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YAMAHA 01X,
TASCAM 2488,
CLAVIA NORD MODULAR G2,
AND 10 MORE

Little Feat
MAKING TRACKS ON THE FARM

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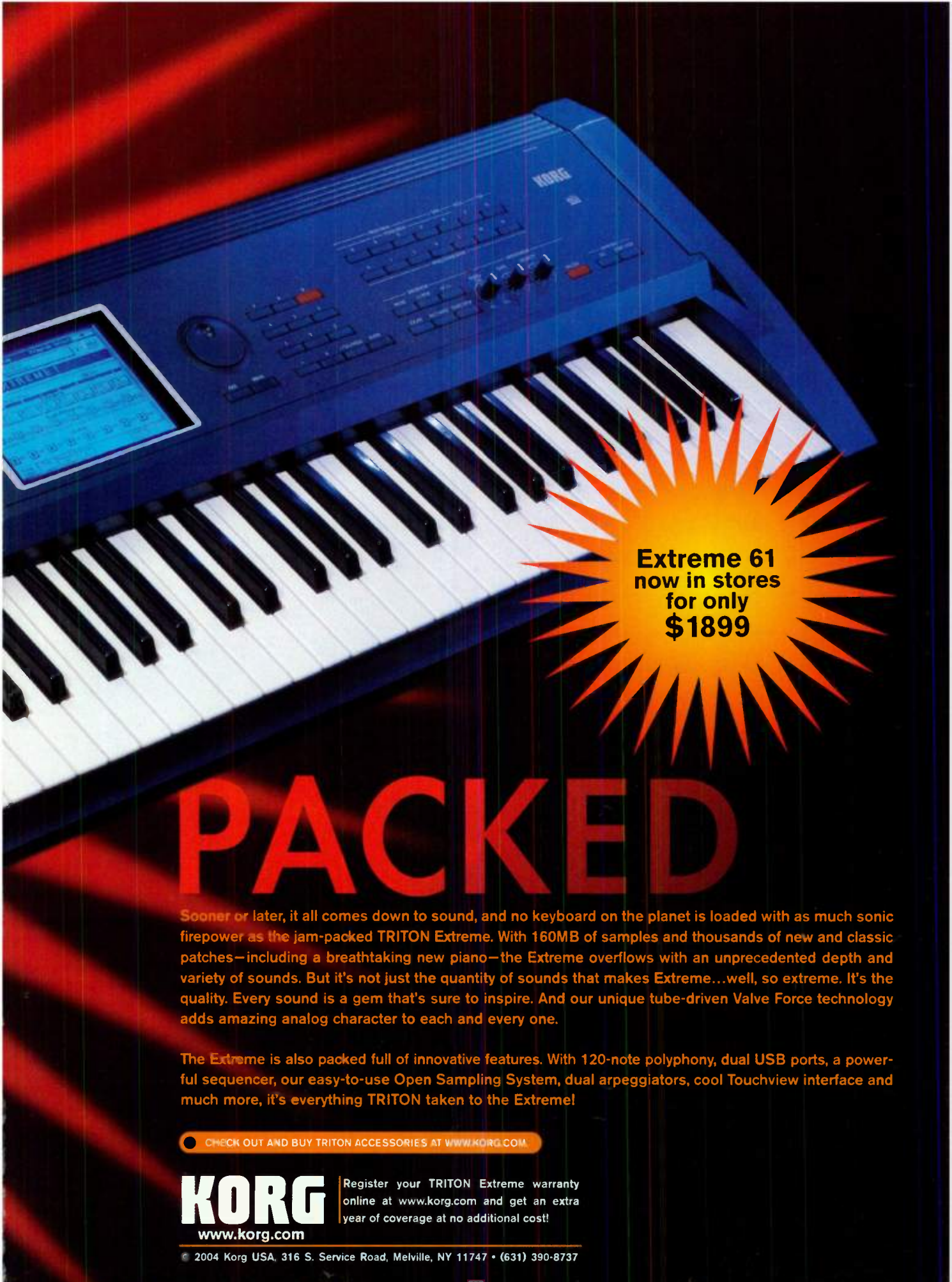

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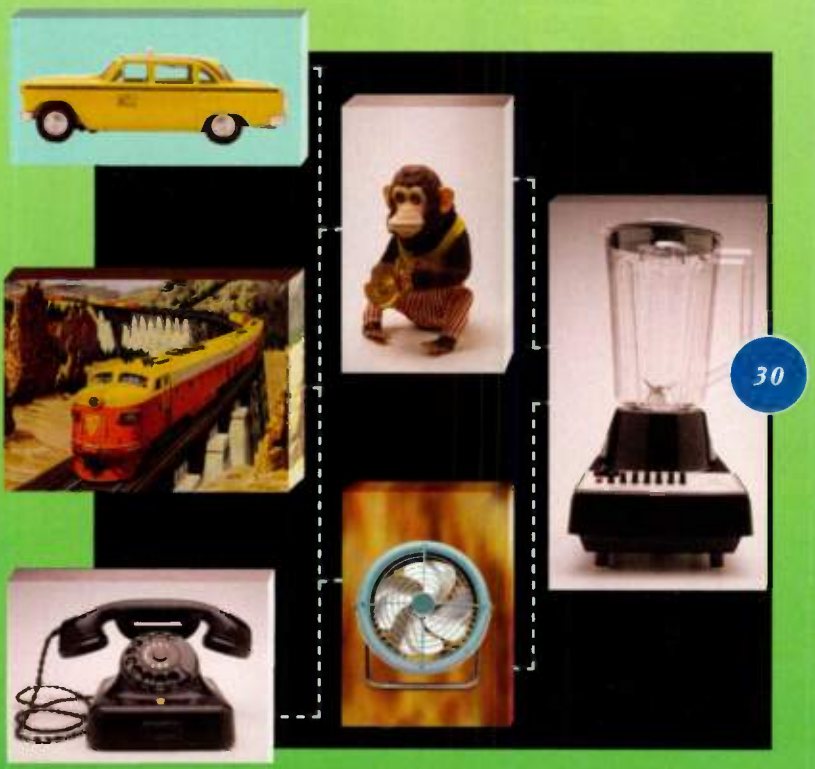
Enhancing your Web presence with audio is easier and more rewarding than ever before! We show you how to take advantage of current technologies to sonify your Web site, including the basics of audio compression, writing HTML code to stream audio, Web multicasting, and the latest file formats.

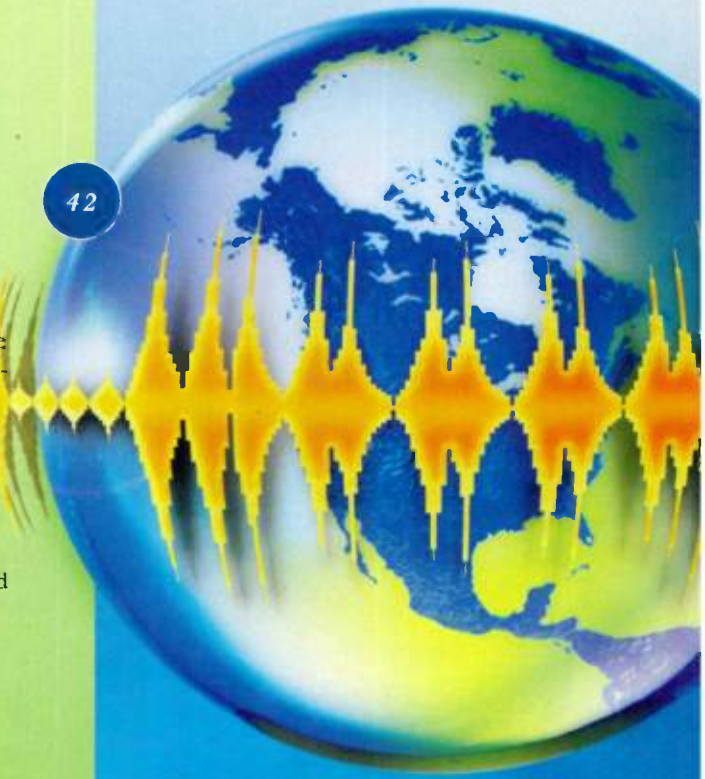
By Thad Brown

54 PRODUCTION VALUES: TRACKIN' IT AT THE BARN

Little Feat recorded its latest CD in an old barn, but the band wasn't just horsing around. Engineer Gil Morales and band members Paul Barrere, Fred Tackett, and Bill Payne reveal how they transformed a farm building into a project studio; recorded tracks that met their high standards; and coped with rain, mud, and the unexpected arrival of the police.

By Mike Levine





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Spreading Your Web

DAN PHILLIPS

The history of the record business is a cyclical one, in which many small labels consolidate but then a plethora of new labels arises. Initially, there were plenty of small labels. The first round of consolidation, to my knowledge, happened when RCA bought Victor and HMV merged with Columbia Graphophone to form EMI. But more new labels sprung up because it was fairly easy to start a record company then. First we had variety, then consolidation, then variety again. The pattern has been repeating ever since. During all cycles, however, the vast majority of musicians reaped few financial rewards from their recording careers.

Today, a variety of small labels still abound, but most have a tough time getting airplay—the traditional way of promoting new music. Recording musicians and indie labels would be in a much worse squeeze except for two saving factors: the evolution of the professional-caliber personal studio and the growth of the Web. With pro-quality, low-cost recording in hand and the Web as a marketing and distribution tool, we can create our own profitable record labels. We are in the variety part of the cycle again, this time with a chance to make it last, even though the mainstream media and major labels are still consolidating. That's because we finally have a viable and affordable alternative marketing tool that serves as a sales and distribution system—and that has been the missing piece all along.

The Web enables us to reach our audience directly. We don't even have to get our music into record-store chains, although we do have to find creative ways of promoting our sites and sounds. We can create Web sites that are at least the equals of anything the large labels have. That said, the big labels can still promote their product in ways that the rest of us can't, and they still have a near lock on radio airplay. The majors will retain the big-name acts.

However, there may be leveling forces at work. Webcasting could eventually prove a viable alternative to radio, especially when most people are able to receive Webcasts in their vehicles. Musicians who don't care about superstardom will increasingly be able to find success without playing the major-label game at all.

Of course, to sell and distribute our music on a larger scale and be the masters of our Web sites, we have to know something about Web design, HTML, and even search-engine optimization. We also need to understand how to make streaming audio work, but that's the sort of skill many electronic musicians will enjoy learning. Whether to provide promotional clips for consumers to audition or to create a full-blown Webcast, it pays big dividends to make your music stream properly.

To this end, we've taken a fresh look at streaming and other Web-related topics in Thad Brown's "World Wide Waveforms" on p.42. So settle in and get ready for a story that will help you propel your music into the Webstream.

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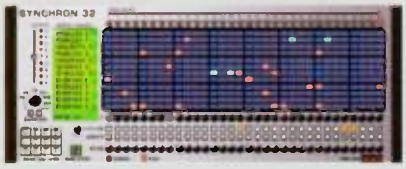

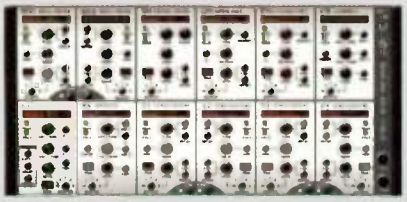

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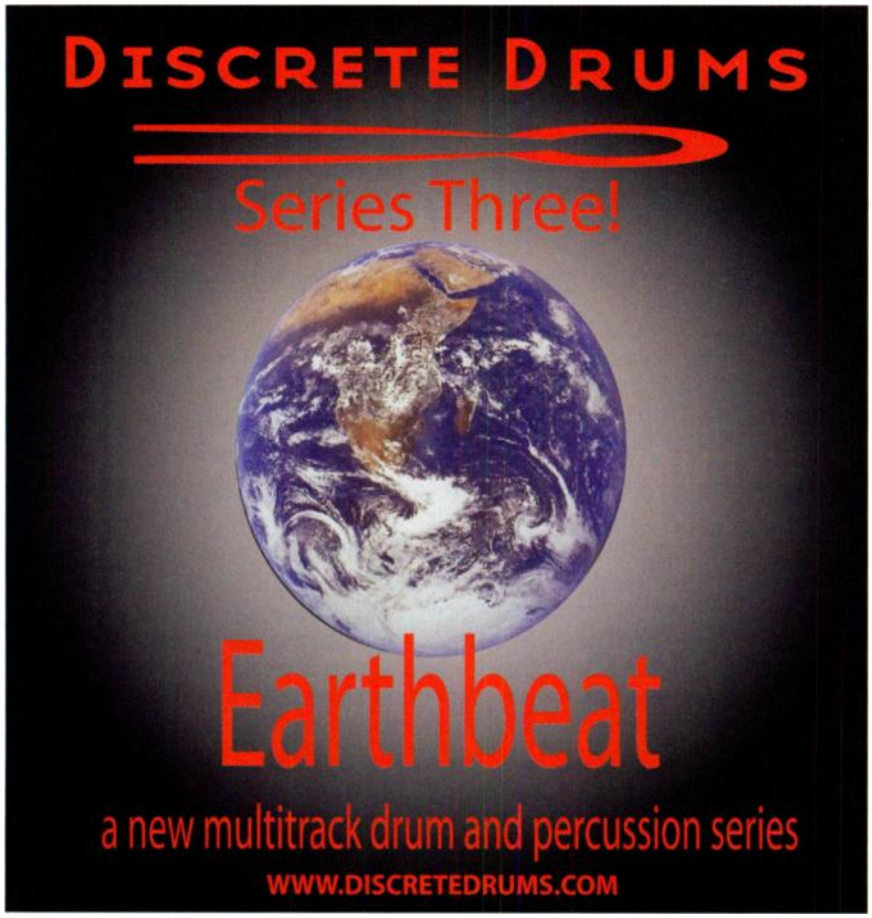

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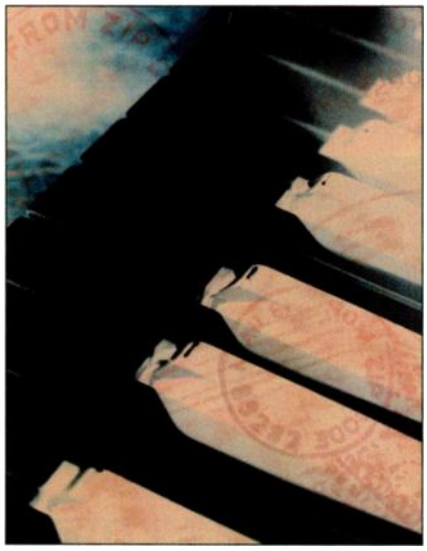

LIZ HEAVERN

WE GOT THE BEAT LITERATURE

I am so glad to that your magazine published the article "Beat Generation" in the September 2004 issue! In fact, I subscribed to EM almost a year ago hoping to come across this exact article.

It would be great if your magazine could do a follow-up article about products that allow you to use drum beats—that were created with a computer—in a live concert situation, using a laptop, sampler, iPod, and so forth. What better magazine than EM to do it?

Wes Grasty
via email

PRODUCER'S CREDIT

As a young producer, I'm writing to praise Lory Kohn's article from September 2004 ("Working Musician: Do You Need a Producer?"). I appreciate having an article that explains how producers can be a great asset to young artists, providing experience and knowledge both before and during a recording session. I enjoyed the article so much that I'm going to recommend it to all of my prospective clients so that they will better understand my role in their projects.

Thanks and keep the great content coming.

Jimy Soprano
Trod Nossel Recording
Wallingford, Connecticut

STEINBERG'S REORGANIZATION

This letter is in response to your magazine's editorial "Can We Still Count on the Big Five?" ("First Take," September 2004). Steinberg has been somewhat remiss in not communicating its status during our reorganization, and we'd like to correct this situation by updating you and your readers.

Change happens with any acquisition, and admittedly the face of Steinberg has changed worldwide. Our sales and marketing operations have been consolidated into the Pinnacle Systems headquarters in Mountain View, California. Our technical support operations have joined Pinnacle's support operations in Indianapolis. The Steinberg sales team has been redeployed geographically to ensure a larger presence in the field, working in partnership with our resellers. We have also established new distribution in Mexico and Central/South America, and our Web site is in the process of undergoing significant changes in order to better serve our customers.

An important bellwether of a company is the state of its product line. Steinberg has just announced the most extensive upgrade to Cubase in Cubase SX3. This, in addition to the introduction of WaveLab 5, the significant upgrades to our line of VST instruments like Halion 3, the incredible success of our entry-level sequencer Cubase SE, the launch of our Cubase System 4 hardware/software music production solution, and the continued success of our flagship product Nuendo 2, would suggest that the company is indeed healthy if judged by its introduction of new products.

The true health of a company is measured by its fiscal performance. The third and fourth quarters of our fiscal year 2004 were the biggest and most profitable in the history of Steinberg in the United States, which we believe reflects favorably on the success of the reorganization and the strength of the products.

In summary, Steve, your skepticism about the health of Steinberg is unfounded. Steinberg has emerged a much stronger and more successful company after the acquisition, and we look forward to serving our existing and new customers for the next 20 years.

David Fabian
Steinberg Media Technologies

GOOD VIBRATIONS, SQUARED

On p. 84 of Mark Ballora's excellent article ("Square One: You've Got the Power," September 2004), it says, "Here's a basic principle of vibrating systems: the amplitude level is proportional to the power level squared." As Ballora makes clear in the next sentence, this should read, "the amplitude level squared is

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proportional to the power level."

Don Wade
Prof., Electronics Technology
Nassau Community College

REVERB TIME IS ON MY SIDE

In the article entitled "You've Got the Power," the close of the last full paragraph on p. 86 states that "*reverb time* is the time it takes a sound to drop to –60 dB SPL." I believe the author meant to say that reverb time is the time it takes a sound to attenuate 60 dB. Otherwise, it was a great article.

Jason R. Gilliland
Columbia, South Carolina

ATTACK OF THE TRANSIENTS

Mark Ballora's article about volume levels ("Square One: You've Got the Power," September 2004) contains a questionable comment about compressors. On p. 87, Ballora writes, "A long attack time can blur an instrument's transient." On p. 88, he adds that "a quick attack time" maintains its transient.

This statement may be more true of a gate. With a compressor, however, longer attack-time settings cause the compressor to "kick in" more slowly, attenuating volume after the attack portion is complete. Setting a short attack time causes the compression to start during the transient. So, as you lengthen the attack time, you are actually preserving a longer portion of the attack transient.

It is also worth mentioning that even compressors that have very quick attack times usually allow the early portion of the transient to sneak through unless the compressor has a look-ahead function allowing the compressor to read a few milliseconds "into the future."

Jon Stubbs
Stubbsonic Audio Services
Lafayette, Colorado

SQUEEZE PLAY

On p. 88 of "You've Got The Power," Ballora's article states, "you can lengthen the attack on the bass compressor and shorten the attack of the kick drum's compressor, allowing the kick drum to give a strong attack to each note, and letting the bass sustain it." If you shorten the attack on the compressor, doesn't that mean that it will clamp down more quickly and thereby actually lower the audible attack of the drum hit? And if you lengthen the attack on the compressor, wouldn't this allow the initial attack of the drum hit to play at full volume before the compressor kicks in, resulting in a stronger attack? Thanks for a great issue.

Dave Saronson
New York, NY

Author Mark Ballora replies: Jon and Dave—You raise a point that could definitely use some elaboration. Let me start off by clarifying a statement made earlier: how is it that a long compressor attack blurs the transient of an instrument?

Say, for example, you have an instrument with a short, high-level transient that decays quickly to a much lower sustain level. At the transient (a sudden rise in input level to something above the threshold) the compression kicks in, "squeezing down" the level before outputting it. You still get an increase in the level, just a smaller one. Then the input amplitude drops significantly, but because the attack time of the compressor is long, it takes some time for the compressor to respond to the change. It remains at a level that is lower than the transient but higher than the sustain. As a result, the sustain is amplified and fades only gradually to the actual level of the input. So, the transient is blurred since the compressor removes the sudden change in level.

A quick attack and an aggressive compression ratio allows you to control how much or how little of an instrument's transient remains after the compressor is added.

Now on to your question. Yes, you would still hear the bass attack if there is a long compressor attack time. Since you have blurred the attack of the bass and applied a tightly controlled attack on the drum, however, it is the drum that gives the transient its punch, while it is the sustain of the bass that receives some added emphasis.

Of course, many factors are involved in this situation—the type of instruments, how you are playing them, the type of microphones that you are using, and so forth. So, in some ways, this example is an oversimplification. But the point is that careful use of a compressor can be an effective mixing tool in addition to these other factors.

WE WELCOME YOUR FEEDBACK.

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

"I Switched"

Who: **Gerhard P. Joost II**

Occupation: Engineer / mixer / producer / audio maverick
Chief Engineer, Groove Addicts, Los Angeles

Clients: Danny Elfman, Stewart Copeland, Stevie Wonder, Teddy Riley, Missy Elliott, Timberland, Jodeci, Usher, Salt 'N Pepa, Silk, BBC Radio, American Top 40, Mattel, McDonalds, Budweiser, Sony, Disney, and countless others

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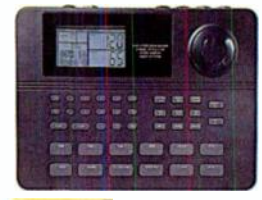

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WHAT'S NEW

By Geary Yelton

▲ DIGITAL AUDIO WAVE DAWIN 6400

Digital Audio Wave's newest notebook computer is the DAWin 6400 (starting at $1,995), a mobile audio workstation weighing less than ten pounds. The 6400 has a 64-bit-capable AMD Athlon 64 processor and a 17-inch WXGA+ display. It comes with an Ultra DMA hard drive, a DVD/CD-RW drive, and 512 MB of dual-channel DDR400 SDRAM that is expandable to 2 GB.

The 6400's dual-boot system runs either in full Windows XP or in a lean, audio-optimized version of XP that makes the maximum number of audio plug-ins and tracks at your disposal. Additional features include four speakers and a subwoofer, an S/PDIF output, three USB 2.0 ports, a FireWire port, and an onboard digital camera. Optional software bundles are also available. Digital Audio Wave; email info@digitalaudiowave.com; Web www.digitalaudiowave.com.

▲ ROLAND FANTOM-XA

Do you crave the sound and the playability of a high-end synthesizer workstation, but you can't spare the scratch? Roland has unveiled the Fantom-Xa ($1,699), a keyboard synth with 128-note polyphony, multitrack sequencing, real-time audio time stretching, and COSM modeling effects.

The Fantom-Xa is a sample-playback synth that permits user sampling by either using the onboard mic/stereo line input or importing WAV or AIFF files. You can expand its 4 MB of sample RAM to 516 MB by installing additional DIMMs. An onboard PC Card slot affords a full gigabyte of backup. The instrument's 64 MB ROM contains all the waveforms and presets of the Fantom-S as well as 128 new presets. You can even expand the internal sounds by adding an optional SRX-series expansion board.

One interesting feature is called Skip Back Sampling, which instantly plays back anything you play without having to touch the Record button. Skip Back Sampling allows you to quickly resample your real-time performances, complete with controller moves and effects processing. The Fantom-Xa also has 61 Velocity-sensitive keys, three multi-effects processors, a mastering processor, dedicated reverb and chorus, a D-Beam controller, three MIDI ports, and a USB port. The synthesizer is 16-part multitimbral and GM2-compatible. Roland Corporation U.S.; Web www.rolandus.com.

▼ MUSE RECEPTOR

Have you ever wished that you could use your VST instruments and effects onstage and in the studio without having to set up your computer? The Receptor ($1,599) is a 2U rackmountable module that runs plug-ins for Windows, handling as many as 16 VST instruments and 57 VST effects simultaneously. Because it doesn't run Windows installers, VST plug-ins often require installers (and for copy-protected plug-ins, an iLok) designed specifically for the Receptor.

The Receptor combines up to 16 audio sources (VST instruments or external inputs) and routes each through as many as three insert effects in series or in parallel. From there, it's routed to a mixer channel with two effects buses (each with three VST effects), and then to the master stereo outputs, also with a maximum three effects. The device has two ¼-inch line-level inputs; a ¼-inch instrument input; coaxial S/PDIF I/O; two ¼-inch outputs; and MIDI In, Out, and Thru.

The Receptor ships with a library of plug-ins already installed, as well as fully functional 30-day demos of various commercial plug-ins. You can control the Receptor using either front-panel buttons; a mouse, keyboard, and monitor; or a networked computer connected by Ethernet. Because the module is MIDI-controllable, it offers full automation when controlled by a sequencer. Muse Research; email info@museresearch.com; Web www.museresearch.com.

SUBMERSIBLE MUSIC

Submersible Music's Drumcore (Mac, $249) is a source of drum tracks that takes an innovative approach. Drumcore is a standalone software drum machine that plays 24-bit, 48 kHz recordings of well-known drummers. Each groove has basic beats, variations, and fills recorded at numerous tempos. The grooves also include a MIDI version for maximum flexibility. More than 8 GB of data is on two DVDs.

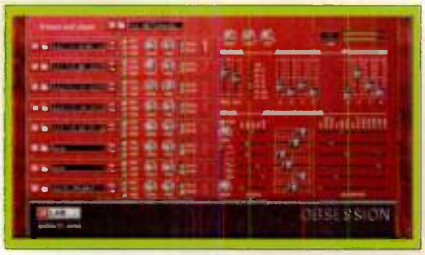
You can search and sort grooves by drummer, style, tempo, and other criteria. In addition, you can import grooves in audio or MIDI format and enter your own metadata for search and retrieval. A tool called the Gabrielizer lets you reshuffle loops to create rhythmic variations. A MIDI DrumKit Editor lets you replace one player's beats with another's.

Because Drumcore supports ReWire, you can sync its playback to any other ReWire-compatible applications. Minimum system requirements are a Power Mac G4/400 MHz, 256 MB of RAM, Mac OS X 10.2.3, 10 GB of disk space, and a DVD drive for installation. Submersible Music; email sales@drumcore.com; Web www.drumcore.com.

DRUMS ON DEMAND

A drum-loop library that demands attention is *Volume 3: Upbeat and Aggressive* ($79.95) from Drums on Demand. This collection contains almost 1,700 rock 'n' roll loops arranged in 25 Song Sets, each containing as many as 60 sections, including verse, chorus, bridge, fill, break, intro, ending, and others. There are a variety of single hits played at varying velocities, as well as Loop Layers for assembling your own matching loops.

Upbeat and Aggressive is available on two CDs in your choice of format—Acidized WAV (16- or 24-bit), Apple Loops, or REX2—and you can combine any two formats for an additional $24.95. Also available is the 8 GB, 24-bit WAV Multitrack Edition ($99.95 extra), which has the same loops recorded using a variety of miking techniques—from dry to ambient—for building custom multitrack performances. Drums on Demand (Hobby Horse Productions); email info@drumsondemand.com; Web www.drumsondemand.com.



E-LAB

If you're searching for the ultimate in funky drum tracks, take a look at *Obsession* (Mac/Win, $299.95) from Swedish soundware developer e-Lab. *Obsession* is a 3.7 GB sample library paired with a REX2 player plug-in. It supplies more than 5,000 samples and 3,000 loops in R&B and hip-hop styles at tempos ranging from 55 to 115 bpm. It can also import REX2 files from other sources.

Eight loop-playback engines let you combine groove elements to create your own mixes. Each engine offers an independent multimode resonant filter, ADSR envelopes, a modulation matrix, and other synthesis parameters. You can sync playback to your sequencer, trigger loops with a MIDI keyboard, and create MIDI files to play groove elements. *Obsession* supports VST in Windows and VST and AU on the Mac. e-Lab/Big Fish Audio (distributor); email office@e-lab.se; Web www.e-lab.se.

DISCRETE DRUMS

Discrete Drums has long been a leader in supplying expertly recorded drum tracks suitable for virtual-studio production. Its latest sample collection, *Earthbeat* ($199), is an eight-CD set featuring Greg Morrow's rock drumming with African, Latin, Eastern, and other world percussion instruments played by Eric Darken. The discs contain individual stereo tracks from multitrack recordings in 24-bit WAV format and stereo mixes in 16-bit WAV and audio formats. All samples have dry and "room-only" versions, and loops range from 4 to 16 bars long.

If you're looking for unique sounds and grooves, check out *Discrete Percussion: The Eric Darken Collection* ($99). One audio CD and two CD-ROMs of stereo 16-bit, 44.1 kHz WAV files give you loops and single hits from a hub cap, a toilet seat, a typewriter, and other unusual sources—as well as more traditional instruments such as frame drums, shakers, and drum machines. The collection has full mixes for Ableton Live and a demo version of Live 3.04 (Mac/Win). Discrete Drums; email contact@discretedrums.com; Web www.discretedrums.com.

DOWNLOAD OF THE MONTH▲▲▲▲

▶ AUDIOCORDER AND SOUND BYTE

You'll find some handy Mac audio utilities at Black Cat Systems (www.blackcatsystems.com). Among its offerings are amateur radio software, diet and health programs, an interactive atomic table, and radiation detectors for both the Mac and PC.

Audiocorder 4.0.2 (shareware) is a Mac OS 9– and OS X–compatible stereo recorder with four recording modes: Manual, Timed, Scheduled, and Voice-Activated (Vox). In Manual and Timed modes, you start recording manually; in timed mode, however, recording is terminated after a user-specified period. Scheduled mode works like a VCR: you can set as many as 50 start and stop times. In Vox mode, recording starts and stops when incoming audio rises above or falls below a specified level for a specified amount of time.

Audiocorder supports 11.025, 22.050, and 44.1 kHz recording at 8- or 16-bit resolution in stereo or mono AIFF or WAV formats. A convenient iTunes mode automatically places recorded files in the iTunes Library and converts them to MP3 format. The Scissors button, another handy feature, simultaneously closes the current recording file and begins another. The OS 9 version can even record phone calls using your computer's internal modem.

Sound Byte 2.2.0 is an OS X software emulation of the cart machines used in radio stations to hold clips, typically commercials, for instant playback. It comes in three versions: Sound Byte Lite (with one rack, $24), Sound Byte (with 5 racks, $49), and Sound Byte Pro (with 50 racks, $99). The application automatically loads and saves racks. Each rack can hold 70 audio files that you can trigger with a mouse-click or with a user-assigned hotkey. Any number of clips can play simultaneously, even from different racks. Sound Byte plays sound files in any format supported by QuickTime, including WAV, AIFF, SD2, and MP3.

Sound Byte's clip slots, called Buttons, give you several options. At minimum, they display each clip's name, length, and current playback position (if the clip is playing), as well as a button for triggering the clip. Buttons can optionally display a playback-volume slider or a fuel-gauge-style playback-position indicator. You can assign each button its own color and specify looped playback. You can also set individual Buttons to terminate playback from all other clips when the clip is triggered. In addition, Sound Byte has a global volume slider and key commands for fading out or pausing all clips currently playing.

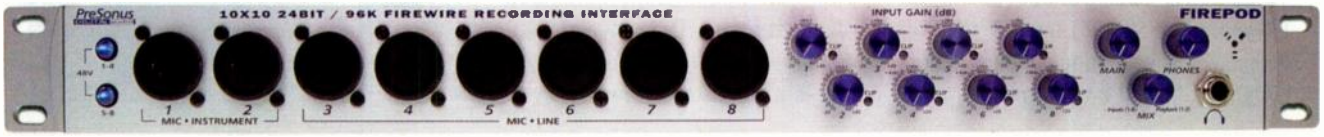
—Len Sasso

▼ PRESONUS FIREPOD

The price of high-quality multichannel audio interfaces continues to fall. Case in point: the 10-input/10-output PreSonus FirePod ($799.95) gives you eight low-noise Class A preamps with ¼-inch/XLR combo inputs (two of which serve as high-impedance instrument inputs), stereo S/PDIF I/O, and MIDI In and -Out ports in a single-rackspace device. Outputs include eight assignable outs, two main outs, and two Cue Mix outs that are suitable for feeding a headphone amp—all on balanced ¼-inch jacks. Preamp outs and line-ins serve as send and return jacks for connecting external processors. The FirePod's 24-bit A/D converters handle 44.1, 48, 88.2, and 96 kHz sampling rates. Either of two FireWire 400 connections ensures high-speed data communication with your computer.

You can control the FirePod's preamps using eight Input Gain knobs, calibrated in decibels, mounted on the front panel. Two buttons each enable 48V phantom power to four mic inputs. In addition to separate level knobs for the main and headphone outputs, a front-panel Mix knob balances the source for the cue and headphone outputs between inputs 1 through 8 and the main outputs.

Because the FirePod supports ASIO, WDM, and CoreAudio, it is compatible with dozens of audio applications for Windows and Mac OS. It comes with Steinberg Cubase LE (Mac/Win), a 48-track DAW program with a bundle of VST plug-ins. PreSonus; email presonus@presonus.com; Web www.presonus.com.



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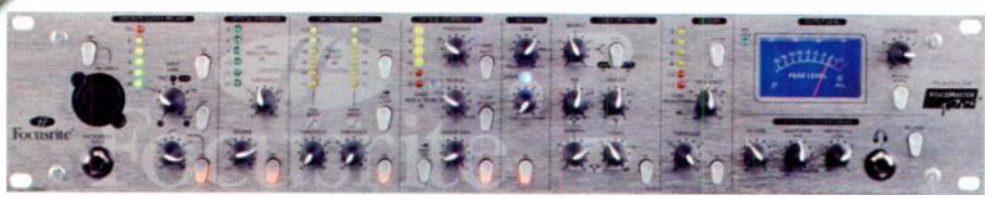

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REV UP▲▲▲▲

▼ CAKEWALK SONAR 4

Cakewalk has unveiled Sonar 4 (Win), an audio-production environment designed to optimize workflow when you record, edit, and mix. The most significant new features in Sonar 4 Producer Edition ($959) revolve around its surround capabilities. It handles multiformat surround mixing with more than 30 supported configurations, and SurroundBridge lets you use stereo plug-ins in a multichannel environment. The surround panner offers control surface and joystick support, speaker muting and soloing options, and an LFE send. Also new in Sonar 4's toolbox are Lexicon Pantheon Surround Reverb and Sonitus Surround Compressor.

Now you can freeze tracks, effects, and synths and convert frozen data to groove clips. Use pitch, gain, and pan envelopes to control time slices in loops. Cakewalk's cooperative efforts with Roland have produced TTS-1, a multichannel DXi plug-in with a General MIDI 2 sound set. Other new features include a Navigator view, a video thumbnail track that supports QuickTime and Windows Media, and the ability to display track layers, which organize multiple tracks in a single folder track.

For project studios and aspiring pros, Sonar 4 Studio Edition ($479) has the Producer Edition's core engine and streamlined user interface, but without Producer Edition's surround mixing and editing, MPEX time scaling, POW-r dithering, Sonitus fx Suite, or numerous other features. Cakewalk; email sales@cakewa lk.com; Web www.cakewalk.com.

▲ APPLE LOGIC PRO 7

One of the most exciting features in Apple Logic Pro 7 (Mac; $999) is the ability to network additional Mac computers to your main computer for added processing power (G5s are recommended). According to Apple, a distributed audio network, using a 1 Gb Ethernet connection, will support 128 stereo audio streams.

A number of new instruments are also part of the upgrade. Sculpture has an extensive feature set devoted entirely to physical modeling. Ultrabeat, designed for creating rhythm parts, offers virtual-analog and FM synthesis, physical modeling, sample playback, and a step sequencer. EFM1, an FM synthesizer, completes the picture.

Guitarists can plug directly into their computer and use Guitar Amp Pro, which models amps and speakers and offers tremolo and reverb effects. Other effects plug-ins include Ringshifter, which combines frequency shifting and ring modulation; Vocal Transformer, for control over pitch and formant change; and Pitch Correction, to correct intonation problems with vocal tracks. A Linear Phase EQ plug-in is also part of the upgrade, as is Match EQ, which can impart the frequency spectrum of one audio signal onto another. For analysis chores, the Multimeter plug-in offers a correlation meter, a spectrum analyzer, a stereo-phase meter, and a level meter.

Logic Pro 7 also supports Apple Loops and comes with the GarageBand instrument set, allowing you to open and work on projects created with Apple GarageBand. Apple Computer; Web www.apple.com.

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PowerCore Compact is the newest member of the PowerCore family. With easy FireWire connectivity to laptops, and VST and Audio Units compatibility, it is designed for artists and studios on the move. Right out of the box you get all of the well-known plug-ins from PowerCore Element plus the Master X3, Filtroid, and the Character, a new plug-in from Noveltech. PowerCore Compact is the doorway to professional production and mastering possibilities from TC Electronic as well as unlimited processing power from 3rd party developers. For more information on the complete PowerCore range, visit: www.tcelectronic.com.

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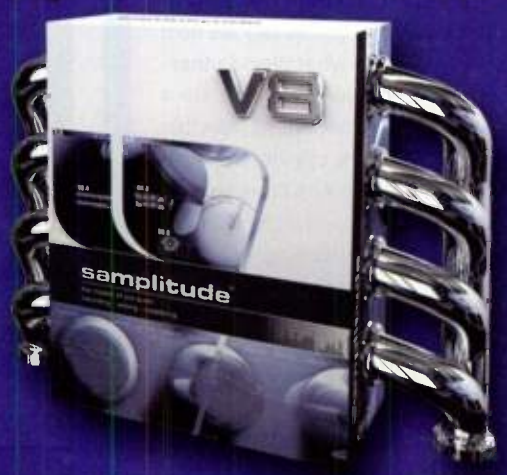

today and get it all!

By Scott Wilkinson

In the Groove

Using particle physics to restore and preserve old recordings.

The history of recorded music is worth preserving for future generations. However, the earliest examples of the recording arts are difficult, if not impossible, to hear anymore. Many wax cylinders and shellac disks are crumbling in archives, unable to be played because any physical contact with a stylus would cause them irreparable damage. Even those that can be played often suffer from surface noise and scratches that cause clicks and pops. Additionally, many are broken, making even the most careful stylus-based playback impossible.

An ingenious solution to these problems was recently discovered by Carl Haber and Vitaliy Fadeyev, physicists at the Lawrence Berkeley National Laboratory (www-cdf.lbl.gov/~av). They realized that the optical scanning techniques used in precision detector arrays and the statistical methods used to analyze the tracks of particles emerging from collision experiments could be adapted to extract audio information from old disks and cylinders.

From the earliest recordings of Thomas Edison to the monaural 78 rpm disks of the 1950s, audio signals were mechanically encoded directly onto the medium. On a disk, a spiral groove was cut into the surface, and audio information was represented by lateral displacements in the groove from its nominal path. In other words, the groove wiggles from side to side on what would otherwise be a simple spiral path. On a cylinder, the groove forms a helix that wraps around the cylinder from one end to the other, and the displacements that represent audio information are vertical, forming small hills and valleys along the groove, rather than lateral wiggles.

To play the audio, a stylus rides in the groove while the disk or cylinder turns at a constant rate. As the stylus follows the wiggles, its velocity changes in a pattern that is analogous to the original audio waveform, which is reconstructed by the playback device.

After hearing about the problems of preserving mechanical audio recordings, Haber and Fadeyev realized they could optically scan the surface of a disk or cylinder and process the resulting data much as they do to reconstruct the paths of particles created in beam collisions. Avoiding all physical contact with the medium, they could remove the effects of scratches, dust, wear, and surface noise, using sophisticated data processing.

Their initial experiments were conducted on 78 rpm shellac disks from the 1950s. Using a computer-controlled optical scanner with high resolution, they imaged small sections of the disk surface (see **Fig. 1**). Each image generated about 1 MB of data; the audio information on an entire 10-inch, 78 rpm disk amounted to 100 to 1,000 GB of data before processing. The computer stitched together the images and analyzed the groove wiggles, deriving the stylus velocity while removing spurious data and reconstructing the audio signal in digital form as 44.1 kHz, 16-bit WAV files.

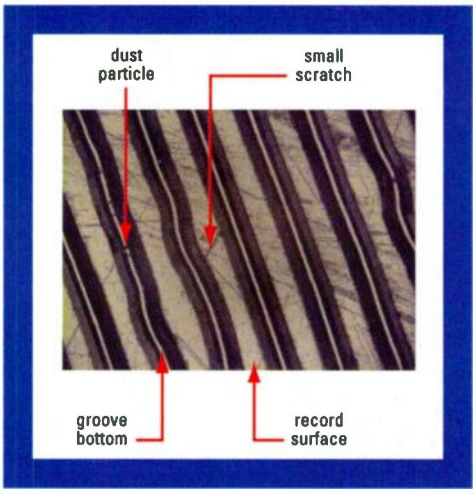

FIG. 1: This section of a 78 rpm shellac disk measures 1.39 × 1.07 mm; the groove is 160 µm wide. The lateral displacements along the length of the groove represent the audio signal. Audible effects created by dust and scratches can be removed using data processing after the surface is scanned.

These experiments were a big success as a proof of concept, but the equipment was not optimized for the task; the process was slow, taking 40 minutes to yield one second of audio. However, Haber and Fadeyev believe that a dedicated system could dramatically reduce the time frame to somewhere between 5 and 15 minutes for a 10-inch 78 rpm disk. In addition, their 2-D imaging cannot be used to scan cylinders; 3-D scanning is required to measure the hills and valleys of the groove's displacement. Haber and Fadeyev have already started experimenting with such a system, and the initial results are promising. Clearly, this work could help rescue our musical heritage from oblivion, allowing future generations to learn from the past as they create the music of tomorrow.

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Industry Profile

Music Technology E-Tail

In most cases, convenience isn't without a price.

By Adam Cohen

The Internet has revolutionized the way we buy things, from music to medication and everything in between. Music technology is no different; in fact, technology savvy musicians, producers and engineers are even more comfortable buying online than the average consumer. However, for most Internet retailers, or "e-tailers," the concept of having an online presence amounts to little more than offering a consumer the option of placing an order any time of the day or night. While the level of convenience in placing an order at 2 a.m. might be nice, it's often gained at the expense of customer service. Music retailers, most of whom are not exactly known for customer service in the first place, don't ever have to interface directly with their online customers who, in turn, are left to fend for themselves when trying to decide what to buy or how to use the gear they've ordered.

ONLINE EASE PLUS THE PERSONAL TOUCH

Sweetwater is one music technology retailer that sees the Internet as a means to expand the level of support they offer to their clients rather than simply an automated 24/7 order taker. In fact, every single order placed at sweetwater.com is confirmed by a phone call from a sales engineer. Rather than replace competent salespeople, sweetwater.com acts as the virtual gateway to an entire staff of music technology experts, all of whom are willing to engage in a one-on-one discussion of your equipment needs.

Nearly a decade ago, Sweetwater was the first music retailer to go live with a website, and over the years, the company has consistently managed to stay a step ahead of their competition in taking advantage of the value that the web is capable of providing to their customers. What started as purely a content-based site branched out to include a full e-commerce section, weekly e-mail newsletters chock full of information about using the gear they sell, an active community of music technology forums moderated by industry pros, and the most comprehensive tech support database anywhere.

CUSTOMER EDUCATION IS THE KEY

When the site first went live, the company saw the Internet as a way to help educate customers about the products available, providing not only manufacturer spec sheets but also product reviews and buying advice from their staff of expert sales engineers. "We realized pretty early on the reach that the internet had and that we could use it to keep our customers informed about all sorts of industry related news, including product release dates, price changes, and more," says Chuck Surack, Sweetwater's founder and President. These days, the site offers comprehensive information on thousands of music technology products, including everything from product manuals to audio and video demos.

One of Sweetwater's earliest online innovations was *inSync*, launched in early '97. Long before the concept of "blogging" became popular, *inSync* established itself as a section of the Sweetwater site, updated daily, where the company provides technical tips, music technology glossary terms, assorted industry news and product information. Seven years later, *inSync* is still going strong, updated daily on sweetwater.com and sent out in digest form once a week free of charge to thousands of subscribers. In 2002, Sweetwater added *GearNet*, a weekly e-mail newsletter that specifically addresses price reductions, special deals and new product releases, among other things.

SUPPORT BEYOND THE ORDINARY

Often, the evolution of sweetwater.com has happened as a function of customer feedback. Sweetwater customers have come to expect a high level of after-the-sale support and want access to that resource online. As a result, there's an entire section of the site devoted to customer support. Dubbed "Sweetcare," it's a comprehensive approach to online support, including the ability to track orders online, searchable technical tip and glossary archives, and the largest music technology support database anywhere. Looking for the hard reset procedure for your old Korg M1? You can find it in the Sweetwater technical support *Knowledge Base*, along with thousands of other tidbits of useful information. The *Knowledge Base* is updated several times a week, based on the research of Sweetwater's award-winning technical support staff.

The innovation at sweetwater.com continues even today. Recently, the company added the *Virtual Guitar Gallery*, where visitors can get an up close and personal look at many of the guitars Sweetwater has in stock and select by serial number the exact instrument they would like to buy.

When asked what the future holds for www.sweetwater.com, Surack simply smiles. "We've got a few more things up our sleeve," he says. If the past is any indication, the online future for Sweetwater looks pretty bright. If you'd like to know more, give them a call at (800) 222-4700, or visit www.sweetwater.com for yourself.

PRO FILE

By Matt Gallagher

Planning Commission

Slicker fuses contrasting sounds and production techniques.

"I was always interested in futuristic-sounding music," says Chicago-based recording artist, producer, and label owner John Hughes III, who records under the moniker Slicker. His third release, *We All Have a Plan* (Hefty Records, 2004), offers clever, evocative, and often humorous electronica that incorporates organic elements of old-school funk, jazz, hip-hop, and soul. "I wanted to make a soulful electronic record," Hughes says. "Electronic music has limitless possibilities."

Hughes sketches song ideas on his Clavia Nord Modular Rack, Fender Rhodes, Moog Voyager, and customized Roland TB-303 with a Devil Fish modification. "I always start with the beat," Hughes says. "Rhythm is the most important thing for me. I throw as many ideas into a song as I can and then pare it down and structure it. The early versions of these tracks are really dense. I start with this huge pile of sounds and elements, and then I pare it down, figuring out how all these things can work together."

Hughes records with a Digidesign 888-24 I/O interface and a Mac G4 running Pro Tools 5. His signal chain includes a John Hardy M-1 mic preamp, two Avalon U5 DI preamps, two Neve 1066 EQ channels, and two Neve 2254 compressor/limiter channels. Hughes' outboard effects consist of an Echoplex tape delay, EMS Vocoder 2000, and Furman RV-1 spring reverb. "That's my crutch," Hughes says of the RV-1. "It makes everything sound cool. I use it more as an effect than as a reverb. It sounds old and nasty.

"I'm into the [sonic] contrast between super-clean and really nasty, that lo-fi and hi-fi dynamic," Hughes explains. "Digital music [sounds] too clean now. I put it in a new realm. Almost everything goes through some sort of analog chain. But I couldn't work going to tape; I'm so spoiled by the way Pro Tools integrates everything."

Hughes eschews MIDI and programs drum grooves in Pro Tools' Grid mode, drawing from his own acoustic-drum samples. "I usually layer my snares," he says. "I'll layer a rim shot with a clap, a crash, or some kind of sound effect or field recording to give it an alien feeling. I created most of the kick drums using [Native Instruments] Reaktor or the Voyager. I also use [Cycling '74's] Pluggo. The Maestro PS-1A phase-shifter pedal sounds good on cymbals. You feed it a hot signal and [the pedal] compresses it a little bit."

We All Have a Plan features 15 guest instrumentalists and vocalists with varied musical backgrounds. Hughes captured their dynamic performances and deftly wove them into his electronic framework. "They replayed some of what I'd written and they lent their own contributions," he says. "I sampled everyone and cut it up or processed it. I didn't use any outside samples. That's when I really show my personality.

"I don't chop up vocals too much, though," Hughes says. "I like to experiment more with miking vocals, like singing into a bucket, trying to get a more natural effect. I try to keep the voice pretty rough and raw and tastefully match it to whatever is going on in the track. It's weird to take a piece of soundproof paneling and wrap it around someone's head, but that's something that I'm into. I'll do what sounds good to my ear."

DAVID BLACK

***We All Have a Plan*/Slicker**

Hughes aspires to produce more artists in the future. "I'm not afraid to sneak into doing mainstream work as long as I can maintain my sound," Hughes says. "You have to show your personality in your recording. I think that's the most important thing."

For more information, contact Hefty Records on the Web at www.heftyrecords.com.

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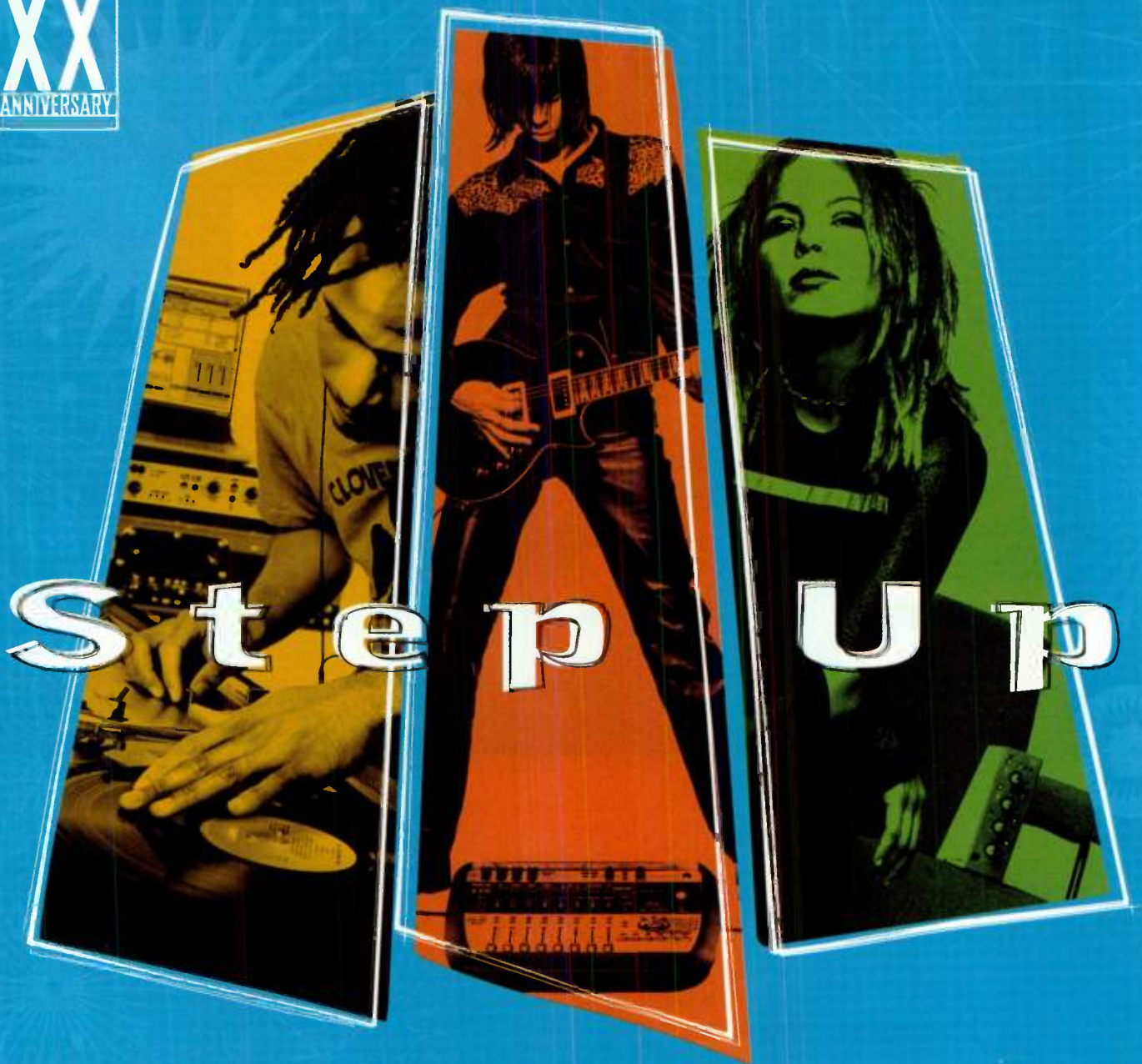

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Best of Reaktor

Master CLASS

LAURA WILLIAMS

Harness the power of Reaktor's extensive library of Ensembles.

By Rick Scott

Reaktor is a powerful and flexible software-synthesis engine. It produces almost any type of electronic music imaginable: analog-synth emulation, sequencing, (re)sampling, granular synthesis, and effects processing, to name a few. But its power and flexibility come with a price—Reaktor is a complex and mysterious beast. Many of the best Ensembles are teeming with controls; they are daunting to look at and even more daunting to make music with.

The goal of this article is to help competent Reaktor users become power users who have the expertise to program existing Ensembles to create unusually beautiful sounds. To that end, I will feature five very different Ensembles—three from the Reaktor 4 factory library (WaveWeaver, SteamPipe, and Grainstates FX) and two from the Reaktor user library (Meanmachine and SeQuenza). You can download all the Ensembles, including the modifications discussed here, from the Native Instruments Web site at www.native-instruments.com/emdownload.info.

PROGRAMMING AN ENSEMBLE

There is no one right way to program an Ensemble. (By programming, I mean manually setting the Ensemble's controls, not building it from the ground up.) As with all art forms, Ensemble programming is highly personalized. In the interest of clarity, however, I'll adhere to the following guidelines for creating and saving Ensemble Snapshots. (See the sidebar "Snapshot Creator's Survival Guide" for tips on how to manage your Snapshots library.)

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You can start programming an Ensemble in one of three ways. You can begin by setting all Ensemble controls (knobs, sliders, buttons, and so on) to neutral values to produce a state of sonic blankness that I call *tabula rasa*; you can start with an existing Snapshot and modify it as desired; or you can use Reaktor's Randomize button (in the Snapshots dialog box) until you arrive at a compelling Snapshot, which you can then hone to meet your needs. (See the sidebar "Creating a Random Snapshot" for suggestions on randomizing Ensemble settings.)

Once you've selected a starting point, you have three approaches to choose from to program an Ensemble. You can proceed holistically, treating the Ensemble's various components and controls as a whole and making changes here and there. You can work individually on one or more of the five classical synthesis elements: rhythm (micro, macro, beat, groove), pitch (interval, bend, unison, spread), dynamics (volume, compression, envelopes), timbre (effects, equalization, filtering), and space (panning, volume, reverb). Finally, you can follow the signal as it makes its way through the Ensemble's signal path from sound source to final output. In practice, you'll probably use all three approaches.

WAVEWEAVER

By Uwe G. Hoenig

WaveWeaver is a sequenced synth that uses a wavetable synthesizer, a sequencer, and a handful of effects to produce pitched grooves (see **Web Clip 1**). It is an ideal machine for live performance, in that it provides extensive real-time XY-style modulation controls, examples of which include Wave/Waveset, Cutoff/Resonance, and Time/Feedback (see **Fig. 1**).

WaveWeaver contains 12 components, all with front-panel controls. They are Wavetable Oscillator, Aux Osc, Ringmod, Noise, Lowpass Filter, LFO, Wave & Filter Env, Volume Env, Sequencer, Mod Delay, Filter Delay, and Output.

Wavetable Oscillator contains a pair of Sampler Loop modules for looping short audio files. An XY control allows you to choose the wave set (the looping sample) and the wave (the starting point of the loop). Aux Osc is a sine-wave oscillator for filling out the sound. Ringmod ring modulates Aux Osc by Wavetable Oscillator, and Noise is noise generator with color and decay controls. Lowpass Filter contains 12- and 24-dB-per-octave lowpass filters whose cutoff-frequency can be modulated by Aux Osc.

LFO is an additive LFO, whose waveform is a mix of sine, triangle, and square waveforms. It can be routed to modulate the Wavetable Oscillator's pitch, Lowpass Filter's cutoff frequency, and pan location. Wave & Filter Env is an ADSR (Attack, Decay, Sustain, and Release) envelope that can be applied to Wavetable Oscillator's pitch and Lowpass Filter's cutoff frequency. Volume Env is an ADSR envelope for the output volume.

Sequencer is a 3-track sequencer with tracks for note-length, pitch, and gate. It features extensive position modifiers, scale correction, and optional transposition by MIDI note input. Mod Delay is a short delay effect for flange, phase, and choruslike processing. Filter Delay is a stereo feedback delay line containing a lowpass filtering network. Output contains an output amp with panning controls.

Fig. 1 shows WaveWeaver in a tabula rasa state, which is well suited for creating Snapshots from scratch. I recommend setting the controls as shown and saving the Snapshot in the first slot of your Snapshots list (see the sidebar "Creating a Tabula Rasa Snapshot" for tips on that subject).

Now that you're acquainted with WaveWeaver's anatomy, it's time to learn some programming secrets. Before you begin, however, you need to make three small fixes to the latest version of WaveWeaver from Native Instruments. (You can download the fixed version from the Native Instruments Web site.) The MIDI button should be off when the Ensemble is first loaded. Otherwise, the internal sequencer could be transposed down five octaves. Make sure that the Noise module (located inside the Noise Macro inside the Wavetable Synth Macro) isn't in Mono mode. If you don't, it won't work when you increase WaveWeaver's voice allocation. The Clk & Reset Macro (located

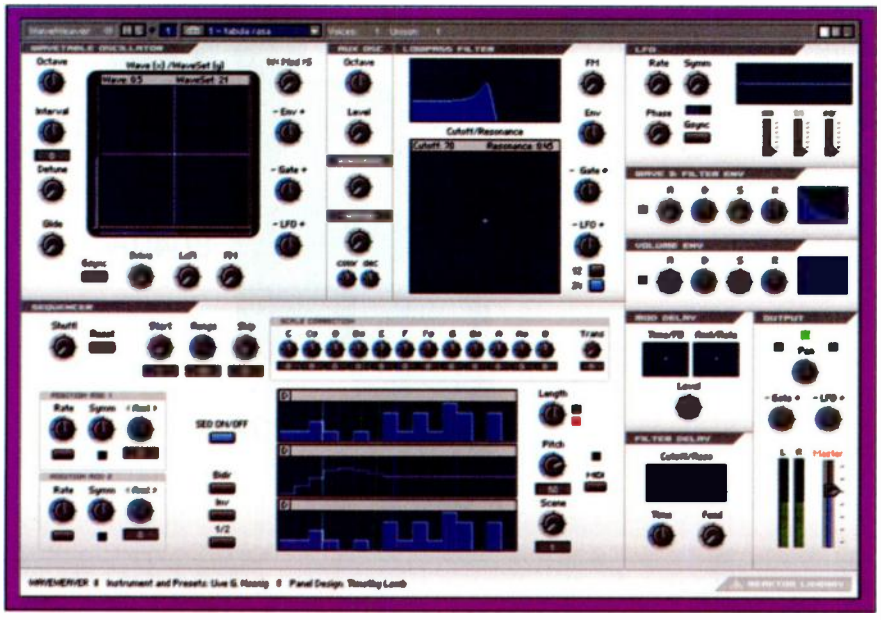
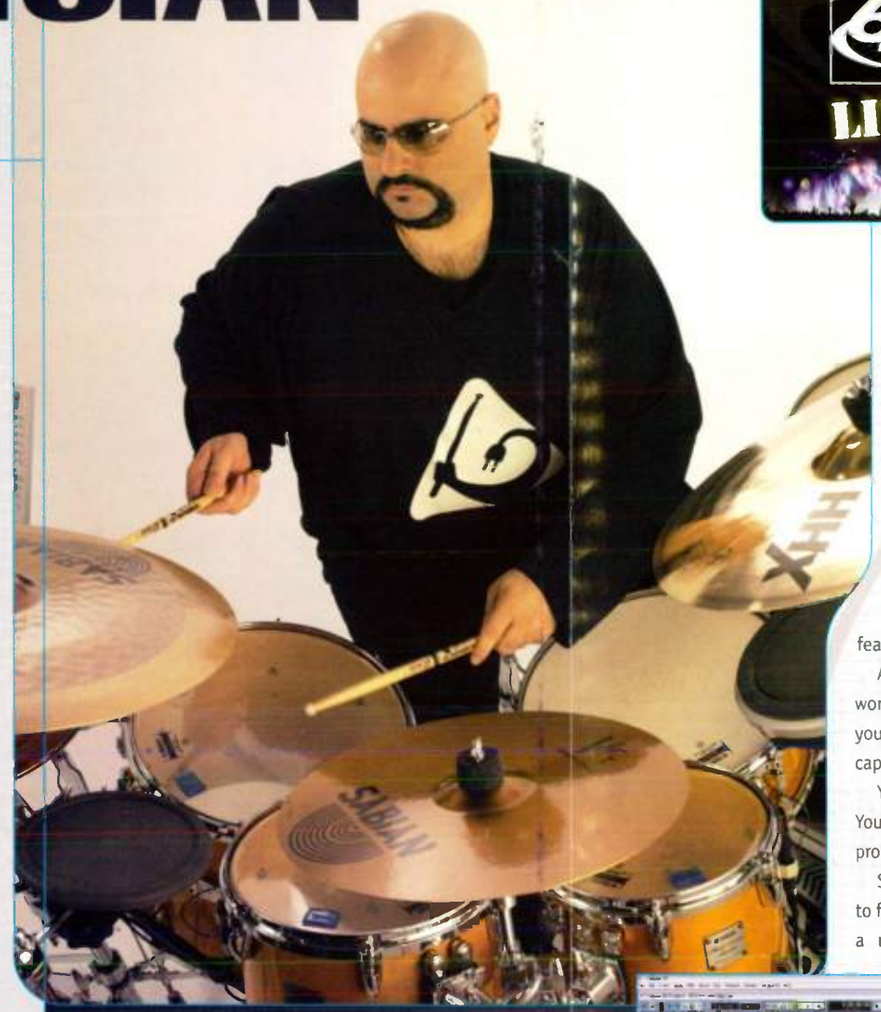


FIG. 1: The WaveWeaver control panel with suggested tabula rasa settings is shown above.

The modern MUSICIAN



Tony V (aka VFX)

Tony, you're working on a new release entitled VFX Vol.2. What types of software and synthesizers are you using for this project?

To record and produce my latest CD, I used Nuendo, Wavelab, Yamaha's DTXTREME IIS electronic drum kit, the Motif ES keyboard, Steinberg's Halion Software Sampler and lots of cool soft synths and VST plug-ins like Groove Agent and Virtual Guitarist.

You use the Yamaha [DTXTREME IIs] to perform. What is it that makes this such a unique performance tool?

It forces you to think like a record producer and composer from the moment you plug it in. It gives me real-time access to thousands of great loops, synth sounds and sampled drums, plus it has a sampler built in. I remix these elements live with my sticks and foot pedals. It also offers me chord voicings, melodic ideas and bass lines in real-time from each pad. I don't feel any difference in response between this electronic kit and my acoustic drums. DTXTREME II is *the* MIDI controller for any forward-thinking drummer/producer.

You are using a lot of VSTs in your music...

I use Halion quite a lot. I love the library of sounds and the ease of use—I never have to leave the computer environment whether I am sampling, mastering, creating loops, triggering samples live or archiving my data. Also, VSTACK allows me to trigger all of these VST instruments live in real time from my PC.

What kind of processing power is needed to run these types of applications?

Since I tend to use very dense layers of virtual synths, a large number of tracks and *many* instances of Halion at one time in any given composition, processing speed is everything! I like to run lots of multiband EQs and compressors on certain tracks, plus all of my effects are virtual. I run dual AMD Opteron processors with Nuendo and I never have any issues. That VST performance window is just chillin' between 10% and 20% of capacity—my system is extremely fast.

What does AMD64 do for your performance?

My AMD system offers me the power and stability I need for demanding studio and remix sessions, the latest being a remix and drum tracking for Dream Theater guitarist John Petrucci.

I also rely on that power when I am triggering and remixing sounds live with my rackmounted PC system. When you have thousands of people watching you on stage during a solo performance, the last thing you want to be worried about is your gear. AMD gives me tremendous confidence and allows me to relax and just stay focused on making great music.

Cubase SX3

Tony Verderosa spends a lot of time in his studio, and he needs tools that work together. Steinberg invented the world-standard VST plug-in format, and Tony makes heavy use of plug-ins when composing. Halion 3, Hypersonic, Virtual Guitarist, Groove Agent, The Grand—they're all there, serving as his instant rhythm section, orchestra and songwriting partners.

But to fully exploit the capabilities of the VSTs, he needs the power of AMD64 processors. With lightning-fast Direct Connect Architecture, superior processing power and a massive L2 cache to efficiently run VST plug-ins, AMD64 processing is the only serious choice when you're serious about your music. It's what Steinberg recommends when running Nuendo or Cubase SX3 and what dozens of top studios and producers have chosen to power their studios.

Cubase SX3's in-place editor maximizes your productivity

Cubase SX3 has revolutionized the way you work by adding many time-saving features. One example is the new in-place editor function that allows you to edit MIDI data directly in a track, saving you from having to switch screens. You can even draw controller data directly into the track!

Cubase SX3 also saves time with Device Maps, External Plug-ins and Studio Connections support. Device Map support allows you to create "virtual control surfaces" that control your external MIDI gear directly from inside your project. External Plug-in support lets you control I/O levels and latency of external gear, and even "freeze" the external effect by committing it to a disc track. Finally, there is Studio Connections, a new industry proposal for tightly integrating hardware and software (see sidebar).

AMD64 *LIVE!*

It's time to make music again and stop putting your creative efforts into working around limitations of technology. To that end, AMD developed AMD64 Direct Connect Architecture specifically with the artist in mind.

At AMD, we simply asked and you told us under no uncertain terms: You want your computer to work, to be invisible and to not interrupt your creativity when the inspiration is flowing.

We got the message and created AMD64. We won't bore you with the technical details about the magic behind the magic (please visit our Website if you really want to know).

We've been working with a spectrum of the best digital artists and we got it right. They loved it.

So what is AMD64 *LIVE!*? It's the difference between *working on* a computer and *performing with* a computer. Think of it as an amp for your inspiration and creativity. Now you can go out on the artistic tightwire without fear as you stay tucked into the creative side of your brain.

AMD64 *LIVE!* is a challenge to spark the renaissance of the world's greatest performances. Give us your magnum opus, your masterpiece, your lightning in a bottle! AMD64 *LIVE!* will capture it whenever and wherever it hits!

You can tell a lot about a musician by the music they play. You can also tell a lot about a technology company by the products it makes.

Some processor makers think they're smarter than you and try to force technology on you that you neither want nor need. We took a revolutionary approach. We listened. It's time to take it live...AMD64 *LIVE!*

Studio Connections

Recall

As studios have grown more powerful and more complex, achieving a seamless cross-platform total recall solution that retrieves all your studio settings for both hardware and software has been illusive. Until now. Introducing Studio Connections, the new cross-platform standard for integrating your external gear into your software world.

The first products to adopt Studio Connections are Cubase SX3 from Steinberg

Yamaha's Studio Manager Software works within the Cubase SX3 environment

and Studio Connections Recall-compatible Studio Manager 2 software from Yamaha. With Studio Connections, you can control your hardware via graphical editing software directly from within your DAW application and save all of the settings for your Steinberg software and Yamaha hardware together in one project file. Just think: No more notebooks with little pictures of knob positions and long lists of parameters. With a single mouse click, Studio Connections technology lets you get your studio connected back up just the way it was last week, or several months ago when you last worked on that project. Studio Connections is a *huge step* forward in the continuing effort to provide seamless integration between software and hardware—for a faster and more intuitive workflow.

Computer Music at the Crossroads

Until now, you've had only two choices in the world of computer-based music production: Buy four or five pieces of gear from different manufacturers and wonder if you'd ever get them to work, or buy proprietary hardware and software from one company. One choice left you scratching your head over manuals, and the other left you wondering what ever happened to freedom of choice.

That's why AMD, Steinberg and Yamaha are working together. Our goal is to make sure that your studio gear, your software and your computer all work together with seamless integration. We also share a philosophy that these advances in integration should be made available to the entire industry to further a common goal of making computer recording easier for everyone.

Open architecture is the cornerstone of the PC industry. Steinberg developed core technologies for computer audio, including ASIO and VST. Yamaha developed the core specifications for MIDI and Audio over 1394 Firewire, and more recently introduced mLAN Firewire Music Networking. These empowering technologies have been made available to the entire industry without cost. AMD raised the bar by creating the world's only Windows®-compatible 64-bit processor and de-bottlenecking the PC platform with Direct Connect Architecture. These features are designed to meet the processor-hungry demands of the digital media age. When the best in the business get together, good things are bound to happen.

Computer Music Production is at a crossroads. Some people see a bleak future limited in creative choice and dominated by companies driven not by customer demand but by their desire to maintain proprietary advantages. AMD, Steinberg and Yamaha realize the future is not software vs. hardware, not them against us. Instead, it's about a common vision where products are seamlessly integrated to work together in one creative workflow. We're tearing down the walls between host-based and hardware-based mixing and processing.

We believe it's all about the freedom to choose a solution that meets your musical needs. It's about being able to record your music where you want, when you want and how you want. AMD, Steinberg and Yamaha are dedicated to providing reliable, flexible and integrated solutions for your computer music production needs, giving you the freedom to be creative and the power to be productive.

Eric Clapton's Crossroads Guitar Festival in June 2004 presented one of the toughest recording environments imaginable: three days, outdoors, live music, multiple stages, legendary performers, 10+ hours of recording a day, high-resolution 24-bit/96kHz audio in the Texas heat. Who did the pros call on to capture the magic? AMD64 and Steinberg. Good call.

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Today's musician faces a multitude of challenges, ranging from limited CPU power to connecting random gear into one complete music production system. AMD, Steinberg and Yamaha have teamed together to offer potent solutions to your real-world problems.

MEET THE PLAYERS BEHIND THE PLAYERS

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The world leader in PC processor innovation, AMD64 technology has energized the music world with the introduction of the world's first Windows®-compatible 64-bit processors, the AMD Opteron™ processor for workstations and servers and the AMD Athlon™ 64 family of processors for desktops and laptops.

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Creativity First

Celebrating 20 years of innovation in music software, Steinberg continues to put creativity first with its complete line of audio/MIDI sequencers such as Cubase SX3, post-production tools like Nuendo 2, editing and DVD-A mastering tools like WaveLab 5, and a full line of VST plug-ins, including Halion 3, Virtual Guitarist, Groove Agent, Hypersonic, The Grand and many others.

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Find out more about how these musicians have come to rely on technology and products from AMD, Steinberg and Yamaha, and how the very same products can help you achieve your dreams.

Why the pros rely on Integrated Solutions from AMD, Steinberg and Yamaha

MEET THE PLAYERS

Peter Frampton

From "humble" beginnings in England to becoming an international rock 'n' roll legend, Peter Frampton has done it all. He's the definition of an active musician who needs his gear to be reliable and mobile.

Tony V

New Yorker Tony Verderosa (aka VFX) is on a mission to devastate dancefloors, taking electronic music to new places by fusing immaculate drumming chops with unique samples and loops into a fusion of styles.

Alan Parsons

In landing perhaps the most esteemed engineering gig possible—working with the Beatles at Abbey Road—Alan Parsons achieved remarkable success at a young age. He's still breaking ground with a new solo album (*A Valid Path*) out now.

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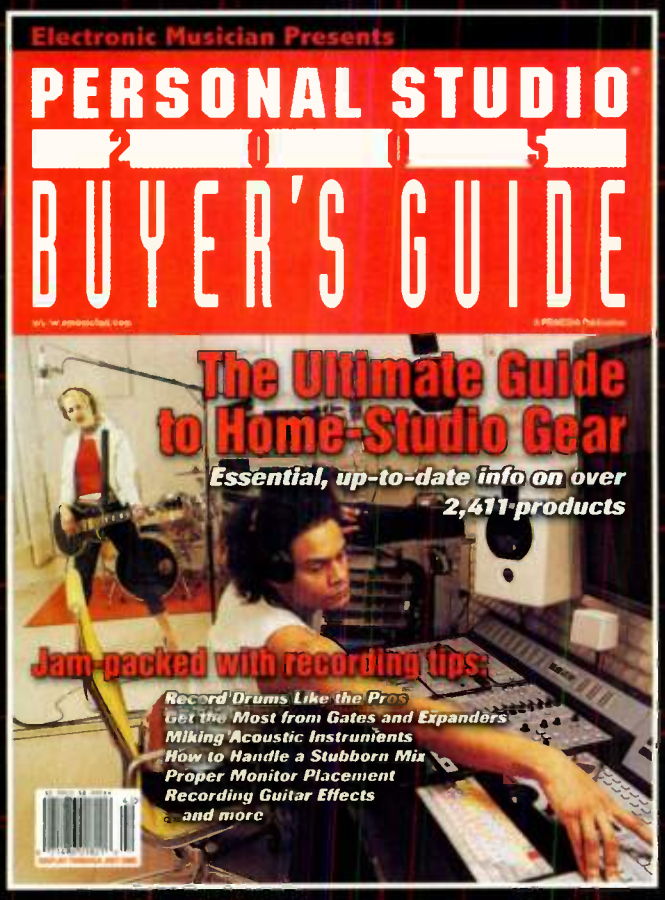

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FIG. 4: This graphic shows the Pain component of programchild's Meanmachine Ensemble.

are so sensitive and interdependent. For programming SteamPipe, I recommend starting with an existing bowed, blown, or plucked Snapshot, depending on the type of sound you're trying to achieve. Randomizing can be touchy, but with patience you can randomize your way to some remarkable sounds (see **Web Clips 2, 3,** and **4**). For best results use a low Rand Amount setting and isolate the Tune and Fine controls in the Del Tune and Allpass Tune sections of the Pipe by turning on their Mrph/Rnd Isolate options.

The expressive power of SteamPipe lies in its ability to create breathtakingly beautiful timbres. The key to creating those timbres is the Gen subcomponent of Steam and all subcomponents of Pipe. So choose your starting point and dive in.

The first two controls you should play with are DC/Noise and Cut in the Gen subcomponent of Steam. The former varies the breathiness of the sound, the latter the buzziness. Try using the 1-pole button to switch between 1- and 2-pole lowpass filters. The results can be dramatic, and you can make dozens of compelling Snapshots using just those three controls.

The real fun begins when you move to the Pipe component (see **Fig. 2**), which is the most responsive and human component of any Reaktor instrument. It is also elegantly and simply programmed; take a look at its structure.

Begin by varying the Tune controls in the Del Tune and Allpass Tune subcomponents, and make sure that Allpass Power is on for the latter. Typically, values close to the center affect only the tuning, but as you move further out, evocative timbral changes also begin to occur. Use the Del Tune section's Tune and Fine knobs to compensate for tuning changes. Also try tweaking the Allpass Dffs knob; again, the extremes yield the most interesting results.

Use Push-Pull with Saturation to modulate the timbre. Try the extremes in various combinations: Offset max and Push min, or Soft/Hard max and Symm min, for example. The Polarity button switches the polarity of the virtual pipe. Turn it on to add a resonant basso profundo to the sound—perfect for a low melodic line in your mix.

Finally, spend some time with the MW Filter controls. Depending on the Snapshot, the HP 0 highpass filter and the LP 0 lowpass filter can change the sound dramatically.

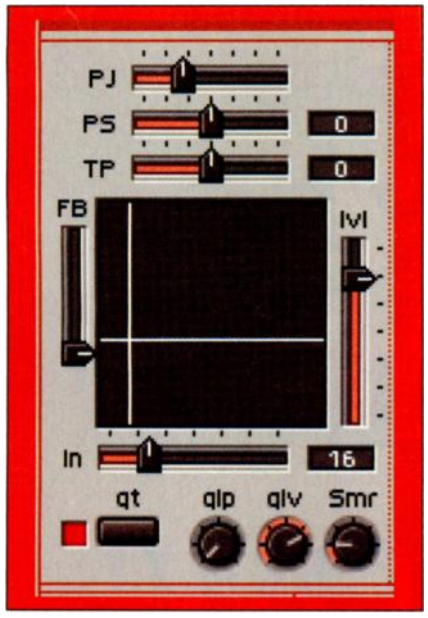

FIG. 3: This graphic shows the Scene component of Martin Brinkmann's Grainstates FX Ensemble.

GRAINSTATES FX

By Martin Brinkmann

Grainstates FX is a powerful (and CPU-hungry) effects box that you can use to create eerie, abstract atmospheres from any type of audio input (audio files, synths, mic feeds, and so on). Built around a pair of granular Cloud Delay modules, Grainstates FX provides slots for eight Scenes that you can select either manually or by using the built-in Scene Sequencer.

A companion Ensemble in the Samplers and Transformers Library called Grainstates SP uses a stereo Grain Cloud module in place of the pair of Cloud Delays used in Grainstates FX. The primary difference between the two Ensembles is that the Grain Cloud module incorporates a multisample player, which allows you to control sample-playback position as part of the Scene processing. Grainstates FX, on the other hand, processes an incoming audio stream. Most of what I cover here applies to both Ensembles.

Grainstates FX has eight components: Granular Delay, Scenes (1–8), Globals, Sequencer Control, MIDI, Move, Filter, and 2-Band Delay.

The Granular Delay component consists of a pair of Cloud Delay modules (one for each channel of incoming stereo audio) and a Freeze button that freezes the delay buffer. In each Scene, a grain position and size is selected within the Cloud Delay buffer. Each Scene also contains controls for pitch jitter and shift, transpose, feedback, level, step length (duration), glide, and smear.

The Globals component contains global attack, decay, and pan-jitter controls, whose settings apply each time a grain is triggered from any Scene. The Sequencer Control component enables you to set the length (number of Scenes) and speed (quarter-, eighth-, or sixteenth-note steps) for automatic Scene sequencing. Clicking the Man button allows you to select Scenes manually for purposes of Scene setup.

The MIDI component lets you set up

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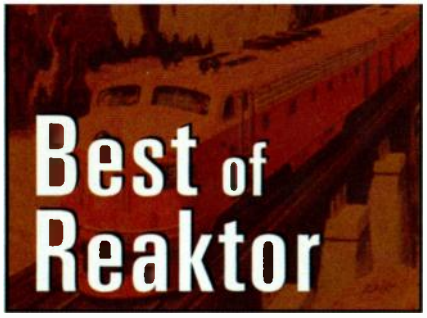

inside the Clock Macro inside the Sequencer Macro) should be in Mono mode; the Position Mod modules won't work if it isn't. You can turn Mono mode on and off in an object's Properties dialog box. After you select the correct settings, resave the Ensemble.

WaveWeaver can randomize nicely, but only if you turn on Mrph/Rnd Isolate for all the controls you don't want to randomize. At a minimum, those should include Seq On/Off, MIDI, and Scene in Sequencer, as well as Pan and Master in Output.

Begin by playing around with the Sequencer modifiers: Bidir, Inv, Start, Range, Skip, and Position Mod 1 and 2. Bidir (bidirectional) runs the sequencer in a forward-backward loop; Inv (inverse) runs it backward; Start and Range set the starting step and number of steps. Skip specifies how many steps are skipped at each position change. Position Mod 1 and 2 use LFOs to modulate the position dynamically. The Position Mods are particularly good for skewing the step order in interesting ways. When you're in an upbeat mood, make sure that 1/2 is turned off—it halves the tempo. Try changing Scenes, or better yet, try drawing your own Scenes. Keyboardists will want to turn MIDI on to transpose the sequencer pitch from their MIDI keyboard. Use Reset to jump all three sequencer layers back to their starting steps for interesting, out-of-the-grid rhythmic variations.

Once you have a good sequence going, tweak Lowpass Filter using the XY control and Env knob to get the right edge to your sound. FM will add a lovely growl to the mix, and LFO will make it change over time following the pattern set by the sin, the tri, and the sqr sliders, at a speed controlled by the Rate knob. Use the Filter Delay to change the groove by adding delayed beats to the mix, but watch the Feed control—too much feedback, and you'll redline!

Finally, turn your attention to the Wavetable Oscillator. Use the XY control to simultaneously change the wave and wave set in real time, and listen to how that affects the timbre with and without glide engaged. W< Mod S> adds jitter to the wave and wave set selections, meaning slightly different values will be used each time a new note is triggered. Change the Octave Interval and Detune controls to vary the register and spread between the two oscillators. If you want a pure tone, keep Drive, LoFi, and FM to a minimum; if you're looking for grunge, turn 'em up! LoFi and FM do a particularly nice job of adding grit.

The Native Instruments' WSM1 map is loaded into both of Wavetable Oscillator's Sample Loop modules by default, but you can change that. Try loading a different map in one or both Sample Loop modules, and make sure to change the Y Min and Max settings for the XY control to accommodate the MIDI trigger values of the samples in your map. Alternatively, try loading a single sample into a Sample Loop module.

Note that the XY control sets both Sampler Loop modules to the same values. For a more complex sound, you can add a second XY control to set them independently or, more simply, use event routers and a button to detach the existing XY module from the second Sample Loop module. You make both modifications in the Wavetable Oscillator Macro.

▼ As with all art forms, Ensemble programming is highly personalized.

STEAMPIPE

By Martijn Zwartjes

SteamPipe is a synthesizer that uses physical modeling of virtual steam passing through a tunable pipe to create realistic-sounding bowed, blown, and plucked sounds. SteamPipe is capable of producing wonderfully evocative hybrid sounds (woodwind guitars, blown strings, plucked flutes, and so on), as well as bizarre sounds that could never be produced by acoustic instruments.

There are four main components to SteamPipe: Steam, Pipe, Reverb, and Output. An additional A440 module plays a 440 Hz sine wave that you can use to tune the virtual pipe.

Steam consists of two subcomponents: Gen and Env. Gen generates the impulse that excites the pipe to create SteamPipe notes. Env uses an ADSR envelope to shape the notes dynamically. Pipe makes use of a number of subcomponents (tuners, feedback, saturation, filtering, and so on) to set the tuning and timbre of the pipe. Reverb is an eminently tweakable stereo reverb, an effect for which Zwartjes is highly regarded in the Reaktor community. Output, which precedes Reverb in the audio chain, is a mono amp with built-in saturator.

SteamPipe does not lend itself to a tabula rasa state, because the controls

FIG. 2: Pictured above is the Pipe component of Martijn Zwartjes's SteamPipe Ensemble.

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control of Grainstates FX from a MIDI keyboard. You can use the keyboard to transpose, select Scenes, reset the Scene Sequencer, and freeze the Cloud Delay buffer. The Move component affects the size and motion (position) of the delay grains. The Filter component contains a pair of variable-bandwidth bandpass filters. The 2-Band Delay component is a tempo-synced, stereo, feedback delay line.

Grainstates FX can transform the simplest sound into a beautiful and mysterious ambient passage. As it is an effects box, you need to provide an audio input. To use Grainstates FX to process an audio file, open Reaktor's Playerbox (View→Show Playerbox), load the desired file, and click on the Play button (looping playback is recommended but not required). To process live audio input, ensure that input from the desired ports on your audio interface is activated (System→Audio + MIDI Settings), and provide audio input. In either mode, you'll need to activate Reaktor's Master Clock by clicking the Play button next to the beats-per-minute display in the toolbar. Grainstates FX uses the Master Clock for its Scene Sequencer.

Any of the three programming starting points—tabula rasa, an existing Snapshot, or a randomized setting—work well with Grainstates FX. I recommend the latter two, because creating a good tabula rasa Snapshot for Grainstates FX is time-consuming.

Grainstates FX can sound great with any type of audio input; its smeary personality, however, does best with legato passages. I especially like what it does with simple melodic material. Solo vocals produce exquisite results when you go easy on the pitch-jitter, -shift, and -transpose controls so that the vocal hovers around its original pitch.

The Scenes are the key to Grainstates FX's dynamic audio processing (see **Fig. 3**). Staying on just one Scene can produce good results, but the real magic occurs in the Scene-to-Scene movement. Take the time to acquaint yourself with the Scene controls (which are the same for each Scene) and to notice how they affect the parameters of pitch (jitter, shift, transpose, glide), timbre and dynamics (feedback, level, smear, grain start/length), and rhythm (step length). There are no pan controls for individual Scenes, but experienced Ensemble builders might want to get under the hood and add them.

If you hit a particularly luscious passage and want to linger, use the Freeze button to freeze the current contents of the delay buffer. That's like listening to an animated still life of your audio input that you can control from your MIDI keyboard. Try turning on MIDI transpose (m TP), freeze (m-frz), and retriggering of the Scene Sequencer (m-tq), and then "play" Grainstates FX from your MIDI keyboard.

Try minimizing the 2-Band Delay component of the signal by turning its D/W (dry/wet) knob to the left. You'll hear more clicks and artifacts, but you might like the crispness.

Grainstates FX has no way to control the output level nor to mix the incoming audio with Grainstates FX output. You can remedy both problems by adding a mixer to the Ensemble structure. To do that, open the Ensemble structure, right-click (Control-click on the Mac) in an empty area and select Insert Instrument→Mixers→Stereo 2 Channel from the drop-down menu. Cable the outputs of the Grainstates FX Instrument into one pair of mixer inputs, and cable the top two inputs from the Audio Input module to the other pair of mixer inputs. Then cable the mixer's outputs to inputs 1 and 2 of the Audio Output module, replacing the cables from the Grainstates FX module. The mixer controls will automatically appear on the Ensemble control panel, allowing you to independently control the wet, dry, and master output levels as well as to mute or solo the wet or dry signal (see **Web Clip 5**).

SNAPSHOT CREATOR'S SURVIVAL GUIDE

Most aspects of Reaktor are elegant and user-friendly; Snapshots processing, however, is not one of them. The Snapshots dialog box can be downright confusing. Here are some tips.

Create a new Snapshot in an empty slot. Select the Snapshot directly above your target empty slot (if the Snapshots list is empty, skip this step). Set the controls as desired, click on the Append button, type your new Snapshot name, and press Enter.

Insert a new Snapshot between two existing Snapshots. Select the Snapshot that appears directly after the place you want your new Snapshot to be. Set the controls as desired, click on the Insert button, type your new Snapshot name, and press Enter.

Copy an existing Snapshot. You can use either of the above two procedures, but don't change any of the control settings.

Modify an existing Snapshot. Select the Snapshot you want to modify, set the controls as desired, click on the Overwrite button, type your new Snapshot name (or leave as is), and press Enter.

Rename an existing Snapshot. Double-click on the Snapshot you want to rename, type your new Snapshot name, and press Enter.

Delete an existing Snapshot. Select the Snapshot you want to delete and click on the Delete button. Note that this does not remove the deleted Snapshot slot from the list, it merely sets the Snapshot to its empty state. There is, unfortunately, no way to remove a slot.

Reorganize the Snapshots list. To move Snapshots around, get rid of empty slots, and the like, you must create a new Snapshot bank (by choosing New Bank from the Banks list box), and then go back and forth between the original and new banks, selecting and appending Snapshots where necessary. When you're done, you can delete the original bank.

MEANMACHINE

By programchild

Meanmachine is a nasty little synth that's capable of producing powerful distorted leads and delicious sonic filth (see **Web Clip 6**). It consists of nine components: Square Osc One, Square Osc Two, Pitchbend/FM, PWM, Amp Envelope, Filter Envelope, Pain, Phaser/Flanger, and Tuned Ambience.

Square Osc One and Two are simple pulse oscillators. Pitchbend/FM sets the pitchbend range of both oscillators and modulates the frequency of Osc Two. PWM uses a triangle LFO to modulate the pulse width of both pulse oscillators. Amp and Filter Envelope are AHDSR (Attack, Hold, Decay, Sustain, and Release) envelopes that control the output amplitude and filter cutoff frequency.

Pain has no label on the control panel, but its controls are in the second row (see **Fig. 4**). It consists of four subcomponents that boost and distort the audio output: cubic shapers, multimode filters, a dynamic chorus-like delay, and an output amplifier. Phaser/Flanger contains a flexible phaser and flanger capable of both subtle and extreme processing. Tuned

CREATING A RANDOM SNAPSHOT

To create a randomized setting for an Ensemble or instrument, click on the Randomize button in its Snapshots dialog box. All controls whose Mrph/Rnd Isolate option is not turned on in the Properties dialog will change to random values within their assigned ranges.

Some Ensembles randomize nicely, producing unusual and useable settings. Others randomize poorly, delivering either silence or horrendous growls and deafening squeals. It's hard to predict how an Ensemble will randomize until you've tried it. But you can maximize your chances of success by doing the following:

- Turn on Mrph/Rnd Isolate for every control that you know you don't want to randomize—typical examples of such controls include level, panning, and feedback of various sorts.
- Set the randomization amount to an appropriate number: 1–50 to create variations on the current setting, 50–90 to create new settings. Don't go much above 90, because controls have a tendency to get "stuck" at those settings.
- Change the range settings of certain key controls to make them randomize more effectively. For example, raise the lowpass filter cutoff range minimum in order to avoid getting a lot of silent random Snapshots.

Ambience is a compact reverb unit.

You can begin programming Meanmachine from any of the three starting points: tabula rasa, existing Snapshot, or randomized settings. You'll need to change some of the default control settings to arrive at a good tabula rasa, but it's worth the effort. If you randomize, be sure to turn Mrph/Rnd Isolate on for controls you don't want affected, such as the output level and delay feedback. Also watch your ears and speakers, because Meanmachine can randomize to earsplitting levels. In fact, I'd recommend delving into the Structure to place a limiter before the final L/R outputs.

You can have lots of fun with the Tuned Ambience controls. Set Tune to Man (manual) and use Tune and Drift to vary the timbre of the reverb. Try extreme settings—the results are unpredictable and sometimes stunning. Alternatively, set Tune to In to let Meanmachine vary the timbre automatically. The Feed, Early/Late, and Mix controls are also very responsive.

Phaser/Flanger can change the sound radically. Try turning Intens up and changing LFO wave. On the flanger end, set Strength to super and twiddle the Flange, Feed, and Wet controls.

Now it's time to inflict some Pain. Begin with the cubic shaper. Its controls, particularly Boost and Shape, affect the degree and timbre of the distortion, changing it from a whisper to a hoarse wail. Next, play with the pre and post filters. Try changing the envelope routing to First, Second, or Both while varying the Envelope knob setting. Then select different filter types, cutoff frequencies, and resonance settings.

Finally, concentrate on the dynamic chorus (the third section from the left), which is a feedback delay with very short delay times (0 to 50 ms). Begin by turning Auto off and working the Delay and Feedb controls to get a choruslike thickening. Turn on the button to the left of Feedb to control the feedback from incoming MIDI velocity. Next turn on Auto, start Reaktor's Master Clock, and play some sustained notes. The results are most interesting at high speeds (tempo settings below ten). To further increase the speed, adjust Reaktor's tempo accordingly in the toolbar.

SEQUENZA

By Rick Scott

SeQuenza is a sampler that's driven by independent sequencers for pitch, volume, sample-playback position, and pan location. Its defining characteristic is its use of manual or automated randomization to change sequencer parameters in real time. In a tribute to the serialist composers of the 50s and 60s, each sequencer contains 12, rather than the more typical 16, steps.

▼

Reaktor produces almost any type of electronic music processing imaginable.

SeQuenza contains nine components: Sampler, Clock, Boosters, Delay/Diffuser, Pitch, Volume, Position, Pan, and Maestro. At its heart is Clock, a Clock Osc module with internal and external sync, reset, tempo (bpm) with jitter, and shuffle controls. Clock drives the four sequencers, each of which has step-value, start-position, length, and skip controls. The step values act as offsets from middle (Mid) or minimum (Base) values. Those offsets are restricted to the range set by the Range knob. Manual and automated randomizers, with individual speed controls, are provided for the step-value settings, Mid or Base and Range settings, and the sequence start and length settings.

Sampler is a Sampler FM module whose amplitude is driven by an ADR (Attack, Decay, Release) envelope. Boosters is a 3-band parametric EQ. Delay/Diffuser is a stereo reflector whose unusually long delay times (up to 280 ms) and small diffusion values make it usable as either a multitap delay or a diffuser. Maestro, the last link in the chain, is a stereo output amp with a low-cut filter to prevent rumble, a limiter-expander to maximize volume (both without panel controls), and a global Randomize button.

To use SeQuenza, select the provided tabula rasa Snapshot, load a sample in the Sampler, and turn on the Run button in the Clock section of the control panel. Start by varying the Att, Decay, and Width controls to see how strongly they affect the dynamic shapes of the sampler events. The values of these controls can make or break an audio passage; in general, you'll want lower values for staccato samples (percussion) and higher ones for legato (melodic lines). Use the Boosters controls to shape the timbre. Note that they are skewed toward boosting the high end; you can change that by mod-

FIG. 5: Pictured above are the pitch, volume, sample-playback position, and pan location sequencers of Rick Scott's SeQuenza Ensemble.

ifying their Min and Max range settings in their respective Properties dialog boxes.

Vary the Clock controls and listen to how they affect the overall rhythmic flow of sampler events. Beats-per-minute jitter and shuffle are useful for adding humanness. Once you have good Clock settings, explore the Delay/Diffuser. Set delay to low and diffusion and feedback to high for a poor man's reflection-reverb effect. Set delay to high and diffusion and feedback to low for a multitap delay.

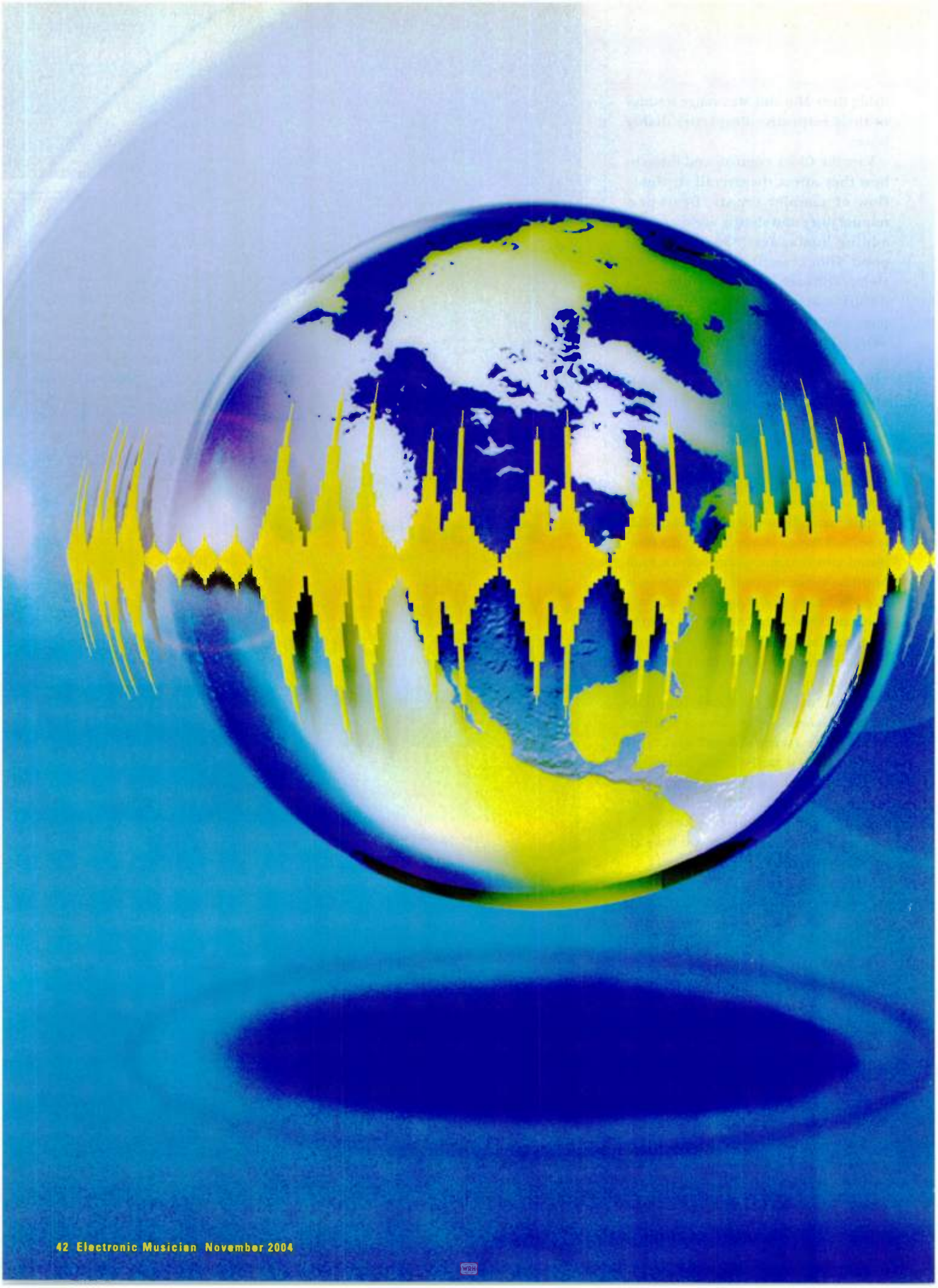
Now to the sequencers (see **Fig. 5**). Moving from left to right, you'll find the 12 step-value knobs; a Skip control for skipping clock cycles to make the sequencer run at 1/1, 1/2, 1/3, and 1/4 of Reaktor's tempo; rndParameter controls that randomize the sequencer step-value knobs manually or automatically; Mid, Base, and Range controls to set the minimum and maximum step values; rndMidBaseRange controls that randomize the Mid, Base, and Range values; Start and Len controls that specify the starting step and length of the sequence; and rndStartLen controls that randomize the start and len values.

You can use the Man and Auto controls to change the sequencer settings in real time (see **Web Clips 7** and **8**). If you turn a few well-chosen Autos on, you can sit back and let SeQuenza create an original composition that never repeats. Turn on Reaktor's Recorder-box for a few minutes, and you have an instant masterpiece.

With 32 Ensembles in the Reaktor 4 factory library and, at last count, more than 1,700 downloadable from the Reaktor User Library, you're unlikely to run out of material to tweak any time soon. Furthermore, there's no better way to get your feet wet in Ensemble building than to start making your own modifications. Caveat emptor: building and modifying Reaktor Ensembles is highly addictive!

EM WEB CLIPS

Rick Scott *is a recovering atonalist and the creator of numerous Reaktor Ensembles. You can sample his Reaktor-centric compositions at www.reaktions.com and download his Ensembles from the Reaktor User Library.*



worldwidewaveforms

By Thad Brown

Sonifying your Web site is much easier than it used to be.

Few tools are of more value to musicians than the Internet. A prominent Web presence is the only way to have your music, and information about it, available all day, every day. Web sites can be used for mundane tasks such as promoting gigs and signing up email subscribers. To take full advantage of the Web, however, you should include examples of your music on your Web site. That could mean anything from sharing a few demos with friends to multicasting for hundreds of people simultaneously. In this article, I'll concentrate on how audio is compressed, how to choose an appropriate compression format, and how to write the basic HTML code for adding audio to your Web page. Along the way, I'll offer some useful tips on how to make the most of your Web site.

BANDWIDTH REALITIES

If everyone in the world sat at the end of a fiber-optic connection to the Internet, inserting Web audio would be a simple matter of uploading your perfectly mixed 24-bit files to your Web site and adding a few links to them. In reality, people can use anything from a 56k modem to a fiber-optic connection. No matter what connection speed visitors to your Web site use, they should all have a good musical experience. As a reference, users of dial-up modems top out at 56 kbps, DSL users top out at 1,500 kbps (uploads are slower), and cable modem users top out at around 2,500 kbps. Those are absolute maximums; quite often, real-world performance is much slower, and for various reasons, bandwidth can change day to day with most Internet providers. The Internet can also slow down as a result of hacker attacks and backbone failures. In short, bandwidth varies, even for those who have the best Internet connections.

worldwidewaveforms

Compared with most kinds of Web content, audio files are very large. For example, one page of my graphics-intensive personal Web site, including graphics files and HTML code, is about 85 Kb of data. One second of stereo CD-quality audio is 1,410 Kb of data; in other words, one second of audio on a CD contains more than 16 times the amount of data contained in one of my personal Web pages. That fact represents the main problem with posting audio on a Web site: only the fastest Internet connections operating under the best of circumstances can stream true CD-quality audio.

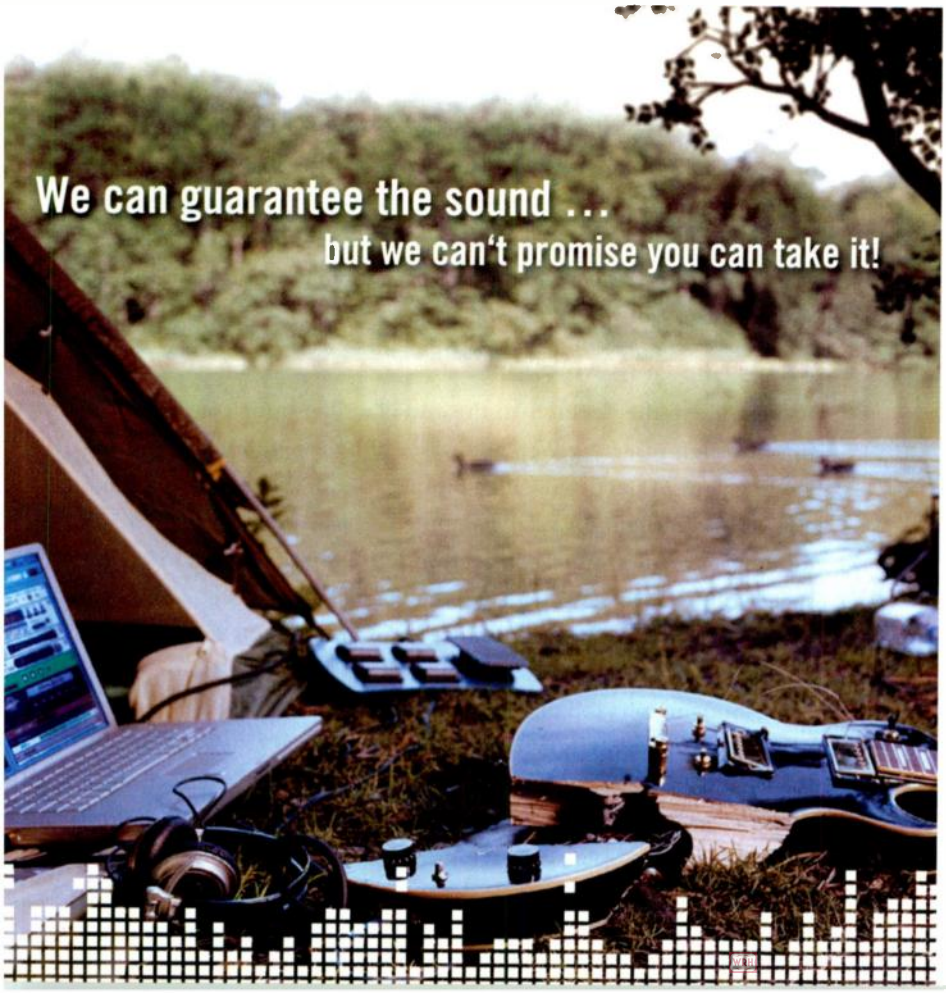
Even if everyone had an Internet connection fast enough to stream full-bandwidth 16-bit, 44.1 kHz audio files, that still might not be the most cost-effective way to download audio files. Most commercial Web-hosting companies charge their customers according to how much data is downloaded each month. The solution to that problem is to compress the audio files.

THEORY OF COMPRESSION

Before I discuss the tools that are available for making compressed audio, it is important to understand the basics of audio compression. Audio-compression schemes use what are called *codecs* to minimize file size. ("Codec" stands for "encode/decode.") Creating the file is half of the equation; after you compress a file using one of various codecs (see the sidebar "Alternative File Formats"), the person downloading the file has to decode it for playback.

By far the most common codec is MP3, so for this article I'll concentrate on how to make good MP3 files for the

FIG. 1: Apple's iTunes is an excellent program for playing and encoding compressed audio in a variety of formats. The encoding setup window is shown in the inset.



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Web. All codecs perform similarly, so what I present in this article applies to all other types of codecs.

The science of audio perception is called *psychoacoustics*, and while many of its precepts are used in designing audio-compression tools, the one most often used is called *masking*. Masking occurs when one sound that is similar in harmonic content to another is louder than the other. In such cases, the softer sound may be imperceptible. An example would be two violins playing the same note, except one violin is played loudly and the other softly. You would barely hear the softer violin, if at all. Audio codecs exploit that fact by getting rid of data that is likely to be masked in one way or another, so that when the audio is decoded, you hear something as close to the original as possible. That process is called *perceptual coding*, because it hinges on what our ears and brains can, and more importantly, cannot perceive.

An MP3 encoder works on many small chunks of audio called *frames*. The MP3 standard dictates that each frame last 26 ms, so an MP3 encoder outputs as many 26 ms frames as necessary to encode the file. Each frame is compared with the mathematical models of perception in the codec itself, and the data that is deemed least important by the codec is discarded. Depending on which settings are specified by the user, the codec can be forced to keep more or less data. The less data that is kept, the more likely it is that some important data will be discarded, resulting in a degradation of audio quality. All perceptual encoding is *lossy*, which means that some information is lost in the process—what comes out is not exactly what went in. Compressed audio can sound good, but even the best encoders make some changes to an audio file. Working with compressed audio is all about the trade-off between audio quality and file size.

PRACTICE OF COMPRESSION

Most musicians and audio engineers classify audio by its sampling rate (the number of times an incoming audio stream is sampled per second) and its word length (how many bits of resolution each sample uses). CDs have 44,100 samples per second and use 16-bit words for each sample. Even modest home-recording setups can now record at a much higher resolution, but 16-bit, 44.1 kHz audio is still a benchmark, if only because of the millions of CDs that use that standard.

Different terminology is used to describe compressed audio; it is categorized by its *bit rate*. The most common bit rate for MP3 files, for example, is 128 kbps, meaning that the file contains 128 Kb of data for each second of audio. MP3 files at that bit rate are often called CD quality. There is an obvious decline, however, in audio quality

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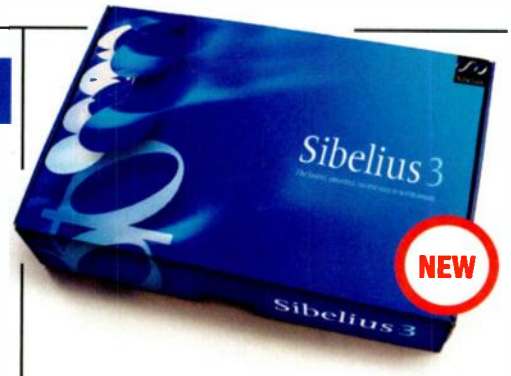

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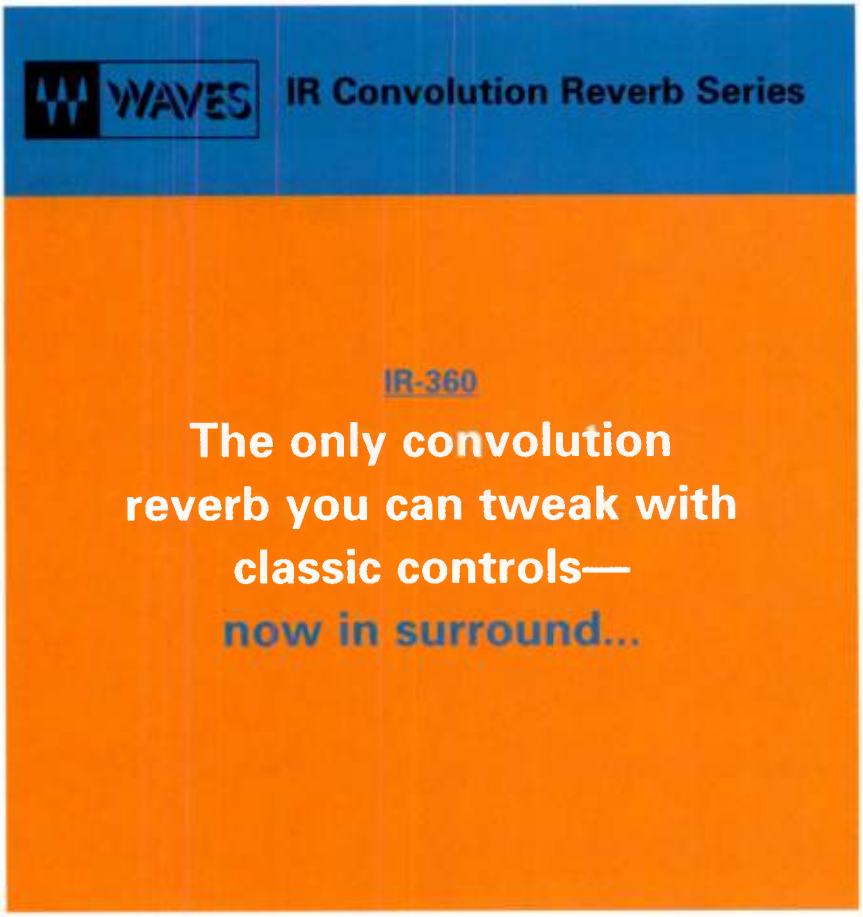
FIG. 2: Cubase SX can export an MP3 directly, at a wide variety of bit rates.

compared with that of a CD. If there were a compressed-audio-file standard, it would be the 128 kbps MP3.

When encoding an MP3, you can use a constant bit rate (CBR) or a variable bit rate (VBR). As the name implies, a CBR file uses the same bit rate throughout the song, whereas a VBR encoder will vary the bit rate based on the complexity of the audio being encoded. In a silent section, for example, the bit rate could be zero, whereas the bit rate for a section with a full band could be the maximum that the codec supports. VBR files are usually preferable, because they sound better than CBR files of the same size. The only downside to VBR files is that some older MP3 players may not be able to play them.

Both Mac and Windows platforms have excellent free tools for making compressed audio files. If you have Mac OS X, you can configure iTunes to make MP3 files instead of using the default Advanced Audio Coding (AAC) file type. Select Preferences from the iTunes menu, click on the Importing button, and select the MP3 encoder (see **Fig. 1**). Mac OS 9 users can download SoundApp (www.spies.com/~franke/SoundApp), a useful audio-file converter for older versions of the Mac OS. Windows users have dozens of options for free MP3 encoders. I prefer Cdex (www.cdex.n3.net), an easy-to-use, free ripper that has lots of options for encoding and



saving files. Alternatively, many digital audio sequencers export files in MP3 and other compressed audio formats (see **Fig. 2**).

Once you are armed with the tools to make an MP3, the next step is to decide which settings to use. When ripping CDs for my personal use, I use a high VBR because, even when I use the highest-quality settings, a file is compressed to one-fifth of its original size. MP3s of that quality sound good on almost any player (see **Fig. 3**). For Web content, however, those files are too large for people who have slower Internet connections to download and play conveniently. For Web content, start at 128 kbps VBR, see how big the file is, and listen to how good (or bad) it sounds. Even someone with a dial-up modem can download a file at that bit rate without experiencing excessive aggravation. If the audio quality at 128 kbps is not good enough, increase the bit rate in small increments until you're satisfied with the sound.

FIG. 3: Shown above is WinAmp, a popular and fully featured Windows MP3 player.

An even better idea is to create more than one file for your Web site—a high-resolution file for the people with faster network connections, and a lower-resolution file for the others. That enables all visitors to your site the chance to enjoy your music by allowing them to choose between audio quality and download speed.

You can often EQ your audio source files to make them sound better after compression. Because the encoding process throws out some data, the encoder is making choices about what is

important in a mix and how it should sound. Sometimes parts of an MP3 file don't sound right. That is especially true with hi-hats, but it can apply to any part of a mix. Problems with sound quality are more common with lower-bit-rate MP3s, because the encoder has to get rid of more data, resulting in a greater effect on the sound. Keep in mind that equalizing for compression is different from equalizing for normal playback—the sound after compression is what you're concerned with.

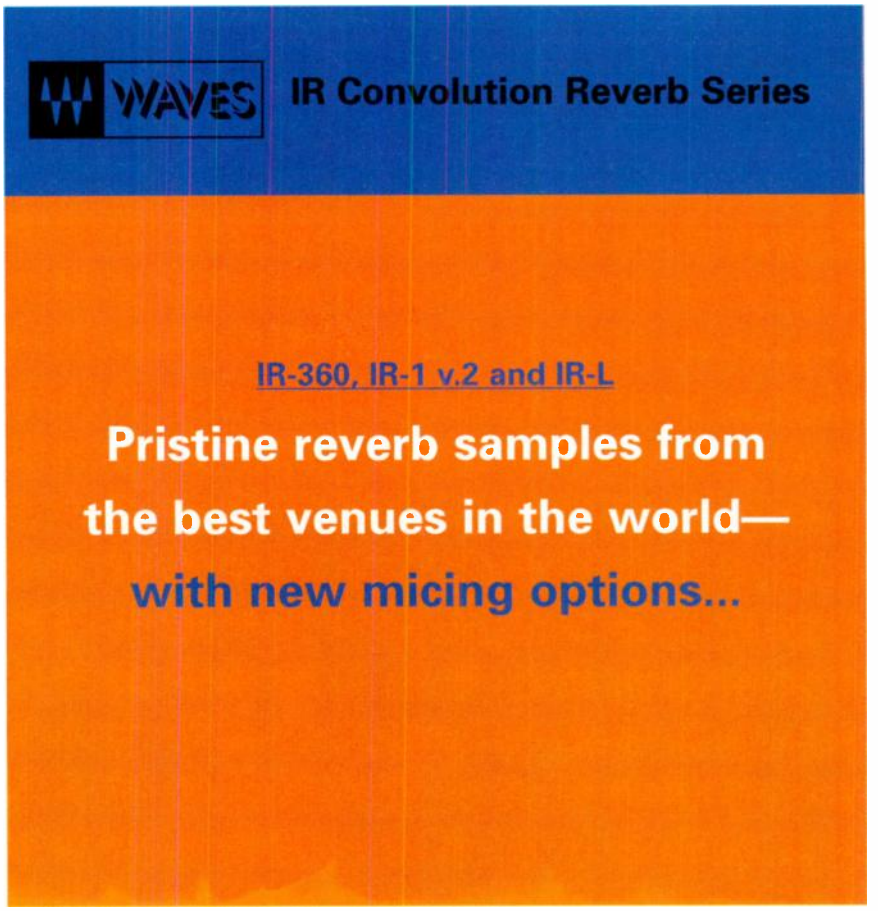
Make your low-resolution file as small as possible. Using a VBR file is almost always a good idea. Trim all silence at the beginning and the end of a song. If you are forced to make small files, you can do two drastic things: set the encoder's output sampling rate to 22 kHz, and encode in mono. That will reduce the audio quality, but depending on the content and the encoder, it might be good enough. The encoded file will be reduced to a quarter of its original size (half due to the encoder's sampling-rate cut and half again for encoding in mono).

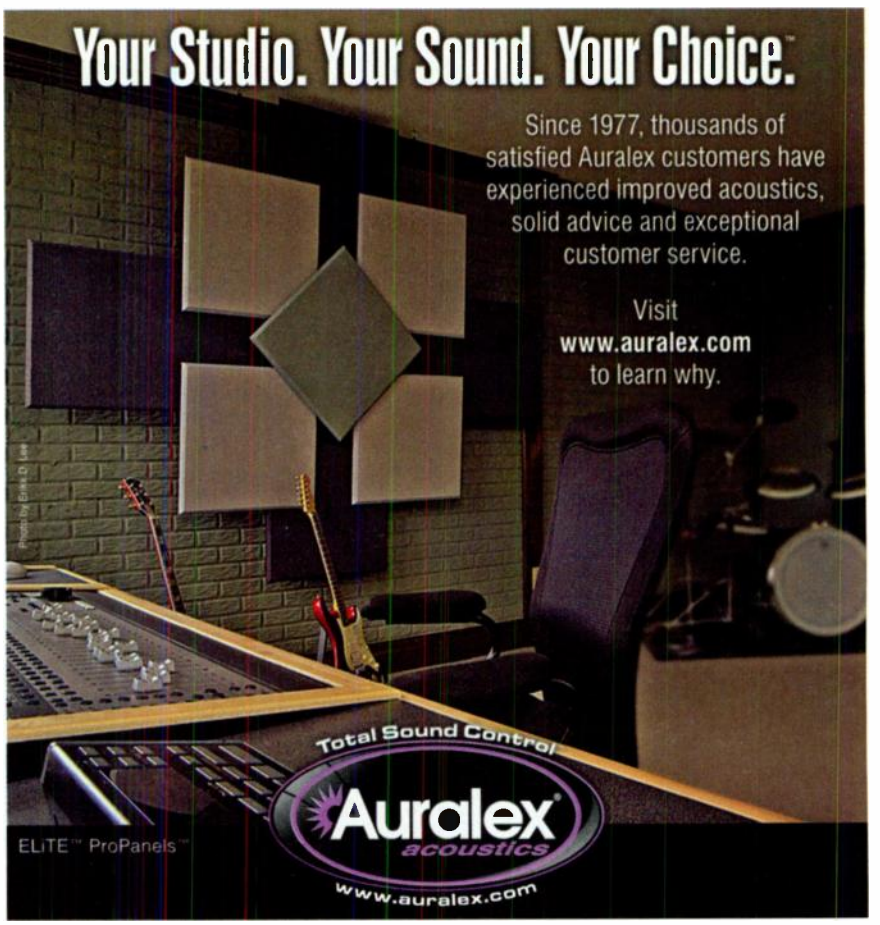
The final task when making an MP3 for your Web site is to edit the ID3 tags. ID3 tags contain information about the artist, the musical style, and an optional thumbnail image. Always include the URL to your Web site in case someone hears the file and wants to find more music like it. Each software encoder has the ID3 information in a different place, but any decent ripper will have the ability to edit the tags.

To illustrate the differences in audio quality using various bit rates, I've posted snippets of one of my songs—one version in its original WAV format (see **Web Clip 1**) and three that are MP3 encoded: 192 kbps, 128 kbps, and 128 kbps at a 22 kHz sampling rate (see **Web Clips 2, 3,** and **4**).

HTML BASICS

A few years ago, getting an audio file to play back from a Web site took a fair amount of effort on both the server and client sides. Today, assuming that the person visiting the Web site has modern software and hardware, the task is straightforward. The simplest





method is to use an FTP client to put the MP3 on the Web server, and then add a link to the file on the Web site. The link is similar to a Web-page link, but the target is the MP3 file. For example, the HTML code to link to a song named Nabakov would be Nabakov.

When site visitors click on the link, the MP3 file starts downloading to their browsers. Most modern browsers buffer a certain amount of the file and start playback when the browser calculates that the file can be played back without interruption. Alternatively, visitors may have configured their browsers to use a preferred audio player—such as iTunes, WinAmp, or Windows Media Player—to automatically play Web audio content. Unfortunately, client-side issues are beyond the control of the Web-site creator, and each browser deals with audio a bit differently.

The only server-side problem that could arise is that your Web-hosting company might not have its Web server configured to recognize MP3 files with their proper MIME type. That problem is exceedingly rare. If, however, a file that is in the right place with a link that is written correctly will not play and your browser properly plays back MP3 files from other Web sites, you should contact your Web host's support staff to see if MP3s are intentionally or unintentionally blocked on its servers.

As an alternative to posting download links, you can embed the audio in your Web pages. That allows the file to start playing automatically when the page is loaded. Embedded audio can be supremely irritating if used incorrectly—nothing drives me more crazy than visiting a Web site only to find a Homer Simpson sample blaring through my studio monitors at 90 dB. A better way to use embedded audio is to have a separate page on your site for each embedded file. That allows you to create your own graphics for the audio as well as include links to other songs and places to buy your music. Providing pictures and text also gives the visitor something to do while the audio is being fetched from the server. The HTML code to embed a song named Nabakov would be <EMBED src="www .mysite.com/music/Nabakov.mp3" autostart=true loop=false volume=100 hidden=true>.

Instead of embedding a whole song, you might consider embedding a short, low-volume loop that is representative of your music. To do that, simply change "loop=false" to "loop=true" in the HTML code. When people visit the page, the loop will automatically play in the background without scaring them to death.

These examples are not only useful for people who hand code their HTML; all of the same things can also be done in most of the popular Web-authoring programs. For example, in Macromedia's Dreamweaver, you can create a link to point to an MP3 file by selecting the link and then browsing to the correct file in the Property Inspector. The Property Inspector can also be used to embed audio files in a Web page. The audio can be set to play when a link is clicked on or when the mouse rolls over a picture. The results can be either incredibly amateurish or, when used judiciously, very professional. Macromedia suggests using its Flash authoring tools to save music as Shockwave files to overcome the differences in how browsers and platforms deal with MP3 audio. That has pros and cons, but it is an alternative to MP3 that is worth considering.

Finally, you might want to give visitors to your site instructions on downloading your music instead of just listening to it. If a song plays back inside a browser, it will most likely remain in the browser's cache for a certain amount of time. However, the user will not be able to easily find the song for playback or for loading into a portable MP3 player. Although it might seem like Web browsing 101, it is a good idea to remind visitors that they can right-click (Windows) or Control-click (Mac OS) on the file to open a contextual menu that allows them to save the MP3 anywhere on their hard drive.

WEB MULTICASTING

When a small number of people are trying to stream music from a Web site, the Web server can handle all of the audio data without much trouble. If, however, you are lucky enough to have lots of people who want to listen to your music at the same time, your server might run out of bandwidth or processing power. Then it's time to consider Web multicasting.

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sending the content to smart routers and switches that can handle new requests for the data stream on their own. If a computer makes a request to listen to a particular song, the nearest router or switch that is already broadcasting the song simply adds the new computer to the list. That saves bandwidth by putting less stress on the server providing the content and by routing the data from the source closest to the receiver.

Multicasting is the best solution for providing Web content to many users simultaneously, but it is not a do-it-yourself project. Your Web server will have to connect to a machine that is dedicated to multicast streaming, and there is usually an extra charge for that service. The two biggest players in multicasting are Microsoft and Real Networks. If you have a commercial company hosting your Web site, you will have to find out what, if any, multimedia streaming and multicasting options are available. If multicasting is offered and is the only way to solve the lucky problem of having too many listeners, the smart decision is to put up the cash.

While putting your music on the Web can include some obstacles, it is undoubtedly worth the effort. The Web gives independent and unsigned artists a superb tool with which they can present their music 24 hours a day, 7 days a week, across the globe. It also provides more established artists with a direct connection to the people who will hear and buy their music. Web-savvy musicians such as Todd Rundgren and Big Head Todd and the Monsters use their Web sites as serious money-making and promotional tools. The more you learn about Web audio, the better you can leverage the Web to get your music out to the masses. EMWEB CLIPS

Thad Brown *is a musician, writer, and consultant whose online avatar resides at www.thadbrown.com.*

ALTERNATIVE FILE FORMATS

MP3 is not the only file format used on the Web. Some alternatives are listed below.

AAC is the native format used by iTunes. While not very common on the Web, both Mac and PC users can play AAC files if they have the current version of QuickTime installed.

Windows users can create and play files in Microsoft's proprietary WMA format. Personally, I think both AAC and WMA files sound better than MP3 at the same bit rate, but fewer people will have the software to play them back.

While there are many free software encoders to make MP3s, the core technology used to make MP3s is still patented. Ogg Vorbis (www.vorbis.com) is an open source, free codec that presents an alternative to MP3. If you are interested in open source software, this is a codec that you may want to learn more about.

Real Audio from Real Networks (www.real.com) is another proprietary format. While Real Audio files can sound decent, most often the format is used for lower-quality sound and video for Web broadcasting. Real Player (a free cross-platform download) must be installed to play Real Audio files.

Shorten (http://wiki.etree.org) is a fairly new lossless-compression scheme. No data is lost, and after the file is decompressed, it plays back exactly as the original did. Unfortunately, the degree of compression is much less for lossless formats—50 to 70 percent in the case of Shorten—making them less suitable for Web posting. Still, the audio quality is the best possible.

Apple Lossless is a lossless-compression scheme that was recently introduced by Apple as part of its QuickTime package. iTunes can be used to encode in that format, and the typical file size reduction is 50 percent.

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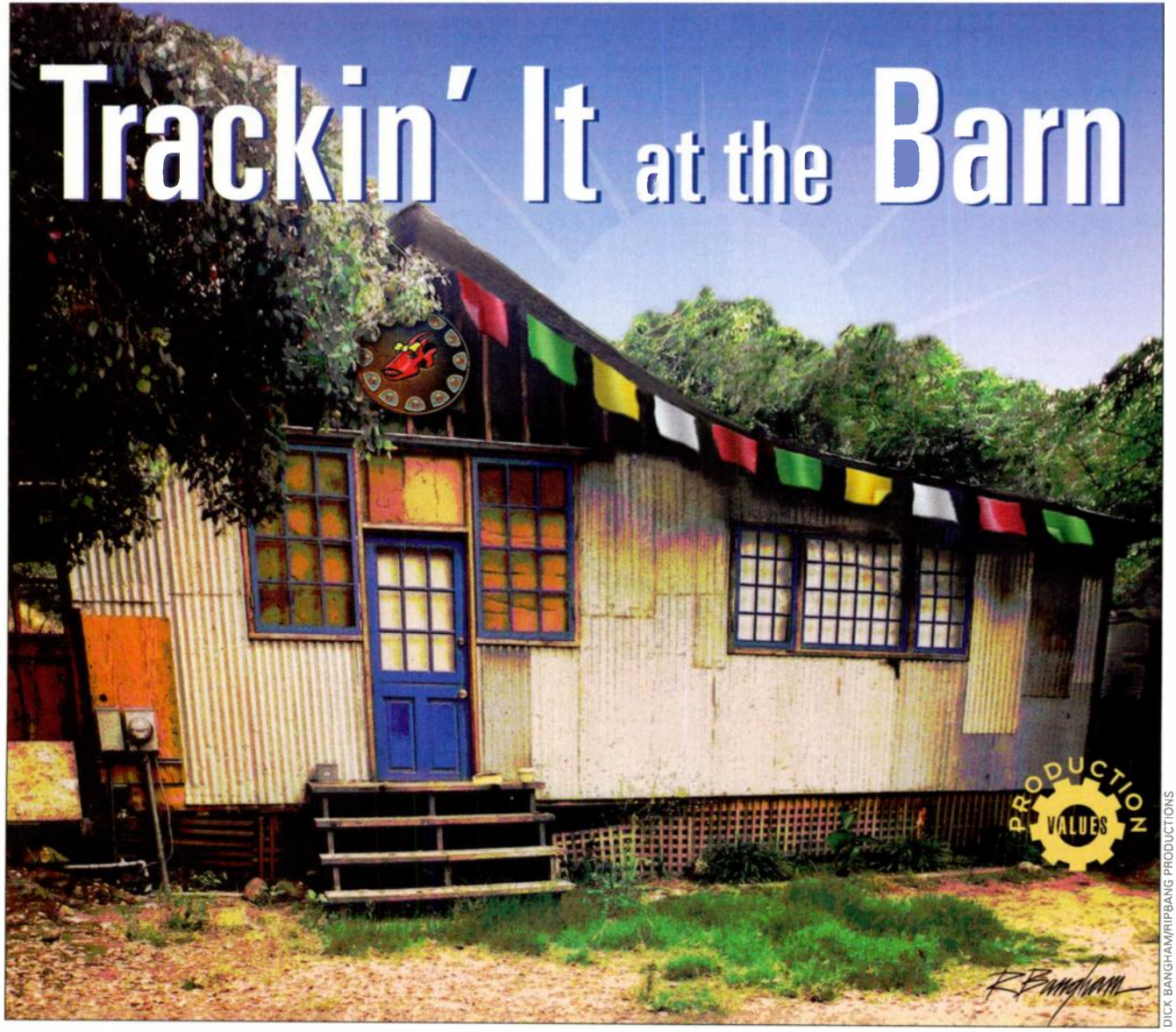


DICK BANGHAM/RIPBANG PRODUCTIONS

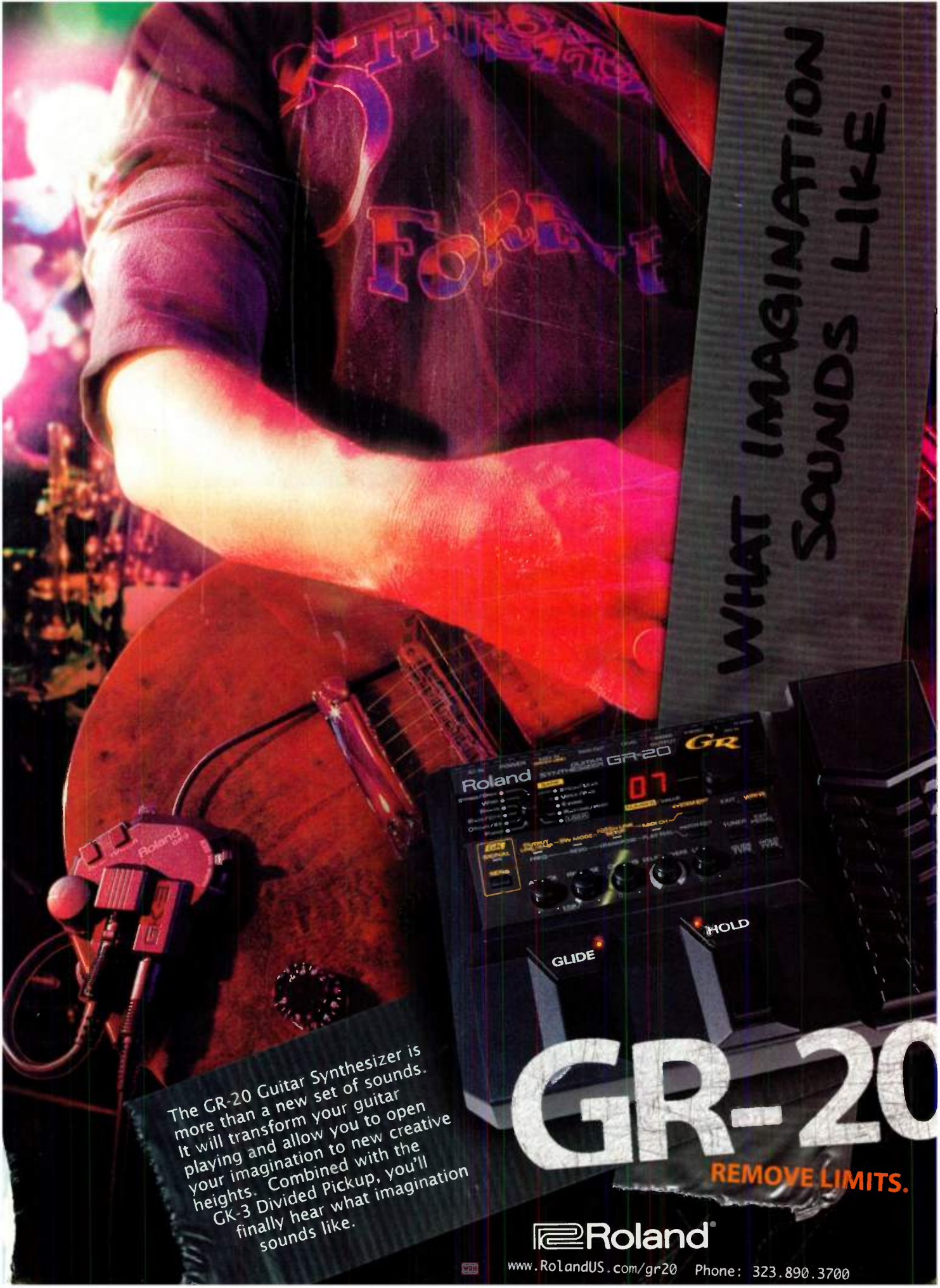
An inside look at Little Feat's rustic project studio and the recording of the band's latest CD.

In these days of high-quality, easily portable studio gear, good recordings can be made in unlikely places. One such recording is the most recent release by the legendary group Little Feat, a band that features its own unique blend of rock, boogie, blues, country, jazz, and New Orleans–style music. The CD was recorded in a rundown, corrugated-tin shack that the band members refer to as "the Barn," located in the Topanga Canyon area west of Los Angeles.

By Mike Levine

The story of the recording is intriguing because the band, along with veteran engineer Gil Morales (see **Fig. 1**), crafted an excellent CD in a studio space that offered plenty of challenges, acoustically and otherwise.

For those unfamiliar with Little Feat's history, its commercial heyday was in the '70s, when Lowell George was the artistic focal point. But George died in 1979, and the band broke up not long after. It reformed in 1988, adding Fred Tackett on guitar and Craig Fuller on lead vocals. The band has kept its lineup together ever since, with the exception of Fuller who was replaced by vocalist Shaun Murphy in 1993. Other than Tackett and Murphy, the rest of Little Feat—guitarist-vocalist Paul Barrere, keyboardist-vocalist Bill Payne, drummer-vocalist Richie Hayward, bassist Kenny Gradney, and percussionist-vocalist Sam Clayton—are all veterans of the band's glory days in the '70s (see **Fig. 2**). Although Little Feat no longer has a major-label deal, it's found a niche as a successful indie act.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Trackin' It at the Barn

The band's current members are no strangers to the world of project-studio recording. Their previous studio CDs, *Under the Radar* (CMC International, 1998) and *Chinese Work Songs* (CMC International, 2000), were tracked at a studio in Barrere's house. But when they got ready to record *Kickin' It at the Barn* (Hot Tomato, 2003), the space requirements of Barrere's family made recording there no longer practical. It was time for Little Feat to find a new studio, and that was when Tackett and the band decided to set up shop in the Barn.

GREG EBERSOLE

FIG. 2: Little Feat's current lineup (left to right): Bill Payne, Richie Hayward, Fred Tackett, Shaun Murphy, Paul Barrere, Sam Clayton, and Kenny Gradney.

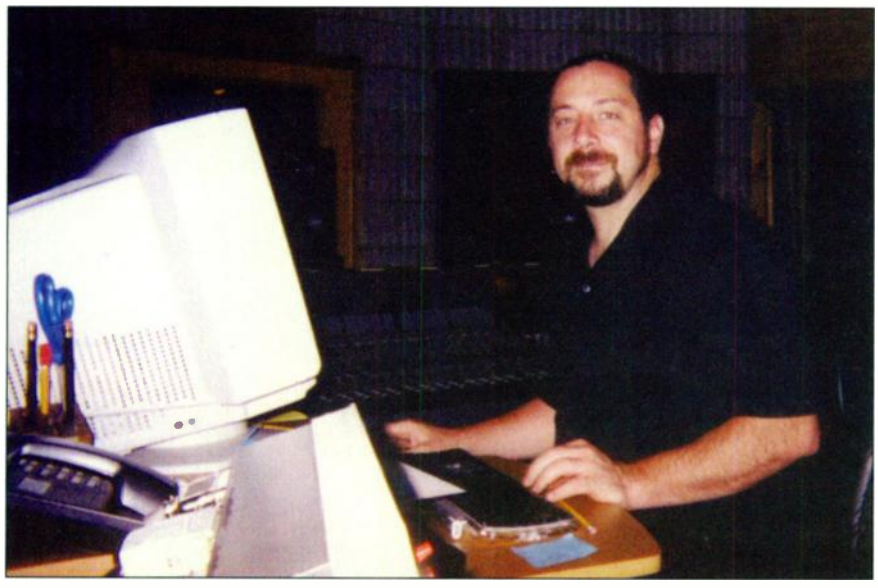
DIAMOND IN THE ROUGH

The Barn is located on a piece of rental property that Tackett owns in the town of Topanga. He says that when he first bought the property, the leaky-roofed structure was hardly a prime candidate to become recording space. "It was covered by brush and had rattlesnakes all around it," he remembers. "Nobody went back there."

The Barn's renaissance began several years before Tackett even thought of using it as a studio. He had rented one of the three houses on the property to a carpenter who fixed up the Barn to use as a shop, plugging its leaky roof and making it into a useable workspace. When the carpenter moved out, the band was looking for a new place to record.

Even with the carpenter's renovations, the Barn needed plenty more fixing up before it would become studio worthy. Besides the obvious acoustical challenges that the tin walls presented, there were other obstacles to overcome. One was access. "It's in a big hollow," says Tackett. "Picture a big bowl; the Barn's down in it like a spoon. It's down in the center of the spoon, and there's a big ridge all around the top of it" (see **Fig. 3**). This was problematic because the only easy access was through the house of one of Tackett's tenants. "The only way to get into the Barn without going through the woman's house and across her patio," says Morales, "was to drive down a steep dirt path. On a good day, you could get in there with a car, but if there was any kind of moisture on the ground you could only get out with a 4×4." The only other option was to park on the street and walk around and down to the Barn, but it was about a quarter-mile hike.

Despite these limitations, Tackett and the other band members decided to convert the Barn into a studio. "We threw a bunch of money into it, and started conditioning it for sound," says Tackett, who adds, "It is not even close to being soundproof, especially when Richie starts playing the drums."



LISA LYNNE

FIG. 1: Gil Morales, who recorded and mixed *Kickin'*, has been engineering for Little Feat since 1995. During that time he's recorded seven CDs and two DVDs for the band.

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Trackin' It at the Barn

MIKING IT UP

When miking the drums in the Barn's main room, Morales used close mics and a variety of overhead and room mics. (See the sidebar "Mikin' It at the Barn" for a complete mic list.) For the overheads, he used Audio-Technica AT4060 tube mics. "I had a pair of those suspended from the rafters," he says, "using the type of clamp-on adapters that you use for tom mics. We mounted the K&M boom to those, and then used those clamps to hold them to the rafters—then we'd gaffer-tape the hell out of them" (see Fig. 7).

Morales used a stereo mic for additional ambient room sounds. "Paul has an old Shure VP88," Morales says, "that's an M/S microphone. I put it in the mode that bypasses its internal M/S matrix. And that one was hanging almost in the crest of the roof. Fred's carpenter left me a 2×6 up in the rafters, and I hung the VP88 from it."

The guitar amps—Barrere used a '57 Fender Vibrolux and Tackett a '63 Fender Deluxe Reverb—were close-miked with Shure SM57s. Both guitarists would crank their amps up full. "For the most part, there's no way you can isolate them in an open space like that," Morales says. However, the amp baffles did have an effect. "They dulled down the bleed in the room. You heard the rumble from them, which is kind of what the room mics are about anyway," says Morales. "Is leakage always a bad thing? In my opinion, the answer to that question is no."

Bassist Kenny Gradney recorded direct. "Kenny would plug in to my Demeter," Morales says. "I've got the H-Series DI. And I just plugged him in to that and took the aux out into an amp." Gradney mainly used the bass amp (Morales recalls that it was an SWR) in order to hear himself.

The CD cover for *Kickin' It at the Barn* shows an idyllic version of the outside of the studio.

Many of the tracks on *Kickin' It at the Barn* feature either Tackett or Barrere playing acoustic guitars or dobros (wood- and metal bodied). Some of the tracks were recorded as overdubs, but many were cut during the basics. "Whoever was playing acoustic would be in the control room with me, and we'd monitor with headphones," Morales explains. "Anything we overdubbed, we did out in the room."

Barrere, Tackett, Hayward, and Gradney played on all of the basics. Keyboardist Bill Payne was there for some, but because he had to commute to the sessions from his home in Montana, he did some of his piano parts as overdubs. When you hear the CD, it sounds as though Payne was playing an acoustic piano; but he played most of his piano parts and some of his B-3 parts on a Korg SGProX keyboard that Morales recorded direct. "It's a wonderful instrument," says Payne about the Korg, which he also uses live. "I mostly used a patch called Classical Piano."

Percussionist Clayton and vocalist Murphy also had to travel a long distance to get to Topanga, so they recorded their parts later as overdubs. Most of the overdubs were done at the Barn on the DA-38s, but some were recorded at Morales's studio into Logic.

Morales brought the band's spare DA-38 home and used it to transfer keeper tracks from the Barn into Logic. "Anytime we got a take that we agreed was a keeper, I'd drive home at night

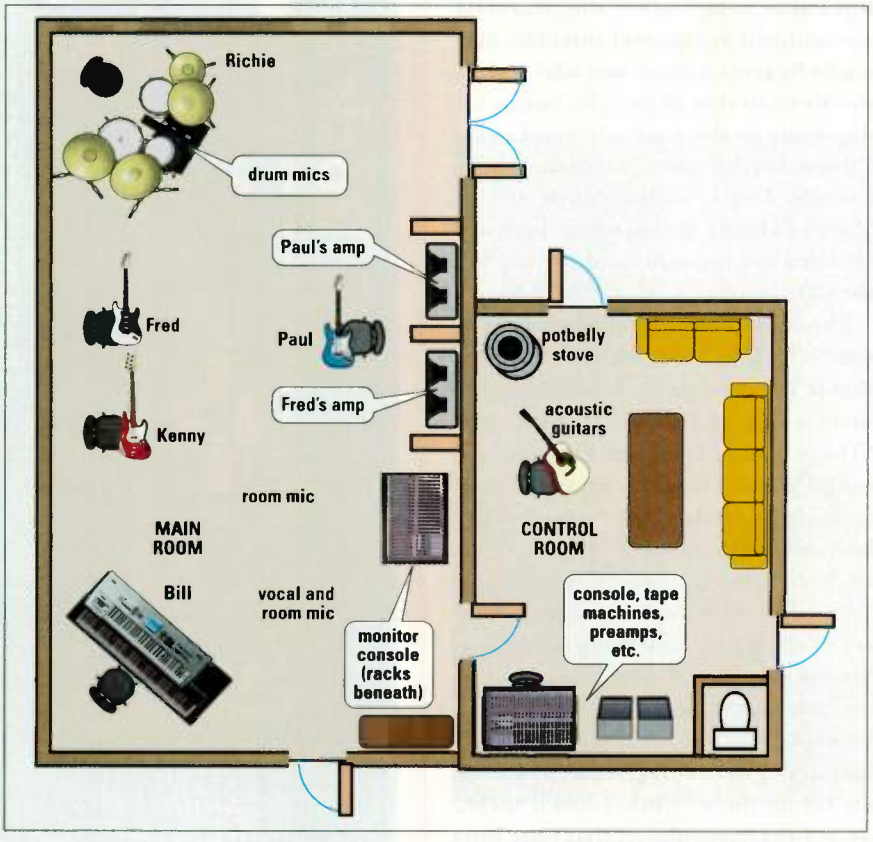

FIG. 5: The above graphic shows the Barn's layout, including its main room and its control room.

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and transfer it," Morales says, "So as we went on, I was transferring master takes into the computer." (The overdubs that were recorded later at Morales's studio were done at 24-bit resolution. Because of the real-time sampling-rate conversion feature in Logic, he was able to use them alongside the 16-bit DA-38 tracks.)

Many of the final lead vocals were recorded at the Barn and were originally intended to be used only as reference vocals. "They'd go in and sing after getting a take," says Morales. "These ended up being the keeper vocals."

Barrere explains that Little Feat's approach to vocal recording has mellowed over the years. "We used to go through and fix every little syllable," he says. "But the last four or five times we keep things natural. So what if it goes a little flat here and a little sharp there? It just sounds natural. We made the ones spot on that had to be. But there wasn't a lot of comping going on."

Morales says that the main vocal mic he used was an Audio-Technica AT4060. Because the band had extensive studio experience, he didn't have to use a lot of compression going to tape. "They've been doing it so long," Morales explains, "that they know how to work the mics. As long as I got it within a decibel or two of clipping and then let them take care of the rest, it worked out." Any necessary dynamic adjustments were done in Logic during mixdown. "I fixed the problem areas more with automation than with a ton of compression," he says.

KEEPING IT ORGANIZED

Although a lot of session time was spent developing and refining song arrangements, Morales had to stay prepared because he never knew when the musicians might play something they wanted to keep. "Basically, I've learned with those guys that if there's more than two of them in a room, I have to roll tape," says Morales, who's worked with Little Feat since 1995, engineering seven CDs and two DVDs for them in that time. "There was one time, many years ago, that I missed one of the best takes I ever heard from them. I learned never to let them be in there without something moving."

As you might imagine, Morales used many of the Hi8-format DA-38 tapes. "I think there are more than 400 tapes," he says. This volume of recorded material also required him to stay organized, or it would have been impossible to remember what was where. He took copious notes, and by the time the project ended he had "stacks of paperwork and uncountable reams of legal pads."

DISTURBING THE PEACE

Despite the efforts by Morales and the band to keep as much of the sound inside the Barn as possible, it got so loud at times that the neighbors were affected. This fact became readily apparent when the band was perfecting the song "Stomp," a long, fast, jazzy instrumental.

Tackett tells what happened: "We must have played that ["Stomp"] for about two days, about eight hours a day. I was doing a guitar solo, and suddenly I turn around and Paul says, 'The police are here, Fred.' I go out and there's this highway patrolman. And he's looking at all these guys, some of us are 60 and some of us are 55, you know, and this guy's half our age.

"He was funny—he was like, 'What are you guys doing down here?' And we go, 'yeah, we're this band Little Feat, we're trying to make a record.' And he says, 'Little Feat, haven't I heard of you guys?' And Kenny started singing 'Fat Man in the Bathtub' and 'Dixie Chicken' and he goes, 'Oh yeah, I know you guys.' And he's looking around at all the old junk that we've taken out of the Barn and

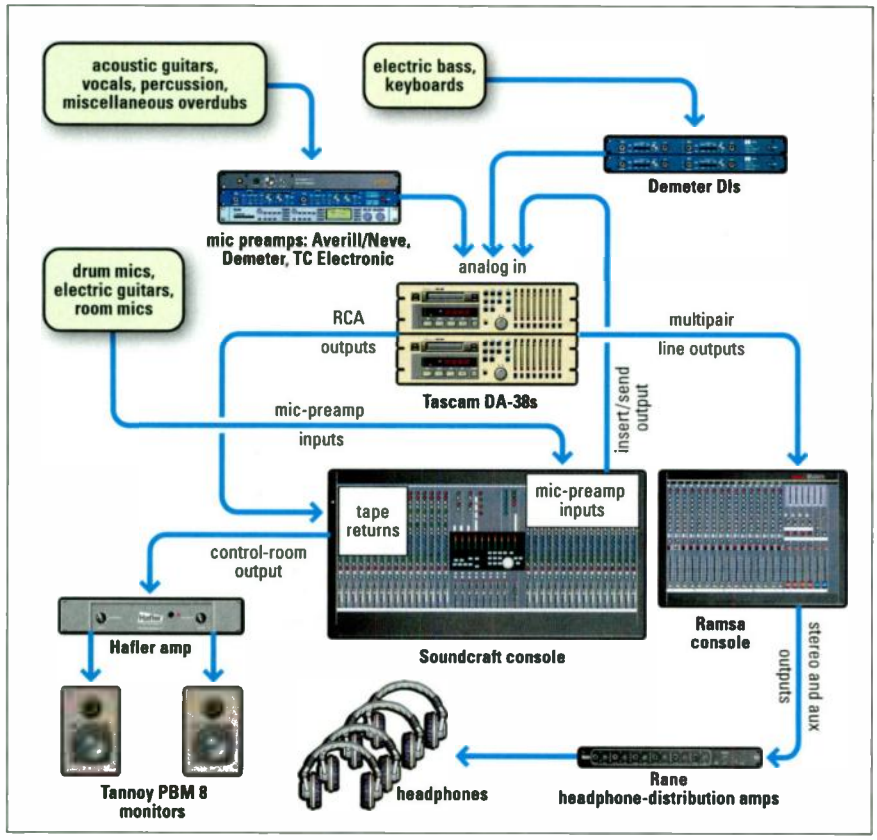

FIG. 6: The above diagram shows the setup that Morales used to record *Kickin' It at the Barn*. Signal flow and recording gear are represented.

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haven't had carted off yet, like old toilets and messed-up wood. It looks like some questionable methamphetamine place."

Luckily for the band, the officer was an understanding sort. "He said, 'You mean you guys work out of this operation?" Tackett recalls, "and we said, 'Yeah man, this is Little Feat World Headquarters.' And he went away shaking his head, and he said, 'Look, you better take care of your neighbor.'"

Morales picks up the story: "It turns out that the woman who complained was a friend of the Tacketts. After eight hours of solid double kick drums out of Richie Hayward, she got pissed." Tackett and his wife brought the woman some roses and candy and smoothed things over. She had assumed it was a bunch of kids playing.

IN THE MIX

Morales did the mixes for *Kickin' It at the Barn* mainly in Logic, using plug-in effects. The band seemed happy with his efforts. "He was trying to make it sound like a band live," says Tackett, "Not too many tricks. He just wanted to make it live and raw sounding."

Morales, who does a lot film mixing, also did surround mixes for soon-to-be-released DVD and SACD versions of *Kickin'*. He is very enthusiastic about them. "It's the most successful I've been at capturing the feel of what it's like to stand in a room with a band," he says. "So when you hear the surround mixes, it's what it was like to sit in the center of that room, with Richie in front of you and the guitars on either side, and just hearing the rumble of the bass guitar."

THE GOOD VIBE

Overall, the experience of recording at the Barn was a positive one for Little Feat, and the band members all appreciate having their own studio where they don't have to worry about the clock ticking. "The vibe was like 1967—hippies hanging out on the farm," says Tackett. "It had a very 'Big Pink' [referring to the album *Music from Big Pink* by the Band] kind of vibe. We took a lot of cue from Levon Helm, who's a good friend of ours. They always found a place to go play that wasn't a recording studio. So we have Levon to thank for that, because he kind of inspired us with all of the Band records he did."

Bill Payne gives Morales a lot of credit for the CD's excellent sound quality. "Gil is one of those guys who understands acoustic music, even if you're not playing on an acoustic instrument, which is something I really admire about him," Payne says. "Also, he works really well with people."

Barrere also praises Morales. "With the recording techniques available today and the amazing mic techniques that Gil used, we ended up with a better-sounding record than we would have going into a studio. Some studios have a very sterile atmosphere, and a band like Little Feat needs something earthier," he says. Barrere indicated that the band will continue recording at the Barn. "The next studio record we do will be recorded up there. At least it sure gets my vote."

MIKIN' IT AT THE BARN

Gil Morales used the following mics and DIs for the *Kickin' It at the Barn* sessions:

Kick: Audio-Technica ATM23HE
Snare: Audio-Technica ATM23HE
Toms: Audio-Technica ATM25 (4)
Hi-hat: Audio-Technica AT4041
Overheads: Audio-Technica AT4060 (2)
Room: Shure VP88
Room/vocal: Audio-Technica AT4060
Electric guitars: Shure SM57 (one on each amp)
Acoustic guitars: B&K 4011, Audio-Technica AT4041
Vocals: Audio-Technica AT4060, Audio-Technica AT4050
Bass: Demeter H-series DI
Keyboards: Demeter H-series DI

CHRIS CAFIERO

FIG. 7: This view inside of the Barn shows the boom arms that were attached to rafters to hold the Audio Technica AT4060s used for overheads.

Mike Levine *is a senior editor at EM.*

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Optical Media Wars: DVD vs. SACD

If you think love is a battlefield, try digital media standards.

By Gary S. Hall

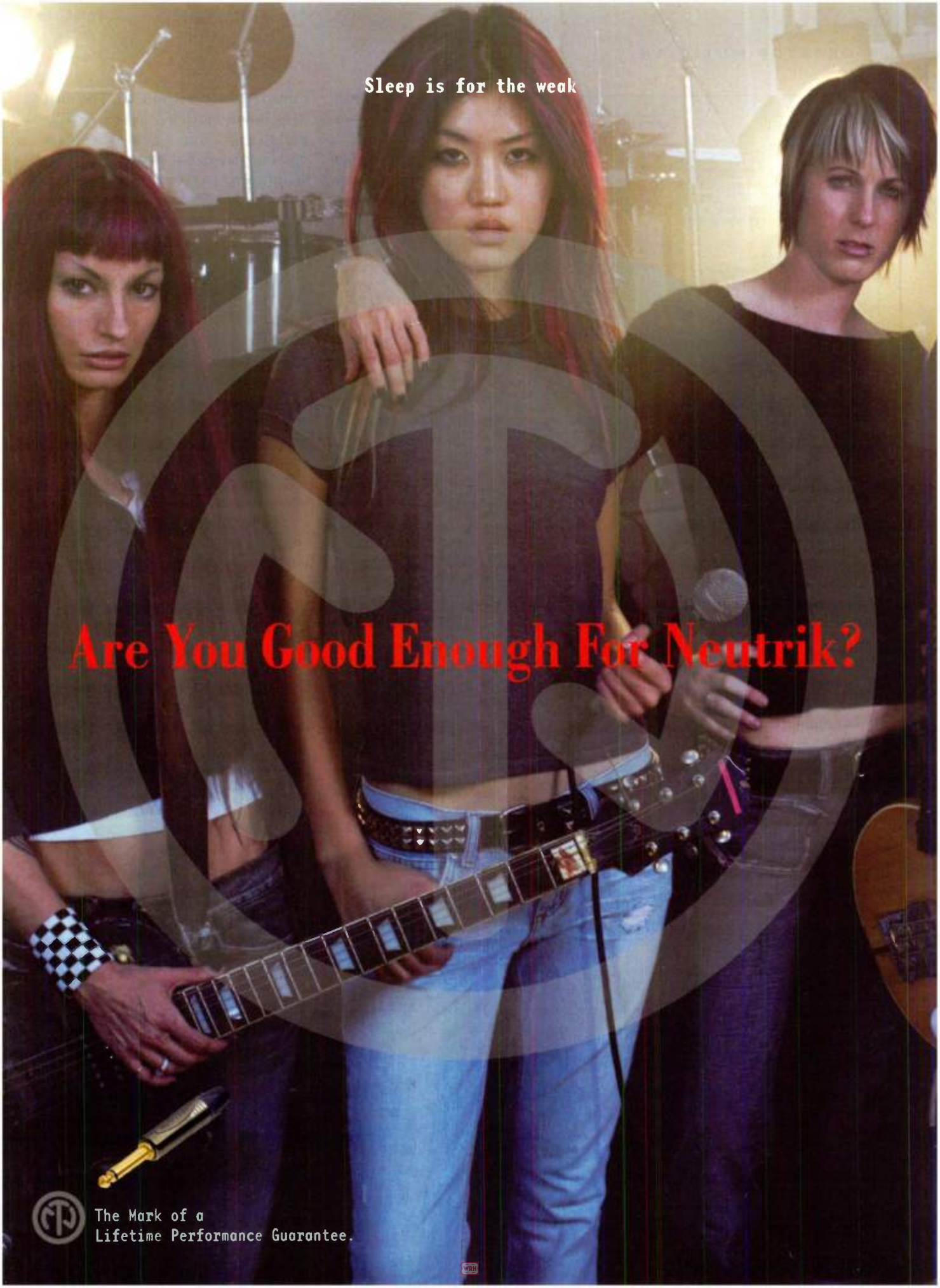
Technologies developed after Compact Disc standards were established make much higher data densities possible on standard 12 cm discs. New formats using smaller pit and track geometries as well as shorter-wavelength lasers allow several times the amount of data to be stored than was possible previously. That higher density in writing laser data opened the door for new standards, which in turn loosened the grip of CD patent holders Sony and Philips, allowing other companies to jump into the fray.

MIKE CRUZ

Toshiba became the leader in the formation of the DVD Forum (www.dvdforum.org), an association of more than 200 companies that guides the development of DVD formats. Not to be outdone, Sony and Philips have developed their own set of competing standards for audio, recordable DVD, and other emerging high-definition formats. The result is two groups of specifications for high-density media. The first, developed by the DVD Forum, consists of DVD-Video, DVD-Audio, DVD-R/RW, and DVD-RAM. The second, developed by Sony-Philips, consists of Super Audio CD (SACD), DVD+R/RW, and Blu-ray Disc. (For more details, see the sidebar "For Your Information.")

Officially speaking, the letters *DVD* no longer stand for anything. They were originally an acronym for Digital Video Disc, but because DVDs were to be used for audio and data as well as video, the meaning was changed to Digital Versatile Disc. When that term failed to catch on, the DVD Forum decided that DVD would simply stand for DVD.

Oddly, the DVD Forum neglected to lock up legal ownership of the term DVD, leaving the Sony-Philips group


Sleep is for the weak
Are You Good Enough For Neutrik?
The Mark of a
Lifetime Performance Guarantee.

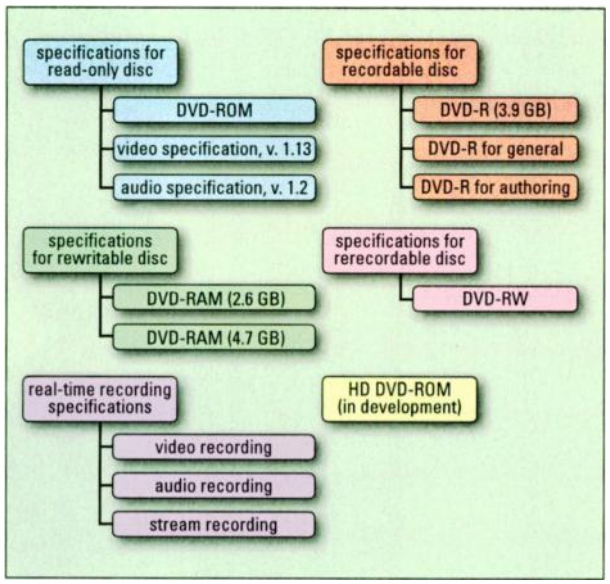


FIG. 1: The DVD specifications maintained by the DVD Forum include the familiar DVD-Video, as well as specifications for DVD-Audio and several formats for recordable DVD.

free to use it for its own format. DVD is now used for various sometimes-incompatible DVD Forum formats as well as for the Sony-Philips DVD+RW format. Although the latter is not endorsed by the DVD Forum, most writers and readers manufactured today support it. **Fig. 1** shows the structure of the DVD Forum specifications.

READ-ONLY FORMATS

The DVD Forum specification for read-only DVD discs consists of four *books*. The first book consists of the physical- and file-system specifications known as DVD-ROM. The other books, called application layers, set the standards for DVD-Video, DVD-Audio, and DVD-ENAV (a recently-released enhanced DVD specification). Those specifications allow DVD discs to be played on commercial DVD players. The DVD-Video application layer, for example, defines a set of compatible media data types (primarily MPEG-2 video and Dolby AC-3 audio), a structure for on-screen menus, and an elaborate set of tables and indexes for navigating to the material on the disc. That application layer makes possible mass-market DVD-Video with its elaborate feature set and high degree of player compatibility.

The physical specifications of DVD-ROM cover things such as gross dimensions, track pitch, and pit size. The specification has options for one or two data layers and single- or double-sided discs, with capacities ranging from 4.7- to 14.7 GB. (The term *layers* here refers to physical layers on the disc, rather than layers as described in the previous paragraph.)

The file system describes the means of locating and accessing data using two forms of addressing. The first is based on sector offsets and is loaded when the disc spins up; the second, similar to the track addressing on audio CDs, is used by low-intelligence standalone players. The file system is also needed for computers to be able to read the discs, and the designers were careful to avoid the problems encountered with CD-ROM. The DVD file system is free of the major limitations in file naming and folder nesting of CD-ROM and is compatible with existing systems.

The DVD-ROM file system goes by the name ISO 9660/micro-UDF. The dual designation indicates that every DVD has two separate file systems. The data is not duplicated, but two sets of tables are provided to locate the data on the disc. A device reading the disc can use the set of file-system tables it understands. ISO 9660 is the CD standard and has backward compatibility. UDF stands for Universal Disc Format as defined by the Optical Storage Technology Association (OSTA). The "micro" designation indicates that DVD uses only part of UDF. Neither Windows nor Mac OS supported UDF initially, but now all major computer operating systems support it. Nevertheless, all DVD-format discs are required to support both ISO 9660 and micro-UDF.

DVD-Video is the textbook example of how to establish a format for market success. Technology companies and content providers were careful to define a robust feature set and to describe it in minute detail. That resulted in a remarkably smooth rollout, with few glitches in the design of players and production tools.

The feature set of DVD-Video is now well known, thanks to the many bonus-packed Hollywood DVD titles available for rental or purchase (see the table "DVD-Video Specifications"). For more detailed information on how DVD-Video works, check out the excellent

FOR YOUR INFORMATION

Jim Taylor's *DVD Demystified* is the most comprehensive book listed here.

DVD Authoring and Production, by Ralph LaBarge (CMP Press, 2001)

DVD Demystified, 2nd Edition, by Jim Taylor (McGraw-Hill Professional, 2000)

DVD Production, by Philip De Lancie and Mark Ely (Focal Press, 2001)

Everything You Ever Wanted to Know About DVD, by Jim Taylor (McGraw-Hill/TAB Books, 2003)

Many Web sites cover DVD, SACD, and HD DVD. But because politics are often involved, especially on the official sites, not everything can be taken at face value.

Disctronics disk replicator: www.disctronics.co.uk/technology/index.htm

DVD Forum official site: www.dvdforum.org

Excellent description of DVD-Video: www.dvd-replica.com/DVD/index.php

HD DVD format: www.hddvd.org/hddvd and www.blu-ray.com/info

Information technology news site: www.theregister.co.uk

Sony official SACD site: www.superaudio-cd.com

Sony-Philips official site: www.licensing.philips.com/information/sacd

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The development of DVD-Audio went far less smoothly than that of DVD-Video. A group of members of the DVD Forum interested in audio was relegated to work on the DVD-Audio format definition. Lacking the focus and motivation of the group that hammered out the video spec, the DVD-Audio group spent far too much time wrangling over competing agendas.

By the time a draft of the DVD-Audio spec was ready, downloading MP3 music files had rocked the music industry, and the DVD-Audio group had to rework its draft to beef up copy protection. When the full spec was finally released, interest at the major record labels had cooled, and titles (as well as the players to play them) were slow to arrive. In addition, consumers clearly valued the convenience and economy of CD over the superior fidelity of DVD. Furthermore, a competitor had emerged—Super Audio CD (SACD). (See the table "Feature Comparison of DVD-Audio and SACD" as well as the description of SACD later in this article.)

DVD RECORDABLE FORMATS

With recordable DVD, things get a bit confusing. The DVD Forum supports three variants of the DVD-R Write-Once format as well as two mutually incompatible rewritable formats, DVD-RW and DVD-RAM. To further confuse matters, the Sony-Philips rewritable disc format is named DVD+RW, even though it is not a DVD Forum format. I'll start with the write-once formats.

DVD Write-Once (DVD-R) is similar in principle and use to CD-R. Originally a professional medium for production houses and data-storage companies, DVD-R initially carried a high price tag—roughly $5,000 for the recorder and $20 or more for media. When the technology matured enough to lower prices, conflicting agendas emerged. The manufacturers of pro DVD-R drives and media were eager to keep their high profit margins, and copyright holders worried about rampant home copying of DVD-Video titles. That resulted in two DVD-R formats—one having two variants, and each differing in its compatibility with existing players.

The first DVD-R for Authoring format released to the professional market offered a capacity of 3.9 GB, compared with 4.7 GB for replicated discs. Although the capacity was less than they wanted, DVD-title producers were ready to pony up for any form of DVD-R they could get. When 4.7 GB recordable media became available, there were problems with player compatibility. As a result, both 3.9 GB and 4.7 GB versions of DVD-R are used today.

DVD-R for Authoring still commands a premium price. It offers better player compatibility than formats available to the mass market, and it is free of copy restrictions. The default standard for holding capacity is 4.7 GB, but there are some older players that can't read the 4.7 GB discs. Media offering 3.9 GB remains available and is generally used for testing because it allows the latest features to be tested on the earliest DVD players. That is of particular importance for high-end Hollywood producers, who strive to obtain the broadest possible compatibility.

DVD-R for General has different reflectivity from DVD-R for Authoring and has reduced compatibility with older DVD players. When you record on a consumer-grade, write-once DVD,

DVD-Video Specifications

The feature set of DVD-Video has provisions for audio in multiple formats, including resolution and sampling rates that far exceed those of Compact Disc.

	Specification	Comment
Video Resolution	720 × 480	Options for lower resolution with increased play time.
Video Encoding	MPEG-2	So-called main level/main profile with variable bit rate.
Play Time	variable	Depends on MPEG bit rate and disc format.
Surround Audio	5.1 discrete	Data compressed with Dolby AC-3 or DTS.
Stereo Audio	linear PCM or data compressed	Uncompressed stereo at 16-, 20-, or 24-bit and sampling rate of 48- or 96 kHz.
Alternate Audio Streams	as many as 8	Viewer can select only one stream at a time.
Subtitle Streams	as many as 32 alternate	Viewer can select only one stream at a time.
Alternate Video Angles	as many as 8	Seldom used because of restrictions and limited play time.
Navigation Method	menu-driven	Selection and control menus can be nested to any number of levels.
Menu Features	motion, audio, transitions	Menus can include motion video and audio backgrounds, with transition sequences when a selection is made.
Interactivity	internal control language	Specification defines a low-level programming language that is built into every player and has a provision for (volatile) register memory and conditional execution.

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— Ray Legnini, *Recording Magazine*, July 2004 Edition

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Feature Comparison of DVD-Audio and SACD

DVD	Audio	SACD
Audio Coding Method	linear PCM direct	stream digital
Channel Configuration	as many as 6, discrete	as many as 6, discrete
Coding Resolution	as high as 24-bit	single-bit
Sampling Rate	as high as 192 kHz	2.8224 MHz
Visual Options	navigable stills, full-motion video*	planned for future
CD Hybrid	no	optional

*Motion video requires dropping audio specs to those of DVD-Video.

your discs should play on newer players but not necessarily on older ones.

DVD-R for General also uses the Serial Copy Management System (SCMS). With SCMS, a copy thus can be made of an original DVD, but during the copying process the DVD-R drive flips a bit in a special area of the disc. Trying to make a copy of the copy results in an error. Support of SCMS is mandated by the DVD Forum in all DVD-R drives that record to the General media.

DVD RERECORDABLE FORMATS

The DVD Forum specifies two formats for rerecordable discs: DVD-RW and DVD-RAM. As previously noted, DVD+RW, the other popular format of rerecordable high-density discs, is supported by Sony-Phillips (see the sidebar "Compatibility" for tips on what to look for in DVD burners).

DVD-RW, developed by Pioneer, uses phase-change media, which allows roughly 1,000 rewritings. The capacity of the disc is 4.7 GB. Recorded media are compatible with most DVD players and DVD-ROM drives currently sold. Because the reflectivity is similar, older drives may mistake the media for a dual-layer DVD disc.

DVD-RAM is different from other Forum-supported formats and is incompatible with most drives installed and sold. It uses phase-change technology and some magneto-optical features in a novel combination that offers fast rewritability with as many as 100,000 rewritings. The medium also has defect-management features for higher reliability.

DVD-RAM comes in two versions. The original format supports only 2.6 GB of data on a single-sided disc. Version 1.0 increases the capacity to 4.7 GB on a one-sided disc; double-sided media is also available.

DVD-RAM discs come in a cartridge that protects the disc. The cartridge can be removed so the disc can be used in standard DVD players and DVD-ROM drives. Most existing players cannot read DVD-RAM discs, but that may change.

In spite of DVD-RAM's incompatibility with other DVD formats, it has found a

COMPATIBILITY

Marketing hype aside, DVD burners increasingly support multiple formats. Here are some points to help you choose the right format.

- When shopping for a burner, check which formats it supports. More is better, but the list should definitely include DVD-R.
- If you're going to read the discs just on the same drive that burns them, you can choose a format based solely on cost.
- Aside from the more expensive DVD-R for Authoring, DVD-R for General is the most compatible format. However, some older drives cannot read it.
- Rewritable DVD, whether –RW or +RW, is compatible with fewer players than DVD-R is.
- DVD-RAM is compatible only with drives specifically designed to handle it.

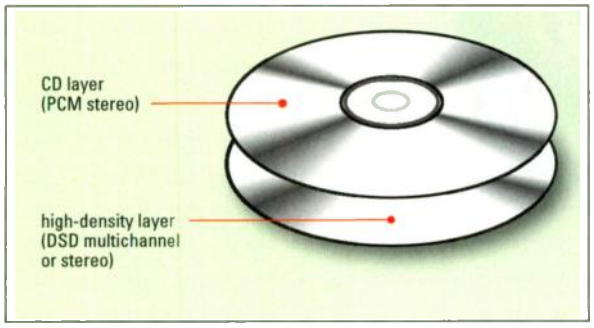


FIG. 2: The Super Audio CD (SACD) format provides for single- or dual-layer discs. One layer of the disc can provide CD-audio compatibility with most current CD and DVD players.

niche because of its fast rewritability in large-scale database and transaction-management systems, where large disc changers can hold vast amounts of data. Video camcorders based on DVD-RAM have also begun to appear, and they often have sophisticated in-camera editing features.

As drives and media became more affordable, manufacturers wanted to produce set-top boxes that could record video and audio in real time, as the data is received over cable or air waves. That is now supported by the DVD Forum's recent rollout of real-time recording specifications for DVD-VR (video), DVD-AR (audio only), and DVD-SR (stream recording) approved by the DVD Forum in the fall of 2001. So far, the latter two haven't seen much use in the field.

SONY-PHILIPS STANDARDS

The DVD Forum maintains the original specifications of the DVD family, but Sony and Philips sustain and promote two DVD specifications outside the Forum: DVD+R and DVD+RW.

DVD+R and DVD+RW are based on CD-R and CD-RW technology. Sony-Philips claims that they are more compatible with existing players than DVD-R and DVD-RW are, but the format has never been able to win the blessing of the DVD Forum.

Super Audio CD is the DVD-like format of greatest interest to musicians. Whereas DVD-Audio is based on linear Pulse Code Modulation (PCM), SACD is based on a technology called Direct Stream Digital (DSD). DSD uses a single bit at a high sampling rate to indicate the rise and fall of a waveform rather than its absolute amplitude, as is the case with PCM. Sony maintains that DSD better reproduces the frequency and phase characteristics important to imaging and transient response.

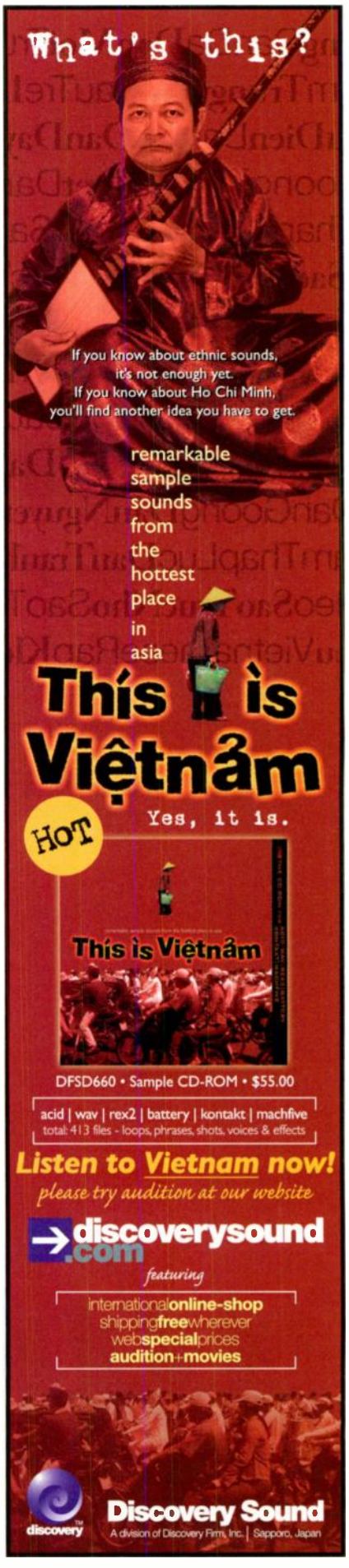
SACD also includes physical watermarking for copyright protection. Called Pit Signal Processing (PSP), this method varies the width of the pits on the disc and is physically stamped into the disc. That is of great interest to record labels.

SACD provides backward compatibility with CD audio by using dual-layer disc technology (see **Fig. 2**). An SACD disc can be manufactured with a layer of SACD data and a layer of standard Red Book audio, readable by most CD and DVD players. The table "Feature Comparison of DVD-Audio and SACD" compares SACD and DVD-Audio. The most important point is that there is no way yet to create one-off SACD discs.

DVD-Video offers most of the benefits of interest (surround audio, better-than-CD fidelity, picture with music) to desktop musicians. Production tools for DVD-Video are readily available, and the discs play on a huge variety of players. Unless you're concerned with being on the absolute cutting edge of fidelity, my recommendation is to stick with DVD-Video for the present time.

The current focus of the DVD Forum's work is HD DVD, which uses refined technologies to increase capacity to the 15- to 40 GB range for higher-resolution video and audio. Currently, there are several contenders for the new standard. It's too early to predict the final outcome, but you can be sure that there will be HD DVD in the not-too-distant future.

Gary S. Hall *develops net-based systems for music-performance skill development and collaborative music production.*



RECORDING MUSICIAN

Brass Tactics

Record great brass sounds in your personal studio.

By David Summer

You most often deal with the sonic elements of guitar, keyboard, bass, drums, and vocals in your studio, but what if you were faced with the task of recording a trumpet player, a trombone player, or maybe even an entire brass ensemble? Would you be ready for that kind of a session? If your answer is "no" or "well, I'm not sure," then read on. In this article I'll outline some successful strategies for recording brass. I'll also discuss important information about brass instruments and how they're played that will better prepare you for recording them.

The focus of this column will be on brass instruments specifically rather than on horn sections, which frequently consist of a mix of brass and woodwind instruments. Although there are many instruments in the brass family—including trumpet, cornet, trombone, French horn, euphonium, and tuba—I'll concentrate on trumpet and trombone because they're the ones you'll most frequently encounter. Many of the concepts described here also apply, however, to other brass instruments.

MIKE CRUZ

BLUE RIBBONS

There's a reason why armies have used buglers for centuries. The sound of the bugle—which is essentially a trumpet without valves—carries in a way that few other instruments do. A trumpet can not only be loud, but it can also be piercing. To keep those highs in check while still capturing the most full and natural trumpet sound (see **Web Clip 1**), I recommend using a ribbon mic.

In addition to controlling the highs, a ribbon mic's bidirectional polar pattern picks up more room sound than a directional mic does, and room sound is generally desirable when miking a

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trumpet. You have to be cautious, though, because some ribbon mics are fragile and can be damaged by the high sound-pressure levels that trumpets produce.

A dynamic mic yields a natural trumpet sound, although the sound is a bit more colored than a ribbon mic's (see **Web Clip 2**). You can get good results miking a trumpet with a condenser; you have to be careful, however, because those mics are often designed with a slight presence boost (for recording vocals) that can accentuate a trumpet's brittle highs (see **Web Clip 3**).

I've also had success using two mics on a trumpet in a spaced-pair configuration, with a ribbon mic feeding one track and a condenser mic feeding the other. (If you try this, make sure to listen for phase problems after you've positioned the mics.) When it's time to mix, I like to pan the two tracks to about ten o'clock and two o'clock, and make the ribbon track a bit hotter than the condenser. That combination allows for the natural sound of the ribbon mic to come through, with the brightness of the condenser mic adding a bit of spice to the sound.

Ribbon mics also work well in capturing the natural sound of a trombone. For a slightly grittier trombone tone, I sometimes opt to use a dynamic mic.

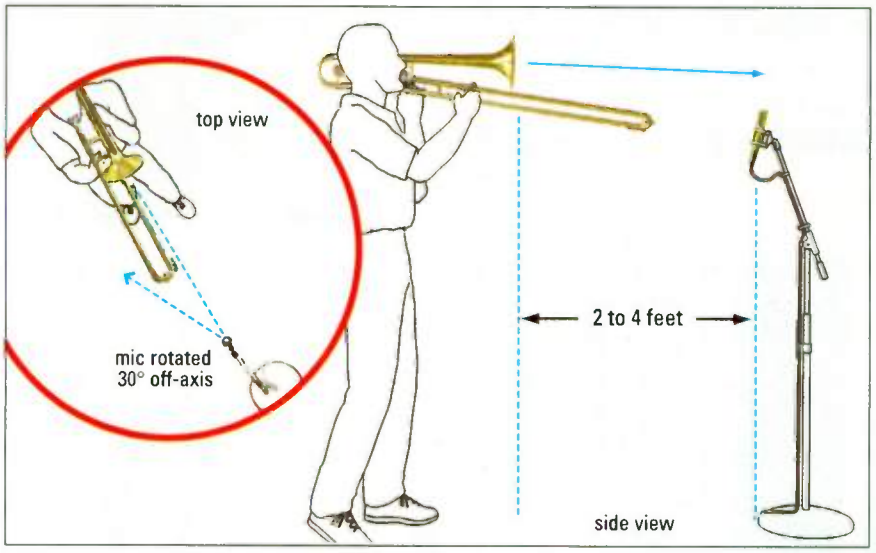


FIG. 2: A suggested mic setup for a trombone features a mic that is placed below the line of sight of the bell, rotated at about 30 degrees, and tilted upward.

When recording a brass ensemble, ribbon mics are my first choice. They capture a nicely blended section sound when used as stereo overheads. I don't recommend miking an ensemble or section with individual mics for each instrument. You'll get a more cohesive sound by recording them all into one mic pair. I've had success using a spaced-pair configuration, but you can experiment with other stereo-miking techniques. (For more on stereo-miking, see the article "More than the Sum" in the June, 2003, issue of EM, available at www.emusician.com.)

Whether you're recording a pop section or a classical ensemble, set up the players in a semicircular arrangement so that they can see each other for visual cues. (See the sidebar "Classical Brass" for more about classical brass ensemble configurations.)

SPACE AND PLACEMENT

When considering mic-placement options, remember that a brass instrument's sound comes solely from the vibration of its bell, which is unlike woodwind instruments (such as sax, flute, oboe, and bassoon), where the sound comes from the keyholes and the bell (or from the "foot" in the case of a flute). Notice that I didn't say the sound comes from the end of the bell, but rather from the vibration of the bell. That is an important distinction. The bell is so important to the character of the sound that a player buying a professional, custom-made brass instrument will usually be given a choice of bell material and shapes, which imbue the horn with a variety of sonic characteristics.

A brass instrument's sound is affected greatly by the room in which it's played. One of the most important considerations when placing a mic to record a brass instrument is how much room

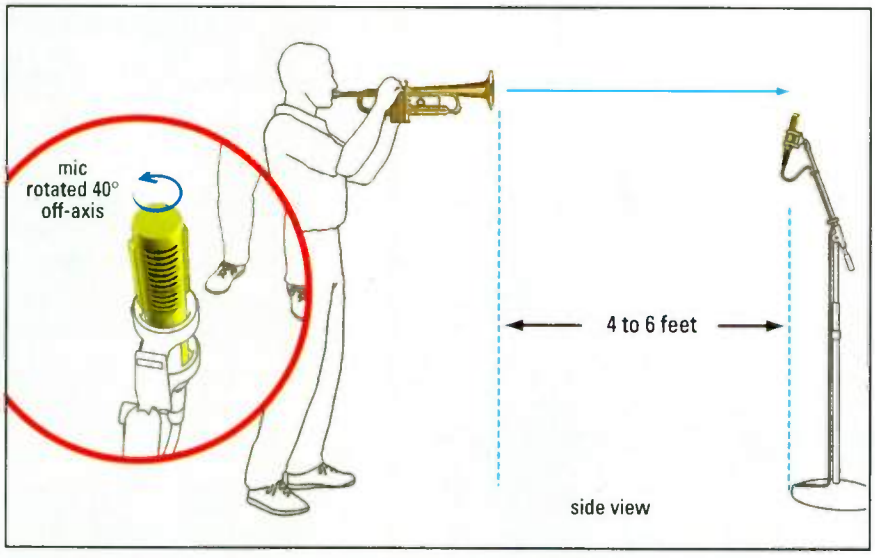
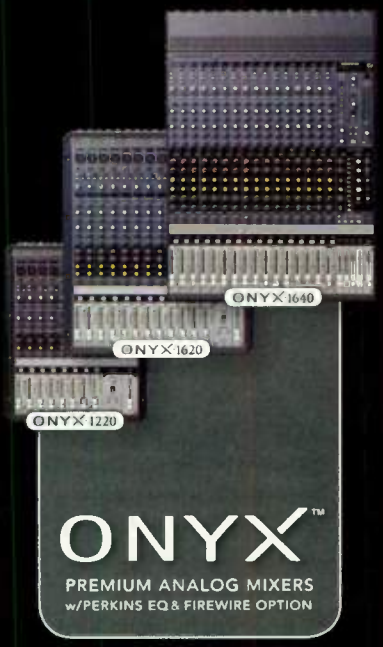


FIG. 1: A suggested mic position for a trumpet features a mic that is placed below the line of sight of the bell, rotated at about 40 degrees, and tilted upward.



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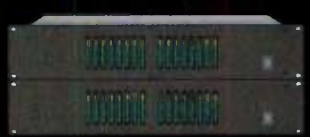

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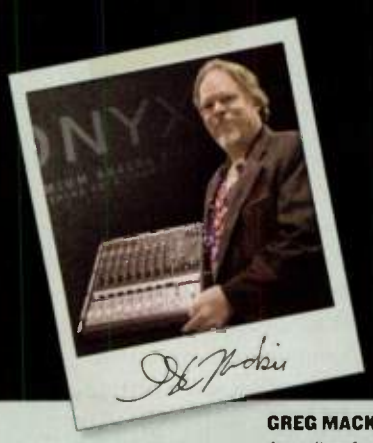

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sound you will capture. If you close-mic the bell, you'll miss out on much of the room reflections, which, in a good-sounding space, can add character and openness to the sound.

There are varied opinions about how far back to place the mic when recording a trumpet. Although some people advocate a much closer placement, I have had the most success putting the mic about four to six feet in front of and a few inches above or below the line of sight of the bell. I point the mic about 40 degrees off-axis to help cut down on air sound as well as capture more of the room sound (see **Fig. 1**). For trombone and other low-brass instruments (see **Fig. 2**), the microphone can be closer (about two to four feet) and a bit more on-axis (about 30 degrees).

Every room is different, so it helps to experiment with mic placement. Before you set up any mics, have the musician move around until you find the spot where the horn sounds best in the room. Then set up the mic, put on your headphones, and move the mic around until you find the most favorable placement. You'll get different reflections depending on the mic's position, and they can have a big impact on the sound. If you want a completely different sound, record the player with his or her back to the mic.

Acoustically speaking, a cramped home studio is often not a good place for brass recording. It's preferable to record in a large space that has hard surfaces to take advantage of the natural ambience. If your gear is mobile, consider using a larger and more reflective venue. An unfinished basement—one that has not been furnished or carpeted—can be a good recording space for brass, because it produces a nice open sound. If you're going for a classical sound, you can record the session in a church. A large, stone church can yield a beautiful, round, natural brass sound.

You can also capture natural ambience by recording a brass instrument in a tiled bathroom. In addition, you can get a focused sound in a bathroom by placing a mic one or two feet in front of and above the instrument and one or two inches from the wall. Have the musician face the wall and blow into the instrument a bit more softly than normal.

One of the best classical brass recordings I've made at home was done using the ribbon-plus-condenser technique described earlier. I placed the ribbon in the bedroom where I was playing and the condenser in a hallway with a stairwell. I panned the tracks and captured great, natural-sounding trumpet tracks without having to use any EQ effects.

MUSICAL WORKOUT

When recording brass, keep in mind that the act of playing is physically demanding on the musicians. It requires a tremendous amount of air and is taxing on the lips. Imagine holding a piece of metal against your lips for a few hours, taking in as much air as possible with every breath, and blowing while intentionally making a buzzing sound. Brass players often jog, swim, or workout with weights to keep up with the physical demands of their instruments.

Brass musicians know that as their physical stamina diminishes with age, they'll lose some of their ability to play. Part of their practice routine is therefore directed toward building endurance. This is true for all brass players, particularly trumpeters. Be cognizant of the endurance factor when planning your session, especially if the musicians are not pros.

Consider recording the more demanding sections of your tunes first, while the musicians are fresh. You may need to consult with the players to identify these sections, but generally they are the parts that are the loudest and contain the highest notes. During the session, use your ears to tell you when the musicians are becoming tired; they may not want to admit it. Schedule more breaks than you would with musicians who play other types of music.

PUNCH DRUNK

When recording brass, expect to do a lot of punch-ins. A discussion of brass harmonics is beyond the scope of this column, but it's important to understand that there are many different notes that can be played on a brass instrument using the same valve combination or, in the case of the trombone, slide position. Brass players must use their lips, tongue, and jaw to hit their intended notes. Occasionally their aim will be off.

Chances for missed notes increase when playing in the upper register where the harmonics are closer together. In addition to missed notes, the brass player, like the woodwind player and vocalist, faces the possibility of a "cracked" note. A cracked note is one that is not attacked correctly.

Sometimes these missed or cracked notes are left in recordings, especially in jazz, where the overall emotion displayed in the performance may be con-

CLASSICAL BRASS

Brass ensembles are popular in the classical music world. If you're ever in a position to record one, you should know the standard configurations. The most common is the brass quintet, which consists of two trumpets, a French horn, a trombone, and a tuba. This ensemble is designed to produce a sound that can fully cover the range of all brass instruments.

Another common group is the brass quartet. This group usually has the same instrumentation as the quintet minus the tuba. However, a quartet will often have two trumpets and two trombones instead.

When recording these ensembles, many of the same rules apply as when tracking a pop "horn" section. Use two overhead mics rather than miking each instrument, and make sure that the musicians are set up so that they can see each other as they play. (In a classical brass ensemble, the first trumpet player gives the cues.)

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sidered more important than an errant note or two. In most situations, though, you'll want to punch in to correct the mistakes.

STICK A MUTE IN IT

During a brass-recording session, you are likely to encounter a player using a mute. Mutes, which are used most often in jazz, provide variations to the standard brass tone colors. There are many types, but the most popular are the Straight, Cup, and Harmon mutes. You will also come across Plunger and Bucket mutes (see **Fig. 3**).

Using a Straight mute will change the sound the least among all the available mutes. It produces a stuffy brass sound (see **Web Clip 4**). The Cup mute gives the instrument a softer sound than the Straight mute (see **Web Clip 5**). Harmon mutes (see **Web Clip 6**), which are often favored by jazz trumpeters, are two-piece mutes with a bottom piece that's referred to as the stem. The Harmon mute can also be played with the stem removed, resulting in a more sophisticated brass sound. (A good example of that is the song "All Blues" on Miles Davis's classic album *Kind of Blue*.)

A mute will reduce the volume level of a brass instrument. For parts that are muted throughout, I typically position the mic one or two feet closer than I would for an open part.

DO A DOUBLE TAKE

Achieving a full and realistic brass sound can be particularly challenging in a home- or small-studio environment. In a nonclassical recording, you can build a fuller sound by having the musicians double their parts, and then use both recordings in the mix, panned to either side. For an even thicker sound, record the parts a third time and use that pass in the center of the mix, although the change won't be as dramatic as going from a single part to a doubled part (see **Web Clips 7, 8, and 9**).

DAVID SUMMER

FIG. 3: Mutes offer brass players a variety of tonal options. Pictured from left to right are Straight, Cup, Bucket, Harmon, and Plunger mutes.

As is true with any type of instrument or vocal part, making a digital copy of a part and panning it opposite to the original is less effective than doubling it. The infinite variations of the human air stream through the instrument and the minute differences in performance are what make that layering technique so effective—especially with a horn. If one recording of a part is all you have to work with, however, your best bet in achieving a doubled sound is to copy it and offset it slightly from the original.

DSP BRASS

Although it is tempting to polish a mediocre brass sound using corrective effects processing during the mix, it is not a productive strategy. Instead, spend the time setting up to record the best sound you can to tape or disk so that there is less need for processing at mixdown—except, of course, for the creative kind of processing.

That said, even a brass sound with naturally recorded ambience will often need additional reverb. Be careful not to overdo it, though. You may also need to apply EQ (often to temper the trumpet's natural brightness), but again, be a minimalist. If the part sounds good without any EQ at all, feel free to leave it as is.

Although I do not like to use compression on brass instruments as I'm recording them, I am not against applying it in the mix. I try to keep the compression minimal so it doesn't interfere with the instrument's natural attack. I use ratios between 1.5:1 and 2:1 and dial in short attack and release times.

TO CODA

Recording brass is often challenging, but the results can be rewarding. The sound of real brass can help make your music stand out, adding sparkle and fire or smoothness and sophistication in a way that sampled or synth brass cannot. As is true in all recording applications, experimentation and patience are the keys to a successful result.

EM WEB CLIPS

10 TIPS FOR RECORDING AND MIXING BRASS

1. Use a ribbon microphone to capture natural brass tones.
2. Don't close-mic the instrument. You want to pick up the room sound.
3. Try using two mic types (such as ribbon and dynamic) in a spaced-pair configuration for added sonic flexibility.
4. Position mics below the player's line of sight.
5. Point mics off-axis from the bell.
6. Move the musician to different parts of the room to find the best sound.
7. Expect numerous punch-ins.
8. Schedule sessions with the "fatigue factor" in mind; tackle the difficult-to-play sections first.
9. Double or triple (nonclassical) parts for a fuller sound.
10. Use reverb and other effects only if you need to.

David Summer *lives in Groton, Massachusetts, where he works as a software engineer and musician. You can find him on the Web at www.summersong.net.*

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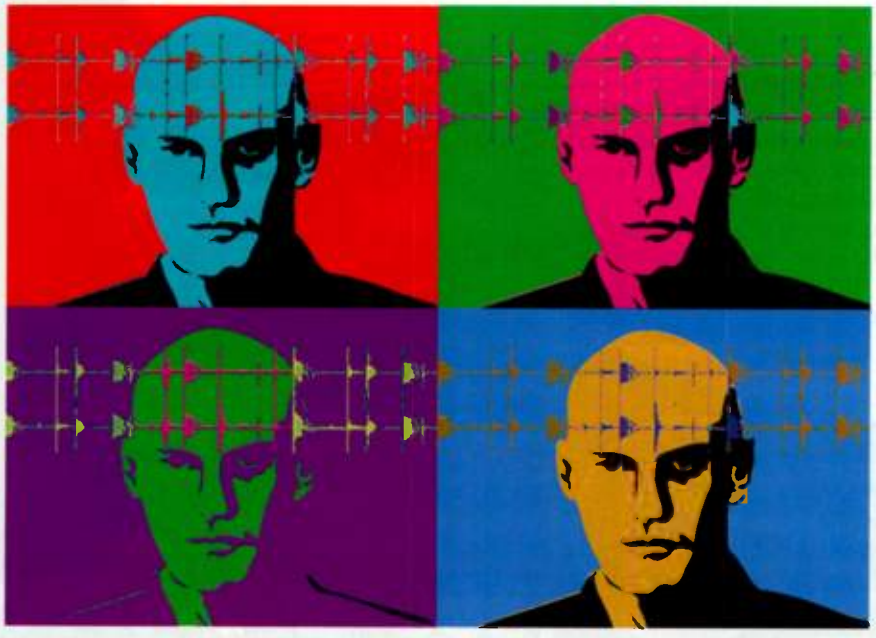
Can You Believe Your Ears?

Psychoacoustics explores our response to sound.

By Mark Ballora

Portable music players are a wonder to behold. Each new compression format sounds better than the last, and the file sizes keep getting smaller. What's the secret behind this magic? It's a process called *psychoacoustic sub-band coding*. The compression schemes (or *codecs*, for *encode/decode*) used by music players—AAC, MP3, MP4, and so on—are based on an analysis of the acoustic material and a model of what actually reaches our brain, and when. Material that, in theory, we wouldn't hear anyway can then be removed. Discarding what we don't need makes file sizes smaller, with negligible loss in audio quality.

In this article, I'll give some basic facts about how the human auditory system works and how it sends information to the brain. Then I'll discuss how the brain processes signals from the auditory system, which is the realm of *psychoacoustics*. Psychoacoustics underlies everything we hear. Understanding how we make sense of our world through sound is the basis of music codecs. You'll see that it can also be the basis of a successful music mix.



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The stirrup bone makes contact with the cochlea at a soft membrane called the *oval window*. The cochlea is a hollow

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All specifications are subject to change without prior notice.

tube filled with a jellylike fluid called *perilymph*. The cochlea, easiest to visualize if it is "unrolled" (see **Fig. 1**), is 35 mm long and is coiled two and a half times. The tube is divided into two levels by the springy basilar membrane, which doesn't quite split the tube. There is a small opening at the far end from the oval window. When the stirrup bone pushes against the oval window, it creates a ripple along the basilar membrane. The moving wave travels across, down, and around the chamber, and is equalized by a corresponding opposite movement of the round window below. When the stirrup is pulled away from the cochlea, it pulls the oval window outward with it, and the round window moves inward to compensate.

The wave shakes the basilar membrane, the way you might shake out a dusty rug. The basilar membrane is embedded with some 30,000 hair cells. Depending on the frequency of the vibrations originating from the stirrup bone, there are different points of maximum displacement (largest ripple) along the basilar membrane. Low frequencies, with longer wavelengths, create a large ripple down toward the opposite end of the cochlea from the oval window. High frequencies, with their shorter wavelengths, cause the maximum displacement to be closer to the oval window. Wherever the point of maximum displacement happens to be, the hair cell there fires an electrical impulse. These hair cells are connected to nerve fibers that lie along the outside of the cochlea like a horse's mane, interwoven with its swirls. The impulse from the hair cells excites a group of nerve fibers, which then send the signals to the brain. Thus, different nerve fibers respond to different frequencies, meaning that the auditory nerves send a spectrum of a sound event to the brain.

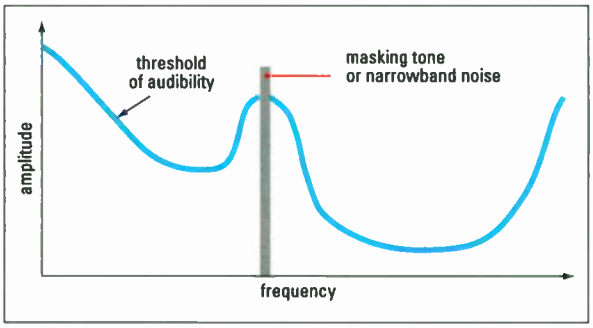

FIG. 2: A masking sound, in this case narrowband noise, raises the audibility threshold of neighboring frequencies.

LET'S ALL BAND TOGETHER

When a sound excites the basilar membrane, a small group of cells at the point of maximum deviation fires with both barrels. The neighboring cells on either side of this point are also disturbed, but to a lesser degree. (They also fire impulses, but not as strongly.) Each point of the basilar membrane is the point of maximum excitation for some frequency, but will also join in the firing squad when a different frequency excites one of its neighbors. So a sound at a given frequency excites nerves belonging to a *range* of frequencies.

The amount of basilar-membrane real estate that jumps into the excitement is called the *critical band*. The frequency range spanned by this section of real estate is called the *critical bandwidth*. It's important to understand the difference between the two, because they do not maintain a constant relationship. A frequency of 350 Hz stimulates a band of cells having a bandwidth of roughly 100 Hz (300 to 400 Hz). But a frequency of 4 kHz excites a band of cells having a bandwidth of 700 Hz (3.7- to 4.4 Hz). The critical bandwidth is much wider for higher frequencies than it is for lower frequencies.

Precisely where along the membrane this point of excitement occurs is another important aspect of the auditory system. As frequencies are doubled, the point of excitement moves in equal increments—an equal length of basilar membrane is traversed to reach the points excited by 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and so on. This corresponds to our perception of pitch: we hear doubling of frequencies as a change of an octave. Other musical intervals are also based on the ratio of any two given frequencies, not the absolute distance between them. For example, a perfect fifth above some note is always a ratio of 3/2: the E above A 440 is 660, an increase of 220 Hz and a ratio of 3 (660) to 2 (440). An additional perfect fifth above 660 Hz is not, however, at 880 Hz (660 + 220), but rather it's at 990 Hz (660 * 3/2). We say that such a relationship, based on

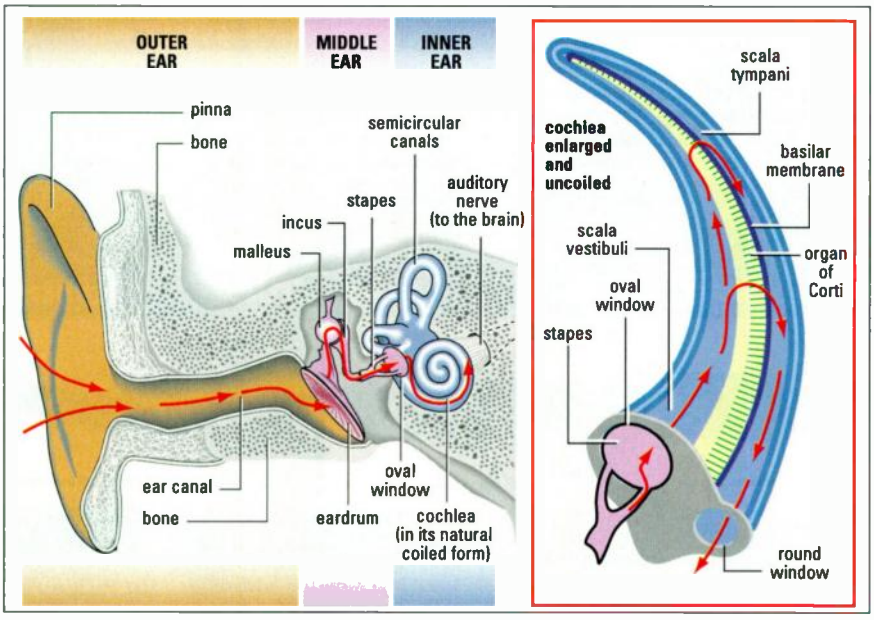

FIG. 1: The cochlea, shown here "unrolled," is a vital part of our complex auditory system and helps relay signals from the outer ear to the brain.

LET GO AND FLOW

SONAR Producer Edition has earned a reputation for delivering powerful production tools in a streamlined interface. Now in version 4, the new recording, editing, comping, and navigation tools give today's professionals like you the freedom to flow. They're so fast, you just have to see it to appreciate it. And the ride doesn't stop there; version 4 adds innovative surround and AV capabilities, along with precise engineering tools—seamlessly combined together to make SONAR 4 Producer Edition the definitive audio production environment on the Windows Platform.

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multiplication rather than addition, is *logarithmic* rather than *linear*.

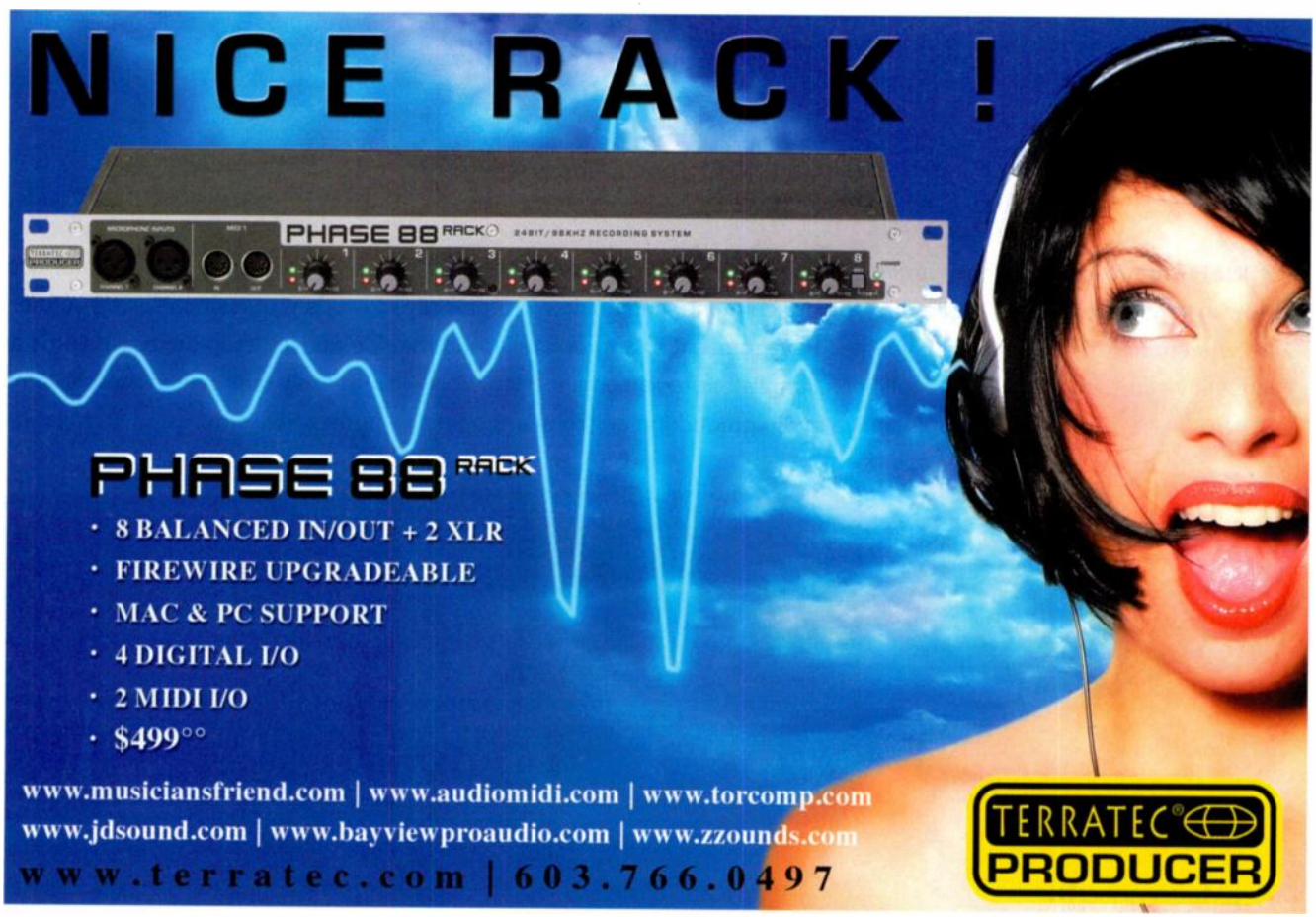
From the example above, you can see that the logarithmic relationship of the basilar membrane to the spectrum applies to our perception of pitch. A logarithmic relationship is also behind the changes in our sensitivity to frequency differences over the frequency spectrum/basilar membrane. When two tones are played consecutively, the minimum frequency difference they must have in order for listeners to notice that difference is called the *just noticeable difference* (JND). The JND depends on a variety of factors, including frequency range, suddenness of the change, and level of musical training of the listener. Generally speaking, however, the JND below 1 kHz is about 3 Hz. The difference between 50- and 53 Hz is about a semitone, and the difference between 997- and 1,000 Hz is about one-twelfth of a semitone. From 1 kHz to 4 kHz, the JND remains at about 0.5 percent of any frequency (about one-twelfth of a semitone). The JND becomes indistinct, but noticeably larger, above 5 kHz. Sine-wave melodies transposed into that range tend to melt into a bunch of screaming, high beeps. (Critical bands play a role with not only sequential frequencies but also simultaneous frequencies. That discussion, however, will have to wait for another article.)

TAKE OFF YOUR MASK!

The auditory system is not completely egalitarian. The minimum power level required for a sound to be audible is called the *threshold of audibility*, and different frequencies have different ones. Lower frequencies must be played at much greater power levels than higher frequencies in order for them to be heard at equal volumes, if at all. The threshold is lowest for frequencies around 1.3 kHz, the range of the spoken voice (see the equal-loudness-contours graph in the article "Loud, Louder, Loudest!" in the August 2003 issue of EM.). But crank up those lows, and you'll find they can drown out lower-level high frequencies (maybe not on your monitors, but it can happen in your ears).

High frequencies excite the basilar membrane at points near the oval window, leaving more distant points relatively undisturbed. But low frequencies, which excite the membrane at points more distant from the oval window, create waves in the membrane that have to travel past those closer points excited by higher frequencies. So when high and low frequencies are heard together, the lows can, in some circumstances, interfere with the highs.

Furthermore, any sound at a high level centered at a given frequency raises the hearing-level threshold for frequencies in its critical band. This phenomenon of some sounds rendering other sounds inaudible is termed *masking*. Systematic studies have shown how tones or narrowband noise at a given frequency



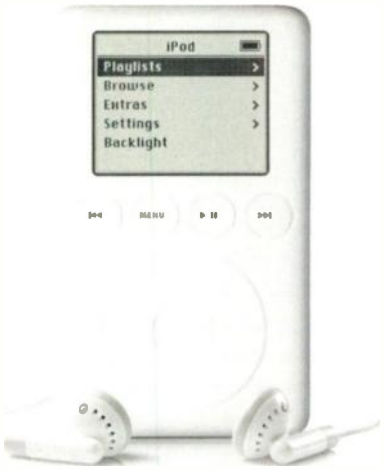


FIG. 3: Like many portable music players, Apple's iPod uses psychoacoustic encoding to compress music files. The user can determine how much compression is applied.

raises the audibility threshold of tones at neighboring frequencies (see **Fig. 2**). A broadband noisy sound, like a sweeper or a loud ventilation system, can be relied upon to raise the hearing threshold of just about everything.

Masking can also be a factor in recording music. Imagine you're mixing something with a kick drum on one track and a bass guitar on another. It might seem that you'd want as much synchronization as possible. The low frequencies of these instruments tend, however, to differ by no more than a few hertz, meaning that these two bottom dwellers could have a number of neighboring frequencies that mask each other. A precise synchronization results in a sound that's more like a dull thud than a blend of two interesting sonic personalities.

There are several ways that you can prevent the kick and bass from stepping on each other. Introducing a delay of a few milliseconds on one can break them up and maintain their individual personalities without producing any audible echo. Alternatively, you can pan them separately in the mix. If you can do a polarity flip on one of these panned channels, so much the better.

ENTER THE CODEC

Uncompressed pulse-code modulation, as we find on CDs, tries to create a perfect representation of acoustic information. Codecs, like the ones used by portable music players, pare down the signal by separating the wheat from the chaff (see **Fig. 3**). Psychoacoustic subband coding refers to the process of sending the block of samples through a bank of bandpass filters, breaking it into sub-bands, and performing an analysis based on the activity within each spectral region (the output of each filter, both alone and in comparison to the output of the other filters). The results are compared with a psychoacoustic model that emulates the auditory system by attempting to remove what the auditory system would not pass on to the brain anyway.

For instance, some low-level frequency regions might be masked by other regions. You could resynthesize a sound containing such a region and reduce its size by eliminating those frequencies altogether. Alternatively, the lower-level regions could be resynthesized with less precision than the more salient frequencies, with the resulting distortion masked. Another thing a codec might do is to watch for transients, such as sudden attacks when new notes are played. A transient can also mask softer tones that occur immediately following it or even immediately prior to it. Removing material that would be masked by transients is another way to resynthesize material with greater economy.

FANTASTIC VOYAGE

This article presents just a brief introduction to the field of psychoacoustics and its relevance to musicians. Type "Albert Bregman" or "Diana Deutsch" into your Web search engine, and you will meet two researchers who have produced a wealth of information about how we hear. Whether you're composing, mixing, or philosophizing, understanding how your brain perceives sound can enrich your work in ways that will probably surprise you.

Mark Ballora *teaches music technology at Penn State University.* *Special thanks to Curtis Craig for his assistance with this piece.*

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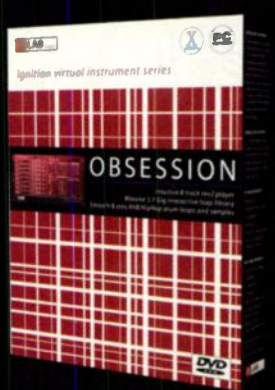

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Cover Your Assets

Protect your property, income, health, and reputation.

By Jeffrey P. Fisher

Do you own any tangible property, such as computers, musical instruments, or a home? These are assets that many of us have and need to protect. Another important asset to safeguard is your health. Talent, reputation, relationships, and intellectual property are often overlooked as real assets, but these intangible assets can be at least as valuable as any traditional tangible property—and they need to be protected as well.

Talent is something that you can preserve by constantly challenging yourself. Haven't new experiences—from getting a new synth patch to starting (or ending) a relationship—always sparked your muse? Doesn't it make sense that adding more experiences to your life should help you become a better music professional? Improving your skills should be a top priority because the more you know, the more you have to draw on for inspiration.

JACK DESROCHER

We all work hard to build and sustain our reputations. Don't let mistakes tarnish yours, because once your reputation ruined, it can take a long time to rebuild. Safeguard and grow your reputation by promoting your image and earning credentials, such as awards and media coverage.

Your most valuable asset is often who you know. Take the time to nurture your network of clients, vendors, peers, media, mentors, and others who form your career bedrock. Healthy relationships require give and take to work, so never forget to support those who support you. These priceless relationships are crucial to reaching your goals.

All creative works, including music and lyrics, are considered intellectual property. Because they are a revenue source, protect them by invoking the

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Matt Hirt – TAXI Member

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I was kind of surprised that the recordings I make in my little home studio were good enough. I guess size really doesn't matter;-)

Want to know what does matter? Versatility. Being able to supply tracks in different genres makes you even more desirable for Film and TV projects. I didn't know that until I became a TAXI member and started going to their members-only convention, the Road Rally.

If you joined TAXI and never sent in a single song, you'd still get more than your money's worth just by going to their convention. It's three days of incredible panels loaded with some of the most powerful people in the music business, and the cool part is that it's FREE!

Unlike some of the other conventions I've attended, the panelists at the Rally are friendly and accessible. I've never been anywhere that gives you so much great information, and so many chances to meet people who can help your career.

If you've needed proof that a regular guy with ordinary equipment can be successful at placing music in TV shows and movies, then my story should do the trick.

Don't let your music go to waste. Join TAXI. It's the best service on the planet for people like you and me – they really can turn your dreams into reality if you're making great music.

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AN APPLE A DAY

Preserving your health not only makes you feel good, but it can benefit you financially. Staying healthy protects your capacity to make money. If you're sick, you are less able to work toward your goals. Staying healthy also protects savings that you may have accumulated. With health-care costs on the rise, a single major illness can put you in the red fast, and you could end up paying the tab for many years to come. Having health insurance can minimize your risk when unforeseen circumstances happen in your life.

Buying insurance is, in a sense, a game. You justify paying the bill knowing that help will be there when you need it. In the back of your mind, you hope that you'll never have to use it. But peace of mind comes with a price that some people are willing to pay. Insurance carriers know that, statistically, most people won't file claims or claims will be minimal.

Many countries, such as Canada, offer universal health care for its citizenry. In the United States, however, we are on our own. Employers frequently provide coverage, but many musicians are either self-employed or work part time, which means health benefits for them are more often the exception than the rule. Buying a policy is expensive, so look for alternatives first. Can you get insurance through a working spouse? Can you join an organization, association, or union that has a group policy, such as the musician's union (American Federation of Musicians, www.afm.org)? For students, even those enrolled only part time, policies through school or reduced rates through a parent's policy may be viable options.

If none of these alternatives apply, you can secure a suitable policy on your own. Thankfully, the Web makes doing research easy. Two possible starting points are www.musicproinsurance.com and www.ehealthinsurance.com. There are others; seek them out by asking friends and colleagues and by searching the Web.

▼

Check to see if your policy pays replacement cost or actual cash value.

HEALTHY, WEALTHY, AND WISE

Major medical policies cover most health-related issues and let you choose the practitioners and facilities that you want to use. They are therefore the most expensive policies you can buy. In contrast, HMO and PPO policies—which are usually cheaper—let you select from doctor and hospital networks, and you must use only those approved by your plan for the coverage to take effect. Any out-of-network expenses either cost you more or are not covered at all. HMOs and PPOs give discounts on routine and preventative care, and savings on certain medical conditions not covered under the medical policy, such as dental and eye care. Many HMO and PPO plans use local health-care providers, so if you're on the road a lot, that choice may not be right for you.

Basic or catastrophic policies cover only emergencies and surgery; you have to pay for routine care yourself. For the young and healthy, that kind of policy can be a good choice. The costs stemming from routine care or persistent illnesses, however, can add up quickly.

The amount you pay for a policy, called the *premium*, depends on its type, medical coverage, deductible, and copayment. Coverage for certain medical conditions, such as pregnancy, cost more. In most cases, you are required to pay initial medical expenses out of your own pocket before the insurance coverage kicks in. This threshold is called a *deductible*. Costs accumulate until you meet the deductible. The higher the deductible, the lower your premiums, but you risk incurring more out-of-pocket expenses. Each person listed on a policy must meet his or her own deductible. If you have a family policy, the deductible is typically three times the amount of a single-policy deductible.

Many policyholders don't realize that once they exceed the deductible, they can still be required to share some of the medical expenses. For example, the insurance company may pay 80 percent of the bill while you pay the other 20 percent. HMOs and PPOs also require copayments in addition to the deductible for certain services. For example, I must pay a $30 copay for each doctor office visit both before and after I meet my deductible.

Thankfully, there is an annual out-of-pocket limit for the maximum amount that you must pay. Once you pay that amount, the insurance pays 100 percent of any additional covered medical costs. When the year is up, you start paying all over again. Be aware that policies have a lifetime limit on the amount that the insurance company will ultimately pay.

Each policy explains in detail what is covered and what is not. Although it's not the most exciting reading, it's important that you understand the specifics of the policy that you are buying and any limitations. You can contact the insurance company and ask a representative to explain it to you. You don't want to merely *think* something is covered; you want to *know* it is.

When choosing an insurance policy, check for prescription drug coverage.

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Medicine can be expensive, and a single infection can set you back several hundred dollars. If you can afford the additional premium costs, then adding drug coverage to your policy can save you money down the road. It's important to note, however, that pharmaceuticals often have a separate deductible.

Health-care expenses are tax deductible once you exceed a certain dollar amount, so it is important to keep good records. The 2003 tax year was the first time that self-employed business owners could deduct 100 percent of their health-insurance premiums from their taxes. Monitor your medical bills diligently. Always check the bills you get from doctors, hospitals, and labs, and carefully compare them with insurance company statements. If you find errors, take the time to get them corrected—doing so frequently works in your favor.

ME, MY, MINE

Obtaining property insurance is the primary way to guard the items that you own. Perhaps you already have a homeowners or rental-insurance policy covering your physical property. Your music gear or anything you use for your business may or may not be covered under that policy. Talk to your insurance agent and describe your situation in detail. You can buy a separate policy to insure your business property or, for a slightly higher premium, you can get a rider for your personal policy.

The insurance business has changed dramatically since the September 11 attacks on the World Trade Center, so check your policy carefully to see which perils are covered and which ones are excluded. In general, fire, water, theft, and natural disasters—except for floods and earthquakes—are covered. Floods and earthquakes require purchasing additional, and often expensive, policies.

Make sure that you know when and where you are protected. If your policy covers only your home, and something gets stolen from your car after a gig, you need to know if your insurance will pay for it.

How much you pay for a premium depends on your coverage amount. Like health-insurance policies, property-insurance policies have a deductible. The insurance carrier pays for the amount that exceeds the deductible. Unlike medical policies, however, these deductibles do not accumulate. The deductible applies to each individual claim. If you file many loss claims, your total out-of-pocket costs could be considerably more than you expected.

Spend time determining the real value of what you are insuring. Read the policy carefully so that you understand its limits. That is usually a total dollar amount; make sure it's enough to cover you should you lose everything. Also, check to see if your policy pays replacement cost or actual cash value. The replacement value pays the full amount needed to replace the item. The cash value pays the market value of the item, which can sometimes be only 10 to 20 percent of the original price. You also need to know how to file a claim—for example, if you are filing for stolen items, you'll need to send in a police report with your claim.

When it comes to keeping records, follow the guidelines established by your insurance carrier. Most require documented inventory of your property. The greater the detail, the easier the claims process will be. I suggest recording the model name and number, serial number, and original purchase price and date for all your gear. If you have vintage equipment, have it appraised regularly. File this paperwork with your agent and keep another copy in a remote location, such as a bank safety deposit box. Photos and videotapes of your property can serve as valuable documentation of what you have.

Protecting health and property need to be top priorities for musicians (see the sidebar "Never Enough" for other types of insurance and protection). While this article gives a basic primer to the subject, it may also pose more questions than it answers. Have this article handy when you call or visit your insurance provider so that you can discuss the options and make informed decisions.

Jeffrey P. Fisher *has written six music and sound books, including* Instant Sound Forge *(CMP Books, 2004). Want to know what he's up to? Visit www.jeffreypfisher.com.*

NEVER ENOUGH

In addition to health and property insurance, these other forms of insurance and asset protection could serve you and your business well.

Auto insurance. This is another special form of property insurance. It is the law in many states, and you should insure any vehicle that you use for your music activities. If your vehicle is for business and personal use, check with your insurance carrier to be sure your coverage is sufficient.

Disability insurance. Should you be unable to work either for a short- or long period of time, disability insurance pays a portion of your lost income. These policies can be rather expensive and pay only 60 to 70 percent of your income prior to the disability. Unfortunately, it can take several months for the insurance to start paying even after approving your claim. If you become permanently disabled, Social Security would be available to you.

Liability insurance. Did you know that in a lawsuit your assets can be liquidated to settle the claim? We live in a litigious society, and an umbrella liability insurance policy can protect you. Umbrella policies are appropriate for people with a lot to lose.

Life insurance. Life insurance pays beneficiaries when you die. Insurance companies determine the premium based on the death benefit amount, your age, and lifestyle. Do other people, such as children, depend on your income? If so, it's a good idea to have such a policy in place.

Partnership contracts and agreements. If you work with a partner, it's beneficial to have a suitable agreement in place to protect the assets that you control together. If the partnership turns sour, having an agreement can save you from experiencing problems down the line.

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YAMAHA

01X

mLAN takes a giant step forward.

By Geary Yelton

Imagine linking all of your audio and MIDI equipment using one bidirectional cable for each device. The mLAN protocol, introduced by Yamaha more than a decade ago, can carry dozens of audio tracks and hundreds of MIDI channels over a single IEEE-1394 FireWire cable (see the sidebar "What Is mLAN?"). No muss, no fuss, and no bother—that's the promise of mLAN. The device that goes the furthest to make good on that promise is the Yamaha 01X.

The Yamaha 01X is many devices rolled into one. It's an mLAN-based multichannel audio and multiport MIDI interface for your computer. It's an 8-input, 24-bit A/D converter that handles sampling rates as high as 96 kHz. It's a freestanding digital mixer with two onboard stereo effects processors and dynamics on every channel. It's a remote control surface with reassignable knobs and motorized faders for your digital audio workstation (DAW) software. Use it to track, mix, and master your studio recordings. Tuck it under your arm and carry it into a nightclub to automate

FIG. 1: The Yamaha 01X combines the functionality of a freestanding digital mixer, two effects processors, a DAW control surface, and an mLAN-based audio and MIDI interface in a single device weighing less than 14 pounds. Impressive flexibility and outstanding ergonomics ensure ease of operation.

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● 01X

INSTALLATION AND SETUP

For this review, I tested the 01X using a dual-processor Power Mac G4/1 GHz with 1.5 GB of RAM running Mac OS X 10.3.5. My DAW software was MOTU Digital Performer 4.12 (DP4). My audio sources included miked voice, percussion, an acoustic guitar, as well as synthesizers, electric guitar, and electric bass.

Two installation CD-ROMs labeled Tools for 01X and Plug-In Effect came with the 01X. A helpful tutorial DVD coproduced by Yamaha and Keyfax called The 01Xperience was also included.

I ran the plug-in installer and authorized all four plug-ins with a serial number (see the sidebar "A Sweet Little Suite"). When I inserted the Tools for 01X disc, though, I didn't find any software for Mac OS X. I consulted the documentation and learned that I needed to download OS X installers from www.mlancentral.com. The Web site currently has the latest software for Windows, Mac OS 9.2, and Mac OS X 10.3.3 and up, as well as setup documentation. Yamaha says that future installation discs will have updated software.

An editor application called Studio Manager for the 01X (Mac/Win) comes bundled with the 01X. A version of Studio Manager ships with every Yamaha digital mixer. Studio Manager is a virtual mixer that works bidirectionally with the 01X: Whenever you make a change in one, it is reflected in the other. Moving a fader onscreen moves the corresponding 01X fader, and moving an 01X fader moves the corresponding fader onscreen. Studio Manager can access every 01X parameter.

SOFTWARE ISSUES

The Mac OS X version of mLAN Auto Connector that I found on mLAN Central's Web site was version 1.0.2b, a public beta. When I asked my contact at Yamaha why it was called a beta, he said it was because it contained known bugs. Nonetheless, it was a vast improvement over the prior official release. I began my review using Mac OS X 10.3.4, which had many mLAN-related problems that were (thankfully) solved by the release of 10.3.5.

The program mLAN Auto Connector is a necessary component for using the 01X with a computer. It has the means to specify the sampling rate, the word-clock source, and the number of channels. However, mLAN Auto Connector is a nonpersistent application, which means that you must open it and change its settings every time you power up the 01X. Unless you happen to use the factory defaults, you must manually reset its various parameters and select Connect for the settings to take effect. Then you have to leave mLAN Auto Connector open until you're ready to disconnect the computer from the 01X. It would be a tremendous improvement if Auto Connector did what its name suggests and connected automatically.

Whenever I powered up the Mac and the 01X, I ran mLAN Auto Connector, changed the sampling-rate setting, enabled channel monitoring, and then selected the Connect command. Fortunately, the 01X has a way to save its user defaults—word-clock source, DAW remote assignment, fader levels, panning, and so on—by means of the Utility page's Backup command. Without that function, the startup routine would have been much more complicated (see the online sidebar "Convolution Shuffle" at www.emusician.com).

The current version of mLAN Auto Connector supports only point-to-point connections if you're using Mac OS X; consequently, it works with only one device and is incapable of handling a true network. When Yamaha introduced the mLAN-based Open Network Expansion (O.N.E.) in January 2004, the promise was to be able to link gear from various manufacturers into a unified system. If you're a Mac OS X user with another piece of mLAN-compatible gear such as a PreSonus FireStation or a Kurzweil KSP8, this limitation is a serious (if only temporary) setback. Yamaha assures me that future software will solve the problem and that the Windows and Mac OS 9 versions are already network-ready.

ONE MIXER TO GO

First and foremost, the 01X is a digital mixer in the tradition of the Yamaha 01V96 and its predecessors. Its feature set and price make it ideal for project

01X Specifications

Sampling Rates	44.1, 48, 88.2, 96 kHz
Sampling Resolution	16-, 24-bits
Analog Inputs	(2) balanced XLR, 48V phantom powered; (6) balanced ¼" TRS; (1) unbalanced ¼" TS
Analog Outputs	(2) unbalanced ¼" stereo/aux; (2) unbalanced ¼" monitor; (1) ¼" stereo headphone
Digital I/O	(1) coaxial S/PDIF I/O; (2) mLAN ports
Other Connectors	(2) MIDI In; (2) MIDI Out; (2) ¼" footswitch
Faders	(9) 60 mm motorized
EQ	(28) 4-band parametric
Display	2 × 55-character LCD with LED backlight
Effects Processors	(2) multi-effects, (43) factory presets, (85) user presets
Dynamics Processors	(26) compressor, expander, gate
Preset Libraries	(100) scenes, (128) effects, (128) dynamics, (200) EQs, (33) input patches, (33) output patches, (129) channels
Power	100–240 VAC to 16 VDC adapter
Dimensions	17.83" (W) × 4.57" (H) × 15.39" (D)
Weight	13.67 lbs.

WRH

studios, and it has a lot to offer live performers as well. Although the 01X is advertised as a 28-channel mixer, it gives hands-on access to some additional channels on the Master layer.

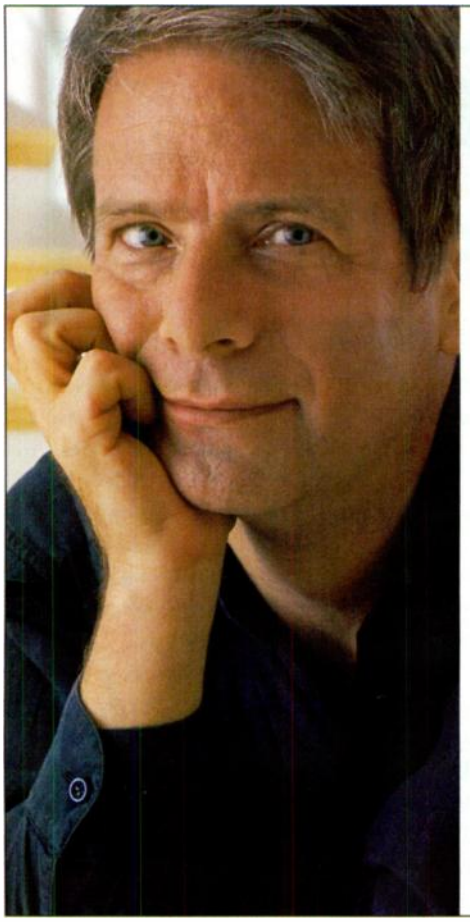
In Internal mode, you can access every channel by pressing the four Layer buttons or by scrolling with the Bank buttons. The first layer controls the eight analog inputs. The second and third layers control 16 inputs over mLAN. If you have instruments with mLAN outputs or an mLAN audio interface such as a Yamaha i88X, you can make use of those 16 channels without the need for a computer, even using the 01X onstage as a freestanding mixer; if you don't, you can stream them from your computer's DAW program, using the 01X to control your audio track outputs.

Layer four is the Master layer, which has the record bus out master, four aux bus masters, and two stereo inputs. The aux inputs and the stereo inputs differ from the others in that a single fader controls a stereo channel, they have no direct output, and no dynamics processing is available on those channels.

All of the other channels have compression, expansion, and gating. User parameters give you control over five degrees of knee hardness, as well as the usual threshold, ratio, attack, release, and gain. The 01X has a library of 40 dynamics presets, each tailored for a specific instrument or application, and 88 user presets.

Each channel also has four bands of sweepable parametric EQ: low, low mid, high mid, and high. Center frequencies cover the entire range of normal hearing, and gain allows up to 18 dB of boost or cut. In Multi Channel mode, you can change the EQ for all channels at the same time. As with dynamics, a 4-band EQ library lets you select from 40 factory presets and 88 user presets.

FIG. 3: The 01Xray Web site (www.01xray.com) gives a tour of 01X features, specifications, links to the latest software updates, FAQs, forums, and an online store.



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George Massenburg,
Producer/Engineer

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EFFECTS WIZARD

Two pre- or postfader aux buses are available for external effects, and the other two are for routing signals to the internal effects processors. Onboard effects can process any of the 24 individual channels (analog or mLAN), either aux bus, the stereo bus, or the main stereo outs. The limitation is that you can patch only one processor to a channel or bus, which means you can't have ring modulation and a rotary effect, for example, on the same track. Twelve combination presets pair certain effects in series or in parallel, but they might not always be the pair you'd prefer.

The two processors are identical, each furnishing 43 factory presets and locations for 85 user presets, which you create by modifying factory presets. The library has a nice balance of reverbs, delays, and modulation effects. It also features distortion and guitar-amp simulation; filtering, flanging, and phasing that respond to changes in dynamics; and a 3-band resonant multimode filter.

I've always liked Yamaha's reverbs, and the 01X's are as smooth and usable as I had expected. I also appreciated the amp simulation, which gives a choice of ten amp types and five distortion types. All effects present an abundance of parameters to tweak, although none provide any means to control them using external switches, pedals, or MIDI controllers.

MANAGE A DAW

It's safe to assume that most 01X customers will want to use it as the hardware front end for their DAW software. In combination with a digital audio sequencer, the 01X can make recording with multitrack software feel a lot like recording with multitrack hardware. It has faders, knobs, and buttons for controlling most aspects of DAW recording and playback—even controlling plug-in parameters.

In Remote mode, the first three mixer layers give hands-on access to 24 audio or MIDI tracks with full automation capabilities. In addition to a moving fader, each track has an on button that serves as a mute function. You can use the channel knobs for dialing in the values of selected parameters.

The mLAN network has five virtual ports called plugs. Before using the 01X with DP4, you must create MIDI devices and make connections in Audio MIDI Setup (AMS). Plug 1 is used to control DAW software with the 01X, but DP4 is the only program that requires you to connect an 01X device to plug 1. Plugs 2 and 3 connect to the 01X's physical MIDI ports; if you want to use those, connect appropriate devices there as well. Plug 4 connects to Studio Manager, and plug

SWEET LITTLE SUITE

The Yamaha 01X ships with a suite of four VST and Audio Units (AU) plug-ins with individual PDF manuals. Whereas the 01X Channel Module (Mac/Win) is specifically for use with the 01X, the other three modules are general-purpose plug-ins that are available separately: Vocal Rack ($199), Pitch Fix ($299), and Final Master ($199). You can use them with any compatible host in Windows, Mac OS 9, or Mac OS X.

Channel Module lets you edit EQ and dynamics within your DAW software and transfer those settings to and from the 01X. The plug-in provides a graphic interface for controlling parameters, and it has all of the presets from the 01X's dynamics library. Channel Module's greatest advantage is that you can specify EQ and dynamics parameters even when the 01X is not connected. Additionally, you can transfer those settings to the 01X later when it's time to record.

Vocal Rack furnishes compression, 3-band EQ, a noise gate, a de-esser, and a simple delay with a range from 0.1 to 50 ms. A Harmonic Enhancer slider boosts a track's overtone content. A simple highpass filter and a phase-inversion switch are also included. Twenty presets are optimized for lead vocal, background vocal, radio effect, and so on.

Final Master is a multiband dynamics processor that is optimized for use in a final mix. Graphics sliders let you divide the frequency spectrum into three bands. Each band supplies a compressor and a limiter, and you can apply one of three soft-clipping curves to the entire spectrum. Fifteen factory presets are available to get you started.

Pitch Fix is a sophisticated pitch-correction plug-in that lets you apply manual controls or assign a MIDI track to control an audio track's pitch (see **Fig. A**). You can shift formants and pitch simultaneously, which preserves the natural timbre, or you can shift them independently for special effects. Pitch Fix can automatically create vocal harmonies, change a singer's gender, or keep a vocal track in tune.

FIG. A: The Yamaha 01X plug-in bundle includes Pitch Fix, a multipurpose tool that lets you alter the pitch and formant of a vocal track, as well as create harmonies.

The bundle has additional software for Windows users. SQ01 is an audio sequencer, and TWE Wave Editor is a multitrack audio-editing program. If you happen to own a Motif Rack, a dedicated editor lets you control its functions from your PC screen.

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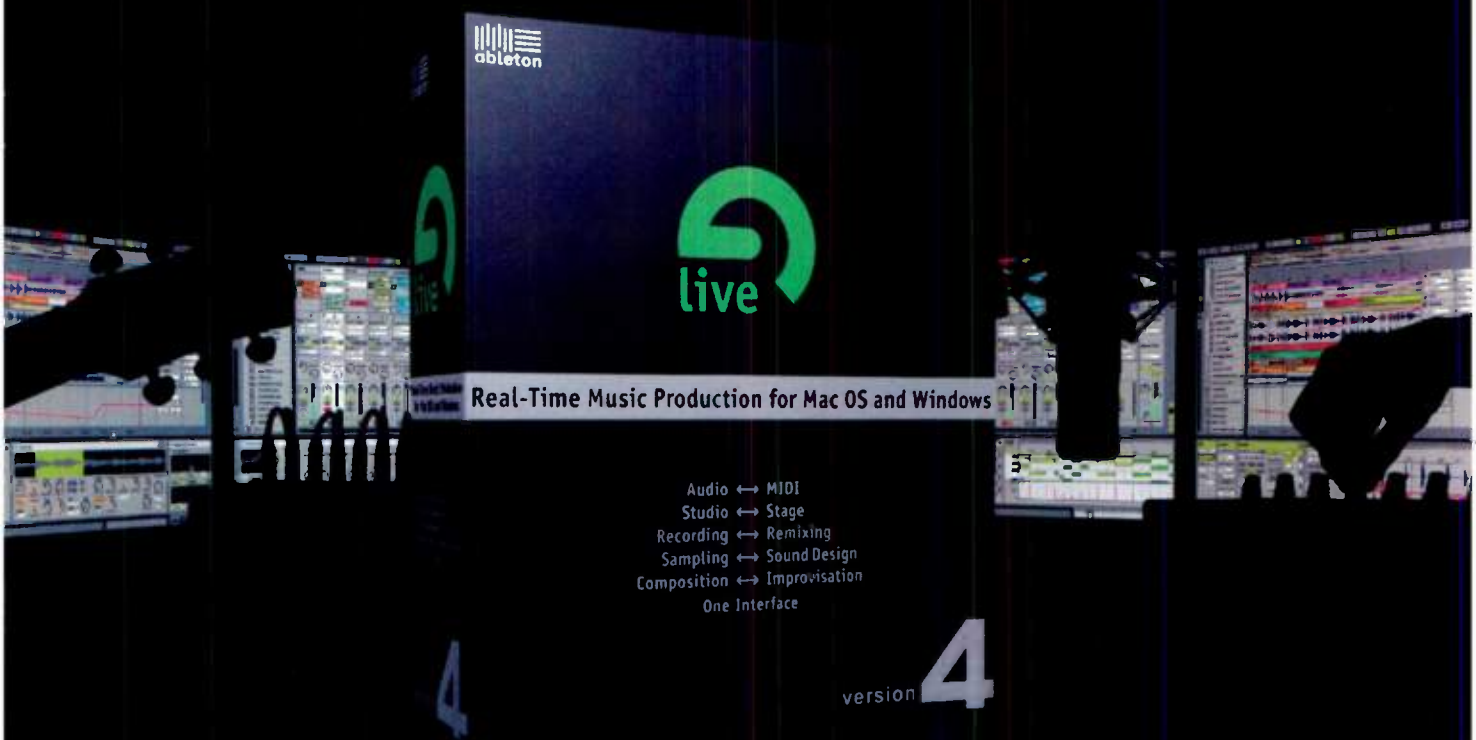

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5 controls Scene changes; neither requires that you actually connect them.

The documentation and DVD have plenty of information about using the 01X with Steinberg Cubase SX. If you use another multitrack recording program, a remote function list in the owner's manual conveniently lists 01X functions specific to several other DAW programs. When you press the Remote button on the 01X's Utility page, you can select templates for Logic, Cubase, Sonar, or Digital Performer; a general DAW template is also supplied. Pro Tools support is conspicuous in its absence, however, because Pro Tools requires Digidesign audio hardware.

To use the 01X with Digital Performer, my first step was to specify the mLAN network in DP4's Configure Hardware Driver window. I then opened Control Surface Setup, enabled the Mackie driver, and specified a connection to the 01X. After that, when I opened a song file, its tracks corresponded to 01X channels: the first track was the first channel, the second track was the second channel, and so on. Changing their order in the Tracks Overview changed the assigned 01X channel, which meant that I was able to determine which fader controlled which track by changing the order of tracks onscreen—a nice feature. I assigned the first eight channels to the 01X's analog audio inputs, but beyond that, anything was possible.

Whenever I pressed an 01X Bank button to scroll to the next set of eight channels, DP4's Mixing Board window changed after a two-second delay to display only the corresponding eight tracks. I discovered that if I had more tracks than would fit in the Tracks Overview, pressing the 01X's Display up or -down buttons shifted the window to display the tracks located at the top or bottom. The function buttons were handy for opening and closing various edit windows; in most cases, that was a two-finger operation using the Shift button.

Controlling transport functions and mixing with the 01X quickly became second nature. According to the owner's manual, I should have been able to add and jump to markers using dedicated 01X buttons. With the Marker button enabled, pressing the Rewind or Fast-Forward button did jump to the previous or next marker as expected, but pressing the Write button didn't add markers as it was supposed to. I checked with Yamaha, and the problem appears to be a limitation of DP4 rather than the 01X.

AGONY OR 01XSTASY?

The Yamaha 01X is an amazing machine that makes more of mLAN's potential than anything else, providing high-quality sound, flexible functionality, and logical operation at a remarkable price. Its crystalline sound gave my projects a nice transparency that I had hoped for. The mic preamps are good, especially when you consider the 01X's price. And once you get going, operating the 01X is a breeze.

Software notwithstanding, there's not much I would change about the 01X. I wish it had balanced XLR outputs; for some users, unbalanced ¼-inch outputs will relegate it to the semipro category.

In addition, the documentation could be better organized. Despite a well-written manual, a supplementary DVD, and third-party online support (see **Fig. 3**), I had a hard time learning how to do what needed to be done at a given moment. Information about how to perform certain operations, such as saving Utility defaults, was buried in the manual.

If you're a project-studio owner in need of a DAW control surface with motorized faders, you're bound to like what you see in the 01X. If you're convinced that mLAN is the wave of the future for studio data communications, the 01X provides an opportunity to get started in that area. If you're a live performer who wants to automate your show, the 01X's Scene capabilities can store and quickly call up setups for up to 99 songs. The 01X combines a lot of desirable functions in an attractive, ergonomic, and portable desktop device. It will undoubtedly find its way into many studios and onto many stages.

EM *Associate Editor* **Geary Yelton** *lives in Charlotte, North Carolina. Despite his best efforts, his software-based electronic-music studio continues to depend on new hardware.*

PRODUCT SUMMARY

Yamaha
01X
digital mixer/mLAN interface
$1,699

FEATURES	4.0
EASE OF USE	3.5
AUDIO QUALITY	4.5
VALUE	4.0

RATING PRODUCTS FROM 1 TO 5

PROS: Compact size. Solid construction. Motorized faders. Flexible routing. Superb audio quality. Excellent effects.

CONS: No XLR outputs. Lackluster support for Mac OS X. Documentation needs better organization.

Manufacturer
Yamaha
email: infostation@yamaha.com
Web: www.yamaha.com

WHAT IS MLAN?

First proposed by Yamaha in 1993, mLAN is a digital communications protocol that uses an IEEE 1394 (FireWire) connection as a pathway for high-speed data transfer. By design, it can carry multichannel audio, multiport MIDI, word clock, video, and control data bidirectionally on a single cable. mLAN adds to the usual point-to-point FireWire protocol the ability to intelligently handle audio application-specific data and manage multiple devices in a network. Like the MIDI protocol, mLAN is an open standard that is not proprietary to a single manufacturer. Numerous other companies, including Kurzweil, PreSonus, and TerraTec, have joined Yamaha in producing mLAN-compatible hardware.

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TASCAM

2488 DIGITAL PORTASTUDIO

A value-priced, 24-track workstation.

By Bob O'Donnell

Twenty-five years after the introduction of its original Portastudio, Tascam has unveiled the 2488 Digital Portastudio, the latest and most complete incarnation of its portable-studio concept. Priced at a level that—when adjusted for inflation—would be considerably less than the original, the 2488 has a feature set that's light years beyond the original 4-track cassette unit.

The 2488 includes 24 tracks of uncompressed, 16- or 24-bit 44.1 kHz digital recording (as many as eight tracks can be recorded simultaneously); 250 virtual tracks; a 36-channel mixer; built-in multi-effects; EQ and dynamics processing; a 64-voice, General MIDI (GM) tone module; an integrated CD-RW drive; and a USB 2.0 port for connecting to a PC (Windows ME/2000/XP) or a Mac (OS 9.2 or OS X). Plug in your instruments, microphones, and a set of headphones or powered monitors and you have the necessary tools to create a professional-sounding CD.

THE LAYOUT

The 2488 has a layout (see **Fig. 1**) that is similar to most portable digital studios, with faders on the left-hand side, transport controls and other multifunction buttons on the right-hand side, and a monochrome display—angled for easier viewing—in the center of the unit.

Most of the patching for the 2488 is done through the rear panel, but there are several connections on the front of the unit. These include a ¼-inch input for guitars and passive basses (according to the manual, a rear-panel line input should be used for active basses), a single headphone jack (I wish there were two), and inputs for both a punch in-out pedal and an expression pedal. The latter of the two can be used to make real-time adjustments of effects parameters, including controlling wah-wah in a number of the guitar multi-effects.

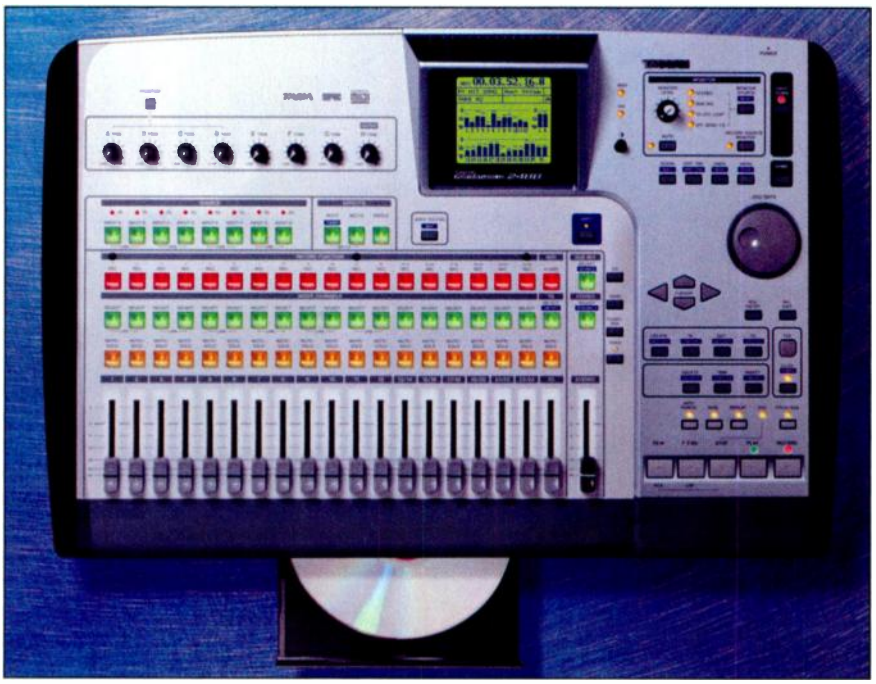

FIG. 1: The Tascam 2488 has 24 tracks of uncompressed digital recording, lots of effects, a GM tone module, a CD-RW drive, a USB 2.0 port, a 40 GB hard drive, and more—all for a surprisingly low price.

DRILLING DOWN

The mixer has 20 faders, which control 12 mono channels (1–12), 6 stereo pairs (13–18), one internal GM tone generator (channel 19), and one overall stereo mix (channel 20).

Above the faders are lit, translucent buttons for mute and solo, channel select, and record enable, all of which correspond to the mixer's 20 channels. Additionally, there are eight input-select buttons labeled A-H. Routing an input to a mixer channel is simple and intuitive: press an input and a channel button simultaneously.

On the right-hand side of the panel above the transport controls are buttons for various auto-locate and punch-in functions, a Jog/Data wheel, cursor arrows, audio-editing controls, and sync buttons, including one for the Tap Tempo function.

The monitoring section is fully featured and versatile. In addition to a monitor-level knob, a dedicated monitor-select button lets you switch between four different monitoring sources: the main stereo mix, a submix of external sources, the internal effects loop, or the two effects sends. In addition, any of the monitoring modes can be folded to mono by pushing a button, and you can mute the external monitor outputs.

The rear panel (see **Fig. 2**) features eight analog inputs, including four ¼-inch XLR TRS combo jacks that have switchable +48V phantom power. Other connections include RCA S/PDIF digital input and output jacks, balanced ¼-inch stereo monitor outputs, unbalanced RCA stereo master outputs, two unbalanced ¼-inch effects sends, a USB 2.0 port, and MIDI In and Out jacks.

OF DRIVES AND GIGS

The 2488's internal 40 GB hard drive allows for about three hours of 24-track recording time. At the factory, the hard drive is formatted into four

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2488 Specifications

Analog Inputs	(4) XLR/TRS combo mic/line, (4) unbalanced ¼" mic/line, (1) ¼" high impedance
Analog Outputs	(2) 1/4" balanced TRS monitor, (2) unbalanced RCA stereo, (2) unbalanced ¼" effects send
Digital I/O	(2) RCA S/PDIF
Data Transfer	USB 2.0 (Windows ME/2000/XP, Mac OS 9.2, OS X)
MIDI Ports	In, Out
Channels	36
Faders	20 (45 mm throw)
Simultaneously Recordable Tracks	8
Simultaneously Playable Tracks	24
Virtual Tracks	250
Recording Format Uncompressed	16- or 24-bit
Sampling Rate	44.1 kHz
Hard-Disk Capacity	40 GB
Frequency Response	20 Hz–20 kHz (±1.0 dB, trim at minimum)
Scene Memory Slots	100 (user rewriteable)
Dimensions	21.5" (W) × 5.7" (H) × 14" (D)
Weight	17.6 lbs.

Tascam-native partitions and one FAT32 partition that's fixed in size at 4 GB. (FAT32 is an updated version of the file allocation table standard, which supports 32-bit processors.) You can create, delete, or resize the Tascam partitions to suit your needs. The hard drive can be accessed from a Windows or Mac computer using the 2488's USB 2.0 port, which is also compatible with USB 1.1.

Unfortunately, the file-transfer process isn't as easy as simply plugging in a cable between the computer and the 2488. Before you can export files to the computer, you need to move them from one of the Tascam-native partitions to the FAT-formatted partition, and then it takes several more steps to complete the transfer process.

You can export either individual or multiple tracks from the 2488—which is something that's not explained in the confusing and incomplete documentation. When you import files to the 2488, you have to go through several steps because it recognizes only mono WAV files. If you have a stereo drum loop, for example, you must first break it into separate mono files before you can import it to the 2488.

Alternatively, you can use the 2488's 4x CD-RW drive for importing and exporting files. The drive functions as a CD burner, a file-backup device, and a file-transfer device. Thankfully, the import process from a CD is relatively easy. The 2488 is finicky about what types of CDs it will accept, however; it will read only data discs, and they must have mono WAV files on the top-level directory. As a result, you can't rip files from an audio CD.

Burning a disc using the built-in CD-RW drive is a much more straightforward process. You create a premastered stereo mix and then record either one track at a time or all tracks at once to disc.

Despite the importing hassles, the 2488 is an excellent companion for computer-based editing programs. The 2488 is not intended to be a complete replacement for a computer DAW, as is the case with many other portable digital studios. You can record your basic tracks in the intuitive hardware-based environment of the 2488, export the file to your computer for detailed editing, and then either mix it in your computer or bring it back into the 2488 for mixdown and CD burning.

PART OF THE PROCESS

The 2488 also includes a host of internal effects that are organized in an unusual manner. There is a guitar-oriented Multi-Effects section, which supports

FIG. 2: With the exception of a dedicated guitar-and-bass input, a headphone out, and punch-in/out and expression-pedal inputs on the front of the unit, the 2488's connections—including line and mic inputs, main and monitor analog I/O, digital I/O, and MIDI I/O—are located on the rear panel.

24-bit/96kHz Xtended Definition recording

Clean phantom-powered XLR inputs

Intelligent "learning" noise reduction

Cable-free digital routing system

Programmable analog compressors

Guitar amp modeling effects

Sub-mix inputs with EQ

Scrub-style track editing

Beat box with PCM rhythms

4-channel parametric EQ on every track and input

Time compression/expansion

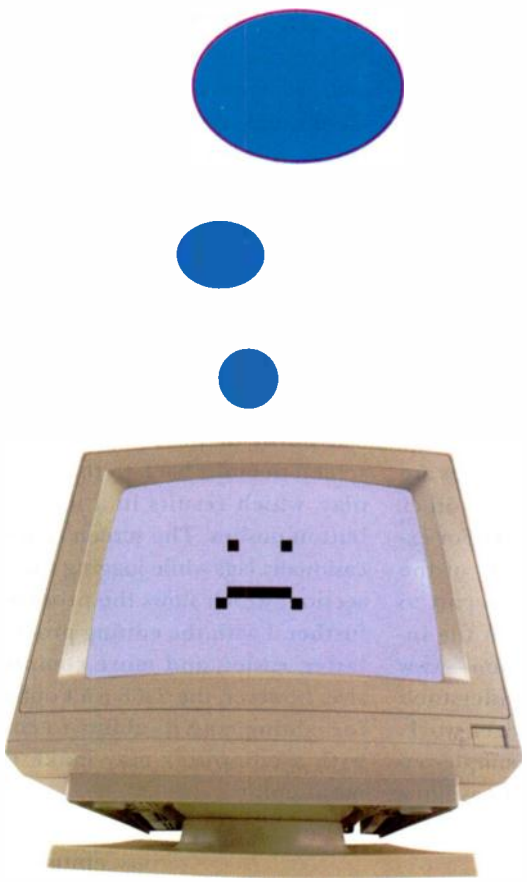
wav file import-friendly

Advanced digital mixer with scene and fader automation

CD-RW burner

Auto-locator with nameable cues

Full complement of programmable master and insert effects



Dream Machine

The D16XD Digital Recording Studio is self-contained, pre-configured, and ready to record, right out of the box. It's everything a computer wishes it could be, but can't. All the advanced recording, editing and mixing features you'd find in a full-blown professional studio are here. Our responsive faders, dedicated knobs and pop-up TouchView interface give you total hands-on control – no keyboard or mouse required. With the D16XD's dedicated operating system, everything works together flawlessly, ensuring reliable, predictable performance. So wake up and start recording in your *own* dream studio.

Now you can track like the masters, capturing the warmth only vacuum tubes can deliver with the new TPB-2 Tube Preamp/Optical Compressor Korg XD Recorder option (shown above). And the rugged, stand-alone TP-2 can be used with any recorder.

The D32XD ups the ante with 32 tracks, over twice the effects, flying faders, a larger hard drive and much more.

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WRH

combinations of as many as five effects simultaneously including noise suppressor; compression or distortion; amp model; flange, chorus, pitch shift, tremolo, or other modulation effect; and delay.

Additionally, there is a Mic Effects section, which is composed of dynamics processors—switchable between compression, expansion, and an exciter effect—that are available on as many as eight individual channels or inputs simultaneously. If you are using Multi-Effects at the same time, the number of simultaneous Mic Effects drops to four.

Three-band EQ, with sweepable high- and low-shelving and completely parametric mids, is available on all channels. A single-stereo processor, called the Single Effect, can be applied to the stereo bus and offers reverb, chorus, delay, pitch-shifting, phaser, and flanger. Also available on the stereo bus is 3-band EQ and a dedicated dynamics processor.

Mic Effects and Multi-Effects are inserts and can be printed to disk as you record, whereas Single Effect and the other stereo-bus effects can be monitored at any time but only printed during mixdown. The stereo-bus dynamics processor can also be printed during a track bounce or when you're using the 2488's mastering features (which allow you to prepare a stereo mix for CD burning).

The following is an example of the effects in use: during the recording of a multipart trombone choir (in which I played all the parts), I monitored my playing with Single Effect set to reverb and the main dynamics processor set to a small amount of compression. Because Single Effect doesn't get printed during tracking, my tracks were recorded dry. During mixdown, I was able to recall the effect settings that I had been using, tweak them to my liking, and print them as part of the 2-track mix.

The quality of the dynamics processors and Single Effect are reasonable, but I was bit disappointed by Multi-Effects. The presets were generally not impressive, and many of the effects were surprisingly noisy.

TWO-STAR GENERAL

The 2488 also features a GM tone module. You can use it either as a Standard MIDI File (SMF) player, with files that you create elsewhere and then import to the 2488, or as a playback engine for the many drum patterns built into the 2488. You must choose either SMF or playback engine, however, because you can't use the GM tone module as both.

Most of the module's instruments have a decent sound. But the drum sounds are solid, and the drum patterns give you plenty of material to work with, particularly for songwriting purposes.

There aren't any MIDI-editing or patch-editing features on the 2488, so you can't edit any imported SMF sequences or create and edit any of the drum patterns. You can, however, select GM instruments, set levels, and tweak reverb and chorus.

▼

I was easily able to tweak the EQ settings for each track.

In the Pattern mode, you can arrange the order of the preset drum patterns, select from different GM drum kits, and adjust the tempo. You can sync internal sequences or patterns to previously recorded audio tracks using the 2488's Tempo Map feature. You can also sync the 2488 to an external device using MIDI Time Code.

EASE OF USE

The 2488's basic recording features are intuitive, but some of the unit's other features aren't as easy to grasp. For example, it wasn't until the end of the review process (and thanks in part to the knowledgeable people in the independent Tascam 2488 forum—www.tascam2488.com) that I understood how the virtual-track features work. The manual leaves out the simple-yet-critical detail that you have to assign a virtual track to a mixer channel before you can record to it.

Working with individual channels and tracks is easy. With dedicated EQ, Send, and Fader/Pan buttons, making adjustments during the recording and mixing process is a simple task. During my trombone-choir project, for example, I was easily able to tweak the EQ settings for each track by selecting the appropriate input channel, hitting the EQ button, and then using the Jog/Data wheel to dial in the equalization.

The graphic display, while somewhat small by today's standards, provided excellent feedback on EQ curves and effects settings. In addition, you can save the current state of the mixer as a Scene Memory. There are 100 Scene Memory slots available, which are saved separately from the song.

The 2488 doesn't have any automated mixing capabilities, but it does respond to MIDI Volume and panning commands from an external sequencer. The mixing process is straightforward and, while the faders aren't silky smooth, they're functional.

SLICING AND DICING

The track-editing functions cover the critical necessities, including commands such as Cut, Copy, Paste, Move, Insert, Silence, Clone Track, and so forth. I was able to make basic edits to cut out extraneous noise and false starts, but I was disappointed by the lack of anything beyond the basics. There's no normalize function, and you can't add fade-ins and fade-outs.

The editing process is a bit tedious because every time you mark an in or out point or perform an edit, the screen defaults back to the home display, which results in a lot of extra button pushes. The screen redraw occasionally lags while jogging through a section, which slows the process even further. I wish the editing process was faster, easier, and more comprehensive; however, the 2488 isn't optimized for editing, and its ability to connect with a computer may make that a moot point.

PRODUCT SUMMARY

Tascam
2488 Digital Portastudio
portable digital studio
$1,499

FEATURES	3.5
EASE OF USE	3.0
AUDIO QUALITY	3.5
VALUE	4.5

RATING PRODUCTS FROM 1 TO 5

PROS: 24-track recording and mixing at a bargain price. Integrated effects, MIDI tone module, and CD-RW. Elegant design and generally intuitive interface. USB 2.0 connectivity with PCs and Macs.

CONS: Effects audio quality is only so-so. Track editing and file import and export are slow and tedious. No MIDI editing. Incomplete, confusing documentation. Only one headphone jack.

Manufacturer
Tascam
tel.: (323) 726-0303
email: info@tascam.com
Web: www.tascam.com

25 YEARS, 24 TRACKS

Overall, I enjoyed working with the 2488. I have issues about the implementation of some of the unit's features, but I'm hopeful that future firmware revisions will resolve them. (A rewrite of the manual would also be helpful.)

At $1,499, the 2488 is a remarkable bargain, considering that you get 24 tracks of uncompressed 24-bit digital recording and mixing, the ability to transfer audio back and forth with a computer, plenty of effects, a CD-RW, and a slew of ancillary features. When you look at what this latest Portastudio offers in terms of power, performance, and price, you realize just how far things have come for the home recordist during the past 25 years.

Bob O'Donnell *is a Bay Area-based radio talk-show host, computer-industry analyst, and fledgling musician. He is a former editor for* EM.

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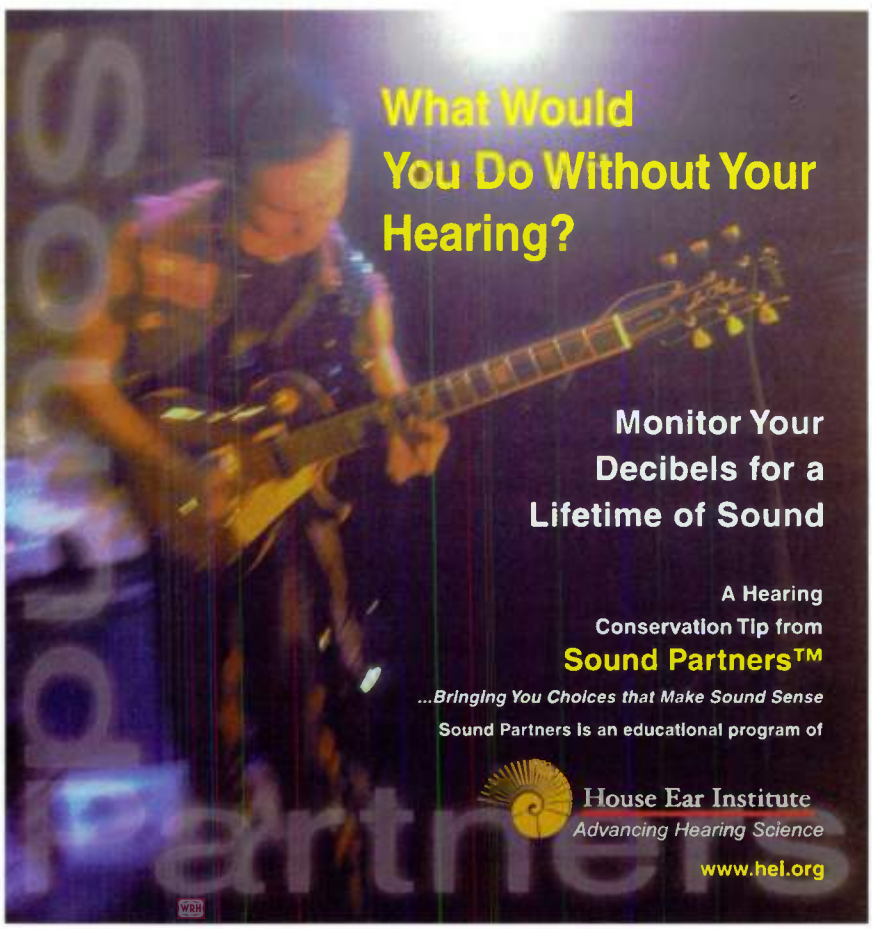

CAKEWALK

GUITAR TRACKS PRO 3 (WIN)

A lean, mean, multitrack recording and editing environment.

By Orren Merton

Cakewalk has updated its Guitar Tracks Pro software to version 3, creating a real contender in the audio-only multitrack wars. Version 3 boasts a new Loop Browser for Acid-style functionality; a navigator pane, allowing you to view a project in its entirety; a Tempo Map for creating tempo changes; and completely reimagined Edit and Mix views. These new features are among the changes designed to increase the application's capabilities and ease of use.

GUITARS OPTIONAL

Don't let the name fool you into thinking that this application is limited to guitar-related uses. Guitar Tracks Pro 3 (GTP3) is a fully featured 32-track audio recording, editing, and mixing application. It can record and play back up to 24-bit, 96 kHz audio. It can import and adjust the tempos and keys of Acid loops. It comes with DX effects and can also use VST effects with the integrated Cakewalk VST-DX adapter. GTP3 can export songs in WAV, WMA, RealAudio, or (using an optional encoder) MP3 formats. Moreover, the Edit, Mix, and Loop browsers are just as effective with a full band, a string section, or vocals as they are with guitar tracks.

GTP3 features some extras that are geared toward the guitarist, including the LE version of IK Multimedia's guitar-amp simulator, Amplitube. The seven effects that Cakewalk designed for GTP3 are ones generally found in a guitarist's rack or stompbox collection, and encompass a tuner, an echo unit, reverb, delay, and chorus. The effects interfaces look like rackmount effects found in pro guitar rigs. The well-done demo song is a hard-rocking guitar affair. Unfortunately, GTP3 has no tablature interpreter or similar guitar-specific function.

LEAVE MIDI AT THE DOOR

Perhaps one reason that guitar-tab functionality was left out is that score and tab functions often involve MIDI. Except for compatibility with a number of popular control surfaces, such as Tascam US-428, CM Labs MotorMIX, and Roland U-8, GTP3 is a MIDI-free zone. A Generic Surface option can be used with most control surfaces, but other than that, there is no MIDI capability in GTP3. That can be confusing, because GTP3 allows you to instantiate a DX or VST instrument (DXi, VSTi) on an audio track, but it offers you no way to play them. According to Cakewalk, GTP3 works with most popular guitar-processors that have a MIDI out, such as DigiTech's popular RP and GNX models. That allows guitarists to operate the GTP3's transport controls and even punch in and out while keeping both hands on their axes.

Cakewalk points out that the lack of MIDI, which many guitarists and audio recordists don't want anyway, tightens the focus and ease of use considerably. GTP3 is designed squarely to be an audio recording and editing application, and plug-in-instrument compatibility enables the use of audio inputs and soft-instrument filters. In keeping with its audio-recording focus, Cakewalk provided useful professional features such as SMPTE time-code generation for locking to standalone hard disk and digital tape recorders and envelope-based (non-MIDI) automation of mixer and effects parameters.

GTP3's focus pays off. The application does an excellent job of organizing its functions into a single window. The Control Bar—with transport controls, song display, locators, and view modes—is always visible, although you can place it at the top or bottom of the window. You also have the option of switching the Navigation Bar—which displays an overview of all your tracks and their position in the project—on

Minimum System Requirements

Guitar Tracks Pro 3

PC: Pentium III/800 MHz; 128 MB RAM; Windows 2000 or XP; 100 MB free hard-disk space

FIG. 1: Cakewalk Guitar Track Pro 3's Mix view offers a fully featured and familiar-looking mixing console that displays 32 audio channels, 8 buses, and 2 aux buses.

(Shown Actual Size)

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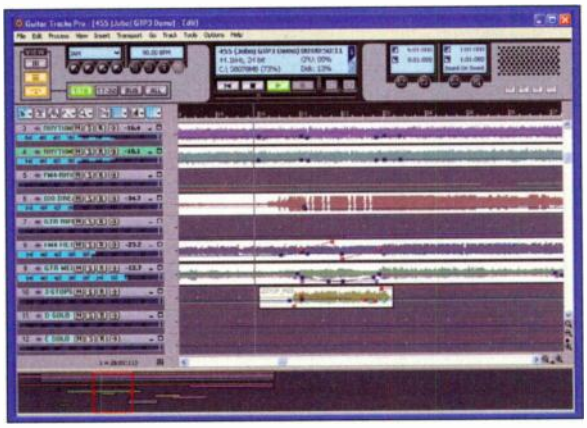

FIG. 2: You can arrange and edit the audio and Groove Clips for your project in the Edit view.

or off. Additionally, you can use the Navigation Bar to zoom in and to move in the Edit view. Finally, you can switch the middle of the window between the two main views in the application: the Mix view and the Edit view.

MIX VIEW

The Mix view (see **Fig. 1**) consists of a straightforward Sonar-like mixer. You can view tracks 1–16, 17–32, bus and aux tracks, or all of your tracks at once. The nonadjustable size of the mixer strips enables 16 tracks to fit across the width of a 1024 × 768 monitor, so the various view options make perfect sense. There are no key commands to switch between mixer views. The mixer has 32 audio channels, 8 buses, and 2 auxiliary buses. In the Mix view you can choose any available hardware input as the input for a track, and you can choose any available hardware output or any of the eight available buses for the track's output. You can assign the two aux buses to any of the available hardware outputs, buses, or auxiliary tracks. The auxiliary send knobs can be either pre- or postfader.

GTP3 has as many as 32 effects per song. These can be distributed among tracks in any way you want—there is no per-track effects limit. GTP3 has plug-in delay compensation on all tracks during playback, so if you use DSP cards or third-party plug-ins with high latency, you don't need to worry about sync. You can easily add effects to the insert field by right-clicking on them—a convenient feature.

The mixer has all of the standard DAW controls and functions and is laid out logically according to the signal chain, with the input at the top, the output at the bottom, and the other controls where you'd expect them. The individual playback meters are accurate, but they create a drain on CPU efficiency. If you find that your project is straining your CPU, the manual recommends that you turn off meters to gain back some CPU cycles. You can automate volume, pan, send-knob, or plug-in edit moves by right-clicking on the control and selecting Arm for Automation. GTP3 also has snapshot automation of these controls.

EDIT VIEW

Click on the Edit view button on the Control Bar, and an arrange-style edit screen, with tracks listed on the left and each track's audio waveforms displayed on the right (see **Fig. 2**), replaces the Mix view. The Edit view allows you to arrange, split, cut, paste, and draw automation envelopes on your audio clips. You can adjust the vertical zoom of each track, and you can horizontally and vertically zoom in on one or more tracks for precise editing. The Edit view has a comprehensive list of musical notation and audio/project-related Snap-to-Grid options, from note divisions and markers to zero crossings. You can also disengage Snap-to-Grid completely for freeform editing. Finally, the Edit view offers an array of metering options, including meter source (record, playback, and bus), meter type (Peak, RMS, or Peak + RMS metering), and meter alignment (horizontal or vertical).

The Edit view features a "smart" cursor that changes function based on its location. At the center of a clip, the cursor becomes a pointer for selection or grabbing. Move the cursor over a clip-envelope line or node, and the cursor changes to a crosshair for operating on the envelope instead of the clip. At the center edge of a clip, the cursor takes the shape of a small box and will expand or reduce the size of your clip (unless your clip is a Groove Clip, which is explained in the next section). A cursor at the top edge of a clip becomes a triangle, indicating that the cursor can draw fades (either fade-ins, fade-outs, or crossfades, depending on whether you are positioned on the right or left edge of the clip).

LOOPER'S DELIGHT

Guitar Tracks Pro 3 has an intuitive Loop Browser (see **Fig. 3**), which can be opened regardless of your current view. GTP3 is fully compatible with any Acidized loop (which Cakewalk calls "Groove Clips"). You can audition your loops directly in the browser. In the Edit view, you can drag them straight onto a track in your project. You can also audition

PRODUCT SUMMARY

Cakewalk
Guitar Tracks Pro 3
digital audio sequencer
$209

FEATURES	3.0
EASE OF USE	4.5
DOCUMENTATION	4.0
VALUE	4.0

RATING PRODUCTS FROM 1 TO 5

PROS: Intuitive layout. Full-featured mixing console. Plug-in delay compensation. Great loop browser. Useful effects. Control surface integration.

CONS: Mix and Edit screens can't be opened in separate windows. Key commands not editable. Mute function can't be automated from Mix view. Mixer channel strips can't be resized. PC-only.

Manufacturer
Cakewalk
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FIG. 3: The Loop Browser allows you to audition Acidized Groove Clips and drag them directly into the Edit window of your project.

loops while the project plays back.

Loops will always play at the current project tempo, regardless of the loop's original tempo. Once on your track, you can repeat (loop) the Groove Clip by dragging it from its center edge. This is a wonderfully intuitive way of looping—I wish that Cakewalk allowed non–Groove Clips to be repeated in this fashion. I also wish that for multiple monitor setups, you could open either the Mix or the Edit view as a floating window.

ROCK ON

Guitar Tracks Pro 3 is simple, powerful, and intuitive. Its well-organized layout keeps window switching to a minimum, and its feature set is streamlined and well implemented. The program is rock solid—it never crashed on me during a month of use. If you want a user-friendly yet capable PC application to record band rehearsals, live gigs, or a bed of loops, look seriously at Cakewalk's affordable Guitar Tracks Pro 3 application.

Orren Merton *is the author of* Logic 6 Power *(Muska & Lipman, 2003) and* GarageBand Ignite *(Muska & Lipman, 2004).*

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CLAVIA

NORD MODULAR G2 (MAC/WIN)

Software-based patching in a hardware synth with real knobs.

By Jim Aikin

Clavia's Nord Modular, introduced in 1997, was a revolutionary concept: a DSP-configurable modular synthesizer in a compact hardware box. A computer was required for programming, but the hardware had a two-octave keyboard and assignable knobs for live performance. At the time, the only comparable product was Symbolic Sound's Kyma system, which had more audio-processing power but cost more and lacked a keyboard and knobs.

In the intervening years, computer-based modular synthesis has made great strides. The advantage of software-only modulars such as Native Instruments Reaktor is that when you buy a new computer with a faster CPU, your existing synth will acquire more polyphony. The chip speed of Clavia's new Nord Modular G2 version 1.10 can't be bumped up, but there are other factors to consider: the advantage of the G2 lies in its well-designed hardware interface, which includes hands-on controls and integrated audio I/O. Once you've used a computer to create your patches, you can take the G2 to a gig and leave the computer at home.

The G2 is a significant advance over the original Nord Modular. In fact, Clavia prefers to look at it as an entirely new product. The hardware package is far more playable as a musical instrument. Although many modules and the basic design of the software interface are the same as before, new types of software modules have been added. Strangely, a few of the more interesting oscillator and filter modules found in version 3.0 of the earlier OS have vanished. According to Clavia, the DSP has been entirely reworked. Patches created in the original Nord Modular are not forward-compatible with the new hardware unit, which is bound to disappoint owners of the earlier instrument who would like to upgrade. They'll have to reprogram their favorite user-created patches from the ground up.

THE RED BOX

Except for the arrangement of knobs and buttons on the panel, the G2 looks a lot like Clavia's other keyboards, sporting a bright red case and the terrific spring-loaded pitch bender first introduced on the Nord Lead (see **Fig. 1**). If you have never used the Nord Pitchstick, you are in for a treat: player-controlled vibrato, which is all but impossible on most synths due to the center detent in their pitch-bending hardware, is both easy to use and expressive. The standard G2 provides a three-octave Velocity- and Aftertouch-sensing keyboard with full-size unweighted keys.

The G2X is functionally identical but has a five-octave semiweighted keyboard. It also offers double the processing power of the G2, as the optional voice-expansion board is built-in. For those who want the sound power but don't need the knobs, the G2 Engine, a 1U rackmount module with no panel functionality at all, is also available.

The keyboard model's front panel has five 2-line-by-16-character green LCDs. One of these displays system information, patch names, and so on. The other four are arrayed above the row of eight definable knobs and show the current knob function and the data value. The knobs rotate freely, and each has a concentric 16-segment LED, which gives you some extra visual feedback on the current position of the knob. Below each knob is a button that can be assigned separately.

Are eight knobs enough? Not to worry. Thanks to an ingenious arrangement of buttons in an L-shaped array at the right end of the panel, you have nearly instant access to any of 15 different knob "banks." In reality, then, the G2 has a generous 120 definable knobs. Part of creating your own patches is manually assigning the knobs to parameters with which you intend to interact, one parameter at a time.

Just above the keyboard is a row of eight Variation buttons, which are used to store variations on the current patch. Variations are like sound programs in a conventional synth in that all of the Variations share the underlying structure of modules and connections that define the patch. If the patch has defined front-panel knobs, you can easily create new Variations and then store the patch (including its variations) without having the computer hooked up. However, reconfiguring the patch itself from the front panel is not possible.

The rear panel is well set up. In addition to the connections you'd expect (four audio outs, MIDI In/Out/Thru, a headphone out, and sustain footswitch

FIG. 1: Clavia's new Nord Modular G2 expands on its predecessors by offering more horsepower and new modules. The system is available in several configurations, including three- and five-octave keyboards and a rack unit.

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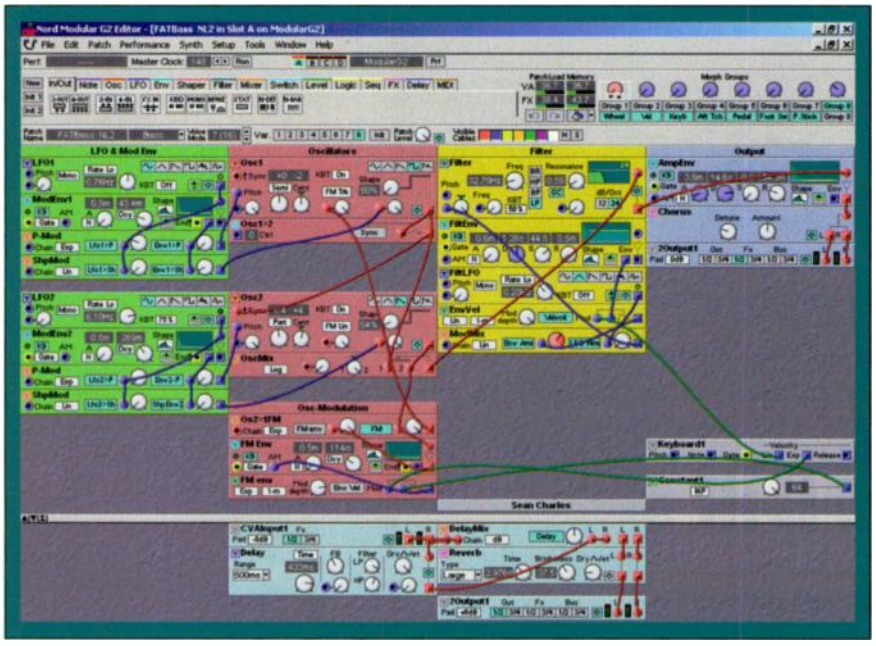

FIG. 2: Shown above is the FATBass NL2 factory patch, viewed in the Nord Modular G2 Editor software. User-selectable colors make the various module sections easier to see. FATBass, which has two oscillators, one filter, three LFOs, and five envelopes, can produce up to seven notes of polyphony.

and sweep-pedal inputs), it has four audio inputs for processing external signals and a mic-level XLR input with a front-panel trim pot and three-LED metering. A USB connector for computer interfacing completes the picture.

The G2 contains 6 MB of patch memory. How many patches and performances you'll have room for, however, depends entirely on the complexity of the patches. According to Clavia, the average patch requires only 3 KB, but complex patches naturally take up more memory. Patches and performances are organized into banks of 128 objects each. There's a theoretical limit of 32 banks of patches and 8 banks of performances, but you'll probably run out of memory before that limit is reached.

PERFORMANCE DEBUT

The G2 is four-part multitimbral, so up to four independent patches can be active at once in a performance, either in keyboard split/layer zones or on separate MIDI channels. Several differences between G2 performances and the multi mode on a typical synth are worth noting. First, each G2 patch will normally have its own effects, though it's possible to use global audio buses to send signals from one slot to another. Second, the G2's performance memory contains all of the actual data for each patch, not just pointers to the single-mode patches. Thus you can freely edit the patches in your performances without worrying about destroying other sounds. Although there's some potential for confusion here, these are excellent features.

Unlike combi/multi/setup definitions in many workstation synths, the performances in the G2 are minimal. In particular, they don't contain information on MIDI channel assignments, audio-output routing, Velocity zones, or even pitch transposition and output volume. Those factors are all handled by reprogramming the patches within the performance as needed. Because the patch data is unique to the performance rather than being a pointer to data stored in patch memory, that is not, for the most part, a problem. However, the MIDI channel assignments for the four slots are found in global (system) mode—that is an inconvenience, as you may want to use different performances over MIDI in different ways. Having to change the channel assignments manually each time you switch to a different musical task is an unnecessary extra step.

Nord Modular G2 Specifications

Synthesis Types	modeled analog, additive, FM, plucked-string
Module Types	In/Out, Note, Osc, LFO, Random, Env, Shaper, Filter, Mixer, Switch, Level, Logic, Seq, FX, Delay, MIDI
Editor System Requirements	PC: Pentium II/500 MHz, 128 MB RAM, Windows 98SE/2000/XP, USB 1.1 Mac: Mac G3/400 MHz, 128 MB RAM, OS X 10.2
Analog Inputs	(4) ¼" unbalanced line-level (-10dBV), (1) XLR mic-level in with adjustable trim
Analog Outputs	(4) ¼" unbalanced line-level (-10dBV), (1) ¼" stereo headphone
MIDI Connectors	(1) In, (1) Out, (1) Thru
Computer Interfacing	USB
Program Memory	6 MB, up to 32 banks of 128 patches each, up to 8 banks of 128 performances each (actual number depends on patch complexity), (8) Variations per patch
Keyboard	37-note unweighted, Velocity- and Pressure-sensitive
Polyphony	patch-dependent
Multitimbral Parts	4
Controllers	(8) knobs with 15 assignments each, (8) buttons, spring-loaded Pitchstick, left-hand wheel
Pedal Inputs	(1) sweep pedal, (1) switch (polarity switchable)
Dimensions	26" (W) × 3¾" (H) × 11" (D)
Weight	11.24 lbs.

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FIG. 3: The DrumSynth module includes a variety of controls and comes with 30 presets.

Using the four slot buttons, the Shift button, and the KB Split button, it's possible to change the combination of active patches while playing the keyboard. You can even switch from one keyboard-assigned patch to another without experiencing any audible glitches, provided that both patches are preloaded. If KB Split is active, one of four green LEDs directly above the keyboard will glow to show the split point. In this situation, the patches in slots A and B will be assigned to the left side of the split, and the patches in slots C and D will be assigned to the right side. The split point can be assigned to only one of the four fixed positions using the front-panel buttons, but the keyboard zones are fully programmable in the Editor software.

The big disappointment with the G2 is its limited polyphony. When I loaded four different factory patches (FATBass NL2, YetAnotherOrgan, Bells, and NordSynth) into the four slots, I found that each of them was reduced to monophonic operation. When I deactivated the other three slots, YetAnotherOrgan was capable of 6-note polyphony, whereas NordSynth by itself could generate ten simultaneous notes. Examining the NordSynth patch, I found a standard lineup of analog-type modules: two oscillators, three LFOs, five envelopes (three of them simple AD types), and a filter, as well as delay, reverb, and chorus effects. The G2 could clearly use more polyphony.

In all fairness, though, the shortage of polyphony may not be a huge drawback, depending on your musical needs. For many modular-type sounds, two or three notes at a time will fill the speakers with convoluted sheets of sound. It may be best not to think of the G2 as a multitimbral workstation. Like other musical instruments, it has unique strengths and limitations. If you need more voices, you can add Clavia's G2 voice-expansion card, which doubles the DSP and retails for only $450.

ROLL YOUR OWN

The concepts behind creating your own patches in the G2 are easy to grasp. The software interface is designed to look a lot like a hardware modular system, in which modules are connected—using the mouse, in this case—by patch cords (see **Fig. 2**). Gaining mastery over the system will take a little time, however, because of the sheer number of modules available, the number of possible connections among them, and the assortment of multiposition switches found in many of the modules.

Individual modules can be dragged into the main work area from the multitabbed "parts-box" interface at the top of the window. It contains lots of modules, and they're grouped into convenient categories: In/Out, Osc, LFO, Random (just released as of this writing), Env, Shaper, Filter, Mixer, Seq, FX, MIDI, and so on. Some categories have only five or six modules, while others have upwards of a dozen. In the oscillator group, for instance, you can choose any of four basic types (OscA through OscD), a phase-modulation oscillator, two oscillators with dynamic waveshaping, a dual oscillator, a Karplus-Strong plucked-string model, an analog percussion-tone source, a fancier DrumSynth oscillator, a noise source, and a master-tuning reference source.

A patch has two work areas: one for modules such as filters and oscillators, which need to be provided separately in each voice, and one for patch-common modules such as effects. The effects area has its own input module, which has two stereo buses, so it's possible to route signals to the effects in many different ways.

Each module has a slightly (or radically) different array of features, and each can use a different amount of DSP. The amount can also vary depending on the positions of various switches in the module. If you choose an OscA or an OscD and set it to produce a sine wave, you'll be using only 1.8 percent of the available DSP (as indicated on a display in the upper part of the screen). The Shape A oscillator, on the other hand, uses 11.8 percent. To maximize polyphony, it's important to choose the least "expensive" module type needed for a given sound. Note that the percentages shown in the display refer to the amount of DSP used within one of the four available slots. If you are playing in single mode, you will have four slots available, so a patch that shows a 20 percent load will be able to play 20 voices (five per slot).

The software functions as a basic librarian: using menu commands, you can upload or download both single patches and performances and entire banks. However, there's no librarian "housekeeping" page with which to rearrange the patches in banks. To do that, you'll need to upload patches one at a time into a bank in the synth and then download your new bank to the computer for disk storage. The Patch Browser in the Tools menu provides a quick way to look at lists of patches in the G2 and on your hard drive and to load patches from the list, but it lacks copy utilities.

The Editor allows you to assign colors to individual modules or groups of modules, which helps to make the organization of a patch visually clearer. Six different cable colors are provided, and cables of selected colors can be hidden to reduce visual clutter. Other visual amenities include blinking LED indicators in some modules—such as LFOs and envelope generators—and

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small envelope-shaped graphics (which can't be edited with the mouse).

The computer's arrow keys can be

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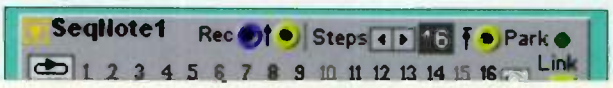


GARRITAN

GARRITAN PERSONAL ORCHESTRA (MAC/WIN)

An affordable symphonic sample library.

By Rob Schrock

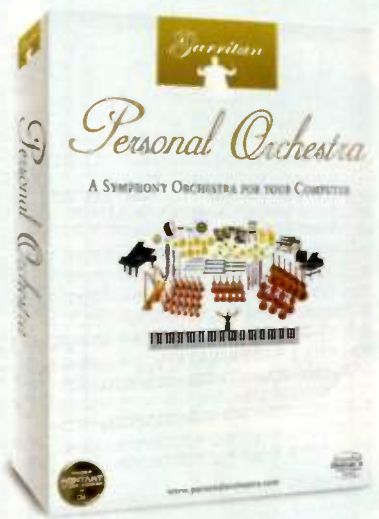
The Garritan *Personal Orchestra* (GPO) packs nearly every instrument of a symphony orchestra into a highly efficient sample library. It uses the Native Instruments Kontakt player, which runs under Mac OS X and Windows as a standalone application or as a VST, DXi, RTAS, and AU plug-in (see **Fig. 1**). Through innovative sound design, up to 64 detailed instruments can run simultaneously on today's average computer, bringing full-orchestra realization to the masses at an extremely affordable price.

BORN OF INNOVATION

Most brass sample libraries provide you with a sample of a three-trumpet ensemble playing the same note, as well as a single "solo" trumpet. Neither of these is satisfactory for reproducing authentic ensemble orchestration. Playing a three-note chord with the ensemble sample results in the timbre of nine players. Using three instances of the same solo-trumpet patch to form a chord sounds unnatural because all three notes have the same character, which makes triads sound like an organ or a kazoo. Playing three notes in unison with the solo patch results in terrible phasing and sounds even worse. This basic principle applies to all of the brass and woodwind instruments in the orchestra: trombones, clarinets, flutes, and so on.

The solution, in that example, is to have three separate trumpet "performers," each a unique set of samples based on different players and instruments, just like in the real world. This method requires more samples, but it allows complete flexibility for orchestrating authentic-sounding chords, doublings, and unisons without the nasty artifacts. The subtle variations of the players cause chords to sound richer and more realistic.

Garritan has created a complete symphonic sample library based on this very principle. Moving in the opposite direction of the huge Garritan *Orchestral Strings* library, the entire GPO library fits into 2 GB and runs completely in RAM (1 GB is recommended).



The Garritan *Personal Orchestra* is a 2 GB library of orchestral samples that uses Native Instrument's Kontakt player as its host. A variety of historic and modern instruments are included in the set.

THE DESIGN

GPO is designed primarily for orchestrators creating detailed mockups and for students learning proper orchestration. When used with the bundled GPO Studio, it's ideal for use with notation programs such as Finale, Sibelius, and Overture because the individual instruments (or players) can be assigned to individual staves or instrument layers within the notation program. This results in much better playback quality than using a computer's built-in sound set. It's also easier to use and much less expensive than creating a huge sample library in your favorite soft sampler.

Each instance of the Kontakt player hosts as many as eight individual instruments. GPO Studio is a standalone application that hosts up to eight instances of Kontakt for a total of 64 simultaneous instruments. (In addition, you can load the GPO Kontakt Player into your favorite digital audio workstation as a virtual-instrument plug-in.) The GPO bundle includes GenieSoft's Overture SE notation program, Steinberg Cubasis VST (Win only), and Magnus Jonsson's Ambience Reverb Plug-in.

REAL-TIME CONTROL

GPO provides simple tools that you can apply throughout the library for controlling articulations. Though some new superlibraries use sophisticated, yet often complex, MIDI applications for creating true legato lines (to avoid the problems of slow attacks on every note), GPO uses a simple and obvious controller—the sustain pedal. Each instance of the Kontakt player can be set to use the sustain pedal for normal sustain or to engage Legato mode, which creates smooth connections from note to note. And unlike some libraries, GPO's Legato mode is polyphonic.

The mod wheel controls dynamics and expression, so you use it to crossfade between samples of varied dynamics. Many of the patches have key switching, and you can use notes outside an instrument's range on the keyboard to switch on the fly between effects such as tremolo, trills, and pizzicato strings.

IN THE STACKS

If this library were 10 GB, it's size would be reasonable. But the fact that it covers as many instruments as it does and is merely 2 GB is incredible(check out www.garritan.com/instruments.html for a complete list of the instruments). The number of articulations that each instrument has is very thorough—practically all of the common articulations found in most orchestrations are included.

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GFORCE

IMPOSCAR 1.0.1 (MAC/WIN)

Performance worthy of an Oscar.

By Peter Freeman

Some very convincing analog-synth emulations have been created, but until recently nobody had attempted to capture the sonic territory of the Oxford Synthesizer Company's OSCar. It was a quirky, utterly unique instrument that could sound like any synth from a PPG to a Minimoog or something totally unidentifiable, depending on how it was programmed. The OSCar's combination of additive synthesis capability, digital oscillators, dual analog filters, and somewhat bizarre aesthetics made for a unique user experience.

On hearing about the GForce impOSCar virtual instrument, I was intrigued by the prospect of multiple OSCars running concurrently with conveniences like computer control, LFOs locked to host tempo, full MIDI control, and polyphony. (The original OSCar was a 2-voice instrument. Designer Chris Huggett built one polyphonic unit with eight OSCar cards for eight voices near the end of the company's life. The prototype was later dismantled for parts.)

RECREATION STATION

I installed the impOSCar on two Macs, a dual 1 GHz G4 running OS 9.2.2, and a 1.25 GHz G4 PowerBook running OS X (version10.3.4). I ran the VSTi version on the desktop machine and the Audio Units version on the PowerBook. (I also installed the impOSCar as a VST instrument on my 2 GHz Pentium 4 desktop PC and verified that it worked. This review, however, is based on the program's performance on the two Macs.) I tried the impOSCar in two hosts, Emagic Logic Pro 6 and Plogue Bidule, a freeware, cross-platform VST/VSTi host.

Visually, the impOSCar is a mostly faithful re-creation of the distinctive black rubber and cream metal surface of the OSCar. The software version features two oscillators; two multimode filters; up to 16-voice polyphony; the ability to create additive synthesis waveforms; a monophonic, duophonic, or polyphonic arpeggiator; an LFO with six waveshapes; and an effects section with programmable chorus and delay. The delay (along with the impOSCar's LFO and arpeggiator) can be synced to host tempo.

The most obvious difference between the work surfaces of the impOSCar and its predecessor is the addition of graphic icons above the Osc 1 and Osc 2 Waveform, LFO Waveshape, and Filter Type controls. These help greatly when programming the instrument, because the control labels are fairly tiny on the somewhat small front panel graphic, which is not resizable.

When you first load the impOSCar into your host, its panel comes up without a visible keyboard. The Edit Mode knob determines whether or not the keyboard is visible directly below the control panel, whether the Harmonic Editor is displayed (in place of the Pitch Bend and Mod wheels), and if so, whether that display shows User Waveform 1 or 2. The knob also offers a fifth choice called CC, which causes numerical labels to appear above every knob on the impOSCar's panel. These are freely editable, and determine the MIDI Continuous Controller to which each knob will respond.

Minimum System Requirements

impOSCar 1.0.1

MAC: G4; 64 MB RAM; Mac OS 9 or OS X 10.1

PC: Pentium II; 64 MB RAM; Windows 98 SE, 2000, ME, or XP

IN HARMONY

One of the OSCar's coolest features was its onboard additive synthesis capability. In short, you could build your own digital waveforms by adding up to 24 harmonics at various amplitudes. You could store these in the OSCar's internal RAM, and freely assign any of them to either Osc 1 or 2. However, when creating the waveforms you were flying blind. No LCD or computer interface was available to show you the current harmonic structure—there was only a tiny row of five LEDs, which didn't make for an intuitive experience.

With the impOSCar, the Harmonic Editor shows the relative amplitude of the 24 harmonics. You can conveniently edit each by simply dragging the mouse over the row of LEDs corresponding to the harmonic you want to edit (see **Fig. 1**). You can create any number of waveforms, which are saved as .hrm files and can be exchanged, along with the .sup setup file, with other impOSCar users.

The impOSCar also includes more filter modes than the OSCar. You can select LoPass 24db, BandPass 24db, HiPass 24db, LoPass 2 pole, BandPass 2 pole, HiPass 2 pole, LoPass//HiPass, LoPass//BandPass, or BandPass//HiPass. (The last three are parallel configurations of

FIG. 1: The impOSCar's main screen with keyboard and Harmonic Editor display at bottom left.

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Muted Staccato
Muted Flutter Tones
Rips
Sforzando
Mute Sforzando
Stopped Horns
Horns Bells Up
Trombone Slides
Trombone Pedal Tones
Effects

Instruments:

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1st & 2nd chair French Horn Section
1st through 4th chair French Horn Section

Trumpets
Solo Melodic Trumpet
1st chair Trumpet
2nd & 3rd chair Trumpet Section
1st through 3rd chair Trumpet Section

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1st & 2nd chair Tenor Trombones
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$179.95	
FEATURES	4.5
EASE OF USE	4.5

tional filter modes, this control takes on even more programming power. I had a lot of fun discovering the effect of the Separation knob on the new filter modes, and a number of interesting new patches were the result.

I created a dual-oscillator patch with a shimmer effect and changing tone using a short, percussive amplitude envelope on the original. That is a powerful tool for creating shifting, animated sounds.

SOUND TO SOUND

I A/B'd the impOSCar's sound with the OSCar's using the original factory patches. I also re-created some of my user waveforms from the OSCar manually on the impOSCar to see if I could

key and Velocity zones, as is commonly done in sample players. The limitation to eight key zones seemed a little stingy to me at first. When I realized, however, that this is not multisampling, in which a single sample doesn't transpose well over large ranges, but is rather a form of crossfade synthesis, I found it quite a powerful feature.

MORPH OR LESS

Like analysis-resynthesis, morphing among different voices is not a new technique, but again, Cameleon's implementation ventures off the beaten path. The Morph space consists of a square, the corners of which represent different voices (see Fig. 2). By default, a single white dot represents the morph position relative to the four presets, and you can move the dot around with the mouse to achieve different morphings.

Behind the scenes, moving the white dot is actually morphing among the amplitude envelopes, harmonic spectra, and noise envelopes of the four presets.

FIG. 2: The corners of Morph Square represent Cameleon's four voices. The dot-and-line graphic within the square represents the morphing pattern among the four voices. The Morph Timeline at the top shows the horizontal (Morph X) or vertical (Morph Y) morphing pattern over time.

In Cameleon, you can choose to morph those characteristics separately, in which

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FIG. 3: Cameleon's Effects panel offers standard distortion, chorus, stereo delay, and reverb as well as multiband and formant filtering. The formant filter's spectrum is controlled with a breakpoint display (top) offering as many as 128 breakpoints.

case the white-dot color separates into green, red, and blue dots representing the individual characteristics. You can, for example, choose the amplitude envelope from one voice, the harmonic spectrum from another, and the noise envelope from a third. And you can assign different MIDI controllers to each dimension of each characteristic, giving you what amounts to six-dimension, real-time control of the morphing process.

Morphing can also be automated directly in Cameleon using breakpoint envelopes on what is called the Morph Timeline. Separate Timeline envelopes control morphing in the horizontal and vertical dimensions of the square. Morphing automation is available only for combined (white-dot) morphing, but that is quite powerful in itself. A good collection of morph-automation presets is provided, and morphing can be randomized separately from the rest of the parameters.

Cameleon's randomization options are extensive. Clicking the Random button at the top right of the control panel, just under the preset selector, randomly selects presets for each of the voices of the Morph Square. Usually the presets are selected from the currently active preset category, but occasionally a preset from another category will be selected, and in that case, the preset's parameters will be adjusted in a way appropriate for the active category. For example, if you've selected the Basses category then click the Random button, you will either get a bass preset for each voice or a nonbass preset adjusted to bass characteristics. The Random button also randomizes the settings on the Morph, Easy, and Effects panels. (The settings on those panels can also be randomized individually.) The result is that you always get a useful sound in the desired category. **Web Clip 2** is a three-part example made totally from random presets.

JUST FOR EFFECT

Cameleon's Effects panel includes the obligatory complement of effects—distortion, chorus, stereo delay, and reverb—as well as a resonant multimode filter and a formant filter (see **Fig. 3**). It might seem odd to have the filters in the effects section, but remember this is additive synthesis, and filters are not part of the basic voice structure.

With the exception of the formant filter, the effects are basic, with three or four controls each. Distortion has

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MUSICIANS FIRST

harmonic distortion, tube-emulating overdrive, bass enhancement, and a simple compressor. The stereo delay has separate delay times for the left and right channels, but the delays are always synced to tempo. Randomization applies to all effects parameters including whether the effect is on or off. Randomizing does not currently affect the formant filter, but that is planned for a future release.

The formant filter is the most interesting Cameleon effect and comes with 15 presets to get you started. Like the envelopes, you set up the formant filter by creating and moving breakpoints, with the horizontal position indicating frequency and the vertical position controlling cut or boost. Also like the envelopes, you can have as many as 128 breakpoints. The frequency range is 20 Hz to 20 kHz. You can shift the entire filter spectrum up or down in frequency using MIDI or one of Cameleon's built-in modulators.

Cameleon's Mod panel allows you to map eight modulation sources to eight targets, with individual range settings for each mapping. Sources have two LFOs and a breakpoint envelope as well as most MIDI messages, with note number and Velocity. Modulation targets have the individual Morph Square dimensions and most effects parameters. You can also use Cameleon's MIDI Learn function to directly assign any MIDI controller to any knob, button, or numerical control.

The LFOs are rather basic, with sine, saw, and square waveforms and, like the delay times, must always be synced to tempo. The LFO rate ranges from eight measures to one eighth note. The breakpoint envelope is a welcome addition. Its routing is somewhat limited, but includes most of Cameleon's morphing and filter parameters.

Cameleon's Easy panel is used for global settings such as maximum number of voices and maximum number of harmonics (useful for saving CPU), output mix of the harmonic and noise-based components of the sound, a dedicated LFO for vibrato and tremolo, and a dedicated output-amplitude envelope. The envelope has a Loop button, which turns on looping for the harmonic and noise components of each of Cameleon's four voices. It also features a useful Stretch control for stretching or shrinking the harmonic and noise breakpoint envelopes of each voice.

Cameleon takes an interesting approach to additive synthesis, and its ability to analyze and resynthesize audio or graphics files as well as to morph among four voices greatly increases its reach. With all that flexibility, it's almost a no-brainer to come up with original sounds. Finally, the extensive preset library and the well-written manual help make this complex synth quickly accessible. Whether additive synthesis appeals to you or not, you owe it to yourself to download the demo from Camel Audio's Web site, www.camelaudio.com, to try it out. EM WEB CLIPS

Len Sasso *is an associate editor of* EM. *He can be contacted through his Web site at www.swiftkick.com.*

PRODUCT SUMMARY

Camel Audio
Cameleon 1.3 (Mac/Win)
analysis-resynthesis additive synthesizer plug-in
$199

FEATURES	4.0
EASE OF USE	3.0
QUALITY OF SOUNDS	4.5
VALUE	3.5

RATING PRODUCTS FROM 1 TO 5

PROS: Excellent and unusual sounding. Extensive preset library and randomization options. Morphing and analysis-resynthesis greatly expand sound palette.

CONS: LFOs and delay times always synced to tempo. Breakpoint editing can be touchy.

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Web: www.camelaudio.com

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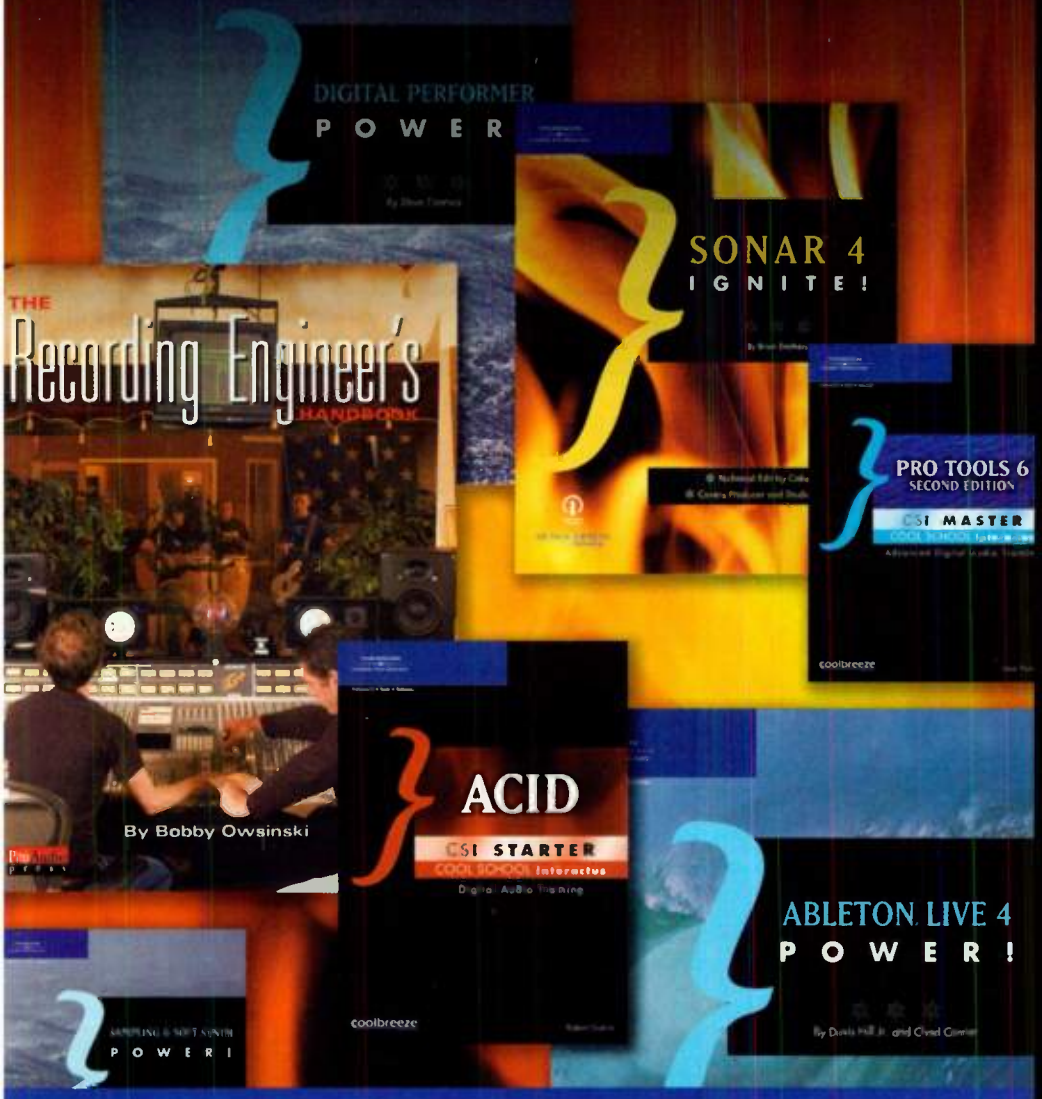

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Quick Picks

ROLAND

GR-20

By Marty Cutler

The GR-20 ($695) is Roland's most recent contribution to guitar synthesis. Housed in a compact floor unit, it offers a strong enticement for guitarists to jump into the MIDI pool. The package includes everything but the guitar: a GK-3 divided pickup; a 13-pin cable; and the GR-20, which serves as MIDI converter, sound source, and foot controller. The front panel's three areas are for patch selection, setup and programming, and the pedals. The Bank knob quickly selects from ten preset and one user bank. Scroll with the Value knob to change the Patch number shown in the display.

Pick and Choose

On the front panel, color coding indicates the function of two rows of buttons. The upper buttons deal with global parameters such as output level, pickup-switch functions, patch mapping, and MIDI channel. The lower buttons edit Patch-specific parameters such as filter cutoff and resonance, transposition, and Play Feel, which gives you six preset Velocity curves to suit your playing style. Below the buttons are knobs controlling attack and release rates, chorus depth, delay or reverb depth, and overall Patch level. Patches contain additional effects such as distortion, tremolo, and overdrive, but those parameters are not accessible. You can store edits to any of the 99 user locations.

The Value knob, pedal, and display functions change depending on the current task. For example, selecting the GK Sens button lets you adjust the GR-20's sensitivity relative to the pickup's output. Consequently, the display indicates the string and its sensitivity level. The Expression pedal can be set to control volume, pitch bend, filter, or effects levels. Buttons to the left of the expression pedal activate the tuner; select the pedal's function, hold functions, and glide type; write edits to user memory; and exit Edit mode. Likewise, the Glide and Hold pedals have contextual functions. Pressing both simultaneously engages tuning, or you can use the pedal to enter parameter values, thus avoiding the need to squat when you want to make adjustments. You can also use the GK-3's two switches to edit parameter values or Patches.

The rear panel sports MIDI In and Out ports, a power switch, a transformer-in-the-middle power connection, and a jack to connect the 13-pin cable from the pickup. Left and right outputs, an output for the guitar signal only, and a pair of Mix-In jacks for outboard processors are on unbalanced ¼-inch jacks. The left output accommodates stereo headphones. You also get a strain-relief power-cable hook and a slot for a security lock.

Batches of Patches

For any controller with a built-in sound source, the quality of the onboard sounds is paramount—kudos to Roland's sound-design team. Most of the sounds are extremely playable, and quite a few standouts grace the sound set. I usually avoid sampled saxophone patches, but Moody Sax is imbued with a delayed, natural-sounding vibrato. You have enough time to play realistic legato lines and faster passages before the onset of vibrato, which fades in naturally for lengthier notes. Pads are lush and animated. Not surprisingly, the least effective sounds are the acoustic guitars, many of which suffer from grainy-sounding decay stages. Electric guitars fare better, and the electric sitar is quite nice. Although it seems a tad quaint that the GR-20 provides "vintage" guitar-synth tones, old-school guitar synthesists should be pleased. I had tremendous fun with splits that had sampled loops in the lower strings and an instrument voice in the upper strings; engaging the Hold pedal lets you play over the loops.

The GR-20's 48-note polyphonic synth tracks very smoothly. When controlling an external device, tracking is a bit slower, but it's still faster and more accurate than the GR-20's recent siblings. If you play cleanly, so will the GR-20. Because pitch

The Roland GR-20 guitar synthesizer is a complete package for MIDI guitarists, providing a synth module, a pickup, and even a cable—everything you need except the guitar.

bends are fixed at 24 semitones, you have to set your synth to match that range. A menu offering preset bend ranges (like the GI-10 has) would be welcome. Although the instrument supports 6-channel transmission (in Mono Mode), the synth is not multitimbral, so plan on another sound source or two for sequencing.

The GK-3 pickup design adapts to guitars with differing bridge shapes and string spacing. Its inclusion helps make the purchase of the GR-20 easier if you're undecided about guitar synthesis.

The GR-20 excels as a live adjunct to a guitar rig. As a sequencing tool, it is slightly hampered by being monotimbral and by its inflexible pitch-bend range. Nonetheless, its convenience, simplicity, and playability, as well as its high-quality sounds and entry-level price, should appeal to novices and professionals alike.

Vanguard's control panel keeps everything up front. Only the LFOs share the same controls.

Overall EM Rating (1 through 5): 4

Roland Corporation U.S.

Web: www.rolandus.com

REFX

Vanguard 1.04 (Mac/Win)

By Len Sasso

Vanguard ($89.99) is the latest creation from reFX software-instrument wizard Michael Kleps, author of the classic plug-ins Slayer2, Beast, PlastiCZ, and quadraSID. Although Vanguard is a synth plug-in that emulates vintage analog synthesizers, its complement of filter types and oscillator waveforms extends beyond traditional designs. Vanguard ships with three factory preset banks (384 presets) that illustrate a broad cross-section of its capabilities, and it is easy to go beyond those because programming Vanguard is a snap.

Vanguard is a VST instrument for Windows, Mac OS 9, and Mac OS X. In addition, it is reFX's first Audio Units (AU) plug-in for Mac OS X. You can download a time-limited demo from the the company's Web site.

Path of Least Resistance

Vanguard's signal path starts with three oscillators, which can be relatively tuned in semitones and detuned with a Fat control. Unlike vintage gear, Vanguard offers 31 waveforms ranging from sine, sawtooth, and pulse to a variety of digital waveforms that have several flavors of noise.

Modulation options are available for several waveforms. The PWM (pulse-width modulation) settings of the LFOs and envelope generators control modulation depth, even when pulse width isn't the parameter being modulated. Examples include morphing between sawtooth and triangle waveforms, applying frequency and amplitude modulation to a sine waveform, and randomizing the pitch of a sine waveform (called R2D2).

The oscillators are followed by a filter section featuring 13 different filter types. Lowpass, bandpass, highpass, and notch are available with varying roll-offs. The filter complement is rounded out with a formant filter and several combination filters: dual bandpass, notch with lowpass, and bandpass with waveshaping. All filters are resonant and have separate controls for key and velocity tracking. There's nothing startling here, but plenty to add shape and contour to Vanguard's ample selection of waveforms.

The signal path ends with feedback-delay and reverb effects you can turn off to save CPU cycles. An output amplifier offers guitar-overdrive emulation and a Spread knob, which determines how far notes alternate between the right and left stereo channels, ping-pong style. The delay effect has four modes: Mono, Stereo, Cross (ping-pong), and Widen. Widen, which delays the left channel relative to the right for a fattening effect, is particularly useful. All delay times are set in tempo-synced note divisions, except in Widen mode, in which the delay time is set in milliseconds.

Vanguard has three triangle-wave LFOs and two ADSR envelope generators. Each LFO targets the pitch and modulation of its like-numbered oscillator. Interestingly, each LFO can also target filter cutoff, creating complex modulation patterns when different LFO speeds are combined. Nonetheless, it's a bit confining to be limited to a single LFO waveform with only the oscillators and filter cutoff as destinations. Both envelope generators can control filter cutoff and pulse width, again offering interesting complex patterns. The first envelope can also modulate level and detuning, whereas the second can modulate resonance and pitch. A third multistage envelope generator would be a nice addition, especially in a typical analog-style setup, in which one envelope is used for level and the other for filter cutoff.

Vanguard's two other modulators, Trancegate and Arp, more than make up for its LFO and envelope shortcomings. Transgate is a 16-step gate effect with controls for mixing the gated and ungated signal and for controlling the gate's attack

and decay times. The gate step size is set in note divisions, and turning on adjacent steps results in longer gates—very handy when you're using Trancegate with the arpeggiator. The arpeggiator (Arp) offers the standard modes: up, down, alternating, original order, and random. Speed and note duration are set in note divisions, and the arpeggio can be extended to four octaves. Using Arp and Trancegate together with greater arpeggio speed than gate step size can produce extended pitch and rhythm sequences (see **Web Clip 1**).

In Simple Terms

Vanguard's charm is that it does what it does—producing classic synth sounds—very well and very simply. The oscillators and filters sound great, and you can begin building your own sounds or tweaking the generous collection of factory presets in minutes. The control panel is clearly laid out; the three LFOs share Speed, Detune, PWM, and Cutoff knobs, but otherwise, all the controls are always accessible. The effects add icing to the cake, and Vanguard is CPU efficient. If you are looking for a vintage synth emulation, the price is right, and Vanguard is definitely worth checking out. EM WEB CLIPS

Overall EM Rating (1 through 5): 4

reFX

email: info@refx.net

Web: www.refx.net

IRIVER

H120 Multi-Codec Jukebox

By Rudy Trubitt

An EM reader introduced me to the iRiver H120 ($399.99) as a potential field recorder. This little MP3 player looked very interesting because of its large internal hard drive, optical digital inputs and outputs, and ability to record 16-bit, 44.1 kHz uncompressed WAV files.

The unit offers USB 2.0 I/O and is extremely fast. For example, I transferred a 30-minute stereo recording (16-bit, 44.1 kHz) in about a minute from the H120 to my PC. None of my Macs have USB 2.0, but I was able to read and write to the unit from my iBook and older G4 desktop at the slower USB 1.0 speed. (Although Mac users will not be able to perform an MP3 library genre/cataloging function available to Windows users, they retain full read/write access to the unit.)

The iRiver H120 is an MP3 player that can record 16-bit, 44.1 kHz uncompressed WAV files.

The H120's battery life is quite good and the wired remote is superior, allowing full control of all playback and recording functionality. Operation is relatively straightforward, although the user interface relies on short or long clicks to access entirely different functions from the same buttons. I also love the H120's compact size.

Details, Details

Although there is plenty to like about the H120 as a jukebox, there are some issues that make this device difficult to recommend for serious field recording. Less critically, there is about a 5- to 8-second delay when starting and stopping a recording, during which the unit performs some sort of internal hard-drive housekeeping. Additionally, there is no input level control for analog mic or line inputs, nor is there any record level metering. Instead, an automatic gain control (AGC) circuit is always engaged, which varies the record level to avoid clipping. While I prefer to set my own levels, I must admit that this AGC works better than most. It is relatively unobtrusive, and it did not yield the annoying pumping/breathing of the noise floor that I normally associate with AGC front ends.

I wasn't overly concerned with the peculiarities of the analog input section, because I planned to use the digital audio input. Connecting a Denecke AD-20 Inbox, an external mic pre and A/D converter, to the unit allowed me to bypass the AGC and set the levels manually. With this professional-grade front end, I made very nice recordings using an assortment of mics.

A Drop in Time

The main problem with the H120 revealed itself more slowly. I noticed occasional low-level clicks in my recordings. Having heard stories of similar products "dropping samples," I decided to put the H120 through a test. Using BIAS Peak, I created a stereo test file with a visible "ruler" in the left channel, using a tiny tick every 10 samples, a medium-size click every 100 samples, and a loud pop every 1,000 samples. Next I put a 400 Hz sine wave onto the empty right channel. To check for dropped samples, I played this test file through the optical out of an M-Audio FW410 interface, and recorded it into the optical digital input of the H120.

Playing the file from the H120 revealed occasional loud clicks in the sine wave. I transferred the test recording to my Windows-based computer using USB 2.0 and used the left-channel ruler track to measure exactly what was happening: every one minute and 20 seconds, the H120 dropped

Resource.

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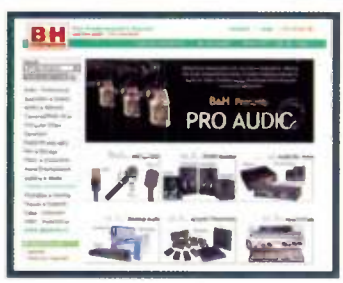

about 45 consecutive samples. Depending on the program content at that instant, one might or might not hear a click. But I'm not prepared to take that chance with music or with my sound-effects recording work.

Mixed Media

After field-testing the H120 (with firmware revision 1.17), however, my opinion was decidedly mixed. On the plus side, it does record uncompressed 16-bit, 44.1 kHz PCM WAV files, as well as compressed MP3 files. And its generous 20 GB internal hard drive leaves plenty of room for your recordings, session files, or whatever else you want to store.

While acknowledging the problem, iRiver points out that the H120 isn't designed for professional work. But that's not the standard I'm holding them to. Rather, I compare this $400 device with a $200 MiniDisc (MD) recorder, another consumer device with an optical input. I've never seen an MD that regularly dropped samples, let alone 45 in a row.

If iRiver were to correct the sample-dropping problem—the device does allow user-installable firmware upgrades—I'd happily recommend the H120. Until then, I'll continue my search for the next generation of small, portable recorders.

Overall EM Rating (1 through 5): 1.5
iRiver America
tel.: (800) 399-1799 or (408) 635-8000
email: estore@iriveramerica.com
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ZERO-G

Morphology (Mac/Win)

By David Rubin

Zero-G's *Morphology* ($219.95) offers desktop musicians a trip through the rabbit hole into a colorful world of surreal soundscapes and unusual sonic sensations. Recorded and developed by independent composer, performer, and analog-synthesis guru Ian Boddy, *Morphology*'s 3 GB library is packed with exotic, continuously evolving pads, ambient textures, and atmospheric backgrounds. The collection also includes an array of simple analog waveforms for recreating some of the signature sounds of the '70s.

EM ★★★★★ hot pick

In Front

Morphology uses Native Instruments' ubiquitous Kompakt Instrument as a dedicated front end, which allows you to play the library as a standalone instrument or as a plug-in for systems that support VST 2.0, DXi, RTAS, and Audio Units. *Morphology*'s hundreds of patches range in size from less than 2 MB to more than 48 MB and make good use of Kompakt's many parameters, with six types of filters, three AHDSR envelopes, four LFOs, and three effects (chorus, reverb, and delay). If you already have Native Instruments' more advanced Kontakt sampler, you can also use it with *Morphology* to gain additional parameters.

Except for the basic waveforms, all of the patches have the Mod wheel assigned to a specific function, providing

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Grand Prize Winner, 2003 West IMWS

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Zero-G's *Morphology* virtual instrument offers a huge collection of complex analog-style pads and ambient textures that evolve over time.

Except for the basic waveforms, all of the patches have the Mod wheel assigned to a specific function, providing real-time control over the sound. For example, in "Crunchy Static," the Mod wheel changes the filter cutoff. In "Eerie Fog World," it changes the LFO amount, and in "Ambient Feedback," it adjusts the delay effect.

Most of the patches have been programmed for 32-note polyphony, and if you like your soundscapes really dense, you can load as many as eight patches into a Multi. That's a great way to fatten up a sound, especially with the basic analog synth samples. Another option is to layer two patches and set up the Mod wheel to crossfade between them. (You'll have to reassign the Mod wheel from the original settings.) Most of the pads and textures already evolve over time, and fading between different patches can add an interesting twist to the "morphology" concept.

Modern Morph

Morphology's 24-bit, 44.1 kHz patches are organized into eight broad categories: Atmospheres, Drones, FX, Harmonic Loops, Industrial, Pads & Synths, Virtual Synth, and Voices. Each of the main categories is further divided into folders that attempt to group similar types of sounds. (These appear as cascading menus in Kompakt.) For example, the Atmospheres category has folders called Arpeggiations, Bells, Cosmic, Eerie, Scary, Sci-Fi, and Surreal. Each of the folders has from 5 to 30 patches that are more-or-less related, although many of the sounds truly defy categorization.

With names like Aqueous Flutter Bells, Murky Grunge Drone, Fog Bound Free Tonal, Waves of Nastiness, Pitch Splitter, Garbled Radio, and Alien Temple, it is easy to see that this library does not lend itself to simple descriptions. In fact, the hardest thing about using *Morphology* is trying to predict what a patch will sound like before you load it. To his credit, Boddy has done an admirable job of organizing this disparate collection of sounds, and the nicely designed and helpful PDF patch list is well worth printing out. Still, using *Morphology* is largely a matter of trial and error, which can be as time-consuming as it is entertaining.

Aural Awakening

It's difficult to capture in a short review the range of sonic colors that *Morphology* offers. Some of the patches evoke creepy jungle settings; others evoke resonant urban environments. Some patches pulse with rhythmic energy; others are calm and ethereal. One patch sounds like wind-swept plains from a distant galaxy; another combines noise with echo effects to create ray-gun blasts and mad-science theatrics.

Morphology's Harmonic Loops section is loaded with gentle liquid fantasy sounds contributed by Markus Reuter. These sounds and many others throughout the library have a distinctly musical quality and usually list an original key or harmonic center. Others are more like gourmet blends of exotic noise. The virtual synth section provides simple patches based on six waveforms: triangle, sawtooth, triangular-sawtooth, square, wide-rectangular, and narrow rectangular. These sounds were sampled, looped, and laid out at minor third intervals across the keyboard.

From raspy and raunchy to celestial and serene, this library covers a lot of ground. With its excellent audio quality and its stunning timbral combinations, *Morphology* is a unique tool that highlights the creative potential waiting to be discovered in the world of analog and digital synthesis.

Overall EM Rating (1 through 5): 5
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SONIC IMPLANTS

Symphonic Brass Collection (Giga)

By David Rubin

Although *Symphonic Brass Collection* ($995) works just fine as a standalone library, it was clearly intended to complement Sonic Implants' popular *Symphonic String Collection*. Producer Jennifer Hruska used the same ace recording team and used the same stereo mic setup in the same front-of-hall position at Sonic Temple Studio. The nicely packaged library installs from three DVDs and requires more than 11 GB of hard-disk space.

Top Brass

The collection consists of five sections: Trumpets, Trombones, French Horns, Tuba, and Ensembles. As the name suggests, this library is designed primarily for standard orchestral composing and film scoring rather than for big-band jazz, pop, or marching band, although it might serve well in those styles depending on the arrangement. For example, the trumpet has presets with a Straight mute but none with a Cup or Harmon mute. The Ensembles section combines patches from the other sections into ready-made keyboard layouts, which is handy for working on quick sketches.

All of the instruments include legato, marcato, staccato, and sforzando presets as well as muted (Straight mute) variants. Most of the presets have multiple Velocity layers (typically from two to four), and some of the short articulations have alternate takes for greater variety. Separate release samples appear throughout the library. Presets without release samples are also included if you want to add your own reverb, or if you just need to conserve on polyphony.

The instruments are presented with varying numbers of players, allowing you to combine them into larger groups as needed. The trumpets and trombones have solo patches along with two- and three-player unison

patches. The C- and E-flat tubas are provided only in solo patches, but the French Horns offer solo patches and two-, four-, and six-instrument options. Other articulations have Flutter Tongue (except Tuba), Falls (Trumpet and Trombone), Glissandos (Horns and Trombones), and Rips (Trombone and Tuba). Several patches in each section let you crossfade between Velocity layers or switch between multisamples with the Mod wheel. Only a few patches use keyswitching.

Polished Brass

Symphonic Brass Collection has a rich orchestral sound with a nicely controlled natural reverb that is spacious without being cavernous. Careful editing has added to the overall quality, and the performances are all top-notch.

The solo trumpet is clear and powerful with a fine presence. As with the other instruments in this library (especially the horns), it has a surprisingly wide dynamic range; you can easily jump from a peaceful pianissimo to a wall-crumbling stentorian blast. In its middle range, the trumpet offers an evocative orchestral sound perfect for Aaron Copland-style solos. For a more sentimental sound, a separate Solo Melodic Trumpet patch with vibrato is offered. Unlike with the trombones, trumpet flutter-tongue and fall articulations are offered only for three-player unisons and only with mutes; a solo muted trumpet is not included.

Along with the French Horn sections and the trombones, the solo and unison trumpets have a number of natural-sounding double-tongue patches. Unfortunately, the library has no easy way to put them to good use. Without an auxiliary applet that automatically alternates between samples, GigaStudio 160 users are left to their own devices. Surprisingly, the library lacks a simple keyswitching patch that would let you manually switch between attacks. (According to Sonic Implants, new keyswitching and auto-alternate programs are planned for a future update, which should be available by the time you read this review.)

The French horns are first rate with a lofty, robust orchestral sound. Separate two- and four-horn unisons were recorded and layered to create the majestic six-horn patches. A Mod-wheel-programmed Sforzando patch lets you crescendo smoothly from the sforzando tail.

Several Bells Up patches deliver an exciting open-brass sound that Sonic Implants also uses as the top layer in its splendid five-layer unison patches; they're among the high points in the library. Also noteworthy are the expressive Solo Horn patches. I was pleased to discover that the library has several fine stopped-horn patches for the two- and four-player unisons, but was disappointed that there are no solo stopped-horn patches. The solo horn also lacks flutter-tongue, double-tongue, and glissando options.

The well-rounded trombone section has two tenor trombones and a bass trombone (mislabeled as baritone). The one-, two-, and three-player patches have open and muted falls, rips, and sforzandos along with the legato and staccato presets. The bass trombone has lots of bite, especially in the bottom octave, and the section patches offer a good range of expressiveness.

Brass Tacks

In spite of a few shortcomings, *Symphonic Brass Collection* offers a wealth of excellent presets. Its playability and great sound quality make it one of the best of the GigaStudio brass libraries and a valuable tool for desktop orchestrators.

Following in the footsteps of its *Symphonic String Collection*, Sonic Implants has released *Symphonic Brass Collection*, offering high-quality trumpet, trombone, French Horn, and tuba samples.

Overall EM Rating (1 through 5): 4

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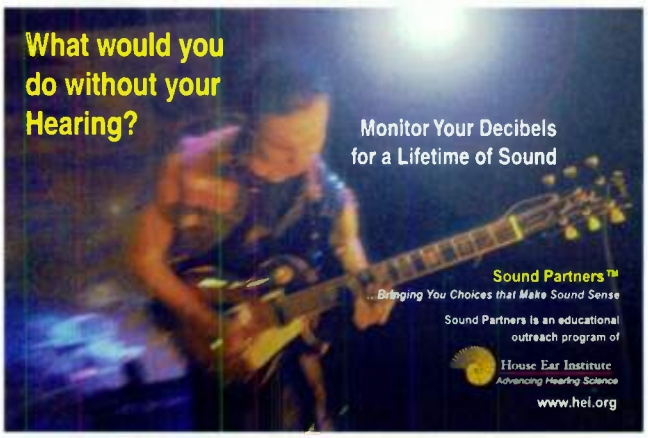

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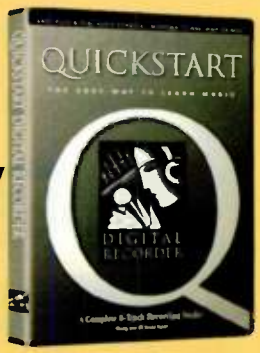

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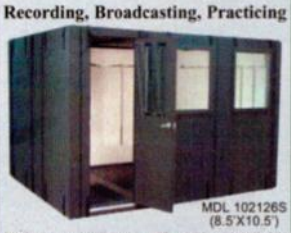

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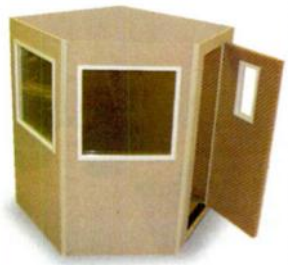

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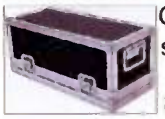
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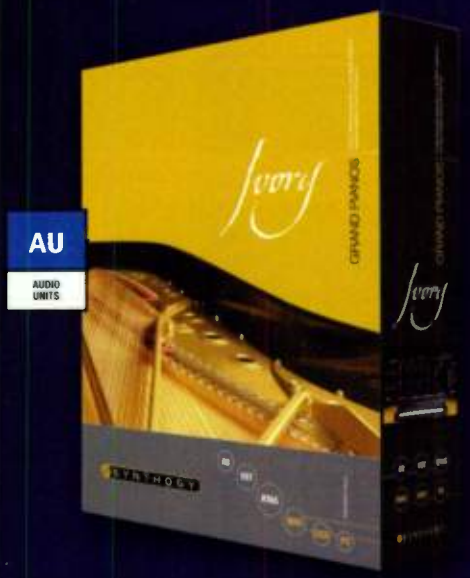

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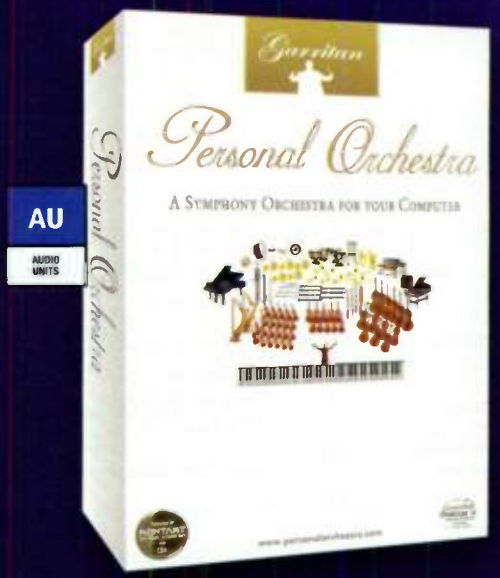

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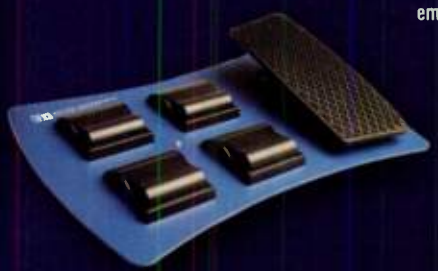

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By Larry the O

Shoring the Foundation

Nothing is perfect, least of all software. That's a fact of life over which we software users have very little control. As a practical matter, software developers cannot make their products perfect. They can, however, make decisions regarding which imperfections are addressed. The most fundamental imperfections are usually the absence of a significant feature or an awkward, incomplete, or flawed implementation.

Updates of digital audio workstations and other large programs tend to be focused heavily on adding new features. But these additions are frequently implemented in order to catch up with the competition's latest "hot" items or to take the lead with some cool new idea, rather than filling in missing functionality. Meanwhile, many older, fundamental features often retain the flaws that they have had for years. That is presumably because developers feel they make more money by selling the latest bells and whistles than by fixing existing features.

Some advances are obviously good and important; in my opinion, though, the No. 1 priority for serious users is to have robust and efficient implementations of the features they use every day. While new features may introduce new capabilities, adding a new feature should take priority over improving an old one only if the new feature obviates the need for the old or if the program previously had no feature for executing a basic task.

My own frustration with a program whose implementation continually presents obstacles to the simple execution of essential tasks has sometimes driven me to jump ship and use another program, despite the resulting learning curve and data-migration issues. In fact, I have participated in software migrations of an entire production department that were caused by the developer's inattention to the implementation of essential features. When customers depart from using a particular program, the developer loses money, not to mention prestige. Even when a problem is not severe enough to cause migration, the product's inability to easily execute crucial operations can create such a bad reputation that a developer can be dogged for many years.

It is easy to understand why making a program sexier is more attractive to a developer than throwing further resources at a feature that already "works." But that reasoning is nonetheless flawed. It is similar to the reluctance of some businesses to invest in infrastructure because it produces no direct profit. The impact of such attitudes is often indirect, making the problems difficult to see until a crisis develops. Fuel is added to the fire when users are more tempted by "sweet candy" features than "nutritious vegetable" ones. Too often, end users realize only after buying a product's upgrade that the product can meet their crucial needs only with great difficulty, if at all.

Whether we are full-time production professionals, part-timers, or hobbyists, our interests are not served when basic aspects of our tools are left for years in an unfinished state, while new, less critical features are added by the boatload—frequently also in an unfinished state. Paid updates are not objectionable when they add real value.

On occasion, a developer does the right thing, such as when Mark of the Unicorn moved the track-addition commands in Digital Performer from contextual menus to global menus and greatly expanded keyboard shortcut capabilities. I noticed, enjoyed, profited from, and heartily applauded this change, which helps me in my daily work. On the other hand, Digital Performer's implementation of markers continues to exhibit several severe flaws that have existed for as long as I have used the program, and that have slowed my pace almost every time I've used it.

I encourage developers to reevaluate their priorities and consider that customers are most loyal when their greatest needs are well met, rather than when the shiniest bauble is proffered. In turn, end users have a responsibility to chew the ears off of developers about improvements to things that really matter, instead of simply accepting and working around flakiness and clumsy implementations of important features.

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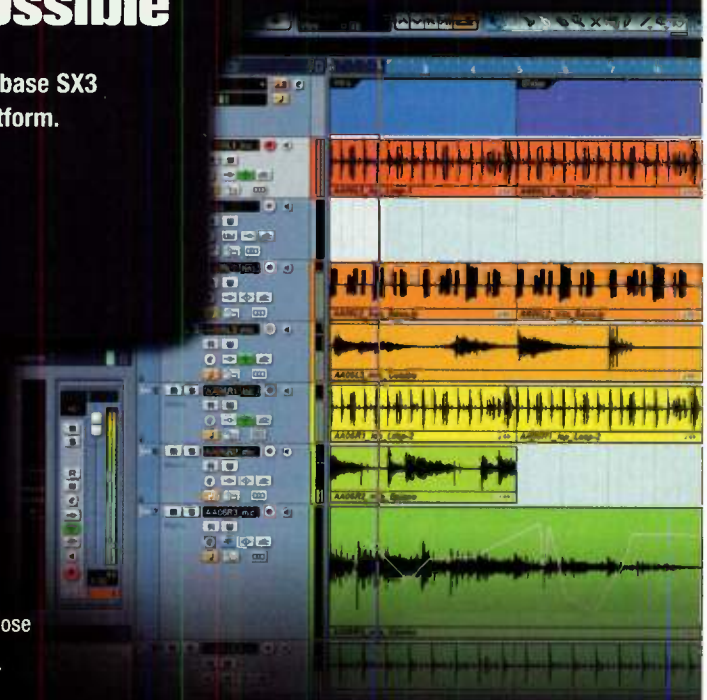

Want to add loops of different tempos to your music? SX3's new Audio Warp feature lets you twist and stretch audio any way you want. Have friends who like working on a different OS than you do? No problem, SX3 is the only cross platform DAW on the market. So whether you choose XP, OS X or both, SX3 is right there with you. Want to add outboard gear into your virtual environment? SX3's new features for integrating external hardware—including FX return channels, advanced latency compensation and Studio Connections Recall—lets you decide what external studio gear you use and how.

Cubase SX3 features the same 32-bit VST 2.3 audio engine as Nuendo 3.0, so it's not only fully VST and 5.1 surround sound compatible, it sets a new standard for audio quality.

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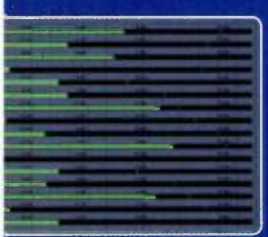
INSTANT INFO

Tracktion follows your every move with its Properties Panel. Click on an audio clip and see its fade-out curve; click on a MIDI clip and quantise away; click on a reverb plug-in filter and fine-tune the pre-delay. The relevant info is always at your fingertips.



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QuickTime

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use 64-bit math when mixing tracks

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If you enjoy clicking through layers of windows to create music, then Tracktion software is definitely not for you. It won't pretend to be a mixing console... It doesn't have cute 3D racks or patch cables... It doesn't contain a single instrument icon.

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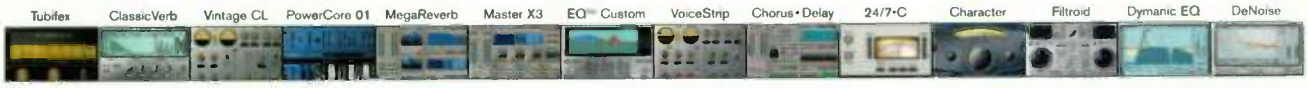

* Via the VST to RTAS adapter from FXpansion (optional)

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eBay has changed the way that individuals conduct business. Musicians especially have a lot to gain from learning the ins and outs of eBay's brand of personal e-commerce. EM's resident eBay expert offers advice and strategies for buying and selling your gear online. By Geary Yelton

48 BUILD A DESKTOP STUDIO ON ANY BUDGET

Given a limited budget with which to assemble a computer-based studio, which products would you choose? Five EM editors met this challenge, specifying the hardware and software they'd buy if they were creating Mac- and PC-based studios at three different price levels, ranging from $5,000 to $25,000. By the EM Staff

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Join former EM associate editor Brian Knave for an inside look at a challenging recording session in Salvador de Bahia, Brazil. The project: an album release by Brazilian percussionist and recording star Márcio Victor. By Brian Knave

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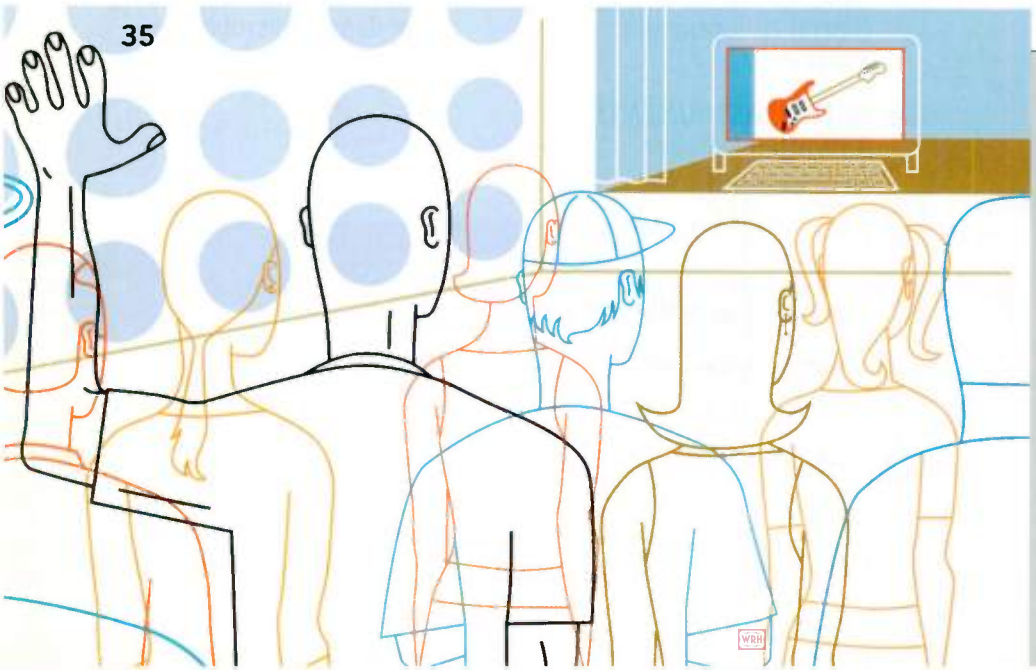

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INDIVIDUALITY

Little Things That Matter

In this month's cover story, "Build A Desktop Studio on Any Budget" (p. 48), we expended a lot of ink discussing which products we would buy if we were putting together or retooling our PC- and Mac-based studios. If you follow our lead but take into consideration your specific studio needs and goals, you can build a terrific rig. But there are many computer-related considerations that we didn't discuss in the story. You already know most of them, but based on the reader emails we receive, some of you tend to overlook them. So I'm going to do you a favor and remind you!

For starters, if you can afford to dedicate a computer to studio applications, do it. A friend of mine has long dedicated a computer to his DAW and plug-ins. Other than the operating system and music-production tools, there is no other software on the machine, which is why it's speedy, reliable, and never crashes. I'd add backup software and a Web browser for downloading and registering updates, but my friend rarely updates his software, since his current system does the job.

We've written before about installing a stripped-down version of OS X (see "Tracking the Big Cats" in the September 2004 issue), and many preconfigured, Windows-based music computers are based on optimized versions of XP. These modifications, if properly done, increase system stability and optimize your system for music production, but you need to know the OS pretty well to pull it off.

JULIE BIRUM

Some of us can't afford more than one computer, and many of us lack the confidence and knowledge to optimize the OS. But we can disable applications that process in the background and periodically interrupt the CPU, such as antivirus and fax software, software firewalls, and some specialized utilities. If you disable firewall and antivirus software, you should physically disconnect your computer from the Internet (especially with broadband connections), and then reenable the security products if you go online to download updates or register new software.

If you are using Mac OS X, avoid Classic; it adds to your CPU load and potentially detracts from stability. I recently replaced my last pre–OS X app on both of my computers, and good riddance.

Back up your files daily to a local hard drive for immediate use, and to DVD-R+W or a portable hard drive that you can store off-site or in a fireproof box. Backup programs such as Dantz Retrospect create compressed archives or a set of duplicate files, but the latter slowly overwrites the entire backup set. I prefer file synchronization that creates uncompressed, immediately usable copies and overwrites only files that have changed. I'm delighted with Econ Technologies' ChronoSync for OS X (www.econtechnologies.com), which is fast, flexible, and meets all of my criteria. I can't make Windows recommendations; I know the OS has backup features, but you might want more. Windows experts should feel free to write us at emeditorial@primediabusiness.com with suggestions.

Enough reminders—we've got a great issue this month, so enjoy!

Steve Oppenheimer
Editor in Chief

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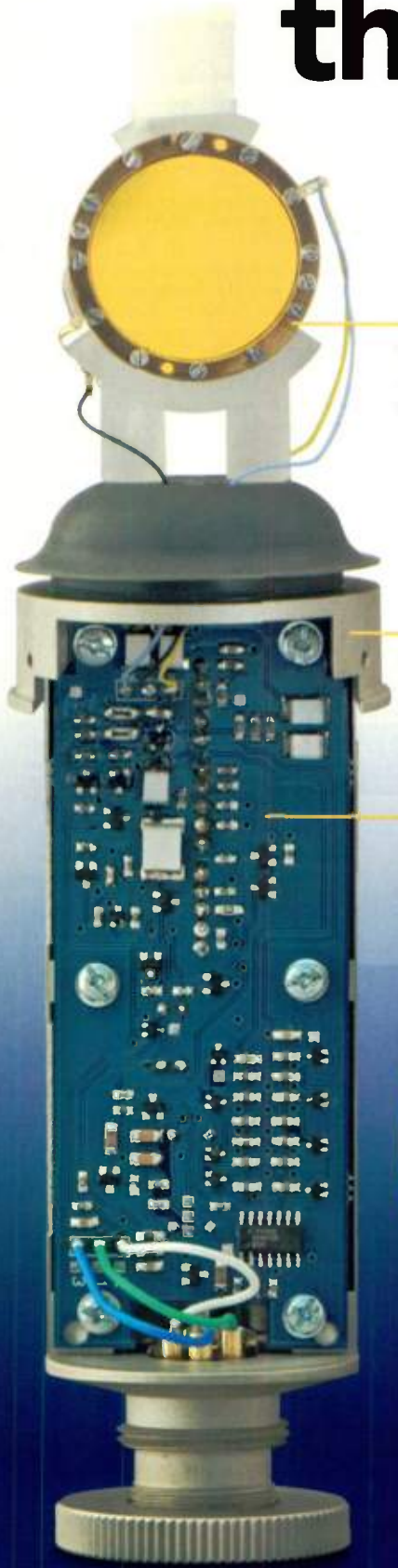
Beauty is more than skin deep.



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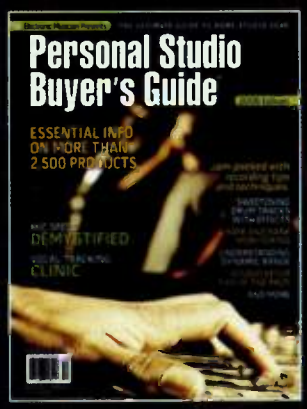

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LAURA WILLIAMS

Letters

Pro Tools Prose

After using Digidesign's Pro Tools LE system for about 95 percent of the music placement in the film *What the Bleep Do We Know*, I wanted to thank Senior Editor Gino Robair for his article about Pro Tools LE 6.7 ("Master Class: Pro Tips for Pro Tools LE," April 2005). Gino's article offers many helpful tips that a person can use daily.

Tim Bomba
via email

Doing Windows

David Rubin's review of Tascam's GigaStudio 3 Orchestra software sampler (see the May 2005 issue) states, "All of the GigaStudio versions support only Windows XP with Service Pack 1." However, I own GigaStudio 3 (GS3), and it runs just fine with Service Pack 2. I think that Mr. Rubin missed the fact that Tascam has released updates that allow GS3 to run with other versions of Windows. After I bought the program, I waited until several bugs had been worked out before I even attempted to install it. And then I installed it on a new system.

I enjoyed the GigaStudio 3 review, and I love your magazine. Every month I find several interesting articles to read.

Gary Smith
via email

Gary—I'm very glad that you enjoyed the review. In order to get some clarification on the Service Pack issue, I spoke with a representative from Tascam. According to Tascam, GS3 works with Windows XP Service Pack 1, and with a little tweaking, you can also use it with Service Pack 2. (The print and online documentation refer only to Service Pack 1.) If you do use Service Pack 2, Tascam recommends turning off any antivirus software and disabling the Service Pack 2 firewall feature in order to avoid problems.

All Service Pack issues aside, you still need to run Windows XP, which, as I pointed out in the review itself, might be a drawback for some users. Tascam also recommends that you upgrade GS3 to the most recent version, which is 3.04 as of this writing.

To obtain more information about working with Windows XP and GS3, you should take a look at Tascam's optimization guide, located at www.tascamgiga.com/TASCAMGigaStudio3XPOptimization.html. —David Rubin

48 kHz Users, Unite!

I have just been informed by Zero-G that the problems that I have been experiencing with my recently purchased Zero-G products (*Sounds of Polynesia* and *The Operating Table*) are a result of the Native Instruments Intakt sample-playback engine's incompatibility with the 48 kHz sampling rate. According to Zero-G, Native Instruments has only recently confirmed to them that this is a known problem, with no fix that is currently available.

Many new sample libraries from various developers incorporate Intakt as their software engines. If you visit user forums discussing Native Instruments products, you will see that 48 kHz issues have been a known problem for at least a year now, which makes Native Instruments' slow response to this problem quite mystifying.

The problem is with Intakt's Beat Machine mode: if your system is set to 48 kHz (which is the preferred delivery format for professional film and television soundtracks), sound libraries that rely on Beat Machine mode will yield glitchy audio and will not loop correctly. It has been reported that

"Quite a few soundtrack composers compose at 48 kHz so that we won't have to convert the sampling rate later."
—*Rob Braynton*

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- **MClass Compressor** – gives your tracks bite and definition
- **MClass Maximizer** – a high-quality loudness maximizer designed to make your Reason tracks sound as loud as you intended them to.

Remote – Thanks to the Remote technology, Reason now integrates even more seamlessly with external MIDI controllers, with full support for motorized faders and control surface displays – right out of the box, no configuration needed. **The Reason 3.0 Sound Bank** – the new sound bank adds a huge selection of multi-sampled instruments as well as fresh synth patches, loops, samples, and combinator patches to Reason's already massive library. **The Reason 3.0 Browser** – surf through Reason's massive soundbank in new intuitive ways; easily locate, audition and organize sounds and patches from all over the library. **Line Mixer 6:2** – 6-channel stereo line mixer for easy sub-mixing. Use with the Combinator or insert anywhere in Reason. **Record automation on multiple tracks.** **Warp speed sample loading.**

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Next Month in EM

Studio in a Box

Portable digital studios offer high-quality recording, effects processing, mixing, and mastering capabilities in small packages.

R STORY

Letters

switching a patch to Global mode and back to Beat Machine will fix the problem. That works sometimes, but I have found that the more reliable fix involves switching the patch to Time Machine mode, although that solution introduces its own problems.

Based on the complaints I've

got from the user forums, there are currently no 48 kHz–related problems with other Native Instruments products. Movie soundtrack composers make up a large share of our user base—Absynth and Kontakt are both staples in the world of soundtrack production—and we are dedicated to

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EMspotlight

Pioneers in Sampling

Decades before the advent of digital sampling, the appropriation of real-world sounds was done with turntables and magnetic tape. In this exclusive interview from the EM archives, Pierre Schaeffer and Pierre Henry discuss their pioneering work in the field of musique concrète. By John Diliberto.

emusician.com/em_spotlight

On the Home Page

EM Web Clips

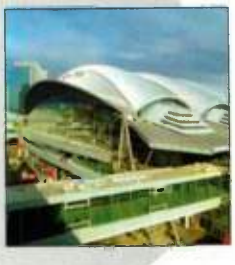
A collection of supplemental audio, video, text, graphics, and MIDI files that provides examples of techniques and products discussed in the pages of *Electronic Musician*.

EM Guides Online

Get detailed specs on thousands of music-production products with our free online Computer Music Product Guide and Personal Studio Buyer's Guide.

Show Report

Frankfurt Musikmesse is the biggest annual musical-instrument expo in Europe. Visit emusician.com for Senior Editor Gino Robair's report on the exciting new recording gear, music software, and electronic musical instruments unveiled at this year's show.



editor's picks

Senior Editor Mike Levine has selected his favorite EM articles about recording electric guitar. The topics include using plug-ins that model amplifiers, and how to get great tone from your tube amp at a low volume.

emusician.com/editorspicks

EM news

A weekly update on new hardware and software releases, manufacturer contests, and pertinent industry news.

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cutting edge environment

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Learn more about SONAR 4's cutting-edge mix environment at **www.sonar4.com/mix**

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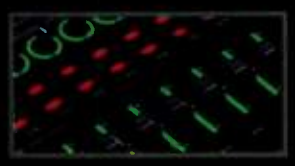

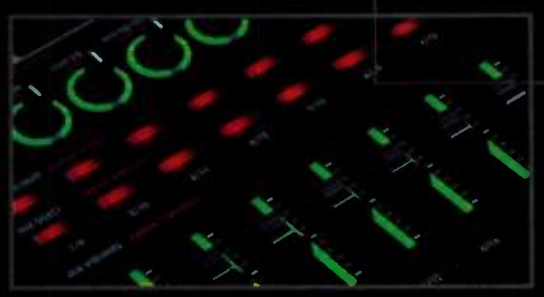

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XT CHAPTER

OASYS

Open Architecture Synthesis Studio

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Experience OASYS today – online at www.korg.com/OASYS and at an exclusive OASYS retailer.

KORG

THE FUTURE IS OPEN

BIAS Peak Pro XT 5

Berkley Integrated Audio Systems (www.bias-inc.com) has gathered together most of its product line in a new bundle called Peak Pro XT 5 (Mac, $1,199). It incorporates the latest version of Peak Pro 5 (Mac, $599; upgrades available) is a major upgrade that greatly enhances Peak's CD mastering functionality. It offers replication-ready CD burning with support for advanced features of the full Red Book specification, including ISRC and PQ subcodes. In addition to a new waveform view that lets you adjust your tracks and crossfades graphically, the Playlist features unlimited undo and redo and the ability to use your keyboard for auditioning and nudging.

BIAS's flagship stereo audio editor with a processing suite comprising SoundSoap, SoundSoap Pro, SuperFreq EQ, and five new plug-ins: GateEx, PitchCraft, Repli-Q, Reveal, and Sqweez.

Peak Pro 5's plug-in-routing window Vbox supports AU as well as VST instruments and effects. BIAS improved many Peak DSP algorithms and added new DSP commands such as Auto-Define Regions and Envelope from Audio. ImpulseVerb lets you control the gain of the source and impulse response. Other enhancements are tape-style scrubbing in Core Audio, automatic track definition, SMPTE HD display, audio file recovery, and lots more.

Several of the suite's plug-ins are based on advanced linear-phase algorithms. Reveal combines seven audio-analysis tools, and PitchCraft gives you advanced pitch-correction and transposition capabilities. Sqweez-3 and -5 are multiband compressor/limiters. RepliQ can flexibly match the EQ profile of a source and apply it to a target signal. GateEx selectively removes signals below a threshold as a downward expander reduces unwanted residual content. SuperFreq 4-, 6-, 8-, and 10-band paragraphic EQ has an improved user interface as well as metering and text-entry features.

Download of the Month

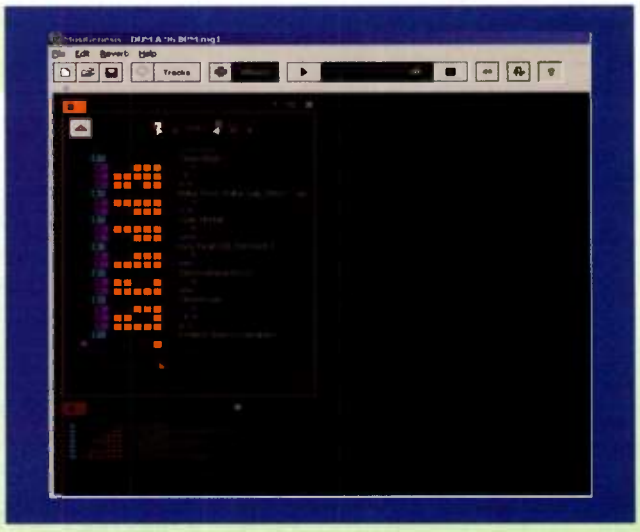
MUSIGENESIS (WIN)

If you've got a PC, stop reading and go get this download. MusiGenesis ($19.95) by Kenneth Adams is an algorithmic music generator that's as much fun as it is easy to use. Will it write your next hit song? Probably not, but it will provide an endless stream of useful ideas.

MusiGenesis operates in two modes: Tracks and Mixes. In Tracks mode, you create tracks that you associate with built-in sampled instruments. The program provides more than 150 tuned instruments and 180 percussion instruments, and you can load your own samples.

Each track can contain as many as eight 16th-note patterns, each of which is from one to four bars long. MusiGenesis automatically creates and adds notes to patterns, giving you the option to reject each change. You can also manually add and remove notes as well as adjust their volume, pan position, and length (for sustaining instruments).

Mixes, as you might guess, are songs composed of patterns. As with tracks, MusiGenesis automatically creates and adds to mixes, allowing you to reject changes and manually modify them as you go. You can have multiple mixes in a project, but naturally, only one plays at a time (see Web Clip 1).



In addition to saving its own project files, MusiGenesis will export your tracks and mixes as audio files in WAV or MP3 format. It will also export your tracks as Standard MIDI Files. That allows you to extend MusiGenesis compositions in your favorite audio and MIDI applications. You can purchase the full version or download a free save- and export-disabled version of MusiGenesis from www.musigenesis.com.

EM WEB CLIPS

—Len Sasso

UNIVERSAL AUDIO

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1176SE	•	•	•
Boss CE-1			
Cambridge EQ		•	•
CS-1 (3 modules)	•	•	•
DreamVerb		•	•
Fairchild 670		•	•
LA-2A		•	•
Neve (8 modules)	•	•	•
Plate 140			•
Precision EQ			•
Precision Limiter			•
Pultec EQP-1A	•	•	•
Pultec Pro			•
RealVerb Pro	•	•	•
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WRH

Camel Audio Multi-Effects

Camel Audio (www.camelaudio.com), makers of the Cameleon 5000 additive synthesizer, is shipping two new VST and Audio Units plug-ins: CamelSpace (Mac/Win, $85) and CamelPhat 3 (Mac/Win, $85). Each is a complex multi-effects processor that includes 128 presets and features an intelligent randomize function for exploring new sounds. Either plug-in lets you use all its effects simultaneously, and you can control any two parameters using a graphical x-y pad. Both are available as a bundle for $149. Visit Camel's Web site to hear audio examples and download demo versions.

CamelSpace is a unique effect that turns any timbre into an evolving rhythmic texture. Its 128-step Trance Gate sequencer can modulate filter depth, cutoff frequency, volume, and panning, with envelope parameters that affect each step. Major features include eight LFO waveshapes, ten resonant filter modes, an enhancer effect, soft saturation, reverb, stereo delay, a full-function flanger, and host synchronization.

CamelPhat 3 is the newest version of a processor designed specifically for guitar, bass, and drums. By combining four distortion modules, three resonant filters, two LFOs, compression, flanging, EQ, and an envelope follower, CamelPhat 3 can add warmth, punch, and presence to your sequencer tracks.

Wusik The Second Wave and Vox'd

Soft-synth developer Wusik (www.wusik.com) is shipping two new VST instruments, The Second Wave (Win, $79.95) and Vox'd (Win, $79.95). Both are sound sets that include WusikEngine, the SSE-optimized software framework that powers the sample-playback synthesizer Wusikstation. Current Wusikstation owners can download either sound set for $39.95.

Like Wusikstation, The Second Wave plays evolving timbres reminiscent of the Korg Wavestation, but with all-new acoustic, electric, and electronic instrumental sounds. Offering one-shot samples and multisamples, The Second Wave supplies 420 MB of original content.

Featuring 96 presets by Tim Conrardy, Vox'd comprises 500 MB of sampled and synthesized voices. It comes with classical solo voices, real choirs, electronic vocalists and choirs, human percussion, vocoder sounds, and vocal atmospheres and effects.

Key Changes

Moog Music is staging the Ether Music 2005 Conference, A Celebration of the Theremin (www.ethermusic2005.com), beginning August 4 in Asheville, North Carolina. The three-day festival will feature keynote speaker Albert Glinsky, panel discussions moderated by Jason Barile, and classes and concerts by renowned thereminists such as Lydia Kavina, Pamelia Kurstin, Barbara Buchholz, and Armen Ra. Most of the events will be held at the Orange Peel, a concert venue that will serve as cosponsor. In addition, Moog Music is accepting applications for a contest in which five original compositions will be selected for presentation. The winners will receive free registration for the conference (normally $395), and one will win $1,000 in cash . . . **Cycling '74** (www.cycling74.com) has lowered the price of its plug-in suite Mode to $99, and it is now available for the Windows OS as well as the Mac OS. In addition, you can download a free subset of Pluggo (currently at version 3.5.1) called Pluggo Junior . . . The Grand 2 is an update to the concert piano plug-in from **Steinberg** (www.steinberg.net). It adds a new sampled piano and greater CPU efficiency. In cooperation with Sony, Steinberg also recently released version 2.1 of the Audio Stream Input Output (ASIO) protocol. It offers support for the Direct Stream Digital (DSD) standard, on which the Super Audio Compact Disc (SACD) format is based . . . To ensure compatibility with Mac OS X 10.4 (Tiger), **Korg** (www.korg.com) has updated the Legacy Collection to version 1.1.4. Registered users can download it for free.

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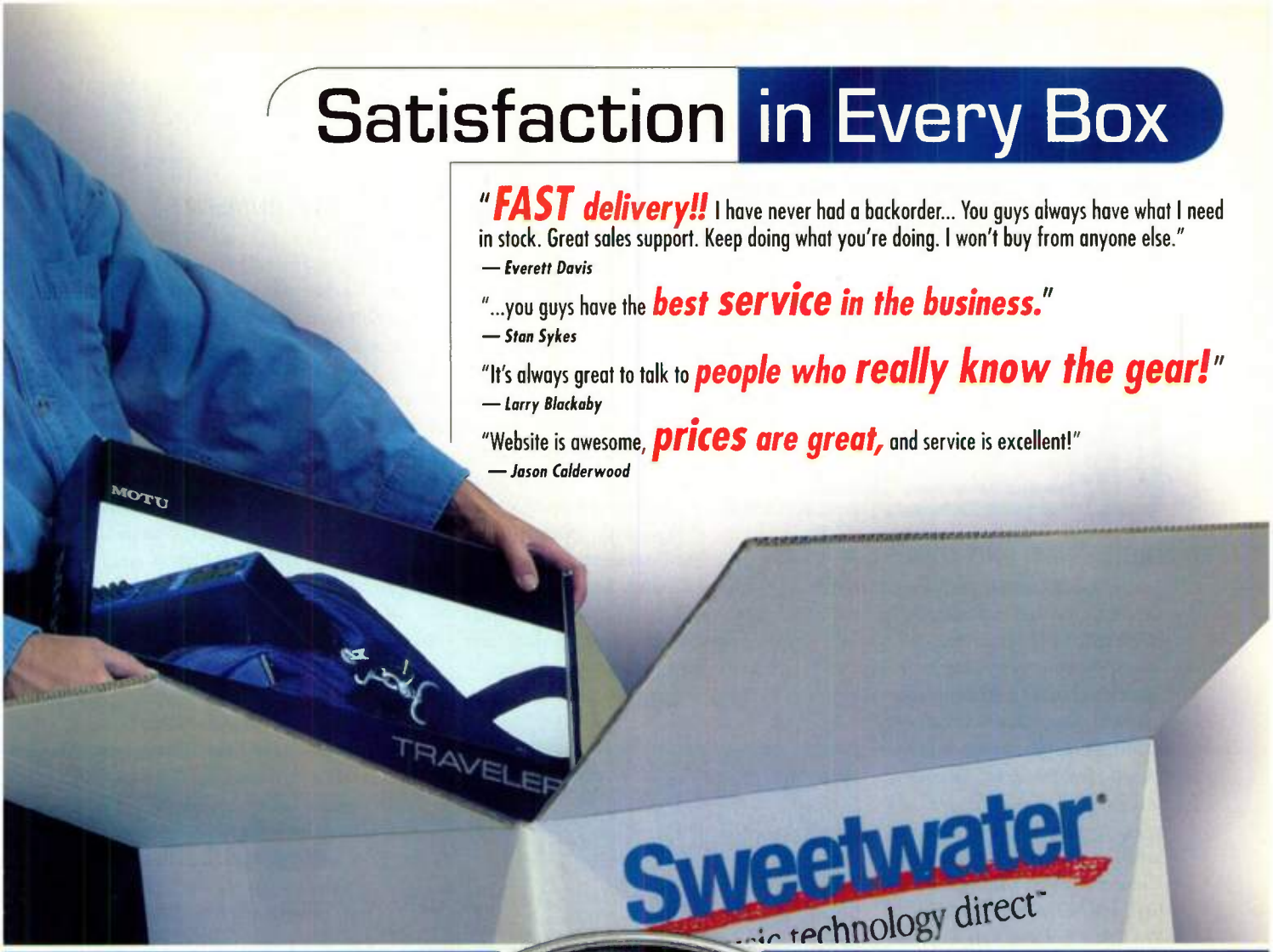

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Rev Up

DIGIDESIGN PRO TOOLS 6.9

Audio hardware and software heavyweight Digidesign (www.Digidesign.com) is shipping Pro Tools 6.9 (Mac/Win), offering numerous enhancements that focus on updated audio mixing and post-production capabilities. It includes EQ III, a high-resolution equalizer plug-in, and the ability to arrange plug-ins by manufacturer and type. It also delivers improved integration with third-party sound libraries and with the DigiDelivery high-speed file-transfer system. Pro Tools 6.9 software is a free upgrade for current owners of Pro Tools TDM 6.4, Pro Tools LE 6.7, and later systems.

For anyone familiar with traditional mixing consoles, the new version introduces features that streamline mixing, such as inline console emulation, new automation capabilities, and AFL/PFL Solo. It adds support for Digidesign's Icon D-Control worksurface and expands support for Avid video peripherals such as the Avid Mojo, Digidesign AVoption | V10, and the companion software Avid Media Station | PT. Combined with integrated mixing controls and better integration with a wider range of file standards, Pro Tools 6.9 is the heart of a well-orchestrated audio-for-video system.

VIRSYN CUBE 2

A new version of the groundbreaking additive soft synth from VirSyn (www.virsyn.com) is available. Cube 2 (Mac/Win, $319) builds on its Editors' Choice Award–winning predecessor by analyzing the spectra of sound and furnishing new and musically useful ways to alter it. An improved spectral analyzer offers numerous algorithms—each optimized for a different type of sound—to reconstruct harmonic, inharmonic, and noise-based timbres. The graphical editor lets you directly manipulate a sound's spectral and spatial structure by drawing in data that affects Cube's synthesis parameters.

Cube's morphing algorithm has been improved, giving you the ability to specify the morph modulation range and turn off the morph envelopes for manual control. Volume envelopes are now independent of the morph envelopes, too. A new residual-noise generator can create evolving noise spectra, resulting in more lifelike sounds. Cube 2 also features a MIDI controller assignment editor, and you can use MIDI Breath and Expression controllers as modulation sources.

An upgrade from the previous version is $99. If you bought a copy in 2005, or if you own all three VirSyn products (Cube, Tera, and Cantor), an upgrade is only $19.

NATIVE INSTRUMENTS REAKTOR 5

Never a company to rest of its accolades, Native Instruments (www.nativeinstruments.de) has unveiled Reaktor 5 (Mac/Win, $579; upgrade, $169). Like previous versions, Reaktor 5 is a modular software environment for building virtual instruments. It comes with hundreds of ready-made soft synths, samplers, drum machines, sequencers, and effects processors. There are more than 20 new instruments, including Skrewell, a soundscape generator; Splitter, a grain sampler; and Aerobic, a drum machine.

Reaktor 5 introduces Reaktor Core Technology, a layer of functionality that enables low-level signal-processing design, offers 64-bit resolution, and incorporates a run-time compiler. A manual about Reaktor Core Technology comes with the program.

In addition, Reaktor 5 has a revised user interface, new voice routing and MIDI capabilities, and an updated macro collection. You can apply skins to all Reaktor modules, customizing the appearance of knobs, buttons, faders, and meters. Create tabbed panel interfaces using the new Micro Stack feature. The extended display functionality lets you create piano-roll and other new sequencer layouts, and configurable Panel Sets optimize workflow. Multistage envelopes feature tempo grids, slope controls, and looping functions. EM

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WRH

NanoRAM

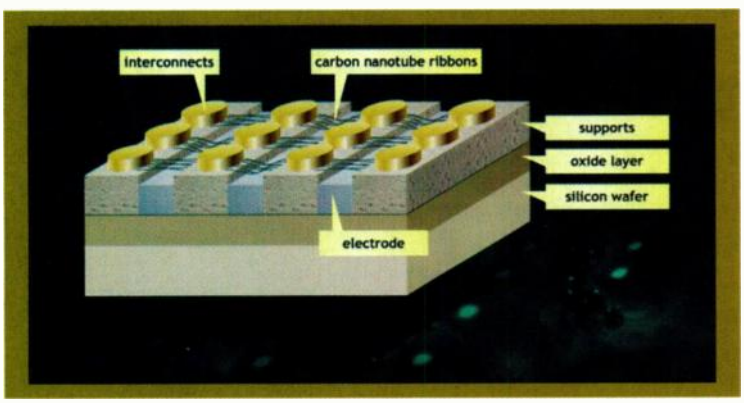
By Scott Wilkinson

Nanotechnology brings new life to RAM.

Storage capacity is critical for electronic musicians; the more, the better. This is particularly true of random access memory (RAM), which is used to hold data being actively processed. As the resolution of digital audio continues to increase, so must the amount of available RAM. But as I've written many times, conventional semiconductor RAM is fast approaching the limits of its capacity, so other approaches must be found if our ever-growing appetite for storage is to be sated.

One solution could come from the field of nanotechnology, which is concerned with constructing the smallest imaginable objects. Among the first such objects to be built were carbon nanotubes—which are cylindrical structures made from hexagonal rings of individual carbon atoms. With a diameter of about 1 nanometer (a billionth of a meter), nanotubes look like rolls of chicken wire, and they exhibit extraordinary strength and electrical properties, making them ideal for a variety of applications.

For example, an unexpected application is a novel form of electromechanical RAM. Originally conceived by Thomas Rueckes, then a graduate student at Harvard University, the new type of RAM is now being developed by a company called Nantero (www.nantero.com), which was founded by Rueckes, Greg Schmergel, and Brent Segal in 2001. The result of their efforts is called nanotube RAM, or NRAM.



COURTESY NANTERO

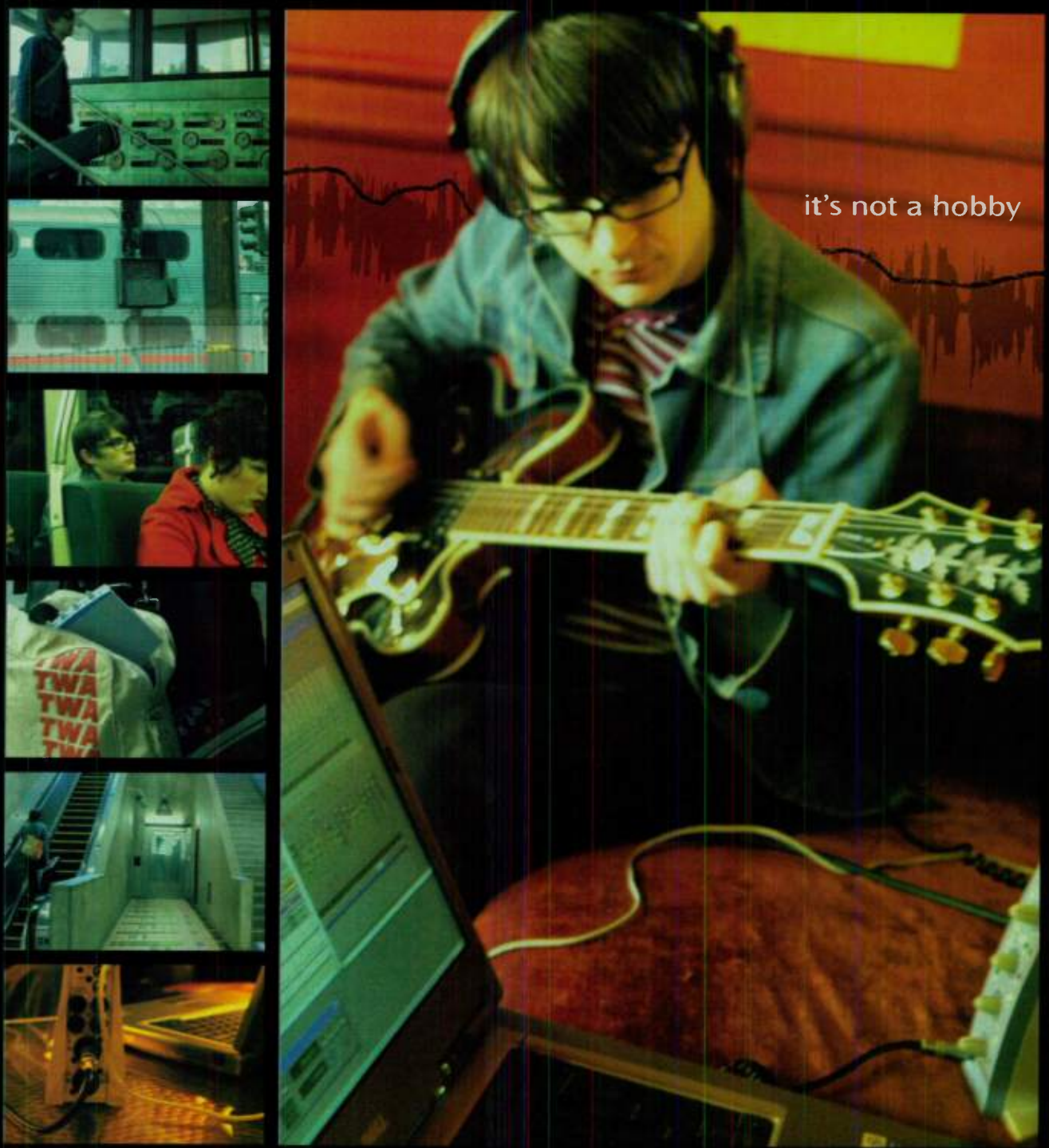
FIG. 1: NRAM stores bits by flexing carbon nanotubes suspended over electrode gaps. If an electrode causes the corresponding nanotubes to sag, that represents a 1; if not, it represents a 0.

The basic idea is that strands of nanotubes are suspended over tiny gaps etched into a semiconductor chip (see **Fig. 1**). The strands are about 13 nm above the floor of the gaps, which are about 130 nm wide. The gaps contain electrodes on top of transistors, which produce electric fields. When a transistor's field is oriented in one way, the nanotubes above it are drawn downward until they touch the electrode. When the field is oriented the other way, the nanotubes remain suspended above the electrode. Those two states represent 1 and 0, respectively, which is highly reminiscent of the mechanical relays in the antique computers that originally inspired Rueckes's idea. Amazingly, the nanotubes stay in position even when the power is removed, allowing them to retain their data like flash memory.

Despite the simplicity of the concept, there were several practical hurdles to surmount. One was the high iron content of commercially available nanotubes. Nantero devoted much of its early work to developing a special filtration process that brought the iron content down to the parts-per-billion range. Then came the challenge of depositing the nanotubes on CMOS (Complementary Metal Oxide Semiconductor) wafers. Gas-vapor deposition requires temperatures that destroy the ancillary circuitry, and a suitable conventional solvent to use in spin coating is too toxic, so Nantero came up with a proprietary, nontoxic spin-coating solvent.

Once those obstacles were overcome, it was time to look for a manufacturing partner. In 2003, LSI Logic agreed to try making NRAM in its Gresham, Oregon, plant, and nine months later, the company had a working prototype. Now the trick is to increase the yield to the point of economic feasibility. LSI wants to use the technology as a replacement for the static RAM embedded in ASICs (Application Specific Integrated Circuits), because NRAM has the potential to be much smaller while consuming less power.

Ultimately, Nantero's goal is to match the speed of static RAM, the data density of dynamic RAM, and the nonvolatility of flash memory. In the short term, the company expects to meet two of those criteria, with data density lagging behind. Current prototypes have capacities in the megabit range, though chips with up to a terabit of storage should be possible eventually. In addition, NRAM consumes less power than other forms of RAM, while remaining more resistant to temperature extremes and electromagnetic fields. What more could electronic musicians ask of their memory? EM



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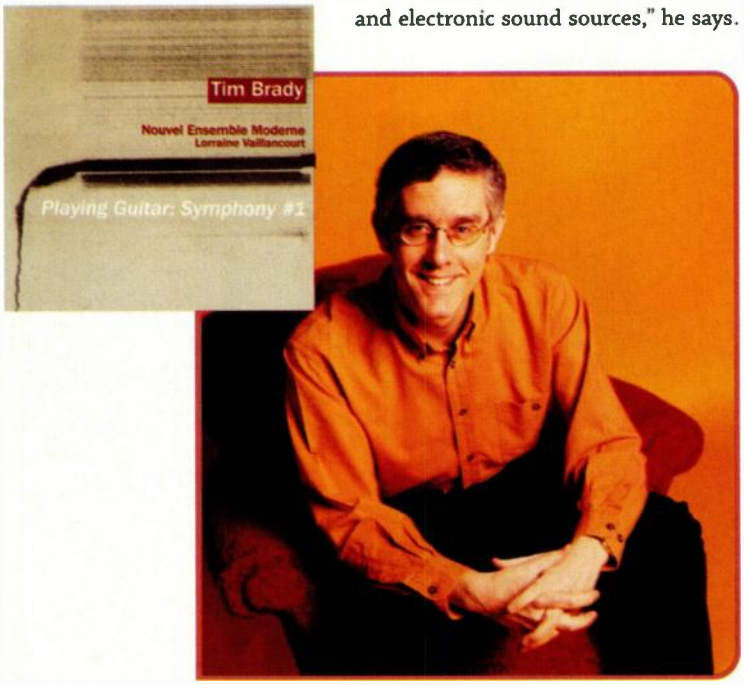
Six-String Symphony

By Matt Gallagher

Tim Brady unites guitar, orchestra, and electronics.

For 25 years, Tim Brady has been carving a niche for the electric guitar within classical music. *Playing Guitar: Symphony #1* (Ambiances Magnetiques, 2004) is Brady's tenth album. Composed largely on electric guitar, it presents his contemporary classical score in five movements for a 15-piece acoustic chamber orchestra.

Brady and coproducer Morris Apelbaum sought to combine the guitar and orchestra with Brady's guitar samples and textures. "My music is somewhat unusual in its combination of acoustic and electronic sound sources," he says.



LAURENCE LABAT

***Playing Guitar: Symphony #1*/Tim Brady**

"I compose on the guitar, on the piano, by singing, writing directly onto score paper, or using a sequencer or multitrack recorder. The choice of composing medium depends on what I'm trying to get at."

Apelbaum and four assistant engineers recorded the Nouvel Ensemble Moderne, conducted by Lorraine Vaillancourt, in Oscar Peterson Concert Hall at Concordia University in Montreal. "We didn't have to fix the room sound," Brady says. "The hall is used frequently for recording in Montreal." Apelbaum recorded the orchestra onto 24 tracks through a number of mic preamps and Apogee AD-16 converters into an Alesis HD24 hard-disk recorder.

The engineers miked each musician individually. "That allowed me to create the final balance in the studio, rather than rely on the conductor's balance," Brady says. "Balancing the tone of the electric guitar and sampler with the orchestra was a question of subtle timbral decisions. Even in a live space with no isolation, [multiple mics] give one a lot more control than a stereo pair." In addition, the engineers placed each mic 18 to 24 inches from an instrument's sound source.

Brady brought the orchestra tracks into his personal studio, which includes a dual-processor Mac G4 running MOTU Digital Performer 3.1 and a MOTU 2408 audio interface. "I played untreated guitar lines live with the orchestra, and then added the processed stuff later," he says. "I replaced a few live parts with overdubs. Sometimes I didn't like the mix of the original guitar tone with the ensemble. EQ can do only so much; sometimes you have to change pick-ups or even guitars to get the sound that you want.

"All the guitar parts were edited and then reamped in my studio using the speaker simulator on my Koch Twintone tube amp," Brady says. "That added warmth, depth, and subtle tube compression. Tubes offer acoustic attack and decay characteristics, so they blend better with classical instruments."

Brady recorded and processed guitar samples in his Yamaha A4000 sampler, which he later added to the existing tracks. His TC Electronic Fireworx effects processor also played a key role. "I used just two bands of EQ to bring out the character of an instrument in the mix," Brady says. "With good mics, good preamps, a good room, and great players, you don't need tons of EQ. I added some reverb and I used DP's volume curves for subtle volume changes."

The album concludes with "Frame 1—Resonance," Brady's piece for electric guitar and acoustic piano. "[It features] quite a bit of digital processing, using primarily an old Boss SE-70 effects processor," Brady says. "The SE-70 has a crude 16-bit sound, but it has some amazing algorithms. The piano plays a dreamlike fantasia part, and the guitar acts like an electroacoustic sustain pedal, taking ideas from the piano and transforming them into an ongoing musical dialogue. I plan on composing more works that explore the electric guitar in a small, intimate chamber-music context—if all goes according to plan." EM

For more information, go to www.timbrady.ca or www.actuellecd.com.

"Slammin'!"

Anthony Roberts, Monitors - Tower of Power

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"I'm in the studio with R.O.D and lovin' the i-5 on guitar cabs. Great punch in the upper mids and perfect for heavy guitars that need that special drive. Also fantastic on snare – it can sure handle some serious SPL's!"
Travis Wyrick, Producer, Engineer, Mixer - R.O.D., Charlie Daniels, Pillar

"So how does it sound? In a word, impressive. ...and on snare drum, it rocked hard. Overall, there's a clarity and openness to this mic that you don't hear from a lot of dynamics..."
Phil O'Keefe, EQ Magazine

"On the road I use it with The Dead and Phil Lesh and Friends. At home, I use it at the Phoenix Theatre in Petaluma with every act imaginable. From the top to the bottom, the i-5 sets a new standard!"
Ian DuBois, Monitors - Phil Lesh and Friends, The Dead

"Audix really delivers with the i-5. Performing well in about every application on which I tried it, the i-5 does justice to many sources both on stage and in the studio."
Karen Stackpole, Electronic Musician

"During our recent tour, I was very pleased with the results using the i-5 on guitar cabs. The sound was smooth and clear with great presence in the mix. The i-5 is rugged and solid. It qualifies as THE all-purpose dynamic workhorse in any mic collection."
Gary Hartung, FOH - Crosby, Stills & Nash

"The i-5 is an awesome utility mic—it is much tougher and sounds better than the 'old faithful' I am now able to replace."
Dave Rat, Rat Sound

"I've used the same mic on snare drum for recording and live sound applications for 30 years. I've tried other mics from time to time but always returned to the old favorite. Recently, I tried the Audix i-5. No matter what style of music, the i-5 sounds great and now has become my new choice for snare drum."
Tom Edmonds, Engineer - Lenny Kravitz

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WILLIAM WHITE, PROJECT COORDINATOR - THE DISCOVERY CHANNEL

"I have dreamed of this day—I can now retire the last of my SM57's. Now that I've been exposed to the future, why would I want to live in the past?"
Eugene "Gino" Mulcahy, Lead Audio Engineer - Mohegan Sun

"This mic is slammin'! And if you're tired of having the cap of your snare mic being blown into pieces from a heavy stick hit—you'll love the i-5!"
Anthony Roberts, Monitors - Tower of Power

"On guitar amps the i-5, compared to the 57, was less hyped in the high mids, but had a fuller overall tone...I'm really digging using the i-5 and will be buying the review mics I was sent, if that tells you anything."
Larry Crane, Tape-Op Magazine

"The i-5 is very impressive as a bass mic. It handles the SPL's and captures the clarity of the notes while still maintaining the warmth of the low end. It's a great new tool."
Deanna Franklin, FOH - Tom Waits

"With the i-5 on my snare drum, there's just no going back. I've just started using it on guitar with very good results there too. The i-5; it's my new little weapon."
Neil Citron, Head Engineer - The Mothership

"The i-5 is truly a multi-purpose microphone. It sounds great on a wide variety of sources, but it particularly shines on snare drums and toms...Sounds like a winner in my book."
Mark Parsons, Modern Drummer

"The i-5 is more than an impressive upgrade to my usual snare and guitar cab mic—it's a big leap forward."
Ed Tree, Studio Engineer - The Spencer Davis Group

"Who needs a condenser when you can get this sound out of a dynamic. Audix has again come up with a winning microphone."
John Gatski, Pro Audio Review

"The best thing to happen to snare drum since Charlie Watts!"
Paul Hagar, FOH - American Hi-Fi

"qualifies as THE all-purpose dynamic workhorse in any mic collection."

Gary Hartung, FOH - Crosby, Stills & Nash

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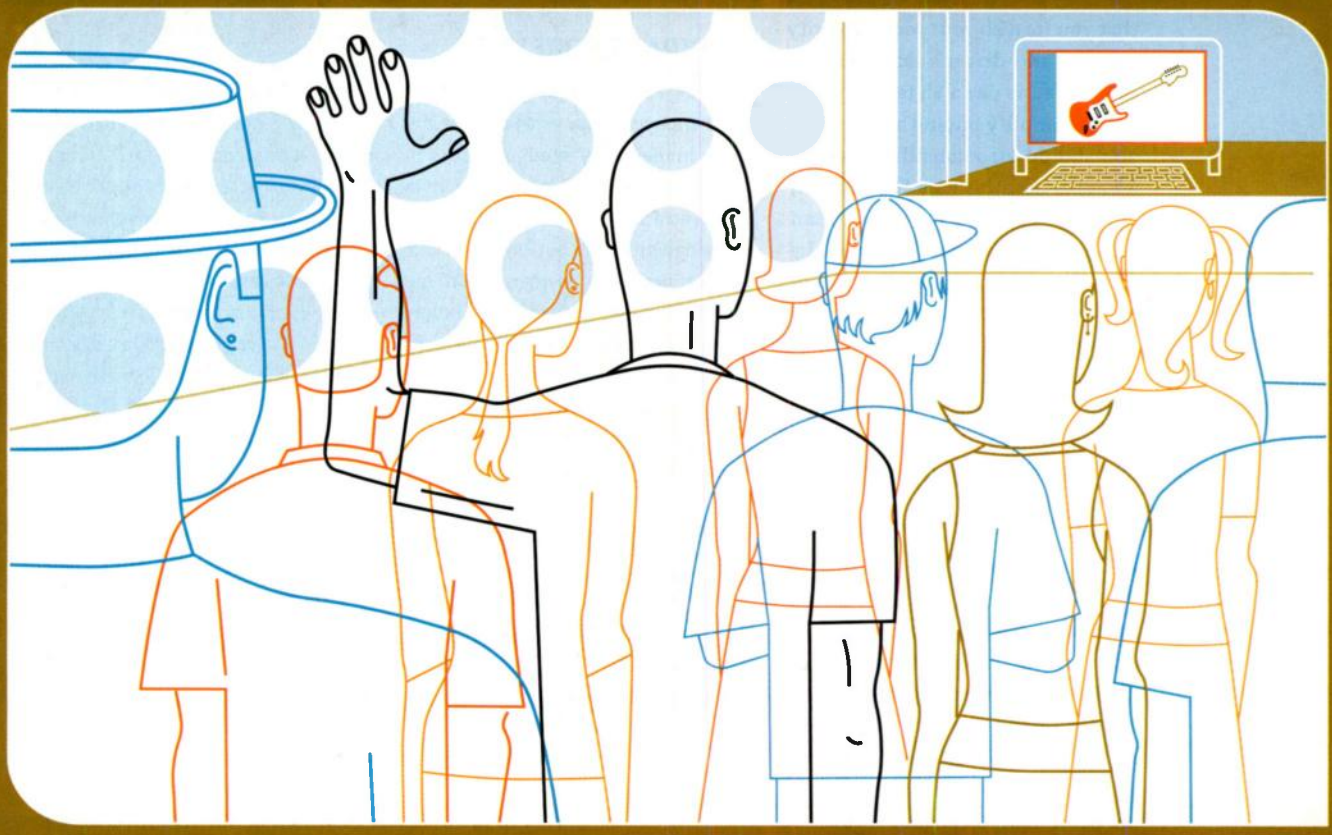

EM's Guide to eBay

By Geary Yelton

Musicians and audio engineers have a rich history of buying and selling used instruments and equipment. Historically, such transactions have taken place between individuals who knew each other or who scoured classified ads in local newspapers and other publications. Before the Internet came along and connected everyone, the pool of potential buyers was mostly limited to the seller's geographical area. Selling your gear was often more trouble than it was worth, and opportunities to receive a fair price were usually limited by local demand.

Like the Internet itself, eBay (www.ebay.com) has drastically changed the way that individuals conduct business. Since its advent, sellers have had a worldwide audience of potential buyers at their fingertips. Musicians in particular have much to gain from learning the ins and outs of eBay's brand of personal e-commerce. Listing an auction on eBay puts your merchandise in front of millions of other musicians who are willing to compete for the chance to buy your used guitar, hard-disk recorder, keyboard stand, or music book.

How to make your e-commerce experience successful and trouble-free.

Get Registered

Before you can buy or sell, you'll need to register as an eBay user. Clicking on eBay's Register link opens the registration page, in which you type your personal data and accept or decline the terms of the user agreement. You'll then be asked to supply a user name and password. Because eBay has literally millions of users, selecting a unique user name can be more difficult than it sounds. Be careful that you don't select something frivolous just to see if it's already been taken; you will be stuck with it for at least 30 days.

After you complete registration by responding to an email sent by eBay, you can bid on any auction you like. To create your own auctions, though, you'll need to create a seller's account and either provide your credit-card data or complete a process called ID Verify. ID Verify requires

that you furnish your social security number and driver's license number, as well as pay a $5 fee.

To simplify buying and selling, you should also consider opening a PayPal account (see the sidebar, "PayPals Forever"). PayPal is an online financial service owned by eBay. In exchange for a portion of each transaction, PayPal lets you instantly pay and get paid for completed auctions. Buying and selling without PayPal can be slow and troublesome, and the convenience it affords usually makes it well worth joining.

Bargain Hunting

Whether you're shopping for a used synthesizer, trying to find an out-of-print service manual, or looking for the best price on the latest software, eBay is one of the first places you should turn. Browsing and searching are easy, and if you haven't tried it yet, bidding and buying are easier than you might imagine.

Shopping on eBay begins with going to almost any page and clicking on the Buy button, located at the top of the page. You'll be presented with a list of categories to browse, one of which is Musical Instruments. Each category is divided into dozens of subcategories, and many of those are categorized even further. Musical Instruments, for instance, is divided into Guitars, Electronic, Pro Audio, and many others (see **Fig. 1**). You'll find condenser mics listed under Musical Instruments > Pro Audio > Microphones > Wired Microphones > Recording, Condenser.

On most pages, a search field lets you enter the name of whatever you're hoping to find. When searching, be as specific or as general as you like: if you want to browse all Moog synths, type "moog" (searching is not case-sensitive). If you're trying to find a Minimoog, type "minimoog" and "mini moog" (try it both ways, because searching will return only the results that include all your search terms). If you want to search for all Moogs except the Minimoog, type "moog -minimoog -mini." Placing a minus symbol at the beginning of a search term excludes that word from your search results.

eBay can sort your search results according to parameters such as price (lowest or highest first), time (when an auction began or ends), or distance (from your location). Such information tells you whether an item suits your desires and how quickly you will need to act. Sometimes viewing search results using different parameters will help you spot something that you might have missed otherwise, especially when the list is several pages long.

Once a list of results is displayed, you can narrow down your search even more by examining the list of Matching Categories on the left side of the screen.

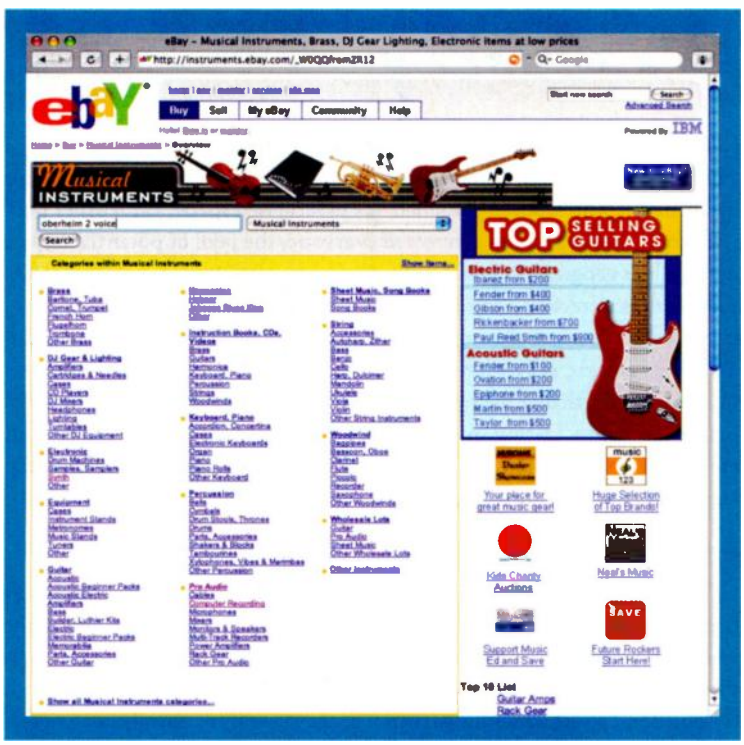

FIG. 1: Dozens of subcategories are located within each eBay category. For example, one of the Musical Instruments categories is Pro Audio, which is divided into Cables, Computer Recording, Microphones, Mixers, and other subcategories.

PAYPALS FOREVER

Joining PayPal (www.paypal.com) can enhance your eBay experience; it lets you immediately send payments to and receive payments from anyone with an account. There's no charge for paying with PayPal, but PayPal will take a portion of any payments that you receive. In exchange for that portion, you gain the ability to accept payment by credit card and to make payments directly from your bank account. You also get a maximum of $1,000 in free buyer protection coverage.

PayPal offers three types of accounts. A Personal account is suitable if you are strictly a buyer and have no need to accept credit-card payments. A Premier account is suitable for most sellers; in addition to providing the means to accept credit cards, it simplifies checkout for your buyers and makes it easier to manage your postauction transactions. A Business account is similar to a Premier account and is best if you're operating under a business name rather than as an individual.

All it takes to open an account is to provide your name, address, and other basic information. To make payments using your Personal account, you'll first need to provide credit-card information. To enjoy the benefits of a Premier or Business account, you must provide information about your checking or savings account so that PayPal can withdraw and deposit money, but only when you authorize it. The convenience of a PayPal account makes it well worth the cost.

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-Craig Anderton, Keyboard Magazine

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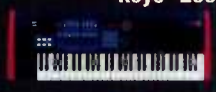
UF5 49 weighted keys $199*

UF6 61 weighted keys $299*



UF7 76 weighted keys $399*

UF8 88 Hammer Action Keys $599*

UF-400e: Firewire Audio Interface Option: 2 Analog ins/outs, 24 bit 192 Khz, 1 Midi I/O, 1 co-axial digital I/O, 111 db, 1 mic input, 2 headphone outputs, mLAN Compatible *249

You would want to include a full set of sequencer transport controls so you could do all your work from your keyboard without needing a mouse or separate controller. Throw in a breath controller and after-touch for added expressiveness for your virtual synths, and then make sure you can add a 24 bit / 192khz firewire audio expansion option, conveniently giving you extra performance and recording power. Of course, don't forget to put in 8 knobs and 9 sliders. For the 88 note version, you would want to put in the same hammer action assembly that is used on one of the most popular digital grand pianos. For the other models, put in a semi-weighted keyboard that is more robust than anything you would find in its price class. There, you've done it..... you've created a series of fully professional, all powerful master keyboard controllers.

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A search for "moog" may produce categories such as Musical Instruments (Electronic, Piano/Keyboard, and Guitar), Music (Records and CDs), and eBay Motors (Parts & Accessories). If you're not interested in Moog auto parts or albums, the Musical Instruments category is your best bet. Still, there's no guarantee that you won't have to wade through Moog baseball caps, refrigerator magnets, and framed magazine ads.

If you're trying to find something specific, such as an Ampeg SVT-AV bass amplifier, you should search for "ampeg amp" and "svt bass" in All Categories, and not just in the Musical Instruments > Guitar > Amplifiers category. If the seller left out any keywords or placed the amp in the Equipment or Pro Audio category rather than where you'd expect to find it, you might find a deal that has eluded other bidders. In fact, amplifiers are often found in the DJ Gear & Lighting category simply because it has an Amplifier subcategory.

When you find something that you might want to buy, read its description carefully. Does it state the item's condition? Is it in good working order? Does the seller offer any sort of guarantee? Are you sure it's exactly the one you want to buy? Is the shipping cost reasonable? Does the seller have a good feedback rating? If you have any questions, do not hesitate to email the seller and ask. If the seller doesn't respond, don't make assumptions and bid anyway. You might end up with something you don't want and may not be able to return.

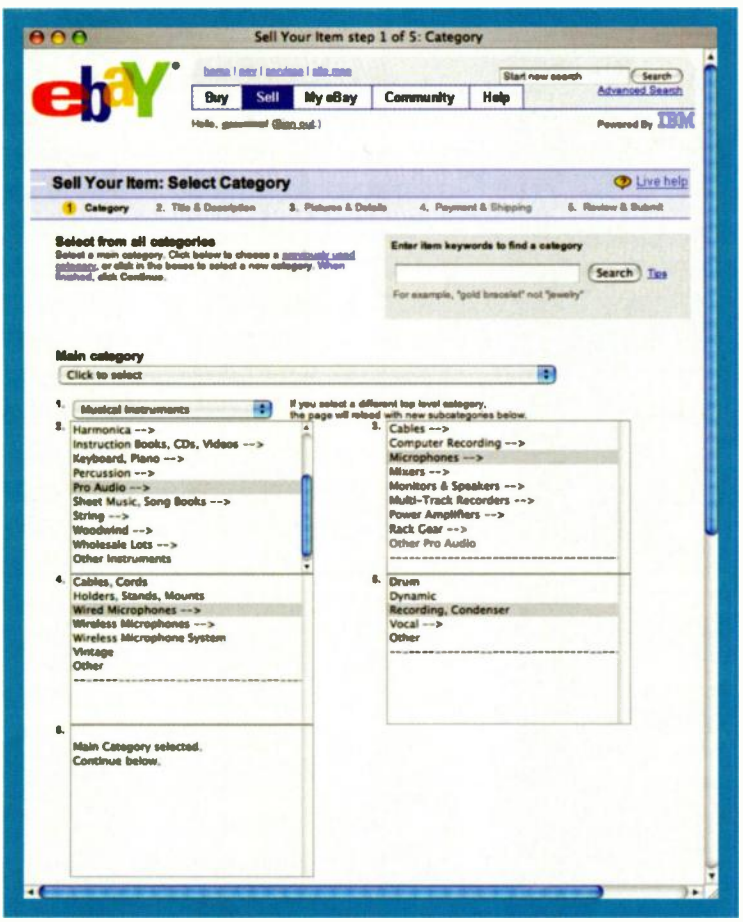

FIG. 2: The first step in listing an auction is to select a classification from eBay's hierarchical list of categories. You can also type in keywords, and eBay will suggest an appropriate category.

Bid High, Buy Low

Auctions are held in a variety of formats, such as multiple-item auctions (aka Dutch auctions), reserve-price auctions, and fixed-price (Buy It Now) auctions. The most common, however, is an auction in which the highest bidder wins. Although your best strategy is to bid the highest price you are willing to pay, you could very well pay less than the amount that you bid.

When you place a bid, you're pledging to pay as much as the amount you've bid; in other words, it's your maximum bid. eBay uses a technique called proxy bidding, in which it will automatically raise your bid only enough to beat competing bids, but no higher than your maximum bid. eBay always displays the auction's current bid, which is only whatever it takes to beat the previous maximum bid (or the starting bid if there are no previous bids). Maximum bids are held in secret and are revealed only when someone exceeds that bid.

Let's say an item's current bid is $50 and you bid $100. If the previous highest bidder's maximum bid were $75, your bid would be entered as $76. (The increment above the current bid depends on the bid amount; see eBay's Help Topic on Bid Increments for details.) If someone came along and bid $80, the current bid would advance to $81, and you would still be the highest bidder. If, however, the previous bidder also had bid a maximum of $100, the current bid will advance to $100 and he or she will be listed as the current high bidder, because you were not the first to bid that amount. The advantage of proxy bidding is that you will pay no more than whatever it takes to beat the next highest bidder.

When you place a bid, you are entering into a contract to pay as much as your maximum bid, plus shipping costs, if you win. If you change your mind and back out after winning an item, you risk receiving negative feedback and you jeopardize your eBay membership. eBay charges sellers a portion of the final selling price, as well as listing fees, as soon as an auction is complete. If a buyer were allowed to back out of a deal, either the seller or eBay would incur a loss, and another auction would be necessary.

Note that the posted time that an auction ends is Pacific Time, so unless you're on the West Coast, you'll need to calculate your local time if you want to be present at its conclusion. When the auction is complete, if yours is the highest bid, congratulations, you've won! Now all you need to do is pay the seller and await the item's delivery.

Variations on a Theme

In a reserve-price auction, the highest bid doesn't win unless it exceeds a threshold set by the seller. A reserve price is the minimum it would take to win the auction. A

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low current price might entice you to bid, but you won't know whether your bid exceeds the threshold until after you place it.

Buy It Now is a means of purchasing an item at a fixed price. When you select Buy It Now, the item is yours and the auction ends immediately. If someone bids lower than the Buy It Now price, however, the Buy It Now option will disappear and the auction will run its entire length. Using Buy It Now is very much like ordering something from a non-eBay online store.

Immediate Pay listings require that you pay right away using PayPal. That ensures that the seller will be paid and the auction doesn't end because of a nonpaying bidder.

Perils and Pitfalls

Although the easiest strategy is to decide on a maximum bid and stick with it, you might want an item badly enough to increase your bid whenever someone outbids you. Beware of getting into a bidding war; I've seen bidders pay much more than the going price just to beat a competitor.

Bidding can be at its fastest and most furious in the seconds before an auction ends. A strategy you should watch out for, and one you may occasionally need to employ if you want to win, is called sniping. Snipers will wait until the last possible moment to place bids, so that unless your maximum bid is higher, they will win before you have a chance to place a higher bid. The best way to protect yourself from snipers is to keep hitting your browser's Refresh button as the auction draws to a close. There's nothing more frustrating than someone else winning an item that you really wanted by paying just a dollar more than your high bid during the final five seconds of an auction.

A related strategy is to wait until the last hour or so to place your first bid. If you bid too early, competitors will have a chance to consider how badly they want an item and bid higher. Such a strategy has its risks, though. If an auction has no bids, the seller can raise the starting price, raise the Buy It Now price, or end the auction anytime up until 12 hours before it is scheduled to end.

More serious problems can occur after the item is delivered. What if it doesn't live up to your expectations? Unless the seller has been fraudulent and the item is indisputably different from what was described, your avenues of recourse are limited. You could try reasoning with the seller or leave bad feedback for the seller (more about that later), but there's not much point in filing a complaint with eBay except in cases of out-and-out fraud. Even then, unless any laws were broken and you want to hire an attorney, eBay can't do much other than threaten to cancel the seller's membership.

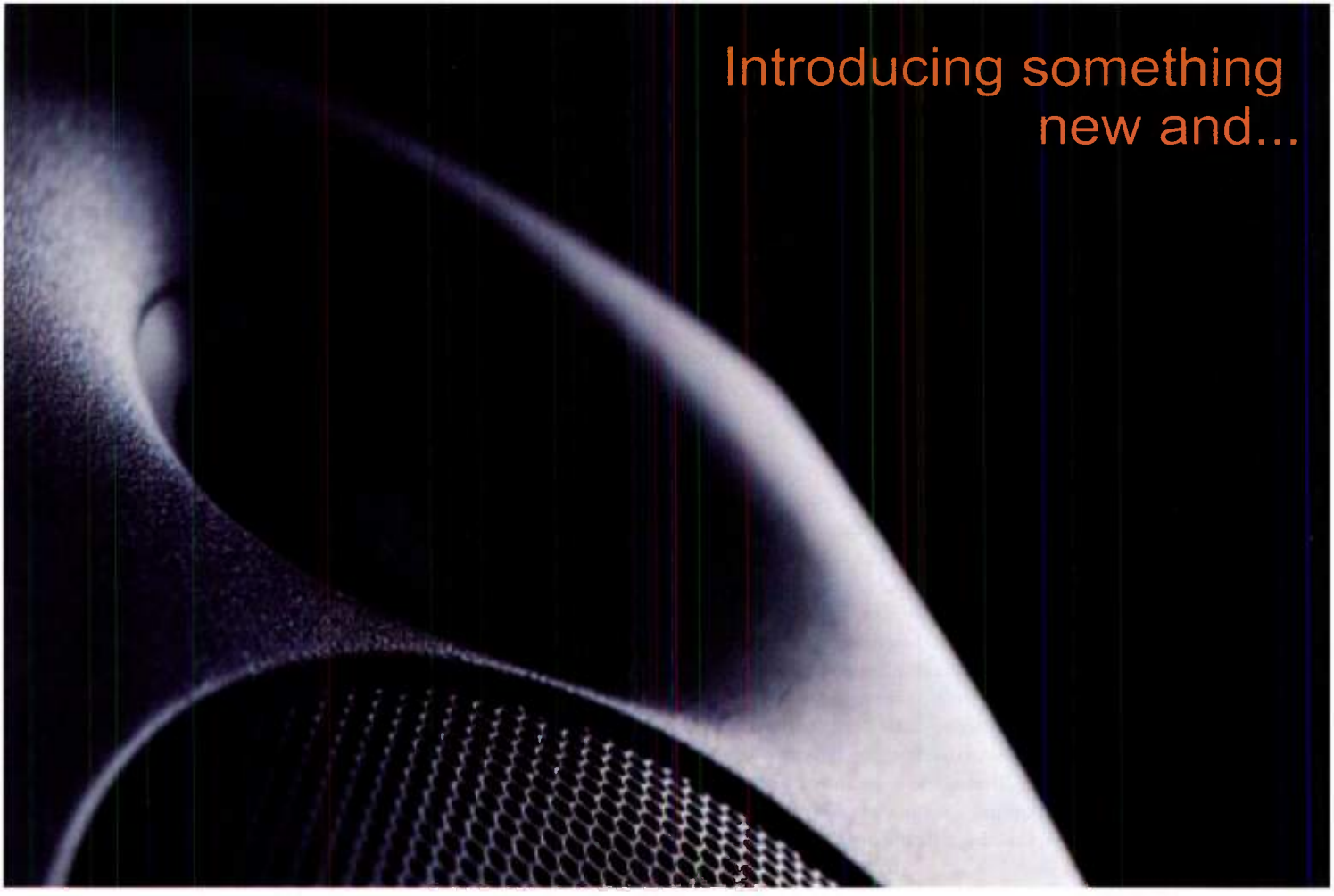
A Seller's Market

Somewhere in the world is someone who wants your old stompboxes, sound-effects records, and audio-equipment catalogs. I should know; I've sold all of them on eBay for more than I would have thought possible. I sold a music book for $75, a synth catalog for $60, and two LPs for more than $100—all items that I had held onto since the 1970s. A few months later, I sold a pair of tattered, hand-embroidered jeans I used to wear onstage for $160. When eBay enthusiasts say there are treasures in your attic, they could be right on target.

If you want to find a buyer for a synth module that you no longer use or for a computer that you've just replaced, eBay offers the largest marketplace. You can find other auction sites and online ad sites, some of which don't charge a penny to use, but none have eBay's mass appeal. It might be more convenient to run a classified ad in a local newspaper, especially if you're selling a large item such as a sound-reinforcement system or a Hammond organ, but listing with eBay will expose your listing to the greatest number of people. And compared to local advertising, eBay is often a good bargain.

In exchange for the services it provides, eBay charges a number of fees. Initially, you pay an insertion fee whenever you list an item for auction. The insertion fee varies depending on your starting or reserve price and currently ranges from 25 cents (for items under $1) to $4.80 (for items $500 or more). You can pay additional fees for optional features—some of which are inexpensive and recommended—such as a gallery photo or Buy It Now. Unless e-commerce is a commercial enterprise, though, you'll probably want to avoid incurring large listing fees.

FIG. 3: Gallery photos, shown here in a list of search results, will draw attention to your listings. According to eBay, investing in a gallery photo can significantly increase your final bid.



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Selling Like a Pro

Before you post an auction, you have several decisions to make. What will your listing say? What category is most appropriate? What's the minimum price you'd accept? How much is enough to end the auction? When is the best time to sell? What will you charge for shipping? Are you willing to ship overseas?

A good place to begin is by examining listings for similar items. Be sure to search for completed listings as well as active ones. Read the descriptions and notice keywords in the titles, how the items are classified, their ending times, and their starting and ending prices (or current price, if the auction is ongoing).

Creating a listing begins when you click on the Sell button on any page. You'll be asked to specify a category. Clicking on a main category usually leads to a choice of subcategories (see Fig. 2). You can also choose a second category, but be aware that it will double the cost of your listing.

FIG. 4: Just before you submit your listing, you'll have a chance to review its contents, its duration, the options you've selected, and the amount you'll be charged.

Titles are limited to 55 characters, including spaces. Because searches are most often based on classification and title, you'll want to pack as much information into the title as possible. Be sure to mention the brand name and any other descriptive keywords. If 55 characters aren't enough, you can add a 55-character subtitle for 50¢ extra, but it won't appear in most search results.

For the item description, be as complete and accurate as possible. Tell prospective buyers about the item's condition, desirable features, the original or retail price—whatever seems most appropriate. Don't forget to mention any flaws as well. Unlike a classified ad, for which you may be charged according to the number of words, the cost of an eBay listing has nothing to do with its length. Still, don't provide so much information that it's difficult for buyers to find key information buried in a mountain of text. Use bullets to highlight important points.

FIG. 5: eBay offers plenty of opportunities to learn how to buy and sell successfully. Some resources, such as eBay University, require that you pay for your e-commerce education, but most are free if you take the time to find them.

It helps to use an offline HTML (Hypertext Markup Language) editor to compose your ad or to insert HTML code within your listing. eBay's HTML Tips page can tell you how to separate paragraphs, specify bold or italic text, create bulleted lists, and so on. Unless you want your description to be one long, monotonous paragraph, using basic HTML (such as inserting <p> to indicate a paragraph break) is essential.

After you enter a title and description, you'll be asked for a starting price and, if applicable, a reserve price and a Buy It Now price. Take special note of the insertion fee increments when deciding on a starting price. It costs twice as much to list an item for $50 as it does to list it for $49.99.

Because a high starting price might discourage potential bidders, a reserve-price auction can stimulate bidding by attracting the attention of potential buyers. eBay refunds the reserve-price auction fee unless the item does not sell, in which case it will cost you $1, $2, or 1 percent of the reserve price.

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Buy It Now is useful if you just want to sell something at a fixed price, but you'll need a minimum feedback rating of 10 to use that option. Buy It Now fees range from 5¢ to 25¢. If you combine a reserve auction with Buy It Now, the Buy It Now option will remain available until someone bids the reserve price.

An eBay auction can have a duration of one, three, seven, or ten days. Seven days is typical, and a ten-day listing costs 40¢ extra. You can schedule a precise start time for 10¢ or begin an auction at the moment you submit it. I've noticed that it helps to end your auction just as the clock strikes the minute. It's a lot easier to remember that an auction ends at 07:15:00 rather than at 07:14:41.

If working musicians are your most likely buyers, consider that they are at home surfing the Web on Sunday nights more often than any other time, so that's a good time to sell pro audio gear. I've also noticed that sales are brisk when buyers have money in their pockets, such as around the time they receive tax refunds.

eBay offers several options for including photos in your listing. It's important to remember the old adage that one picture is worth a thousand words; you should therefore supply the best possible image. The insertion fee includes the cost of one picture as large as 400 × 300 pixels. Extra photos are 15¢ each, or you can buy a Picture Pack to display 6 for $1 or 12 for $1.50. Picture Packs include a gallery photo, which displays a small version of your first picture alongside search results (see **Fig. 3**). Because they draw attention to your listing, gallery photos are well worth the 35¢ that they normally cost. Other options are supersize photos and hosting your photos on a Web site other than eBay.

Your listing should specify payment and shipping details. Potential buyers are more likely to bid if they know whether you can accept credit cards (you can if you have a PayPal account) and how much shipping will cost. Your audience will be much larger and may bring higher bids if you're willing to sell worldwide and ship overseas.

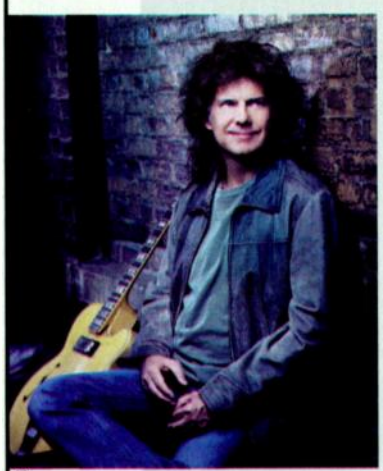
Before you submit your listing, you'll have a chance to preview it and review all the details and fees (see **Fig. 4**). Once an auction is underway, eBay discourages sellers from ending it early without good reason.

An Auction's Aftermath

What if you list an item and it doesn't sell? Unless you want to give up and keep it, you could reassess your strategy and list it again. If you select Relist within 90 days and the item sells, you won't have to pay the insertion fee a second time unless you raise the starting price. You will, however, have to pay for any options, such as a gallery photo. When relisting an item, you might want to consider rewriting the title and description or lowering its starting price. Note that you won't receive a credit if you simply list an identical auction; you need to click on the Relist link.

If you do succeed in finding a buyer, you'll have to deal with shipping what you've sold. As soon as the auction is complete, email an invoice stating the total charges, which may differ according to the buyer's location and whether he or she wants you to insure the shipment. If the buyer wins

CAN YOU IMAGINE...



Composing a 68-minute score, then allowing millions to view and play it over the Internet?

The Pat Metheny Group's "The Way Up" and Sibelius

In order to have the Pat Metheny Group rehearse and perform the continuous 68-minute album release: The Way Up in full, Co-Writers Metheny and Lyle Mays, with editing by bassist and fellow producer Steve Rodby, created the score with Sibelius 3 software. Pat realized that through the Sibelius Scorch plug-in, fellow musicians and fans could view and listen to the MIDI playback over the web.

"We used Sibelius to make parts for the band throughout the recording. We found out about Scorch and it seemed like a natural choice to offer the "Scorched" version of the score on our website." *-Pat Metheny*

The Scorch version of The Way Up score is available at www.patmethenygroup.com

For information about Sibelius 3 and Scorch, please visit: www.Sibelius.com

Sibelius

Photo by Jimmy Katz, courtesy of www.patmethenygroup.com

additional items that you can ship at the same time, it's a good policy to offer a discount to reflect the money you'll save on shipping.

Select whatever carrier you or your buyer prefers. UPS, FedEx, and the U.S. Postal Service all handle domestic and international shipments up to a certain size and weight. Their respective Web sites can help you to determine your exact costs and to schedule pickup and delivery. For larger or heavier items, you'll need to hire a freight service to deliver your package. eBay provides some excellent resources in its Shipping Center section, including a rate calculator and label printing.

You'll certainly want to be paid as quickly as possible. Your auction should specify payment options, such as PayPal, personal checks, cashier's checks, money orders, wire transfers, COD (cash on delivery), or credit cards. Because most individuals aren't set up to accept credit cards, PayPal is probably the best option for quick payment. PayPal will take a share of the total selling price, including shipping charges, but its fees are reasonable when compared with the cost of a traditional merchant account. The disadvantage of checks and money orders is that they take longer and they might bounce (a buyer can stop payment on either). Wire transfers are reliable, but they're expensive for the buyer, and you have to either go somewhere to pick up your payment or wait for a check to arrive. COD is the least attractive solution of all; not only do you have to wait for a check, but the buyer has the option of refusing delivery.

Feedback Control

When an auction is complete, the buyer and seller have the opportunity to leave positive or negative comments about the transaction. I can't stress the importance of maintaining a good feedback score, especially if you are a seller. A high feedback score is a valuable asset, and having 100 percent positive feedback is like having money in the bank. It is good form to always leave feedback at the completion of a successful transaction.

Sometimes, however, you'll need to leave neutral or negative feedback. Negative feedback is appropriate when a buyer backs out or pays with a rubber check, or when a seller takes a month to ship the item or fails to disclose that an item is nonfunctional. Unfortunately, leaving negative feedback is risky. Although it's against eBay policy, nothing prevents someone from leaving

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negative feedback for you in retaliation for negative feedback left by you. You'll have a chance to leave a comment about the feedback you receive, but any negative feedback permanently affects your score.

Another very important point to consider is that as a buyer, you should examine a seller's feedback before you bid, especially if you want to avoid an unpleasant experience. If he or she has left a long line of dissatisfied customers, nothing prevents you from becoming one of them if you choose to bid anyway. I have won auctions for items I never received, and later wished I had heeded the negative comments.

eBay for Everybody

eBay is so vast that I've only scratched the surface here. Fortunately, its Help page is a pathway to learning everything that you could ever want to know about buying and selling. Clicking on Help Topics will display basic information about using eBay, and you can do a search if you have a certain topic in mind. For a fee, you can even take online courses at eBay University (see Fig. 5). If you want more personalized instruction, the Education Specialist Program lets you search for classes or instructors in your geographic area.

eBay provides plenty of free resources for you to explore almost every aspect of buying and selling. Animated Audio Tours such as "My eBay Tour" and "How to Sell Tour" guide you through the steps needed for successful transactions.

Although the eBay experience isn't perfect, it's a lot more efficient and fun than classified ads, and it beats most other methods of buying and selling musical instruments and audio gear online. Joining the ranks of eBay users is a smart move. Once you get started, you'll wonder what took you so long.

EM associate editor Geary Yelton has been an active eBay member since the late 20th century.

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"This is the kind of software people need: an open and transparent interface, instruments that can be made to do all sorts of stuff (quickly!), and a set up time that would make the folks over at Jiffy Lube green with envy. Fast, easy and totally flexible, the Storm Music Studio has quickly become my editing suite of choice."

DJ Spooky That Subliminal Kid

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The Lower-Price Windows Studio

By Dennis Miller

My entry-level Windows system allows me to create music for lots of situations, including electronic-music production and sound design for games, theater, and more. I am not concerned about recording acoustic and electroacoustic instruments in this studio, which is why I didn't buy a lot of mics and preamps.

At the heart of my studio is a 3.2 GHz Pentium 4 processor. I needed $2,000 to pick up a computer that has 1 GB of RAM, a 160 GB SATA system drive, a 400 GB SATA data drive, a 19-inch CRT or 17-inch flat-panel display, and Windows XP SP 2. The Dell Precision Workstation 370 met that spec.

Another option is to purchase a machine that is designed specifically for music production. Sweetwater's Creation Station Pro 3.2 (www.sweetwater.com), for example, costs about the same and uses silent fans and other noise-reducing components. Among its other benefits are a DVD-RW, dual SATA drives from Glyph, and seven USB 2.0 and two FireWire 400 ports. Digidesign also recommends this system for use with Pro Tools, although we aren't specifying Pro Tools for this studio. You'll spend extra for a monitor, but you can probably make some of that up by pressing your sales rep for a break on an accompanying software bundle (but don't tell them I told you so).

Cabled to the computer is an M-Audio FireWire Solo audio interface (see **Fig. 1**), which provides drivers (including ASIO2, WDM, and GSIF2) for a variety of production environments, S/PDIF digital I/O, 24-bit/96 kHz audio support, and flexible software-controlled routing. I can send the headphone outs to a video deck or other peripheral device when needed, and the separate level controls for the two inputs (XLR mic/line) add to the unit's flexibility.

I chose to pipe the FireWire Solo's output to a pair of M-Audio BX8 powered monitors, which are sharp-looking and a good value. The BX8s provide excellent frequency response (37 Hz to 20 kHz) with their 8-inch woofers and 1-inch tweeters and should be well suited for most tasks. Monitors are a matter of personal taste, so feel free to substitute others if you have a preference. For those late-night moments when inspiration strikes, I chose to have a set of Sony MDR-7505 headphones on hand.

FIG. 1: The compact M-Audio FireWire Solo bus-powered audio interface routes 24-bit, 96 kHz digital audio to a PC or a Mac and sports a guitar input, XLR mic input, dual line inputs, S/PDIF digital I/O, and headphone output.

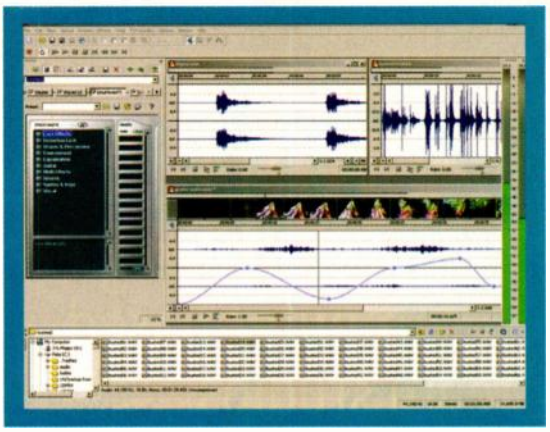

FIG. 2: Sony Media Software's Sound Forge 8 offers numerous native effects and processing plug-ins and also supports VST effects. The new Scrub tool makes locating any spot in a file a breeze.

The Soft Side

Owning a wide range of software ensures that you always have the best tool for the job. Heading up my software choices is Sony Media Software's Sound Forge 8, a stereo audio editor that has a large number of effects (see **Fig. 2**). Although I have audio-editing options in some of my other software, you can't beat Sound Forge's tool set. The new capabilities in version 8, which include a Scrub tool and support for ASIO and VST plug-ins, make it an invaluable resource.

For MIDI sequencing, I chose Steinberg's Cubase SL3, which has many of the same features that the flagship Cubase SX3 does, but it costs $300 less. Cubase SL3 has 32 VST slots, an unlimited number of MIDI tracks, three modes of time stretching and pitch shifting, and many other high-end features to keep you busy.

For my sample library, I chose *Garritan Personal Orchestra* (GPO), which works standalone, using the Native Instruments Kontakt Player, or as a VST plug-in. The library offers a wide range of great-sounding solo-instrument samples and a comprehensive collection of string bowings, such as pizzicato and marcato. The percussion section is robust and includes all the standard orchestral instruments, as well as a wind machine and a variety of percussive toys. Woodwinds and brass are also out in full force. GPO has been smartly programmed to produce numerous realistic playing techniques in response to real-time MIDI Control Change messages. Without too much effort, you can become a one-person band simply by using a MIDI keyboard.

I selected Native's Instruments' Reaktor 4 for my studio environment (see **Fig. 3**). Reaktor ships with

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an extensive instrument collection, much of which is documented in its Reaktor Library Instrument Guide. Additionally, the vast number of free downloadable user-contributed patches (nearly 2,000 at last count) will satisfy your every need.

Reaktor's excellent sampling features, though no match for a dedicated sampler such as Tascam's GigaSampler 3 or Steinberg's Halion, are more than adequate for my purposes, and its vast set of sound-design modules provide the raw materials for those wanting to create custom instruments or effects. Incidentally, if Reaktor is more toolkit than you need, a good alternative is Plogue Bidule 0.8 ($75, www.plogue.com), a modular synthesis and processing system. Bidule (which means "gadget" in French) is an open-ended application that has a large number of building blocks for constructing sonic networks of all varieties.

Freeware and shareware programs can enhance a software collection without blowing the budget. It never hurts to have a wealth of reverbs, so I picked up a copy of Christian Knufinke's free SIR impulse-response processor. SIR can be used to apply the room ambience of any acoustic space onto a sound file of your choosing. Want to make your drum tracks sound like they were recorded in a car's trunk? SIR can do the job. But since you can use any arbitrary WAV file as an impulse, you can create sonic crossings inspired by your wildest dreams—ocean wave meets hi-hat, lion meets Harley-Davidson, you name it! With SIR installed, I visited NoiseVault (www.noisevault.com) to pick up free impulses extracted from high-end effects units by Eventide, Kurzweil, Lexicon, and Quantec, to name a few.

FIG. 3: Native Instruments' Reaktor 4 is a modular toolkit with enough sound-producing and -generating prototypes to keep even the most hyperactive tweaker busy. The instrument shown above is from the Electronic Instruments II collection.

To add some plucked-string sounds to my arsenal, I grabbed a copy of Ugo's free String Theory 1.5, which runs as a VST plug-in and has oscillator, filter, and effects sections, as well as a flexible arpeggiator. The Pick Noise and Bow parameters can be adjusted to add (or avoid) realism. And for experimenting with alternate types of control surfaces, I downloaded the JoyMachine soft sampler (currently freeware but soon to be shareware) from the AcousModules Web site. JoyMachine puts 128 samples under the control of a joystick, a graphics tablet, or a mouse and offers a number of other unusual triggering options. At the same site, you'll find a multiplicity of programs that explore surround and other spatial techniques, something that is certain to become an important part of many studios before long.

The Lower-Price Windows Studio

ITEMS	PRICE
Acousmodules JoyMachine soft sampler	Free
Audio Technica AT-822 stereo small-diaphragm condenser mic	$419
Christian Knufinke SIR 1.8 convolution software	Free
Dell Precision Workstation 370 computer	$2,000
Edirol PCR-M50 keyboard controller/interface	$285
Garritan Personal Orchestra sample library	$279
M-Audio BX8 powered monitors	$399
M-Audio FireWire Solo audio interface	$249
Native Instruments Reaktor 4 soft-synth toolkit	$559
Sony MDR-7505 headphones	$79
Sony Media Software Sound Forge 8 stereo audio editor	$299
Steinberg Cubase SL3 digital audio sequencer	$499
Ugo String Theory 1.5 soft-string synth	Free
TOTAL	**$5,067**

Take Command

To control this jam-packed rig, I chose an Edirol PCR-M50 keyboard controller/interface. The unit is loaded with programmable sliders, buttons, and knobs (27 in all), and its action is quieter than that of its predecessor, the PCR-50, though I like the old silver color better than the new gray-black. The Pitch-Bend and Mod wheels on the new model also have a better feel.

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NEW! FW-1082

NEW! FW-1804

	I/O @ 48kHz	I/O @ 96kHz	MIDI I/O	XLR Mic inputs	Digital I/O	Motorized Faders	Encoders
NEW! FW-1804	18 in / 12 out	14 in / 8 out	2 in / 4 out	4	S/PDIF & ADAT		
NEW! FW-1082	10 in / 4 out	10 in / 4 out	2 in / 2 out	4	S/PDIF	9 • 60mm	pan, aux & EQ
FW-1884	18 in / 18 out	14 in/14 out	4 in / 4 out	8	S/PDIF & ADAT	9 • 100mm	pan, aux & EQ

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The PCR-M50 comes with a software editor that allows you to select from 12 Velocity curves and can store more than a dozen setups. Like most keyboards in its class, the unit can be powered by a USB or an AC adapter.

FIG. 4: Ableton Live's Session view allows you to trigger clips or rows of clips from a MIDI or computer keyboard.

Although audio recording won't be the main goal of this studio, the versatile Audio-Technica AT-822 mic is a smart addition for an occasional voiceover, for a vocal sound effect, or for sampling in the field. The AT-822 will be more than adequate for recording solo instruments or a small ensemble as well.

Future Earnings

For comparatively little money, we have a credible studio that's built with expansion in mind: it can easily accommodate more sample libraries and soft synths, a second display, or external hard drives. I'll have computing power to burn and plenty of good software. Let's fire up the rig and get busy!

The Lower-Price Mac Studio

By Len Sasso

Given $5,000, I've designed a studio for creating electronic music and doing sound design completely inside the computer. Sound design is an integral part of electronic-music composition, but it also has broader applications, including music for games, video scoring, and sound-effects production. Staying inside the box and not recording acoustic or electroacoustic sounds implies some reliance on prerecorded content, and to stay within my budget, I've chosen software applications that include large and varied content libraries.

I took a somewhat nonstandard approach in designing my studio and ignored the wisdom that a serious sequencing and sound-design studio must be built around one of the major digital audio sequencers. That is a fine approach, and you will find it well represented in this article, but the prevalence of loops, samples, and virtual instruments in today's desktop music makes my approach equally valid.

One advantage of my approach is that the applications around which it is based—Propellerhead Software's Reason, Ableton's Live, and Apple's GarageBand—are relatively easy to learn and will allow beginners to start making music quickly. Another advantage is that those programs come bundled with loads of content covering a variety of genres. If you're starting from scratch, that is a big bonus. Furthermore, much of the software is widely used and cross-platform, which facilitates collaboration with other desktop musicians.

What's Not Included

You won't find tools for score editing and printing in this studio, because scoring in standard notation is not among my goals. The MIDI editing tools are also less full-featured than you'll find in high-end digital audio sequencers such as Apple Logic, Steinberg Cubase, and Mark of the Unicorn (MOTU) Digital Performer, but the tools I've selected are adequate for my purposes.

Another thing you won't find is a full-size, weighted-action MIDI keyboard; if you're a keyboard player, you may want to forgo some of the specialty software in favor of a better keyboard. In that case, you might opt for a different MIDI and audio interface and add a dedicated MIDI control surface, such as the Evolution UC-33e or one of the Behringer 2000 series.

Finally, as noted, I've taken a completely inside-the-computer approach to music making and have not devoted any of my budget to live recording or field sampling. The necessary software tools for live recording are there, and the audio interface even has a phantom-powered mic input, but if you want to use those tools, some of the specialty-software budget will have to go toward mics.

The Box to Put It In

In a $5,000 Macintosh studio, Apple is clearly going to take a big bite out of the budget. The computer, however, is no place to skimp, and the $1,899 I've budgeted for a 1.8 GHz G5 iMac with a gigabyte of additional memory puts me in good shape. I've spent a little more for the model with a 160 GB hard drive and a 20-inch screen, because when making music, you can never have too much storage and screen real estate.

For getting MIDI and audio in and out of the computer I've chosen an M-Audio Ozonic FireWire audio and MIDI interface with a built-in 3-octave keyboard and control surface. It is by no means high end, but it will do the job. The Ozonic features four channels of 24-bit, 96 kHz audio I/O; a set of MIDI I/O ports; a 3-octave,

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Cubase SE and E-MU 0404	$199
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Cubase SX3 and Presonus Firepod	$1329
Cubase SX3 and MOTU Traveller	$1129
Cubase SX3, Groove Agent 2, Guitar Rig, Presonus Firepod	$1999
Cubase SX3 and Yamaha 01X	$2699
Cubase SX3 and RME Fireface	$2149
Digi002 Rack	$1399
Digi002 and Pro Tools LE	$2599
GigaStudio 3 Orchestra and RME HDSP9652	$1119
Nuendo 3 and RME HDSP9652	$2949
Sonar 4 Producer and E-MU Emulator X Studio	$999
Sonar 4 Studio and Behringer BCA2000	$539

Solution packages are available at these prices when you purchase a Carillon PC. All prices include VAT.

Due to the ever-changing nature of the personal computer industry, prices and specifications are subject to change without notice.

Please visit **www.carillonusa.com or call 866-4CARILL** for up-to-the-minute pricing and component info.

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