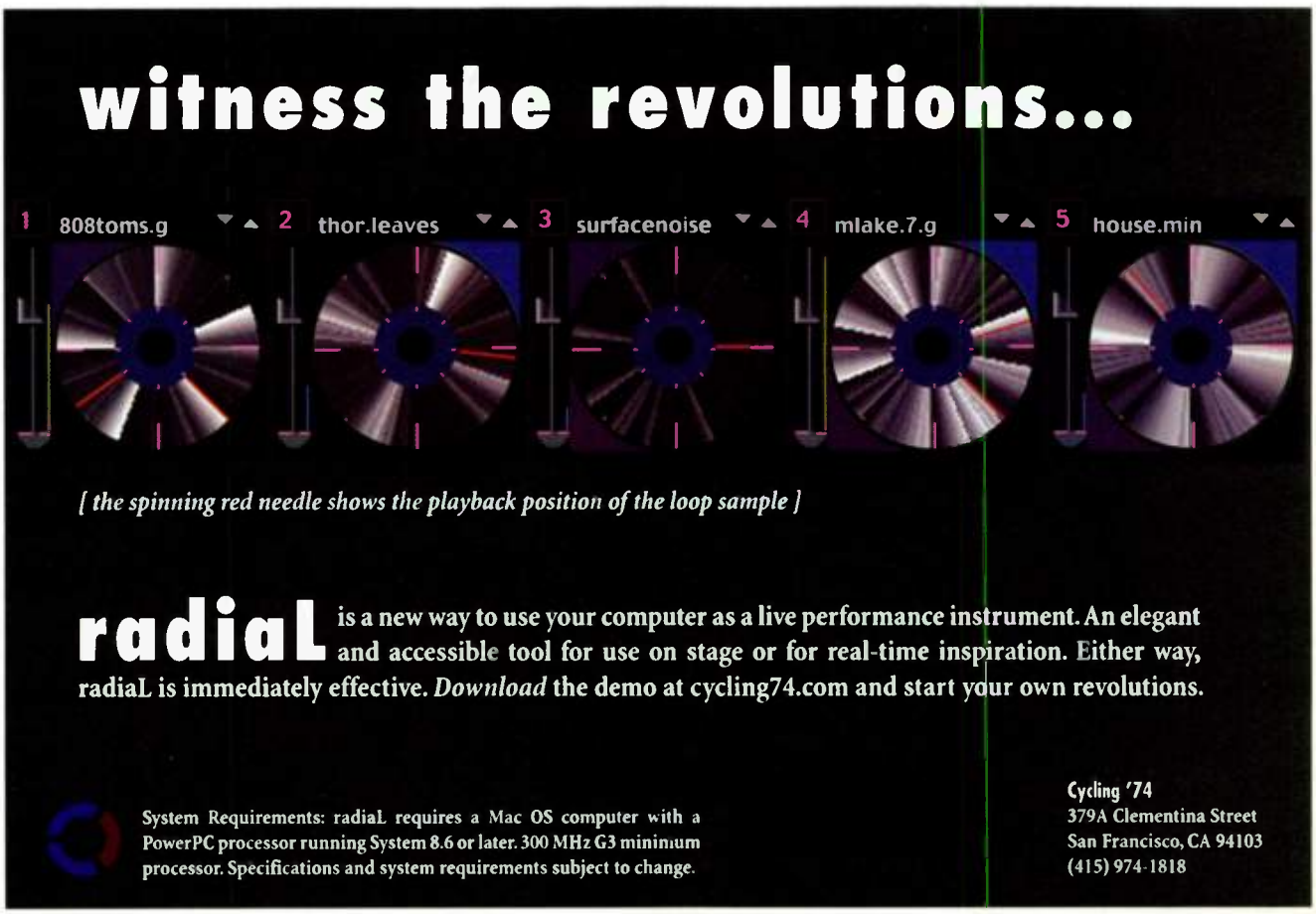
Programs that combine audio editing (and other kinds of processing) with audio restoration often provide a good level of versatility and flexibility. These products fall into two fairly clear groups: restoration/mastering programs that have evolved editing functions, and audio-editing programs that include restoration tools in their processing menus.

In the former category, three products stand out; all are for Windows. Alien Connections' Pristine Sounds 2000 ($249; www.alienconnections.com) is a tool for remastering vintage or new recordings. It includes broadband denoising and click removal along with an interesting frequency-space editor. For another look at restoration, check out the white paper "Introduction to Audio Restoration Using Computer Applications" on the company's Web site.

DART XP Pro from DARTech ($199) is also designed as an integral environment for restoration and mastering. It boasts a built-in CD-burning tool and audio-editing functions. In addition to denoising (with a real-time mode), frequency-selective click removal, and hum filtering, the program includes two kinds of real-time analyzer and vocal-canceling functions.

Diamond Cut's DC5 software (www.diamondcut.com) sells for $199. (A specialized version for forensic work that includes brickwall filters is available for $1,399.) DC5 offers the usual denoising and click removal but also provides a declipping tool (unusual at this price) and a fine-grained sampling-rate conversion feature for speed correction. Audio editing, EQ and dynamics processing, reverb, and CD burning round out a powerful and cost-effective package (see Fig. 10).

Full-blown audio-editing applications with built-in restoration features offer the greatest versatility in an integrated



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package. Along those lines, Syntrillium's Cool Edit Pro (Win; www.syntrillium.com) has to be one of the great values in music software at $249; that's why it won an **EM** Editors' Choice Award this year. Among its many excellent features are several restoration tools that are unusually powerful for a product in this class.

In addition to a clipping corrector, the program offers a flexible declick tool and separate denoise and dehiss tools. (Denoise requires a noise "footprint" to work; dehiss uses a generic tape-hiss curve.) Notably, the declick tool includes a manual command to fill an individual click. That's an important addition because automatic click detection never seems to find everything. (For a full review of Cool Edit Pro, see the December 2002 issue of **EM**.)

Although they're outside the limits of this price range, two other audio-editing programs are also noteworthy for their restoration capabilities. Steinberg's WaveLab 4.0 (Win, $599; www.steinberg.net/en) includes a very good declicker and denoiser along with a set of very capable analysis tools (see a full review in the November 2002 issue of **EM**). TC Works Spark XL (Mac, $749; www.tcworks.de) is another high-powered editing program that includes a respectable set of denoising and declicking functions, filters for hum and constant noise removal, and signal analyzers (see a full review in the May 2003 issue of **EM**).

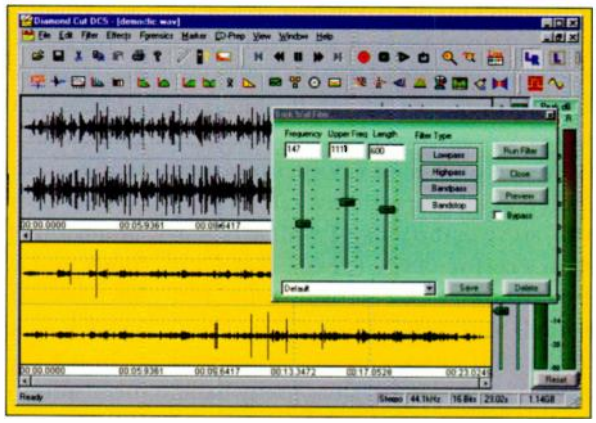

FIG. 10: Diamond Cut DC5 offers a full suite of denoising, click removal, and declipping tools. The display shows a scratchy file before and after a single pass through the declicking tool.

Two collections of plug-ins round out the offerings in the $99 to $299 price range. Sonic Foundry's aptly named Noise Reduction ($279.97; www.sonicfoundry.com) and Virtos Noise Wizard ($99; www.virtos-audio.com) both run in Windows and offer potent DirectX suites of restoration-oriented processing, albeit with fairly generic user interfaces.

LOW-COST TOOLS

Not surprisingly, things get a little bit uneven once you drop below the $99 level. All of the products in this category run on the PC and generally lack the benefits of professional user-interface design.

Nevertheless, there are some gems to be found. We particularly like Algorithmix's Easy Tools ($59). It operates in real time in a similar manner to Sound Laundry but with a much simplified set of controls. Even so, it made my "bad vinyl" test samples sound good immediately, and it certainly fits the description of cheap and cheerful.

Coyote's Groove Mechanic ($39; www.coyotes.bc.ca) is about as basic as you can get in restoration, but it does a creditable, non-real-time job with material that isn't too scratchy. Wave Corrector from Ganymede ($45; www.wavecor.co.uk) is dedicated to declicking vinyl and also works well for the money, although it has the odd characteristic of processing your file the moment you open it. Jeffery Klein's ClickFix and ClickFix Lite ($45 and $20; www.jdklein.com/clickfix) are plug-ins that run only in Cool Edit Pro. I found them to be somewhat more effective than Cool Edit Pro's built-in declicker in single-pass operation.

EASY-BAKE OVEN

Back in the '80s when doing rock 'n' roll dates in Miami, we wrestled with what is now a well-known problem. Old-school analog tape is a carefully crafted mix of iron oxide (aka "rust") attached to a flexible plastic backing. The chemists at Ampex, 3M, BASF, and Agfa had decided they could "improve" their otherwise perfectly acceptable products, so they all changed the formulation for the binder, the glue that holds their proprietary rust particles onto the backing.

Unfortunately, the new binders were hydrophilic (water-loving), and in humid Miami, it didn't take long before our brand-new master reels literally began falling to pieces as the water-softened binder stuck to the tape transport rather than staying attached to the backing. Bummer.

Fortunately, a low-temperature oven and plenty of patience can often restore these rancid recordings to like-new status. An inexpensive convection oven set to 120 to 130 degrees will slowly drive out the moisture, leaving a more robust tape. Raise the temperature slowly until you reach your comfort level, leave the tape for 4 to 20 hours depending on the setting and your patience, then slowly ramp the heat back down to room temperature. Slowness is the key to preventing uneven drying and subsequent mechanical stress to the tape.

If you're going to try this, spend some money on an accurate thermometer, because too high a temperature spells toasted tape and certain doom. Be sure to store the tape in a sealed plastic bag or container after baking to prevent rehydration.

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Excla WAVclean and WAVhum ($30 and $35; www.excla.com) appear to be designed mainly for processing short WAV files intended as operating system sound effects in Windows. Milan Vidakovic's Glitch Eliminator ($20; http://solair.eunet.yu/~minya/Programs/ge/ge.html) is a similar product. All offer a limited number of options for more serious sound cleaning work.

Steinberg's Clean 4.0 ($39.99) is described as restoration and CD-burning software that removes hiss and crackle from recordings. It includes processing for surround and sonic enhancement (tube simulation), and also includes a lite version of WaveLab 2.5. Clean Plus ($99.99) provides a compact phono preamp/converter that connects directly to a USB port.

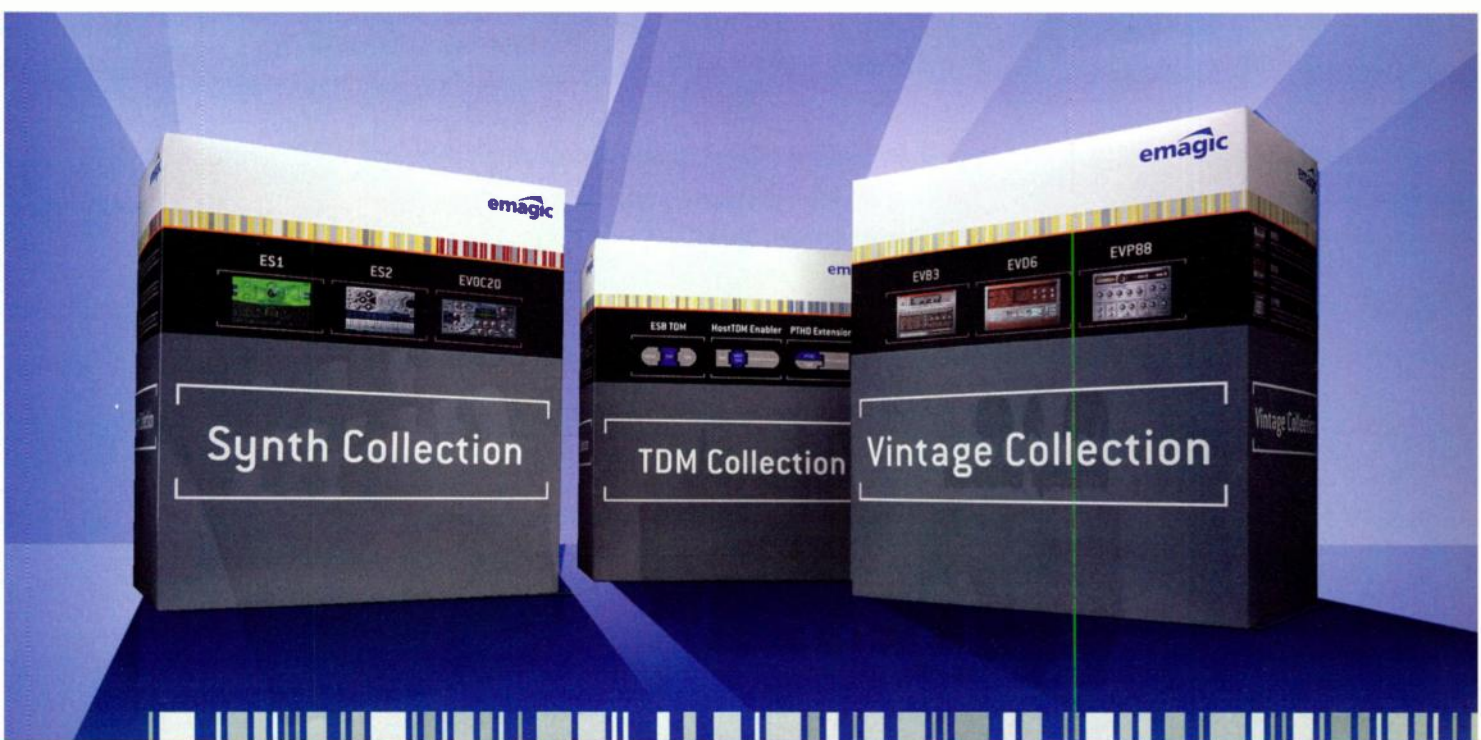
Also, a couple of freeware programs for the PC are available for download at www.sonicspot.com. Antipop by Vladimir Bashkirtsev is designed purely for click removal from WAV files in stereo at the CD-standard 16-bit, 44.1 kHz sampling rate. It runs in a command-line interface under DOS.

D/Noise from Fast Mathematical Algorithms and Hardware is intended for broadband noise removal and provides a graphical interface in Windows. The company, whose primary business is cleanup of visual images, cautions that the program is not intended for commercial restoration. (It says it's a work in progress.) The program uses a novel single-pass reduction procedure that is not explained in the user documentation. This is true tweakware. The parameters are rather inscrutable, but the price is right. Check out the company Web site (www.fmah.com) for a restoration of a truly hideous Edison cylinder of Johannes Brahms playing one of his own pieces.

Finally, Declick 2000 by Michael Paar (free; www.uuhome.de/mpaar/) consists of two plug-in filters that are specific to Cool Edit 2000 or Cool Edit Pro.

As you can see, powerful tools for audio restoration are available at every conceivable price point, and some once-difficult tasks can now be executed speedily and with reasonably good results. Still, true audio restoration remains a demanding craft. Rescuing the beautiful sound lying beneath the scratches, hiss, hum, camera noise, and other artifacts that can befall an audio signal—without making more problems than you solve—requires patience, skill, careful listening, and a real bent for solving difficult and nonobvious audio problems.

Former **EM** *technical editor* **Gary S. Hall** *is the inventor of the infinite audio delay line, which has been hailed as the ultimate noise reduction device. In the world of restoration,* **Oliver Masciarotte (Omas)** *has seen it all as he helps audio dweebs, media conglomerates, and forensic agencies rid our world of noise (www.seneschal.net).*



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The Ultimate Acoustic Drum Library

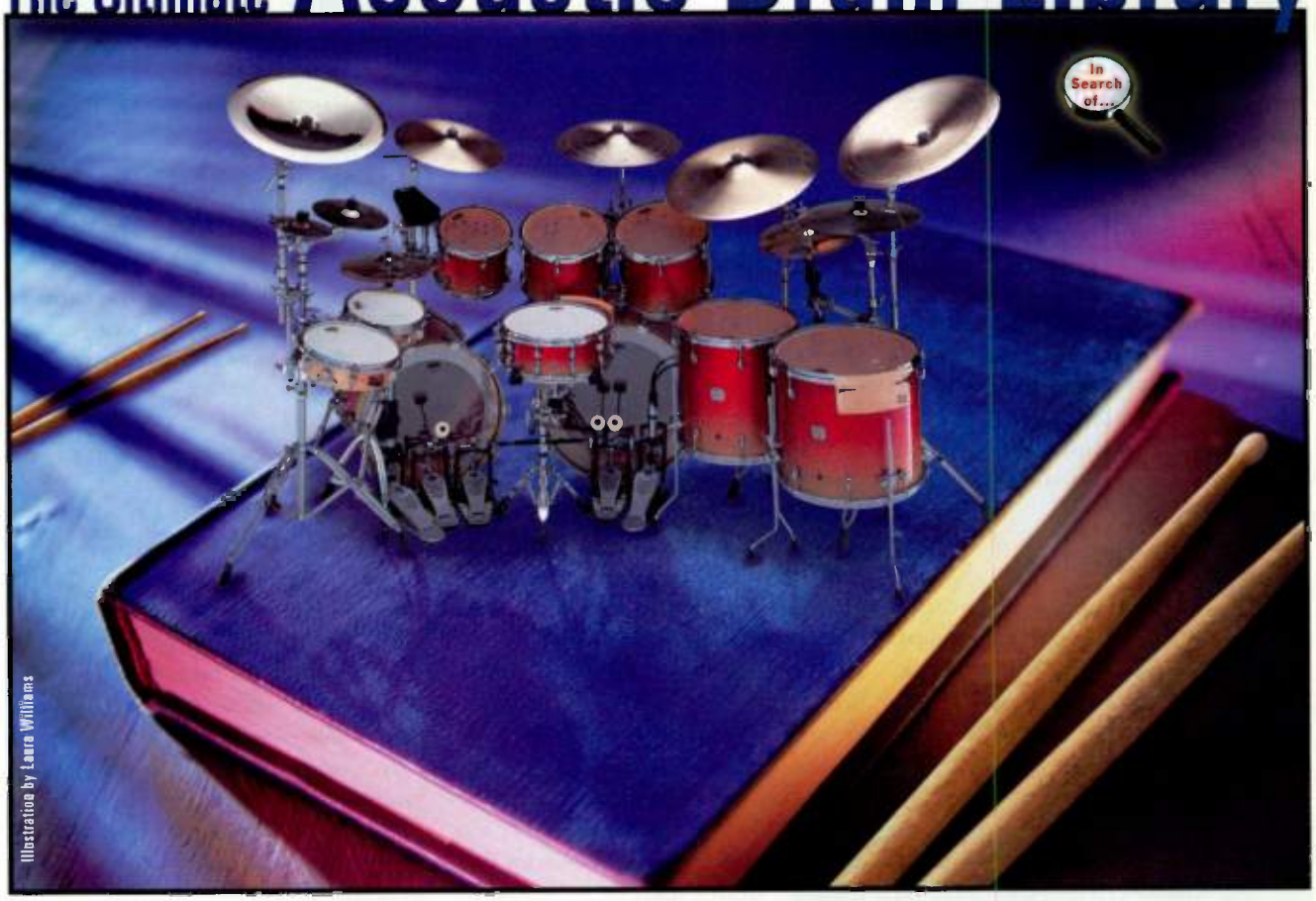

Illustration by Laura Williams

Beating the bushes for the best-sounding drum samples.

By Rob Shrock

Without a doubt, the acoustic drum set has been sampled more than any other instrument. Ever since the first drum machine played back digital recordings of actual drum hits rather than synthesized emulations, the world of popular music has been transformed by the sounds of sampled drums.

Composers, arrangers, and producers can now make competitive recordings without the expertise, expense, or time that is required to record a drum set in a commercial studio. Moreover, sonic explorations with drum samples and loops have helped lead to the development of numerous musical styles that now stand completely on their own, using deliberate alternatives to the traditional drum set.

The acoustic drum kit was an easy target for early sample developers because the sounds are relatively short and static as opposed to, for example, a violin section or a piano. It's a mistake to think, however, that a single hit of a real drum always sounds the same. We've come to accept—and even expect—drums to sound consistent and static because we've been fed 20 years of consistent and static drum sounds in so many pop records. The way we program drum parts has been largely defined by the way real drummers play; and ironically, the way real drummers play today is often influenced by the way in which sampled sounds are applied in various styles.

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The Ultimate Acoustic Drum Library

More snare-drum hits are commercially available than any other sampled sound, yet the list of acoustic-drum sample libraries continues to grow each year. Apparently, our fascination with the infinite varieties of sounds that can be derived from banging on drums with sticks is not easily satisfied, especially considering that drums come in so many shapes and sizes and are made from such a wide variety of materials.

ROAD RULES

Because so many great-sounding drum libraries have appeared over the past decade, this installment has been the most difficult of the "In Search of..." series to write. For this article, however, I'm narrowing the scope to cover acoustic-drum-kit libraries that attempt to capture the sound, flexibility, and dynamic range of a bona fide drum set. Because there are so many drum libraries to choose from, I had to set some harsh standards to narrow the field to a manageable number of titles. The truth is that the right drum sound for a particular song could come from just about any library. The point of this article, however, is to provide you with a good place to start when you're looking for a great-sounding collection of drum-kit samples.

I have therefore established the following rules for this feature: I'm covering only single-hit libraries, not loops and not heavily processed or synthetic-sounding drum and percussion samples. Special attention was given to libraries that make use of the latest technology, especially multitrack layers (close-mics, overheads, room mics). Libraries with mono-only cymbals were largely eliminated unless they had some killer drum hits to justify inclusion. Libraries that feature multiple Velocity layers were given more consideration than those offering only one or two hits per drum.

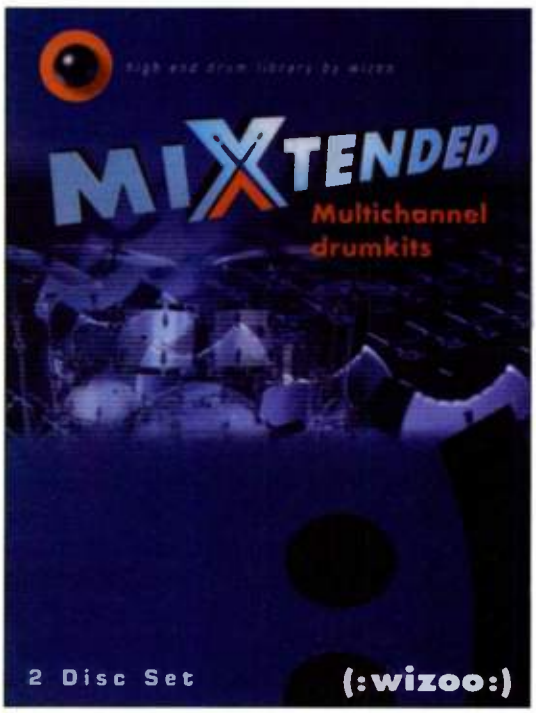

FIG. 1: Big Fish Audio's two-CD *MIXtended Drums* library offers excellent and well-organized samples at a very reasonable price.

No particular prejudice was applied toward libraries that didn't include room ambience or judicious processing such as compression and EQ; if they sounded great, they were included. Libraries that were uniformly excellent ranked higher than libraries that offered only a limited selection of standout samples. I used two questions to help me narrow the search as I evaluated the libraries: if I had to fit my whole sample library onto a single hard drive for portability, would those sounds make my must-have list? And more importantly: would I use these sounds on a commercial recording in lieu of a real drum set?

So, after months of pounding on my keyboard and MIDI drum controller, here are the libraries that I couldn't leave home without.

FIG. 2: Big Fish Audio's *Ross Garfield Drums 1* boasts many high-quality and well-prepared drums, along with an assortment of Latin and techno samples.

BIG FISH AUDIO

MIXtended Drums

This two-CD set offers five different drum kits in General MIDI (GM) format. The kits are labeled Funk, Jazz, Heavy, Rock, and Soul, although they're compatible enough for easy mixing and matching within the same song. The samples are well recorded in 24-bit resolution and should work fine in many productions with little or no additional processing.

MIXtended Drums (see **Fig. 1**) takes advantage of today's streaming sample technology, so the kits are big and detailed; each note features between 4 and 12 stereo samples. The outstanding feature of *MIXtended Drums* is that each kit is provided in identically mapped dry, overhead, and room versions, which allows you to layer the three kits and dial-in the balance to taste. That would be virtually impossible with a hardware sampler and its limited RAM, but today's streaming samplers like Emagic EXS24 and Steinberg HALion handle the tasks easily even with modest CPUs.

MIXtended Drums also features XXL versions of each kit that offer up to 32 stereo layers per drum with a resampled blend of the three mic perspectives. The Velocity crossfades are excellent and natural; the results are outstanding.

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The Little Engine that Could

By Steve Oppenheimer

Recording musicians and personal-studio owners have plenty of choices when it comes to digital-recording devices. For example, you could buy a rack-mount hard-disk recorder, a modular digital multitrack tape deck, or a computer with audio interface and recording software. Each of these solutions has distinctive advantages and disadvantages, and there are legitimate reasons to choose any of them.

But if you want a combination of ease of use, good basic—and in some cases, amazingly advanced—recording features, a physical mixing surface, straightforward connectivity, complete portability, and great value, nothing beats a portable digital studio (PDS). These devices combine a mixer, digital recorder, and effects into a single unit that is easily transported and that is far more reliable than most laptop computers. This marriage of essential features, portability, and reliability makes the PDS ideal for recording live performances and rehearsals, a prime choice for songwriting, and an excellent centerpiece for a personal studio. All you need are powered speakers, your instruments, one or more microphones and stands, and only a few cables, and you are ready to rock.

Portable digital studios may be relatively small in size, but like the Little Engine That Could, they can accomplish great things. They are generally extremely easy to use, allowing you to get the job done quickly. And if you need more power to get your project over the mountain, you can usually get it. Some portable digital studios offer extensive waveform editing within the unit, allowing you to do professional-style edits. In addition, many of today's portable digital studios (including all three units discussed in this supplement) can export WAV files, and some can connect directly to a Mac or PC, allowing you the best of both worlds. Furthermore, all three of the portable digital studios presented in this supplement include CD burners, so you can take a project all the way from conception to a CD submaster that is ready for replication. On the other hand, if you don't need all those features, a less complex PDS might be just the ticket, offering the ultimate in ease of use.

Although several companies make portable digital studios, three have become the clear leaders in the field: Korg, Roland, and Yamaha. Each of these well-established companies offer a distinctive line of digital recorders, giving musicians a choice not only between different design concepts but also several different models within each basic design approach. With all these options, you are highly likely to find just what you're looking for in a PDS.

Can you make a high-quality recording with a PDS? Like the Little Engine That Could, if you think you can, and you are willing to give it your best effort, you surely can do it.

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The Songwriter's Choice

KORG

Korg's easy-to-use D1200CD is the digital recorder of choice for songwriters and guitarists.

By Tom Norton

The D1200CD is a new 12-track hard-disk recorder offering 16- and 24-bit uncompressed recording, a full-featured mixing section, a 40 GB internal hard disk, USB connectivity, and a built-in CD-RW drive. It's designed to make the recording process as easy as possible and includes the professional features found in the D1600 digital recording studio. The D1200CD lets you effortlessly take your musical ideas all the way to the CD master using just one piece of gear! Although it can be used in any recording application for any musician, it is quickly finding its way into the hands of many guitarists and songwriters, thanks to its many guitar-friendly features and ease of use.

Icons and Knobs

The D1200CD's front panel provides an uncluttered, easy-to-understand user interface with the priority on simple and intuitive operation. Track faders, pan knobs, and transport controls are right at your fingertips. The input connectors and trim knobs are on the top panel so that you can easily see and work with instrument patching and input levels, and the friendly, icon-based LCD display can be angled to the exact position you need.

When you first power it up, you'll notice the stunning clarity of the D1200CD's new display. Next, you'll notice the Blue Zone, a silkscreened guide that takes you through the entire recording and CD-mastering process. Three silver knobs below the display access the exclusive Resonant-structure and Electronic-circuit Modeling System (REMS) modeling mode. We've created a collection of guitar, bass, and microphone models with simple icons for user-editable parameters, which are controlled with the knobs. Recording begins by choosing a modeling effect and tweaking it as needed. You can save your tweaks as Insert effects—and recall them instantly—even after the D1200CD is powered down.

Modeling Mode

You connect your guitar and headphones to the provided front-panel jacks, and then press the Modeling button to display icons for each of the three modeling categories. Select Guitar Modeling as the first step in this simple process. Pressing Enter automatically arms tracks 1 and 2 for recording and leads you instantly to Drive (knob 1), Tone (knob 2), and Cabinet (knob 3) settings, where you can put together your own amp setup.

You begin with the first knob, selecting from ten stompbox distortion units

The Korg D1200CD's front panel controls are arranged to follow the recording process from start to finished CD. The angle of the backlit 240 x 64-pixel LCD display can be adjusted for comfortable viewing.

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and renowned amplifier-head models. The second knob controls tone, providing a tube-preamp model, which adds a unique, nonlinear distortion to modify the overtone structure of the sound. To complete your new amp setup, you can use the Cabinet knob to select from eleven cabinet configurations. After this, you can choose three additional edit parameters for each, again using icons and knobs for immediate access. Available parameters include Level and Noise Reduction for Drive settings; Bass, Middle, and Treble controls for Tone; and Room Ambience, Level and Presence for your Cabinet selection.

That was easy! Now you're ready to prepare for tracking, but before you do, you'll find a top-panel Tuner button that accesses the built-in auto-chromatic tuner. Right next to it is a Rhythm button that provides you with over 300 metronome and Pulse-Code Modulation (PCM) rhythm patterns—a great collection you can record to tracks or use as a rhythm guide. You can chain rhythm patterns together to create song-length performances, complete with intros, fills, and endings. Once you've tuned up and selected a pattern, use the familiar Record and Play buttons to record, and you'll be guided in perfect sync by the rhythm pattern you've selected.

The D1200CD's simple, clean rear panel includes master and monitor outputs, optical S/PDIF digital I/O, MIDI I/O, and a USB port for connection directly to a Mac or Windows PC.

You might decide that your first take just didn't cut it. Don't worry: the D1200CD provides you with up to 99 undo levels, as well as eight virtual tracks for each of the 12 available tracks. That's 96 tracks! The Track button instantly takes you right to the Virtual Track page.

You can store four locate points, and 100 Mark points are available for every song. The D1200CD lets you store up to 100 scenes per song to provide snapshot automation of fader, pan, and effect settings.

The Fast Track

At 1 p.m., your rhythm guitar track is complete. The doorbell rings, and in walks your bass player and lead vocalist. The bass player returns after raiding your refrigerator at 1:15 p.m. and, with your assistance, selects a bass-modeling effect and tweaks it to taste. Somehow, your bassist gets it right on the first take.

It's 1:30 p.m. and time to lay down a scratch vocal track. Unfortunately, the only mic in the apartment has been used as a hammer and appears to be growing moss in the equipment case. Somehow it still works, and it sounds halfway decent. You plug it into one of the two XLR inputs on the D1200CD's top panel. There's no need to switch on phantom power for this session, although it's there for both mic inputs if necessary.

Again, Modeling mode comes to the rescue. You select from six room types, seven world-class microphone simulations, and three dynamics processors, and voila! You've put a new face on that old mic! As with the guitar and bass models, mic modeling allows you to choose and edit three parameters each; in this case for Studio, Mic Sim, and Dynamics selections. After you record the first vocal track, you opt to have the singer lay down four virtual tracks. You'll pick the best one later.

At 2 p.m., you add a lead guitar track after selecting one of the 98 effect chains; this one includes a Wah effect, which you control via the D1200CD's expression pedal input!

Ten minutes later, the singer's two cousins arrive unexpectedly, each with an idea for backing vocal parts. Within minutes, you've recorded four more harmony parts—two tracks at a time—using different mic models on the cousins. The singers have asked for different types and amounts of reverb in their cue mix. No problem: you have two master effects to choose from, each with 32 preset and 32 user effects available, and separate send levels to the masters for every track.

Time to recap: tracks 1 and 2 provide rhythm guitar, with lead guitar on 3 and 4. Bass is on track 5, lead vocal on 6, and backing vocals occupy pairs 7-8 and 9-10. That leaves tracks 11 and 12 open. Just then, your keyboard player (carrying a Korg Triton, of course) knocks at the door.

At 2:30 p.m., the Triton is plugged into channels 3 and

PRODUCT INFORMATION

KORG	Contact Information
D1200CD	Korg USA
portable digital studio	tel. (516) 333-9100
$1,250	Web www.korg.com

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4; with the D1200CD's easy input patching, signals are routed internally to tracks 11 and 12. A couple of rehearsal passes, and your keyboard player lays down a nice stereo piano track. It's now 3 p.m.: a couple of hours of work, and your entire demo song has been tracked! Now to edit, mix, burn it, and get it downtown before 6 p.m.

Change Is Good

Too bad that last chorus didn't repeat for another eight measures at the end of the song. And it would have been nice to copy the guitar lead to the end choruses, as well, only with a different EQ and Insert effect applied, maybe even with the track reversed. No problem: you can do all of that with the D1200CD. Just select the region of audio you want to edit, and in the Track Edit page, copy the audio data to the destination tracks you've set. You can even scrub the audio with visual waveform editing to zone-in precisely on a section of audio. Track editing lets you copy, insert, normalize, swap, reverse, expand or compress, and more!

The D1200CD can easily take your ideas from conception to CD master.

Time to add some insert effects. First, a quick mix is saved as an initial scene. Next, return to the Blue Zone, where an arrow leads you to the Insert Effect button, with up to eight inserts available for your song. It's easy to route tracks to specific inserts, and edits made to preset effects can be saved as user Insert effects. You have 106 effect types and 384 effects program locations to work with!

Now to add some EQ to the keyboard tracks. Fortunately, the D1200CD provides 3-band EQ for every track.

Next, it's on to the Master effects, which feature two processors and 32 preset and 32 user programs, with independent send levels for every track. You apply a bit of Smooth Hall on the backing vocals and send the rhythm guitar into a Bright Room reverb.

The next arrow leads you to the Final effect for putting the finishing touches on your song. There, you can select one of the 32 preset or 32 user dynamics effects, including stereo compressors, limiters, gates, and parametric EQ. The Master and Final effects aren't printed to the internal 40 GB hard disk until you actually bounce tracks with effects applied, or when you master to external gear through the Master outputs or the S/PDIF optical output. All in all, the D1200CD provides up to 11 simultaneous effects per song.

Ready For a Final Mix?

You add a few more scenes during the song, with changes to fader and pan and with a few effects adjustments on the backing vocals during the choruses. Now you'll want to bounce all 12 tracks down to a final stereo mix. Guess what? Another arrow leads you to the Bounce button, where you can select up to eight virtual-track pairs to do multiple mixes and then select your favorite mix.

Your song is mixed and ready to burn. With the included CDRW1x8 burner installed, you're ready to go! Follow the Blue Zone guide to the last step in the process: the CD button. Pressing it allows you to select the stereo source tracks for burning. Also included is a new feature: Disc At Once is useful when you want to burn and finalize your multisong CD in one automated process or when you record your band in live performance. You can record the entire show as one long track; later, you can set Marks for each song, and the Disc At Once function will use those Marks to create separate tracks automatically.

You have your CD master, and you're ready to deliver it on time. Before you take off, it's nice to know that the D1200CD auto-saves everything at power-down, and it can import and export multiple tracks as WAV files. Imagine loading your audio tracks into external digital-audio applications for additional editing and for conversion to MP3 format for Internet distribution! Of course, you can back up your songs and user effects to CD-RW media, and it's a snap to use the built-in USB interface to connect your D1200CD to a PC or Mac. Best of all, no additional software needs to be installed in your computer; a D1200CD icon automatically appears on your computer desktop once USB mode is selected in the D1200CD; you're connected and ready to back up song and effects data!

The Bottom Line

Think of the D1200CD as a professional recording studio filled with great amps, effects, and microphones. It's easy to use, yet it is packed with powerful features. Best of all it's amazingly affordable. Still not convinced that the D1200CD is perfect for you? Check it out for yourself! You can find a dealer in your area by visiting www.korg.com/D1200CD, where you'll find lots more information plus D1200CD tips and tricks and MP3 demos.

For more than 12 years, Korg USA's **Tom Norton** *conducted product training, demonstrations, and workshops teaching retailers and end users how to get the most from their Korg keyboards and recorders. He is now Manager of Product Training, and oversees the entire team of Product Specialists for all Korg USA-distributed products.*

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The No-Hassle Pro Studio

Roland

Roland's VS-2400CD workstation delivers 24 tracks at a 16-track price—and much more.

Need a good excuse to record your band? Roland just came up with the best one: the new VS-2400CD 24-Track Digital Studio Workstation. The VS-2400 is a complete digital recording, mixing, and CD-burning workstation with 24 tracks of 24-bit digital audio, a 48-channel automated digital mixer, two stereo effects, and more.

The 2400 has pro-level specs and features, including motorized faders, a 96 kHz sample rate, and full 5.1 surround-mixing capability. The best part is that you can connect a VGA monitor to the 2400's built-in VGA output and use the included mouse for software-style waveform editing. Compared to its big cousin the VS-2480CD, the VS-2400CD is smaller and lighter, so it's easy to take from gig to gig. And it's significantly smaller in price—a feature sure to put a smile on any musician's face.

By Laura Tyson

Captured Live

Because the VS-2400 can record 16 tracks at a time, it's perfect for recording a full-size band, including drums, bass, guitars, and vocals. That was exactly the task I faced on a recent Saturday in April. I was hired to cut a demo song for an alt-rock band from upstate New York.

Rolling all the qualities of Green Day, Weezer, and Jimmy Eat World into one, the band Lester wanted a professional demo for a local radio contest. Their lineup included drums, bass, and two guitarists who sang lead and background vocals. They wanted the demo to sound like it was recorded in a professional recording studio, but they lacked the professional recording-studio budget. I knew that the 2400 could handle this assignment with room to spare, so I placed it in the back seat of my two-door coupe and made the drive to the band's home in Rochester, NY.

We agreed to meet on a Saturday morning at the drummer's nicely equipped basement studio. The environment was perfect: wood floors, brick walls, drapes scattered here and there, and a token lava lamp in the corner. Because I had done most of the preproduction work on the 2400 in my hotel room the night before, all that I had to do was fire up the 2400, connect and position the mics, and set levels. I gave the drummer a set of headphones, turned on the 2400's built-in metronome, and went

Roland's VS-2400 hard-disk recorder is a complete digital music-production workstation, providing 24 tracks of 24-bit digital audio recording, a 48-channel automated digital mixer, two stereo effects processors, a built-in CD burner, and more.

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about positioning mics and setting levels as he warmed up.

Out of the box, the 2400 has eight XLR inputs, each with switchable phantom power. The unit's 24-bit mic preamps are super-high quality, so I didn't need to bother with external mic preamps. The R-BUS port on the back of the VS-2400 provides the other eight inputs. For the Lester recording session, I connected an optional Roland SI-24 Studio Interface to the R-BUS port to get eight more XLR inputs. In addition to the eight studio-quality mic preamps, the SI-24 offers motorized faders and a handy joystick for doing surround panning. It also looks really cool.

The final setup included mics on the kick, snare, and toms, with a pair of mics for overhead cymbals. The bass and both guitars were connected direct, and we still had plenty of inputs for vocals—but those would be overdubbed later.

Each analog input on the 2400 has a full-featured channel strip, including a 4-band EQ and a compressor. I kept the EQ off but turned the compressors on for the kick, snare, and bass guitar. The gain-reduction metering in the compressors makes setting them up a no-brainer.

The VS-2400 has two stereo effects processors; I used these to insert Composite Object Sound Modeling (COSM) guitar-amp modeling on the guitar inputs. Applying the JMP-Stack preset on the rhythm guitar made it sound as if he was playing through a stack of Marshall amps. I handed the effects-editing controls over to the lead guitarist, and he dialed in his own tweaked version of the SLDN Lead preset for his sound. Knowing a good thing when I heard it, I saved his setting to the VS-2400's User Effects bank as Jason's Guitar Sound. It would come in handy later on. In both cases, I inserted the amp modeling on the 2400's mixer in such a way that the guitarists would hear the modeling in all its glory as they played, but without printing the effect. That way, I could mess with the sound later during mixdown.

With the addition of a mouse and a VGA monitor, the VS-2400CD transforms into a computer-like workstation.

The band pleaded for a quickie last-minute rehearsal of the tune, so I gladly relented and used the time to make sure that all the levels were good and to fine-tune the headphone mix. Soon, everyone was warmed up, tuned up, and fired up, so we started recording. This was the easy part, as all I had to do was keep an eye on the levels. Once the rhythm parts were laid down, I excused everyone except the lead singer, and we tracked the vocals. By mid-afternoon, we had cut the background vocals.

As anyone can tell you, time progresses at a different rate in the studio; before I knew it, we had recorded all the tracks, overdubbed all the vocal parts, and it was time to pack up. Anyway, I needed to get back to New Jersey to feed my cats.

Back at the House

Back at my farmhouse a day later, I cleared a space on the dining room table for the 2400 and hooked up a VGA monitor and mouse. With the monitor and mouse, the 2400 behaves and looks just like a computer-based recording system, albeit without all the extra hassles and baggage inherent in a general-purpose computer. As a dedicated recording system, the 2400 offers sheer, unadulterated power, so (for example), I never have to worry about bogging down the CPU with too many effects and EQs running at once. With the coaxial digital output of the 2400 feeding my Roland DS-90A 24-bit Digital Studio Monitors, I was ready to start mixing.

Everything sounded even better than what I had remembered from the original session; it was almost perfect. The final touch would be the addition of a scorching lead guitar solo played by a guest soloist. With the band's approval, I recruited the talents of a well-known LA-area guitarist.

Because the 2400 can import and export WAV files, I can collaborate with musicians anywhere in the world. Distance is no longer an issue when it comes to getting the best players for your songs. All that you need is a VS-2400 and high-speed Internet access. I simply exported a mix of the tracks as a stereo WAV file, minus the original guitar solo, and I emailed it to the guitarist. I gave him free rein to go crazy and record as many solos as he wanted; the VS-2400 has room for 384 tracks per song. His assignment was to crank out the solos, save them as WAV files, and email them to me. I would burn the files to CD and import them into the VS-2400. He pulled the mix into his own system and recorded a staggering 23 different solos; some guitarists never run out of ideas! He then emailed the files

PRODUCT INFORMATION

Roland

VS-2400
portable digital studio
$3,295

Contact Information
Roland Corporation U.S.
tel. (323) 890-3700
Web www.rolandus.com

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to me (thank goodness for broadband Internet), and I burned them to a CD and imported them into the VS-2400.

Inside the 2400, I stacked the solos into virtual tracks under tracks 18 and 19. That way, I could listen to each solo in place against the original tracks and decide which one to use. Even better, I could copy the best parts from each solo to assemble my own "comp" track for the guitar solo.

Next, I used the mouse to assemble the guitar solos at the right location in the song. On demand, the 2400 will snap audio phrases to a grid, so it's easy to line audio up to bars and beats. The waveform views showed me exactly where each riff started and ended. Like the audio equivalent of Dr. Frankenstein, I had soon created the ultimate monster guitar solo.

It was time to evaluate the vocal tracks. My 2400 has the optional VS8F-2 Effects Expansion board installed, so counting the two built-in boards, I had four stereo effects to work with. The vocal tracks were originally cut through an AKG C3000 condenser mic, so I started out by experimenting with different flavors of COSM Mic Modeling before settling on the Vintage Condenser model. Adding a tiny amount of the Large Hall reverb gave the vocal parts just the right sound.

In the Mix

I was now ready to mix the song and burn a CD. With the touch of a button, the 2400's motorized faders switch between tracks 1 through 12 and tracks 13 through 24. I could also mix several tracks with one fader, thanks to the Group Fader mode. I set the levels for the drum tracks, assigned them to Group 1, and then assigned the rhythm guitar parts to Group 2. I kept everything else on individual faders, so I had my entire mix right under my fingertips. I turned on the Automix feature, letting the 2400 listen to and memorize my fader movements as the song played, then I played it back, hands-free. The best part about Automix is that the 2400 does the work for you, letting you sit back and focus on the way your song sounds instead of worrying about when to fade in the background vocals and such.

I was almost ready to burn the song to a CD and send it to the band, but I wanted to make sure the mix was as loud and punchy as some of the music I've heard on the radio. First, I mixed all the tracks down to a stereo master from inside the VS-2400's Mastering Room. Then I inserted the Hard Compression preset of the Mastering Tool Kit. Was that enough? Will this mix sound as punchy and as loud as, say, *Lifestyles of the Rich and Famous* by Good Charlotte? There was only one way to find out. I slapped my copy of the Good Charlotte CD into the 2400's CD tray, and used the track-ripping tool to bring the song in question into the 2400's Real Time Spectrum Analyzer. The Analyzer immediately revealed that my mix had too much mid-range and not enough high end, as compared with *Lifestyles*. A few strategic tweaks of the Mastering Tool Kit fixed that. Satisfied, I burned my mix to a CD.

The VS-2400's back panel offers mouse and keyboard inputs, a direct out for a VGA monitor, optical and coaxial S/PDIF digital I/O, an assortment of analog outputs, a footswitch jack, and two R-BUS ports.

And the Winner Is...

Whether Lester wins the radio contest or not, the VS-2400CD is the real winner when it comes to recording your band. With its musician-friendly price tag, there's nothing else that even comes close. It provides professional recording and production tools in a sturdy, reliable package that morphs into a computer-like recording system when you connect a mouse and VGA monitor. You get the ability to record, edit, mix, and burn CDs anywhere at any time with total reliability and hassle-free operation.

So, what are you waiting for? Get out there and start recording!

Roland Digital Recording Product Specialist **Laura Tyson** *has a degree in music engineering and technology from the University of Miami. She began using digital recording systems in 1986 (with New England Digital's Synclavier) and has been nonlinear ever since. Numerous recording and mixing projects on Roland V-Studios now keep her busy.*

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Continuing a Great Legacy

YAMAHA

Yamaha's AW16G is a winner onstage or in the personal studio.

It's no small feat to combine a mixer, recorder, mix-down deck, and CD burner in a single, portable package, but Yamaha brings years of experience to the task. That includes thirty years of building professional mixers. You can hardly go to a major concert without seeing a Yamaha mixer doing front-of-house sound and onstage mixing. Add Yamaha's fifteen years of building digital mixers: the company is a world leader in the field, from the groundbreaking DMP7 through the paradigm-shifting ProMix01, 02R, and 01v to the current 02R96, 01v96, PM1D, and DM2000.

The Yamaha AW16G's legacy capitalizes on over a decade of digital recorders. Although the unit is not the first of its kind, it has delivered on the promise of a small-format, fully professional hard-disk recorder and CD burner that doesn't break the bank. Its two bigger cousins, the AW2816 and AW4416 offer great expandability, but what makes the AW16G so right is that it is just what you need for a small home studio or on-the-gig recording rig. The AW16G features eight inputs—two XLR and six 1/4-inch TRS jacks, plus a Hi-Z input for guitar or bass—eliminating the need for a direct box.

Talk the Talk

I am a musician who learned about recording the hard way. On my first recording session with my band, I realized that I could not communicate with the engineer in his language. I immediately saw that recording was an important tool in the creative music-making process, and I owed it to myself to learn all about it. Back then, recording gear seemed to be the exclusive domain of rocket scientists. However, over the past 30 years, the world of recording and the world of the musician have come very close together. The AW16G is a great example of that.

The first thing you'll notice is that the AW16G talks your language. For example, musicians don't care that you are 2 minutes and 24.567 seconds into the recording;

The Yamaha AW16G features a clear, intuitive interface that makes setup and recording a breeze. Dedicated buttons let you freely switch between the functions you use most, such as Record and Monitor modes, and a Quick Rec function lets you quickly assign inputs to recording tracks.

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they want to know if you are at measure 78. The clock in the AW16G tells your kind of time. You can teach it your song's tempo and time signature, and it will faithfully count measures and beats for you and even provide you with a metronome to play along with—no matter how complex the meter. If playing along with drum grooves is your thing, the unit has four stereo sampling pads that let you record, import, and place four banks of your favorite sample loops. Loop tempos automatically adjust to your song. You can grab audio from virtually any source, including your own tracks, commercially available CDs, or from the onboard 250 MB library of loops.

Mature Librarians

Maturity in a product line is an important consideration; it means that the product has a history and has already benefited from the feedback of thousands of users. You may not appreciate that at the outset but it will reward you many times over as you go along. The Library concept in the AW16G is one such benefit of maturity. A Library is a database of tried-and-true setups that you can recall; some are presets that let you learn from the pros if you are new to recording. A Library can also contain favorite setups that you've created.

The AW16G brings the world of the recording engineer and the musician very close together.

The Input Library lets you instantly recall a channel setup that could include a 4-band parametric EQ, a speaker simulator, a dynamics processor, and an effects processor. You may spend an hour getting the ideal guitar setup, but when your guitarist returns next week to redo a few licks, you can recall that recording setup instantly. You can even import setups from previous sessions. The Library offers presets for electric guitar, acoustic guitar, bass guitar, and vocals.

Perhaps you have never worked with a professional 4-band parametric EQ, and you do not have a clue about the way to properly EQ a kick drum. You can recall an EQ for bass drum from the AW16G EQ Library. If you're an old pro and know what you want, just set up your favorite EQ and name and store it in the Library for future recall.

Getting Your Duckers In A Row

Dynamics processors are probably one of the most significant tools in the AW16G arsenal. These are leveling amplifiers that you can assign to each channel to help control and maximize your signal. You can configure a dynamics processor as a compressor, limiter, expander, noise gate, compander, or ducker. You don't just get one dynamics processor in the effects section; this is a professional unit, with a dynamics processor for every channel, input, track, and even the stereo sampling pads and stereo output. Back in the day, your pro studios might have two, if you were lucky.

Perhaps you already know just how important dynamics processing is to getting a solid, "in your face" recording. But even if you are new to all this, you will be grateful for the Dynamics Library: preprogrammed setups that you can recall, apply, and tweak. You can recall an appropriate setup from the AW16G Dynamics Library for, say, kick drum or vocals, and then tweak it for the sound that will make your recording stand out from the crowd.

Yamaha is a pioneer in DSP technology and has been building studio-quality effects processors for many years. There are two effects blocks. You can move and patch these blocks wherever and whenever you need them. Although many feel that they do not need help in setting them up, the AW16G provides an Effects Library section. If you come up with any cool settings, you can name and store it in the Library.

The Master Library will help you in the all-important final mixdown process where you put it all together. As with the Input Library, the Master Library is a combination of several different processor blocks working together to make your final mix something special.

The Library concept is important because it is there for you to learn from and archive your best work. When you start a new session, the unit will ask you if there is any work you would like to import from a previous session. You can recall your favorite setups from the various libraries.

Easy Does It

Ease-of-use is a concern of many aspiring engineers. The AW16G is designed to make the complex job of professional recording easy. Assigning inputs to tracks could not be more intuitive.

PRODUCT INFORMATION

YAMAHA

AW16G
portable digital studio
$1,299

Contact Information
Yamaha Corporation of America
tel. (714) 522-9011
e-mail info@yamaha.com

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FIG. 4: EastWest's three-disc *Real Giga Drums* library includes five drum sets with dry, overhead, and room versions.

are especially good, with 8 to 12 layers per note.

Platinum 24 Acoustic Drums also has five GM-mapped, single-layer ambianco programs for layering behind the drier samples: small, medium, and large plates; brick-wall limited room; and gated ambiance. The ambiance layers are moderately useful, but not nearly as effective as the newer libraries that provide detailed overhead and room kits. I'd rather have had the space dedicated to more samples and articulations in the main kits. However, the overall value of this library is excellent.

BIG FISH AUDIO

Ross Garfield Drums 1

The *Ross Garfield Drums 1* library (see Fig. 2) gives you 20 kits drawn from a pool of drums that includes five kicks from Gretsch, Ludwig, and Remo; ten snares from Ludwig, Leedy, Noble & Cooley, and others; toms from DW, Gretsch, and Roto; and a variety of cymbals and hi-hats. The library also includes a good collection of Latin and pop percussion and a variety of techno and 808-style kicks, snares, and other sounds.

Unlike the *Drums 2* library, *Drums 1* uses only two to four Velocity layers. The quality is high overall, but the usefulness is hit-and-miss. This library (unlike *Drums 2*) has samples that are stylized with EQ, compression, and other processing. Although some of the drums are used for more than one kit, the kit names (such as Metal and Dry Pop) group the appropriate drums for each given style. Overall, *Ross Garfield Drums 1* is a solid collection, especially if you need to get a lot of mileage out of a single library.

BIG FISH AUDIO

Ross Garfield Drums 2

As you would expect from Ross Garfield, the drums used in these sampling sessions sound great. The tuning is spot-on, and you can tell that care went into prepping the drums for recording the samples.

Black Beauty, Garfield Custom, Ludwig, and Noble & Cooley snare drums are covered in great detail. Of particular note is the collection of multirod snare samples, which are especially strong in this library. Yamaha, Ludwig, and Gretsch toms are also included, along with Gretsch and DW kick drums.

Most of the drums in this 16-bit library have four to eight Velocity layers. Dry and ambient versions are provided for all drums. The hi-hats are good and the cymbals are okay, but they typically have only one or two layers. The library's strength is clearly its collection of drums, so I often use drums from this library mixed with cymbals from elsewhere.

The drum samples are very natural and realistic, much like what you get when you place a quality microphone in front of a great-sounding drum and record it without processing. That may make this library sound a bit smaller and duller than other libraries that have added some EQ and compression to the samples.

Garfield's approach to *Drums 2* has its advantages and disadvantages. The sounds are of high quality and take well to compression, EQ, and other processing that you would usually add when working with drum tracks, and that gives you lots of flexibility. On the other hand, the sounds usually need some processing to compete with most of the drum sounds in modern productions. Nevertheless, for high-quality samples and flexibility, *Ross Garfield Drums 2* is a winner.

EASTWEST

Pure Drums

I broke one of my own rules by including *Pure Drums* in this article (see Fig. 3)—all of the 16-bit samples are in mono. However, they sound so great that they deserve inclusion. The tone of all the drums is full and natural, with great transients—in fact, some of the best transients in this entire roundup. There are up to 16 Velocity layers per note, and with a little artificial ambiance, the samples sound stunning.

The *Pure Drums* sounds are mapped in GM kits with names such as PopKit, HipHop, FunkKit, and SoulKit, so it takes

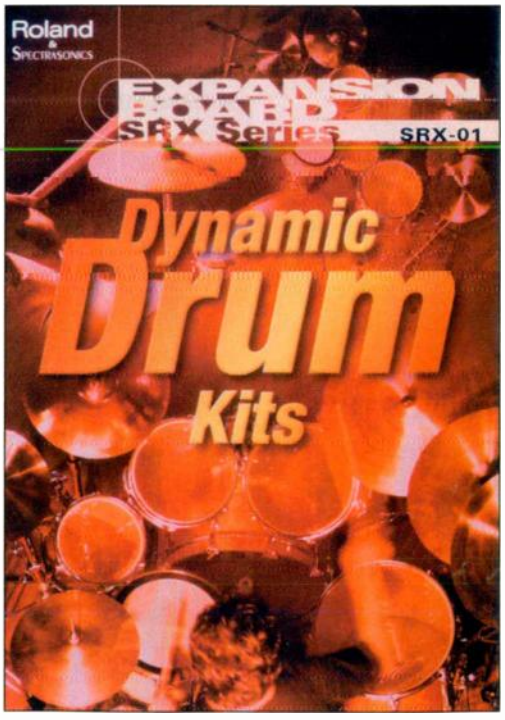

FIG. 5: Roland's SRX-01 Dynamic Drum Kits expansion card adds a large collection of powerful drum sounds to Roland XV and Fantom series synthesizers.

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a little searching to find exactly what you want in a particular sound. Nevertheless, all of the samples are great, and they mix and match quite well. I still wish the cymbals were in stereo, although adding a little mono-to-stereo reverb usually fixes that situation. Or you can easily use cymbals from another library, which is what I usually do. I often start with *Pure Drums* when looking for kick, snare, and tom samples.

EASTWEST

Real Giga Drums

Real Giga Drums is an incredibly well-thought-out three-disc library (see **Fig. 4**). The five kits average 7 to 13 16-bit stereo samples per note. Each kit is offered in three versions: dry, overhead, and room. All three versions are mapped exactly the same for layering, just as *MIXtended Drums* is.

Each of the five kits is given in GM layouts as well as in custom mapping programs that feature more samples. Economy versions of the kits consist of a premixed blend of the dry, overhead, and room mics. Those smaller versions are especially great for reducing the drain on your computer's resources while sequencing; you can later print the independent versions of the layered kits for ultimate control. However, the economy kits sound great in their own right and will satisfy many users.

More snare-drum hits are commercially available than any other sampled sound.

The toms are the weakest instruments in the kit—I wish they had a little more ring to them—but I'm splitting hairs here. *Real Giga Drums* is a great value.

ROLAND

SRX-01 Dynamic Drum Kits

I occasionally cover hardware in the "In Search of..." articles if it fills the "best of" criteria that is the premise of the series. Roland's SRX-01 expansion card fills a unique niche (see **Fig. 5**). It offers the equivalent of 64 MB of 16-bit samples, all dedicated to drum sounds.

As is typical of Roland's products, a lot of sounds are crammed into the available space on the SRX-01. A bunch of meaty-sounding kicks, snares, and toms maintain their character without being cleaned up or overedited

SAMPLE LIBRARIES

DISTRIBUTOR	TITLE	FORMATS	DESCRIPTION	PRICE
Big Fish Audio	*MIXtended Drums*	EXS24/Battery, HALion/LM4	2 CDs	$99.95
Big Fish Audio	*Platinum 24 Acoustic Drums*	Akai	2 CDs	$99.95
Big Fish Audio	*Ross Garfield Drums 1*	Akai, Audio, E-mu, Kurzweil, Roland, SampleCell	1 CD	$199.95 Akai, E-mu, Kurzweil, Roland, SampleCell; $79.95 Audio
Big Fish Audio	*Ross Garfield Drums 2*	Akai, Audio, Giga, Kurzweil, SampleCell	1 CD: Akai, Audio, Kurzweil, SampleCell; 2 CDs: Giga	$199.95 Akai, Giga, Kurzweil, SampleCell; $79.95 Audio
EastWest	*Pure Drums*	Akai, EXS24, Giga	1 CD	$149.95
EastWest	*Real Giga Drums*	Akai S5000/6000, E-mu, Giga	3 CDs	$199.95
Roland	SRX-01 Dynamic Drum Kits	XV-series synths, RD-700, Fantom, Fantom-S, MC-909	expansion card	$395
Sonic Network	*Sonic Implants Drum Series 1*	Akai, EXS24, Giga, Kontakt, Kurzweil, SoundFonts	1 CD	$199.95
Studio Cat Software	*Purrrfect Drums*	Giga, HALion	8 CDs	$249
Sweetwater Sound	*Total Stereo Session Drums*	Kurzweil	1 CD	$199

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Advertisement

You connect your inputs from the Direct assign screen to the track. You can pair inputs for stereo signals and tracks can be paired too. The Selected Channel section makes navigating the operating system a breeze. Below every input-gain control and above every track fader you have a lighted Select button. When that button is illuminated you have a set of knobs that get you to any of the main controls for the selected input or track channel: EQ, Dynamics, Effect 1, Effect 2, and Pan/Balance. Push the EQ knob to see the selected channel's EQ graphically and clearly. You have four Frequency Band Select buttons to make equalization easy and intuitive. Press the knob again, and you enter the Library. It is that easy to get around.

The unit easily handles cut-and-paste editing, waveform views, marker placement, erasing, deleting, moving, and inserting. You can leave markers at key locations in your composition. The A and B working markers mean that you never have to write down time positions. You can place markers with single-sample accuracy (1/44,100th of a second), zooming way in on the waveform, auditioning the wave, nudging the marker, and positioning it with accuracy that boggles the mind. When you need to make an edit, just press A and Enter to recall the position and that value is entered automatically. Defining your cut points could not be easier or more accurate.

Plays Well with Others

Yamaha is aware of real-world recording situations: you are not locked into the tools onboard the AW16G. The AW16G is a sturdy, road-worthy machine that can go to the rehearsal or record the gig so you can bring it home and work with the best tools available. The unit is designed to work in conjunction with the latest and greatest software audio editors on the planet. You can easily and rapidly export your tracks to a CD as individual WAV files and move them over to your computer. You can then import them back to the AW16G for mixdown and mastering. You don't have to choose between a computer recording system and a dedicated tool like the AW16G.

If you're running a MIDI rig, it's good to know that the AW16G can send MIDI Clock or MIDI Time Code and can serve as a controller for a wide variety of sequencers. Yamaha provides templates for many of the popular programs, and with the Learn feature, you are seconds away from creating your own templates. The Learn function makes it easy to program the sliders and switches as MIDI controllers for just about anything you want. You never have to know the command. Arm the AW Learn function, send it the target control message, and you've assigned it. All of your mix parameters can be sent via MIDI for complete automation.

Are you performing an overdub session in your living room? You can configure the Stereo and Aux outputs as two separate, prefader headphone mixes, letting you monitor a separate mix from the musicians. It's a professional system every step of the way!

The AW16G's eight inputs include two XLR mic inputs for channels 1 and 2; balanced, 1/4-inch inputs for channels 3 through 7; and both a balanced and an unbalanced, high-impedance (guitar) input for channel 8. Other ports include optical S/PDIF digital I/O, MIDI I/O, a footswitch jack, main and monitor outputs, and a headphone output.

Whether the AW16G is your whole studio or just one part of a growing system, you could not find a more powerful and user-friendly tool. That is why it receives awards and is in such great demand. Of course, the sound quality is great —after all, it's a Yamaha product. Take it for a test drive, and you'll see and hear why critics and musicians the world over agree, the AW16G is the one that really delivers!

Phil Clendeninn *has been a Product Specialist and Technology Jedi for Yamaha since 1987. He is a musician, recording engineer, and Grammy-nominated songwriter. After 25 years, you can hear his music again on* Tarika Blue *and* The Very Best of Tarika Blue *(Downtown Sound Records/Soul Brother Records).*

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The cymbals are envelope shaped at the sample level to ring for only six or seven seconds, which is my biggest criticism of this library. In the context of a full drum-kit performance, however, the shorter ring of the cymbals is usually not a problem. Also, the open hi-hat sounds on A♯ are cut off only by the foot hi-hat sample on G♯, and not by the stick hit on F♯. A little tweaking in EXS24 fixed that minor bug.

The concept of *MIXtended Drums* is great, and the execution and organization is excellent. Especially considering its price, *MIXtended Drums* is a true winner.

BIG FISH AUDIO

Platinum 24 Acoustic Drums

Another bang-for-the-buck library, *Platinum 24 Acoustic Drums* consists of 16-bit stereo samples (in the Akai version) with up to 32 stereo layers per note. (According to Big Fish Audio, 24-bit EXS24, Giga, and HALion versions will be available soon.) The two-CD library has no full drum kits, although most individual instruments adhere to the GM drum map. In addition, the samples are mapped chromatically starting an octave or two above the GM layout in the same patch. That lets you play a specific sample more easily without having to trigger it with its corresponding Velocity range, and you can have full Velocity control over it.

Ludwig, Premier, Sonor, and Ayotte snare drums are represented and flams are included. The snares sound great, except for a few Premier single-hit snare samples that sound abruptly chopped off, which affects the perceived ambiance. It is noticeable, because most of the surrounding samples have more of a decay tail. Another point worth noting is that many of the instruments have a few more samples in the chromatically mapped area—eight to ten samples per note—than there are in their GM layout.

FIG. 3: Although its samples are in mono, EastWest's *Pure Drums* library gives you an array of stunning drum sounds with up to 16 Velocity layers.

The toms are from Yamaha, Sonor, and Pearl. Oddly, the toms are mapped chromatically only, with no corresponding GM layout. Four toms are mapped at C1, C2, C3, and C4 with eight samples per drum. There are no tom flams, but the drums sound very good in a market that offers surprisingly few great tom samples. The hi-hats

TEST PATTERN

When creating most of my drum parts, I obtain the best results when I mix and match sounds that are from various libraries. Auditioning a multitude of drum sounds, however, can quickly become tedious as well as very time-consuming. Fortunately, I have found an effective way to speed up the process of searching for the right drum sounds.

I have created a little eight-bar pattern that plays through all of the drums in a way that provides a quick feel for the sounds that are in the current setup. The sequence consists of a couple of full-kit sections that go in and out of fills. The fills are dynamic (loud to soft or vice versa), so I can hear the basic dynamic response of the drums. I use a lot of cymbal hits, too. I wouldn't use this little sequence in a musical context, but the pattern offers enough variety that I can listen to it for 10 or 15 minutes without going crazy. I've created the eight-bar pattern so that only a brief moment passes before I hear a few hits of any given drum sound.

Of course, I have a main General MIDI layout of the test pattern that works for many libraries. But I have also customized the pattern for each of the dozen or so main libraries that I use on a regular basis. Most of the libraries, even if they have an unusual layout, are usually consistent. So even if, for example, a library lays out its snare-drum samples chromatically starting at C3, it most likely stays that way throughout the library.

I've copied and edited my basic test pattern to match each library's mapping scheme and have renamed each sequence to match each of the library names in my short list of favorites. That lets me quickly hear drum sounds in a more musical context than if I were to manually trigger one-shot hits ad nauseum.

All of the copies of the test pattern reside in my sequencer template in either an alternate sequence or in a nested folder, which I can delete later once I have started a new song. I've found that this process has greatly improved my ability to quickly audition drum sounds so that I don't have to fall back repeatedly on the same old sounds when I'm short on time.

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to the point of sounding generic. The sounds are punchy, too, which is usually not the case with expansion-card sounds.

The cymbals aren't great; they lack the transient zing that many of the other libraries have, and there are only a few cymbals that serve all of the included kits. But cymbals aren't the focus of this card. The many kicks, snares, toms, and full brush kits are the main attraction, and they're real winners. I mixed a couple of preset kits (without cymbals) for a professional song and for a demo remake of the Burt Bacharach/Hal David song "Windows of the World." When I played the mix for Bacharach recently, he asked me who was playing the drums! I had to hold back a smile as I pointed to myself.

If you own an XV-series synth, Fantom workstation, or some other compatible synth, I recommend this card. It puts lots of excellent drum sounds immediately at your fingertips, and you can feel good about using an expansion card without compromising quality.

SONIC NETWORK

Sonic Implants Drum Series 1

This powerful 16-bit library has five kits, three of which were sampled at Blue Jay studio (known for its drum sound). The other two session kits give you four-to-eight-Velocity cross-switched stereo layers per note in GM format (see **Fig. 6**).

FIG. 6: The *Sonic Implants Drum Series 1* library from Sonic Network offers carefully programmed punchy sounding samples from five drum kits.

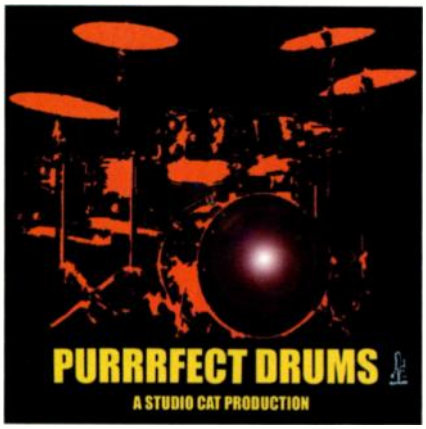

FIG. 7: Studio Cat Software's eight-CD *Purrrfect Drums* library is dedicated to a meticulously sampled Yamaha Recording Series drum kit.

As with all of the company's *Sonic Implants* products, great attention has been given to the programming, and patches have been customized to take full advantage of each native format's strengths. As a result, a lot of programs use effects and filtering that don't translate well into other formats. For instance, when importing the Giga version of *Drum Series 1* into EXS24, I had many patches that were sonically identical, because EXS24 doesn't recognize the effects setting in GigaStudio. (According to Sonic Networks, *Drum Series 1* should be available in native EXS24 and Kontakt formats by the time you read this.)

This collection is especially noteworthy because its sounds are ready to go right out of the box. Sonic Networks has created a musical blend of close-mic, overhead, and room mics, and the sounds are extremely punchy and have an ample supply of transients. The kits are so versatile because they respond well to additional processing, yet they can easily stand on their own. *Sonic Implants Drum Series 1* is a fine, well-produced collection.

STUDIO CAT SOFTWARE

Purrrfect Drums

The prize for the largest sampled drum kit goes to Studio Cat. *Purrrfect Drums* comes on eight CDs, all of which are dedicated to a meticulously sampled Yamaha Recording Series drum kit (see **Fig. 7**). The 16-bit library

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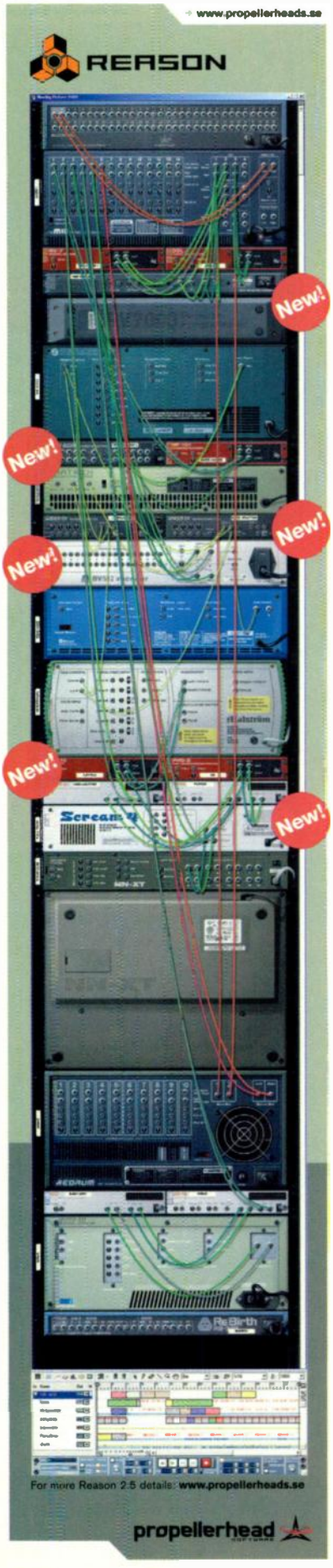

has a few alternative snares and toms, but by and large it is dedicated to a single kit with 16 Velocity-switched samples per note.

One unique feature of *Purrrfect Drums* is that most of the Velocity-switching is weighted toward the upper end of the 0 to 127 range. That causes different samples to be triggered more often than usual when a performance stays in the upper dynamic range, which could be a problem if not implemented well. In *Purrrfect Drums*, however, the sound designer has maintained strict quality control; the results are a very playable and natural-sounding dynamic drum set.

Purrrfect Drums does include some processing, especially EQ, but I find that I still need to add some EQ and compression for a finished result. The toms ring for an especially long time, and I usually have to gate them to prevent them from muddying a fill. However, I'd rather have the natural, long ring of real toms to work with than to be stuck with toms that sound chopped off.

The cymbals and hi-hats are particularly good, so if you find that the snares, kick, and toms are not to your liking, these cymbals should work well with most of the other libraries covered in this roundup. Studio Cat has just released its second title, *Purrrfect Brushes*, which promises to raise the bar for brush kits.

SWEETWATER SOUND

Total Stereo Session Drums

As its title states, all of the samples in *Total Stereo Session Drums* (see **Fig. 8**) are in stereo (although I suspect a few mono samples may have slipped in). The drum sounds run the gamut from excellent to mediocre, and I even found a few stinkers. However, *Total Stereo Session Drums* was intended to cover lots of sonic ground, and it accomplishes that goal admirably. (According to Sweetwater, the library was designed to offer a wide range of sounds from top-level pro to low-level garage band.)

What makes this library great is its collection of cymbals. For years, they were the only realistic-sounding stereo cymbals that I found satisfying; I used them on several big records. Even though sampled cymbals are getting better in the more recent libraries, I still call on these cymbals when I'm in a hurry, because I know that I can fully trust that they will sound good.

Many kick and snare samples are crammed onto this disc, so you can probably find something you like. However, most of the sounds are either one-shots or have only a couple of Velocity layers, which may be too limiting for some people.

In addition, I've never been able to successfully translate this Kurzweil-only library into GigaStudio or EXS24 formats. (According to Sweetwater, that's because the library includes a lot of

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programming specific to the Kurzweil platform.) That means that to use this library I still have to fire up my K2000 rack, which I'm doing less and less frequently as I continue my migration into software synths and samplers. If you own a K2000, K2500 or K2600, however, this is a good library to have. I've gotten lots of mileage out of it over the years; it has provided me with a unique collection of stereo drum sounds that many of my competitors haven't had.

HIT PARADE

All of the libraries in this roundup are very good. However, as I mentioned earlier, you may need to mix and match samples from different collections to build the ultimate kit for a particular project (see the sidebar "Test Pattern").

I usually start with *Real Giga Drums* and *MIXtended Drums* because the flexibility offered by their multimic perspectives is hard to beat. I sometimes get mixed results, though, when combining some of the drum sounds from the two libraries. The most noticeable differences occur when using the room layers.

It's a mistake to think that a single hit of a real drum always sounds the same.

On the other hand, the dry and overhead perspectives blend quite well between the two libraries, and I ordinarily build a room perspective with external processing. I can usually use either of the libraries' premixed kits for basic sequencing, and then go back later and swap individual drums between the two libraries before the final recording. That approach has worked very well.

If I can't find the right toms or snare, I most often turn to *Pure Drums*, *Platinum 24 Acoustic Drums*, or *Drum Series 1*. They offer so many great hits that I'm usually satisfied. For cymbals, I turn first to *Real Giga Drums* or *Total Stereo Session Drums* and then augment the drum set from there if necessary.

FIG. 8: Sweetwater Sound's *Total Stereo Session Drums* library covers lots of sonic ground in a Kurzweil CD-ROM.

When I want a pure, unprocessed sound or want to work on customizing the sound of a drum kit, I reach for the *Ross Garfield* libraries. The raw samples can take a lot of processing and still hold up, much like a well-recorded live kit. If I want a very detailed drum performance, and I don't mind working to customize the sound with processing, the multisamples found in *Purrrfect Drums* are hard to beat. This library probably affords the best opportunity for emulating a live kit. When I want great results in a hurry, I jump into Roland's SRX-01 expansion card and *Drum Series 1*.

As you can see, plenty of excellent drum samples are currently on the market, and new technologies continue to offer more opportunities for creating better drum tracks with 24-bit samples, streaming technology, and multimic perspectives. These recent developments have greatly improved the sounds and performances of sampled drums, and you can expect to see drum libraries emerge in the near future that are even more detailed.

Producer/musician **Rob Shrock** *has worked with Burt Bacharach, Elvis Costello, Faith Hill, and a host of others. He is currently on the Board of Governors for NARAS.*

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MIDI Me

The keys to recording and controlling your synthesizer performance.

By Jim Aikin

If you're coming in to the world of desktop music production as a person who doesn't play keyboards—if you're a guitarist/songwriter, for instance—you may find MIDI somewhat mystifying and intimidating. Even after you start to master skills such as miking, mixing, and adding effects, the more sophisticated MIDI features of your multitrack sequencer/recorder might do nothing but gather dust.

That would be a shame, because even a basic MIDI synthesizer (either a hardware instrument or a software plug-in) can add a lot to your music. By using a MIDI drum module rather than sampled loops, for instance, you can create your own beats. Though MIDI has been around for 20 years, it's far from obsolete. To make the most of it, though, you need to grasp a few basic concepts. In this article I'll focus mainly on the side of MIDI that's used for controlling a synth from a sequencer. I'll save other MIDI features, such as synchronization, for another time.

DMITRY PANICH

WHAT IT IS

MIDI (Musical Instrument Digital Interface) began as a way of letting musicians play one keyboard while hearing their performance come from other keyboards or rackmounted tone modules that could be placed at a distance, say, on the other side of the room. If you think of MIDI as remote control for keyboards, you're on the right track.

When you hook up a synthesizer or other keyboard to a computer using MIDI, you can record, edit, or play back your keyboard performances in a software sequencer. Compared to digital audio, which requires a fast

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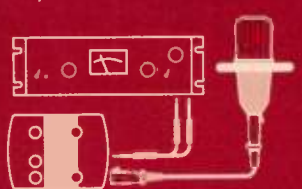

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FIG. 1: To get MIDI in and out of your computer, you need a MIDI interface, such as this USB Midisport 2×2 from M-Audio. The Midisport has two outputs, which allow you to use up to 32 MIDI channels (16 on each output).

computer and hard drive, MIDI is extremely efficient. Even an old, slow computer, which may break a sweat when asked to play a few audio tracks, can breeze through a complex song containing dozens of MIDI tracks without trouble.

But while the MIDI and audio tracks may lie side by side in your sequencer, and while you'll hear them all when you hit the Play button on the sequencer's transport bar, MIDI and audio are completely different. MIDI is not sound: it's a performance-control language. When you press a key on your MIDI keyboard, the keyboard sends out a MIDI message called a *Note On*. When you let the key up, the keyboard sends out another message called a—you guessed it—*Note Off*. Those two messages will be exactly the same whether the synth is making a sound like a flute, a Hammond organ, a kick drum, or anything else.

In order to hear MIDI tracks, then, you need to send the data they contain to a synth or some other type of tone module that makes the actual sound. If you want to make a mix of a song that includes both MIDI and audio tracks, you have to record the output of the synth into the sequencer as a new audio track. Once you've done that, you can mute the MIDI tracks and unplug the synth.

GET SET

MIDI messages are generally carried on 5-pin cables. Some newer MIDI keyboards, however, can send and receive MIDI when hooked directly to a computer through USB. Assuming that you're using standard MIDI cables, you'll need to connect the keyboard's MIDI Out jack to the computer's MIDI In jack and vice versa. Because computers don't have built-in MIDI jacks, the connections are made by way of a MIDI interface such as the one shown in **Fig. 1**. If your computer has a consumer sound card, you may be able to buy an inexpensive adapter that plugs in to the sound card's joystick port and provides MIDI jacks.

Because MIDI cables don't carry audio signals, you still need to plug your keyboard in to a sound system to hear it (unless, of course, it has its own built-in speakers). If you play the keyboard and hear sound coming from your computer's audio output, the keyboard is most likely controlling a MIDI synth inside the computer—either the one that is on your sound card or one that's running entirely in software.

If you're planning to use only computer-based software synthesizers, any MIDI keyboard will do the job. You don't even need to plug in its audio output (if it has one). It's also possible to record MIDI data directly into your computer sequencer using the mouse or QWERTY keyboard, but a hardware MIDI keyboard is much faster and more fun to use.

CHANNELING

MIDI defines 16 channels for performance data such as Note Ons, Note Offs, and the other types of data discussed below. For a MIDI track in your sequencer to be played by a synthesizer, both have to be set to the same channel. If you don't hear any sound when you send MIDI messages to a synth, the first thing to check is whether the synth is receiving on the wrong channel.

Messages on all 16 channels can travel down a single MIDI cable at the same time (actually, one right after the other in extremely rapid succession), so you can easily hook up several synths to the computer and have each synth play an independent part. One might play the bass line, for instance, while another plays a piano accompaniment. When a single synth is switched to *multitimbral mode*, it can play multiple parts on several MIDI channels at once.

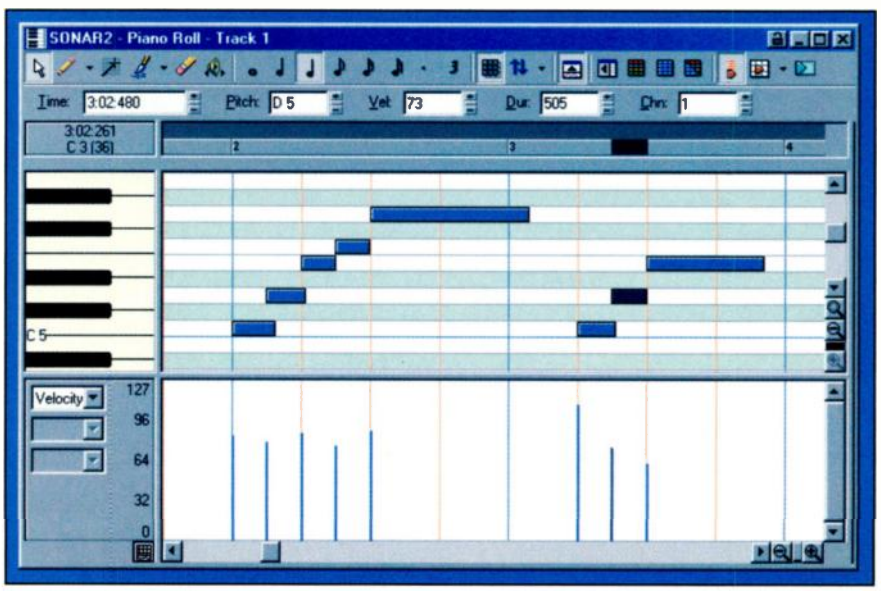

FIG. 2: This figure shows some MIDI notes recorded into Cakewalk Sonar. The area near the bottom of the window displays the Velocity values for all of the notes. The pencil tool (upper left) can be used to edit the values graphically.

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For the third time, Logic Platinum has been honored with one of the most prestigious awards in the music business – the 2003 Musikmesse International Press Award for best recording software. The prize, conferred by 55 editors from leading international music magazines, demonstrates once more the uncompromising standards of Logic Platinum. We are honoured by this, but more importantly, the prize is for all users worldwide who put their trust in working with Logic every day. It gives them the assurance that they have invested in the right recording software – namely, the best. We also hope that this award will make the decision that much easier for those who have not yet decided on Logic. For Emagic, this award is a clear indication that we are on the right track, and it gives us further incentive to work even harder to improve Logic Platinum, and retain the title of best recording software.

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NOTES AND VELOCITY

We've already met MIDI's Note On and Note Off messages. They're used for starting and stopping notes. Each Note On and Note Off message includes a *note number*. MIDI defines 128 note numbers, a wider range than a grand piano keyboard. Middle C is note number 60.

Once a note has been started by a Note On message, it has to be stopped by a Note Off message that has the same note number. If the note numbers don't match, the receiving synthesizer will ignore the Note Off message, and the note will never stop sounding.

In addition to a note number, each Note On message contains a *Velocity* value. If you strike the key harder, it generates a higher Velocity value; if you strike the key more gently, the Velocity is lower. A Note On message can have a Velocity value anywhere between 1 and 127. (A Note On that has a Velocity of 0 is interpreted as a Note Off, for technical reasons that we needn't go into here.)

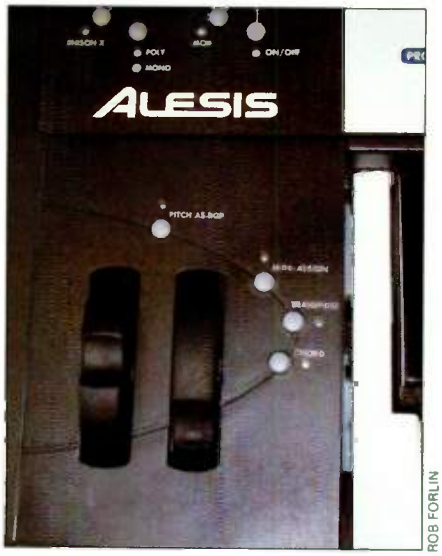
Most often, the Velocity data is used by the receiving synth to decide how loud the note should be. If your MIDI track is too loud, one quick way to make it softer is by reducing the Velocity values of the notes. Most sequencers provide graphic editing for Velocities, as shown in **Fig. 2**. By boosting the Velocities of single notes, you can add accents.

TAKE CONTROL

There's more to music than just starting and stopping notes. In order to shape the sound while a note plays, MIDI provides various types of *controller* data.

Many synths have knobs, wheels, sliders, joysticks, or ribbon controllers like those shown in **Fig. 3** on their front panels. These hardware controllers can usually be assigned to one or more of the synth's sound parameters (such as filter cutoff frequency or vibrato amount). If you're playing the keyboard live, you can use the knobs, wheels, and sliders to shape the tone and never worry about MIDI. They will also transmit MIDI controller data, however, and the data can be recorded into your sequencer. When the controller data plays back, you hear the knob or wheel movement just as you played it, even though the knob or wheel won't physically move.

There are three basic types of controller data. *Pitch Bend* data, as the name implies, is usually used to change the pitch of a note. Your synth may have a dedicated pitch wheel or joystick for just this purpose. *Aftertouch* is usually generated by pressing down on a key while it's playing a note. Aftertouch can be used for many different musical effects, such as adding vibrato or giving the note an expressive volume swell. Finally, MIDI defines a set of more than 100 *Control Change* messages. Like Aftertouch, Control Changes can be used to change the sound in various ways. In owners' manuals and articles such as this one, you'll often see Control Changes referred to with the abbreviation "CC."



ROB FORLIN

FIG. 3: In addition to controlling the synth's internal sounds, hardware controllers, such as those found on this Alesis Andromeda A6 keyboard, can send out MIDI Pitch Bend and Control Change messages to other instruments.

Each Control Change message has a channel number, a controller number, and a value between 0 and 127. A few of the controller numbers have defined meanings. For example, CC 7 is the Master Volume controller. So if your sequencer sends out a CC 7 message that has a value of 0 on channel 3, any synthesizer that is receiving on channel 3 should respond by turning its output volume down to zero. Other CCs have no defined meanings, so you can use them to shape the sound in whatever way your synth allows.

The Pitch Bend message is unique in that it's *bidirectional*. Zero is in the middle of its range rather than at the bottom, so you can bend the pitch up or down. The maximum range of a pitch bend—that is, how far up or down the pitch goes when you throw the pitch wheel or lever to the outer end of its travel—is set in the receiving device. It's not part of the MIDI Pitch Bend message itself.

HOW TO AVOID TIMING DELAYS

When you play a note on a MIDI keyboard or any other instrument, you want to hear the sound now, not a week from Tuesday. MIDI is fast enough (barely) that it won't cause any audible timing delays by itself. But delays in a MIDI system can become a problem.

If you're playing computer-based instruments from a MIDI keyboard, you'll need an audio interface and music software that uses a low-latency standard, such as ASIO or WDM.

If a hardware synthesizer responds sluggishly to MIDI data that is already recorded into the sequencer, you need to thin out the data or to reprogram the synth so that it doesn't have to work so hard. You may have recorded a lot of Aftertouch data into your MIDI tracks without meaning to. Try erasing it all. If the synth is playing big chords that have four-oscillator tones, try reducing the oscillator count to two or three per note.

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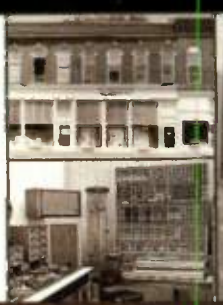
"I feel very nostalgic when I see this revival of the Moog modular synthesizer which I have used regularly for years. The interface using patch cables is gorgeous and the sound is just what it should be. For the new generation, I would like to say, please take the time to challenge the sound design which was for me quite painful sometimes. And discover the unparallelled possibilities of this awesome piece of Software." **Isao Tomita**



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PROGRAM CHANGES

Your synth probably has a memory bank containing numerous sound programs (also known as patches, presets, or voices). Instead of selecting a new program manually with the front-panel buttons, you can send the synth a *Program Change* message, which will accomplish the same thing.

MIDI allows for 128 different Program Change messages on each channel. Unfortunately, the numbering system used (0–127 or 1–128) won't necessarily correspond to the numbers used on the synth. For instance, some hardware manufacturers number their programs A1 through A16, B1 through B16, and so on. It's up to you to figure out which MIDI Program Change number corresponds to which synth program. If your synth has a General MIDI sound set, however, you may be able to select the programs by name from your sequencer, which is convenient.

If you think of MIDI as remote control for keyboards, you're on the right track.

These days, a synth may have several hundred programs organized into various banks. To access them using MIDI, you need to send the synth a *Bank Select* message to choose the correct bank, followed by a Program Change message to select a program within the bank.

TRIED AND TRUE

Don't look down on MIDI just because it isn't the latest and greatest. With a good synthesizer or two and a knowledge of MIDI, you can craft incredibly expressive tracks and weave sonic tapestries that will leave your sample-loop-using friends slack jawed with envy.

Jim Aikin *has been writing about music technology for over 25 years. His new book, Software Synthesizers, came out in April 2003.*

Photo courtesy of Ed Dzubak, three-time Emmy winner and enthusiastic REALTRAPS customer.
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World Radio History

Reel Money

Stake your claim in the film and TV music gold rush.

By Skip Adams

You've heard the rumors. Like never before, unknown bands and singer-songwriters are getting their music into films and on TV shows. From the Travel Channel to network prime time, from small indie flicks to major studio releases, personal-studio denizens are making their marks and cashing in.

Well, the rumors are true, and the change is due largely to a timely convergence of three major factors. Most important is the explosion of cable TV, which has created a huge demand for content to fill the programming hours. That in turn has created a huge boom in all types of content production, from shot-on-DV reality shows to traditional film-based productions—all of which need music. On your side of the fence, the low cost of high-quality recording equipment has created an unprecedented supply of master-quality recordings looking for a home. Finally, there is the limited music budget that most of these productions now have. Producers of every show would love to have songs by big-name stars but simply can't afford them. So they turn instead to music supervisors, publishers, licensing agents, music libraries, and direct submissions from independent producers like you to provide the music they need at a price they can afford. I've put together a road map that leads you through the film and television wilderness. This real-world guide is designed to take you from dream to screen in the most effective and painless ways possible.

MIKE CRUZ

THE ROADS TO HOLLYWOOD

Some of the major players that can help you get your music onscreen include music supervisors, publishers, and library

World Radio History

"Two Publishers Fought Over My Music Because I Joined TAXI"

Bill Gordon – TAXI Member

You would think that after thirty-five years of writing, and recording my own music, I would have had some major commercial success. Sadly, that wasn't the case.

Then I joined TAXI.

As a result of my membership, I signed a deal with a boutique publisher that got me my first placements in TV and film.

Soon after that, a large-scale, international publisher contacted me about publishing some of my tunes.

The next thing you know, the two publishers were "fighting" over my music!

While nobody threw any actual punches, it was incredible having two great companies slugging it out over my songs. A musician's dream-come-true.

The end result? I'll tell you in a minute.

First, I want to tell you the ironic part – I almost didn't join TAXI. I thought it sounded too good to be true. Man, was I wrong!

TAXI's comprehensive feedback shows me where I'm strong, and where I'm not – a constant reality check. And getting tons of opportunities to pitch my music has helped me stay focused and very productive.

It's obvious to me that the people at TAXI *really* want me to succeed. And they do so much to make sure that I do. It feels like I've got a team of experts who are on "my side."

I can unequivocally say that the people at TAXI are the most informed, honest, honorable, helpful and loyal folks I have ever known in the music business. They never make a promise they can't deliver on, and they do it all at a reasonable price.

Then there's TAXI's private convention which is FREE to members and their guests. The Road Rally isn't just the icing – it's a whole other "cake." It gives me a deeper understanding of the music business, a bunch of great new contacts, and a jolt of inspiration.

TAXI also connected me with a Grammy™ winning producer who has worked with such legends as Jackson Browne, Michael McDonald, Luther Vandross, Maynard Ferguson, Freddy Hubbard, and Sarah Vaughn.

Two years later, he produced my album. The very same album that started the publisher slug-fest I told you about earlier. And how did it turn out?

I'm happy to tell you that *both* publishers signed some of my songs!

Thirty-five years as a working musician, a degree from Berklee, and all it took was a membership to TAXI to make me an "overnight success."

Make the call, and take advantage of all the opportunities TAXI has waiting for you.

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companies. (For a complete overview of what those jobs entail and what their places in the film and television industries are, see "Working Musician: You Ought to Be in Pictures" in the January 2002 issue of EM.) Those professionals should be prime candidates for your mailing list. However, because music reaches the screen over many different roads, I'd expand that list to also include music editors, picture editors, show producers, and music-licensing agents. You should promote your music to all of them. Don't get caught up in the notion that one way is the best way. You will only limit your opportunities.

For example, every show would love to have the ears and talent of a great music supervisor, but the truth is that most productions can't afford to hire one. So if you limit your efforts to contacting only music supervisors, you'll miss many potential opportunities provided by those shows that don't have one on staff. Picture editors, for instance, are constantly cutting in placeholder or *temp* music that often becomes permanent when the producer or director winds up falling in love with it. Perhaps that music could be from your CD. In other cases, shows turn to the music editor to help find tunes. And everyone has heard the story about the associate producer who has a friend who has a cousin who is in a band. Many roads lead to Hollywood. Why not take them all?

YOUR BEST BETS

Trust and confidence mean everything in this business. Nobody wants a copyright problem gumming up the works, or perhaps even ruining the show, so most professionals turn to the following trusted sources when they look for music. You should investigate these avenues for your music.

Music libraries. The bigger libraries are staples in the industry because their business is clean and their prices are predictable and affordable. If you are an instrumental composer, writing music for these libraries should be your prime focus. You probably won't participate in sync fees, but you will typically get up-front money and keep your writer's share of performance income.

Boutique publishers. Specializing in film and TV placement, these smaller publishers are an increasingly popular resource for shows seeking all kinds of music. They know the ropes, the players, and, like the music libraries, offer

WORDS FROM THE PROS

Below are edited excerpts from interviews I conducted with some of the top music people in film and TV. This is invaluable information that is straight from the source.

What sources do you look to for obtaining independent music?

Jonathan Firstenberg (music supervisor credits include *General Hospital, Guiding Light,* and *Santa Barbara*): Well, among others, I use some of the boutique libraries, independent publishers, and the standard music libraries that come with a studio like ABC. I tend to use whichever source has the right music for the scene.

Jeff Charboneau (music editor for *The X-Files, 24,* and others): We have a whole circle of libraries and publishers that control 100 percent of the rights to the music they carry. So, it's like one-stop shopping. [You'll find] really good material in those catalogs that are just as worthy of being in a show as stuff that's on the radio every day. It's a great opportunity for new artists to be heard.

David Sibley (music supervisor for *American Family, The Little Richard Story,* and many others): An excellent source for me is the Music Report [a music-listing service for industry professionals only]. I've used it on all of my projects in the last few years. Another great source is networking with live-venue music bookers as well as other music supervisors. I definitely use libraries, too. When a project has severe budgetary limitations and I have very little time to negotiate deals, I use music libraries exclusively.

Amy Rosen (music supervisor for *Lovely & Amazing, Thirteen,* and many others): I get a lot of amazing submissions for independent artists from licensing agents. Also publishers and record companies, certainly, but for those independent musicians without a record or publishing deal, third-party agents are a very good idea. I use music libraries too . . . [and] also will go to reputable music-listing services like TAXI or The Music Report.

Do you accept music from unknown bands and singer-songwriters?

Matt Kierscht (music-supervisor credits include *The Drew Carey Show, Meet My Folks,* and MTV's *Tough Enough*): Absolutely. I'm always looking for independent music because a lot of the shows I do have smaller music budgets, so I'm always looking for the best-quality, low-cost music that I can find.

Madonna Wade-Reed of Daisy Music (music supervisor for *Boston Public, Alias,* and *Smallville*): All the time. Good music is good music. We don't care where it comes from. It doesn't need to have sold a million records to be considered good.

Amy Rosen: I love dealing with artists directly, but the truth of the matter is that sometimes, due to schedule and time limitations, it's much easier for me to go with people I know. I don't want to be discouraging, but it is easier when you're dealing with somebody who knows the game. It's the truth.

If you'd like to hear more from these professionals, I've put up a special page on my company site with expanded versions of these interviews at www.globalgraffiti.com/quotes.htm.

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Where do you want to take your music?

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4-in/10-out operation includes **two mic/instrument preamps**, eight discrete analog outs, digital I/O and MIDI I/O. The on-board **ASIO 3-compliant mixer** and software control panel provide **total flexibility** in routing inputs and outputs—perfect for applications like monitoring with external effects. FireWire 410's eight direct outs and AC3/DTS-encoded digital outs also make it perfect for **surround sound mixing**. You also get ultra-low latency software monitoring and zero latency hardware direct monitoring—and two headphone outs with independent level controls let you collaborate with a partner anywhere, anytime. FireWire 410 can even be completely **bus-powered** for total mobile operation (*Mac or 6-pin 1394 only). **Where do you want to take your music?**

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one-stop music clearance. Typically you won't get up-front money, but you will participate in fees, which can be substantial, and you'll keep your writer's share of performance income.

Licensing agents. These are well-known, highly specialized professionals employed by rights holders on a commission basis to place their music in various media. Because their participation is usually limited to commissions on the income they generate, they often represent a clientele that can command higher fees. If you can get one interested in your music, many doors can open for you.

Independent A&R. TAXI, Tonos, and Kings of A&R, among others, are Internet-based companies that, in one way or another, will represent you to the industry (see the sidebar "Do Your Homework"). TAXI is the all-around powerhouse. Staffed by industry heavyweights with impressive pedigrees, they listen to your music, advise you as to how to get it into shape, and then send it out to all types of industry pros—including those in film and TV—all for a reasonable fee. In addition to anything else you might do to further your career, I feel TAXI is a must.

DO IT YOURSELF

If you wind up being represented by a publisher, music library, or licensing agent, then good for you. Besides the numerous doors they can open for you, you'll get to spend your time creating music rather than trying to sell it. On the other hand, if you want to go the do-it-yourself route, you must have a few crucial details in order. Is your business house in order? Is your CD master quality? Is your presentation up to snuff? Do you know who to call and what to say? Don't put a single CD into a mailer until you know the answers.

Business stuff. Anyone interested in using your music in a show will need to secure two basic kinds of rights: *master use* and *synchronization*. Do you control both? Be sure now, because if you're even a little bit wrong, there can be some very unpleasant legal and financial repercussions for anyone in the chain responsible for infringing those rights. If they get even a whiff of a murky business situation on your end, the door will very subtly close in your face and may never reopen again. So, be prepared to demonstrate that you control all the rights to the master as well as all the rights to the underlying song. If you're the sole writer, paid for the recording yourself, and haven't assigned rights to anyone else, then you're probably in the clear. *If any other situation exists*, you need to secure an agreement with the interested parties (cowriters, contributing bandmates, outside investors, and others) in writing before you can proceed. This agreement doesn't have to be lengthy or complicated; it just has to cover what's needed. I strongly recommend that you get an attorney to craft it for you.

One more thing. You should become a member of a performing-rights organization (see "Working Musician: Play Rights" in the April 2003 issue). Networks pay a fee to use the music of ASCAP, BMI, and SESAC, and whenever a song airs on TV a performance royalty is generated for the member associated with that song. If you're not a member, you won't get paid!

Master or disaster? Master recordings on CD are the coin of the realm. What's a master? That determination is very subjective, but let's just say that your recording should sound as good as anything else you hear in films or TV shows. Get second, third, and fourth opinions on yours. Again, TAXI is a good source for that kind of evaluation. In any case, *do not send a demo.* The only exception to this rule is when a music supervisor is looking for a song but wants to record the master him- or herself. Don't send MP3s or cassettes unless you're specifically asked to do so.

Presentation. A good presentation will make the right first impression; it will show that you have your act together in your art and business. The most important thing is to include all the relevant information, such as song titles, who wrote what, who publishes what, which rights you control, how to contact you, et cetera. Madonna Wade-Reid of Daisy Music, music supervisor for the television shows *Alias, Smallville,* and *Boston Public,* has allowed us to publish her seven rules for submitting music (see sidebar, at left). Read it and heed it!

Everything else is just icing on the cake. Bios, Web sites, concert dates, and press releases can be helpful if they make you seem like more of a happening thing, but don't overhype. Cool graphics and a professional-looking CD package can help get your CD listened

SEVEN RULES FOR SUBMITTING MUSIC

Madonna Wade-Reed of Daisy Music is a music supervisor for some of the biggest music shows on TV including Alias, Smallville, and Boston Public. She has graciously consented to letting us reprint her rules for submitting music here. Follow these guidelines and everyone in the business will know you've been paying attention in class.

Madonna Says...

1. Send a proper CD case (no clam shells or slim cases).
2. The spine of the case must be labeled (if you want us to find your CD among all the others on the shelf).
3. Provide the track list on the case cover (not on the CD sticky label).
4. Provide contact information on both CD label and cover (phone number and name of contact are most important).
5. Provide the writer and publisher information (everyone who wrote each song, publisher[s] involved, and what percentage each controls).
6. Master information must be provided (who owns and controls the master, and what percentage).
7. Please, let us call you once we've had a chance to listen.

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to, but none of that will make a difference if the music isn't good or right for the project.

MAKING CONTACT

Find out what kind of music is needed before you send a CD. Nobody in this business knows what to do with unsolicited material. There simply aren't enough hours in the day, and a strange CD coming through the door is just a question mark that will most likely end up in the trash, so don't waste your time and money. The way to avoid that fate is to do some preparation first. Learn something about the person or the company that you want to contact. If you know about a show they are currently working on, take the time to watch it and see if your music fits. Your efforts will be appreciated and your chances for success will increase. In every case, make an inquiry *before* you send anything. A simple conversation,

DO YOUR HOMEWORK

SOURCE BOOKS

The Film & Television Music Guide, published annually by The Music Business Registry; tel. (818) 769-2722; e-mail info@musicregistry.com; Web www.musicregistry.com.

The Musician's Atlas, published annually by the Music Resource Group; tel. (973) 509-9898; e-mail info@musiciansatlas.com; Web www.musiciansatlas.com.

Recording Industry Sourcebook, published annually by artistpro.com; tel. (707) 554-1935; Web www.artistpro.com.

EDUCATIONAL BOOKS

The Indie Guidebook to Music Supervision for Films by Sharal Churchill (Filmic Press, 2000).

Music Publishing: A Songwriter's Guide by Randy Poe (Writers Digest Books, 1997).

Music Publishing: The Real Road to Music Business Success by Tim Whitsett (artistpro.com, 2001).

WEB SITES

The Film Music Network (www.filmmusic.net)
The focus here is on composers, but many songwriters benefit too, including (for a nominal monthly fee) the Jobwire, which lists film and TV shows looking for songs and composers.

Kings of A&R (www.kingsofar.com)
A Web-based showcase for indie bands. Getting featured here is based on whether they think you're good enough. Give it a shot!

The Music Report (www.breakdownservices.com/musicrpt.html)
This is a professional service that a lot of music supervisors and publishers use. You probably won't be able to subscribe to it yourself, but check out the old listings that The Music Report posts as samples of its service. You can gain valuable insight into how this aspect of the industry works.

Starpolish (www.starpolish.com)
This is a great overall career site, but it also has a handy Resources section containing dozens of listings for music supervisors.

Taxi (www.taxi.com)
More than just Web based, Taxi is a full-service company dedicated to helping all types of musicians better themselves in any number of ways. Pitching your music to the film and TV industry is one of its strong points. Become a member.

Tonos (www.tonos.com)
For a monthly fee, Tonos allows you to upload songs to listings for all kinds of top flight projects, including film and TV, in need of songs.

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over the phone or by e-mail, will educate you as to what's needed, establish the beginnings of a relationship, and make you more memorable, which is a big plus when the mail carrier delivers your CD.

Getting contact information is the easy part. Many resources in print and on the Web will give you what you need to get started (see the sidebar "Do Your Homework"). Actually contacting a live person is the part that can give you butterflies, but if you've done your homework and have a short introduction rehearsed, you'll get through it with flying colors.

First, do your research and compile a contact list. After that, it is just a matter of picking up the phone and dialing. When you reach the person you want to talk to, state your business succinctly. You should say something like "Hi Mary, I'm Bill O'Lading with The Glow Worms out of Spokane. We've been watching *Punktown* [the show you know she supervises], and our CD has several songs on it that we think would fit. Would you mind if we sent it to you?" Now just clam up and listen. From this point on it's just an ordinary conversation that you can learn much from. Answer her questions. Don't be disappointed if she turns you down. She'll tell you the reason, and you must accept it. If she agrees to listen to your CD, thank her, confirm her address information, thank her for her time, and then send the CD ASAP. Wait for a call. If she likes your music and thinks it's a fit, you'll hear from her. If she can't use your music, you'll know it by the quietness of your telephone. Resist the temptation to call back. I know that goes against human nature and most normal business practices, but you have to believe she received your CD, and you should keep in mind that no one wants to have the "I didn't really like it" or "It didn't fit" conversation. You might call back in the future *only* if you have something new to send; otherwise, just move on and keep calling the people on your list.

If you learn nothing else from this article, get this: you can do this. The people you want to send promotional materials to are, by and large, good people who want to hear your music. They'd love nothing more than to find a great new artist like you and give you the chance to be heard in their film or on their TV show. If you follow the guidelines found here, you'll make the whole process easier on everyone. And if you're persistent and have something to offer, you *will* be heard.

Skip Adams *is a music publisher in Venice Beach, California.* *He would like to thank Jeff Charboneau, Jonathan Firstenberg, Barklie Griggs, Matt Kierscht, Amy Rosen, David Sibley, and Madonna Wade-Reed for their help with this article.*

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FIRST IMPRESSIONS

The Tyros passed my "make great (if slightly cheesy) music without cracking the manual" test with flying colors. In no time at all I was romping through "Sweet Georgia Brown," soloing on piano over a full backup band, and inserting breaks and fills with abandon. The Intro, Main Variation, Break, and Ending buttons are laid out in a convenient row along the lower left corner of the panel, making them easy to reach with your left hand.

There are *plenty* of buttons, though, so mastering the intricacies of the panel and operating system takes time. Most of the operations are well explained in the owner's manual, but as I got deeper into the Tyros, I found the manual less than clear about song recording and creating my own Styles.

What I initially thought was going to be a significant ergonomic complaint dissolved into thin air. The LCD Contrast knob didn't allow me to view the LCD at a normal playing angle—but then I discovered the whole LCD panel tilts up. Yes! Maybe someday all keyboards will have full-color, hi-res tilt-up displays like this.

Connecting the Tyros was a tad tricky because the rear-panel jacks are not labeled along the back edge of the top panel. On the plus side, the rear panel includes a stereo aux send and return, allowing you to patch in an external effects device (see Fig. 2). You can route individual parts to the sub outs if needed, so you can do tricks such as sending your lead lines to a guitar amp and your bass track to a big cabinet. The aux sends are not available as additional sub outs, however.

If you're planning to use the Tyros at home, you might be concerned that it has no built-in speakers. Not to worry—if you choose Yamaha's optional TRS-MS01 speakers ($199, including the subwoofer), you can mount them in the optimal listening position directly on the Tyros. The instrument's rear panel has separate outputs for left, right, and subwoofer. But because the speaker connections are designed specifically for the TRS-MS01s, you'll need to use the main outputs for any other speakers.

Included with the Tyros is a modern-looking clear-plastic music rack, which can be mounted off the rear edge using a couple of plastic brackets (also included). I appreciated that the tilt-up LCD doesn't obscure your view of the sheet music. The music rack itself lifts off, but the brackets are attached with two screws each. Unless I had Yamaha's optional soft bag ($200) or hard case ($500)—which also have room for the two optional speakers—I'd be a little leery of transporting the instrument without removing the brackets, as they protrude 3 inches from the chassis. The Tyros is surprisingly light, however, and very transportable.

The Tyros takes the concept of in-store demos to a whole new level. Along with the lush multitrack demo sequences, you get a slide show and paragraphs of text explaining various features, all accompanied by stylish music. If I were a retailer, I'd be salivating: this keyboard does everything but verify the customer's credit card. Also, with such a feature-rich instrument, going through the demos after you buy it is a good way to make sure you aren't missing anything.

A Help menu is also included. The Help text explains what each feature is used for, but it doesn't tell you which buttons to push to get to the appropriate page or which buttons to push once you're on that page. There's room for improvement here.

FIG. 3: Double-clicking on a Voice name in the editor software opens this window, in which you can switch elements on or off, choose effects, and so on.

MILES OF STYLES

The first thing you need to know about the Tyros's accompaniment Styles is that many of them are programmed for use in Europe. The needs of European solo lounge performers include certain traditional genres (the jolly 3/4 accordion of "French Musette," for instance) for which there isn't much call in the U.S.

But don't judge the Tyros based on a few unhip Styles. It also provides some very respectable jazz, Latin, and American pop. In particular, the Bebop Style *smokes*. Its walking bass and piano comps are on the money, the drumming is tasty, and when you choose the D variation, you actually get to trade fours with the drummer. Four different drum breaks are included in this 32-bar variation, all of them crisp and stylish. Laying down a happening trumpet solo over Bebop or the slow groove of ModernJazzBld is almost impossible to avoid. The drum breaks in those Styles provide exactly the right push when you're entering a new section, and the variations make sense. I did find myself wishing that some of the breaks were two bars long rather than one, though, especially in the faster Styles.

The Styles are arranged in categories on the front panel: Pop & Rock, Swing & Jazz, Latin, World, Ballad, R&B, Ballroom Party, Dance, Country, and Movie

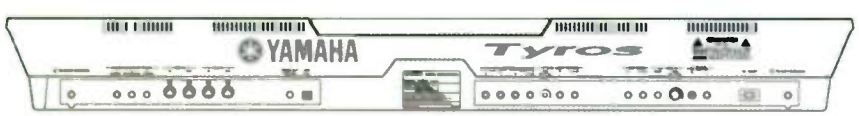

FIG. 2: The Tyros's rear panel provides connections for analog audio, external speakers, control pedals, video, MIDI, and USB.

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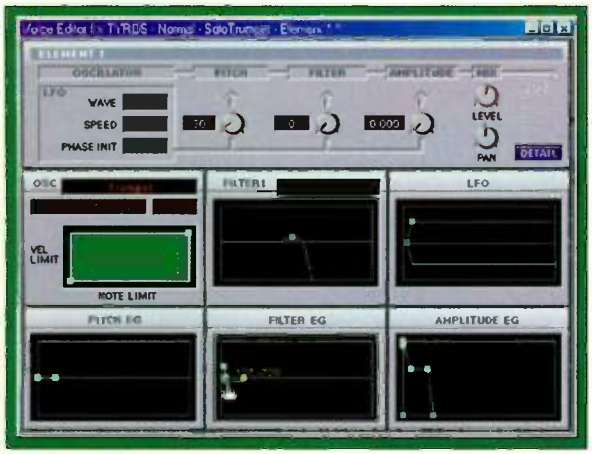

FIG. 4: In this screen, you can graphically edit the parameters of an individual Voice element.

& Show. The Latin Styles, many of which were programmed in the U.S., are dynamite. The R&B page doesn't include anything I'd call either classic Motown or contemporary R&B, but the Rock&RollShfl Style is rollicking enough to win them over in a Texas roadhouse. GospelSwing pumps along nicely in a triplet groove with both piano and rich Hammond organ comps reinforced by a guitar chop on the backbeat. In the Pop & Rock category, Unplugged1 provides a very realistic steel-string guitar strum with a subdued tambourine backbeat. Songwriters are bound to find this one useful for sketching out verse-and-chorus structures.

The Programmable Music Finder (a big blue button) will be useful for people who know what tune they'd like to play but haven't a clue about what Style would be appropriate. The button pops up a database of more than 1,400 items, each with a pseudo song title, Style, and tempo. Some of the sidestepping used to avoid possible copyright issues is amusing: "By the Time the Phoenix Arrives" will work well for "By the Time I Get to Phoenix," and "I Watch My Tears Go By" is a good setup for "As Tears Go By." What's amusing about this subterfuge is that it's unnecessary—song titles can't be copyrighted, at least not in the U.S. That being the case, it's an open question whether it will be more trouble than it's worth for novice musicians to guess how the song they're trying to find will show up in the list. Some of the pseudo titles *are* amusing, though; I especially liked "Great Fire Balls."

I appreciated the Tyros's ability to find the root of four-note left-hand chord voicings. I'd much rather play the whole chord myself than try to remember an arcane two-finger method. The instrument stumbled on a couple of chord voicings, though: near the end of an eight-bar phrase, I played a tonic chord in second inversion (for you Baroque music fiends, that would be an I6/4) as a lead-up to the dominant. The Tyros assigned the bass track to the root of the tonic chord, not the fifth. More problematic, the voicing G-C-F is interpreted as an Eb maj9 (add6), rather than as a G7 sus4, which is what I thought I was playing. Add the D to the voicing and the Tyros gets it right. Hmm—no matter how smart they make these gadgets, you still have to learn the system.

Programming your own Styles is possible, but it's no stroll in the park. You create new Styles by editing the factory Styles. You can combine individual tracks from various Styles into a new composite, though this can easily lead to a mishmash. The manual turns cryptic when discussing Style creation, but I was able to discern some odd limitations. After copying the data from a factory preset Style into the editing area, for instance, you can't actually edit the notes in the pitched instrument tracks—you have to delete all the notes in a given track and start fresh. The preset drum tracks can be edited and overdubbed, however.

An event editor is provided for step entry and fine-tuning your Style tracks, but such niceties as drum-machine-style scoop-out erasure of single notes during real-time recording are not provided. If you're up on inserting meta-events into Standard MIDI Files (SMFs), you can create a Style in a computer-based sequencer and then import it into the Tyros. The manual doesn't explain how to transfer the sequencer data into the Tyros's Style memory, but a quick call to Yamaha will clear up the mystery.

SOUNDS ABOUND

The Tyros has an extensive collection of high-quality preset Voices in all the expected categories. The keyboard, orchestral, and pop music sounds have many usable variations. Although you won't find much in the way of visionary timbres, aggressive synth effects, or cutting-edge patches suitable for electronica, the Tyros is far more than a garden-variety GM/XG synth. It offers a good set of analog-type lead and bass synth tones, for instance, as well as plenty of lush, spacey pads.

In the keyboard department, the acoustic piano is very satisfying. The tone is solid without being overbearing. Notes decay realistically, and the Velocity response is smooth. As in many synths, the electric pianos tend to use Velocity cross-switching, a Voice programming technique that can easily result in an unpleasant, uncontrollable keyboard response. However, I was quite pleased by smooth and playable Voices such as SuitcaseEP (a Rhodes multisample) and VintageEP (a Wurlitzer). The Velocity-layered samples in StageEP aren't so well matched, though.

The Tyros also boasts an excellent drawbar organ emulation that uses

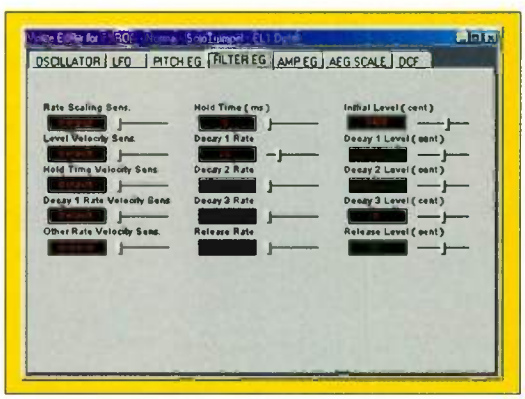

FIG. 5: Clicking on the Detail button in Fig. 4 opens this window, in which each parameter has its own slider.

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physical-modeling synthesis rather than sample playback. You can use the buttons below the LCD to manipulate the graphically displayed drawbars. The rotary-speaker simulator speeds up and slows down in a realistic way, and percussion (an attack transient) can be added at 2', 2⅔', and 4' with adjustable volume and length. Although there are only eight drawbar buttons, you can access all nine drawbars by using a button that toggles between two of them. When moved in and out, the drawbars change the tone in a realistic stepped fashion. You can assign separate drawbar presets to the left and right sides of the keyboard for two-manual work.

The front panel provides one-button access to the 16 different Voice categories, including Choir, Perc/Drum Kit, Saxophone, Synth, and Organ Flutes (that's what Yamaha calls its drawbar organ synthesis). Some categories include only 11 or 12 sounds, but others include as many as 60. The quality of the samples is uniformly high, and the percussion and acoustic guitars are standouts. For almost any kind of mainstream pop arranging, this keyboard comes close to having everything you could possibly need.

A few of the Voices, notably bass and acoustic guitar, use a new Yamaha technique called Mega Voice technology. Mega Voices are Velocity cross-switched, but not in the usual way. Those Voices are meant for sequencing, not live playing. In fact, you almost couldn't play them live, because the eight different samples played by a single key may include fret noise, harmonics, hammerons, and who knows what else. By editing your Mega Voice tracks in a sequencer to zero in on the correct Velocity values, you can produce quite realistic performances.

Tyros Specifications

Sound Engine	PCM playback, drawbar organ modeling
Keyboard	61-key; transmits Velocity, Key Pressure
Polyphony	128 notes
Multitimbral Parts	16 internal; 32 via MIDI
Analog Audio Inputs	(2) unbalanced ¼" TS aux/loop returns (with trim); (1) unbalanced ¼" TS mic/line (with trim)
Analog Audio Outputs	(2) unbalanced ¼" TS mains; (2) unbalanced ¼" TS subs; (2) unbalanced ¼" TS aux/loop sends; (1) stereo headphone; (2) ¼" speakers; (1) ¼" subwoofer; (1) 8-pin subwoofer
Digital Audio I/O	none
MIDI	(2) In, (2) Out
Additional Control I/O	(1) USB 1.1; (3) assignable ¼" control inputs with reversible polarity (defaults: sustain, DSP variation, and volume)
Video Output	NTSC/PAL composite RCA
Program Memory	400 ROM; 3.3 MB of RAM (shared by user-programmable Voices, Registrations, Styles, and Songs)
Drum Kits	36
Waveform ROM	96 MB
Effects	29 reverbs, 8 delays, 7 early reflection/karaoke, 18 chorus, 9 flanger, 7 phaser, 19 distortion, 16 distortion+ (with delay and compression), 3 pitch shift, 20 wah (including combinations with delay and distortion), 3 dynamic, 16 rotary speaker, 6 tremolo, 4 spatial, 6 EQ/enhancer, 12 miscellaneous
Sequencer	16 tracks, event edit, records accompaniment performances; compatible with lyrics and vocal harmony data encoded in SMFs; interactive loop playback
Accompaniment Features	300 factory Styles, each with 4 variations, fill, 3 intros, 3 endings (30 Pop & Rock, 42 Swing & Jazz, 33 Latin, 30 World, 26 Ballad, 35 R&B, 30 Ballroom Party, 40 Dance, 21 Country, 13 Movie & Show)
Performance Features	Registration Memory, One Touch Setting, Multi Pads, tap tempo, fade-in/out buttons, left-hand sustain button
Disk Drives	3.5" floppy; optional, user-installable internal hard drive
Display	7.8", 640 × 480-pixel color LCD
Included Accessories	detachable music rack, USB cable, CD-ROM
Dimensions	45.6" (W) × 5.5" (H) × 17.1" (D)
Weight	27 lb.

SEQUENCE OF EVENTS

You can use the Tyros's sequencer either for conventional 16-track MIDI recordings or to record the autoaccompaniment section's output into a sequence. Unlike Yamaha's older PSR keyboards, the Tyros allows you to mix and match the two methods. For instance, you could start your recording by playing a solo piano intro, tidy that up, and then punch in some Style tracks starting at bar 33.

The event list works well for step entry of notes and for microscopic edits of timing, Velocity, and so on. Given the beautiful LCD, I was hoping for a piano-roll edit window, but there isn't one. A few basic editing commands are provided, but the emphasis is on *basic*. Quantization, for example, can be applied to a whole track but not to a portion of a track. You won't find utilities for stripping out controllers, scaling track Velocities, transposing tracks, and that sort of thing. Block copying of data is not implemented. Most significant, in my view, is the lack of a utility for inserting empty measures into the middle of a song. You might need to do that, for instance, if you want to lengthen the intro. In sum, the Tyros's sequencer is significantly less powerful than the sequencers on Yamaha's pro-oriented products.

The sequencer does have some useful features, however. After you play a song

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with accompaniment and capture your performance into the sequencer, you can overdub extra harmony lines, drum fills, and so on. You can edit the chord progressions you played after the fact, as well as individual notes in the accompaniment tracks. And because loops triggered by the Multi Pads (which I'll discuss later) appear in sequencer tracks in note-by-note form—they're not sampled loops, in other words—you can delete or edit single notes in the loops as needed.

You can also load and play SMFs from floppy disk. The Tyros can automatically map General MIDI (GM) program changes to its own enhanced XG sounds (stereo drum kits, for example), so you may find that prerecorded MIDI files sound better than on other GM products.

The Tyros sequencer has a wonderful live performance tool I'd love to see implemented on every sequencer-equipped professional keyboard. You can insert four song markers (on the fly, if you need to) by double-clicking dedicated panel buttons. Once a marker is set, you can single-click the button, and at the next bar line the song playback will jump seamlessly to the marker. Press the Loop button and playback will loop between the current marker and the next one. Only 4/4 and 3/4 time are supported, but most musicians will never notice this limitation. As a visual aid, a marker button's LED will glow green when that marker has been created and red when the song is in the section following the marker. Whether you're accompanying karaoke or riffing behind the next Steve Vai while he takes an extended guitar solo, you'll find this feature invaluable.

BUNDLE OF GOODIES

You can accomplish a certain amount of basic Voice editing from the Tyros's front panel. If you need to go further in customizing your own sounds, the instrument ships with a CD-ROM containing a PC-only Voice editor (Windows 98/2000/ME/XP; see **Fig. 3**). Also on the CD are a file-management utility and additional software, which are also compatible with Mac OS 8.0 through 9.2.2. The editor is functional but rather crude. The graphic envelope editing is extremely awkward (see **Fig. 4**). The editor's small MIDI Setup button-window doesn't dock, but floats on top of every other window on the screen, even those from other programs. Also, note that Yamaha does not support the editor software.

Even so, it does work. Creating new Voices by layering as many as eight elements is fairly easy. Each element can have its own settings for the resonant filter (a number of types are available), LFO modulation, envelopes, Velocity and key range, and so on (see **Fig. 5**). The Voice as a whole has low and high EQ, as well as response controls for Velocity, mod wheel, Aftertouch, and so forth. You can assign any of 183 different effects algorithms and set the wet/dry mix and one parameter for the effect. Global reverb and chorus sends are also programmable per Voice. Key-by-key drum kit editing is provided.

The greatest weakness of the Tyros's Voice programming is in the Velocity cross-switching area. When choosing a waveform for a given element, you pick the waveform (along with all of its associated element parameters, which serve as useful starting points for creating your own sounds) from a dialog box that lists all of the elements of all of the factory Voices. In other words, you don't get to choose from a list of raw waveforms. For example, you choose Element 3 from the ChorusBell sound and it's imported into your Voice with all of its settings intact. The imported settings include the upper and lower Velocity bounds, but whereas the rest of the parameters can be edited, those can't. The Velocity window can be further narrowed by editing the Velocity bounds for the element you're working on, but if the waveform isn't set up to respond to the full Velocity range, you can't make it do so. Thus many waveforms are all but unusable outside of their original Voices.

The file-management utility, again, is not elegant, but I had no trouble copying banks of Voice data from the Tyros to my computer's hard drive. Copying SMFs directly from the Tyros's floppy drive to the computer was just as easy.

Once the Tyros is installed as a USB MIDI device in your computer's operating system, you can address its 32 internal MIDI channels directly from your software sequencer. It's too bad the Tyros can't be set up to retransmit channels 17 through 32 on its MIDI B output, as that would allow it to be used as a MIDI interface for connecting to other hardware modules.

PERFORMANCE FEATURES

As befits a keyboard aimed squarely at the solo lounge performer, the Tyros has a *lot* of performance features, many of which can be activated with a single button press. In the Song Control (sequencer playback) section, for instance, is a Fade In/Out button, for those moments when you want to sound as much like a CD as possible. In addition to a dedicated tap tempo button, the Tyros has octave-transposition and semitone-transposition buttons located at opposite sides of the keyboard, which is a

PRODUCT SUMMARY

Yamaha
Tyros
keyboard workstation
$3,495

FEATURES	4.5
EASE OF USE	4.0
QUALITY OF SOUNDS	4.0
VALUE	4.0

RATING PRODUCTS FROM 1 TO 5

PROS: Incredible color LCD. Tons of interactive features, including vocal harmonization and sheet music and lyric display. Computer software for Voice editing and file handling.

CONS: Onboard Voice editing and sequence editing are limited. No tech support for software. Mic input is ¼-inch, not XLR. No digital audio I/O. Sustain pedal and speakers not included.

Manufacturer
Yamaha Corporation of America
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bit odd, though the Octave button applies to the right-hand Voice only.

Additional one-button operations include turning keyboard splits and layers on and off, and the buttons glow brightly when the split or layer is active. If the balance isn't right, just tap the Mixing Console button and use the eight pairs of up and down buttons below the LCD to adjust each layer (or the level of the Style Playback or Song Playback) as needed.

If you've set up a two- or three-Voice layer in the right-hand section, the layers can be detuned or octave-shifted, but not tuned up or down in half steps. Those tuning controls are in the mixer display and might take a few keystrokes to get to.

The rear-panel mic input (¼-inch, unfortunately—a dual-purpose Neutrik connector would have been a better choice) is intended mainly for vocal chores. It has both a trim pot and a Volume knob, the latter located on the front panel. Effects processing for the vocals can be switched on and off, as can a vocal harmonization feature. Harmonization relies on special data encoded in an SMF; I tried it with a couple of classic pop tunes (provided by www.eatsleepmusic.com) and was suitably impressed. Hey, I sound just like the Beach Boys!

Also encoded in the SMF, the song lyrics were displayed five lines at a time in big, easy-to-read letters on the Tyros screen, and the Tyros paged through the verses and choruses automatically. I didn't test the NTSC/PAL video output, but if you're doing karaoke gigs, the Tyros and a video monitor should be all you need to get the lyrics up where the audience can read them.

The Style Playback section provides the expected Intro and Ending buttons (three of each), a Break button, and four Main Variation buttons. More interesting are the four Multi Pad Control buttons, which trigger one-shot recordings (a keyboard glissando, for instance) or short loops. The loops play in sync with the current Style, so you can layer a hip-hop beat under a romantic ballad whenever the impulse should strike—no need to plan such perfidy in advance. You can record your own loops and one-shot flourishes for the Multi Pad buttons, but a generous assortment of 80 sets comes preloaded.

Conveniently located in the center of the panel are eight Registration Memory buttons. These can store just about any combination of settings for the whole instrument, including which song and Style are cued up to play, which Voices are assigned to the keyboard, and so on. You can save and recall banks of eight Registrations. If you don't remember what's in a given bank, all it takes is two button presses to see the names you've given the individual Registrations.

More versatile than the Registrations are the four One Touch Setting (OTS) buttons, which can memorize different

Joe McGrath...

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mixer settings and keyboard Voices for a given accompaniment Style. After you call up your customized country-picking Style, for instance, you can switch from the banjo solo to the stand-up bass solo with one button press, without ever having to open the Voice menu to find either instrument. The system is actually a little slicker than that: if the OTS Link button is lit, when you switch from one Main Variation to another in the Style, the corresponding One Touch Setting button will also be activated.

On the front panel's right end, the Guide button activates another of the Tyros's luxury features. In Guide mode, a student can watch a page of sheet music on the LCD and play the melody notes as the bouncing orange ball reaches them. The notation display is small but crisp and readable. If the student plays a wrong note, the Tyros will stop and wait for the right one. For the best pedagogical results, it's advisable to choose or edit the song files with care. When I tried Guide mode with Eatsleepmusic's version of "Bye Bye Love," I found the forest of triplet syncopations and ties rather hard to read, especially at the song's breakneck 164 bpm tempo. But with a little supervision, a youngster could learn a lot this way.

STEEL-BELTED TYROS

The Tyros is sweet enough to make me wish I were doing a solo lounge act—it's that good. (Okay, maybe not karaoke—nothing is *that* good.) The front panel's array of interactive features is inspiring. For home use, there are certainly more affordable instruments, but it's hard to imagine anything better in a 61-note keyboard.

Songwriters should be able to find something suitable in the beautifully programmed array of Styles whenever inspiration strikes. Although I wouldn't necessarily try to do a complete recording session using only the Tyros, the quality of the sound set is high enough that with judicious mixing, you could bounce a few tracks into Pro Tools and fool most of the people most of the time. A younger student could play the piano sound for hours without aural fatigue, and seasoned veterans will appreciate the drawbar organ emulation. All this and a tilt-up color display, too!

Most of my complaints are minor. The Style creation utilities are too hard to use, the sequencer's editing utilities are weak, the included computer software could have been designed better, and an instrument in this price range should ship with at least one footpedal, if not an assignable sweep pedal.

I hope Yamaha will spin off the Tyros technology into synths aimed at pro musicians—or at musicians who play more intense, youth-oriented styles. Being able to trigger loops from panel buttons, adjust multipart mixer levels from a big display, and store the entire instrument setup in Registration Memory would be a plus for almost any performer. If Yamaha replaces a few of the buttons with programmable sliders and puts a full complement of Voice-editing features in the instrument itself, watch out! ●

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WAVES

MASTERS BUNDLE V4 (MAC/WIN)

Put the finishing touches on your mixes with these world-class plug-ins.

By Michael Cooper

Audio quality is a preeminent consideration for mastering applications. A low-fi plug-in might sound great on a grungy electric-guitar track or kick drum sample, but pristine processing is of paramount importance when treating an entire mix. Waves, one of the planet's most highly regarded purveyors of plug-ins, has created an awesome software bundle specifically for this purpose.

Waves' Masters Bundle V4 includes three plug-ins: two linear-phase plug-ins—Linear Phase Equalizer and Linear Phase Multiband—and the company's L2-Ultramaximizer (the latter available for the first time in native formats). Linear phase response is part of what makes the Waves equalizer and multiband plug-ins sound so pristine. Conventional analog and digital filters—used in most equalizers and multiband processors—shift the phase of various frequency bands by different amounts, causing transients to smear and clarity to become compromised. Waves' linear-phase plug-ins, on the other hand, use Finite Impulse Response filters that shift all frequency bands by the same amount, preserving detail and transparency in the treated program material.

Despite the intense calculations that linear-phase processing requires, Linear Phase Equalizer and Linear Phase Multiband can both process audio in real time. The trade-off is that both plug-ins cause latency—between 42.6 and 60.9 ms for Linear Phase Equalizer (depending on the sampling frequency used) and roughly 70 ms for Linear Phase Multiband. Unless you plan to use these plug-ins for multitracking applications, however, latency should not concern you. Latency is virtually never an issue in stereo mastering applications, where live musicians are not performing and static settings are almost always used for processing program material. Of course, you can use single or multiple instantiations of any or all of the Masters plug-ins in a multitrack setting, as long as your CPU can handle the load.

Minimum System Requirements

Masters Bundle V4

MAC: G4/450; 256 MB RAM; Mac OS 9.2.2 or OS X 10.2.2

PC: Pentium III/800 or AMD Athlon/500; 128 MB RAM; Windows 98SE/2000/ME/XP

Masters Bundle V4 supports WaveShell-DAE 4.0 (for TDM, RTAS, and AudioSuite) and WaveShell-VST 4.0 (for VST-compatible host applications, such as Steinberg's Nuendo and TC Electronic's Spark) on both the Mac and the PC, as well as WaveShell-MAS 4.0 (for MOTU's Digital Performer v. 2.72 or higher and AudioDesk v. 1.02) on the Mac. There's also support for DirectX and DirectX 8 (with automation) on the PC. Mac users take note: although Masters Bundle V4 supports OS X, Apple's Audio Unit plug-in format is not supported with this release. Waves has promised Audio Unit support with the next update, due around the time you read this. Also, Waves will support Digital Performer running under OS X in an upcoming version. Users who buy or upgrade to V4 will be entitled to free updates for one year. For this review, I used the MAS version in Digital Performer 3.11 with a dual-processor Mac G4/867 MHz loaded with 768 MB of RAM running OS 9.2.2.

All of the plug-ins included with Masters Bundle feature 48-bit processing, can dither to 24-bit output, and support 44.1 and 48 kHz sampling frequencies in all WaveShell formats. In addition, L2-Ultramaximizer can operate at up to 192 kHz sampling rates in both native and TDM formats, and both Linear Phase Equalizer and Linear Phase Multiband can provide 96 kHz operation in native versions.

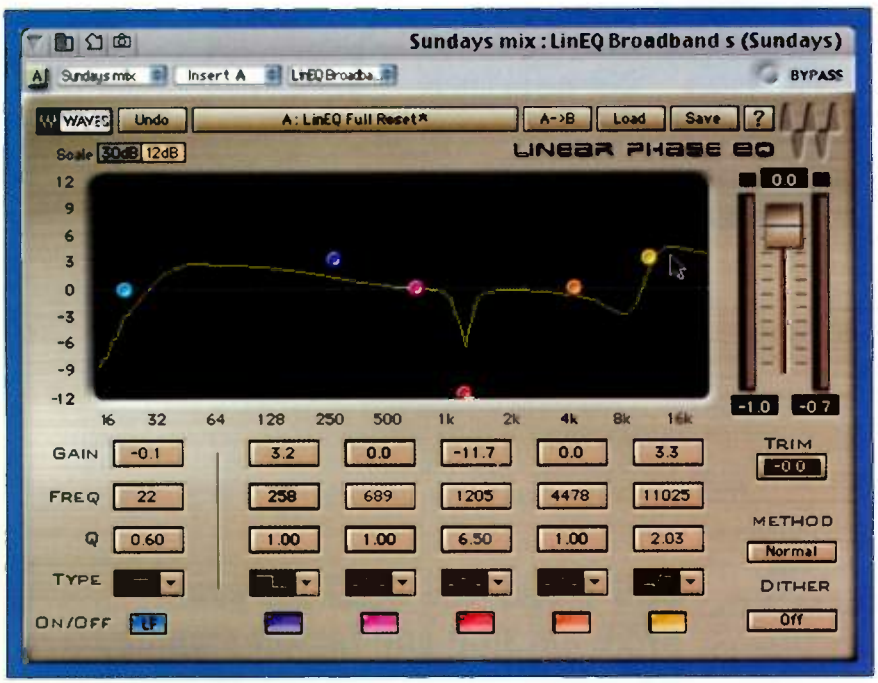

FIG. 1: This shot of the LinEQ Broadband plug-in shows (from bottom band to top band) a V-Slope Hi-Pass filter at 22 Hz, a V-Slope Low-Shelf at 258 Hz, a Bell (in this case, a notch filter) at 1,205 Hz, and a Resonant Hi-Shelf at 11,025 Hz. Note how the relatively high Q setting causes a slight peak as well as a pronounced dip in response around the corner frequency of the Resonant Hi-Shelf.

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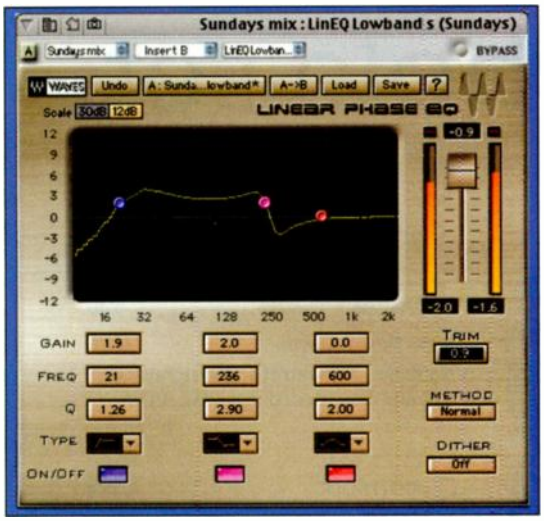

FIG. 2: This is a shot of the LinEQ Lowband plug-in illustrating a Resonant Hi-Pass filter at 21 Hz and a Resonant Low-Shelf at 236 Hz.

I regard Masters Bundle as consisting of four plug-ins instead of three. That's because Linear Phase Equalizer can be instantiated in two quite different forms, LinEQ Broadband and LinEQ Lowband. Each LinEQ version shows up as a separate item in Digital Performer's Insert menu. LinEQ Broadband offers six bands that, taken as a whole, cover the entire audio spectrum, while LinEQ Lowband is endowed with three bands that focus with generally greater precision on bass and low-mid frequencies only. Both LinEQ plug-ins are capable of mono and stereo processing. Let's begin our in-depth tour of Masters Bundle by taking a closer look at each of the LinEQ plug-ins.

LINEQ BROADBAND

LinEQ Broadband provides five overlapping "general" bands of EQ that each operate in the 258 Hz to 21.963 kHz range, and one special "low-frequency" band that works between 22 Hz and 1 kHz. Nine filter types are available for each of the five general bands. These include a bell-curve (parametric) filter and two flavors of each of the following types of filters: lowpass, highpass, low shelf, and high shelf.

The two flavors for the shelving and high- and lowpass filters are Variable Slope Precision Filter (or "V-Slope") and Resonant Analog Modeled Filter ("Resonant" for short; see **Fig. 1**). The V-Slope filters produce exactly the kind of curve on a graph that you'd expect to see and sound very precise, focused, and transparent. The Resonant filters, on the other hand, were designed to incorporate the best attributes of vintage API, Pultec, and Calrec analog EQs, and their curves look quite different from what the V-Slope filters produce. The Resonant filters cause a resonant peak and dip in response both above and below the corner frequency. The degree of resonant overshoot can be adjusted with the band's Q control (more on Q in a bit). I found that all the Resonant filter types sound quite analog in that they are warmer but mushier than their V-Slope counterparts. Neither filter type sounds better than the other for tonal-shaping purposes, but the V-Slope filters offer a more predictable response when performing surgical tweaks to correct narrow-band equalization problems.

LinEQ Broadband's special low-frequency band offers the same filter types as the general bands with the exception that resonant-type filters are omitted, for a total of five filter types. (Fortunately, as you'll soon see, LinEQ Lowband includes some resonant filters for sculpting the low end.)

Each of LinEQ Broadband's six bands offers independent gain (providing ±30 dB boost or cut), frequency, and Q adjustments and a separate bypass button. Of course, the Q control sets the bandwidth for bell-curve filters. For shelving and cut (that is, lowpass and highpass) filters, however, the Q control adjusts the steepness of the filter's slope and the amount of overshoot in the Resonant filters.

You can edit the gain, frequency, and Q parameters by dragging their numeric values with a mouse or by selecting the field you want and typing in new numbers; the latter method will make the parameter jump to the nearest value available. Or you can simply drag the band marker for each band in the graphic frequency-response display to create the EQ curve you want (within the constraints of each filter type, of course). Keystroke-and-mouse combinations expedite editing any band's Q, filter type, or bypass status from within the graph. The graph can be scaled to show a ±12 dB or ±30 dB response range.

A fader controls attenuation of the plug-in's output gain, and there's a corresponding numeric readout above the fader. I wish this fader also provided gain boost, but it does not. Although you might be able to apply makeup gain in a downstream plug-in or channel fader, the inability to do so in both the LinEQ Broadband and Lowband plug-ins precludes effective A/B comparisons between dry and processed sounds when applying EQ cut to program material.

LinEQ Broadband also provides separate L/R meters for stereo program material (or one meter for mono tracks), permanent-hold peak-level readouts, and a very useful trim function that automatically adjusts the fader for 0.1 dB headroom at the plug-in's output. Only overall attenuation, and not boost, is possible with the trim function. That is, although the trim function can boost a fader that is set lower than 0 dB (unity), it cannot provide boost beyond unity makeup gain. You can dither the plug-in's 48-bit output to 24 bits if you like.

You can also choose from three rather subtle methods of EQ-curve generation—Normal, Accurate, and LowRipple—that affect the smoothness and slope of EQ curves in all but the low-frequency band of LinEQ Broadband. The Accurate method is your ticket for creating the deepest notch filters. The LowRipple method creates a smoother curve than Normal or Accurate when used on filters of all types, but it does so at the expense of attaining a slope that's less steep. Use your ears to determine which method sounds best for your application.

LINEQ LOWBAND

LinEQ Lowband differs from its Broadband sibling in only a few major

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respects. Lowband offers only three bands of EQ (see Fig. 2). Its lowest band ranges from 10 to 600 Hz, while the two higher bands each offer a 32 to 600 Hz range. Bell, low-shelf, and highpass filters (including V-Slope and Resonant variations of the latter two filters) are included, for a total of five filter types; it wouldn't make sense to offer high-shelf and lowpass filters on a lowband equalizer meant to treat broadband mixes. The center or corner frequencies available in LinEQ Lowband are generally changed in 11 Hz steps when you drag a band marker in the plug-in's graph. LinEQ Broadband's five general bands offer roughly 86 Hz adjustment increments, giving you comparatively fewer choices of frequencies in the low mids. Fortunately, LinEQ Broadband's low-frequency band can be adjusted in 1 to 8 Hz increments (increasingly wider as you move from low to higher frequencies). Used together, LinEQ Broadband and LinEQ Lowband offer enough flexibility to satisfy even the pickiest EQ microsurgeon.

LinEQ Lowband's ability to hone response in three bass bands at once makes it a great tool for shaping tone at the bottom end of a mix, although I generally prefer to use the low-frequency band in LinEQ Broadband to remove rumble because of the exacting 1 Hz increments the latter offers. I love the fact that I can employ both a rumble filter (that is, a highpass filter set between roughly 21 and 40 Hz) and a low shelf simultaneously with one plug-in; either LinEQ plug-in will do the job in this application. Of minor concern is the fact that in both LinEQ Lowband and the low-frequency band in LinEQ Broadband, you don't hear the results of moving a band's marker until you release the mouse. Real-time response would make it a little easier to sculpt the low end of a mix.

LINEAR PHASE MULTIBAND

Linear Phase Multiband (LinMB) is an improved version of the Waves C4 Multiband Parametric Processor, offering linear-phase crossovers and additional innovative features. LinMB divides mono or stereo program material into five independent frequency bands and then allows you to perform different processing—EQ, compression, limiting, or gating—in each band. Of course, you can always apply the same type of processing to each band to fashion, for example, a split-band compressor.

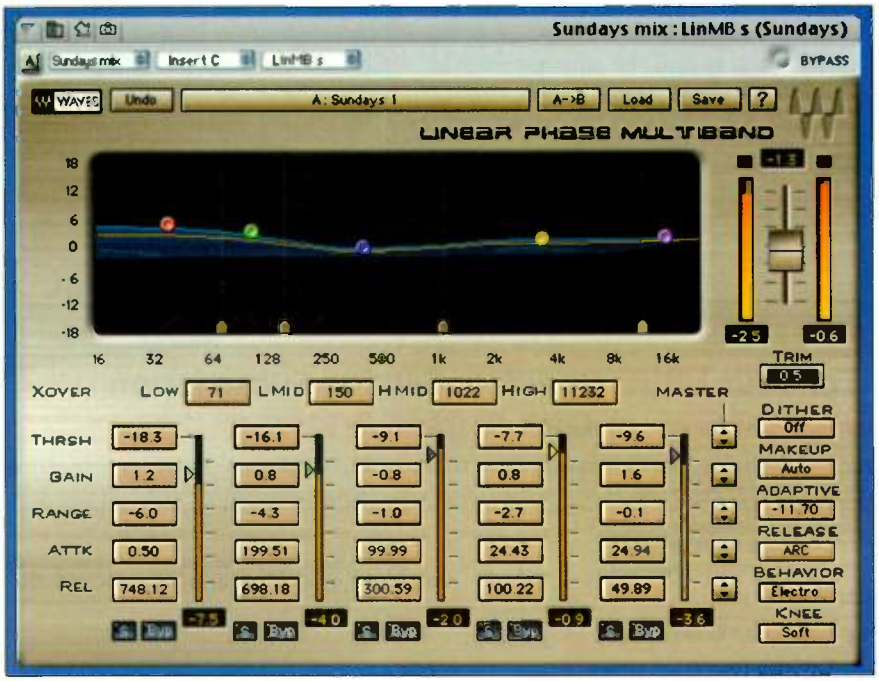

FIG. 3: Here, the Linear Phase Multiband (LinMB) plug-in is set up to perform split-band compression.

LinMB lets you adjust four overlapping crossovers that define the split points between its five frequency bands (see Fig. 3). Of particular importance, LinMB's lowest crossover frequency can be adjusted as low as 40 Hz. This is much lower than what most competing multiband plug-ins provide (PSPaudioware .com's VintageWarmer being a notable exception) and offers outstanding control over the perceived "weight" of a mix (thank you, Waves!).

Each band also has its own user-adjustable (text-based) threshold, attack, release, makeup gain, and range controls. Gain can also be adjusted in each band by dragging its respective band marker in LinMB's outstanding graphic display. Small threshold-setting arrows can also be dragged up or down alongside meters that show the spectral energy present in each frequency band; this arrangement provides a clear visual indication of how the current threshold relates to signal level in each band.

The range control substitutes for a ratio control but goes one step further: not only does it adjust the intensity of processing, it also limits the amount of gain adjustment due to dynamics processing in its associated band. In addition, each band features its own bypass and solo buttons. Bypass buttons greatly facilitate activating and deactivating processing in select bands while retaining your painstakingly wrought settings. Per-band solo buttons allow you to monitor the effect of processing in an individual band or group of bands.

Global controls in LinMB's master section let you adjust all the threshold, attack, release, gain, and/or range parameters up or down as a group, while preserving parameter offsets in each band. LinMB's master section also includes the same type of output-level fader, output-level meters, peak-hold readouts, clip indicators, trim control, and dither function as LinEQ. There's also an Auto Makeup feature that can apply makeup gain in excess of unity when needed.

Also in LinMB's master section, you can choose between two different release curves (dubbed "opto" and "electro"),

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select a soft- or hard-knee processing response (or any response in between), and switch between manual and auto-release (program-sensitive release) times for all bands. Regarding the latter feature, activating Waves' ARC (Auto-Release Control) function does not disable manual control but rather *modifies* your manual settings as needed to better handle the current program material without pumping or causing distortion.

Another innovative (and pioneering) feature in LinMB's master section is the Adaptive threshold function, which automatically varies the processing threshold of a band to minimize frequency-masking effects. (Frequency masking is a phenomenon in which loud, lower frequencies tend to progressively obscure quiet, higher frequencies as the former get louder.)

LinMB is an extremely versatile plug-in. By adjusting a band's range control to be a negative number, I performed compression (or, with a hard-knee setting and fast attack times, limiting) in that band. Conversely, boosting the range control into positive territory prompted upward expansion. And by dialing in a zero value for all the range controls and boosting or cutting each band's make-up gain, I turned LinMB into an equalizer (albeit one that was far less flexible than LinEQ). Space constraints preclude my detailing how various other applications work, but suffice it to say that split-band noise gating (think noise reduction), bootstrap (or "bottoms-up") compression, and automatic loudness contouring (boosting lows and highs at low signal levels only) are all a snap to accomplish with the chameleon-like LinMB. This plug-in rocks!

L2-ULTRAMAXIMIZER

Waves' Masters Bundle makes the critically acclaimed L2-Ultramaximizer plug-in available in native formats for the first time. L2 is essentially an improved version of the seminal L1-Ultramaximizer. L2 combines an ultratransparent "look-ahead" peak limiter and level maximizer with Waves' outstanding IDR word-length reduction system. (*IDR* stands for Increased Digital Resolution, and, believe me, that's no empty claim.) Full mixes can be processed with L2 to reduce very brief peaks caused by drum and percussion hits and plucked instruments, and the output level automatically rises to exploit the newly gained headroom. The result is dramatically increased loudness and, often, a more aggressive sound.

L2 offers by far the simplest interface and operation of all the plug-ins offered with Masters Bundle (see **Fig. 4**). First, set the maximum output level you want your mix to attain by dragging the output-ceiling control with your mouse to the appropriate value (typically just barely below 0 dBfs). Then adjust L2's Threshold control to whatever level gives you the desired amount of brickwall limiting. Input-, output-, and gain-reduction level meters, along with associated numeric readouts, guide you in making your adjustments. You can set the limiter's release time wholly manually or activate Waves' ARC function (which works identically to the same feature found in LinMB). Choose the bit depth you want to dither L2's output to and the type of dither and noise shaping you want (if any), and you're done!

IDR can dither L2's output to 24, 22, 20, 18, or 16 bits, and features ninth-order (54 dB per octave rolloff) noise shaping that greatly reduces the audibility of noise caused by dither and/or requantization (word-length reduction). Two types of dither and three different noise-shaping curves are offered with L2. Dither and noise shaping can also be independently turned off.

You wouldn't want to use L2 to master classical music or any other style where a completely faithful reproduction of the live performance is sought. But for other forms of music, such as rock, country, R&B, hip-hop, and even adult alternative, a little bit of L2 processing can make a mix sound like it's on steroids. *Heavy* L2 processing can make your mix sound like it's exploding out of your speakers! Because L2 is intended for use in mastering (and, in fact, as the last process used on a file), it is offered only as a stereo plug-in. I wish it were also available in mono format, however, so I could process individual tracks with it before mixing.

FIG. 4: The L2-Ultramaximizer plug-in's interface and operation are simple. Here, controls are set to produce an ultralow-noise, 16-bit CD master.

COMMON GROUND

Each of the Masters Bundle plug-ins allows you to save your custom settings

PRODUCT SUMMARY

Waves

Masters Bundle V4 (Mac/Win)
signal-processing software
native versions (Mac/Win) $900
TDM version (Mac only) $1,800

FEATURES	4.5
EASE OF USE	3.5
DOCUMENTATION	4.5
VALUE	4.5

RATING PRODUCTS FROM 1 TO 5

PROS: Pristine sound quality. Extraordinary control over critical bass frequencies. Interactive graphic displays greatly facilitate editing. Innovative trim functions. Expansive selection of filter types.

CONS: Plug-ins are voracious CPU hogs. Cannot apply positive makeup gain in the master-output section of either LinEQ plug-in. Can't undo preset recall. L2 cannot process mono tracks.

Manufacturer

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as application-wide or file-specific presets and toggle between two alternative setups (for example, different EQ curves), designated as "A" and "B," for comparison purposes. Unfortunately, LinEQ Broadband and LinEQ Lowband share the same user-presets menu. Since the two plug-ins understandably cannot invoke each other's settings (as they have somewhat different parameters), all EQ settings are nulled (zeroed) in the plug-in's current Setup when you attempt to load a LinEQ Lowband preset into the LinEQ Broadband plug-in, or vice versa. Hopefully, Waves will provide separate user-presets menus for each of the LinEQ plug-ins in a future update.

Helpful factory presets are provided as starting points for working with each plug-in. Each plug-in also offers a global bypass button and one level of undo. Unfortunately, you can't undo a preset recall. All parameters for all Masters Bundle plug-ins are automatable; that said, most of the time you'll be using static settings for mastering applications.

The Masters Bundle plug-ins (especially Linear Phase Multiband) devour hefty amounts of CPU resources. With Digital Performer's buffer set to 1,024 samples on my dual-processor Mac G4/867 MHz, one instance of each of the four plug-ins ate up 85 to 90 percent of my available CPU power and dramatically slowed down screen redraws—including critical metering. You rarely use more than four plug-ins when mastering, however, and low buffer settings aren't required for this application. Use Masters Bundle with the fastest dual-processor G4 or Windows machine you can get your hands on and the highest buffer settings you can tolerate.

Waves' Masters Bundle—in particular, Linear Phase Multiband—is a bit more difficult to learn and use than its plug-in counterparts from other Waves bundles. But the learning curve and extra effort are well worth the rewards. Simply put, DAW-based processing doesn't get any better than this. Masters Bundle provides the discerning mastering engineer with a formidable tool set capable of handling virtually any EQ or dynamics challenge, and with grace. I was particularly impressed by how superior Masters Bundle is in addressing the critical bottom end of a mix, which is where many competing products come up short.

If you're in the market for some serious mastering processors or simply want the highest-quality signal processing for critical multitracking applications, Waves' Masters Bundle will not disappoint you. Two wildly enthusiastic thumbs up!

EM *contributing editor* **Michael Cooper** *owns Michael Cooper Recording, located in beautiful Sisters, Oregon. Cooper's studio offers a wide range of recording services, including mastering for CD.*

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NATIVE INSTRUMENTS

FM7 1.1 (MAC/WIN)

FM synthesis is born again.

By Brian Smithers

For many of us, frequency modulation (FM) synthesis conjures up fond memories of the Yamaha DX7, with its bell-like pianos and gooey pads. The DX7's characteristic timbres were so varied and different from the analog synths of the day that it quickly became one of the most popular synthesizers in history.

Native Instruments' FM7 re-creates the sound engine of the DX7 and its siblings while adding a few new tricks. FM7 can run as a standalone synthesizer or as a plug-in within a VST, DX, or MAS host. Digidesign Pro Tools compatibility is available through DirectConnect, and MIDI support on the Mac includes OMS and FreeMIDI.

I tested FM7 using a Mac G4/733 MHz with 768 MB of RAM, a Digidesign Digi 001 interface, and an M-Audio Oxygen 8 MIDI controller. I had no trouble setting up the program in standalone and DirectConnect modes, and syncing the delays and envelopes to MIDI Clock was a piece of cake. With the Hardware Buffer set to 128 samples, FM7's performance was crisp and responsive, with no audio glitching.

Minimum System Requirements

FM7 1.1

MAC: G3/400 (G4 recommended); 64 MB RAM; Mac OS 8.6; OMS or FreeMIDI

PC: Pentium III/450; 64 MB RAM; Windows 98/2000/ME/XP

FACTUAL MATTERS

The printed manual that comes with FM7 is exceptional. It provides complete step-by-step instructions for setting up FM7 within major host applications on both Macs and PCs. It also covers advanced features, such as how to use a bus to record the synth's output to an audio track in Pro Tools. In addition, the manual lays out the theoretical underpinnings of FM synthesis.

FM synthesis has been implemented in a variety of ways over the years. FM7 uses *phase modulation*, a fraternal twin of frequency modulation and the actual flavor implemented by Yamaha's classic synths. (For a detailed discussion of frequency modulation, see "Square One: FM Basic Training" in the April 1999 issue of EM.)

An FM synth's architecture is built around *operators*. In FM7, an operator is a module that contains an oscillator, an amplifier, and an envelope generator. The output signal of an operator can either be heard directly, in which case the operator is called a *carrier*, or be used to affect the behavior of another operator, in which case it is called a *modulator*.

Operators can function as both carrier and modulator, and they can even modulate themselves, which is referred to as *feedback*. The relationships between operators are defined by *algorithms*, and whereas a DX7 had a finite number of fixed algorithms to create patches, FM7 allows you to create an enormous variety of algorithms using a matrix (see Fig. 1).

FIG. 1: In the right side of the window is the FM Matrix view, where the algorithm is defined in a simple click-and-drag interface. The arrows indicate signal flow, and the modulation amount can be adjusted by dragging your mouse on the displayed value.

One of the first things I did after installing FM7 was to turn to the matrix page and start cross-pollinating operators to see what sounds might ensue. In a mere 30 seconds, I discovered most of what I needed to know to program new sounds.

The operators are laid out on a grid. If you want a signal to travel from one operator to another, simply click and drag the mouse on the lines that intersect the two. You can control the amount of signal flow by dragging the cursor in the value box that appears at the intersection. Should you find this process less intuitive

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than I did, the manual explains everything you need to know in explicit detail. (For more information, see the master class on programming FM7 in the June 2003 issue of EM.)

FLAVOR MODIFICATION

As if this weren't already a big improvement over FM programming through the DX7's tiny display, Native Instruments has created a simplified programming interface that allows users to tweak sounds without ever seeing an algorithm or operator (see Fig. 2). The Easy Edit page offers 20 sliders that let you increase or decrease plain-language parameters such as Brightness, Detune, Vibrato, and Envelope Amount. For customizing presets, the Easy Edit page is all most users will ever need to know about FM programming.

If moving sliders up and down is more effort than you want to exert, the Library page allows you to randomize various aspects of a sound. Six parameters—Operators, FM, Envelope, Key Scaling, Modulation, and FX—can be randomized repeatedly until you stumble across something that interests you. You can even specify the degree of randomization independently for each parameter. This is typical of the kind of attention to detail you'll find in FM7.

Another example is a slider on the Master page labeled Digital, which lets you reduce the bit depth of the instrument to the original DX7's 12-bit word length or lower. Unfortunately, there is no indication of where 12-bit resolution is on the slider or what the resolution of the lowest value is. On the same page is a slider labeled Analog, which controls an emulation of the random variations that temperature and other factors introduced into early analog-synth circuits.

The Modulation Matrix lets you determine what gets modified by each controller. If you want pitch bend to move a carrier by seven semitones, simply click and drag at the appropriate intersections until the correct value appears.

PRODUCT SUMMARY

Native Instruments
FM7 1.1 (Mac/Win)
software synthesizer
$299

FEATURES	4.5
EASE OF USE	5.0
QUALITY OF SOUNDS	4.0
VALUE	4.0

RATING PRODUCTS FROM 1 TO 5

PROS: Flexible sounds. Programming is easy yet deep. Extensive modulation possibilities. Supports VST, DX, MAS, DirectConnect, OMS, and FreeMIDI. Standalone mode.

CONS: Can't type numeric values into value boxes.

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FIG. 2: The Easy Edit page allows users to modify patches without having a deep knowledge of operators and algorithms. Although you can't harness the full power of FM7's synthesis engine from here, you can still get a lot of tweaking done.

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FASCINATING MUSIC

Native Instruments' *FM7 Sounds, vol. 1* ($49.90) comes with 256 patches grouped into categories such as pads, loops, drums, and synths. Each category features 64 examples of what frequency modulation can do. All the sounds are of high quality, although your musical tastes and mood will determine which ones are most useful to you.

The pads tend to use the mod wheel to vary timbre, allowing you to shape phrases intelligently. Aquazoo, for instance, is an undulating pad with a swirl of bell-like sounds, and moving the mod wheel introduces a warbly component that makes the pad more active. Yed Prior uses the wheel to morph between sonorous and dissonant timbres, whereas Cinematica uses the mod wheel to fade in an interval of a fifth above the fundamental, which adds a dramatic sense of anticipation.

There are some interesting electric pianos among the synths, including the clangorous Bridges, the harpsichordish Dee Kay, and the toy-like Lullaby. Not to be left behind on the modulation front, the EWI-7 Monolead goes through some very nice timbral changes when you use the mod wheel.

I found fewer useful drum sounds, but this is mostly a stylistic issue. I've never been fond of FM drum sounds, and this collection has not changed my mind. There are certainly some interesting variations, and the drums are as well programmed as any other instrument in this collection.

The loops do a great job of demonstrating the depth of FM7's programming capabilities. They sync to incoming MIDI Clock and provide a nice alternative to audio loops. *FM7 Sounds, vol. 1,* is worth having just to dissect its programming. On the other hand, if you're trying to avoid getting your hands dirty, you'll find lots of fresh sounds to spark your imagination. But be warned: touch that mod wheel once and you'll never leave it alone!

An entire page of controls is devoted to pitch manipulation, including four different pitch-bend modes and microtuning. Up to 32 microtuning presets can be saved, including stretch tunings. The Pitch Envelope offers intuitive breakpoint manipulation of pitch over time. You can also loop a series of breakpoints and lock to MIDI Clock to create arpeggiator-like patterns that follow your sequencer's tempo.

FM7 has a handy Learn mode for setting up controller assignments. This allowed me to easily assign the Oxygen 8's knobs to parameters such as an operator's modulation amount, its detune value, and its pitch-bend range.

FRIENDLY MANIFESTATION

Countless DX7s have been collecting dust for years because their signature sounds were played out and they were difficult to program. Fortunately, FM7 can load DX and TX sounds, allowing you to breathe new life into your vintage patches using its straightforward programming interface.

The expressive abilities of FM7 are impressive, and the modulator-and-carrier architecture lends itself to sounds that undulate, pulse, or morph as you sustain a note or chord. In addition, the majority of the factory sounds, as well as those in *FM7 Sounds, vol. 1* (see the sidebar "Fascinating Music"), respond in interesting ways to Velocity and mod-wheel changes. FM7 does a fine job of capturing the essence of the great FM synths while making the power of FM synthesis more accessible.

Brian Smithers *is course director of audio workstations at Full Sail Real World Education in Winter Park, Florida.*

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SHURE

KSM141

A rugged, well-featured end-address condenser microphone.

By Richard Alan Salz

It has been a few years now since Shure debuted its KSM series of studio microphones. The KSM32 led the pack, followed by the KSM44 and KSM27. All three were side-address, large-diaphragm—or at least *relatively* large-diaphragm—condenser microphones. Now, with the introduction of the KSM141, KSM137, and KSM109, Shure has broadened the KSM range to include end-address, small-diaphragm condensers.

This review focuses on the KSM141 (see Fig. 1) but also applies to the KSM137. That's possible because the two microphones employ identical electronics and capsules, the difference being that the KSM141 offers switchable cardioid and omnidirectional polar patterns, whereas the KSM137 ($575) has a fixed cardioid pattern. The only sonic difference I could ascertain between the two models was in the resonant tone of their housings when tapped externally; in terms of cardioid sound capture, they sounded identical.

ROUND AND ROUND

The KSM141 is an end-address, permanently polarized ("electret") condenser microphone featuring a Class A, discrete, transformerless preamplifier and a ½-inch-diameter, 2.5-micron-thick, 24-karat-gold layered Mylar diaphragm. The polar pattern is switched by turning a knurled ring just beneath the mic capsule. Below the knurled ring are two recessed, 3-position microswitches. The top one allows you to select one of two attenuation pads (–15 dB or –25 dB) or a 0 (unpadded) setting; the lower switch allows you to choose one of two highpass filters (at 80 and 115 Hz) or a flat setting. The microphone has a silver finish and weighs less than 6 ounces.

The KSM141 derives its polar patterns by traditional mechanical (porting) means, and switching between the two patterns is also done mechanically—the knurled ring moves a sliding cover that blocks or unblocks vents on the microphone, thus changing the polar response. The polar patterns are clearly marked on the rotating ring, and a very positive detent in the mechanism, as well as a visual notch, eliminates any ambiguity about which pattern you have selected. By the way, the KSM141 makes quite a bit of mechanical noise when you change polar patterns, so be sure to mute or lower the preamp gain before switching patterns.

The KSM141 comes packaged in a nice, hard-plastic carrying case complete with a nylon mic clip and foam-rubber windscreen. The overall fit and finish of the microphone is indicative of high quality and ruggedness. The KSM141 is manufactured in the United States and has a two-year warranty.

A SHURE THING

I received a pair of KSM141s for this review. All testing was carried out using the following equipment: a Neotek IIIc console, Urei 809 and Fostex NF-1 monitors, D.A.V. Electronics Broadhurst Gardens (solid-state) microphone preamp, Peavey VMP-2 (tube) microphone preamp, and MCI/Sony JH-24 multitrack and Studer A 80 RC 2-track recorders.

The first test I conducted was a comparison of the two KSM141s. By positioning the microphones as close together as possible and then reversing the polarity on one of the mics, I achieved a very high null, indicating that the microphones were well matched. I also checked out the KSM141s on a variety of sound sources.

According to the KSM141's frequency-response plots, in cardioid mode the microphone's low end starts rolling off at around 300 Hz and is down more than 5 dB at 20 Hz. The high end shows

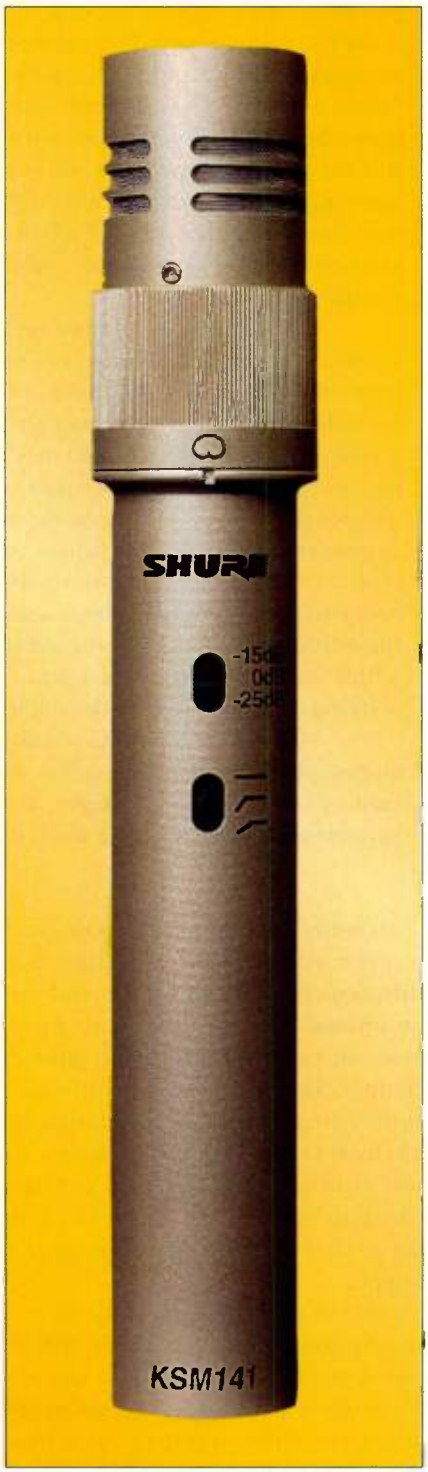

FIG. 1: The Shure KSM141 features a unique rotating ring used for mechanically switching the polar pattern. The mic offers cardioid and omnidirectional patterns, as well as dual-setting attenuation pads and highpass filters.

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a smoothly rising presence boost between 4 and 14 kHz, peaking 2 dB up at 9 kHz. In omnidirectional mode, the low end practically inverts, rising smoothly from 500 Hz to 2.5 dB up at 20 Hz. The high end (in omni mode) shows a broader yet still smooth presence boost spanning from around 2 to 20 kHz and up nearly 3 dB between 6 and 8 kHz.

Acoustic guitar. I miked my Ricardo Sanchis Carpio classical guitar with the pair of KSM141s positioned in an ORTF spaced-pair configuration. A classical guitar with a tight-grained cedar top, the Sanchis Carpio is a well-balanced-sounding instrument with a forward midrange and a pronounced bass register.

The KSM141s sounded best with one placed in front of the sound hole about 6 inches away, aimed somewhat toward the bridge of the guitar, and the second suspended about 12 inches over the guitar and aimed toward the neck near the tenth fret. I experimented with both polar patterns, but preferred the sound of the microphones in cardioid mode for this application.

▼

Switching to omni mode helped bring up the low end.

I liked the mic better on fingerpicked passages—its presence boost helped bring out the detail of fingers on the strings. On strummed passages, though, the KSM141 highlighted the pick sound more than I cared to hear. Overall, the sound was somewhat flat (one-dimensional), shy on the lows, and not particularly true to the sound of the instrument. Then again, given the KSM141's bass-shy response, it could be just the thing for an acoustic guitar with a boomy low end that needs some taming.

Snare drum. Unlike many engineers, I don't much like the sound of a dynamic microphone on a snare drum. Even though the *donk* sound that typically results is usually punchy and great for driving a reverb, I find that dynamic mics tend to homogenize the tonal differences between snare drums. I much prefer small-diaphragm condenser microphones, which I position close to the shell of the drum, sometimes right at the rim, and occasionally pointed at the head.

I tried the KSM141 in all three positions, both on a standard-size Ayotte Keplinger stainless-steel snare drum and on a maple Ayotte "piccolo" snare. I was a bit disappointed with the resulting sound. It was slower (in terms of transient response) and darker than what I am used to, and overall the sound was a bit boxy and dry—indeed, it reminded me of a dry '70s snare sound. The track was usable, just not my cup of tea.

A quick switch to an Audio-Technica AT4051—one of my favorites for miking snare drums—showed that to be the case. Interestingly, the KSM141 sounded more like a Shure SM57 than your usual small-diaphragm condenser.

Tambourine. I experimented with both a single KSM141 and a stereo pair on a Rhythm Tech tambourine with chromed-steel jingles. (Incidentally, I didn't particularly care for the mic-stand adapters supplied with the KSM141s, as they were too shallow to thread all the way onto my stereo-miking bar. But I solved that problem easily enough by placing additional locking rings on the bar before attaching the stand adapters.)

In this application, I especially liked the results I got with a single KSM141 in omni mode. Positioned about ten inches away from the tambourine (and routed through the D.A.V. solid-state preamp), the microphone captured a nice bit of room sound along with a good dose of direct jangle. Though I have often found this particular tambourine to sound rather harsh, the KSM141's relatively dark presentation tamed the somewhat nasty nature of the steel jingles and resulted in a nice-sounding track.

Drum overheads. Again using the D.A.V. preamp, I miked the studio's GMS kit from above with the microphones positioned about five feet off the floor and slightly out in front of the bass drum. I set the KSM141s to cardioid mode and positioned them in an XY configuration with one aimed between the snare drum and hi-hats and the other at the floor tom.

I was not favorably impressed by what I heard. Everything sounded somewhat boxy and closed in, and neither the tonality nor the attack captured by the microphones conveyed what the drums actually sounded like. Undaunted, I moved the mics further back into the room. But they still sounded a tad pinched.

Next, I switched the microphones to omni mode. This helped considerably in bringing the sound of the kit together: the low end came up, and overall the frequency content was truer to the drum kit. However, the off coloration and less-than-stellar transient response remained. Both the low end

PRODUCT SUMMARY

Shure
KSM141
condenser microphone
$1,540 (pair)

AUDIO QUALITY	3.0
VALUE	2.5

RATING PRODUCTS FROM 1 TO 5

PROS: Quality construction. Two attenuation pads. Two highpass filters. Quiet. Big dynamic range. High SPL handling. Relatively dark presentation can help tame overly bright or harsh sources. Comes with carrying case, mic clip, and windscreen.

CONS: Low end is underrepresented. Tends toward flat, one-dimensional sound. Electret rather than "true" condenser. Short threading on microphone clip.

Manufacturer
Shure Inc.
tel. (800) 25-SHURE or (847) 866-2200
e-mail info@shure.com
Web www.shure.com

World Radio History

KSM141 Specifications

Element	fixed charge backplate, permanently polarized ("electret") condenser
Diaphragm	¾", 2.5µ, 24-karat-gold layered Mylar
Polar Patterns	cardioid, omnidirectional
Frequency Response	20 Hz–20 kHz (+2, –5 dB)
Dynamic Range	131 dB
Signal-to-Noise Ratio	80 dB
Self-Noise	14 dB
Maximum SPL	145 dB SPL (without pad)
Highpass Filters	80 Hz, 18 dB/octave; 115 Hz, 6 dB/octave
Attenuation Pads	15 dB, 25 dB
Power	48V phantom
Dimensions	5.75" (L) × 0.80" (D)
Weight	5.5 oz.

and high end still sounded a bit rolled off, and the midrange had a hard, one-dimensional quality.

Room mic. Using the same setup, I pulled the microphones back into the room about 15 feet from the drum kit. Unfortunately, in this application the KSM141's rolled-off lows and highs and boxy-sounding midrange were even more apparent. Also, the sense of real space—admittedly one of the more difficult things for a microphone to capture—was never really there. I was surprised at how flat and one-dimensional the drums sounded, especially given the fairly live space I recorded them in.

Just to be sure, I double-checked my impressions by substituting a pair of Neumann KM 184s (also small-diaphragm condensers). Though the Neumanns are not my favorites—they have a somewhat bloated-sounding low end to my ear—they are very transparent and provide excellent transient response. At any rate, it took only a few moments of listening to the Neumanns to confirm my impressions of the KSM141s.

Djembe. I positioned a KSM141 about 4 inches from the top head of my 12-inch Latin Percussion djembe and was pleased by the nice, round tone I heard upon playback. I also got good results by placing a KSM141 slightly inside the open end of the drum. This was one of the more flattering applications for the KSM141—the microphone's overall midrangy sound was very complimentary to my djembe.

Guitar amp. Emboldened by the KSM141's 170 dB SPL rating (with the 25 dB pad engaged, that is), I fired up my Mesa/Boogie Dual Rectifier amp, plugged in a Fury Baritone guitar, and cranked out some truly wall-rattling tones. With the microphone positioned close to the grille cloth, aimed between the speaker's cone and surround, I got a huge, ballsy sound. However, though tonally the sound was excellent, it still seemed a bit slow compared with the sound of the amp.

The KSM141's dark presentation tamed the nasty nature of the jingles.

A quick switch to a hypercardioid dynamic microphone I often employ on high-decibel amps yielded a less satisfactory sound as far as transient attack was concerned, and the amp sounded smaller to boot. Going back to the KSM141 and switching it to omni mode opened up the sound quite a bit, but also allowed some unwanted interaction with reflections from the floor. I was able to alleviate that problem easily enough, though, by putting a small, thick floor mat in front of the amp. The resulting sound was much more like the amp actually sounded.

KSM COUSINS

The Shure KSM141 is a rugged, well-featured, and versatile small-diaphragm condenser microphone. Having two polar patterns—cardioid and omnidirectional—as well as a choice of low-cut filters and attenuation pads extends the mic's suitability for a range of applications.

Sonically, the KSM141 is not exactly transparent, nor is it airy and open sounding. Rather, it tends toward a darker, drier presentation than other small-diaphragm condensers I am familiar with. In fact, the KSM141 made me think of a Shure SM57 on steroids—it's a bit brighter and faster than that legendary dynamic, but it definitely has a 57 vibe. There's a kind of hard and flat (one-dimensional) quality in the midrange, and both the highs and lows—especially the lows—sound overly rolled off. In addition, the KSM141 does not exhibit exceptional transient response, at least as compared with similar condensers.

Just the same, the KSM141 did a nice job on a variety of instruments. I loved it on djembe, and its dark quality helped smooth out some harshness on a tambourine. Recordists with particularly bright sound sources—or overly bright recording spaces—may find the mic helpful for taming edginess. In general, I liked the KSM141 better in omnidirectional rather than cardioid mode—the lows are much better represented in omni. Still, to my ear the KSM141 does not sound as good overall as certain other comparably priced microphones, and it is considerably more expensive than many other small-diaphragm, electret-type condensers currently on the market.

Richard Alan Salz *is a producer, engineer, and composer living in southern Vermont.*

World Radio History

LEXICON

MPX 550

Killer reverb and multi-effects in an affordable package.

By Nick Batzdorf

Lexicon reverbs have a distinctive sound that has made them a staple in the studio. Dense, smooth, and full of character, the reverb just seems to stick to whatever you run through it. To many musicians and engineers, mixing without a Lexicon reverb in their palette is like painting without one of the primary colors.

Lexicon's multi-effects processor, the MPX 550 Dual Channel Processor, offers a lot more than the company's famous reverb algorithms. The unit's 255 factory programs include a variety of time- and frequency-based effects as well as dynamics processing. This means the MPX 550 can be used as an insert, across the stereo mix bus, or between an instrument and an amp.

LEXICHIP INSIDE

Lexicon reverbs rely on a custom processor called the Lexichip. Although the MPX 550 uses only one Lexichip, its features and sound quality bring it well above the entry level.

The MPX 550 offers two discrete channels. You can use it as a stereo or dual mono processor, or run two mono signals through different effects and keep them separate. Some of the programs throw all the available horsepower at one high-quality effect; the reverbs are a good example of this.

The MPX 550 includes S/PDIF digital I/O, balanced analog ¼-inch and XLR I/O, and MIDI I/O (see Fig. 1). The processor offers extensive real-time MIDI control, including the ability to sync delay times and modulation rates to MIDI Clock. It can even get its tempo from a suitable audio source.

TWISTING AND PUSHING

At the center of this 1U device is a backlit LCD that displays the current program, a graphical representation of the DSP building blocks and how they're patched together, and level meters. Even though it's possible to go as far as five screens deep when editing, the MPX 550's interface is very easy to navigate and understand.

The MPX 550 includes four rotary encoders to the left of the LCD. Each knob's function is labeled at the bottom of the screen, rather than directly over the knob itself. The large rotary knob on the other side of the screen scrolls through presets and user programs, and you can push it to get to Banks. Normally, the current program remains active until you push the Load button, but there is a preference setting that causes the device to load programs automatically when you park on them for a short time. Once chosen, the programs load quickly.

The Bypass button can mute the entire unit, mute the input only (so you hear only the effects at the output), or pass the input directly to the output through the unit's 24-bit digital converters. This last feature allows you to use the MPX 550 merely as a 24-bit A/D converter. You can also send the dry signal through the digital outs while the analog outs carry the wet signal, which is useful in situations such as live recording.

GET WITH THE PROGRAM

The preset programs are arranged in five categories: Single, where the entire processor is used for one effect; Dual, which gives you two effects simultaneously; Special Effects; Mastering Dynamics; and Live-FOH (front of house) for live applications. Within each category, programs are grouped into Banks of similar types of effects, such as plate reverbs, hall reverbs, and gated reverbs.

Remarkably, the MPX 550 provides the same level of editability that you'd get from more expensive Lexicon processors, which is something I didn't expect. But it's not always necessary to dig deep into the menu layers when editing. The first soft knob is assigned to a control labeled Adjust. This gives you instant access to predetermined parameters that Lexicon thinks you would reach for first when tweaking a particular program. In the hall reverbs, for example, Adjust moves the midfrequency reverb time and the decay slope simultaneously. On plate reverb programs, the Adjust parameter controls the reverb decay and high-frequency rolloff simultaneously. In other programs, Adjust controls only a single parameter, such as feedback in a delay program.

The MPX 550 includes a wide variety of delay programs in various rhythmic configurations. You can select a standard delay that merely repeats the

FIG. 1: The user interface (top) of the Lexicon MPX 550 is clean and simple. It features a large LCD screen and four soft knobs that make editing a snap. The rear panel (bottom) includes analog ins and outs on XLR and balanced ¼-inch jacks, digital S/PDIF on RCA coaxial jacks, and MIDI I/O.

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original sound, or a filtered tape-echo simulation where the sound gets darker with each repetition. Or you can program the delay so that each of the six independent delay channels changes relative to the current tempo setting.

Single programs include tremolo, chorus, flange, pitch-shifting, and delay/echo, which offers 5½ seconds of mono delay with up to six taps and feedback. The MPX 550 includes a lovely rotating speaker program, Rotary, that is based on the Leslie Model 122, which simulates the woofer and tweeter spinning in opposite directions.

The dual programs are designed to get more mileage out of the unit. These programs consist of flange, chorus, or pitch-shifting, with reverb or delay. They're arranged in various configurations, such as in series or in dual stereo. In general, the dual programs don't sound quite as rich as the single programs, but they're completely usable.

As you would expect with a Lexicon device, the MIDI implementation is well thought out. MIDI controller numbers are preassigned to editing parameters, and you can easily change the assignment from the front panel. Alternatively, you can set the assignment by having a knob learn what MIDI controller you're moving; the distance you move the controller scales the distance necessary to move the parameter through its range. MIDI is also used for program changes, and you can dump and load the entire user bank, the current program, or the system setup. All of the MPX 550's program parameters can be controlled using MIDI System Exclusive data.

MPX 550 Specifications

Analog Inputs	(2) XLR; (2) ¼" TRS
Analog Outputs	(2) XLR; (2) ¼" TRS
Digital I/O	(1 pr.) S/PDIF (RCA coaxial)
Other Connections	MIDI In, Out/Through; ¼" TRS footswitch jack
Preset Programs	255
User Locations	64
A/D Converters	24-bit
D/A Converters	24-bit
A/D Dynamic Range	105 dB
D/A Dynamic Range	101 dB
Internal Processing	24-bit
Frequency Response	20 Hz–20 kHz (±1 dB)
Sampling Rates	44.1 and 48 kHz (selectable)
Dimensions	1U × 4" (D)
Weight	3 lb.

DYNAMIC TRIO

The final edit page of every program (except the mastering-oriented dynamics programs) accesses a compressor. Signals going to an effects processor often benefit from extra dynamics control, so it's nice to be able to apply that right inside the box. You can set the compression parameters globally or use the ones stored with each program.

The MPX 550 also includes dynamics processors for mastering, including peak limiting, expansion, and compression. The expansion and compression programs have a fairly subtle saturation algorithm, available in "modern" and "vintage" variations. The result is an increase in density with a slight loss of clarity. My preference would be to use it on individual tracks or possibly groups of tracks rather than an entire

MPX 110

Lexicon's entry-level MPX 110 ($299) updates the MPX 100 with higher-resolution converters (24-bit versus 20-bit) and internal processing (24-bit instead of 16-bit). The MPX 110 also offers some of the Banks of single and dual programs found in the MPX 550, but without the LCD screen of its larger sibling. Instead, you use a 16-position rotary encoder to select programs (see **Fig. A**).

The MPX 110 comes with 240 presets and 16 user slots. The processor has unbalanced, high-impedance analog inputs designed to accept instrument or line-level signals, and unbalanced outputs (although the left output can power a pair of headphones). There's a S/PDIF output on the MPX 110 with 24-bit, 44.1 kHz resolution, but no digital input. You can use the MPX 110 as a standalone 24-bit A/D converter by engaging the effect bypass switch. Overall, the MPX 110 is a simpler, less programmable unit than the MPX 550. However, it includes the Adjust control, which behaves the same way as the one on the MPX 550, and many parameters can be controlled with MIDI. Priced at $299, the MPX 110 is an unbeatable entry-level effects unit that offers a wonderful collection of programs.

FIG. A: The Lexicon MPX 110 lacks the MPX 550's LCD screen but offers instant access to many important features.

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PRODUCT SUMMARY

Lexicon
MPX 550
multi-effects processor
$649

FEATURES	4.0
EASE OF USE	4.5
AUDIO QUALITY	4.5
VALUE	4.0

RATING PRODUCTS FROM 1 TO 5

PROS: Good sound quality. Excellent selection of programs. Easy interface. Quick access to programming parameters. Hassle-free digital I/O.

CONS: Mastering effects reduce input level.

Manufacturer
Lexicon, Inc.
tel. (781) 280-0300
e-mail info@lexicon.com
Web www.lexicon.com

mix, in order to keep detailed instruments, such as cymbals, out of it.

One thing that surprised me about using the S/PDIF digital I/O with the MPX 550's Mastering Dynamics programs is that the effect reduces the input level. You have to raise the gain to 7 in order to match the level of the bypassed signal, even when all the parameters are set flat.

A BIG DEAL

While there are differences in the complexity of the reverb sound when you compare the MPX 550 with the high-end Lexicon processors—I used one of my NuVerb cards for comparison—the differences are subtle. The MPX 550's reverbs are great, and the other effects are equally outstanding.

The factory programs cover a wide range of applications very well: the vast majority of the programs are useful, bread-and-butter effects. Overall, the MPX 550 is a sophisticated, versatile processor that sounds better than what you'd expect from a multi-effects unit in this price range.

Nick Batzdorf *is a writer, composer, and general audio nerd who hails from Los Angeles.*

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ANALOGUE SOLUTIONS

BLACK COFFEE

A feature-packed analog synth module with MIDI.

By Mike Peake

Analogue Solutions' Black Coffee is an analog synth module that maintains much of the sonic character of larger analog synths but in a portable package and at a reasonable cost. It is housed in a rectangular, black plastic case that is slightly larger than a stack of paperbacks. But don't let its size fool you—the Black Coffee offers an impressive amount of functionality within the space of most single-function analog synths.

The Black Coffee crams an entire analog monosynth into what is typically a single panel of a modular synth. Analogue Solutions gets extra programming mileage by including six push/pull pots and using ¼-inch jacks.

A HINT OF VINTAGE

The Black Coffee was designed in the tradition of early monophonic synths, but with the modern convenience of a built-in MIDI-to-CV converter. The module is a complete synth in itself, combining an oscillator with sawtooth and square waveforms, a suboctave generator, an LFO with sawtooth and square waveforms, an AR (attack and release)–style envelope generator (EG) with switchable sustain, a noise generator, a lowpass filter, a ring modulator, and a VCA.

On the front panel are eight ¼-inch jacks for patching to and from external sources. The jacks include CV inputs (pitch, pulse-width modulation, oscillator sync, filter cutoff, and trigger), an audio input, and two audio outputs, including an LFO output. The front panel also includes ten knobs and six switches. Six of the knobs act as 2-position (push/pull) switches.

The rear panel houses an additional audio input and output, MIDI In and Thru ports, a MIDI-channel selector, a manual-trigger button, and a CV pedal input and associated level control (see Fig. 1). Four large rubber feet help keep the module from sliding around as you work.

If you want to mount it in a Euro subrack, the Black Coffee can be purchased without the case, power supply, or MIDI ports ($339). In a modular configuration, it is compatible with other modules from Analogue Solutions as well as those from Analogue Systems and Doepfer.

TONEHENGE

A front-panel Tune control adjusts the Black Coffee's slightly gritty oscillator over a two-octave range. MIDI and external CV signals extend the pitch range to six octaves.

The Mix control is used to select the oscillator waveform: turn the control fully clockwise, then pull the knob to get a sawtooth wave or push it for a square wave.

A toggle switch next to the Mix knob selects whether noise/suboctave or ring modulator/external audio is mixed in with the oscillator. The in/out position of the knob determines which signal is heard: with the Mix pot pushed in and set fully counterclockwise, setting the switch to Noise/Sub will give you the noise source. Pull the Mix pot out and you will hear the suboctave oscillator. Set the toggle switch to the Ring/External position and turn the Mix pot counterclockwise to get the ring modulated signal when the pot is pushed in, or the external audio signal when the pot is pulled out.

The Black Coffee oscillator doesn't track perfectly throughout its entire range. For melodic material, it's most useful within a four-octave range. However, it can be optimized for a particular range by adjusting the internal Scale and Tune controls. The tracking artifacts do, however, add somewhat to the Black Coffee's vintage sound.

The warm, Moog-style 24 dB lowpass filter can be set into self-oscillation. Pulling out the Cut-Off control adds audio-rate frequency modulation from the oscillator. The result is a nice fattening and slight brightening of the sound when filter resonance is absent, and an edgy, aggressive sound when resonance is added.

However, when the Mix knob is set to either extreme, you can hear bleed-through when the filter-frequency control is set near minimum. The bleed-through can be reduced by keeping the Mix control between the 9 o'clock and 3 o'clock positions when using the sawtooth wave. But when the square wave and noise generator are selected, you can hear noise bleeding into the filter, even when the Mix control is set fully clockwise.

Although the Black Coffee has a Moog-style filter, it self-oscillates at a much lower frequency than the original Moog-modular filter. But as with other filters of this design, bass response decreases as you increase resonance. This allows you to create mid-bass kick drums as well as snappy percussive sounds.

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CONTROL AND CONQUER

The Volume control is also a push/pull knob. When pushed in, the EG controls the module's VCA. When the Volume pot is pulled out, you can use another switch to select between two modes of operation. In Drone mode, an external signal passes through the module regardless of a key trigger. In Gate mode, the volume turns on sharply with each note, remains at full volume as long as a note is held, and then falls to silence immediately after the note is released. Gate mode allows you to use the EG to sweep the filter and oscillator at different rates.

The Black Coffee's EG has a fast, snappy response and a maximum release time of 26 seconds. Unfortunately, the attack time doesn't go beyond 3 seconds. The VCA exhibits an audible tick in response to minimum envelope times. It's also a tad noisy, but well within a musically acceptable range. In addition, loud, high-frequency signals fed into the external audio input are audible even when the module's volume is turned off.

The LFO comes with controls for frequency and depth, and you can select either a triangle or square waveform. To modulate the oscillator's pitch with the LFO, pull out the Tune control and choose one of the two predetermined speeds. To modulate the filter, pull out the EG Mod control. An LED displays the LFO rate.

The EG or LFO can modulate the pulse width of the oscillator's square wave by a predetermined amount. The LFO amount is musically satisfying, but the EG amount is a bit too subtle for my tastes.

PRODUCT SUMMARY

Analogue Solutions
Black Coffee
analog synth module
$595

FEATURES	3.5
EASE OF USE	3.5
AUDIO QUALITY	3.5
VALUE	3.5

RATING PRODUCTS FROM 1 TO 5

PROS: Multiple features in a small space. Portable. Built-in MIDI-to-CV converter. Externally patchable. Audio input.

CONS: Unable to defeat MIDI. Audible signal bleed-through. Incompatible with some MIDI-to-CV converters. Plastic case seems fragile. Dark blue graphics are difficult to read in dim lighting.

Manufacturer
Analogue Solutions/Sweet Noise (distributor)
tel. (818) 980-6983
e-mail info@analoguesolutions.com
Web www.analoguesolutions.com

Black Coffee Specifications

Sound Engine	analog subtractive synthesis
Polyphony	1 note (monophonic)
Audio Inputs	(1) ⅛" on front panel; (1) ¼" on rear panel
Audio Outputs	(1) ⅛" main and (1) ⅛" LFO, both on front panel; (1) ¼" main on rear panel
Patch Cord Connections (CV and audio)	(8) ⅛" minijacks on front panel; (3) ¼" and (1) ⅛" on rear panel
Sound Sources	(1) VCO; (1) suboscillator; (1) LFO; (1) noise generator
Filter	(1) resonant lowpass; 24 dB/octave
Effects Processor	(1) ring modulator
Amplifier	(1) VCA
MIDI-to-CV Converter	MIDI In and Thru; pitch, modulation, gate, accent, and legato
Power	15VAC, 500 mA wall wart
Dimensions	4.00" (W) × 5.25" (H) × 8.00" (D)
Weight	2.2 lb.

World Radio History

FIG. 1: The Black Coffee's rear panel includes MIDI In and Thru ports, a trigger button, and ¼-inch jacks for audio input, audio output, and CV pedal input.

JUST ADD MIDI

The Black Coffee synth includes MIDI functionality, albeit at a bare-bones level. Rear-panel DIP switches select the MIDI channel, and all MIDI-to-CV connections are internally set and cannot be defeated. For example, Velocity and Pitch Bend control the filter cutoff by a fixed amount, and a Note On sends a gate signal to the EG.

However, MIDI control gives you access to the Black Coffee's otherwise hidden slew generator: when two notes are played simultaneously, a small amount of portamento is automatically introduced between them, an effect reminiscent of the Roland TB-303. The MIDI interface also lacks normal pitch-bending capabilities, signifying to me that it is intended for pattern-based, note-entry sequencing rather than, say, keyboard soloing.

I also connected the Black Coffee to external MIDI-to-CV converters with a limited amount of success—one of my two converters would not trigger the EG. I tried the manual's suggested work-around of patching the LFO square wave output to the EG trigger input. In both instances, the trigger LED lit, but the EG didn't fire. The Manual Trigger button on the rear of the unit functioned consistently.

IS THIS BREW FOR YOU?

The Black Coffee packs a surprising amount of features into a small box. It excels at slightly menacing Moog-style bass sounds, especially when the sub-octave oscillator, pulse-width modulation, and filter frequency modulation are combined.

As a simple module—without the case and MIDI features—the Black Coffee is a bargain and would be a good place to begin building a modular synthesizer. But as a tabletop unit, the Black Coffee is a nice alternative to buying a vintage monosynth and adding a MIDI retrofit. It has a desirable character all its own.

Mike Peake *has been a modular-synthesizer enthusiast since 1978.*

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Quick Picks

IK MULTIMEDIA

AmpliTube (Mac/Win)

By Steve Broderson

Maybe you noticed the 2003 **EM** Editors' Choice for the best individual signal-processing plug-in. If you attended this year's Macworld Expo in San Francisco, you also might have heard a guitarist wailing onstage with nothing but his guitar and a PowerBook. AmpliTube ($399), from Italian software developer IK Multimedia, is a VST, HTDM, RTAS, and DX plug-in that lets you craft your electric guitar tone using software that models some of the most enduring amplifiers and effects in music.

Stages of Life

AmpliTube's interface simulates three stages of an electric guitar rig's signal flow: the Stomp module (for footpedal effects), the Amp module (emulating a preamp and power amp), and the Post FX module (providing stereo effects). Each stage adds its tone-shaping character to the guitar's sound. A noise gate with selectable sensitivity precedes the first module.

IK Multimedia's AmpliTube is a software plug-in that emulates a guitar amp and effects. Its tone-shaping modules are Stomp, Amp, and Post FX.

The Stomp module provides five effects—chorus, delay, flanger, overdrive, and wah—modeled after classic analog stompboxes. You can use a MIDI expression pedal to control the wah effect (depending on your host software). Each virtual stompbox models the analog circuitry of the box that it's emulating and provides the control knobs you'd expect for each.

The Amp module offers preamp, EQ, power amp, cabinet, and mic selections. Tremolo and spring-reverb controls duplicate those found on a conventional combo amp. You can mix and match the combinations of amp, EQ, preamp, and cabinet or lock the components into the configurations on which they were modeled. A master Output control compensates for the wide gain differences you'll encounter with different models.

The Post FX module supplies reverbs, delays, and parametric equalization, all in stereo. Its capabilities go beyond the Amp module's spring reverb and amp-head EQ and the Stomp module's mono delay.

Plug-in Power

AmpliTube's user interface is beautiful, complete with glowing tubes and vintage-style knobs. Turning the knobs is tricky, however; a MIDI control surface would definitely help. In addition, the text is so tiny that if you have a small laptop or a fuzzy monitor, you could be in for some serious squinting. A pull-down menu provides access to many preset amp-cabinet-effects combinations, and more are available for download. You can also save your own preset configurations, of course.

Although it will process recorded tracks, you'll probably want to hear AmpliTube's effect on your sound as you play the guitar. For that, your host software must be able to monitor a live input through plug-ins, which isn't a problem for most DAWs. You'll also need a low-latency ASIO 2.0 card and a high-impedance input into your computer for the best possible sound. A direct box with a gain control is recommended. For my tests, I used Roland's SI-24 studio interface and RPC-1 card connected to a dual-processor Mac G4. Latency was negligible.

As of this writing, IK Multimedia is set to launch AmpliTube Live for Mac OS X. Live is a standalone version of AmpliTube that uses the Mac's audio I/O for very low-latency playback.

Virtually Real

When I tested AmpliTube using a Les Paul, Rickenbacker 360, and Stratocaster copy, its performance was nothing short of amazing. Three other guitarists who dropped by concurred that AmpliTube sounded and reacted like a guitar amp. The Post FX reverbs are better than many plug-ins I've heard. Clean sounds (especially the tube models) were punchy and present, and every gain point between edgy and over-the-edge distortion was colored with lush overtones. AmpliTube's real power is that it inspires like a well-crafted amplifier should.

Five years ago, guitar players would have snickered at the suggestion of including a computer in their live rigs, especially if it was to be the centerpiece of their tone. After hearing AmpliTube, though, some of them might be willing to trade their stack for a Mac. Download a demo and hear what I mean.

Overall EM Rating (1 through 5): 4.5

IK Multimedia; tel. (866) 243-1718 or (772) 466-9763; e-mail ikmus@ikmultimedia.com; Web www.amplitube.com

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By Myles Boisen

When it comes to complex recording setups involving multiple mics, phase problems can be hard to avoid. Drum-set miking provides the classic example: with so many sound sources being picked up by an array of mics, some parts of the kit will often "cancel out" or undergo tonal changes when tracks are panned and mixed together. The phase difference

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Quick Picks

ZERO-G

Beats Working

By Dan Phillips

Sometimes it's hard not to judge a book by its cover, especially when its cover looks really, really good. Take Zero-G's *Beats Working* drum loop library, for example. It's packaged in an ultraslick custom metal case with the Zero-G logo embossed onto a separate shiny plate. The $495 collection includes 11 CDs: 9 with 24-bit, 5.1 surround-format data for Digidesign Pro Tools, and 2 (also available as a separate $129.95 set) with the same material mixed down to 16-bit stereo in audio and Acidized WAV formats. It's very cool.

Moreover, this library boasts a noteworthy pedigree. Producer-engineer Haydn Bendall—whose credits include Kate Bush, XTC, and Paul McCartney—recorded the drums in Abbey Road's gorgeous-sounding Studio 2. Behind the kit was drummer Ralph Salmins, whose diverse credits run from Tom Jones to Madonna to Björk.

With its cool packaging, impressive credentials, and multiple gigabytes of data, you naturally expect great things from this library. And what do you get?

Grooves Galore

To start with, you get 38 basic grooves that are organized into five main sections: Classic Modern Grooves, Odd Time Grooves, Big Band Grooves, Modern Pop Kit, and Filmic Grooves. Each groove has from 6 to 39 variations. The CD booklet—one of the best I've seen for a loop library—includes a brief but helpful description for each groove.

Among my favorites are the swaying groove of African Style 9/8 118 bpm; the smooth and lovely MK Brush 70 bpm; and the great-feeling, totally solid groove of Medium Pop Tight 94 bpm. The simple, atmospheric Filmic Multirods 83 and 90 bpm—featuring loose-sounding doweled sticks on toms—seem custom-made for suspense scenes. The *Beats Working* library also includes a variety of jazz grooves, including several big-band "Crooner" grooves and Jazz Brushes 118 bpm, with its easy-flowing feel and beautiful timbre.

Packaged in an eye-catching metal case, Zero-G's *Beats Working* drum loop library offers a wide range of commercial styles in stereo or premixed for 5.1 surround projects.

Speaking of timbre, all the multitrack material sounds absolutely fantastic. It includes the six standard channels of 5.1 surround—left, right, center, left and right surround, and LFE (Low Frequency Effect)—

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along with separate stereo tracks of both near and far ambience.

Ready Mix

The premixed 5.1 tracks make it a piece of cake to drop drum loops into a surround project, and the selection of different natural acoustic ambiences is extremely handy for good old-fashioned stereo production. I particularly enjoyed pumping the far ambience tracks through some extreme compression and then mixing them back in with the dry stereo mix.

The stereo mixes in the audio/WAV version are a reasonable approximation of the multitrack recordings, but I came across a few troublesome flaws, including some bad splices (resulting in flam effects) and a couple of strange zipper artifacts on fade-outs. Some of the jazz mixes also seem a bit too heavy on the low end. In all cases, the problems are not present in the multitrack data.

Play Time

Some of the performances are more of an issue for me. Salmins seems completely at home with the jazz material, approaching the rhythms with ease, grace, and flair. His jazz sensibility, however, doesn't always translate well into pop and rock grooves. Several otherwise excellent tracks—including Up Pop 1 and 2, Stompy Pop, and Modern Kit 110—are marred by inappropriately busy ghost notes on the snare. I found myself wishing that simpler, more straightforward versions were available.

Make no mistake, though: these are great-sounding drums played in a classic room and recorded by a skilled engineer. I only wish that more care had been taken in creating the stereo version and that drummer Salmins had tempered the jazz influences on his pop and rock beats. If the packaging were all that counted, *Beats Working* would clearly be the undisputed champion of rhythm libraries. As it is, this massive 11-disc loop collection is generally quite good, although it falls a bit short in several places. ❦

Overall EM Rating (1 through 5): 3.5

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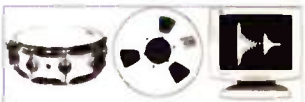

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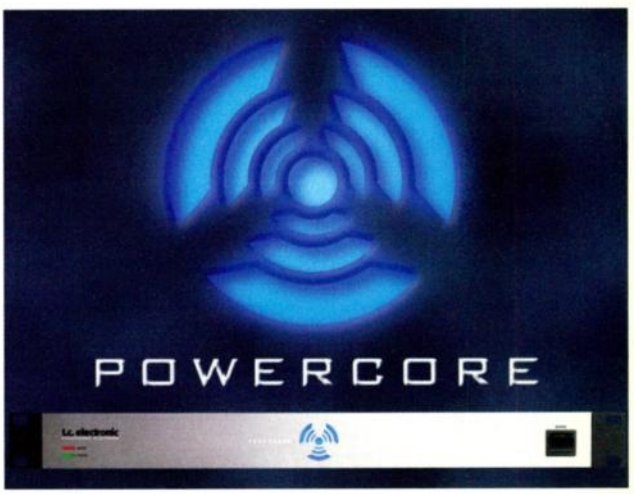

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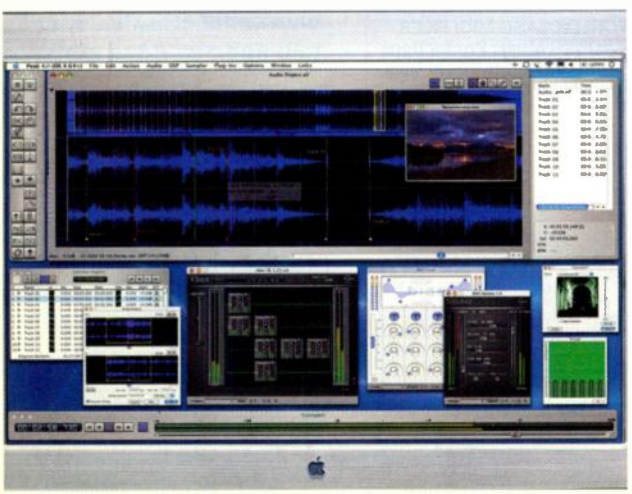

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By Larry the O

Free Games for May

After many, many years of doing audio post-production for film and TV, as well as music recording, I entered the world of sound for games just over eight years ago. Starting at LucasArts Entertainment (and now continuing at Electronic Arts), I quickly found game development to be completely different than anything I'd done before. The audio skills I had spent years honing turned out to be less than half of what I needed to do the job.

Now, being somewhat more experienced, I mulled those differences as I slogged my way through another massive work crunch in preparation for the all-important E3 (Electronic Entertainment Expo) trade show, held each May in Los Angeles. E3 is the primary U.S. trade show at which every game company tries to get the press and public drooling over the games they intend to ship at Christmastime.

The fact is that making games is more difficult than all other audio tasks I've ever undertaken, which, in addition to studio work, have included live sound, retail sales, and even being a bench technician. I have several times seen film audio people try their hand at games and tell me, "Holy cow! This is *hard*!"

What makes audio production for games such an imposing challenge? There are many factors: first, games are software, so game development is actually software development. Second, unlike for film and TV, game audio is not a post-production process; it is part of production, because the audio is designed and built at the same time as the game. Third, game play is real time and, to a great degree, unpredictable. Fourth, regardless of the quality of the production facilities, playback of the finished product must be accomplished with an extremely limited set of resources. Adding to this last fact is the economic necessity for many game developers to deliver a title on multiple platforms, each of which has its own unique set of extremely limited resources.

Starting at the top, that games are software introduces elements of unpredictability. That is because one can't always predict bugs and how long they'll take to fix or whether a projected strategy will have a major flaw that materializes only after considerable time and effort has been expended.

The aspect of game audio being production instead of post-production means that the task is often undefined at the point that audio production needs to start. It's difficult enough to have to make sound for picture when there's no picture; worse, it is often unknown which sounds need to be built. Furthermore, things keep changing until the product ships.

Unlike an album or soundtrack, the real-time nature of game play makes it impossible to create a static mix because the sounds that are playing at any given moment will differ every time the game is played. Mixing is an iterative process of successive approximation: changing an element, playing the game, changing it again, and doing that for each of the many hundreds of elements until an acceptable compromise is reached.

Very limited resources force the game-audio designer to be a MacGyver of sound, using clever tricks, resourcefulness, and arcane knowledge garnered only through hard experience to surmount or work around the limitations. My great friend, game-audio pioneer Clint Bajakian, says, "When I go to parties and people ask me what I do for a living, I tell them I do sound and music for games. But what I really do is overcome obstacles to doing sound and music for games."

In the liner notes of Little Feat's album *Feats Don't Fail Me Now*, the late Lowell George wrote, "Do not be deceived by, nor take lightly, this bit of musicianship that one describes simply as 'bass.'" I certainly agree with that statement as it stands, but I also find it equally applicable to game-audio production. I have not even touched on music composition for games, which is a whole different kettle of impossibly difficult fish. Keep that in mind as you put James Bond through his paces in the next game title bearing his name.

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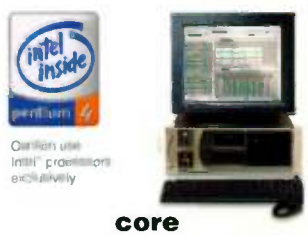

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