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OCTOBER 2005

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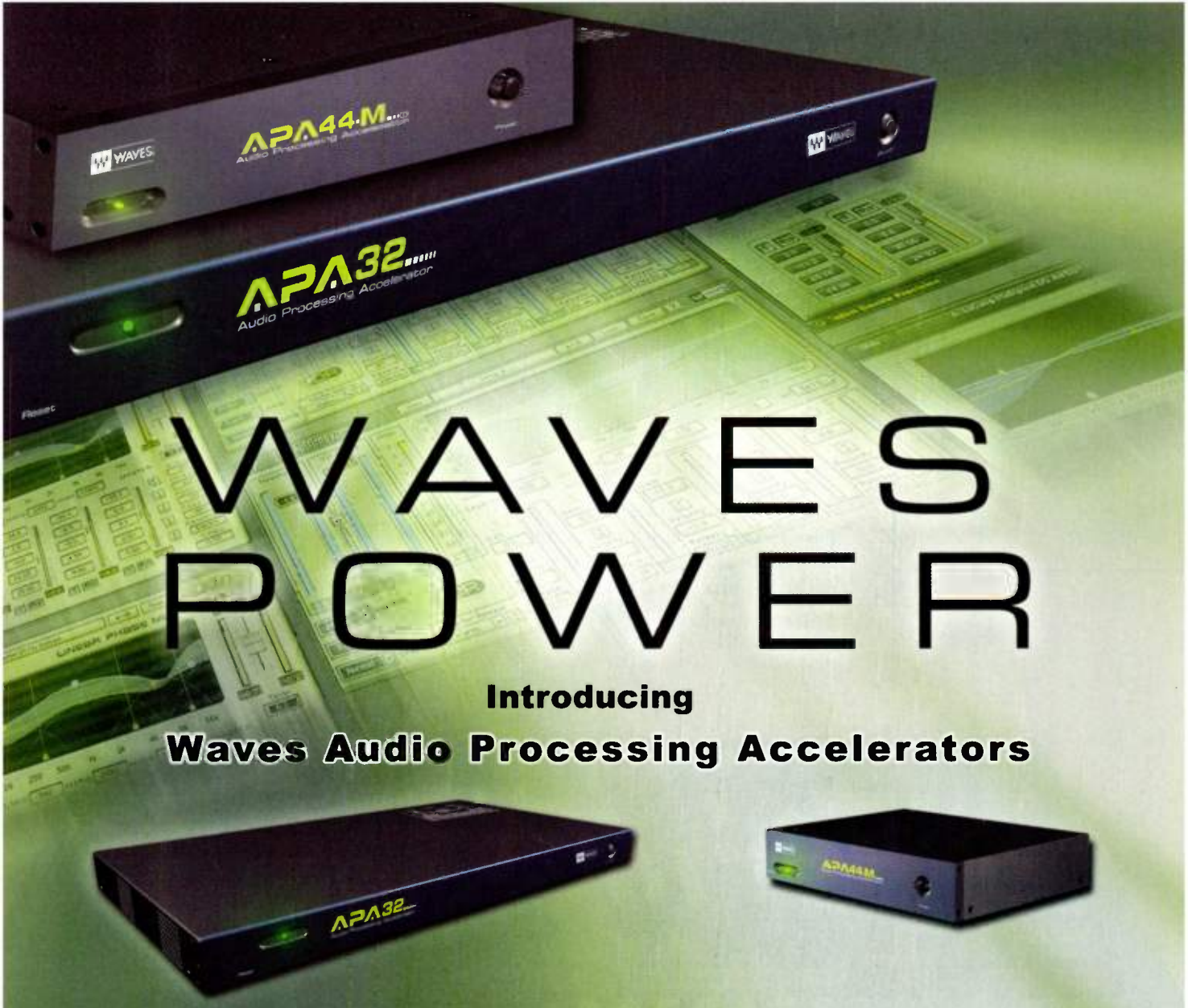

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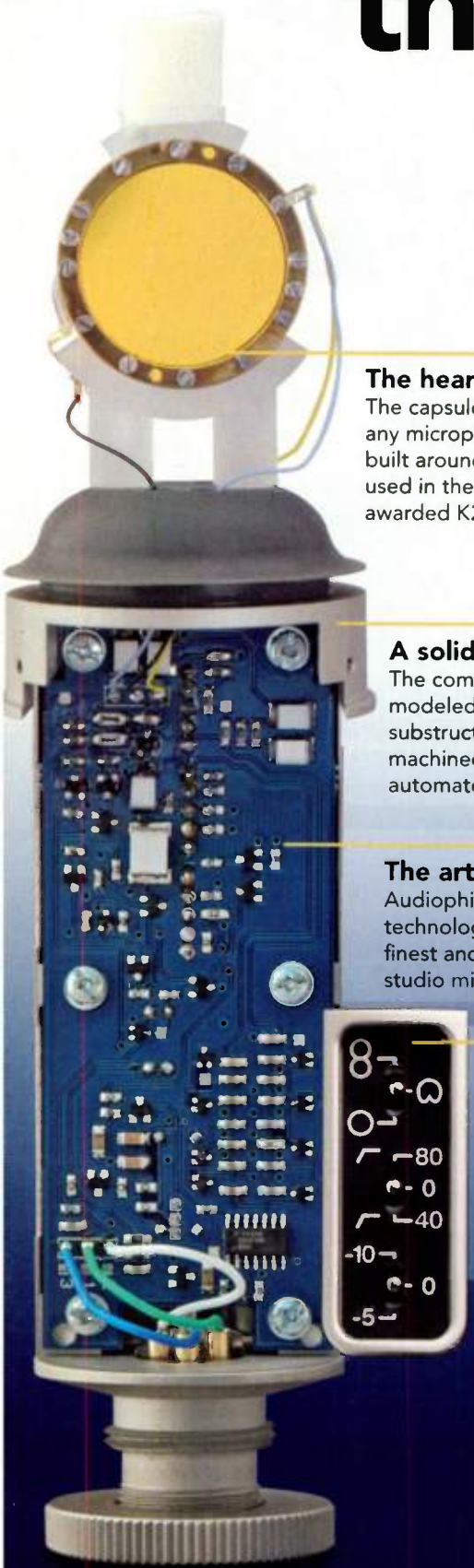

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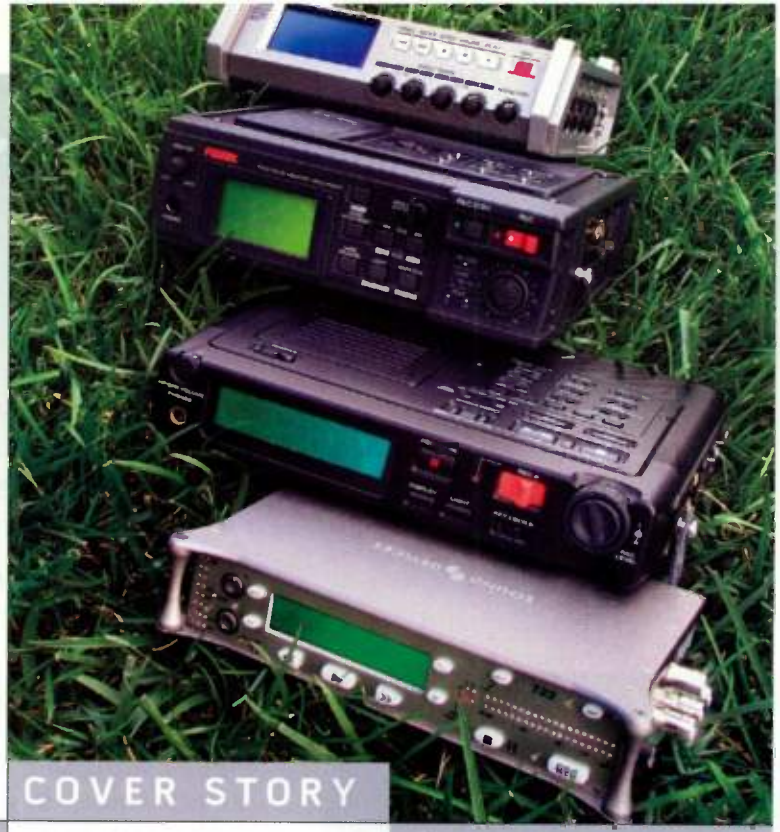

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FEATURES

COVER STORY

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DEPARTMENTS

Electronic Musician
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INSIDE

COLUMNS

REVIEWS

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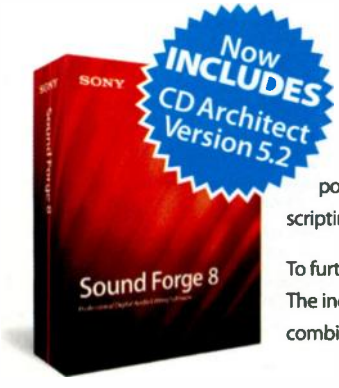

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A Legend Passes into History

The world of electronic music has been blessed with many brilliant pioneers. But of them all, one man became the veritable symbol of electronic music: Dr. Robert Moog, who passed away shortly before this issue went to press.

We EM editors have long had a special place in our hearts for Bob Moog. Aside from his many accomplishments, he was a fine and generous man who had a sharp sense of humor and a desire to help others succeed. Considering how famous he was, he was remarkably humble and unpretentious. He worked in a modest workshop, drove a beat-up old Toyota that his daughter had festooned with primitive psychedelic murals, and dressed like an engineer, without much regard for style. I often addressed him as "Uncle Bob," and many of us in the music industry thought of him that way. You'd be thrilled if your children grew up to be like Bob Moog.

JULIE BIRUM

And of course, he designed great products, especially synthesizers. Like many musicians and music lovers, I first became aware of Moog synthesizers thanks to Wendy Carlos's *Switched-on Bach* and, later, Keith Emerson's spectacular performances. But it was Jan Hammer's Minimoog leads with the Mahavishnu Orchestra that drove home the point, so to speak. Hammer is a superb musician, of course, but that *sound*—it was incredible!

In 1971, Moog sold Moog Music but kept working for the company until 1977. The next year, Bob's love of the Blue Ridge Mountains brought him to Asheville, North Carolina, where he founded a new company, Big Briar. A few years later, he began teaching electronic music at UNC-Asheville.

Initially, Bob ran Big Briar out of his home and focused on repairs, consulting, and custom work. Eventually, though, he stopped teaching and began hiring employees. He also served as VP of new-product research at Kurzweil from 1984 through 1989. Already a public figure, Bob became an informal spokesperson for music-education technology, giving interviews about the future of music education to a variety of print and broadcast journalists.

When Bob resumed manufacturing, he returned to his roots: Theremins. In 1995, he agreed to publish the plans for his new instrument in EM's "DIY: Build the EM Theremin" (see the February 1996 issue). I had the honor of working with Bob to develop the article; it took us almost a year, but when it was done, we had a classic story. (The Theremin project and Moog's EM obituary for his friend Professor Theremin, are available on our Web site at www.emusician.com.)

Once back in the manufacturing business, Bob produced a variety of excellent products, winning three EM Editors' Choice Awards. And after considerable hassle, he was able to regain the rights to Moog Music in 2002, and that's the company name today.

Yes, our industry has indeed been blessed with numerous brilliant trailblazers, all of whom deserve our deep appreciation. Bob Moog was among the greatest of them all, and his legacy will shine on as long as electronic musicians remember their roots.

Steve Oppenheimer
Editor in Chief

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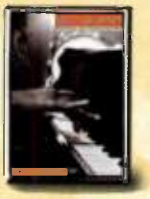

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LAURA WILLIAMS

Letters

Clean Slate

I enjoyed Larry the O's "Final Mix" column, "My Mind Is a Blank" (August 2005). As a composer and teacher, I've had to deal with blank-page syndrome. It's nice to have another opinion and a resource to pass along to students so that we all realize we aren't alone in our struggles with the creative process.

Mark Crawford
via email

I Don't Know But I Been Told

Julian McBrowne's "Do the Wrong Thing" (August 2005) is well written and full of great ideas. However, the article has an error in describing Jimmy Page's guitar tone on Led Zeppelin's "Black Dog." It's true that Page's guitar was plugged in to a mic preamp on a mixing console. But the guitar's tone was largely created by chaining two 1176 compressors in series. Andy Johns, the engineer on *Led Zeppelin IV,* describes the method he used in an online interview with Universal Audio's Webzine (www.uaudio.com/webzine/2003/april/index8.html). The following passage is taken from that interview:

"So, 'Black Dog' has a direct Gibson Les Paul Sunburst 52 or something going right into the mic amps on the mixer, which is going through two 1176s, and it sounds like some guy in the Albert Hall with a bunch of Marshalls. I couldn't have done it without the 1176s."

Because Johns says he "couldn't have done it without the 1176s," I'd hate to have EM's guitar-tone fanatics trying in vain to capture this tone with their tube-mic preamps alone.

Joseph Lemmer
via email

Joseph—Thanks for pointing that out. The 1176s were the key factors in creating the "Black Dog" tone, not "overloading the input," as was stated in the story. The interview with Johns that you cite (from the April 2003 issue of the UA Webzine) gives even more details. Page's creative signal path further reinforces the main point of the story: it's okay to buck convention when recording, as long as the results sound good.—Mike Levine

Phase In, Phase Out

Julian McBrowne's article "Do the Wrong Thing" (August 2005) offers an informative overview of nonstandard recording techniques.

However, when McBrowne discusses using an EQ or compressor as a send-return type effect, he does not mention problems with this technique that would be typical in a DAW environment. On my DAW, a Pro Tools|HD system, the resulting parallel monitoring of the dry signal with the effected one would produce intense comb filtering that results from phase shifting between the two signals. That is because of the slightly different processing delays for the dry and effected signals. Someone trying this technique for the first time might hear the phase shift and think it was part of the intended effect.

A number of work-arounds can restore the phase alignment, but readers should be made aware that it's a likely issue in DAW systems.

Jon Gordon
via email

Author Julian McBrowne replies: Jon—It's true that phase- and comb-filtering problems can arise with parallel monitoring in the send-return effects I described, but that occurs only in DAWs that lack plug-in delay compensation. Fortunately, your Pro Tools|HD system includes that feature, as do several other professional DAWs. Another work-around in a Pro Tools|HD system would be to use an RTAS plug-in, which has no processing delay. That is a nonissue for Pro Tools LE users and is one instance in which they have an advantage over their HD-equipped brethren.

Let There Be Drums

The article "Recording the Drums of Salvador" (July 2005) was really helpful for understanding how all those drums are recorded in a studio. The Web Clips that you provided online enabled me to compare which method of recording sounds best when one is recording large drum ensembles.

Articles like this one keep EM at the top of the game. Keep up the good work!

Dick Morningdew
via email

From the Ground Up

I read "Build a Desktop Studio on Any Budget" (July 2005) and the letters that responded to it ("Letters: Studio on a Budget" and "Letters: What Gives?", September 2005), and I think a couple of factors were left out. This discussion applies mostly to PCs. I realize that Macs require a different approach.

You can configure PCs to be effective recording machines if you do some research, such as figuring out which sound cards or audio interfaces will work best for you.


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Next Month in EM

COVER STORY

Ribbon-Mic Roundup

EM rounds up the currently available ribbon microphones for the personal-studio market, including mics from AEA, Apex, Coles, Nady, Oktava, Royer, and SM Pro Audio.

FEATURES

Game Sound-Design Tools and Techniques

We look at practical considerations when creating sound effects and music for today's electronic games.

Lost in Translation: Translating Between Sample Formats

Translating between sample-file formats can be dicey, and it's difficult to know beforehand where the problems will arise. EM discusses how to make your file translations go smoothly with one of the leading authorities on sample-file translation.

COLUMNS

Making Tracks: Automating Cubase SX

How to use mix automation in unusual ways in Steinberg's Cubase SX.

Sound Design Workshop: Daily Double

Digital techniques for creating doubled parts when the real thing isn't available.

Square One: Surround Speaker Configurations

The concepts, challenges, and standard practices of surround speaker setup.

...and much more!

Letters

You can do the actual construction yourself. Even relatively small towns have computer shops that are eager to build a machine to your requirements and can often improve on your own limited ideas. You then have the luxury of building a computer out of parts that are often of higher quality than what you get in a prefab box. If you guess incorrectly about a component, you can replace the inappropriate part with a better one.

Many vendors use the cheapest power supplies they can, given the price pressures of the marketplace. I've had two power supplies fail—one of them catastrophically. I now spend extra money on that humble unit.

When must-have software is written to take advantage of new processing technology, you can upgrade your PC to use it properly. The processing speeds of my two PCs have gone from 533 MHz to 2 GHz and 833 MHz to 1.5 GHz, respectively, and memory has quadrupled.

The rapid growth in hard drive space over the last few years is a great example of the ability to upgrade. My recording computer started with a single 20 GB drive. Then I added a second 30 GB drive, and it now has two internal 40 GB drives and 200 GB in external drives.

Then there is the separate but related issue of integrating your computer with the gear that you already have. I started with the computer, some mics, and an analog mixer and slowly stirred in a digital mixer, two different sets of monitor speakers, and various subs. I ended up with a setup that uses ADAT Lightpipe I/O, separate preamps, and tons of other gear.

Articles on turnkey systems disregard the integration of existing hardware, software, and whatnot. How about doing one on the best ways to upgrade your PC, identifying weak links, and some real nuts-and-bolts advice?

Keep up the good work. Great magazine.

John Weigel
Nacogdoches, Texas

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or email us at emeditorial@primediabusiness.com.
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From the Vault

Thank you for putting digital versions of EM's back issues online. I've been subscribing to the magazine for almost 15 years, and it's impossible for me to find things in the piles of old magazines I have. Are there any plans to make issues prior to September 1999 available?

Thom Cox
Boston, Massachusetts

Thom—It has long been a dream of mine to have the entire back catalog of EM available in electronic form, preferably PDF rather than the HTML we currently deliver. However, it would not be a simple matter, so it might remain an unfulfilled dream.

It is possible to create online versions as far back as late 1997, because we still have the page-layout files for those issues. But we don't still have the published files for earlier issues, so to produce electronic versions, we'd have to scan the magazine and perform optical character recognition (OCR) on the scans, then manually fix any OCR glitches. That's how we prepared the pre-1997 EM Classic stories at www.emusician.com, such as the Thomas Dolby and Frank Zappa interviews from 1986. However, that is very time-consuming, and we don't have the resources to do it on a larger scale, so we'd have to pay a service to do that. Unless readers were willing to pay for an electronic EM library, I doubt we could financially justify it. But never say never!—Steve O EM

/new_instruments/

This is the guitar onslaught you've been waiting for! A virtual instrument guitar done right, with over 11 gigs of multiple amps and levels of distortion, mono and stereo files. Loops that can be time stretched to match the tempo of your tune automatically, Sustained notes, chugs, hammer-ons, bends and lots more, so you can create your own guitar parts. Listen at www.bigfishaudio.com/ragingguitars

$299.95 Kontakt Player (AU, VSTi, DXi2, RTAS - Mac, PC Standalone Application)

/new_loops/

Rock Bass

$49.95
AIFF/Apple Loops/
REX/WAV

You may have other bass sample CD's to choose from but none will compare with the precision and character of this library. From Underground Rock to Brit Rock it's all here for your sampling pleasure. If you desire a pro rock bass player who never fails to come to a session with a fresh new hook or groove, then look no further.

Jazz Quartet

$99.95
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Apple Loops

Over 80 Construction kits of the sophisticated, satisfying sounds of piano, bass, drums and guitar, all together in perfect harmony. Whether you need a cozy and intimate setting, or a grand concert hall feel, these recordings will give you an authentic jazz environment. Kits from 52 to 148 bpm.

Hip Hop High

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WAV/REX/AIFF/
Apple Loops

Fresh tracks, new sounds, and gettin' your head bobbin' is what "Hip Hop High" is all about. Hip Hop High will take you back and then take you places you've never been. So mix it up with construction kits ranging from 86-100 BPM. Over one gig of fresh material.

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Brain: One Stroke Done

$199.95 24-bit multitrack ProTools sessions
$99.95 WAV/REX/
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Bryan "Brain" Mantia has toured worldwide with Primus, Guns&Roses, Vanessa Carlton, and Tom Waits. One Stroke Done is a killer collection of multi-track drum performances (or choose the stereo-mixed version in WAV/REX/Apple Loops). From Funk and Hip Hop, to Rock, Soul, Alternative and Underground.

Funk City

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Funked-up construction kits featuring slammin' drums, groovin' percussion, slappin' bass, greazy funk guitar, slippery synths, vocal bits, and one big-ass horn section! If you're looking for old school and nu school Funk & Soul, you've come to the right place.

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Greg Adams' Big Band Brass

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LAURA WILLIAMS

Letters

Clean Slate

I enjoyed Larry the O's "Final Mix" column, "My Mind Is a Blank" (August 2005). As a composer and teacher, I've had to deal with blank-page syndrome. It's nice to have another opinion and a resource to pass along to students so that we all realize we aren't alone in our struggles with the creative process.

Mark Crawford
via email

I Don't Know But I Been Told

Julian McBrowne's "Do the Wrong Thing" (August 2005) is well written and full of great ideas. However, the article has an error in describing Jimmy Page's guitar tone on Led Zeppelin's "Black Dog." It's true that Page's guitar was plugged in to a mic preamp on a mixing console. But the guitar's tone was largely created by chaining two 1176 compressors in series. Andy Johns, the engineer on *Led Zeppelin IV,* describes the method he used in an online interview with Universal Audio's Webzine (www.uaudio.com/webzine/2003/april/index8.html). The following passage is taken from that interview:

"So, 'Black Dog' has a direct Gibson Les Paul Sunburst 52 or something going right into the mic amps on the mixer, which is going through two 1176s, and it sounds like some guy in the Albert Hall with a bunch of Marshalls. I couldn't have done it without the 1176s."

Because Johns says he "couldn't have done it without the 1176s," I'd hate to have EM's guitar-tone fanatics trying in vain to capture this tone with their tube-mic preamps alone.

Joseph Lemmer
via email

Joseph—Thanks for pointing that out. The 1176s were the key factors in creating the "Black Dog" tone, not "overloading the input," as was stated in the story. The interview with Johns that you cite (from the April 2003 issue of the UA Webzine) gives even more details. Page's creative signal path further reinforces the main point of the story: it's okay to buck convention when recording, as long as the results sound good.—Mike Levine

Phase In, Phase Out

Julian McBrowne's article "Do the Wrong Thing" (August 2005) offers an informative overview of nonstandard recording techniques.

However, when McBrowne discusses using an EQ or compressor as a send-return type effect, he does not mention problems with this technique that would be typical in a DAW environment. On my DAW, a Pro Tools|HD system, the resulting parallel monitoring of the dry signal with the effected one would produce intense comb filtering that results from phase shifting between the two signals. That is because of the slightly different processing delays for the dry and effected signals. Someone trying this technique for the first time might hear the phase shift and think it was part of the intended effect.

A number of work-arounds can restore the phase alignment, but readers should be made aware that it's a likely issue in DAW systems.

Jon Gordon
via email

Author Julian McBrowne replies: Jon—It's true that phase- and comb-filtering problems can arise with parallel monitoring in the send-return effects I described, but that occurs only in DAWs that lack plug-in delay compensation. Fortunately, your Pro Tools|HD system includes that feature, as do several other professional DAWs. Another work-around in a Pro Tools|HD system would be to use an RTAS plug-in, which has no processing delay. That is a nonissue for Pro Tools LE users and is one instance in which they have an advantage over their HD-equipped brethren.

Let There Be Drums

The article "Recording the Drums of Salvador" (July 2005) was really helpful for understanding how all those drums are recorded in a studio. The Web Clips that you provided online enabled me to compare which method of recording sounds best when one is recording large drum ensembles.

Articles like this one keep EM at the top of the game. Keep up the good work!

Dick Morningdew
via email

From the Ground Up

I read "Build a Desktop Studio on Any Budget" (July 2005) and the letters that responded to it ("Letters: Studio on a Budget" and "Letters: What Gives?", September 2005), and I think a couple of factors were left out. This discussion applies mostly to PCs. I realize that Macs require a different approach.

You can configure PCs to be effective recording machines if you do some research, such as figuring out which sound cards or audio interfaces will work best for you.

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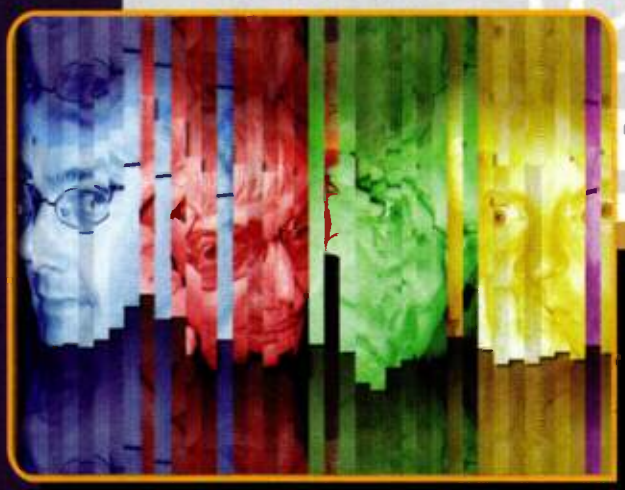

EMspotlight

Getting Down to Business with Negativland

Picking up where Dada and Fluxus left off, Negativland creates outrageous audio collages by appropriating sounds from broadcast radio and television, shortwave, police scanners, and other media. Its work exposes the hypocrisy of mainstream American and challenges the limits of intellectual property ownership. In this exclusive EM interview, members of the band discuss long-distance collaboration, fair use, and their latest release, *No Business* (Seeland, 2005). By Gino Robair.

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

The 2005 summer NAMM show is one of the largest annual musical-instrument expos in the United States. Visit emusician.com for Associate Editor Geary Yelton'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 Gino Robair has selected his favorite EM articles about drum recording. In addition to covering the basics, the articles focus on getting a good-bass drum sound and coaxing new and unusual timbres from everyday percussion.

emusician.com/editorspicks

EM news

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

emusician.com/news

EM newsletter

Sign up for our free online newsletter, eMusician Xtra, for up-to-the-minute information about new products, software upgrades, and more.

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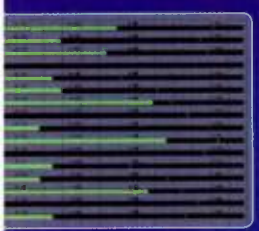

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When setting levels, T2 can turn the full screen into a giant meter bridge with the press of a button.

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QuickTime

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In addition to Tracktion's ReWire host functionality for use with applications like Reason, T2 supports MIDI Time Code (MTC) and MIDI Machine Control (MMC) input/output, plus MIDI Clock output.

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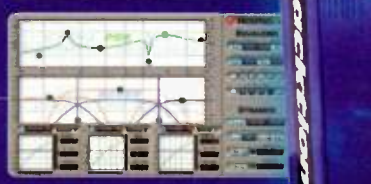
Much has been made about the "summing bus" in DAW software. Tracktion 2 features a new high-definition 64-bit mixing engine for uncompromising sound.

YOU CAN'T PUT A PRICE ON FREEDOM. BUT HOW DOES $199* STRIKE YOU?

Amplitube LE


SampleTank SE

RMIV


Final Mix

Amplitube LE, SampleTank SE, Linplug RMIV and Final Mix: just four of over 30 plug-ins included with Tracktion 2.

There's nothing like the creative freedom that comes with having a complete suite of music production tools at your fingertips. Unfortunately, most comprehensive music software packages come with steep learning curves and price tags upwards of $500. Until now.

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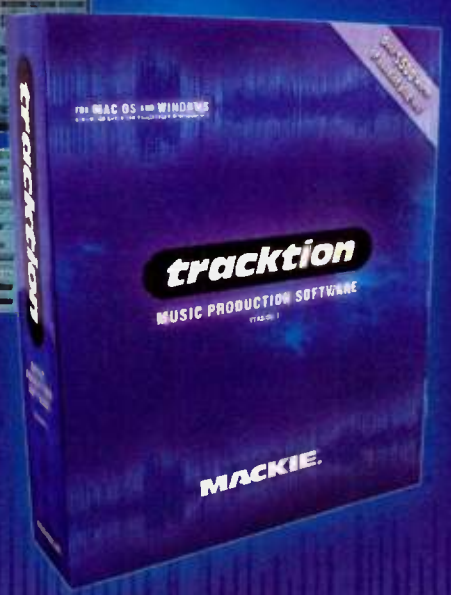

With bundled Amplitube™ LE Guitar Amp Simulator and Sampletank™ SE Sample Player, the LinPlug RMIV™ drum machine, the reFX Slayer 2™ guitar and bass plug-in, and a full suite of Mackie Mixing and Mastering tools, you'll never lack the right software for the job at hand.

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By Geary Yelton

M-Audio MicroTrack 24/96

Its name makes it sound like an electric shaver, and it looks a bit like one too. But the MicroTrack 24/96 ($499.95) is a pocket-size stereo digital recorder from M-Audio (www.m-audio.com). It records 16- or 24-bit PCM audio at rates as high as 96 kHz, as well as 96 to 320 Kbps MP3s at rates as high as 48 kHz. Its storage medium is a CompactFlash card or a microdrive (a 64 MB card is included).

Although the MicroTrack 24/96 is smaller and lighter than an Apple iPod, it has loads of gozintas and gozoutas: balanced ¼-inch TRS inputs with a mic/line switch, mic preamps with phantom power, a ⅛-inch TRS input for the included stereo electret mic, coaxial S/PDIF, RCA line outputs, a ⅛-inch stereo headphone jack, and USB 2.0 for drag-and-drop audio transfer. Connecting it to your computer even recharges the lithium-ion battery, which lasts as long as eight hours.

Body Glove Instrument Cases

Applying years of experience manufacturing wetsuits, snorkeling gear, and sunglasses, Body Glove is now making hybrid soft/hard shell cases for guitar, keyboards, and cymbals. Distributed by eBlitz Audio Labs (www.eblitzaudiolabs.com), Body Glove's cases combine the light weight of soft cases with the durability and protection of hard cases. All feature high-density nylon exteriors, moisture-wicking interiors, ABS plastic reinforcement panels, and high-grade industrial zippers.

Guitar cases ($129) come is eight sizes, each with shoulder and back straps, multiple pockets and pouches, and a four-point backpack harness with lumbar and waist support. Keyboard cases (priced from $179 to $249) come in five sizes: for 61-note instruments and controllers, for 76-note instruments, and for 88-note instruments and controllers. Each is double-stitched with inline skate wheels, a unique keyboard-stand carrying harness, and storage pockets for footpedals and switches, cables, and accessories. Cymbal cases ($89 to $129) have storage for eight cymbals and sleeves for sticks, drum keys, and accessories. All Body Glove cases come with a limited lifetime warranty.

Yamaha S90 ES

Yamaha (www.yamahasynth.com) recently introduced the S90 ES ($2,599), an 88-note, weighted-action keyboard workstation. It combines new features with those of the original S90 and the Motif ES series, including the entire ES wave ROM. The 48-pound instrument has 640 presets, 256 user locations, 65 drum kits, and 128-note polyphony. With more than twice the wave memory of the S90, the S90 ES offers a 53 MB sampled grand piano and a full range of PCM synthesis capabilities. Adding the optional FC3 footpedal gives you half-dampening control of the piano sounds, and an insertion effect simulates soundboard resonance.

A pair of USB ports provides computer and external storage connectivity. Although the S90 ES has no internal MIDI recorder, it will play MIDI files stored on a USB drive. Three PLG slots let you add optional plug-in expansion cards, and an optional mLAN card turns the S90 ES into a 16-in/8-out audio interface for your computer. You can also download editing software that runs standalone or inside a Studio Connections-compatible host.

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FLEXIBILITY

Waves GTR

The latest contender in the guitar-amp emulation wars comes from a nearly two-year collaboration between plug-in pioneer Waves (www.waves.com) and master guitar maker Paul Reed Smith (PRS). Waves GTR (Mac/Win, $600 native, $1,200 TDM), which stands for Guitar Tool Rack, is a software and hardware hybrid. GTR's software components consist of Amp, which models seven amps, six mics, and various speaker cabinets; Stomp, which simulates an arsenal of 23 stompboxes using a MIDI-controllable virtual pedalboard; and Tuner, which you can set to standard or alternate tunings.

Designed by PRS, the Waves/PRS Guitar Interface is a high-impedance direct box with level-matching circuitry. By addressing the impedance mismatch that most audio interfaces ignore, GTR can respond to your playing much as a real guitar amp does. The hardware interface has balanced and unbalanced mic and line outputs, but no A/D converter. A free video DVD about GTR is available from Waves.

REV UP

CAKEWALK SONAR HOME STUDIO 4

Cakewalk (www.cakewalk.com) has announced a major upgrade to both editions of its entry-level sequencer Home Studio and made them part of the Sonar family. Now dubbed Sonar Home Studio 4 (Win, $149) and Sonar Home Studio 4 XL ($229), the new versions offer improvements you might expect only in pro-level sequencers, such as 24-bit, 192 kHz support; as many as 64 audio tracks and unlimited MIDI tracks; and as many as 16 simultaneous mix buses.

New Track Presets let you set up and recall an assortment of templates that store mix, routing, and effects settings. Integrated music notation tools let you transcribe and print musical scores. The Master Control Toolbar gives you quick access to all the most-used views and functions. For burning CDs of your recordings, Pyro Express is bundled with Sonar Home Studio 4 and Sonar Home Studio 4 XL. You also get ReWire 2.0 support, hundreds of Acid and MIDI loops, and the same loop-editing functions found in Sonar 4.

In addition to all those features, the XL version has Reverb XL, two PowerFX content CDs, and three new virtual instruments: the analog-modeling Square I, the SoundFont player PowerFX Dyad, and the sophisticated REX player RXP. Both editions of Sonar Home Studio are available in English, French, German, or Spanish editions. Upgrades from previous versions are $59.

FINALE 2006

MakeMusic (www.finalemusic.com) is shipping Finale 2006 (Mac/Win, $600, upgrades $99 to 149), a major revision of its flagship music notation program. Among its many improvements, Finale 2006 features Native Instruments Kontakt Player paired with Garritan Personal Orchestra Finale Edition, which furnishes more than 100 instrumental sounds. A new feature called Studio View integrates sequencing tools into each musical staff, making it possible for users to control recording, panning, volume, and other parameters in real time, and for educators to teach composition and arranging using standard music notation.

TempoTap allows you to control and automatically record nuances such as accelerandi, ritardandi, and rubati while listening to a transcription. New tools such as Engraver Copy and Paste simplify editing, and copy-and-paste settings are saved automatically. Additional enhancements in Finale 2006 include mid-measure playback and repeats, chord analysis, Music XML import and export, and support for Native Instruments plug-ins.

The Pro in your Tools

The best stereo tools, now for TDM

It's the announcement Pro Tools HD users have been waiting for: Stereo reverbs and mastering tools from TC Electronic's flagship System 6000 available for TDM!

Throughout the years TC has developed superior technology that requires seriously dedicated and sophisticated hardware. Today, Digidesign's HD DSP hardware provides a processing infrastructure powerful enough to host a choice selection of stereo reverbs and mastering tools from TC's flagship, the System 6000. Go to *www.tcelectronic.com* for more details on how to get the Pro in your Tools.

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FXpansion Guru

What do you get when you cross a polyrhythmic drum machine, a beat slicer, an analog-style sequencer, and a multitimbral sampler? Guru (Mac/Win, $249), from FXpansion (www.fxpansion.com), is a fresh new software beatbox workstation developed in cooperation with Devine Machine. Guru can simultaneously play as many as eight independent Engines, each with 16 pads to trigger audio events; a 128-event sequencer; 24 MIDI-triggered patterns; three aux effects; and a master effects processor. You can enter notes and other data using step-sequencing techniques or by recording in real time. Guru's SmartSlice feature automatically slices and maps sampled drum loops by detecting their beat transients and pitch ranges. You can even extract the groove from one audio or MIDI file and apply it to another.

Guru's Pad Editor gives you control over playback parameters for each sample, including tuning, panning, start and end points, 8-layer Velocity crossfades, choke groups, amplitude and effects envelopes, and resonant multimode filtering. In addition to hundreds of MIDI patterns, Guru comes with more than 350 drum kits, 1,300 audio loops, and 5,000 one-shot samples—more than 2 GB of third-party content in all. You can find audio demos and instructive video clips on FXpansion's Web site.

Download of the Month

Tobybear MonsterBag (Win)

MonsterBag ($45), from Tobybear Productions (www.tobybear.de) is a collection of 14 VST effects plug-ins for Windows. Despite their Japanese-gumball-machine appearance, MonsterBag delivers some serious sound-mangling effects.

The MonsterBag plug-ins consist of three modulated filters, four delays, six special distortion effects, and a gate effect. Many have two independent parameter sets that you can switch between, morph between, or apply to separate sides of a stereo mix. Most also allow some degree of MIDI remote control and have one or more tempo-synchronizable LFOs for modulating their parameters.

AlliGator (shown here) is a gating plug-in with some interesting twists. You can switch between two independent gate circuits or apply them in stereo. Settings for gate level, slope, width, and phase make for very flexible gate sequencing. The gate can control volume, pan, or the cutoff and resonance of an internal filter. Gating can be always active or toggled by incoming MIDI Note messages, with adjustable fade-in and -out.

I think of RedRack as a 16-tap delay line on steroids. It comes in stereo and 8-output versions (for hosts that support multiple outputs). Each tap has settings for delay, feedback, level, and pan position as well as cutoff and resonance for the tap's dedicated multimode filter. Each of RedRack's two LFOs can be routed, per channel, to any parameter. In a nice touch, each channel's input can be taken from the left or right channel, or from their sum, difference, or product as well as from inversions thereof. Hearing is believing (see **Web Clip 1**).

RoboBear X is MonsterBag's most out-there distortion effect. Dubbed a granular sonic decomposer, it combines control over grain size, pitch, and feedback with multimode filtering and three varieties of ring modulation. RoboBear's parameters are only vaguely described, but its cute little randomize button can help you out.

Each of the plug-ins deserves an audition, and even if you find only one you like, MonsterBag is well worth the price. You can download save-disabled demos from the Tobybear Web site.

EM WEB CLIPS

—Len Sasso

Korg D3200

The cost-per-track ratio of hard-disk recording keeps falling. The newest member of the D-Series family of portable digital studios from Korg (www.korg.com) is the D3200 ($1,799), which supports 32-track playback and 16- or 24-bit recording at 44.1 or 48 kHz. Twelve balanced ¼-inch inputs—eight paired with XLRs that supply 48V phantom power—let you record as many as 12 tracks simultaneously. Virtual tracks give the D3200 a maximum track count of 272 per song, all with full editing capabilities such as copy, normalize, reverse, and fade, as well as time stretching, noise reduction, and 16 levels of undo and redo.

ClickPoint, an exclusive 3-axis fingertip navigation tool, and a matrix of multipurpose control knobs provide quick and intuitive operation, according to Korg. In addition to 32 recorder channels, the D3200's mixer section gives you 12 submix channels for a total of 44 input channels. You can recall 32 songs and store fader, EQ, pan, and effects settings as one of 100 scenes per song. The D3200 has an internal 40 GB hard disk, a CD-RW drive, USB 2.0 connectivity, support for MTC and MMC, and 11 onboard effects. It also introduces Session Drums, a real-time method of creating rhythm tracks without programming.

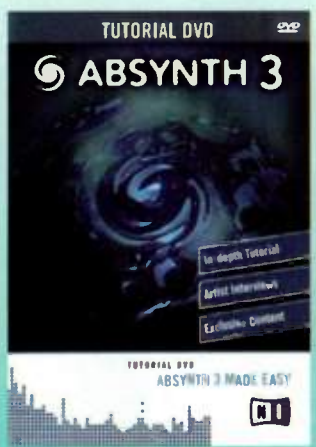
Sony Hi-MD Recorders

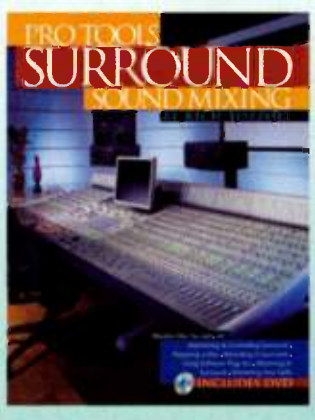
At summer NAMM, (www.sony.com) Sony unveiled a new digital storage format called Hi-MD, which can record as much as 94 minutes of uncompressed 16-bit, 44.1 kHz PCM audio on a single 1 GB high-density MiniDisc. Using ATRAC3plus compression, its maximum storage capacity is about 34 hours, and so is the maximum battery life. The Hi-MD format also plays back conventional ATRAC and MP3 files.

Two models are available: the MZ-M10 ($329) has a 5-line LCD display, and the MZ-M100 ($439) has a larger 6-line electroluminescent display. Both models include earbuds, a long-life rechargeable battery, and an ECM-DS70P stereo electret condenser mic. A USB 1.1 connection lets you transfer recordings to and from your computer, where you can edit them and store them as WAV files. For exchanging audio files, SonicStage (Win) and Hi-MD.WAV Importer (Mac) are included. You can also use the recorders to store your computer's data files.

Get Smart

Although it isn't a video DVD, most of *Absynth 3 Tutorial DVD* (Mac/Win, $59), from **Native Instruments** (www.native-instruments.com), consists of video clips that explore in depth the unique semi-modular soft synth. By taking you on a step-by-step journey—beginning with an overview of patches and controllers, continuing through sampling and effects, and working up to more advanced topics such as multiple LFOs and MIDI note scaling—host Brian Smith reveals the inner workings of Absynth in enough detail to give you a solid working knowledge. Along the way, you'll have opportunities to interactively explore the concepts he presents. The lessons wrap up with lectures presented by Absynth's creator, Brian Clevinger. Also on the disc are banks of sounds by Clevinger and others, and a collection of tutorial presets.





It's reasonable to assume that studios built around Digidesign Pro Tools are the most likely to embrace surround production. A new book from **Backbeat Books** (www.backbeatbooks.com) is a practical resource for learning the tricks of that trade. *Pro Tools Surround Sound Mixing* ($34.95), by Rich Tozzoli, takes you on a guided tour that covers preproduction, setup, recording, monitoring, mixing, and delivery, with an emphasis on understanding concepts and solving problems specific to surround production. One chapter looks at software plug-ins and another explains various surround formats. An included DVD supplies 13 audio examples in Dolby Digital AC-3 format.

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NATIVE INSTRUMENTS
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Yellow Tools Candy

After years of development, Yellow Tools (www.yellowtools.com) has released Candy (Mac/Win, $399), distributed by EastWest. Candy is a virtual sax performance instrument built around a well-organized 9 GB sample library. Harnessing the same MVI sound engine as Yellow Tools Culture and Majestic, Candy is designed for CPU efficiency and flexible operation.

Candy lets you play as many as 8 simultaneous layers routed to 16 audio outputs, with easy switching between different instruments and hands-on control of each keygroup's attack time. Choose from soprano, alto, tenor, baritone, or bass sax with an assortment of mouthpieces and reeds. You can connect playing styles and techniques to suit the music in your production. Candy runs standalone or as a plug-in for VST, RTAS, DirectX, or Audio Units hosts.

MOTU Symphonic Instrument

The newest virtual instrument plug-in from MOTU (www.motu.com) is the cleverly named Symphonic Instrument (Mac/Win, $295), which features an 8 GB orchestral sample library that's compatible with MachFive. Based on Ultimate Sound Bank's cross-platform UVI Engine, the plug-in supports MAS, VST, RTAS, HTDM, Audio Units, and DirectX formats. Symphonic Instrument has 500 instrument presets, 200 ensembles, and 26 sampled spaces for the onboard convolution reverb. To conserve computer resources, conventional reverb is also available.

You can load as many as 16 individual instruments and save them as a group to create your own multitimbral ensembles. An expert mode lets you load and layer sounds on the fly using key switches, note ranges, or Velocity ranges. For real-time control, you can map most parameters to external MIDI controllers, and scroll-wheel support lets you quickly adjust parameters or select timbres. If you'd like to know more, you can hear audio examples on MOTU's Web site.

Ueberschall Liquid Instruments Saxophone

One instrument that's always been tough to simulate is the saxophone. Finally, two new virtual instruments rise to the challenge of producing realistic sax performances with your computer. One of them is Yellow Tools Candy, and the other is Liquid Instruments Saxophone (Mac/Win $199.95), created by Ueberschall and distributed by EastWest (www.soundsonline.com). Using audio-manipulation technology developed for Celemony Melodyne, Liquid Instruments Saxophone (LIS) gives you new techniques for controlling sax phrasing and timbre. Now you can quickly edit pitches, formants, tempo, and other aspects of sampled sax parts.

Because it's based on Melodyne, LIS lets you control audio data as if it were MIDI. You can transpose notes within a phrase, edit tempo and key signature, and select from a range of musical scales, all in real time. The audio material in LIS was performed by David Milzow, playing a variety of saxophones with vintage mouthpieces and encompassing styles ranging from pop and funk to bebop and R&B.

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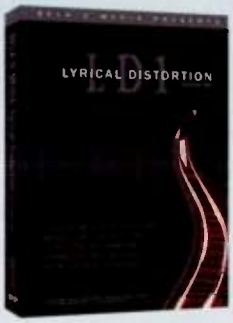
Sound Advice

Sonic Implants (www.sonicimplants.com) has brought together four massive sample libraries in *Complete Symphonic Collection* ($2,995). Encompassing *Symphonic Strings Collection*, *Brass Collection*, *Woodwinds Collection*, and *Percussion Collection*, this 80 GB compilation ships on 20 DVDs exclusively for Tascam GigaStudio 3.1 (GS3). The collection takes advantage of GS3's legato mode, Dynamic Expression filter, and Portamento Reshaping filter (which Sonic Implants helped develop) to enhance the realism of your performances. The culmination of years of work by hundreds of people, it features recordings of orchestral instruments played by members of the Boston Pops and Ballet orchestras, as well as an assortment of impulse responses for GigaPulse.

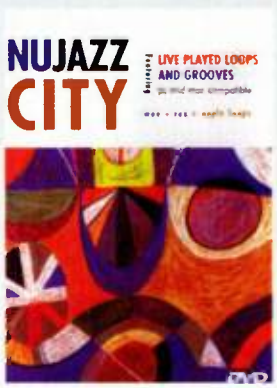
Using Native Instruments Intakt Instrument as a front end, **Zero-G's** *Beats Working in Cuba* (Mac/Win, $399, www.soundsonline.com) features performances by some of Cuba's finest percussionists in a variety of Latin musical styles. More than 8 GB of 24-bit samples supply 12 Afro/Hispanic rhythms that include not only the usual Mambo, Cha Cha, and Bolero, but also Danzon, Guajira Son, Conga Habanera, and other less familiar styles. Recorded entirely in Havana, hundreds of multitrack grooves and individual beats are yours to command, with variations that let you select modern or traditional arrangements. *Beats Working in Cuba* runs standalone or as a VST, RTAS, Audio Units, or DirectX plug-in.

World-class synthesist Ian Boddy, creator of the acclaimed virtual sound module Morphology, has done it again with *Analogue Sequencer Loops* (Mac/Win, $219), from **Zero-G** (www.soundsonline). Employing all three sampler modes in Intakt Instrument, ASL contains more than 1.5 GB of 24-bit samples recorded from an arsenal of vintage analog synthesizers and sequencers such as the Moog IIIC, Roland System 100M, and Doepfer A-100. Among the sound categories are pitched and sliced Melodic Sequences, Hi-hat & Noise Loops, and Sine & Pure Sequences, all at tempos from 90 to 150 bpm.



Forging ahead in the quest for authentic electric guitar samples, **Bela D Media** (www.beladmedia.com) is shipping *Lyrical Distortion* ($149) for Kontakt and GigaStudio 3. This 3.6 GB DVD features a 1994 Paul Reed Smith Custom 22 played through a Mesa/Boogie Dual Rectifier amp. Picked, hammer-on, and palm-muted techniques were used to play single notes and power chords. For greater realism, you can layer samples of release triggers with sustained single notes. During playback, random cycling helps to avoid telltale repetition by alternating between four different samples for every note. All samples were recorded with no vibrato.

Two new sample libraries from **Big Fish Audio** (www.bigfishaudio) cover a lot of ground in the jazz idiom. *Jazz Quartet* ($99) concentrates on a traditional jazz ensemble, with dozens of loops and phrases played on acoustic piano, electric guitar, upright bass, and drums. Individual tracks are presented in construction-kit format, supplying audio material you can assemble into complete songs, at tempos ranging from 52 to 148 bpm.



Big Fish Audio's *Nu Jazz City* ($69) comprises 25 construction kits that feature modern styles such as acid jazz, Latin jazz, and '70s-style fusion. A remarkable variety of grooves are played on Fender Rhodes, synthesizer, electric guitar, alto sax, trumpet, and many other instruments in assorted keys and tempos. Featured musicians have recorded with such big names as Miles Davis, Wynton Marsalis, and the Gil Evans Orchestra. Both libraries are formatted as Apple Loops, REX, and WAV files. EM

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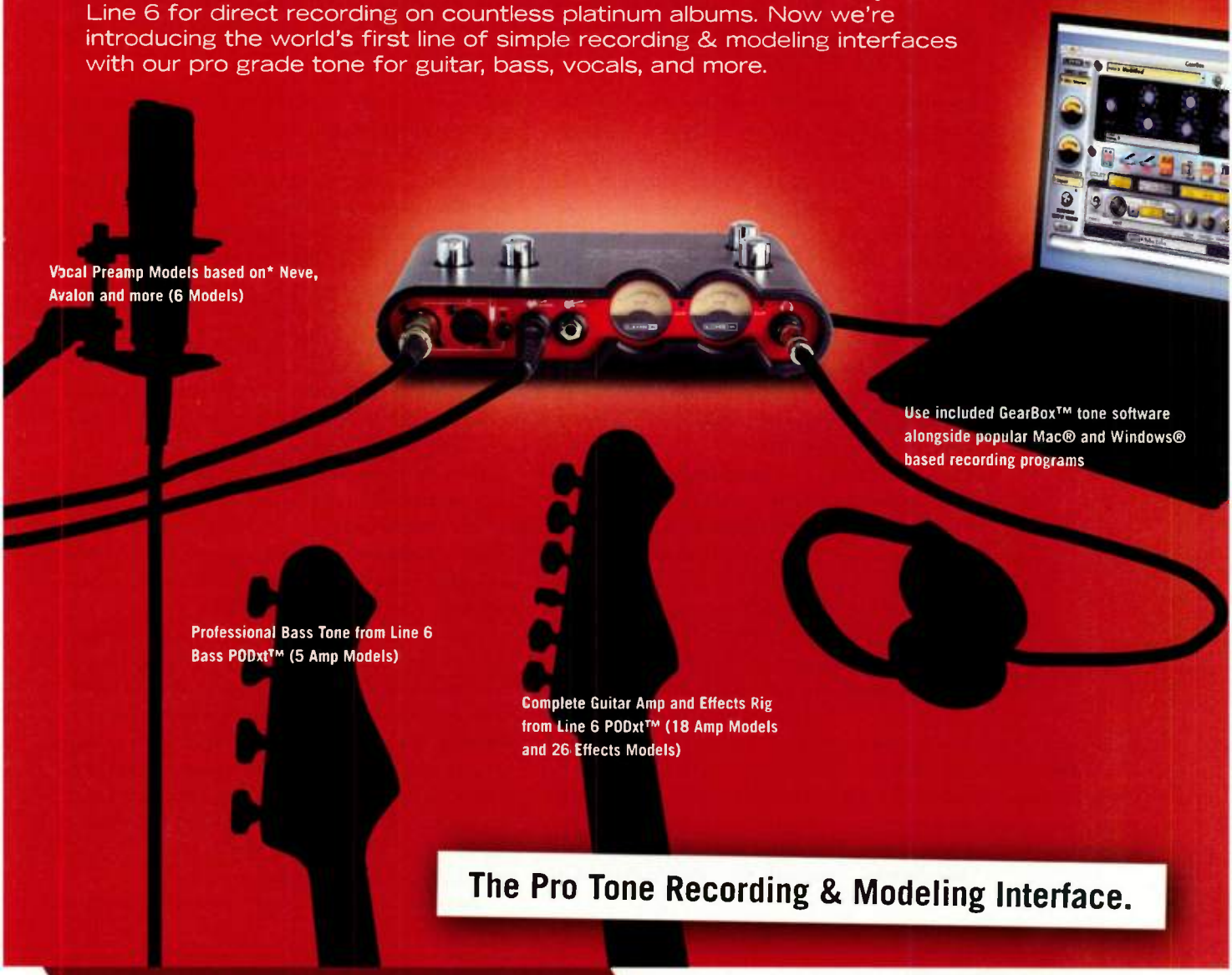

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LINE 6

Molecular Memory

By Scott Wilkinson

Smaller is better.

Electronic musicians are familiar with some of the prefixes that indicate data-storage capacity. For example, the maximum amount of RAM in the original IBM PC was a whopping 640 kilobytes (thousands or 10^3 bytes). Today, of course, RAM is measured in megabytes (10^6 bytes) and gigabytes (10^9 bytes), and hard drives and RAID arrays are now available with one or more terabytes (10^{12} bytes) of capacity.

If we learn anything from history, it should be that the need for storage capacity inevitably increases over time, and new prefixes must be added to the vernacular once in a while. So what comes after terabytes? The next step is petabytes (10^{15}), followed by exabytes (10^{18}), zettabytes (10^{21}), and yottabytes (10^{24}). Who could possibly use so much memory? That's what they asked about the original IBM PC, and look how far we've come since then.

One company that understands this better than most is ZettaCore (www.zettacore.com), a startup based in Denver, Colorado. Founded in 2001 by scientists from the University of California at Riverside and North Carolina State University, ZettaCore is developing molecular memory—that is, digital memory using individual molecules to store bits of data. This approach has the potential to create memory devices that are far smaller, with far greater density, and that use far less power than conventional semiconductor technology can achieve.

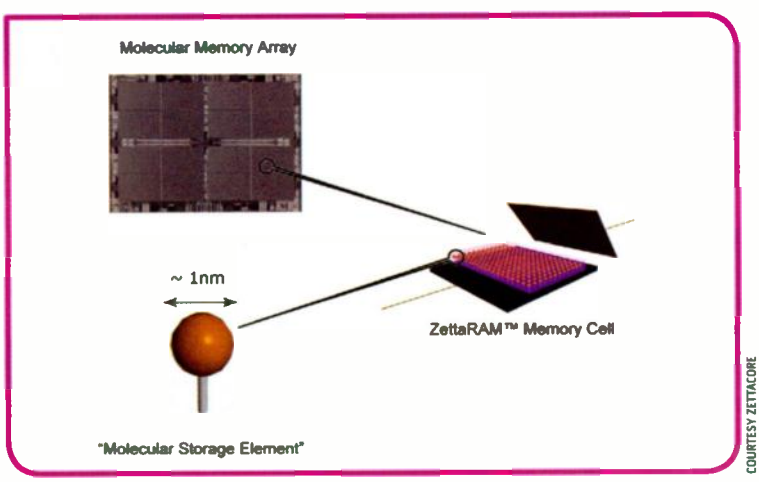
The molecules used in ZettaCore's research are called *multiporphyrin nanostructures*. They consist of several hundred atoms and measure only a few nanometers in size. Data is represented by removing or adding a few electrons and then detecting the molecule's charge state, which consumes much less power than conventional memory.

The molecules are designed to exhibit certain well-defined charge states called *oxidation potentials*, which are the energy levels required to remove one or more electrons. ZettaCore has designed molecules with up to eight oxidation potentials, allowing as many as three data bits to be stored in a single memory location.

Another critical property of ZettaCore's molecules is chemical self-assembly, which causes them to attach only to the desired materials, such as silicon or gold. In addition, they automatically pack tightly together and align themselves to operate as intended. That allows the use of equipment and techniques that are already common in the semiconductor industry; the molecules are applied to entire wafers, but they adhere only to the exposed surfaces they are designed for.

As with most solid-state memory, individual memory locations are arranged in a 2-D array (see **Fig. 1**). Each location contains between a few thousand and a million molecules, depending on the required size of the memory elements. This high degree of scalability is made possible by the fact that the properties of the molecules remain constant, even at very small sizes, unlike conventional semiconductor memory. The presence of many molecules at each location provides high signal-to-noise characteristics and redundancy-based defect tolerance.

ZettaCore's initial efforts are targeted at the DRAM and SRAM market, but the potential of this technology goes way beyond that—for example, solving the problem of long-term archival storage, which is especially important for musicians and other digital-media artists. The capacity of optical discs and other current forms of storage is quickly being outstripped by the ever-larger files generated by these artists. And who can say how long those storage solutions will survive or when they will become obsolete? Molecular memory devices with zettabytes or yottabytes of capacity and an unlimited lifespan could keep all the music in the world safe and available for the foreseeable future. ZettaCore's molecular-memory prototypes are nowhere near that capacity yet, but the way these things progress, it might not be long before they are. EM



COURTESY ZETTACORE

FIG. 1: ZettaCore's molecular memory uses molecules measuring 1nm across to store data bits. Multiple molecules at each memory location provide redundant defect tolerance and high signal-to-noise characteristics.

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Land of Oz

By Matt Gallagher

Creative editing helps shape Oz Noy's music.

Guitarist Oz Noy invigorates New York City's music scene with a distinctive style that seamlessly integrates rock, jazz, funk, pop, blues, and heavy metal. For his solo debut, *Oz Live* (2003), Noy recorded four nights at the Bitter End nightclub with his trio using an ADAT and edited tracks afterward in Pro Tools LE. For his second release, *Ha!* (Magnatude Records, 2005), Noy recorded in the studio with regular members of his trio: bassists James Genus and Will Lee, and drummers Keith Carlock and Anton Fig. Guitarist Mike Stern and keyboardists George Whitty and Shai Bahar appear as guests.

"It's all about interaction," Noy says of his music. "I had to go to a big studio to get the sound that I'm used to when I play live." Noy, Carlock, Fig, Genus, Lee, and Stern recorded in Bennett Studios, a commercial facility. "It has a Pro Tools MixPlus rig, a Neve board, and a big [live] room," Noy says. Engineers placed Noy's guitar amps in a separate room. "I stood in front of that room with the [sliding] door half open," Noy says. "I need to feel the sound of the amp. We recorded with all the options—close miking and room mics.

SANDRINE LEE

Ha!/Oz Noy

"I recorded for four days with a different rhythm section each day to get a variety of sounds," Noy says. "Anton's sound is a rock sound, and Keith's sound is jazzier. Setting up two drummers would have been hard, so I recorded each song with each drummer separately with a click track. I took everything home on hard drives and started editing."

Noy spent three months editing tracks in his personal studio using his Mac G4, Digidesign Digi 001, and Pro Tools LE. "I tried to make [the album] sound like we did it live," Noy says. He meticulously alternated and layered drum tracks throughout. "It was more about getting the sonic effect that I needed," Noy says. "On the title track Anton plays the 'A' parts and Keith plays the 'B' parts. 'Chillin'' was based on the way Anton played the tune, and when we got to the solos I chose Keith's stuff. I looped a section of Keith playing on top of Anton's stuff, and on 'Say What' I did the opposite."

"Hey You" features the effect of a vinyl record skipping at various points in the track. "One day while I was writing I mistakenly looped a bar and it sounded like a record skipping," Noy says. "I used it as a musical idea. When we recorded that tune I told Keith, 'Every time you get to the end of that section play something hip on the snare, the hi-hat, or the bass drum and I'll deal with it later. I took a couple of beats, looped them, copied them, and put mutes between them."

Adding Whitty's keyboard tracks was the final step in production. "I emailed the tracks to him, he recorded his parts at home, and he emailed them back," Noy says. "The keyboard parts are minimal. Otherwise, they'd change the whole vibe of the tune." Noy asked Kevin Shirley to mix the album at The Hit Factory. "He gets incredible [guitar] tone and sounds," Noy says. "He ended up using whatever was recorded and it was fine.

"When you have a really small budget you have to just go in, record, hope you did it the best you could, and then fix whatever you need to fix in Pro Tools," Noy says. "Pro Tools can help you make things sound better in a very natural, musical way—if you know how to use it right." EM

For more information, go to www.oznoy.com.

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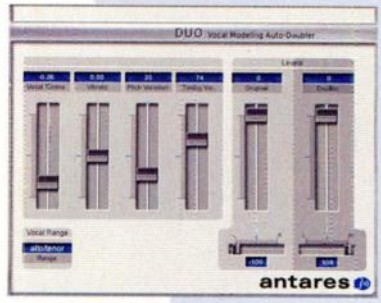

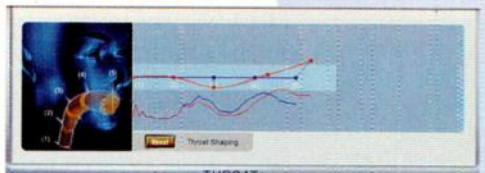

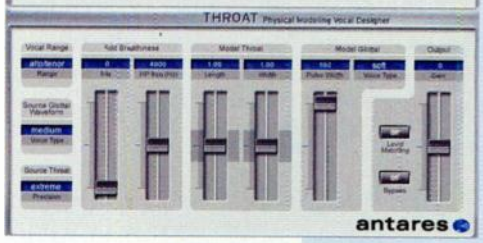

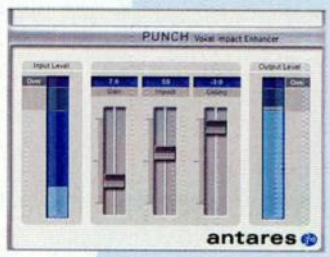

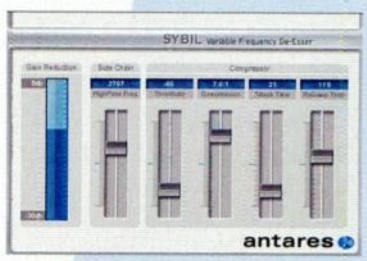

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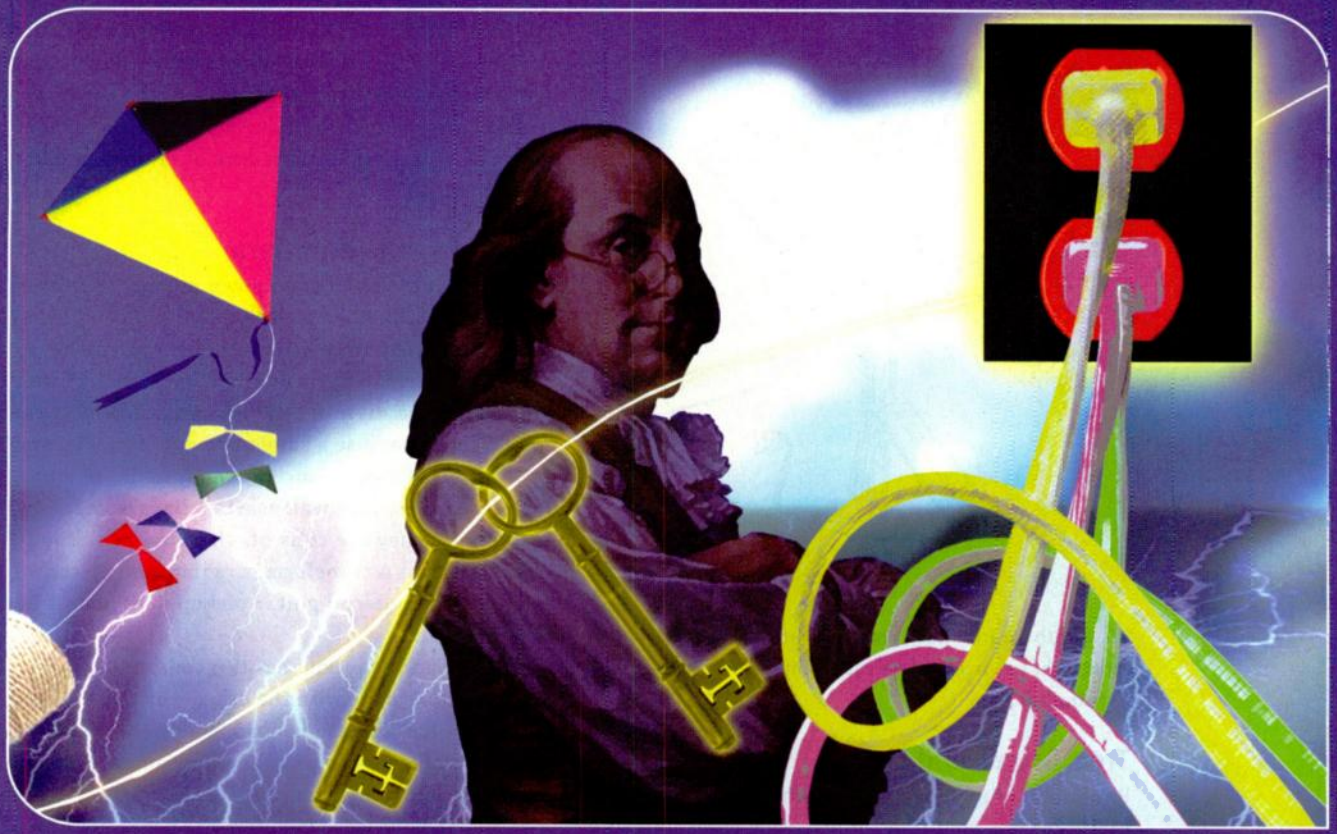

Knowledge and Power

By Eddie Ciletti

DIY tips for reducing power-related noise in your studio.

No matter what size studio you have, power-related noise can cause serious problems. The typical scenario in the personal studio goes something like this: the console is on one side of the room, and the keyboard and rack modules are on the other side. The system, however, always has power-related noise, sometimes even with the mixer faders down.

Power-related noises with analog gear are obvious and fairly easy to troubleshoot, because you can hear changes instantly as you experiment. Hums and buzzes in the analog domain may be the only clue to mysterious problems in your digital devices; power-related noises may not be audible but they can affect equipment performance.

When I used to make house calls for a living, I was usually able to pinpoint and resolve such issues. Even if I offered advice over the phone, it was never quite enough and my presence was requested anyway. Perhaps my explanation was too matter-of-fact, or the client never believed that they had the power to fix many of the problems. But you do have that power. In this article, I will address a number of power-related topics, from chasing down and minimizing a variety of noise problems to determining your power capacity and optimizing distribution.

If you choose to take the DIY approach, have respect for electricity: wear socks and shoes, don't stand in a puddle of water while working, and always keep one hand in a pocket while probing (with a meter, for example). Basically, you don't want the jolt to hit you across the chest, from hand to hand or from hand to foot. If the electrical investigation requires you to go beyond your comfort level, find a knowledgeable electrician who is sensitive to the needs of a multimedia system.

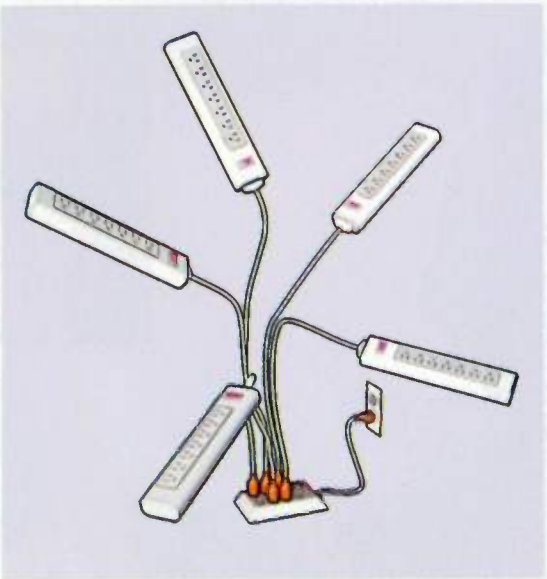

FIG. 1: With the Tree, Trunk, and Limbs method, imagine that the outlet is the tree trunk and the outlet strips that are plugged into it are the branches.

Tree, Trunk, and Limbs

Randomly plugging your gear into the most convenient outlets around a room can be the beginning of trouble. Power distribution in a home or office is not configured to audio standards, so there is an increased potential for noise when using more than one outlet.

The first questions that I ask a customer is how many outlets are in the room, and how many are being used? I suggest that everything be plugged into one outlet using the Tree, Trunk, and Limbs (TTL) approach to power distribution (see Fig. 1). Think of the outlet as the bottom of a tree trunk. Plug an outlet strip into the trunk and connect the branches (more outlet strips). Then plug your gear into the branches.

Typically, when I visit a customer's studio, I notice that at least two outlets are being used. When asked why, the customer usually explains that he or she didn't think one extra outlet would make a difference and that it's inconvenient to use only one outlet.

Although it may not be an ideal solution—it does have limitations—the Tree, Trunk, and Limbs method distributes the same power and ground to all your outlet strips and gear, which is the ultimate goal no matter what size system you have. If you have noise problems, that approach will most likely reduce or eliminate most of them.

Noise Noise Everywhere

Every electronic product you own dumps noise back into the power line. Power-related noises can be distributed by the power wiring or through the air by induction. The best receiver is the electric guitar, which acts as a divining rod for radiated electrical noises. That's because a single-coil guitar pickup and a power transformer—such as those found in amps, power supplies, and wall warts—have something in common: they are coils of wire wrapped around a hunk of iron. A transformer radiates an electrical field, and a single-coil guitar pickup does just as its name suggests.

A humbucking pickup has two coils, one of which is wired out of phase with the other. Any noise that is common to the coils and in phase is rejected. That type of phase cancellation technique is a common strategy for dealing with noisy lines.

Computer and video monitors also have coils, which coerce electrons into creating recognizable images on screen. Flat-panel displays have coils to generate voltage for the light source behind the panel. Both technologies radiate noise, so you should gather your audio harnesses with cable ties and dress them as far away from power sources as possible.

Light dimmers and fluorescent lights also generate electromagnetic interference (EMI). Bill Whitlock, president of Jensen Transformers, recommends using

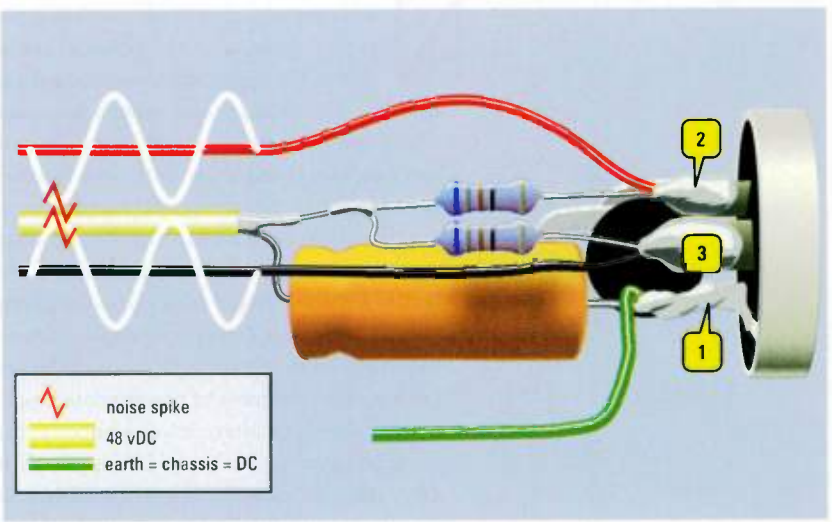

FIG. 2: The audio signals—two out-of-phase sine waves—are on the red and black wires and attached to pin 2 and pin 3, respectively. Common-mode noise, which remains in phase, is represented by the red noise spikes.

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an AM radio to track down noise sources, such as defective transformers in fluorescent light fixtures. To do this, tune the radio to an unused frequency and walk close to any potential noise sources: the radio will pick up and amplify the interference.

Speaking of noisy lights, small, affordable dimmers do not belong in a recording environment. Instead of varying the voltage to change bulb brightness, those super-efficient dimmers chop up the 60 Hz wave into small pieces for dim and passes the full wave for bright. If your light needs include atmospheric control, chose a Variac-based dimmer. Although these are transformers and should be positioned away from sensitive gear, they don't generate high-frequency noise, which tends to travel better through the air, just like Radio Frequency Interference (RFI).

Power transformers radiate energy into the air and into nearby metal objects, such as the chassis that houses your gear. Connect any two devices, and noise current from one chassis will flow through the signal cabling to the other (and vice versa), specifically through the shield that is supposed to protect the signal wires from radiated noise. All mic- and line-level audio cables have a shield, no matter what type of connector is used on the end.

How the mating connector is mounted to the chassis determines a device's noise immunity. What you want is an electrical firewall, a safe place for the shield to dump its noise so that it doesn't get into the box. (Once it is inside, it's harder to remove.) Renowned Toronto-based engineer Neil Muncy named that the pin 1 issue, but it's not exclusive to XLR connectors. RCA, ¼-inch, and even FireWire and USB cables are all vulnerable if the shield/pin 1 connection does not go directly to the metal chassis. This is the case for some connectors that are isolated from the chassis for ease of manufacturing. If the path from pin 1 to the chassis is through a printed circuit board trace, then all the noise infiltrates the ground scheme, where it can be amplified.

FIG. 4: A clip-on ammeter can be used to measure current consumption at the breaker box. The orange jaws open so that the power wire can be inserted.

Balancing Act

An unbalanced audio cable has two conductors: a wire for signal and a protective shield in the form of a multistranded wire-wrap, a braided screen, or an aluminum-foil wrap. A balanced audio cable has three conductors: the shield and a twisted pair of wires for the signal. In either case, the shield alone is not enough to stop a transformer's strong electrical field, whether it's the pin 1 issue or the system's inherent ability to reject noise.

For example, if an unbalanced cable is too close to a wall wart, the electrical field radiating from the transformer will pass through the shield and into the signal wire, producing a pronounced hum. Even if pin 1 is correctly implemented, you will get noise through induction. But if the source and the destination are balanced, the noise will be minimized as much as the circuit topology allows.

Balanced input and output circuits come in two primary forms: as active electronics or as a passive device known as a signal transformer. Transformers are more tolerant than poorly implemented transformerless designs. Both amplify a differential signal pair—that is, two signals of opposite polarity—but reject noise that is common to both signal wires. That relationship is known as the Common Mode Rejection Ratio, or CMRR. Look for it when checking out mic preamp specs. It also applies to line inputs, where it is usually taken for granted.

In **Fig. 2**, the audio signal is on the red and black wires, connected to pin 2 and pin 3, respectively. Notice that the two sine waves are out of phase with each

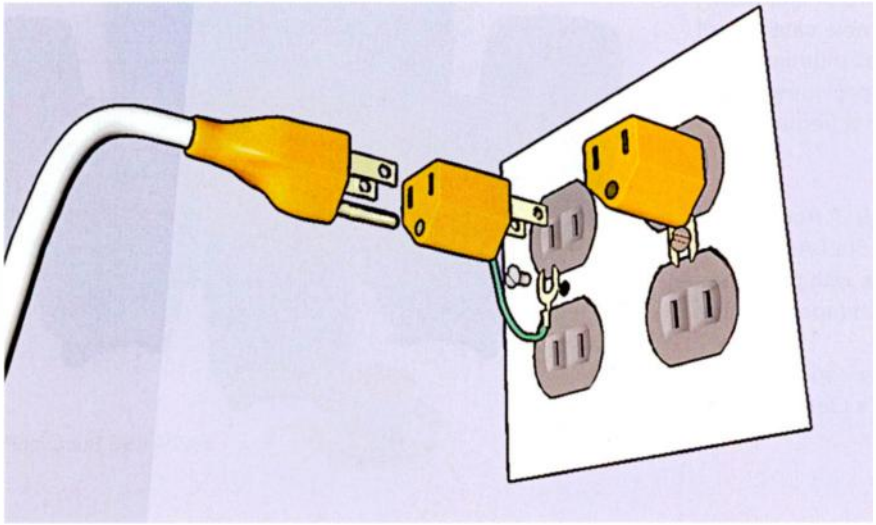
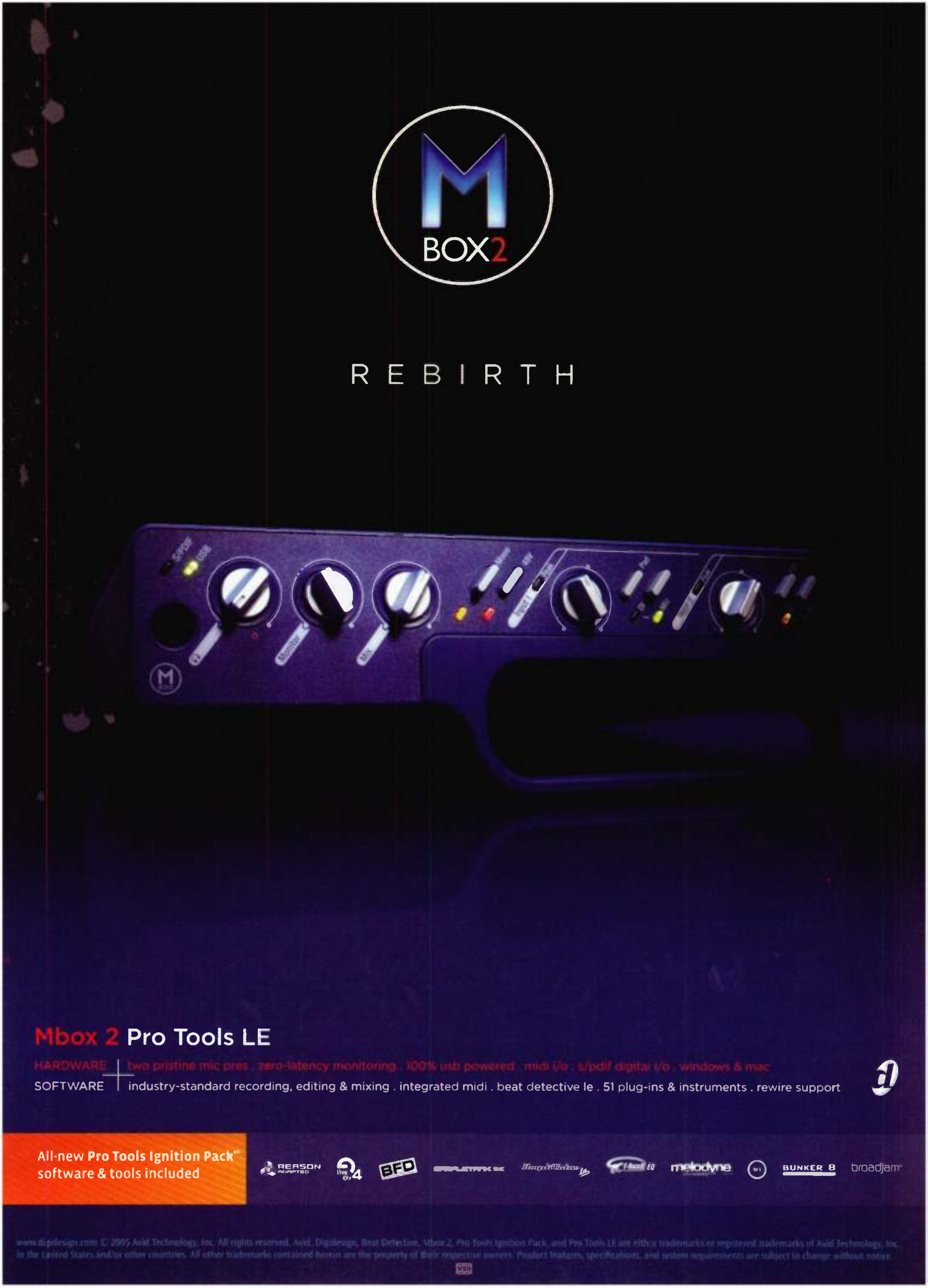


FIG. 3: The purpose of the ground adapter is to temporarily modify an old-fashioned two-prong outlet and provide the third-prong ground through the outlet's plate screw.



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other, but the red noise spikes (common-mode noise) are in phase. (Another common mode signal, 48V phantom power, travels over the yellow wire feeding the two resistors. It's called phantom power because no additional wires are required to power the microphone.)

There are two types of active balanced configurations: full balanced and impedance balanced. Full balanced has two identical signals traveling down a shielded twisted-pair cable; one signal, however, is 180 degrees out-of-phase with the other. The amplifier driving each wire has a defined output or source impedance, just as some vacuum-tube guitar amps have a back panel selector switch to match the impedance of the amp with that of the speaker cabinet.

The math of amplification and rejection in an ideal balanced system is simple. For example, I'll call the positive (pin 2) signal +1 and the negative (pin 3) signal -1. If each of these signals were on a mixer fader, the result of the addition would be zero, or cancellation. But a balanced input amplifier, also known as a differential amplifier, looks for differences in a signal. A differential amplifier subtracts what is common to both wires—in this case, the noise. But when it attempts to subtract two mirrored signals ([+1] - [-1]), the double-negative becomes addition, yielding two instead of zero.

Because an impedance-balanced configuration has only one modulated signal wire, it is crucial that the unmodulated signal wire be sourced by the same impedance (it's simply a resistor to ground). Matching those two impedances allows the differential amplifier at the other end of the cable to do its job. Maximum noise rejection occurs when both wires are equally susceptible to noise. For really troublesome noises, a transformer at the input (destination) is more tolerant of circuit idiosyncrasies and can deliver 90 dB of CMRR.

FIG. 5: Use an outlet tester to confirm that your outlets are wired correctly.

In the Unbalanced World

If you are using unbalanced gear, the devices must be physically close together (preferably in the same rack), so that the interconnecting cables can be as short as possible. Long cables act as antennas for noise. In addition, use high-quality cables, with robust shields. If you have only one rack of gear, the noise situation is relatively manageable.

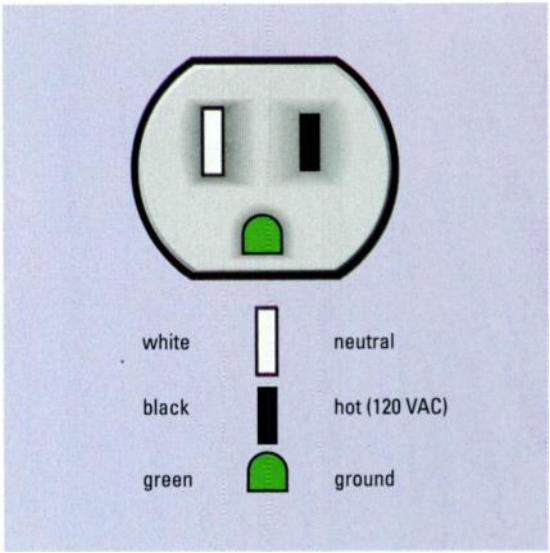

FIG. 6: In a properly wired outlet, the black wire is hot, the white wire is neutral, and the green wire is ground.

While most sound modules and keyboards are unbalanced, it doesn't hurt to route them to a balanced mixer using balanced audio cable. While it's far from an optimum solution, there will be some noise canceling from doing so. In hostile environments, installing unbalanced-to-balanced converters at those sources will give you a fighting chance against noise. Use digital outputs wherever possible (it's worth the extra money to buy gear that has that option), and make sure you have separate physical paths for power and audio. It's always a good idea to keep wall warts and power cables as far apart from audio cables as possible.

Ground Control

There has always been considerable fuss about the dreaded and misnamed ground loop which, in reality, is the unavoidable ground current. As soon as a piece of gear is rackmounted, plugged in, and connected to another piece of gear, there will be ground currents in all cables. It would seem as if we are doomed at the start and that meeting any electrical code and achieving a quiet system are disparate goals, but that is not the case.

The most common bad-practice electrical activity is the misuse of the ground adapter as a ground lifter (see **Fig. 3**). Use it only as a testing tool, never as a fix. Nothing is more permanent than a temporary solution.

There are many so-called fixes applied to how the ends of interconnecting cable wiring are terminated. Tricks such as flying shields, where the shield at one end of the cable is not connected, complicate the wiring scheme. Keep things simple by connecting the shield

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at both ends to let the noise-prone gear reveal itself. Rather than compromise or complicate the system, the funky gear should be fixed, modified, or thrown away. There are several products that can interface unbalanced gear with balanced gear. Transformers may cost more, but they are also more effective.

System Overload?

Using the TTL method to solve power-related noises might also push the limits of the single circuit breaker now powering the entire system. For example, you might not want to turn everything on at once because the power-up current draw is much more than current draw once everything is on. The total power-draw for any breaker should be 75 percent of its rated value (such as 15 amperes [amps] for a 20-amp breaker).

If you are concerned about overloading the electrical system or popping breakers or fuses, there are two ways to determine your total power consumption. The easy way is with a clip-on ammeter (see **Fig. 4**). It eliminates all of the guesswork, but requires a professional electrician's respect for electricity.

Start by determining which circuit breaker feeds each outlet. Current is measured with a clip-on ammeter while your gear is on and doing work. The red-orange jaws of the ammeter open so that a single wire from a breaker can be inserted. The jaws are then closed and the current is measured without making a physical or electrical connection, proving that wires radiate an electromagnetic field.

After measuring the circuit breakers to which all the audio equipment is connected, add up each reading. If the total is within 75 percent of 20 amps (15 amps or less), you are safe to plug all gear into one outlet using the TTL method.

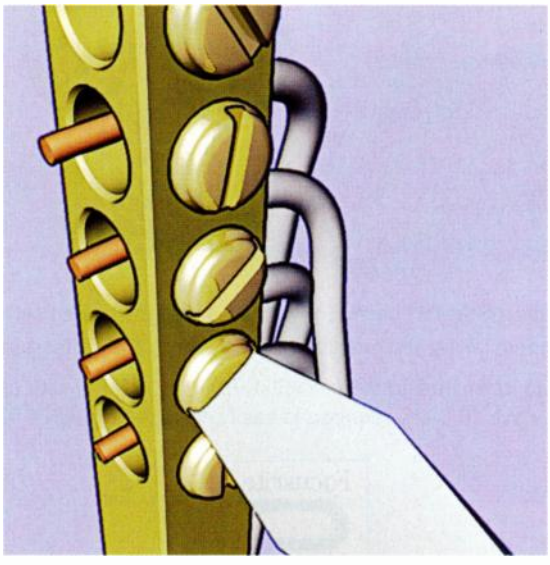


FIG. 7: Tightening the screws on the buss bars in your breaker box can help alleviate noise problems.

PLUG AEROBICS

While a new audio system may start out quiet enough, a gradually elevating noise floor is not uncommon. Cable connectors are one of the first and easiest places to look. For example, silver-plated XLR connectors turn black when oxidized. It never hurts to disconnect everything, clean the contacts with 99 percent isopropyl alcohol, and then apply a contact cleaner or preservative using a cloth or a cotton swab. Avoid spraying the cleaner directly on anything because it will attract more funk than it washes away.

Note that the propellant that forces the cleaner/lubricant out of the can is cold, and water vapor may condense on cold connectors, causing additional corrosion. Other contaminants can accelerate the corrosion process, causing sulfur-based films to coat the contacts, which are harder to see than copper or silver oxide.

Another way to determine your power consumption is to calculate it using the specs from each device you use. Circuit breakers are rated in amps (A), but appliance power consumption may be rated in amperes, watts (W), or volt-amperes (VA). Remember that power (in watts) equals volts multiplied by amps. The difference between watts and VA is the power factor. Unless the power factor is known, use the following formulas:

(W to VA) W ÷ 0.85 = VA

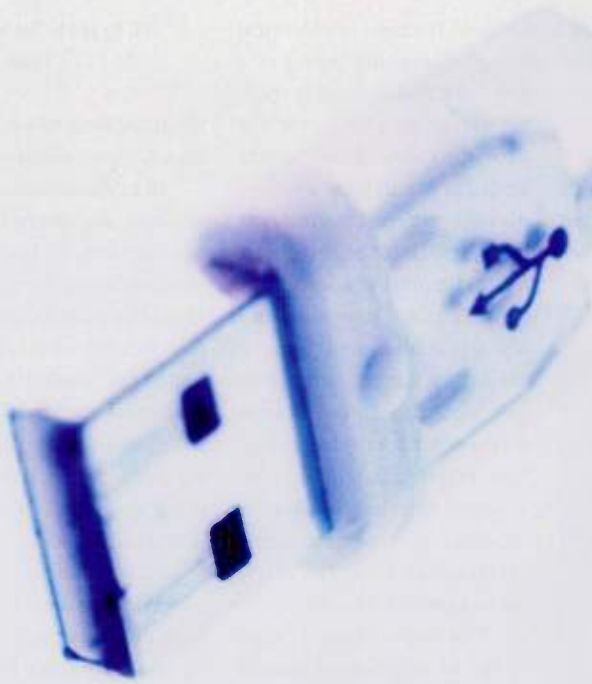
(VA to W) VA × 0.85 = W

Depending on your enthusiasm for calculating the total power consumption of your system, this might be the time to look in the Yellow Pages for a local electrician.

If the total draw of your system exceeds 15 amps, power down any items that do not seem relevant to the problem but leave everything plugged in to maintain the conditions that may be causing the hum or buzz. We don't want to pop the breaker from excess current and, as mentioned, the goal is to localize and weed out the noise-prone gear. If your system requires more than 15 amps and you have the luxury of rewiring, put each outlet on its own breaker with its own ground wire back to the box using the isolated ground outlet detailed in the following Faulty Outlet section.

Another warning sign that you are pushing the power strips and extension cables to their limit is when power plugs are warm to the touch. However, plugs can become warm if the wires in the plug or socket are not secure. Molded power plugs should have spot-welded connections. Unfortunately, cheaper products only crimp the wires to the prongs. Over time, and through repeated cycles of heating and cooling, oxidation builds up resistance at the junction of wire and prong, causing the plug to warm. The same is true for outlets that have lost their grip.

think inside the box



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Replacing power strips is easy, but you should also have your electrician inspect all power outlets, tightening or replacing them as necessary. Use either heavy duty outlets or the orange hospital-grade power outlets.

Faulty Outlet?

If plugging everything into one outlet lowered the noise, then your problem is related to the wiring in one of the outlets. Use an outlet tester, available at most hardware stores, to confirm that your outlets are correctly wired (see **Fig. 5**). An outlet tester can detect gross wiring errors, although problems are typically more subtle than that.

Fig. 6 shows how an outlet should be wired: black for hot, white for neutral, and green for ground. Neutral is also referred to as the return wire that completes the circuit.

In the wiring of a standard household electrical socket, ground travels through the round prong of a power plug. It's important to note that ground is there for safety purposes, not for providing low-noise audio. Standard outlets receive ground when the mounting screw touches the outlet box. Hospital-grade orange power outlets have a ground screw that is isolated from the mounting flanges. That gives you an isolated ground wire all the way back to the breaker box, avoiding potential interruptions such as loose screws at each conduit extension or interference from the spiral metal jacket of BX cable.

The route from orange outlet to a dedicated ground wire terminating into a 6-foot spike set into damp earth requires extra time and money, but it's not cost prohibitive. That said, it still doesn't ensure a quiet ground connection. The isolated ground wire is easily contaminated by noise currents in the black and white power wires because of their close proximity within the conduit. To prove that, I experimented with running ground wires outside the conduit with greatly improved results, but I have never investigated the electrical code to see if it's a legal and safe implementation. Consult your local electrician.

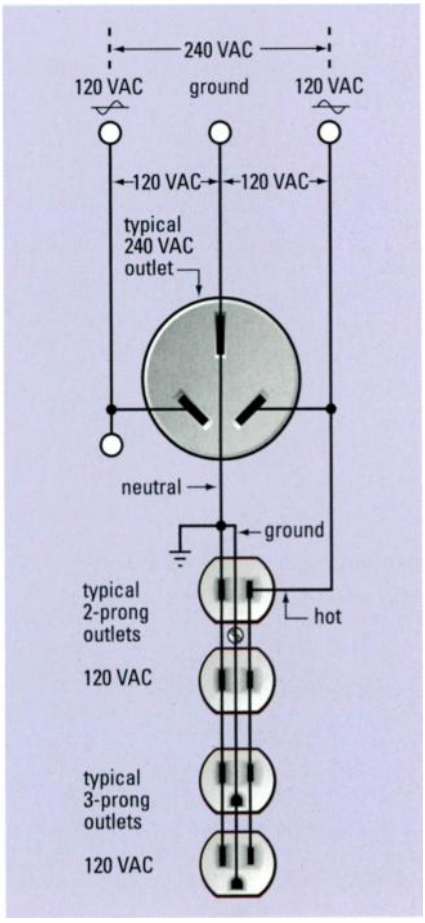

FIG. 8: Electrical power enters the home as a 240 VAC sine wave, which is divided into two 120 VAC sine waves that are 180 degrees out of phase with each other.

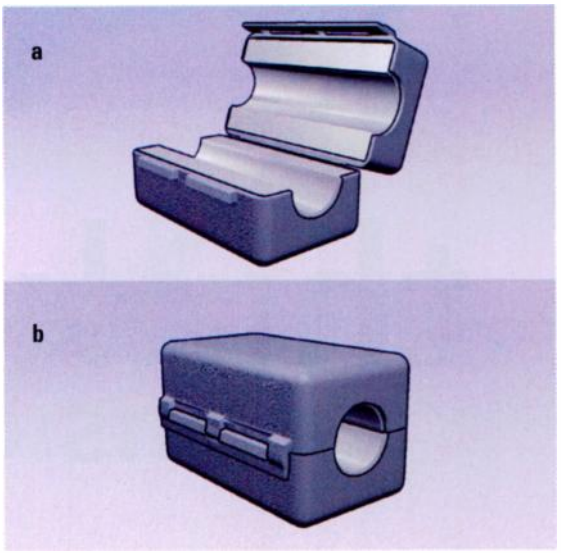

FIG. 9a and b: The ferrite clam, which attaches to the end of a cable, can help eliminate RFI and TVI problems.

In a typical home or office building, outlets are daisy-chained, and every loose connection between them—whether it is on the hot, neutral, or ground line—is a potential noise source. With the breaker off, each outlet should be pulled, inspected, and tightened by a licensed electrician if necessary.

In the breaker box, there should be two buss bars (hunks of aluminum, copper, or copper-alloy) tapped with screws for multiple wires (one for neutral and one for ground). Because every connection is a potential noise source, all of the screws should be checked and tightened if necessary (see **Fig. 7**).

All of your gear reflects noise back into the power wiring, but if a more serious variety of noise is coming from outside your facility, the best way to tame it is with an uninterruptible power supply (UPS). A UPS converts AC power to DC power by charging up batteries instead of capacitors, and then converting the power back to AC. A UPS effectively cleans up noise and provides a safeguard against spikes and power failures. Remember that isolation and balanced power transformers do not filter noise, and to be truly effective, they must be properly installed where power enters the building.

I'm not a big fan of rackmount voltage regulators and surge protectors. I would rather have a UPS take care of all that. It also gives me a backup in case of power failure. Not every model of UPS offers voltage regulation; the American Power Conversion (APC) Back-UPS Pro line (www.apcc.com), however, does provide voltage regulation. Unless you live in an area that has frequent voltage swings, most of your gear has sufficient internal regulation. Most computers, for example, will run on 90V to 200V by design.

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Balanced power enters the home as 220V to 240V. Neutral comes from a center tap on the utility pole transformer, hence the 110V to 120V standard outlet power (see Fig. 8). Neutral is tied to ground as it enters the home, but it tends to get dirty from all the appliances that are constantly switching on and off (such as a microwave oven, a refrigerator, a washer, or a dryer). It's even worse in a commercial building, which may have elevators and HVAC.

A 1:1 isolation transformer can help avoid the neutral noise by taking the 220V on its primary side. A new, clean neutral is then established on the secondary side for your audio power network. It's not a big deal to add one, but it's also not a DIY project. I have mixed feelings about balanced power. It is somewhat effective, but not a panacea. Like the impedance-balanced method of interconnecting audio gear, balanced power requires a similar form of impedance equity in the power-distribution system to be effective. Not all gear treats incoming power in the same way. A customer once bought a balanced-power transformer because he had read in a magazine that it was a miracle box. When it showed up, it was too heavy to move and there was nowhere to put it. The real problem, however, was summer brownouts, something that a balanced-power transformer doesn't fix.

All transformers that are big enough to run an entire recording area—including lights—are big, heavy, and potentially noisy. They make physical noise as well as radiated noise, so choosing a proper location is vital (preferably one where the power lines enter the facility and is as far away from guitars and analog tape machines as possible). Although there are project-studio-size transformers available, consult an electrician about the best solution for your needs and the optimum place to install it.

Floating Interference

RFI and Television Interference—also known as RFI/TVI—are a lot more squirrelly than your garden variety hums and buzzes, but the root of their evil is the

A CHEAP BUZZ

Noise-prone equipment is not necessarily due to poor design. It is more likely due to shortcuts taken to aid mass production. Eighties-era gear often used plastic-insulated jacks mounted directly to a printed circuit board (PCB). As a result, the noise was dumped directly to the PCB ground, to which many high-gain amplifiers are referenced, instead of being stopped at the firewall (the metal chassis that houses the circuitry).

For an example of good design, check out any Mackie mixer. Notice that all of the ¼-inch jacks have metal threads and a metal nut securing them directly to a metal chassis. Minimizing noise susceptibility is almost that simple.

same. RFI has an obvious sound. TVI, on the other hand, sounds similar to a power-buzz, except that it tends to vary in character, with a phase-sweeping quality. That is because TVI is video picture noise with a 59.95 Hz fundamental—0.05 cycles per second less than 60 Hz AC power. Hearing them together causes the slow-phasing artifacts.

One of the DIY solutions for eliminating RFI/TVI is the ferrite clam, which is easy to apply to cable ends (see **Fig. 9a** and **9b**). You have probably seen these before on computer video-monitor cables, hidden under shrink tubing. In essence, the ferrite acts as a near-short circuit at frequencies from 1 MHz to 100 MHz—exactly where you need them to work. The clam-shell filter comes in various sizes to accommodate wire thickness. Guitar cables are also good candidates for ferrite clam filters.

Another RFI/TVI fix requires the most basic soldering and mechanical skills and it applies to the male end of an XLR cable. A standard 3-conductor XLR configuration has shield/ground on pin 1, signal high/hot on pin 2, and signal low/cold on pin 3. There is also a fourth pin available that connects directly to the chassis by means of the connector shell. XLR pin 1 is supposed to go directly to chassis, but when it takes a more circuitous route, high-gain mic preamplifiers see hum, buzz, and RFI/TVI. If adding a jumper wire from pin 1 to the chassis-lug fixes your problem, you may want a technician to go inside the box to make it permanent.

FIG. 10: Inserting an isolation transformer between the cable wire and your cable box or video recorder will alleviate hum that appears on video and computer monitors.

Video and computer monitors have their own way of displaying hum, as a rolling horizontal bar. You will typically see and hear hum when integrating a cable TV box into an audio system because the cable is grounded when it enters the building, and that will not be at the same

potential as the audio system ground. As a result, current will flow. The fix for that noise is to insert an isolation transformer between the cable wire and the cable box or video recorder (see **Fig. 10**).

Dress Right

Cable quality can also affect noise reception in hostile environments. Typically, multichannel snakes have a foil shield with a drain wire. Those may be acceptable for line-level applications, but for mic and unbalanced lines, a heavy copper braid or a wrap is better because it reduces noise by 15 dB. Canare Star Quad cable, which has a braided shield, is best, because it has a 40 dB reduction.

Now it's time to address the wiring in the rack. Here it would be helpful if all manufacturers adhered to a standard location for the power connector. When applicable, I place a vertical power strip on the cabinet side that has most of the outlets, using short, 18-inch IEC power cords. Avoid coiling any power or audio cables so that you minimize noise generation and pickup. Don't forget to use cable ties to bundle audio cables on one side of your rack and power cables on the other side.

The Knowledge of Power

Understanding potential noise sources and using the TTL method of power distribution should allow you to identify and in most cases reduce the major noise problems in your system. There are situations, however, that require the combined support of an experienced technician and an understanding and sympathetic electrician—for example, one that may also be a musician. Although it may be more expensive than the DIY approach, a system that is consistently safe and quiet will be worth the investment. (For more information about cleaning up your studio's AC power situation, see Scott Wilkinson's article "Power to the People!" in the October 1997 issue of EM at emusician.com.)

Eddie Ciletti winds up by repairing and modifying gear (www.tangible-technology.com) and unwinds by editing a new instructional music video. He also teaches recording and maintenance one day a week at www.iprschool.com.

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ALESIS

Playing the Field

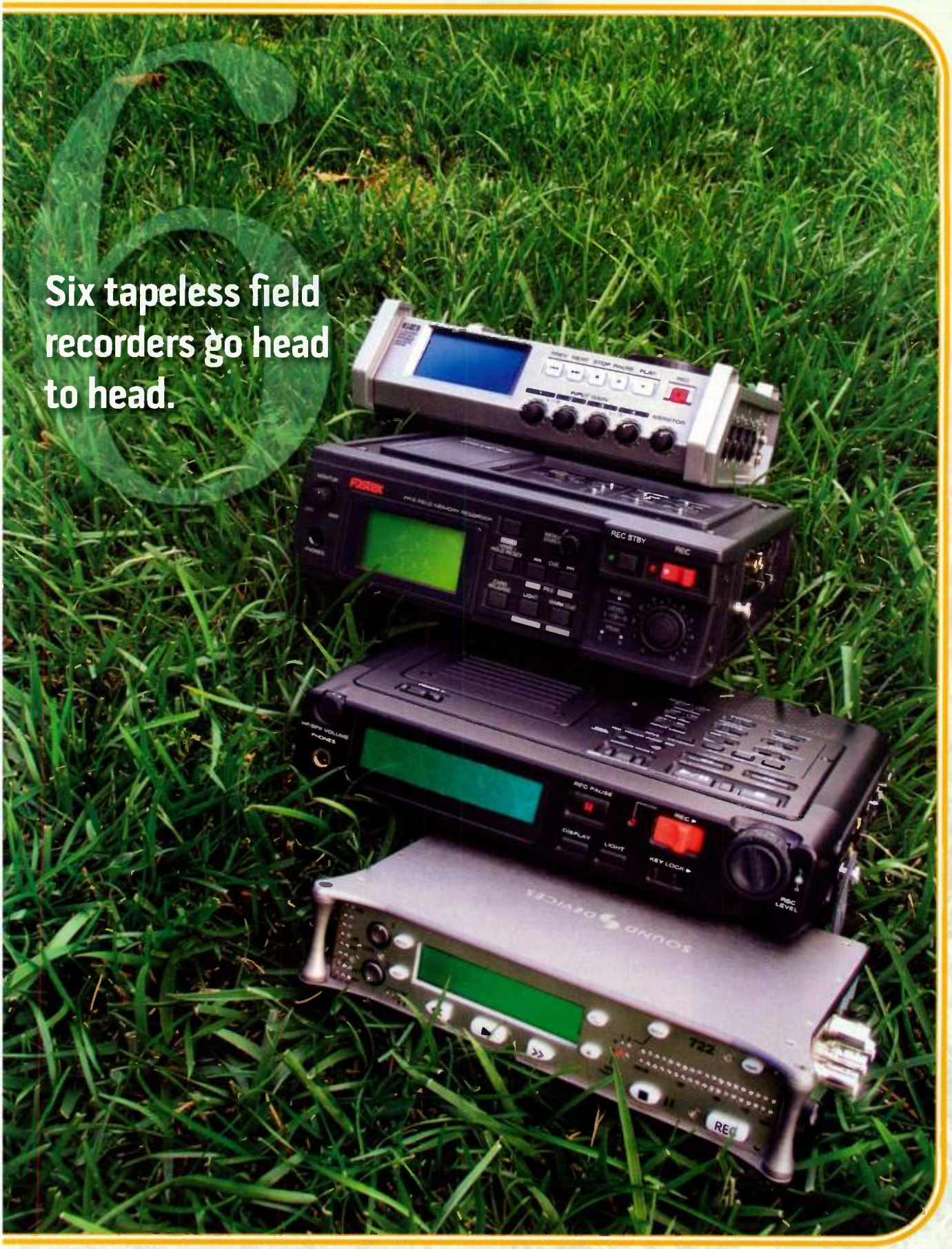
By Nick Peck

Thanks to the popularity of notebook computers and digital cameras, evolutionary technology has led to new, relatively low-cost products that are extremely useful for the music, film, and broadcast-audio communities. Solid-state removable RAM cards and small, high-capacity hard drives have improved by leaps and bounds as prices have dropped steadily. Many audio professionals will remember 2005 as the year that tapeless field recording became affordable.

For decades, film-audio professionals have used the legendary and ubiquitous Nagra analog field recorders. Though large, heavy, and somewhat cumbersome, they sound incredibly good, conveying all the richness (and inherent hiss) of analog tape. In the '90s, portable DAT recorders made serious inroads among field recordists. The cost and size of DAT tape, as well as the lack of noise and the price of the units, were tough to beat. But DAT also has at least three disadvantages: the tiny tapes are fragile, you must transfer your field recordings to a DAW for editing in real time, and DAT is limited to 16-bit, 48 kHz audio. Over the past five years, excellent hard-drive-based field recorders have emerged from companies such as Nagra, Deva, and HHB, moving the industry into the random-access age. Those specialty products, however, are priced out of the reach of most individuals.

Enter the more modestly priced tapeless field recorder. A number of products that record to either CompactFlash cards or to notebook-size hard drives have emerged in the past year or two. Whether you are a musician looking to record your rehearsals and gigs with little hassle, a sound designer interested in capturing new real-world grist for your signal-processing mill, a concert recordist interested in getting that performance in high fidelity, or a location recordist garnering production dialog and effects on the set, an excellent new product is out there to fit your needs. EM decided to take a look at what some of these great new recorders have to offer.

One of the big challenges in any product roundup is determining what to include and what to leave out. In the interest of fairness, EM's editors and I devised a set of rules to help with that decision. Because affordability is paramount, each unit had to have a retail price



PHOTOGRAPHY BY DMITRY PANICH

below $3,000 (and most are priced less than $2,000). We don't consider laptops with USB audio interfaces to be sufficiently rigorous to withstand many common field-recording situations, so we limited our scope to standalone devices. Finally, sound quality is crucial, so we limited our coverage to products that have the ability to record linear uncompressed audio.

Nonetheless, the included recorders do vary greatly in price and intended applications. Most are stereo, one is a 4-track recorder, and two are intended primarily for recording speech. The most expensive model costs almost five times as much as the least expensive one. I will discuss the less costly recorders first and then work my way up in ascending order of price.

To help with the evaluation process, I selected a few audio professionals who make field recording an integral part of their careers. I handed each of them one of these products to take out on a real-world mission. Their impressions and subjective results accompany the product descriptions.

EDIROL R-1

The Edirol R-1 ($550) is a handheld, CompactFlash-based portable recorder (see **Fig. 1**). Slightly too large to be called pocket-size, it does manage to pack impressive specs into a small package. The R-1 records 16- and 24-bit uncompressed WAV files at 44.1 kHz and MP3 files at rates from 64 kHz to 320 kHz. With a built-in stereo mic, half-speed playback, on-the-fly looping, and built-in effects, it functions as a terrific composing and practicing recorder. A stereo minijack provides an input for external microphones, and it supplies 2V plug-in power for electret condenser mics as well. For rapid data transfer, the R-1 will connect to any PC or Mac through USB.

FIG. 1: The Edirol R-1 delivers the goods in a small, inexpensive package.

As with most of the units covered in this article, the R-1 includes a 64 MB CompactFlash card to get you started, but it is far too small to be of practical use. With it, the R-1 can barely record 3 minutes of 24-bit uncompressed material. With almost daily price reductions of CompactFlash media, though, storage cost really shouldn't be an issue. The R-1 can see partitions as large as 4 GB, so anything larger will have to be split into multiple partitions.

Little Wonder

Tim Nielsen is a sound designer and editor who has worked on *Pirates of the Caribbean* and the *Lord of the Rings* trilogy. He used the R-1 for a month and liked it. In terms of sound quality, he said that it "was better than expected for a $400 recorder, even when using the internal stereo mic. While it's no replacement for a high-end professional recorder, the input stages appear fairly clean, and I was generally impressed with the sound. I tested the R-1 with a pair of Audio-Technica omnidirectional lavalier mics. While not audiophile in any sense, that pairing generated surprisingly high-quality recordings."

FIG. 2: The Marantz PMD660 is well established as the field recorder of choice for radio and news gathering.

Tim liked the streamlined nature of the R-1, but he found a few glitches as well. "Usability is about as simple as can be, but it's here that the R-1 shows a couple of flaws. The first is the metering, which is accomplished with a 15-segment, mono, sluggish LED display. The meter updates are so slow that it's useless as a peak meter and appears to be showing averaged levels."

The R-1 has some simple and marginally useful built-in effects such as three simple reverbs, simple EQ, and a de-esser; Tim liked the effects for monitoring. "While none of the effects are quite up to snuff to use for recording, they're convenient to have on playback. But there is a flaw: if you engage them while recording, they will be recorded, and the audio-effects button is easily bumped. If you're not monitoring while recording, you could be in for a nasty shock as you playback later only to find bad simulated plate reverb married to your recordings. The R-1 does have a hold button, though, a nice safety feature that should prevent any mishaps."

All in all, Tim was impressed with the R-1, especially as a replacement for a portable DAT or a MiniDisc recorder (see the sidebar, "HHB MDP500 MiniDisc Recorder"). "While it's no competition for my Sound Devices 722, I could easily see replacing my Sharp MiniDisc with the R-1. I loved the ease of use, the quality for the recordings, and the simplicity of drag-and-drop file transfers. I wish it were a bit smaller, that the batteries lasted a bit longer, and that the metering was more usable. But

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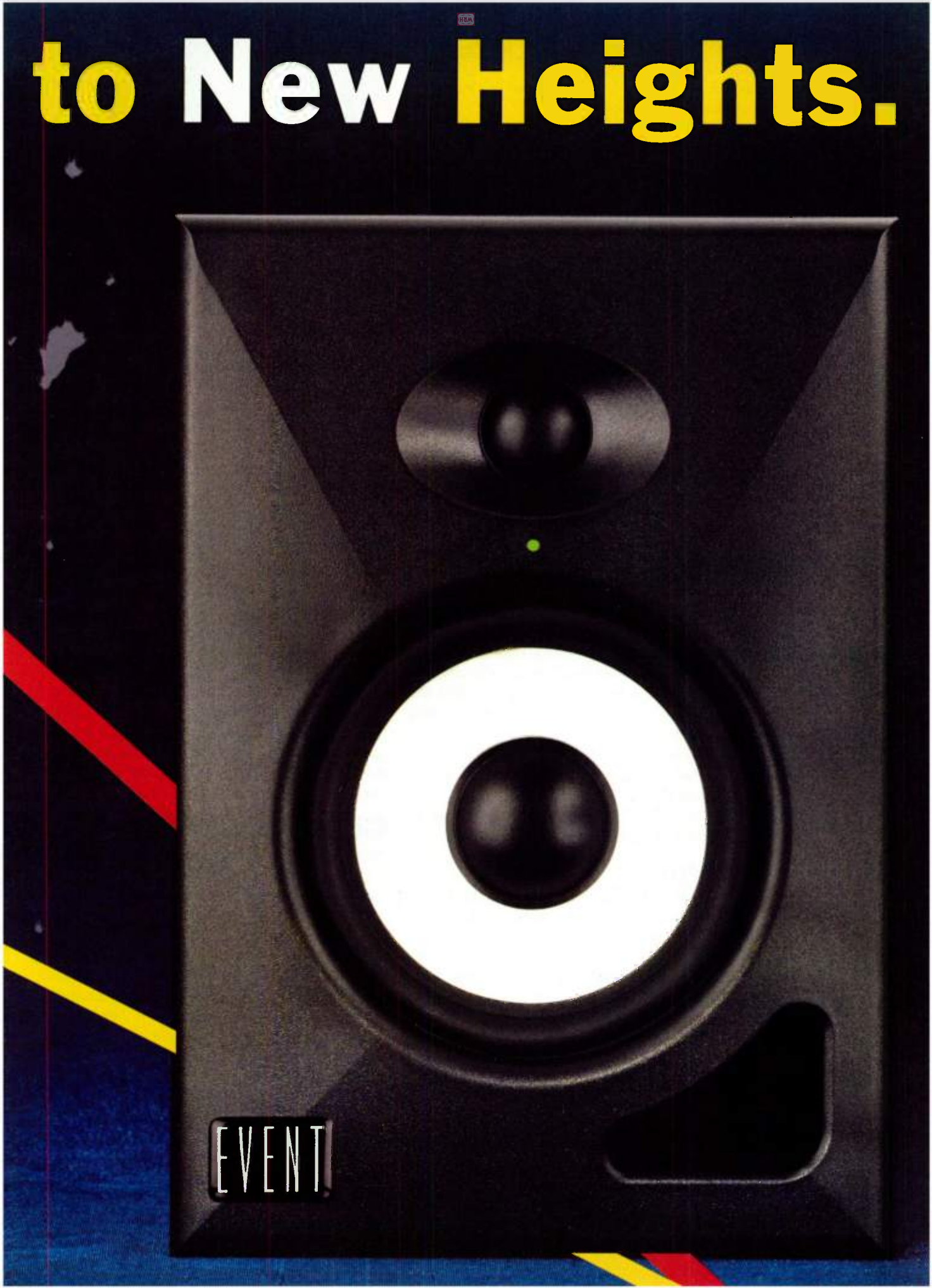

as it is, it's a bargain for the price, and as a practice or composing tool, it's perfect."

MARANTZ PMD660

The Marantz PMD660 ($649) solid-state recorder is about the size and weight of a thick paperback novel (see Fig. 2). The PMD660 is optimized for quick, on-the-go news gathering and interviews. Though relatively inexpensive, the PMD660 feels sturdy, well constructed, and is able to withstand some knocks in the field. All the buttons, knobs, and other protrusions have been carefully recessed into the casing for maximum protection.

The PMD660 has two XLR mic inputs with phantom power and a pair of internal microphones. Unbalanced line inputs and outputs are on ⅛-inch TRS jacks. A built-in speaker and a headphone jack let you listen to your recordings. Audio resolution maxes out at 16-bit, 48 kHz in WAV format, and files can be recorded in MP3 format. The meter has an 8-segment LED display, which is a welcome surprise considering how many of these units use less-readable LCD bar graphs instead. Although the user interface is simple and streamlined, learning how to configure the unit will probably require a trip to the manual. Once you've decided on your record settings, you can store them to one of three user-configurable presets.

Though the PMD660 is moderately priced, it has a number of useful and welcome features such as a prerecord buffer, built-in limiting, rudimentary track editing, and a dedicated Marker button that drops an edit-decision-list mark into the file during record. It also has automatic pause recording, which stops recording during silence and then records again when the noise level exceeds a user-configurable threshold. Edit functions include setting in and out points after recording, copying segments to new files, deleting files, and creating virtual tracks, which can combine sections from one or more files stored in CompactFlash memory.

Triple Play

Although Marantz intends the PMD660 to be used for recording interviews and other spoken-word applications, I tried using it to record sound effects for a short film entitled *Pancho's Pizza*. I used a Sennheiser 416 running into a Grace Design Lunatec V2 mic preamp, which then fed the PMD660's line input. Lower-level recordings, such as car bys, lighter flicks, and pizza-box Foley sounded fine. The recordings were crisp, detailed, and neutral in character. Louder sounds, such as door closes, had a tendency to distort, although the clip light didn't alert me.

Mac Smith is a sound editor whose credits include *Harry Potter and the Chamber of Secrets*, *November*, and *Star Wars Episode III: The Video Game*. He worked with the PMD660 and heard the same distortion problems that I did. "The biggest downfall is that if you are recording any moderately loud sounds, the signal will clip. I was recording vocalizations from my one-year-old son, and the audio would distort using both the internal microphones and an external microphone." He also noted, "The internal microphone, while convenient, does pick up some noise from the unit and is very sensitive to any slight touch of the recorder." Clearly, recording sound effects is not the PMD660's forte, nor is it intended to be.

FIG. 3: The Marantz PMD671 has professional features at a modest price.

For its intended applications, however, the PMD660 shines. John Fletcher is a radio journalist for KVMR-FM in Nevada City, California. "I've been using the PMD660 for in-field interviews for about three months now," says Fletcher. "It's a vast improvement over the MiniDisc players that we had been using before. Playback and editing are simple, and I love the ability to edit directly on the machine. It's lightweight, and the built-in microphone eliminates problems that I've had with handling noise using external mics." Back at the studio, his interviews are edited in Pro Tools for broadcast. "We have a CompactFlash card reader hooked up to our Pro Tools system, so at the end of the day, we pull the card from the PMD660, pop it in the reader, add some sound effects and music, and out it goes on the air."

MARANTZ PMD671

The bigger sibling of the PMD660, the PMD671 ($1,199) is Marantz's flagship portable solid-state recorder (see Fig. 3). It is based on the popular PMD670 model but offers 24-bit, 96 kHz audio and an improved mic preamp design. The unit is designed for traditional over-the-shoulder field recording.

Marantz has been in the business of portable field recording for a long time. I have fond memories of beginning my recording career with its PMD430 cassette field recorder 20 years ago. Not surprisingly, the PMD671 shares many design decisions with Marantz's other portable products; consequently, if you like their design, you'll feel right at home with this one.

Mic and line inputs are separate jacks, with mics on +4 dBU XLRs and lines on -10 dBV RCAs. Phantom power is available, as well as a –20 dB mic pad, bandpass and highpass input filtering, and a limiter. Monitoring

features include source/file monitoring and the ability to play back and listen through an internal speaker or headphones. Other professional features include on-the-fly EDL marking during record or playback, a Record Undo button, a prerecord buffer, a Loop Repeat button, and rudimentary track-playback sequencing.

The PMD671 requires 8 AA batteries, but optional NiCad and NiMH battery packs fit in the same area. The included AC adapter will automatically charge the battery pack when it's plugged into the unit. Coaxial S/PDIF in and out supports all sampling rates as high as 96 kHz. Interestingly, the PMD671 can record in MP2 and MP3 formats at rates as high as 384 Kbps. Linear PCM sampling rates go from 8 kHz to 96 kHz.

In the Field

David Hughes is a sound designer and editor with a long string of top films under his belt, including *Fight Club*, *Minority Report*, and *Panic Room*. He used the PMD671 to record doorknobs and doors opening and closing with a Sennheiser MKH40, narration with the same mic, and a Martin D-35 acoustic guitar with a pair of AKG 414 mics.

The PMD671 had aspects that David really liked: "There are a few nice thoughtful features that I liked. The headphone monitor can be switched to listen to stereo, left routed to both, or right routed to both. While not as useful as an M/S decoder matrix, that can help make dual-level mono or M/S recording a little less confusing in the headphones. There is a prerecord buffer of four seconds, but at higher bit rates and sampling rates, that is cut to two seconds; it's still useful, though. The ergonomics of the machine are easy to run and easy to look at in action, with big meters and a big level knob. The unit mounts on a Mac desktop through USB with no fuss and no drivers to load."

A self-professed picky recordist, David had problems with the PMD671's preamps. "I wanted to love the unit, but the mic preamps were disappointing. Their high self-noise made any recording that I gathered practically unusable for professional applications without using lowpass filtering to remove the hiss. I was using

FIG. 4: The Fostex FR-2 has superb sound quality and optional support for SMPTE time code.

FIG. 5: The Edirol R-4 features four mic preamps, 4-channel recording, and a 40 GB hard drive.

an MKH 40, which is one of the quietest mics you can buy. It's a great machine for someone who already owns a high-quality portable mic pre. Otherwise, this machine would be stellar if [Marantz] would improve that one problem." Since then, David has gotten his wish: according to Marantz, recent firmware and hardware updates have addressed such concerns.

FOSTEX FR-2

The Fostex FR-2 field memory recorder ($1,499) is built for the working professional. It is a no-nonsense, somewhat bulky black box that definitely looks like it can take the punishment of working in the field (see **Fig. 4**). The unit can record mono or stereo Broadcast Wave Format files in 16- or 24 bits at sampling rates from 22.05 kHz to 192 kHz. Line and mic inputs share a single pair of XLR jacks, and the analog output is unbalanced –10 dBV on RCA jacks. Digital audio I/O is AES/EBU or S/PDIF on XLR jacks, maxing out at 96 kHz.

Unlike all the other units, the FR-2 features input trims in addition to record-level knobs to best maximize gain structure. It also has switchable 100 Hz highpass filters, a limiter, and a prerecord function. The optional SMPTE card ($799) allows the FR-2 to slave to and generate SMPTE. The FR-2 is the only unit in this roundup that's capable of doing that.

Kudos also for the FR-2's Menu knob: rotating it changes menu options, and pressing it in selects the currently focused option. That method of navigation and selection is quick and easy.

The FR-2 has two ports for storage: CompactFlash and PC Card. The PC Card port can use Flash ATA micro drives, which currently store as much as 5 GB.

In a professional situation, every moment counts, and searching for a parameter in a menu system can be difficult and frustrating. The FR-2 assigns all the most important recording parameters to hardware knobs and switches that you can see and change at a glance. That includes knobs for sampling rate and bit depth and switches to select 48V phantom power, a 100 Hz highpass filter, and mono or stereo operation. The FR-2 reminds me of a Dodge Dart: it may not be the smallest

or sexiest-looking ride available, but it is solid, dependable, and easy to drive.

The FR-2's Achilles' heel has to be its battery system. It uses 8 AA batteries that should last for 80 minutes, according to the specs. They actually lasted about an hour for me, which means you would need 64 batteries in a single eight-hour day of field recording. Having several sets of NiMH rechargeable batteries would be an absolute must for using the FR-2 away from AC power; a far more hassle-free solution would be to connect a 12V lead-acid external battery to the FR-2's DC input. Fortunately, the FR-2's power-saving mode can extend battery life somewhat.

I have a few minor grumbles about the FR-2. The AC supply ($69) is a separate item to be purchased from Fostex. The FR-2 comes with neither a CompactFlash card nor an AC power supply. Every other unit in this roundup that relies solely on CompactFlash as a storage medium comes with a small card to get you started. I also wish the FR-2 had a ladder LED VU display like the Sound Devices 722 (discussed later in this article) does. For something as critical as constantly checking level, a dim LCD VU display just doesn't work for me. In addition, high-resolution files can get big quickly. Next time around, Fostex should consider putting in a faster data transmission protocol, such as USB 2.0 or FireWire.

I tried the FR-2 in a number of different environments for recording car doors and engines, birds and frogs in the wild, and a jazz-funk band rehearsal. In each case, the unit performed like a champ. The mic preamps are dead quiet and detailed, and I liked the solid feel of the unit's buttons. One peculiarity is that you have to press Rec Standby to finish recording; the Stop button is for playback only.

Overall, I was blown away by the sound quality and solid feel of the unit. It is clearly built to last and was designed with the needs of the field-audio professional in mind. At $1,500, it takes dead aim at recordists retiring their Tascam DA-P1 DAT recorders, and it makes an excellent upgrade. Most of my colleagues and I felt that the FR-2 truly had the best-sounding mic preamps in the roundup. If budget is an issue but getting the highest possible sound quality is important, then this is the unit for you. Aside from the annoying AA battery drain and Fostex's dubious decision to sell a unit like this without an AC adapter, I unhesitatingly recommend the FR-2.

EDIROL R-4

The Edirol R-4 is a 4-channel desktop-oriented portable recorder (see **Fig. 5**). At $1,895, it is shooting for the upper end of the affordable tapeless field-recorder world, and it has the feature set to justify the price. Four channels of recording set it apart from all the other contenders in this roundup. The extra power is perfect for recording a band rehearsal with

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separate tracks for different musicians, for recording quadraphonic ambiences (making it useful for film or video games), or for multichannel production recording. The R-4 comes equipped with a 40 GB internal hard drive, which can hold a lot more 24-bit, 96 kHz 4-channel recordings than a CompactFlash card could (a CompactFlash port is included, too). The unit has built-in stereo microphones and stereo speakers. A sturdy padded carry bag is bundled with the unit.

FIG. 6: The Sound Devices 722 delivers great sound quality and professional features in a sleek package.

The R-4's design favors desktop use more than over-the-shoulder recording. It is powered by 8 AA batteries or an AC adapter. For long jaunts away from power I would recommend getting NiMH rechargeable batteries or a lead-acid battery that could plug into the R-4's DC power jack. The recorder's look and user interface are classic Roland, and it is exceptionally easy to use, with a big user-friendly LCD display and dedicated rubberized buttons for most of the commonly used functions. The mic/line inputs are of the combination XLR/TRS variety, with switchable phantom power in banks of two tracks. Rudimentary wave-editing procedures let you trim, divide, combine, and merge files on the unit. I give the R-4 two big thumbs up for the shuttle and scrub wheels, which allow you to move through recorded material forward and backward to find the moment that you're looking for.

Like the R-1, the R-4 comes with built-in effects that can be configured for playback only or for recording and playback. Unlike the R-1's, the effects sound pretty good and are oriented toward optimizing the recording rather than the creative processing. The effects include 3-band parametric and 6-band graphic EQ, a noise gate, an aural enhancer, and a compressor/de-esser.

Four on the Score

Al Nelson was sound-effects recordist on such films as *AI* and *The Hulk* and is currently recording effects for the upcoming Pixar film *Cars*. Al was also the sound designer on the recent Sony Classics release, *November*. He used the R-4 in the field and was impressed. His favorite aspect was simply the fact that it was tapeless.

"Despite a number of critiques that I may have, let's remember this: no more DAT tape. No $40 runs to the pro audio store before we go on that little recording adventure. No unraveling the little tape from around my Tascam DA-P1's insides after getting the one great take that I was waiting for. Just power up and start recording. And with 40 GB, you can keep the past month's stuff without fear of running out of space. Transferring my recordings to the computer was easy. I plugged the R-4's USB port into a Mac and it showed up on the desktop as a drive. Dragging and dropping was as simple as could be. It was way better than loading a linear tape."

Al also liked the R-4's layout and user interface. He said it was "an easy ramp-up to use. To start recording, it's pretty straightforward. There are not many menu items overall, and it's intuitive as to where you need to go to set up to record. The first time I had to go to the manual was to figure out how to monitor input without recording, which is achieved by pressing Pause while in Record mode."

Al thought that the preamps were clean, though he heard "a little bit of that hissy air with a quiet source and high gain. The device itself is very quiet, perfect on the Foley stage." He thought the input metering was reliable enough, but that the clip indicator was "not obvious—it was just a black dash. I would really prefer to see green, yellow, and red LCDs."

Al played around with the onboard effects as well. "The EQ seemed useful for auditioning whether or not a particular recording situation could be fixed in post, but I wouldn't choose to process internally if I had better outboard options or plug-ins. Things like emphasis and compression would probably be useful for vocals, though. Great for that indie film editorial team who might be recording voice-over or maverick-style ADR."

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The R-4 does have its share of drawbacks. Al noted that the phantom power "comes in banks of two. What if I have three dynamics and a condenser?" In addition, Al would like to see a mid-side (M/S) decode headphone-monitoring mode, which is useful for field recordists. The only unit in this roundup that does offer such a mode is the Sound Devices 722. He felt that the preamp "gain is clean, but I could use a bit more." Ultimately, he didn't think the R-4 was an appropriate choice for field recording, because "the thing is big and kind of clunky. It's set up like a desktop device. For what I do, it needs to be streamlined. It's really designed to lay flat for easy use. The transport is on the front, but all other menu options, switches, and so on are on top."

In summary, Al said it was a great tool for low-budget film projects. "For all of those spare-bedroom editorial departments making documentaries and indie movies, the R-4 will be a life-saver. Small productions can now buy a decent shotgun mic and an R-4 and prep most of their track. There's no timecode; by recording guerilla-style to picture, however, they can shoot narration, maverick-style ADR, simple Foley, and so on. They can record sounds while they shoot, spend a few weeks hunting and gathering, and actually create their project's sound library for cheap."

He also said, "For music, it looks to be a great tool as well. It's clean and quiet enough to take to your favorite room, empty lecture hall or church; plug in a few mics; and record for hours. Those extra two inputs could make a huge difference in allowing you to record close- and distant-perspective versions of the music."

SOUND DEVICES 722

The Sound Devices 722 ($2,650) is the unit that most pros I know either own or are planning to buy (see **Fig. 6**). Though it is the priciest of the bunch (costing $1,250 more than the excellent Fostex FR-2), it is loaded with features that would make any sound recordist drool. The 722 is small and lightweight, sounds great, and comes loaded with a 40 GB internal hard drive.

For protection, the 722 is built from solid aluminum plates all the way around. Because it has no controls on the top or bottom plates, you can operate it easily within a protective case with just the front and sides exposed. The front panel is loaded with bright LEDs and an LCD, with a relative paucity of knobs and buttons—13 in all. A knob on the side lets you control most functions by giving you access to the 722's menu system.

The 722 records WAV files as high as 24-bit, 192 kHz. It can also encode to MP3 format, providing a maximum record time of 1,422 hours at 64 Kbps. The unit has a

LISTENER COMMENTS

Recording Test	Comment
Snare Drum	
R-1	Rockers might like this unit. Too hot for me and a bit dull and harsh overall.
R-4	Best ambience. Balanced the resonance.
FR-2	Good overall but missing the highs.
PMD660	Noisy. Poor definition. (Not its intended use, Marantz stresses.)
PMD671	Good transient response, but little less of high mids.
722	Quiet, less low end and less punch than the R-1.
Dialog	
R-1	Noisy. Not enough gain offered by mic pre.
R-4	Clear, but without the low-mid fullness desirable for male voice.
FR-2	Dialog sounded natural, had good dynamic range.
PMD660	Somewhat brittle, but good detail and fairly well balanced.
PMD671	Natural and very flattering frequency response for male voice. Distortion is more musical when it breaks up.
722	Very clean. Good headroom during the loud passages.
Ambience	
R-1	By far the widest soundstage. Most natural sound.
R-4	Good overall frequency response with clear highs.
FR-2	Very natural sound. Could hear bare feet walking across the ground.
PMD660	Good, with more high-frequency response than the R-4.
PMD671	Did not care for the imaging. Too much amp noise in the signal.
722	Good overall. Nice image.

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WRH

RECORDER SPECIFICATIONS

	Edirol R-1	Edirol R-4	Fostex FR-2	Marantz PMD660	Marantz PMD671	Sound Devices 722
Price	$550	$1,895	$1,499.99	$649.99	$1,199	$2,650
Audio Formats	WAV, MP3	WAV, BWF	BWF	WAV, MP3	WAV, BWF, MP2, MP3	WAV, MP3
Sampling Rates	WAV: 44.1 kHz; MP3: 64-, 96-, 128-, 160-, 192-, 256-, 320 Kbps	44.1-, 48-, 96 kHz	22.05-, 44.1-, 48-, 88.2-, 96-, 176.4-, 192 kHz	WAV: 44.1-, 48 kHz; MP3: 64-, 128 Kbps	WAV/BWF: 8-, 11.025-, 12-, 16-, 22.05-, 24-, 32-, 44.1-, 48-, 88.2-, 96 kHz; MP2: 64-, 96-, 128-, 192-, 256-, 384 Kbps MP3: 64-, 80-, 128-, 160-, 256-, 320 Kbps	WAV: 32-, 44.1-, 48-, 88.2-, 96-, 176.4-, 192 kHz; MP3: 64-, 96-, 128-, 160-, 192-, 256-, 320 Kbps
Bit Depths	16, 24	16, 24	16, 24	16	16, 24	16, 24
Storage Formats	CompactFlash	CompactFlash, 40 GB internal hard drive	CompactFlash, Flash ATA PC Card micro drives	CompactFlash	CompactFlash	CompactFlash, 40 GB internal hard drive
Computer Interface	USB 2.0	USB 2.0	USB 1.1	USB 1.1	USB 2.0	FireWire
Battery Type	(2) AA	(8) AA	(8) AA	(4) AA	(8) AA	7.2V rechargeable lithium-ion
Analog Inputs	(1) ⅛" stereo line, (1) ⅛" stereo mic	(4) XLR/TRS	(2) XLR/TRS	(2) XLR, (1) stereo ⅛"	(2) XLR), (2) RCA	(2) XLR
Analog Outputs	(1) ⅛" stereo line/headphone	(2) RCA, (1) ¼" stereo headphone	(2) RCA, (1) ¼" stereo headphone	(1) stereo ⅛" line, (1) ⅛" stereo headphone	(2) RCA, (1) ¼" stereo headphone	(1) ⅛" stereo TRS, (2) TA3 balanced, (1) ⅛" stereo headphone
Digital Inputs	none	coaxial S/PDIF	AES/EBU on XLR	none	coaxial S/PDIF	AES/EBU and S/PDIF on BNC, word clock on BNC
Digital Outputs	⅛" S/PDIF	coaxial S/PDIF	AES/EBU on XLR	none	coaxial S/PDIF	AES/EBU and S/PDIF on BNC, word sync on BNC
Additional Features	built-in stereo mics, internal DSP	4-channel recording	optional SMPTE card	built-in stereo mics	(2) remote control connections	simultaneous hard disk and CompactFlash recording
Dimensions	3.9" (W) × 1.2" (H) × 5.3" (D)	9.5" (W) × 3" (H) × 8.5" (D)	9.8" (W) × 3" (H) × 8.7" (D)	4.5" (W) × 1.9" (H) × 7.2" (D)	10.4" (W) × 2" (H) × 7.3" (D)	8.2" (W) ×1.8" (H) × 4.9" (D)
Weight	0.6 lb.	3.8 lbs.	3.3 lbs.	1.1 lbs.	2.9 lbs.	2.5 lbs.

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The Guitar window is enhanced, and now supports **Alternate Guitar tunings,** including DADGAD, Drop D, Double Drop D, Open G and 11 others, including Nashville High Strung tunings! Guitar bends now show up in real-time on the guitar fretboard.

New 3, 4, and 5-part Jazz Harmonies are added with voicing in Fourths.

"Auto Endings" are added for styles that don't have endings, such as styles made from MIDI files. **Synthesizer Patch file lists** (.PAT files) can now be made easily by converting PowerTracks or Cakewalk patch lists.

"Jazz Chord-Symbol Graphics" (triangles for major, circles for diminished and a circle with a slash for half-diminished) are now supported. A new **"Vocal Wizard"** displays and transposes to the best song keys for your vocal range.

Editing of the Audio Track is now **non-destructive**, so changes only become permanent if you save the file. The TC-Helicon Audio Harmonies have been enhanced with **Vocal Pitch-Styles** (automatic "Vibrato" and "Scooping") that can be added to the vocal harmony parts. **Multiple sound cards are supported**—you can now choose which sound card to use. **Full Stereo or Mono support** has been added for the Audio Track. There are now on-screen **VU meters** to monitor the Audio Track.

Multiple lines of Lyrics are now supported on the Fake sheet and Printout. Chords and Lyrics can be displayed on separate lines on the Big Lyrics Window. A new **Play-Loop feature** allows you to select an area and play it in a repeated loop.

The SongPicker can display in subfolders, and you can add styles to the StylePicker. Karaoke files (.KAR) can now be read directly, including lyrics and analysis of chord symbols... **and much more.**

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- ✔ **NEW! Essential Rock Guitar Vol. 2: 20 Tunes** 2 hrs. video
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CompactFlash port that you can use instead of the hard drive. If you're concerned about the reliability of hard drives in the field, you can record to CompactFlash and the hard drive simultaneously, ensuring redundancy in case of failure.

The 722 is crammed full of more features than space permits me to describe; suffice it to say that flexibility and detail were clearly the intentions of the design team. Some examples are flexible routing between inputs and recording tracks and the ability to route input, track, or postrecord (confidence monitoring) to the headphones. You can adjust the meter ballistics, LED brightness, highpass-filter knee and cutoff frequency, and the output level of the warning beep. Presets let you set your favorite recording and headphone configurations, a reference tone oscillator, and a VCR-like time and date auto-record feature.

Special kudos must go to the 722's battery system. Rather than using AA batteries, the 722 uses 7.2V lithium ion (Li-ion) cells that are compatible with current-generation Sony camcorders. The included battery stores a relatively paltry 1,500 mAh, which will power the 722 for two hours, but larger batteries are available through consumer electronics and camera stores. The included AC-to-DC adapter will run the 722 and charge the battery simultaneously. For serious excursions into the wilderness, you can connect large-capacity lead-acid batteries to the DC power input.

On the Job

I used the 722 for a variety of sound-design and audio-production tasks for about a month, and was very pleased with the results. The upcoming DVD rerelease of the film *Titanic* includes a new scene where a character is playing an old upright piano. I used the 722 on a variety of pianos in different situations and recorded mono from six feet away using a Schoeps cardioid mic to get an appropriate room sound. The 722's clean mic preamps picked up a good balance of room reverb and piano, creating a convincing image.

My favorite use of the 722 so far has been for recording natural ambiences in a quiet environment. I used Sennheiser MKH 30 and MKH 40 mics in an M/S configuration for recording crickets, wind in trees, and general rural ambiences. I was absolutely blown away by the level of detail afforded by that combination. The mics have exceptionally low noise floors, which worked beautifully with the 722's crisp, detailed preamps to give me a clear, subtle signal with no hiss. The 722's ability to decode the M/S signal through the headphone monitor while recording the unencoded materials to the hard drive affords a great level of flexibility. I'm absolutely sold on this pairing as a high-end audiophile recording solution for nature recordists and sound-design professionals.

The 722 does have a learning curve. Though it's obvious that Sound Devices carefully thought out the interface, certain idiosyncrasies take some getting used to. The VU meter calibration is different from that of most digital systems with which I am familiar, with only four LEDs representing the area between –12 dBfs and 0 and 15 LEDs representing the region between –50 dBfs and –12. The result is that I calibrated my recording level lower than I normally would, creating fairly quiet

HHB MDP500 MINIDISC RECORDER

No self-respecting article on field recorders would be complete without at least a nod to the venerable MiniDisc. Tiny, lightweight, and inexpensive, the MiniDisc is based on magneto-optical technology. It is capable of recording as much as 80 minutes of stereo, 20-bit, 44.1 kHz audio. The MiniDisc's primary disadvantage is the use of a lossy compression codec called ATRAC (Adaptive Transform Acoustic Coding). ATRAC is similar to other audio compression algorithms such as MP3 in that it takes advantage of the psychoacoustic phenomena of perceptual masking to remove data that the listener is less likely to notice. Although any audio compression format is a compromise relative to linear audio, MiniDisc sounds pretty good and has been popular for years.

FIG. A: HHB's MDP500 is a ruggedly built MiniDisc recorder with a well-rounded feature set.

HHB's MDP500 ($1,712) professional MiniDisc recorder is a serious piece of equipment, designed for field and concert recording (see **Fig. A**). The MDP500 is loaded with pro features and is ruggedly built to last. Handy features include balanced mic/line inputs on XLR jacks with phantom power, a mono internal microphone, a monitor speaker, and optional limiting. Line outputs are stereo unbalanced RCA jacks, and S/PDIF in and out are available on either coaxial or optical ports. The MDP500's USB connection will stream audio in real time into your computer, though you can't access files on the unit as you can with the linear recorders in this article. Track editing in the box, a lockable record-level setting, a six-second prerecord buffer, an NiMH rechargeable battery pack, and user-configurable recording presets round out a comprehensive feature set.

I recorded a band rehearsal with the MDP500 and was more than satisfied with the results in terms of sound quality and ease of use. MiniDiscs are so cheap (around $1.50 each) and so small that they are an excellent medium for recording rehearsals and gigs. Their random-access nature makes it fast and easy to separate the wheat from the chaff, and 80 minutes of recording time is just right for an evening's rehearsal or a set at a club. The MiniDisc is particularly useful if you are on the road and don't have time to offload material from a CompactFlash card in between shows.

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files that sometimes needed to have gain added in Pro Tools. The 722 doesn't give you a way to delete files directly from the recorder; you must connect it to a computer and do so remotely. Sound Devices made that decision specifically to avoid undue hard-drive fragmentation. Nonetheless, users have requested the ability to delete files directly, and a future firmware update will implement that feature.

While the 722 is a deep and comprehensive box that I see as the de facto choice for many professionals, I still can't shake the feeling that the product got rushed to market before it was completely ready. Though the fit and finish is generally first-rate, the BNC connectors on the right side stick out farther than the protective paneling and are thus exposed to knocks. (Sound Devices assures readers that the connectors have been rigorously tested and should withstand any handling.) The lock washers holding them in place protrude asymmetrically to one side, which is a niggling detail but surprising considering the price of the unit. In the first unit I received for review, the FireWire connection did not work; Sound Devices immediately sent me a replacement. Transferring data through FireWire required a bit of futzing about before my Macs would see the unit. If I had the 722 connected to the Mac but powered down, powering it up will immediately crash the Mac, requiring a restart. I've discovered through trial and error that the most reliable method is to make sure that both units are powered up, connect the FireWire cable to the Mac first, and then connect the cable to the 722. The previous unit also crashed on occasion, though I experienced no crash problems with my current unit (firmware rev 1.37). According to the manufacturer, Mac OS X connectivity issues will be resolved in the 722's next firmware update.

My biggest gripe about the 722 at present is the lack of a dedicated switch for engaging phantom power. The default method for turning on phantom power is by accessing menu items, making what should be an instantaneous act require at least three button clicks and two twists of the Menu knob. Fortunately, pairs of buttons on the front panel, when pressed together, serve as navigation shortcuts to toggle phantom power on and off. Nonetheless, having friendly switches labeled 48V near the mic inputs would make the unit more intuitive and easier to use. Those issues aside, if budget is not as important a consideration as size and features and your primary purpose is portable field recording away from power sources, the 722 is tough to beat.

Apples to Apples

To get a relative sense of how these machines sound in comparison with one another, I recorded the same materials to each unit. I tried to exercise the full dynamic range of the preamps by recording a snare drum at close range, dialog at medium range, and a quiet nighttime exterior ambience. I recorded the snare using a Shure SM57 placed two inches from the rim of the instrument. I recorded myself reading the dialog—a scene from a movie script—with a Sennheiser 416 shotgun mic at a distance of 12 feet. I recorded the ambience in a suburban neighborhood on a quiet, breezy night using a pair of Earthworks QTC1 omni mics placed about ten feet apart. Though each recording was a unique performance, I took scrupulous care to make sure that the levels of the performances, as well as the VU meter readings on the recording units, were as closely matched as possible. Although 24-bit recording would have probably revealed additional differences, all recordings were made at 16-bit, 44.1 kHz.

Because the R-1 does not feature 48V phantom power, I used a Lunatec V2 mic preamp on the dialog test for

that unit to power the mics. In addition, the R-1's mic preamps did not have enough gain to record the quiet nighttime ambience convincingly.

I transferred the recordings to a Mac using FireWire or USB 2.0 and then edited them in Pro Tools. The only processing that I performed was some slight level balancing to even out their loudness. Once I had completed that process, I sent the files to a number of golden-eared listeners without telling them which file was recorded on what machine.

As with any subjective experience, different listeners had different impressions; a few of their observations are listed in the table "Listener Comments." There certainly were trends, though. Nearly everyone really liked the sound of the Fostex FR-2's preamps on all three record sources. No one cared for the PMD660's recording of the snare drum, which was no surprise because its preamps were not designed for recording music. Nonetheless, many people liked it on the ambience recording. No one liked the R-1's dialog recording, but it added a surprising amount of compressive rock punch to the snare recording that appealed to many. Most people liked the PMD671's dialog recording, but felt it was too noisy and had an unconvincing stereo image in the ambience recording—but again, that was not its intended application.

The Envelope, Please

If you want something inexpensive, portable, and easy to throw in your bag to capture that perfect aural moment, the R-1 is hard to beat. The built-in mics and onboard DSP make it the unit of choice for musicians and casual field recordists.

The award for best user interface goes to the Edirol R-4, whose big, clearly marked buttons; easy-to-read LCD panel; and generally good layout allowed me to get right in and record without cracking the manual. It's also the only field recorder in this price range that offers four discrete mic preamps. For a semiprofessional production sound gig that doesn't require SMPTE, the R-4 could be a great choice, allowing for three separate actors on lavalier mics and a boom mic. It would also have solid advantages for recording a live band from a board; you could record a stereo band mix, with two separate tracks for vocals.

The Marantz PMD660 is the unit best suited for news-gathering and interviews. Its small, fairly lightweight size; strong build; and built-in mics make it the choice for grab-and-go situations.

To my ears, the best mic preamp was a tie between the Fostex FR-2 and Sound Devices 722. Both preamps are whisper-quiet, clean, and detailed, with headroom to burn and the ability to record materials with a wide dynamic range. I'd feel comfortable using either unit to record anything from crickets to a rock concert.

The FR-2 and 722 are also tied in the contest for the most suitable for professional audio field production. If money were no object and I were primarily focused on field recording, I would favor the 722 because of its miniscule size and excellent battery system. If I were recording production audio, I would go for the FR-2, whose professional, no-nonsense knob and switch-based interface; ability to read and write SMPTE; external speaker; and sturdy, block-like design make it a winner.

Just before this article went to press, three new tapeless field recorders were announced. For details, please see the M-Audio MicroTrack 24/96 and the Sony Hi-MD Recorders descriptions in this issue's What's New section. EM

Nick Peck is a sound designer, jazz organist, composer/engineer, and interactive-audio consultant living in the San Francisco Bay Area. *Special thanks to Al Nelson, Mac Smith, Tim Nielsen, David Hughes, Matt Gallagher, Agnes and Julian Peck, and all the intrepid surveyors (you know who you are) for their help in creating this article.*

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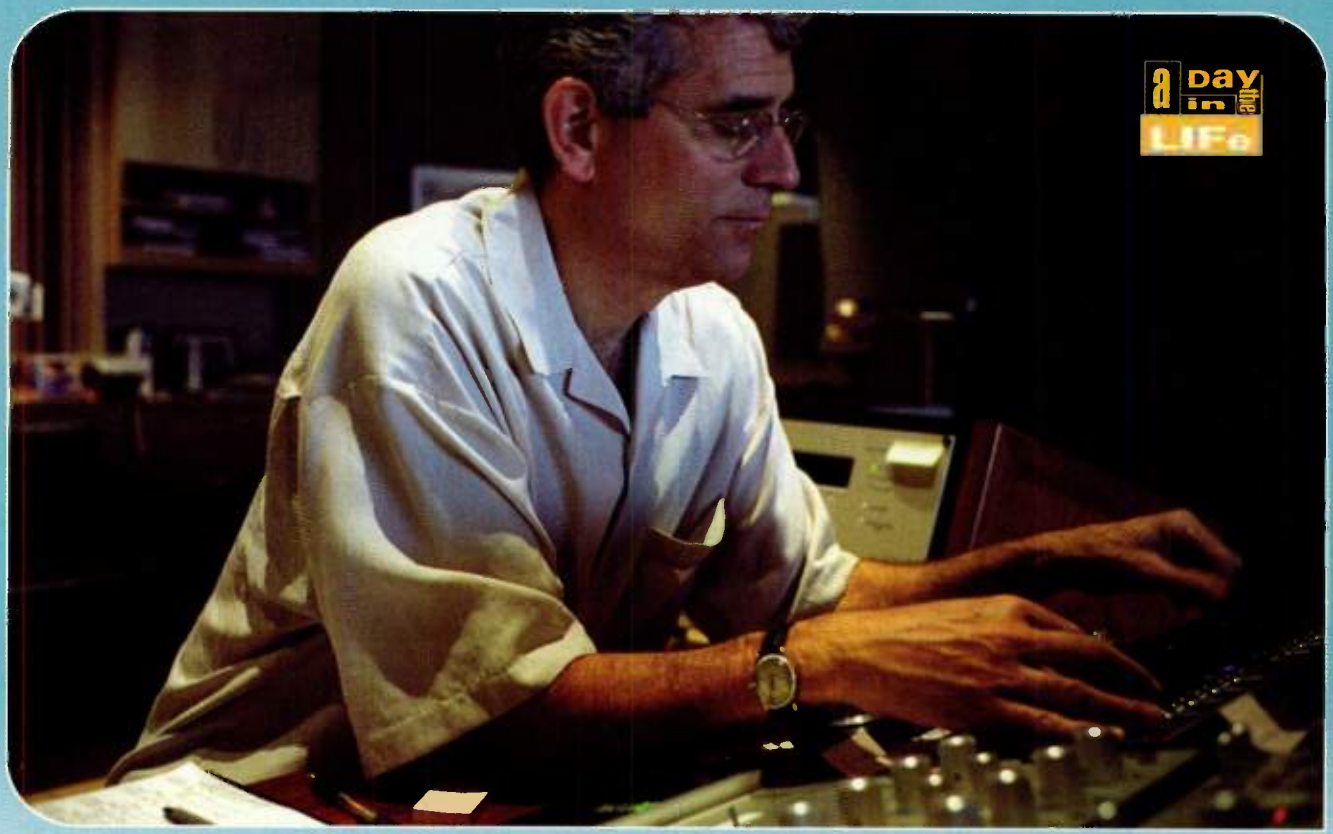

COURTESY MORISEN RECORDS

Mastering in Manhattan

By Mike Levine

Engineer Greg Calbi performs his studio magic.

Mastering is one of those mysterious arts that you hear a lot about but rarely get a chance to witness. So I jumped at the chance when I was invited to observe a complete session with Greg Calbi, one of the top mastering engineers around, working at New York City's Sterling Sound, one of the top facilities around.

Calbi has been mastering since 1972 and has a discography that spans 15 pages on the Sterling Sound Web site (www.sterling-sound.com). It includes some of the most acclaimed albums of all time including Paul Simon's *Graceland* and Bruce Springsteen's *Born to Run*, and CDs by current artists such as Ani DiFranco, Amos Lee, the Strokes, Gov't Mule, Lenny Kravitz, Branford Marsalis, the Kills, Kaki King, and many more.

Although much of Calbi's work is with high-profile, major-label acts, he also has a clientele of indie-label artists. The session I attended featured the music of a band called The Talk (see **Fig. 1**), who are signed to MoRisen Records, an indie label out of Charlotte, North Carolina.

10:30 AM Sterling Facilities

On an overcast spring morning, I arrived at Sterling Sound, which is on Tenth Avenue on the western edge of Manhattan's chic Chelsea district. The facility is located in a large industrial building that also houses Chelsea Market, a bustling mall filled with gourmet shops and restaurants. Understandably, Sterling Sound keeps a low profile, and only after wandering around the market for a while did I see a discreet sign for it.

As I exited the elevator into the Sterling facility, I walked into a huge open room with high ceilings and a modern décor. On the left I saw a raised café area with picture windows and a panoramic view of the Hudson River and New Jersey. To the right was the reception and administrative area.

I was told that Calbi, who is one of the owners of Sterling, was still in a meeting, and so I had a cup of coffee and waited in the café. About 15 minutes later, he emerged from his office and took me on a tour of the facility.

MIKE LEVINE

FIG. 2: Calbi adjusts a digital processor on his right. When he's facing forward in the mix position, his console and some of his analog processors are in front of him, and his other analog processors and his XLR patch bay are to his left.

10:45 AM Going on Tour

Sterling, which was previously housed in an office building in midtown Manhattan, has been in its Chelsea location for five years. It opened on April 1, 2000.

The facility is about two miles north from Ground Zero, and had had a direct view of the World Trade Center towers. "We were all here on Sept. 11, 2001, for a 9 o'clock engineering meeting," Calbi recalls. "We went on the roof and saw the smoke."

The present Sterling location was custom designed as a mastering facility. It contains seven mastering rooms, five of which have an identical footprint designed by Fran Manzella of FM Acoustical Design. The mastering rooms all face a hallway that's located along an exterior wall. As a result, each room has a window to the hallway, which itself is lined with windows to the outside and thus provides natural light for the mastering rooms. "That was an important prerequisite," Calbi told me. "We wanted to have that feeling of being attached to the outside."

Another advantage is that the outer hallway provides a place, outside of the mastering rooms themselves, for keeping CPUs and other noisy gear. "When you go in the room, you hear dead quiet," said Calbi. "It's really very helpful. Usually when you go into a mastering room, you'll see a closet with this stuff in it. These are all designed so this gear is out in the hallway."

During the tour, Calbi introduced me to various other engineers and staffers. At Sterling, each mastering room has an associated production room. In one such room, we met Will Quinnel, an assistant to senior mastering engineer Chris Gehringer. "Will is a mastering engineer part time," Calbi explained, "but his full-time job is to take Chris's stuff and basically manufacture it in this room, to go to the manufacturer. It's what we used to call 'parts.'"

Calbi explained that one of the important parts of the assistant's job is to make sure that the files are not corrupt and that the version that gets sent to the manufacturing plant is the correct one. "There could be ten versions of the album in the computer," Calbi said. "Especially in the hip-hop world, there could be clean versions, instrumental versions, a cappella versions, and so forth."

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FIG. 1: During this session, Calbi was mastering a CD by MoRisen recording artists The Talk. Lead singer Justin Williams (center) attended the session.

11:15 AM Calbi's HQ

After checking out many of the other mastering and production rooms, we finally arrived at Calbi's mastering room. The gear in his work area is set up in a U shape, with analog processors and his XLR patch bay to the left

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of the his chair, his custom-built Muth console (mastering consoles are tiny compared with regular studio mixers) along with more analog processors in front of him, and his digital processors on his right (see Fig. 2). A computer monitor, displaying a Mac running Digidesign Pro Tools is on his far left, and a monitor displaying Merging Technologies Pyramix software (see Fig. 3), a multitrack editing environment for the PC is on his right.

His analog processors include a Dangerous 2-Bus Analog Summing Mixer (see Fig. 4). "It's one of the great tools that we have," Calbi said. "The I/O from the Pro Tools rig comes out so we have each of those now analog, each of the eight pair come up analog, and I can route those into my analog EQs and resum them back in at the end [using the Dangerous 2-Bus], and I'll end up with something considerably different."

Other analog devices he uses include a Pendulum Audio OCL-2 tube compressor, a Pendulum Audio ES-8 tube limiter, a Focusrite Blue 330 mastering compressor, a Focusrite Blue 315 equalizer, a pair of EAR 822Q equalizers, an Avalon Design 2077 equalizer, a Manley Massive Passive tube equalizer, a Manley Variable Mu Limiter Compressor, and an API 550M equalizer (see Fig. 5). For connecting his gear, Calbi has an XLR patch bay that features thick, blue-and-gold cables from a company called Wireworld.

"Every cable has a sound," he explained, "and I auditioned a bunch of them about five years ago, and I really liked this one called Wireworld. They're made by David Saltz in Ft. Lauderdale, Florida. They really do sound different. A much fuller, more detailed sound."

His digital processors include a Weiss DS1 Digital Dynamics Processor, a TC Electronics Finalizer, a DBX 120A Subharmonic Synthesizer, a Z-Systems z-Q6 Mastering Equalizer, a Waves L2 Ultramaximizer, and a custom-designed Z-Systems peak limiter.

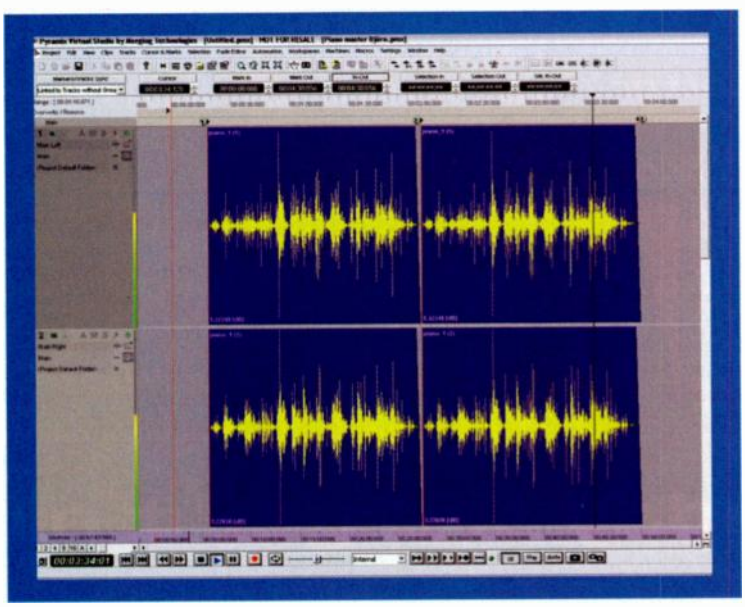

FIG. 3: Calbi uses Merging Technologies Pyramix (Win) as his primary DAW software during the mastering process.

MIKE LEVINE

FIG. 4: Beneath Calbi's Macintosh monitor and keyboard is the Dangerous Music 2-Bus, a summing mixer that can handle up to eight analog stereo pairs. On the lower right (next to the trackball) is the Muth mastering console, and in the background is one of Calbi's ProAc Response 4 monitors.

Calbi uses ProAc Response 4 monitors, which are tall, tower-style enclosures that have been placed about ten feet back from the listening position. I asked him what are the optimum listening levels when mastering. "Everybody's got their own level. I think mine's about 100 or 105 dB. I know that it's louder than it should be. We all have our level that we hear our balance on. George Marino listens lower than that. Ted Jensen listens fairly loud," he explained, referring to two other Sterling engineers.

Calbi's ears are his most valuable asset, so he's very careful to minimize his exposure to loud volumes. "I only listen at my level when I have to," he told me, referring to when he's actually figuring out settings for a song. After that, when he's transferring the song, he turns the volume down. "If the client wants to hear it again, I'll turn it up—but I won't turn it up as much."

11:30 AM Listening Down

Chuck Morrison, the owner of MoRisen Records, arrived. Shortly thereafter, Calbi started listening to the stereo mixes for the session (which were delivered on a hard drive) on his Pro Tools rig. The songs, by The Talk, could be described as guitar-based, British-sounding pop rock with an indie edge.

Calbi explained that first it's important to listen to at least part of all the songs to get a good idea of what needs to be done. It's better, he said, "than starting to twist and turn knobs and take something to a place

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According to Calbi, the preliminary listening lets him get a handle on the overall fidelity. "Whether its smooth or rich sounding, whether its plastic sounding or digital sounding." As he listened to one of the mixes, he said, "This one is sort of on the plastic-digital side. And I can definitely deal with that in two or three different ways immediately, by going through this tube equipment.

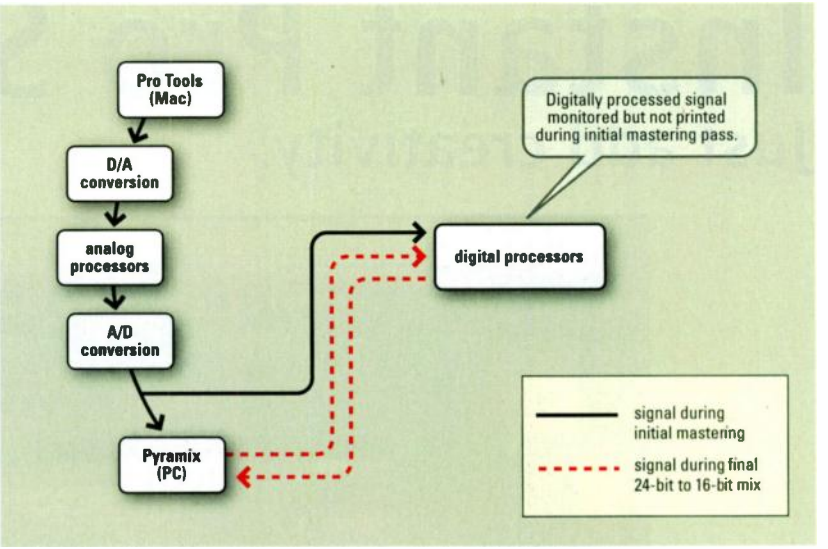
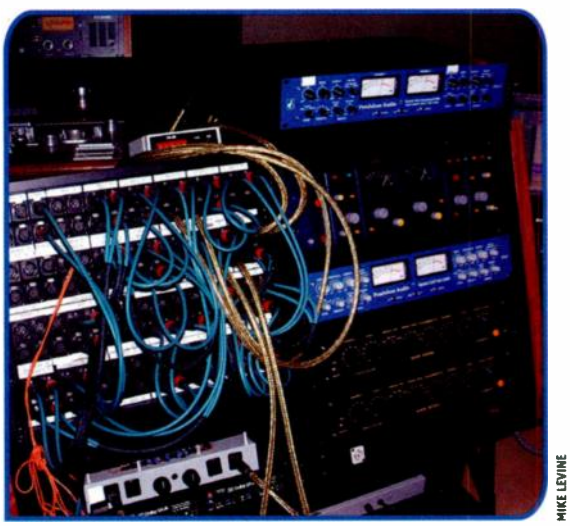


FIG. 6: This shows the basic signal flow that Calbi used for the session.

"The great thing with this song is that balances seem correct to me. The vocal balance compared with the guitar seems right, the bass—although the sound could be improved—is not too loud or too low. If the balances are good, we know that we're not going to have to struggle today. A lot of it is going to be just a matter of trying to make it more texturally pleasing."

As you might expect, badly balanced mixes are a lot more challenging to master. "If you get something where the drums are like, way, way too loud, the vocals are buried, the guitars are too low, or the guitars are overwhelming everything and they're really bright," Calbi said, "then you're going to have a very remedial sort of day, and it's really tough."



MIKE LEVINE

FIG. 5: When Calbi's in his mix position, his patch bay and a number of his analog processors sit to his left. The Studer 2-track machine in the background gets used on some sessions to add analog tape qualities to a mix.

After listening to more of The Talk's songs, he said that he was noticing "some bass inconsistency that we're going to have to iron out. Otherwise, the songs where the bass is light are going to have less impact and are going to sound weak, and the album is not going to have momentum."

He listened for one song from the group to use as a benchmark that he could tailor the rest of the mixes to. "You look for one to do first that's pretty much where you want to go."

While Calbi continued to listen, I talked to Morrison. He told me that MoRisen has nine artists on its roster currently, including The Talk. I asked him if they're all from the Southeast. "Everybody's from North Carolina, believe it or not," he said. "There's a good regional scene there."

Morrison was enthusiastic about The Talk's upcoming CD. "It's the biggest record I've done to date," he said, "in terms of time, budget, people working on it, additional musicians that we used on a couple of songs, and so on."

I asked him how long the mastering sessions he attends generally last. "Usually, just a day," he said. "I've never had a two-day session mastering, anywhere." Calbi told me that about 60 to 70 percent of his sessions are attended.

12:10 PM Let the Tweaking Begin

Calbi had finished his preliminary listening and was ready to get started with the actual mastering. He decided to start with a song called "Any Other Saturday" and use it as his benchmark.

The basic signal path that he would use throughout the session started at the Pro Tools rig, where the source files resided (see Fig. 6). The signal would then pass digitally through the Muth console after which it would be converted, temporarily, to analog. Then it

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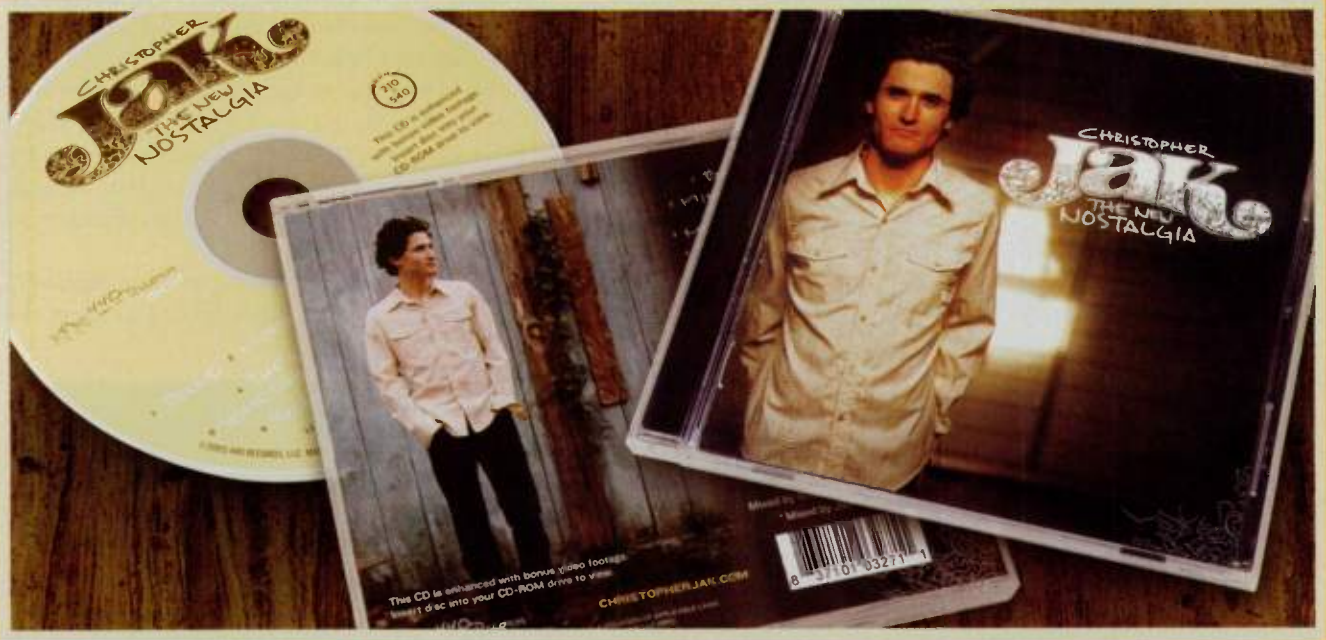

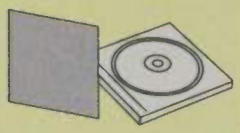

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would pass through a custom-built tube amplifier that Calbi decided to use to help warm up the sound. While it was still analog, Calbi could also patch in a variety of processors, as needed for each song.

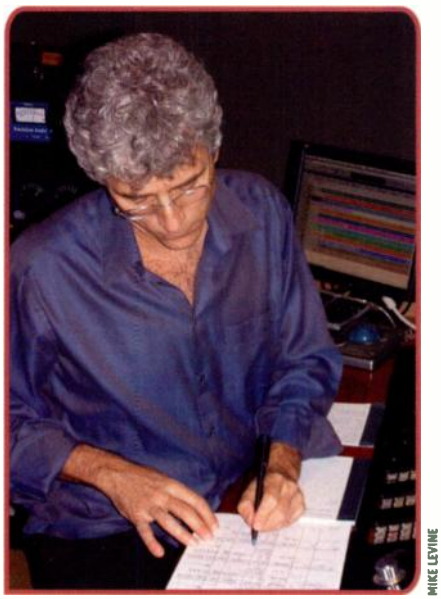
Next, the signal would be converted back to digital and split, with one pair going to the rack of digital processors and the other going into the inputs for Pyramix on the PC. With the sophisticated switching and monitoring capabilities of the Muth console, Calbi would be able to compare the original song, the analog-processed version, and the analog and digitally processed signal.

12:25 PM All Things Being Equalized

For "Any Other Saturday," Calbi eventually decided to add several equalizers from his analog arsenal. He chose the Manley Massive Passive and the two EAR 822Qs. He pushed a button on the console that sent the mix through an M/S matrix, allowing him to work on center-channel elements. "The Manley is set up so I'm EQing the center channel separately from the side channel," he said. "The vocals are being pulled forward, and I'm pulling the bass out a little bit."

I asked him what frequencies he had adjusted with the various EQs on this song. "A dB at 150 Hz, a little bit at 112 Hz, and that center channel EQ that I talked about at 1.2 kHz," he said. "I'm getting the vocal all clear and the bass nice and filled out."

He also decided on some digital EQ settings, and then printed a copy of the song (minus the digital EQ, which will be printed later) into Pyramix.



MIKE LEVINE

FIG. 7: Calbi constantly jots down settings for his analog processors on recall sheets.

"Notice that I lowered the volume when making a copy," he pointed out. "That's what I was talking about before: I only listen to something loudly when I have to. That's why I always turn it down. Otherwise, at the end of the day, everything starts getting brighter. It's like when you get in the car the next morning after you were listening to music the night before, and you turn the car on and all of a sudden, 'Wow! What the hell was I doing?'"

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12:51 PM On to the Next

Calbi ordered out for food. "I'm still in breakfast mode," he said. He then listened to the next song, "I Started Running," using the same basic signal path and processors from "Any Other Saturday." I noticed that he was careful to write down all analog processor settings on recall sheets in case he needed to reconstruct the session at a later date (see **Fig. 7**).

Calbi explained that in the mastering business, revisions are often required. "There could be an endless amount of give and take. That's what you dread. It could be that the guy in the room at the time gave you a certain bit of information which some of the other people on the production team didn't agree with."

Calbi uses his late afternoons and evenings, after the day's session has ended, to deal with revisions asked for by the clients. "It could be sequence changes, it could be little level changes, it could be the intro level—all kinds of stuff," he said. "That's why I'm rarely home before 9 or 10 o'clock. You have to take care of business. You have to take care of these projects."

Calbi checked his email periodically throughout the session. He explained that he did so to keep tabs on his recently finished projects, in case any revisions were requested.

1:00 PM Looking for the Answer

After listening more to "I Started Running," Calbi decided that the tone of the bass needed some work. "It's great in the intro, but it changes in the verse," he observed. He did some equalizing and added a multiband compressor from the digital signal chain using a TC Electronic Finalizer.

He listened back but wasn't satisfied with the results. "I was boosting down at 160 Hz, but it was introducing a filminess over the bass that was not working," he explained. "It's a balancing act, how much bass you can put in the 2-track without messing up the middle."

He decided to add the Pendulum Audio OCL-2 tube compressor into the signal chain. He dialed in a subtle 1.5:1 ratio, which allowed him to add its tone without much compression. After listening, he was satisfied with the effect. "That's great," he said. "I think that setting is going to help us with some of the other songs."

1:15 PM Moving Ahead

Next up was "I Don't Want to Choose." Calbi started to work on it, using the Manley Massive Passive equalizer to boost the bottom end. "This thing really needed some low end," he said to Morrison.

Calbi made some more adjustments and used some additional processors. Eventually, he had five different EQs boosting different bass frequencies in the song. He checked the sound against the songs he'd already worked on to make sure that there was consistency. Satisfied, he recorded "I Don't Want to Choose" into Pyramix.

1:35 PM What's That?

The next song up was called "With Guns in Our Hands." Calbi ran it through the same analog signal chain that he'd been using on the other songs and was immediately pleased. "It's pretty close to the other one; it's got almost the same EQ," he said.

He noticed a rhythmic anomaly, however, that sounded as if it could have been a bad edit. He asked Morrison to contact Williams (who was expected to arrive at the session soon) to find out if there was an edit in the song. Morrison wasn't able to reach Williams, but he put in a call to the producer, Brian Paulson.

1:52 PM The Producer Calls

While waiting to hear from Paulson, Calbi moved on to the next song, "New York–L.A.," which didn't need bass treatment like some of the others. "This one's better," he said.

Paulson called in, and I heard Calbi talking to him on the phone about the mysterious rhythmic moment, which apparently was just part of the performance of the song. "It's fine, as long as it's not an edit," Calbi told him. "I'm not here to critique; I just wanted to make sure there's no technical glitch in that spot."

Calbi had stressed to me earlier that he's very careful to avoid being critical of the material he's presented with for mastering. He doesn't feel that's part of his job. "Many of the clients want a verbal description of what you're doing," he explained, "and you have to be very careful not to go into criticize mode; you have to go into helpful mode."

He looks at it philosophically. "Your job is to make it sound better—it's not to criticize what they've done. That's why a certain type of personality is not great for a mastering job. You assume that what they [the clients] have is what they want, because they've already approved the mixes and they want to master it."

2:09 PM Go for the Lows

Calbi started mastering a medium-tempo song called "Man Narrates." He spent some time adjusting the bottom. "I'm just trying to get the low end as consistent as possible so that none of the songs sound smaller [than the rest]."

Calbi told me earlier that he's now a strong advocate of artists bringing in stem mixes to mastering sessions. "It's perfect for people who do home-studio projects, who really know the sounds that they like and have got great effects. But somehow in the listening environment of their mix room—which could be their bedroom or living room—they haven't had the ability to really listen to it clearly; haven't really heard what's on there."

He told me about an artist who recently brought his album in for mastering. Calbi could tell after listening to it that the acoustics in the personal-studio where it was mixed were problematic. "There was no bass," he said. "You couldn't

hear it." He was concerned that trying to boost the bass as much as it needed from the stereo master would cause problems elsewhere in the mix. "The bass is so locked up into the bass drum and the bottom of the guitar," he said, speaking generically, that if you boost it too much, "the whole thing will start sounding mushy and muddy."

The answer for that artist was to bring stem mixes to the mastering session. "He let me take the bass separately and the drums separately," Calbi recalled. "He had the drums on a separate stem, he had the bass on a separate stem, he had all the guitars, then he had three vocals, then he had background vocals and effects." Because of the flexibility that the stems afforded, Calbi was able to salvage the project.

"It was fascinating how much better it sounded. And it wasn't a remix—it was mastering. But it wasn't really mastering; it was beyond it. It was like a step between mixing and mastering, which I haven't invented a name for yet, but a lot of mastering engineers are doing it. For mixes coming from home studios, it's a very powerful tool."

One of the problems with the stem approach, he explained, is that it can cause political problems. The mix engineer spends lots of time and effort mixing the songs, and might feel usurped when the mastering engineer starts changing levels of the bass, drums, or other elements.

2:20 PM Dial It Back a Bit

Calbi moved on to the song "I Can't Go Out." After tweaking it for a while and listening to what he'd done, Colbi said, "I might have gone a little overboard with that one. That was a case of everything getting too dark." He then backed off some of the EQ and was satisfied. "The frequency [500 Hz] was right, but the amount was a little over."

The next song that Morrison wanted Calbi to start mastering was not on the hard drive that had the other tracks. Apparently, it had been FTP'd over separately, and Calbi had to spend some time looking for the file and downloading it (something his assistant, who was off that day, would normally do). While he worked on that, there was a break in the session.

3:04 PM Dynamic Tweaks

After Calbi found and downloaded the missing song (called "Eskimo"), the session resumed. While listening, he noticed that it had too much compression. "The first thing I'll do," he said, when dealing with an overly compressed mix, "is to take all of my compressors off."

He found that "Eskimo" was also lacking in lower mids. "I'll try [to boost] 800 Hz to get more bottom out of the snare," he said.

3:10 PM Really Swell

Calbi appeared to be working more quickly as the project moved along. He attributed that to getting a good basic signal path worked out in the beginning. For the most part, he has only had to tweak the rest of the way. He said that his ability to work quickly is largely dependent on the consistency of the mixes.

The next song to be worked on was called "Swollen." It needed some additional adjustments; Calbi felt that the guitars were a little thin. "You have to find something texturally to make up for some of the things that aren't as powerful," he said. His answer for this song was to push the low end. "I'm allowing it [the song] to be driven more by the bass," he explained.

Singer Justin Williams arrived, having walked across 14th Street from the East Side to get to Sterling. By then, Calbi had moved on to the song "Warm Gun," which didn't require a lot of tweaking beyond the digital-to-analog-to-digital signal path that Calbi had been using throughout.

3:30 PM The Back Stretch

After listening to the next song, "Queen (She's Leavin' the Road),"

Calbi decided it needed a midrange boost. He boosted at 700 Hz but found that his tweak had adversely affected the kick drum. "Sometimes, when you push too much in the mids, then you lose bottom," he pointed out.

He reduced some of the 700 Hz boost until he finally found a happy medium. After listening to the song through the digital effects chain and figuring out which of those processors he was going to use on it, Calbi recorded it into Pyramix.

By now, Calbi had treated all the songs through his analog processors and recorded them into Pyramix. Although he monitored them all through selected processors in his digital signal chain and saved all the settings that he came up with, he hadn't actually printed the signals through the digital effects as of yet.

He explained that the songs don't go through the digital processors during the mastering session itself. That's done later by his assistant Steve Fallone, who also checks the fades and edits, listens for digital artifacts, and does a final check of the song-to-song levels.

Then Fallone does what's called a "16-bit wraparound mix." Each song comes digitally out of Pyramix and goes through whatever digital processing Calbi had decided on during the session. In the process, the files are converted from 24-bit to 16-bit. "At that point," Calbi said, "you can print CDs and masters—whatever—from them. Dithering is added with the dB Technologies 3000S."

4:00 PM In Sequence

Calbi was finally ready to put the songs in their final order, work out the spacing between them, and add any fade-outs required. I was surprised to discover that space between songs on a CD is typically done by feel and is rarely uniform from song to song. Calbi explained that the variables are changes in key, rhythm, and mood from one song to the next.

"Some keys are kind of dissonant," he said, "and you need to leave a longer space sometimes. If the rhythm changes funny [from song to song], you end up kind of falling over your feet a little bit, and you need more space."

Calbi went through each transition, putting in the spaces and the fades. Morrison and Williams made suggestions as the process moved along. Calbi said he finds Pyramix really good for adding fades. "It's one of the best things about the software," he said. There's a fade tool shaped like a hand that lets you easily enter precise fades.

The sequencing of the CD progressed quickly. "This used to be an all-day process in the early days with analog," Calbi said. Today it took only a little more than half-an hour. "If you have a band in the room, you could spend hours doing this, because they're fighting all the time," Calbi observed. "Anything takes hours if you have a band in the room," quipped Williams.

4:40 PM The Finish Line

The session ended a bit over five hours after it began. The final version of the CD, with the fades and spaces, was just a little over 30 minutes long.

Observing the session had been a fascinating experience. It had provided me with a glance at the inner workings of a pro mastering studio. The biggest lesson that I took away from it was that no matter how good you are at mixing and no matter how good you think your listening environment sounds, a trip to a professional mastering studio is a sure-fire way to dramatically improve your final product. EM

Mike Levine is a senior editor at EM. *He wishes to thank Chuck Morrison, Justin Williams, and especially Greg Calbi for the help and cooperation that made this story possible.*

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Buffer Madness

With the exception of sound quality, a software instrument's most important characteristic is its responsiveness, or playability. Most musicians dislike lag times when they play their instruments, and managing latency is therefore the first order of business when developing an efficient system to host VIs.

Several factors, including the quality of your audio interface and drivers, can contribute to latency, but if your hardware is optimized for audio, the most important software setting is the size of the program's audio buffer. Software instruments usually offer a range of settings between 64 and 512 KB. Lower settings, in the 64 to 128 KB range, can reduce latency to levels that rival hardware instrument response. But lower settings also make your computer work harder. The goal is to have an optimum setting that will give you the responsiveness you need without producing glitches in the audio. Extremely low buffer settings are required only during the tracking stage of a recording project. Once you've recorded your virtual instrument parts, you can select a higher buffer setting for mixing and monitoring.

FIG. 1: FXpansion's BFD, a drum instrument that has a large add-on library, offers numerous settings to help reduce memory requirements and achieve an optimal balance between the amount of sample data loaded into RAM and streamed from disk.

Even so, simply playing back a track with a virtual instrument can consume more of your computer's resources than playing back a regular audio track. As track counts rise and resources get tighter, you may want to render your VI track as audio using your application's bounce or freeze command. Bouncing instrument tracks reduces the hit your CPU takes on playback and frees up resources for other tasks, such as powering effects plug-ins.

Project Streamlining

Tweaking buffers and bouncing tracks let you trade in some flexibility for extra power. If your system is pushed to the limit, though, you might have to use other trade-offs to fully fuel your instruments. Here are some additional tricks for squeezing a bit more juice out of your CPU for VIs:

Avoid using multiple instances of plug-ins. For power-hungry plug-ins like reverb, use aux sends to allow several tracks to share one effect. Similarly, don't activate more virtual-instrument plug-ins than you are actually using. Just having an instrument instantiated can drain CPU power.

Use guide tracks. Create a submix to use as a guide track, so that you can mute power-draining instrument tracks when overdubbing. Alternatively, you can use a hardware synth temporarily to play back the MIDI data of your VI tracks while overdubbing. When the recording process is completed, you can raise buffers and restore the original software-instrument sounds.

Use a hardware synth for MIDI recording. This can be very effective with a piano part. Record the part using a hardware instrument (perhaps your trusty old Kurzweil). Once your MIDI data is recorded, you can use it to drive your multigigabyte software piano for maximum playback quality. This process eliminates the need for low-latency settings. You can then render this track as audio, disable the software piano, and conserve even more resources.

Use hardware effects. Disabling plug-ins during recording will conserve CPU power that can be used for VI tracks. You can work with, say, a less demanding reverb plug-in while overdubbing, and then switch to your highest-quality reverb for mixing.

Close nonessential windows. If you need to run as many VIs as possible, avoid diverting precious CPU resources to functions like screen redraw.

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Self-Storage

Your available hard-drive space and RAM will also affect your system's ability to handle virtual instruments. Today's sample-based VIs can consist of a staggering amount of waveform data, more than what can fit in a computer's RAM. As a result, the VI streams the data directly from hard disk. That can present multiple challenges.

To deliver the streaming data with peak efficiency, you need a fast (7,200 rpm with a 10 ms or faster seek time), large-capacity hard drive. I recently bought a 200 GB Seagate drive for storing my new VIs, and installed just two virtual instruments—FXpansion's BFD + XFL drum plug-in and EastWest/Quantum Leap's Symphonic Orchestra Gold. The drive is now already one-quarter full.

To minimize drive strain and fragmentation, and to keep your sample library organized and portable, it's best to dedicate an entire drive to the tasks. If you also follow the common practice of using a separate audio and system drive, then you may run short on internal drive bays. External FireWire drives are helpful in situations like this. An external drive makes it easier to use your library on another computer. Some orchestra libraries are so massive that they cannot even fit on a single drive, and samples must be streamed from multiple drives.

Intelligent Design

Even though the bulk of an instrument's sample data is stored on your hard drive, the instrument's initial transient data is loaded into RAM. Some virtual instruments are so enormous that they can command a substantial portion of available RAM just for this transient data. Fortunately, software-instrument designers are including built-in interface features to help you conserve RAM and other resources.

FXpansion's BFD 24-bit drum-sample library, for example, features a 16-bit mode, which effectively halves your memory requirements (see **Fig. 1**). Toontrack's Drumkit from Hell Superior, another popular drum plug-in, includes a cache mode to help keep RAM usage to a minimum by loading only the samples requested via MIDI. Native Instruments recently introduced a resource-conserving tool called Sample Purge for the company's Kontakt 2 soft sampler. The feature searches through a track and unloads any samples not actually used in the track. Meanwhile, MOTU's MachFive sampler offers a 32-bit mode, which might be the best option if you have RAM to spare but need to conserve CPU cycles. These options can help you better manage the resource tug-o-war.

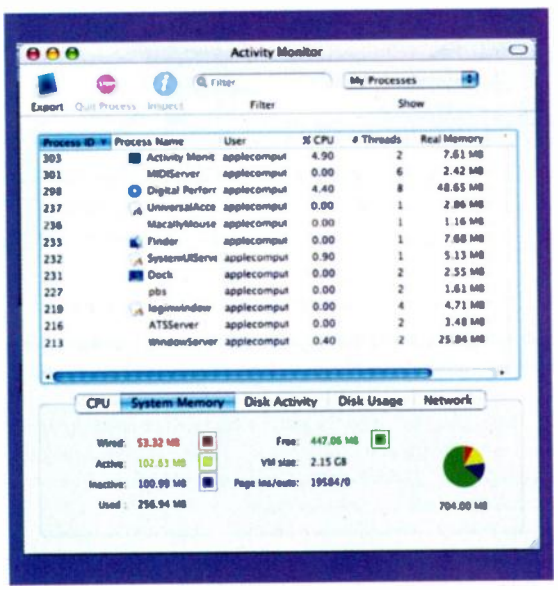

FIG. 2. The Mac OS X utility Activity Monitor provides detailed information on resource usage and gives users the option to display in the Dock a pie chart indicating the amount of available RAM.

Checking the Gas Gauge

Many audio applications include performance meters that give the user visual feedback on processor and virtual-instrument performance. But they may not give you all the information you need. For example, how do you know if you have enough available RAM to load that giant grand-piano library into an already-bloated project file?

Mac OS X includes a utility called Activity Monitor, which can give you detailed information about resource usage (see **Fig. 2**). The utility's menu bar lets you access an option (Monitor>Dock Icon>Show Memory Usage) that will display a handy pie chart in the Dock to let you know how much free RAM remains. A quick glance at the Dock tells you if you have enough RAM to load another instrument.

Windows XP offers its own feature for checking resource usage, the Windows Task Manager. You can call it up by right-clicking on the Task Bar, choosing Task Manager, and clicking on the Performance tab.

Multiple Resources

For maximum flexibility and minimal need for workarounds, consider running multiple computers. I currently run two PCs as dedicated virtual instrument hosts and a Mac for my sequencing and audio tasks. (For more on similar techniques see Two Heads Are Better Than One, available online at emusician.com.)

The dream of completing all of your musical tasks with one computer is stronger than ever, and in the future faster computers may help users realize this dream. Today, however, virtual instruments continue to make us perform a balancing act among CPU, RAM, and hard-disk resources. Using the techniques described here can help you tip the balance of power in your favor. EM

Babz is composer/multi-instrumentalist and freelance writer on music technology based in New York City.

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Resonant Filter Sweeps Reborn

By Peter Schwartz

Phasing and panning can enhance filter sweeps.

Resonant filter sweeps are as old as synthesis itself, and they often tag a track as dated and synthy. Nevertheless, a good old-fashioned *eeeeowww* is often just the thing to cut through the mud and grab a listener's attention. Here are a few ways to add interest to that time-honored sound.

Start by selecting or creating a monaural patch on your favorite soft synth with a typical downward resonant filter sweep (see **Web Clip 1**). Insert the same synth and patch on a second track, panning one track hard left and the other hard right. Next, set up your MIDI routing to simultaneously play both patches. If the sound is being generated from a synth with free-running oscillators—meaning that the phase of the oscillator waveform is not reset each time a note is triggered—the part may already have a nicely animated stereo spread and a fuller overall sound.

The animated stereo effect comes from differences in the phase of the free-running oscillators. If you're using a single-oscillator synth patch, you'll probably need to slightly offset the pitch of each synth to avoid phase-cancellation effects. You can also avoid that problem while achieving thicker textures and a more animated stereo effect by using detuned two-oscillator patches.

Keeping Track

Although this simple trick can be highly effective, it is often avoided because it eats up two tracks. You can make the sound even more interesting and perhaps justify burning that extra track by slightly offsetting one synth's filter-cutoff frequency (see **Fig. 1**). That will increase the stereo separation and add harmonic interest as the two synths' filters sweep through different resonant harmonics (see **Web Clip 2**).

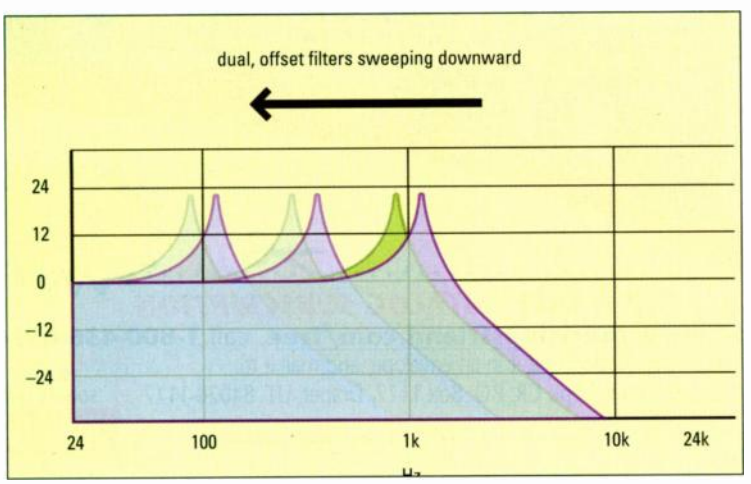

FIG. 1: The purple and green peaks indicate the cutoff frequencies of two parallel lowpass filters at three different times during a downward filter sweep.

Although that effect may sound as though it's out of phase, it is perfectly mono compatible. If worse comes to worst, you can retrieve the extra track by bouncing to mono without losing the new timbral quality. Bear in mind that a slight difference in the cutoff frequencies produces a subtle timbral change that lends new character to the sound, but too great a difference results in distinct, hard-panned sounds rather than a cohesive stereo effect.

As an alternative to using two mono tracks, you can often produce the same effect with a single stereo synth patch. The Moog Voyager is particularly well suited to that task. While the cutoff frequencies of its parallel filters are adjusted with a single control, the Voyager's Spacing control creates an offset between their cutoff frequencies. Other synths are equally capable of creating these effects, though some may require a little more work than others to set up.

As a variation on that theme, keep the filter cutoffs set identically and vary the decay time of one filter's envelope, making it a little faster or slower than the other (see **Web Clip 3**).

Different Mothers

You can create that effect with hardware synths that do not offer multiple outputs by recording one pass of the sound. Play the recorded part panned hard to one side while making your pitch, filter, and decay adjustments to the live part, panned to the other side. Be sure to use the same MIDI data for each part.

You can even create the effect with a sampler playing back a sampled filter sweep. The trick is to detune one of the samples; but take care with the tuning, because too slight a tuning difference will produce flanging when rendered in mono (see **Web Clips 4** and **5**). EM

EM WEB CLIPS

Peter Schwartz is a composer, arranger, and keyboardist living in upstate New York. His analog synth programming is heavily featured in the factory patches of the new Korg OASYS.

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Making Waves

By Jim Aikin

Oscillators are at the core of every electronic sound.

The sound emitted from almost every synthesizer and sampler comes from a module called an *oscillator.* The output of the oscillator is usually processed by a filter and an amplifier, and perhaps by other modules. Without an oscillator to produce a signal, the filter would have nothing to filter, and the amplifier would have nothing to amplify. In this column, I'll discuss the sound-shaping parameters that are most often found on oscillators, beginning with the most important parameter of all—the *waveform.*

Synths do have other sound sources. Most have a *noise source,* and on some instruments the filter can be induced to "squeal" (self-oscillate) even when the oscillators are silent. We'll look at those, however, in a future column. We'll also hold off on any discussion of low-frequency oscillators (LFOs), which are slowly moving oscillators that are typically used as modulation sources. (Their signal is not present in the audio output.)

One final exception: on synths that use FM (frequency modulation) synthesis, you may not see anything called an oscillator. Instead, FM synths use modules called *operators.* An operator is an oscillator coupled with an amplitude envelope. The oscillators on modern FM synths operate much like those on any other synth, so there's no need to single them out for special attention.

Now Hear This

You probably listen to music through loudspeakers at least some of the time. If you've ever removed the front grill cloth from a speaker enclosure, you've seen that the speaker cone moves rapidly in and out while the music plays. As it moves toward you, it pushes the air, creating a zone of increased air pressure that travels rapidly outward toward your ears. As the speaker cone moves away from you, it pulls air back into the space it has vacated, creating a zone of decreased air pressure. Sound consists of such changes in air pressure.

If I were to draw a diagram of the in-and-out travel of the speaker cone or of the increases and decreases in air pressure that the speaker produces, the diagram might look something like **Fig. 1.** In fact, the relationship between speaker movement and the changes in air pressure in front of the speaker is not as simple as this description would suggest. But for now, we'll skip the technical details.

When you choose a waveform for an oscillator, you're choosing a shape or a contour that will cause a loudspeaker to move in and out in a predictable pattern. (How often the speaker moves in and out is a function of the waveform's *frequency,* and how much it moves is related to the waveform's *amplitude.*) If you look at a diagram of the waveform, you'll see the pattern. The waveform may be simple or complex, smooth or jagged. The resulting sound will be determined in a very precise way by the shape of the waveform. Change the waveform in some way, and the resulting sound will change. (There are some exceptions to this rule, but they're highly technical.)

In general, smooth waveforms have fewer high-frequency partials. Those that have sharp, jagged edges have more highs. Waveforms whose peaks and valleys are close together are also higher in pitch, and those whose peaks and valleys are further apart are lower in pitch. It's usually impossible, however, to guess what a waveform will sound like by just looking at it.

Early analog synthesizers had a small set of waveforms that were chosen because they were musically useful and because they were easy to generate electrically (see **Fig. 2** and **Web Clip 1**). Today, many synths come equipped with dozens or hundreds of waveforms. These can include traditional analog types, which are only one cycle in length, and digital recordings of actual sounds, which are longer and more complex sampled waveforms.

Sampled waveforms can emulate acoustic instruments more realistically than analog waveforms can, but

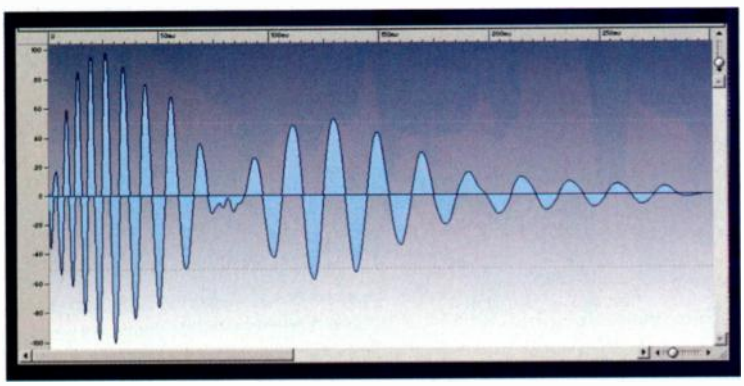

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FIG. 1: This waveform diagram can represent either the movement of a loudspeaker cone toward and away from the listener, or the regions of higher and lower air pressure the cone creates as it moves.

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their strong character makes them less adaptable and all-purpose with regard to creative sound design. Analog-type waveforms are static (unchanging) and can become boring unless processed with a filter or effects. But their pure sound has a strong appeal for certain types of music.

Sonic Checklist

Every type of synthesizer has a slightly different set of sound-design parameters. But your synth probably has most or all of the parameters listed below. In this discussion, I've used the word "knob" to refer to any parameter control that can be adjusted over a range of values. Your synth may have sliders instead of knobs, or some combination of the two.

Octave tuning is often indicated using a type of terminology borrowed from the world of pipe organs. A longer organ pipe creates a lower pitch, and cutting the length in half raises the pitch by one octave. So synth octaves, selected with a multiposition switch, are often indicated by the numbers 32' (the lowest), 16', 8', 4', 2', and 1' (the highest).

Semitone tuning in half-steps is sometimes combined with octave tuning on a single knob that covers a multi-octave range. On synths that have a separate semitone tuning knob, the knob will usually have settings from –12 to +12, which covers the range from one octave above to one octave below the default pitch.

Fine tuning, also called *detune*, is used for adjusting the pitch of the oscillator in increments that are smaller than a half-step. On many synths that have two or more oscillators per voice, only the second and subsequent oscillators have detune knobs. That allows them to be tuned up or down relative to the first oscillator.

The *pitch envelope amount* knob applies an envelope that changes the pitch of the oscillator during the course of each note. The oscillator may have its own dedicated pitch envelope, or the pitch envelope amount knob may apply modulation from one of the general-purpose envelopes elsewhere in the instrument. Pitch envelopes are often used to create a quick upward or downward *blip* at the start of each note, which creates a percussive effect.

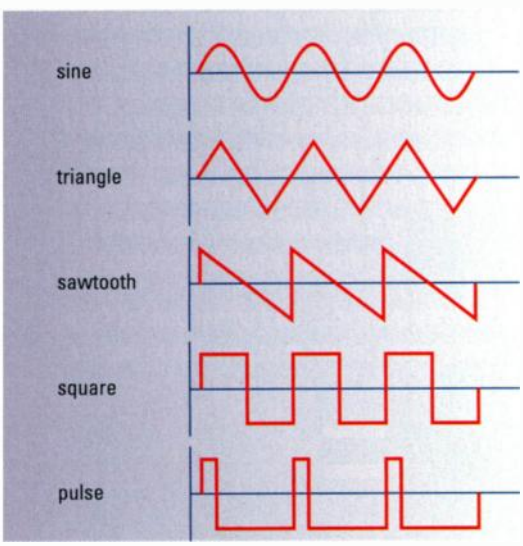

FIG. 2: Analog synthesizers typically offer a few standard waveforms, including (top to bottom) sine, triangle, sawtooth, square, and pulse waves.

Oscillator sync, a switch found on only analog-type synths, causes the synchronized oscillator to retrigger a new waveform every time the master oscillator to which it is synced starts a new waveform. The result is that the pitch of the master oscillator determines the perceived pitch of the synced oscillator. The tuning controls, pitch envelope, and any other pitch modulation of the synced oscillator are transformed into waveform-shaping controls. Sweeping the pitch of a synced oscillator is useful for razor-sharp lead-synth tones.

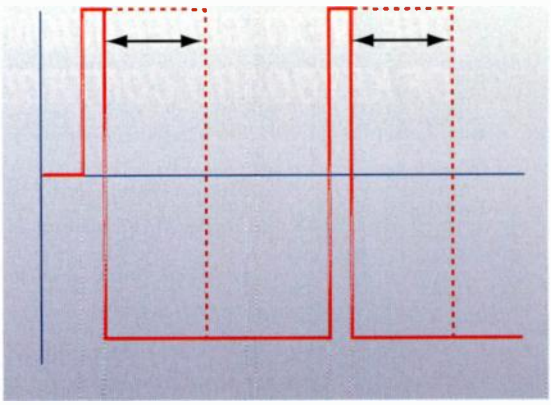

FIG. 3: By using the pulse-width knob, a square wave (left) can be progressively turned into a narrow pulse shape (right). A narrow pulse has a thin, crisp sound and is good for synthesizing Clavinet-type sounds.

The *pulse-width* knob is found, like oscillator sync, on only analog-type synths. The pulse-width knob may be active only when the square wave (also known as a pulse wave) is selected, and allows you to adjust the square wave from a square shape to a narrow pulse, as shown in **Fig. 3**. Alternatively, this knob might be able to adjust the shape of all of the waveforms. For instance, you may be able to morph a triangle wave into a sawtooth by adjusting the pulse-width parameter.

Pulse-width modulation (sometimes abbreviated as "PWM" on the front panel) introduces a modulation signal that, in effect, turns the pulse-width knob for you. Pulse-width modulation is used to add animation to the relatively static tone of a pulse wave. Most often, pulse width is modulated by an LFO, but an envelope generator, a modulation wheel or lever, or Channel Pressure (Aftertouch) might also be available as a source for pulse-width modulation.

The Perfect Wave

Getting to know the waveforms in your synthesizer is the first step to becoming an ace sound designer. Open up the filter, shut off the effects, and use your ears. You might be surprised at what you hear. EM

Jim Aikin writes about music technology for various magazines and Web sites. He is the author of Power Tools for Synthesizer Programming *(Backbeat Books, 2004). You can visit him online at www.musicwords.net.*

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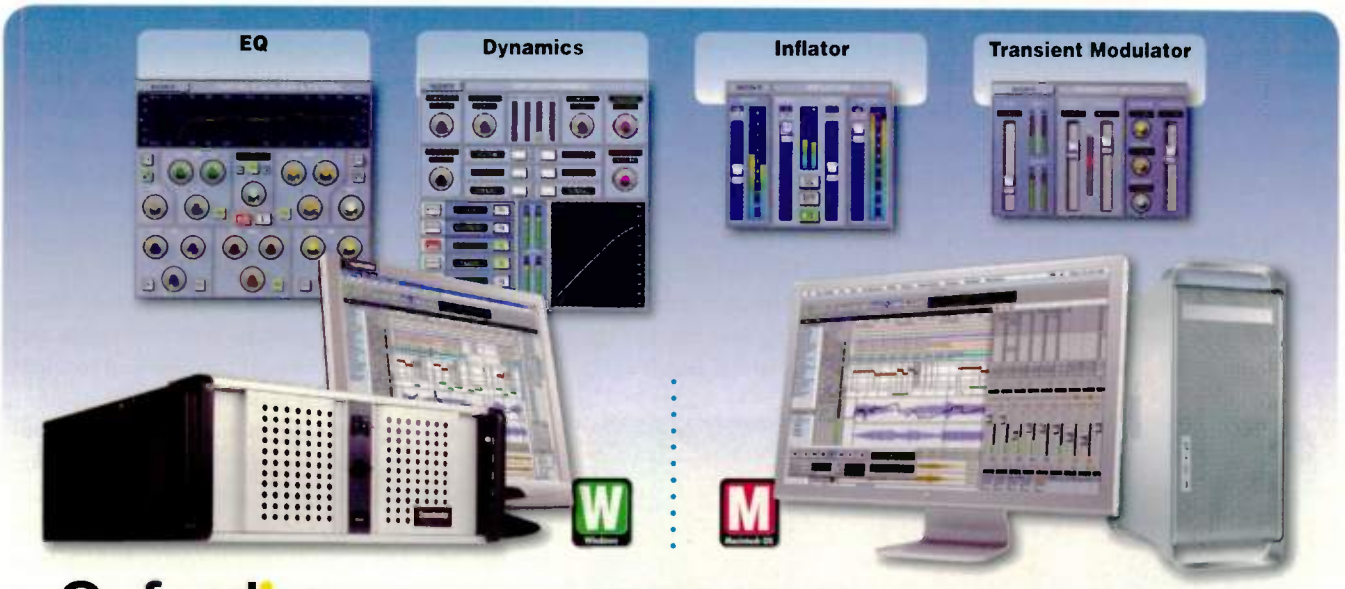

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Growing Your Studio Business

By Ravi

Expand your income by broadening your client base.

The proliferation of home studios has not only caused a downturn in the commercial-studio business, but it has affected those personal-studio owners who rely on outside clients for income. If, however, you have a quality setup, strong engineering chops, and a willingness to promote your business, there are clients out there who can use your services.

One approach is to reach beyond the traditional client base and find nonmusicians who have audio needs. With many commercial studios closing their doors forever, this particular group of music users, who need technical skills and quality output, is steadily growing. To locate those users and to make sure you get your share of the diminished pool of musicians who need studio services, you must market your facility creatively.

Getting the Word Out

A case in point is John "Ratso" Gerardi, a hometown guitar hero who owns Lenox Sound Recording (www.lenoxsound.com) in Stamford, Connecticut. Gerardi started in a cozy basement studio and has now moved to an impressive space in a former two-car garage that boasts an isolation booth and a cathedral ceiling (see **Fig.1**) . He has invested years of heart, soul, networking, and business savvy into recouping his investment.

BOB CAPAZZO

Fig. 1 Gerardi transformed Lenox Sound from a small basement setup into a well-appointed project studio through hard work, clever marketing, and interaction with his community.

His hard work has resulted in the transformation of his personal studio into a revenue-generating machine. "I built the studio to do my own stuff, and now I find it hard to block time for myself," he says. "That's not a bad place to be!"

"Between 60 and 70 percent of my business comes from word of mouth," he says. "But advertising is also very important." He advertises on his Web site and runs a full-color ad in the local Yellow Pages each year. Of all the studio ads, his is the only one with a photo, and it gets a good response. "It's expensive, but one gig will pay for the year," Gerardi points out.

Look in New Places

Like Gerardi, you can fill out your calendar by finding nonmusicians, mainly organizations and local businesses, that need audio services. For example, figure-skating clubs often require time-cued music edits for training and competitions. Coaches are eager to find someone to handle their students' needs, and relative to the cost of enrolling a child in a skating program, charging a couple of hundred dollars for a few edits provides great value and convenience to parents.

Psychotherapists also have recording needs. Many of them like to provide patients with meditation and relaxation tapes. Those sessions can also lead to duplication work in manageable quantities.

Freelance language translators with voice-over contracts are another business type that can generate significant income for a studio. A single track of narration can result in several days of studio time. Those projects are often corporate accounts that are outsourced to freelancers who charge back studio costs.

While many of these jobs may seem pedestrian, the benefits are tangible. The money is generally good, and the work is pretty easy compared with recording a band's CD project.

How do you find such work? At businesses or organizations such as language schools and skating clubs, try direct contact and advertising through flyers put on bulletin boards. Networking is always the best route to work, so if you know somebody associated with one of these businesses, use that person to put the word out for you.

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I don't make what you'd call "mainstream" music. I like to call it, "Ethno-Electronica" with a jazzy edge. Record companies aren't exactly coming out of the woodwork trying to find artists like me, if you know what I mean.

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So many people think that TAXI is just a songwriter organization, but it's actually much, much more. They help artists get deals, songwriters get cuts, and film, TV, and commercial work for writers and artists in just about every genre of music.

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I don't know why every musician on the planet hasn't joined TAXI yet. It's exactly what you've been waiting for, and it's been sitting right under your nose since 1992!

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Making the Most

Maximizing the potential of your equipment is crucial to your turning a profit and carving a niche. Thoroughly learn your gear and software to get the most value and efficiency from it. A capable engineer who keeps a session running smoothly with good results will make a positive impression on clients, which can often lead to word-of-mouth referrals.

A studio with vintage gear can attract clients, but antiquated equipment piling up in basements and garages can also yield great value—especially when used along with their modern day replacements. For example, many baby boomers inheriting their parents' record collections are preserving this fragile media by having it archived to CD. An old turntable capable of playing 78s, paired up with a CD burner, could help you corner the local "transfer" market.

"We do transfers that other studios don't do, such as ¼-inch to CD, cassette to CD, Micro cassette to CD, etc.," says Gerardi. "It's pretty straightforward—sometimes we sweeten the track—and it's a nice way to make a few extra bucks."

Businesses may have training tapes and presentation materials that need to be transferred to CD, and plenty of individuals have memories stored away in yesteryear's preferred formats. Whether it's a recording of an old high-school band or a mix tape from a Sweet 16 party, an upgrade to CD could be very attractive. These potential customers might not even recognize this opportunity until it is presented to them. The challenge for you as the studio owner is to find such prospective nonmusical clients and make them aware of how they could benefit from your facilities and skills.

What's in Store

Building a bond with your local music retailer is a smart strategic move that can lead to more business for your studio. When people outside the music business seek recording services, the first action they often take is to look up the local music store in the phone book. The key is to be on top of that retailer's referral list.

Another benefit of developing a close relationship with the local music store is that music teachers are often associated with it. Although some teachers doubtlessly have their own studio setups, others, and their students, sometimes need a place to record.

Provide the music store with a professionally printed brochure or a printed or photocopied list of your services. The more professional your presentation the better. If you do not already know the owners and managers, build a personal rapport and a serious business relationship.

Consider offering a small commission to the store for new-client referrals. That will create added incentive and put things on a professional level. As a good customer and business partner, you might even get professional-courtesy discounts on additional gear purchases. The commissions you shell out will quickly pay for themselves. Regardless of the deal you strike, remember where your clients come from and always refer them back to the source for future work.

Smart packaging of the finished product that you give to your clients will also help grow your network. Computer-printed labels with detailed program information, proper invoices, and the archiving of your client's master copies add greatly to the service you provide. Make sure that your studio's name, phone number, and Web URL is on all masters and accompanying notes. That will enable your clients and their associates to easily find you again.

Schmoozing It Up

Think of other ways to raise your studio's profile within the local music community. At Lenox Sound, Gerardi hosts occasional clinics with touring artists in his "live room." The clinics provide the artists with a little extra income on the road, while giving Gerardi's music community intimate access to world-renowned players. Gerardi can charge a relatively high attendance fee because the event typically includes "dinner with the artist," in which the attendees are fed a meal while they hang out with the guest of honor.

Scott Henderson, Matt "Guitar" Murphy, and John Patitucci are among the artists that Gerardi has featured. Such events bring in revenue, provide reasons for a studio advertising campaign, and generate local media coverage.

If you have a suitable space and don't mind having a small crowd of people in your facility (always take into account the security of your gear), you might consider a similar event. A good place to start when setting one up is an artist's Web site, which often will have touring and contact information on it.

Field of Dreams

Even if recording your music is your primary interest, outside projects can help finance your long-term dreams. As the Rolling Stones say in "Ruby Tuesday," however, "Lose your dreams, and you will lose your mind." Never forget why you invested in your own personal studio, and bring that passion and pride into every project you do. As long as you block out time to complete your own music, opening your doors to the community is a win-win opportunity. EM

Ravi (www.ArtisticIntegrity.org) tours the country playing original music and lecturing on ethics and marketing in the music industry. Formerly the guitarist with Hanson, he has released two independent CDs and an autobiography called Dancin' with Hanson *(Simon & Schuster, 1999).*

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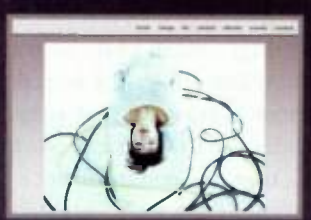

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FRONTIER DESIGN GROUP TranzPort

Look ma, no cables!

By Michael Cooper

Every time I want to record my own musical performance from inside one of my tracking rooms, I struggle with running a 30-foot MIDI cable from my MOTU FastLane MIDI interface in my control room out to a MIDI controller (a Casio CZ-101) in the studio. I then send MIDI commands from my CZ-101 to control various functions in Digital Performer (DP). That works great, except that I can't see record levels from the studio. Fortunately, there is an excellent solution—the Frontier Design Group TranzPort lets you control your DAW and monitor its levels remotely without even touching a MIDI cable.

FIG. 1: Frontier Design Group's compact TranzPort wireless DAW controller is an excellent solution for controlling recording devices remotely. It is a flexible unit that would be suitable for many studios.

Unplugged

The TranzPort is a compact, bidirectional, wireless DAW controller that works with Mac OS X (10.2.8 or higher) and Windows 2000 or XP (see Fig. 1). The TranzPort controller interfaces with a supplied transceiver, called the Bridge, which plugs into a USB port on your computer and allows the remote to operate your DAW from at least 33 feet away. (The manufacturer claims that the unit can work as much as 100 feet away from the remote, depending on physical orientation of the unit, interference from other wireless devices, and other factors.) As of this writing, compatible DAWs include Digidesign Pro Tools, MOTU Digital Performer, Apple Logic, Propellerhead Reason, Adobe Audition, RML SawStudio, Steinberg Cubase and Nuendo, and Cakewalk Sonar and Guitar Tracks Pro.

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The TranzPort's installers, software components, and documentation are provided on a CD-ROM. Setting up the TranzPort was a breeze. I had to install some drivers and a "plug-in" (in this case, an invisible DAW interface), connect the Bridge to an available USB port, and insert four included AA batteries into a compartment located on the bottom of the TranzPort. (The TranzPort uses only batteries and doesn't have an Off button; it does, however, go into a low-power Sleep mode after a user-programmable time has elapsed without any activity.) TranzPort has two control modes that emulate either Mackie Control (for use with Cubase and Nuendo) or HUI (for use with Pro Tools). There is also a Native Control mode for use with DAWs that allow the creation of custom control surfaces, such as Digital Performer, Logic, Audition, and Sonar. (Native mode converts the TranzPort's commands into wireless MIDI messages.) I reviewed the TranzPort using its version 1.0.0 driver and version 1.03 plug-in with Digital Performer 4.52 and OS X 10.3.8.

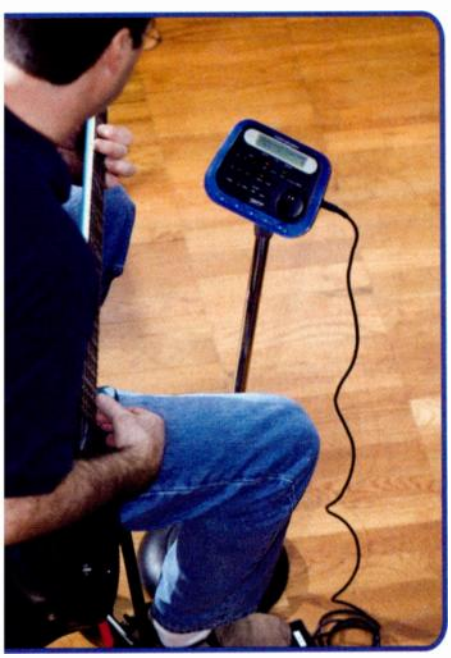
TRANZPORT SPECIFICATIONS

Operating Range	33 ft. (typical)
Operating Frequency	2.4 GHz
Footswitch Jack	¼" punch-in/punch-out, for use with normally open switches
Power Requirement	(4) AA batteries
Battery Life	~100 hours (alkaline batteries, active use, backlighting off)
Dimensions	5.5" (W) × 2" (H) × 7" (D)
Weight	1 lb.

Character Reference

The TranzPort features a 2 × 20-character LCD screen. When you first open a project in your DAW, the TranzPort activates itself in Track Mode, in which the unit's LCD shows the name of the project's first audio, MIDI, or aux track and its fader level and pan position, along with the sequencer's current timecode location. You can then use the TranzPort to step or scroll quickly through each of the project's tracks and view their parameter values on the LCD screen. An alternative to Track mode is Bus mode, which shows the project's buses (Master tracks in Digital Performer). During DAW playback, the LCD shows the mono or stereo level(s) for the currently selected track or bus using a horizontal bar graph.

FIG. 2: The TranzPort works equally well hand-held, on a desktop, or mounted on a mic stand (using an optional adapter).



JERRY HALSTEAD

Eighteen dual-function buttons and a data wheel, which offers multiple detents, are situated below the TranzPort's LCD. Pressing and holding down an additional Shift button allows you to toggle the buttons to perform their alternate functions. Button functions include basic transport (play, stop, rewind, fast-forward, record, return to start, go to end); record-enable, mute, and solo for the currently displayed track (and respective clear functions for all tracks); and adding and stepping through markers in either direction. Other functions are creating in and out points for and activating or disabling auto-punching and global looping, and multiple-level undo and redo (to a maximum of the host DAW's capabilities). Increment and decrement buttons let you step through all the tracks and buses in your project, and variously colored status LEDs show the current track's record, mute, and solo status. An Any Solo LED flashes when any track, not just the currently selected one, is soloed. Other LEDs light up when the DAW's auto-punch and memory-loop functions are active. A Link LED lights to confirm the TranzPort is within working range of the Bridge.

You can also use the TranzPort's Shift and Stop buttons in Native Control mode as modifier keys for most of the other buttons to execute additional user-definable DAW functions. In Digital Performer, for example, you assign such custom TranzPort key bindings in the Setup-Commands window. Using the TranzPort's data wheel, you can scroll your DAW's current timecode location forward or backward in time, scroll quickly through track displays (which is useful for projects that have large track counts), or adjust the playback level and pan for the currently selected track.

In addition to the 18 dual-function buttons noted above, there are additional local-control buttons that check the TranzPort batteries' strength and toggle the LCD's backlight on and off. Frontier Design Group maintains that four fresh alkaline batteries will give the TranzPort roughly 100 hours of active operation (not in Sleep mode) with backlighting turned off.

Optional accessories for the TranzPort include a footswitch (for punching-in and -out by way of a ¼-inch

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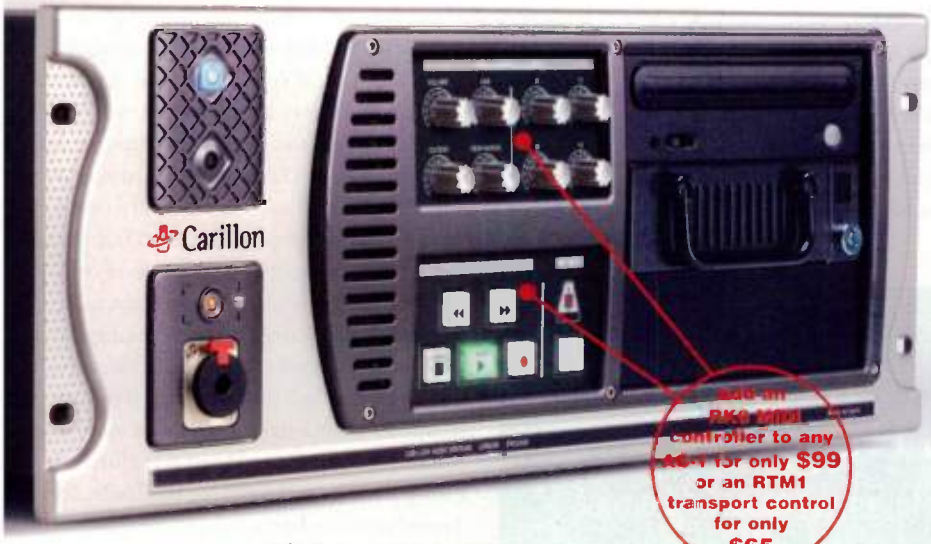

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jack on the TranzPort's right side), a mic-stand adapter, and a padded bag. You can purchase each item for $14.95 or the entire bundle for $39.95.

Can You Hear Me Now?

I used the TranzPort to remotely control DP 4.52 while tracking my vocal and acoustic-guitar performances in one of my tracking rooms. Walls didn't seem to compromise the TranzPort's wireless transmission and reception. But my review unit worked reliably only at a maximum of about 28 feet away from my DAW, which is nevertheless sufficient for most small studios.

It was easy to add new tracks with the TranzPort. Setting markers, memory-cycle (loop) points, and auto-punch-in and auto-punch-out points on the fly was also a breeze. The TranzPort's ability to step sequentially through markers (in either direction) helped expedite isolated punch-ins. I also put the TranzPort's Undo button to good use whenever I needed to nuke the last record pass. After a great take, I could remotely invoke the Save command in Digital Performer using the TranzPort, a welcome convenience. It was also great to be able to solo or mute any combination of tracks while recording or playing back, and then clear all solos or mutes afterward.

I was happy to note that the TranzPort could execute most of its functions (with the exception of user-definable commands) even with all Master toggles disabled in Digital Performer's Commands window. The unit also reliably updated timecode locations after auto-returns to a stopped position; it didn't need Digital Performer's transport to be rolling to see timecode. The TranzPort also has a helpful two-button prompt to clear error messages in Digital Performer that would temporarily disable (until cleared) the DAW and TranzPort.

One of the TranzPort's most valuable features is its excellent multisegment LCD

PRODUCT SUMMARY

FRONTIER DESIGN GROUP TranzPort

wireless DAW controller
$249

OVERALL RATING (1 THROUGH 5): **4**

PROS: Highly portable. Wireless operation precludes cable clutter. Bidirectional functionality allows metering and status indicators that standard MIDI controllers can't provide. Most functions don't rely on MIDI remote commands being enabled in your DAW.

CONS: Consistently reliable working range is only sufficient for very small studios. Can display levels and status indicators for only one track at a time. TranzPort displays aux tracks in Digital Performer as MIDI tracks.

MANUFACTURER
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level meters. A vertical bar at the top of the meters' range indicates maximum level before clipping and, when clipping occurs, it is replaced for several seconds by a square box. A Big Meter mode dedicates the entire LCD to a large 19-segment stereo meter complete with –1, –4, –9, –24, and –42 dBfs scale markings, which is an outstanding feature. There is one caveat: as of this writing, the TranzPort's track scrolling and advanced meter functions were not yet implemented for all DAWs that the unit otherwise supports, so check with Frontier Design Group to see if these important functions work with your particular DAW.

The TranzPort can display only levels of signals passing through the CPU and not those of inputs being shunted directly from a computer audio interface's input(s) to its output(s), as in DP's zero-latency Direct Hardware Playthrough mode. Also, aux tracks in Digital Performer were displayed as MIDI tracks by the TranzPort—nominal fader levels of 0.0 dB were often shown in the TranzPort's LCD as 90, and +6 dB (the maximum fader value) was shown as 127. But the TranzPort's overall reliability was solid, and I observed only one isolated instance of buggy behavior during my review process.

The TranzPort's optional mic-stand adapter swivels roughly 110 degrees on axis with a mic stand, tilting more than enough to present a suitable angle for easy use (see **Fig. 2**).

Control Issues

The TranzPort works best when recording one track at a time because its LCD can display parameter values and levels for only a single track. Though a MIDI keyboard (with DAWs that support MIDI commands) can also execute many of the TranzPort's functions, it's convenient to have such a compact device—especially one that's wireless—with many functions screened right on the controls. MIDI keyboards can't give you the bidirectional response—such as the multisegment level metering and record, mute, solo, auto-punch, and loop-status indicators—that the TranzPort provides.

It's a bonus that the TranzPort does not rely on MIDI commands being enabled in native applications, because that allows you to unlink such commands from MIDI performance gestures when recording MIDI parts in the control room that are out of reach of your DAW. Overall, the TranzPort offers an elegant and unique solution for remote recording at an incredibly low price.

EM Contributing Editor Michael Cooper is the owner of Michael Cooper Recording, located in beautiful Sisters, Oregon.

FIG. 1: The Photon X25 sports full-size keys, ten user-configurable buttons and endless rotary knobs, oversize Mod and Pitch Bend wheels, and a 3-D Dome controller.

ALESIS Photon X25 (Mac/Win)

A control surface and audio interface for the road.

By Len Sasso

A slew of inexpensive, compact combination MIDI and audio interfaces from a variety of manufacturers has recently hit the streets. Alesis's contribution to this embarrassment of riches for laptop musicians is the Photon X25—an audio interface and two-octave, Velocity-sensitive keyboard with an interesting assortment of MIDI controllers.

The Photon X25 is a USB device that can be powered by bus, battery, or optional wall-wart power supply. For portable use, battery power is a welcome option because a laptop computer running on its own batteries is unlikely to provide adequate USB power. Alesis claims a set of batteries (four C cells) will provide power for five or more hours, and during the course of this review, I got considerably more.

Driver installation is generally unnecessary under Mac OS X and Windows XP; installing the provided ASIO audio drivers, however, is recommended for Windows. (Earlier versions of Windows and Mac OS are not supported.) The X25 was truly plug and play for audio and MIDI on my Mac PowerBook and my Power Macintosh, but I had some initial trouble getting the unit recognized on my PC laptop. The X25 was eventually recognized (after several power cycles), and at that point I was able to install the ASIO audio drivers and had no further problems.

The MIDI Ditty

Although a two-octave keyboard has its limitations, the X25's keys are full size and have a good, solid feel (see Fig. 1). The keyboard is comfortable to play, the octave-transpose buttons are conveniently located for easy access and, in a nice touch, the buttons light at different intensities to indicate the current transpose.

Translucent rubber Pitch Bend and Modulation Wheels to the left of the keyboard also feature variable-intensity illumination, though it's hard to imagine what purpose justifies the added power consumption. The wheels are larger than usual and offer just enough resistance to make them easy to position accurately. I'd love to have these wheels on my 88-key controller.

The X25's variation on the joystick is a proprietary Axyz Dome Controller that senses the up-down (distance), right-left, and forward-back position of your hand while it's over the Dome and sends out values for three different MIDI controllers in response. Although not easy to control accurately, it does have a certain novelty value, and it can be turned off to save power as well as avoid accidental controller changes.

Making the Rounds

Ten user-assignable buttons located above the keyboard are handy for toggling virtual-instrument and -mixer buttons. They're also a viable substitute for hardware pedals when you're on the road—you can develop sustain-pinky chops in fairly short order. The buttons can be conveniently configured in toggle (press on, press off) or momentary (press on, release off) mode.

Ten endless rotary encoders (aka 360-degree knobs) and three independent settings layers provide ready access to 30 MIDI Control Change settings. Unfortunately, the encoders do not implement one

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of the common increment-decrement schemes nor is feedback supported. That means that when you change assignments, the old knob value is retained, and the new target parameter will jump to that value.

Nonetheless, endless encoders are an enhancement. One reason is that they have higher resolution; it is actually possible to increment their value one step at a time. Another reason is that the layering scheme can support 30 distinct values rather than the much-less-useful 10 distinct values that would be possible with standard knobs.

Presets and Resets

The X25 has a 20-preset memory for the configuration of all knobs, buttons, and other controllers. The unit I received contained 13 factory presets covering a variety of software products, including digital audio sequencers Steinberg Cubase LE (a copy of which is shipped with the unit), Cakewalk Sonar, MOTU Digital Performer, and Ableton Live. Software instrument presets cover several Native Instruments products, Applied Acoustics Lounge Lizard, and most of the modules in Propellerhead Reason.

Cardboard templates for insertion on the X25's front panel are provided for each of the factory presets, including the default preset resident in memories 14 through 20. All of the templates I tried, including the default, unfortunately had inaccuracies. But because the templates are difficult to install and read, they probably won't get much use, and you'll quickly memorize the presets that you use the most.

In addition to preset configurations, you have access to several global settings. Those include contrast for the 2 × 16 LCD display, Velocity curve for the keyboard (linear, logarithmic, exponential, and constant), semitone transposition, and direct audio-input monitoring.

The X25 offers several MIDI utilities. You can send and receive SysEx dumps for individual presets or the whole preset bank. You can send MIDI Program Change messages with or without bank. And you can send a MIDI All Notes Off command (which usually kills hung notes) by simultaneously pressing the Page-Up and Page-Down buttons.

PHOTON X25 SPECIFICATIONS

MIDI Keyboard	25 notes
MIDI I/O	(2) USB and DIN
Controller Inputs	(2) TS (for pedals)
Rotary Encoders (360°)	10
Buttons (toggle or momentary)	10
Wheels	(2) (Modulation and Pitch Bend)
Axyz Dome	3-D
Audio Outputs	(2) balanced/unbalanced TRS
Audio Inputs	(2) balanced/unbalanced TRS
Headphones Output	(1) stereo TRS
Display	2 × 16 LCD
Power	USB, battery, wall wart (optional)
Dimensions	18" (W) × 3.5" (H) × 9.5" (D)
Weight	4 lbs.

Now Hear This

The X25 features a basic but excellent-sounding USB 1.1 audio interface. It supports balanced and unbalanced stereo I/O at 44.1- and 48 kHz sampling rates with 24-bit resolution. All audio I/O uses ¼-inch TRS jacks, and headphone as well as main outputs are provided. Front-panel knobs control output level and input gain (to a maximum of 30 dB), and the input can be routed directly to the output for no-latency monitoring.

I plugged the X25 into a Macintosh G4 PowerBook and a Windows laptop and, running all units on battery power, was able to push the computers to their processing limits without experiencing any audio dropout. The signal was clear and clean in headphones and through my mixer and monitors.

In addition to USB MIDI I/O, the X25 sports a second MIDI interface, allowing it to communicate with other MIDI hardware. MIDI input is passed to the computer on a second MIDI port, and USB MIDI output from the computer is sent to the MIDI output jack. In a nice touch, if no USB is connected, the X25's MIDI is passed directly to the second output jack, allowing the X25 to function as a standalone MIDI controller.

The Photon X25 is a well-endowed and reasonably priced MIDI controller and audio interface for the portable studio. It's rugged, well engineered, and ergonomically laid out. It may not be as full-featured an audio interface as you would want in a desktop studio, but it makes a great auxiliary MIDI controller in that environment.

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

PRODUCT SUMMARY

ALESIS Photon X25

USB keyboard controller and audio interface
$299

OVERALL RATING (1 THROUGH 5): 3

PROS: Rugged, ergonomic design. Simultaneous access to 30 MIDI controllers with high-resolution, 360-degree rotary encoders. Clean and efficient USB audio performance.

CONS: Rotary encoders don't support any increment-decrement scheme.

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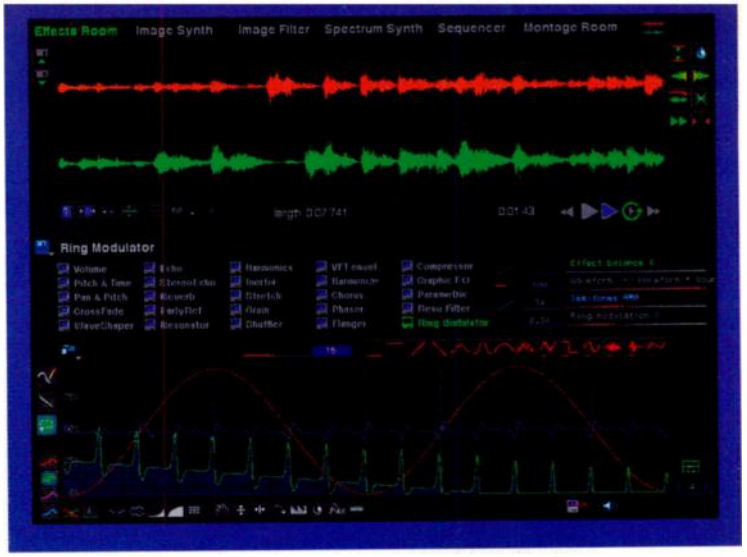

FIG. 1: The Effects Room's Ring Modulator provides envelopes for the modulating waveform (sine, shown in red), the modulation amount (green), and frequency variation (blue) from the base modulation frequency set by the Semitones slider at the top.

U&I SOFTWARE MetaSynth 4 (Mac)

In a class by itself.

By Len Sasso

It was a long time coming—so long that they've skipped a version number. But MetaSynth 4 for OS X is well worth the wait. Some features, such as effects processing and instrument management, have been greatly enhanced. Performance and user-interface improvements grace the Image Synth and Image Filter sections. The Spectrum Synth adds a new twist to looping, slicing, and analysis-resynthesis. Finally, the Sequencer and Montage Room, respectively, provide integrated (but limited) note-based and multitrack audio sequencing.

Reviewing a one-of-a-kind product always presents a quandary; you can compare the product only with its former self. In addition, there's no way to evaluate its price; if you want what it does, it costs what it costs. Given MetaSynth 4's broad range of functionality, its price is quite reasonable and, compared with its predecessor, has skipped ahead by at least two generations.

Crank It Up

The best way to describe MetaSynth is as a graphics-oriented sound generator and effects processor that includes a sophisticated complement of spectral analysis and resynthesis tools. MetaSynth 4 comes in two flavors: MetaSynth 4 and MetaSynth 4 Pro. The Pro version adds 24-bit processing and the ability to record audio directly in the Montage Room, the program's multitrack audio sequencer.

At the core of MetaSynth is an additive-synthesis engine capable of synthesizing hundreds of voices simultaneously. Depending on how you use it, you can push almost any computer over the top, but paying attention to your audio settings along with reducing the sampling rate for real-time previewing brings most tasks within reach of a reasonably modern Mac. I used versions of MetaSynth on a dual G5/2.0 GHz Power Mac and on a G4/800 MHz PowerBook, and got good performances on both machines.

Rooms with a View

MetaSynth is actually seven applications whose operation and output are seamlessly integrated. The single-window interface is split, with the Sample Editor always available at the top and one of six specialized editors, called XEditors or Rooms, occupying a larger section at the bottom. I'll start with a brief overview of each XEditor, then follow with the details.

All the XEditors integrate with the Sample Editor by either analyzing, altering, or replacing its contents, which is why the Sample Editor is always present. The processing, called rendering, isn't carried out in real

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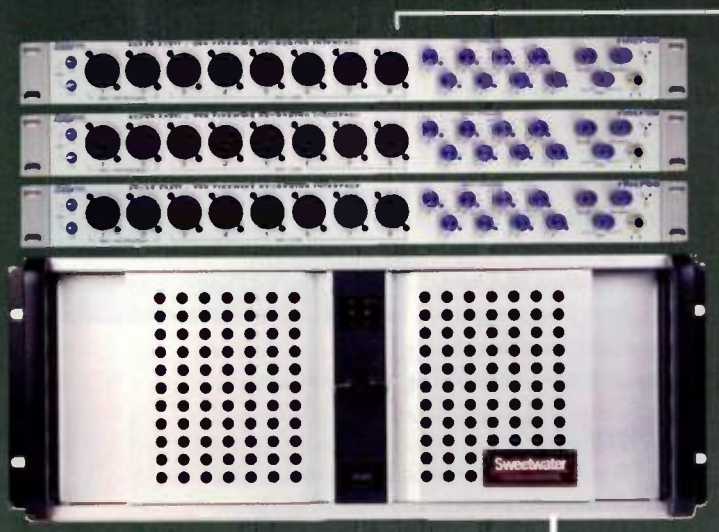

PreSonus FIREPOD The FIREPOD is the most affordable professional FireWire recording interface on the planet with eight pedigree Class A PreSonus microphone preamplifiers, eight balanced outputs, MIDI/SPDIF I/O, and free Cubase LE 48-track audio production software. Up to three FIREPOD's can be daisy-chained together for 24 simultaneous microphone/line inputs for professional multi-track recording in the studio or at a live show. The FIREPOD has been tested and approved by Sweetwater for use with the Creation Station so that you can be confident your recording system will work flawlessly and efficiently from day one!

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The KSM32 cardioid condenser microphone has an extended low frequency response and is designed to provide an open and natural reproduction of the original sound source. Flexible enough to handle a variety of demanding sound sources, the KSM32 has a 15dB attenuation switch for handling extremely high sound pressure levels associated with drums, percussion, ensembles and wind instruments making it equally useful at home in the studio or on stage. To achieve extended low frequency reproduction, the KSM32 features an embossed, ultra-thin, high-compliance diaphragm. This gold-layered, low-mass Mylar® diaphragm provides the excellent transient response necessary to faithfully reproduce any sound source.

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and Synthesize Spectrum functions in version 2.5. When used as an analyzer, it cuts the selection in the Sample Editor into as many as 64 slices and calculates an instant spectrum of each slice (see **Fig. 3**). It arranges the slices in its Sequencer window for you to manipulate and resynthesize. It has more slice- and harmonic-oriented tools and spectrum analysis that is more precise than the Image Synth. Another thing that is different from the Image Synth is that resynthesis is always done with sine waves, rather than with one of MetaSynth's more complex instruments.

FIG. 4: The MultiWaves instrument allows you to combine three single-cycle waveforms in a variety of crossfade and FM configurations.

The wide variety of uses for the Spectrum Synth make it MetaSynth's most intriguing new feature. You can use it to harmonically manipulate the spectra of individual sounds, for example, to tune the harmonics of percussion sounds, merge the spectra of two instruments, or apply the formants of one sound to another. You can use it to create custom tunings for the Image Synth so that synthesizing any picture (think Granny) filters the harmonic spectrum from which the tuning was derived. It's also useful for quickly building MultiSampler presets for use in the Image Synth or Sequencer Rooms.

Because it works its way sequentially through the spectrum slices, the Spectrum Synth is a natural for creating rhythmic patterns from nonrhythmic material. For example, you can start by analyzing a choir singing a chord, and then create an Instant Spectrum for use as a custom tuning in the Image Synth, manipulate the individual spectrum slices to emphasize notes within the chord (thereby creating an arpeggio), and resynthesize the arpeggio at different pitches to create a MultiSampler preset for use in the Image Synth and Sequencer Rooms (see **Web Clip 6**).

Take Note

MetaSynth's Sequencer Room is a bare-bones version of U&I's OS 9 MIDI sequencer Xx. (An OS X version of Xx is currently in the works.) The Sequencer has no MIDI support, has only one track, and is limited to 16 measures (though a measure can have as many as 16 beats). It is intended for generating short patterns that can be imported into the Image Synth for further graphic manipulation or rendered using one of MetaSynth's instruments.

Although the Image Synth is ideal for adding texture and nuance to note-based images, it is not ideally suited for creating them. Even with its limitations, the Sequencer is much better suited to that task, and once a sequence is created, it can be imported into the Image Synth with a single keystroke.

The Sequencer Room is also the best place for creating and editing Instruments. You can start a sequence looping, and then open an instrument and edit while you hear the changes. You can even use the Sequencer's tools to edit the sequence while the Instrument Editor is open. Finally, the Sequencer is well suited for creating short loops (especially percussion loops) for use in a Montage.

Instrumental Decisions

Although pure additive synthesis uses sine waves to render individual harmonic components of a sound, MetaSynth expands the range of possibilities for graphic sound sculpting by providing five instruments with which to play sequences and render Image Synth pictures. Each instrument offers a different user-programmable synthesis or sampling algorithm, ranging from basic sample playback and granular synthesis to variations on FM synthesis. Instrument presets are automatically saved with Sequencer Room sequences and Image Synth picture presets, and the Sequencer is the preferred tool for creating and auditioning instruments.

The WaveSynth and Sampler are the most basic instruments. With the WaveSynth, you set amplitude attack and decay times; create a single-cycle waveform by blending 15 preset waveforms ranging from sine to random; and choose one of eight effects that include chorus, distortion, echo reverb, and an assortment of filters. (The same effects are available on all the instruments.) Sampler maps a single sample across the entire note range; the sample can be loaded from disk or grabbed directly from the sample editor. Sampler offers a variety of sample-start offset options including 8- and 16-step sequencers.

Against the Grain

GrainSynth combines granular techniques with the single-cycle waveform tools of the WaveSynth. Enhancements include formant filtering, several targets for LFO modulation, and grain attack and width.


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MultiSampler offers the same parameters as Sampler, but allows you to map as many as 24 samples across the note range (see Web Clip 7).

MultiWaves is the most unusual of the bunch (see Fig. 4). It combines three single-cycle waveforms (created as in WaveSynth) in one of nine configurations. Four crossfade configurations assign different waveforms to the attack and sustain (or both) portions of the note. Four configurations offer different FM routings. The ninth option uses all waveforms in parallel.

Putting It All Together

As you've undoubtedly gathered by now, MetaSynth does things in its own way, and its approach to audio tracking is no exception. The Montage Room replaces U&I's previous audio tracking application, called MetaTrack, whose files it can read.

The Montage Room has 16 tracks, each with its own effects processor; not surprisingly, the effects are the same as those just described for the instruments (see Fig. 5). Interestingly, although you are limited to 16 tracks, you can play several audio files simultaneously on a single track, if need be. All audio files in a Montage must have the same sampling rate, but you can mix mono and stereo files and different bit rates.

FIG. 5: The Montage Room is a 16-track audio sequencer for mixing files rendered in MetaSynth's other Rooms.

Although the Montage Room works with audio files, its elements are displayed in their source format (Image Synth pictures, Sequencer note sequences, and so on) where possible. What is actually played in the Montage Room, however, is the rendered audio file. A handy Render and Save function will render the necessary audio file, save it next to the source file, and make it available on the appropriate Montage Room menu. I had mixed results using that function, though. You can also load audio files directly into a Montage.

Getting Down

MetaSynth is an excellent and unusual sound-design tool. If you're already a MetaSynth user and have been waiting for the OS X version, you won't be disappointed. It takes MetaSynth to a new level and is easily worth the upgrade price.

For new users, the call is currently a little more difficult. For one thing, MetaSynth is available only as a 75 MB download, with the consequence that the content (much of which is carried over from version 2.5) is somewhat limited. A product of this complexity and price deserves a CD or DVD with lots of content and a printed manual. Both are planned for the future.

Having said that, the PDF manual and tutorials for each Room are well written and, together with the downloaded content, are definitely enough to get you up and running. Furthermore, there is no alternative; if you want what MetaSynth has to offer, you've got to have it.

EM WEB CLIPS

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

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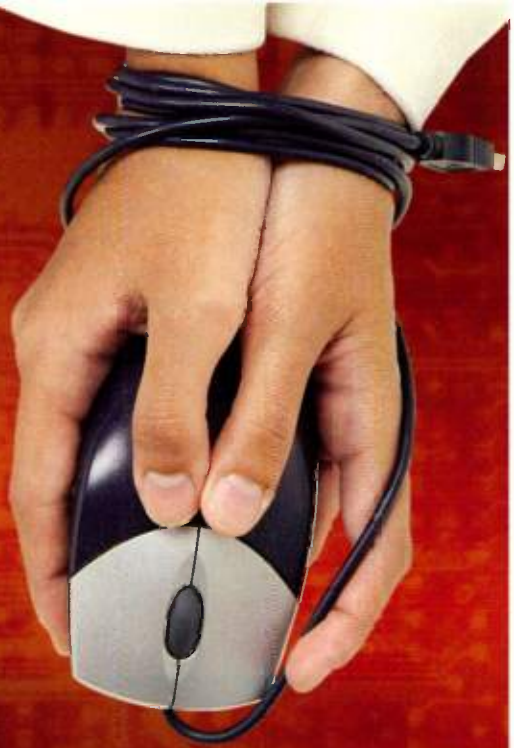

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PRO AUDIO

FIG. 1: SV-315 has two choices of compression curves (settings I and II). Crush and Hold knobs and a limiter section control the treatment of transients. Alternative sidechain-filter buttons are located below the Crush and Hold controls.

SONALKSIS SV-315 Compressor SV-517 Equalizer (Mac/Win)

Creamy analog sound in the digital domain.

By Michael Cooper

British software manufacturer Sonalksis is a young company, but its four founding members are former R&D engineers for AMS-Neve, purveyor of high-end analog gear. That foundation in analog-circuit design formed the basis for the company's first two DAW plug-ins, SV-315 Compressor and SV-517 Equalizer. Both plug-ins use modeling to replicate in the digital domain the characteristics of analog signal processors designed by Sonalksis' engineers.

Zero-latency throughput for both plug-ins permits use while tracking (as long as you can set your host's buffer setting low enough to preclude a delayed monitoring path). Other applications include mixing and mastering. Both plug-ins support standard sampling rates from 44.1 to 192 kHz and ship in mono and stereo versions. The plug-ins support VST (Mac OS 9/X and PC), DirectX (PC), and Audio Units (OS X). RTAS support on both platforms is planned and may be available by the time you read this review.

You can download the plug-ins from the Sonalksis Web site or order boxed CD versions. You'll need a valid email account to receive the registration-key files (one for each plug-in) that are needed to unlock the plug-ins for unrestricted use.

SV-315 Compressor

SV-315 Compressor comprises a compressor and a limiter chained in series. SV-315's graphical user interface (GUI) has continuously variable controls for setting the compressor's threshold, ratio, knee, and attack and release times. There is also a program-sensitive auto-release function. The ratio control has a working range from 1.5:1 to 10:1. You can adjust the knee to be exceedingly soft, causing the gradual onset of compression as low as 30 dB below the threshold. (The threshold can be set as low as –48 dBfs).

SV-315's compressor section allows for classic and contemporary compression curves by giving the user a choice between two modeled attack-and-release circuits (see **Fig. 1**). A Crush control modifies how easily the compressor's gain-control element will saturate; lower settings let more transients through unprocessed. A Hold control—available only when the plug-in's auto-release function is activated—leaves transients progressively more intact as the Hold value is raised. SV-315's sidechain can use any of four different filter settings.

To the Limit

SV-315 has a separate limiter circuit, which can be bypassed and which has its own LED-style indicator that lights progressively brighter with increasing amounts of limiting. The limiter can be switched to exhibit either a fast or a slow release time. Bypassing the limiter and closing the plug-in window conserves CPU resources, allowing for more instantiations.

A switchable auto-gain function automatically provides compressor make-up gain before the limiter section. SV-315's auto-gain feature can sometimes cause "overs" if the limiter section is not active. There are controls for master (post-limiter) output level (with

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associated metering and peak-hold Over indicator) and global bypass, as well as a Reset button, which returns all SV-315 controls to default values. As much as 24 dB of compressor makeup gain and ±24 dB of post-limiter gain or attenuation are possible.

An interactive graphical display illustrates SV-315's combined compression-and-limiting curve and gives you handles that you can move to adjust compressor and limiter thresholds and compressor makeup gain; unfortunately, the compressor makeup gain parameter lacks a numeric readout. The gain-reduction meter below the graphical display shows the combined total gain reduction from the compressor and limiter sections.

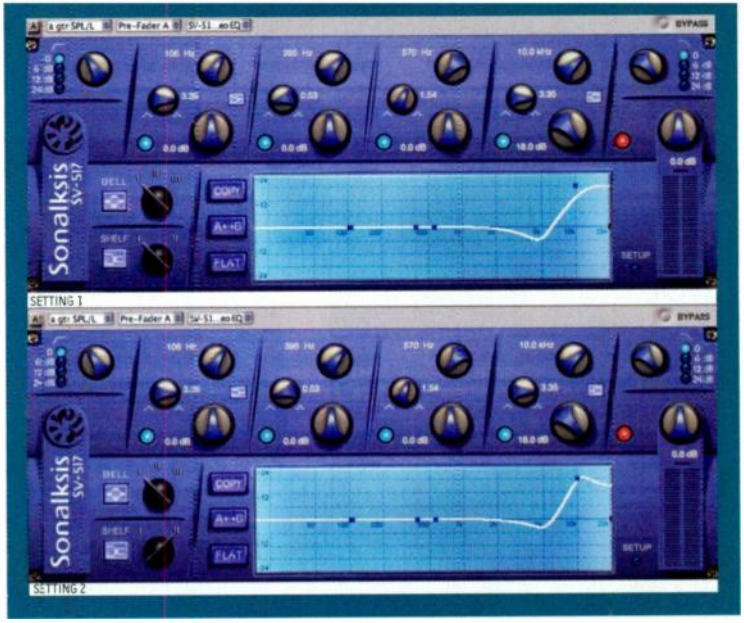

FIG. 2: SV-517 offers two types of global, analog-style shelving filters. Setting I (top) produces a prominent dip in response at the transition and corner frequencies. Setting II sports a less prominent dip at the transition and produces a resonance (boost) at the corner frequency.

While My Guitar Gently Gets Squashed

SV-315 sounded awesome on electric guitar blowing through a Roland Micro Cube amp miked with a Royer R-122. With a 6:1 ratio and very soft knee dialed in, the differences between SV-315's classic and contemporary compressor settings were subtle yet quantifiable: the classic setting sounded slightly warmer, whereas the contemporary setting was more open and airy. Both settings sounded decidedly analog and not what I expect from most digital compressors. Putting the limiter section in the circuit and turning up the Crush control put a tight lid on transients, creating an in-your-face sound that was dynamite. Boosting SV-315's Hold control a little bit seemed to choke the sound and make it pump, but fortunately the Hold control can be defeated.

In other tests, SV-315 gave an electric-bass track more weight, fullness, and authority. Compressed lead vocals sounded warmer and stronger than the original. But on stereo drum overheads, I couldn't get the classic Led Zeppelin sound that I was looking for—a 10:1 ratio caused hi-hat hits to leap out of the mix regardless of the attack and release settings used and with 12 dB of gain reduction on peaks (even with Crush maxed).

PRODUCT SUMMARY

SONALKSIS SV-315 Compressor

compressor software plug-in
$227.99

OVERALL RATING (1 THROUGH 5): 4

PROS: Smooth, analog-like sound. Multiple compression models. SV-315 features independent limiting and four sidechain filters.

CONS: Hold mode causes pumping. No numeric readout for makeup gain. Minimum attack time is too slow. Automatic headroom adjustment is available only during the peak-hold interval.

MANUFACTURER
Sonalksis/GSF Agency (distributor)
www.sonalksis.com or
www.gsfagency.com

SV-517 Equalizer

Six widely overlapping bands of EQ are provided in the SV-517 plug-in. The highest and lowest bands offer variable-slope (0-, 6-, 12-, or 24 dB/octave) lowpass and highpass filters, respectively. The four middle bands are fully parametric bell-curve filters, but the lowest and highest of those bands can be independently switched to give you low- and high-shelving EQ, respectively. Three styles of parametric bell-curve filters and two types of shelving filters can be globally selected for their respective filter types (see Fig. 2).

Each band has its own frequency control that sets the center frequency for bell-curve response or corner frequency for shelving, highpass, or lowpass filter response. Each of the four middle bands has a gain control (giving you as much as 18 dB of boost or cut), a bypass button, and a Q control. When either the low- or the high-frequency filter is set to shelving response, its Q control adjusts the steepness of the filter's slope. Bypassing individual bands or closing the plug-in window conserves CPU resources and allows for more instantiations.

Global Issues

Global controls include a master bypass button and a gain control. The latter boosts or cuts the plug-in's output level as much as 24 dB and has LED-ladder-style metering and a peak-hold Over indicator. Clicking on the Flat button resets all filter gain controls to zero (no boost or cut) and turns off the highpass and lowpass filters, while retaining all other equalizer settings as a baseline for renewed tweaks.

An interactive *x-y* graph (showing frequency versus gain) displays the user-adjusted frequency response of

the equalizer. You can tweak the equalizer by clicking on and dragging the graph's various handles.

SV-517 is one of the most euphonious digital equalizers I've heard, with a character that sounds surprisingly like high-end analog EQ. Lows are tight and robust, mids are clear and sweet, and highs are silvery smooth. SV-517's interface is a joy to work with—it gives you a wealth of intuitive controls. Having the ability to simultaneously work with shelving filters and highpass and lowpass filters gives tremendous flexibility in a variety of equalization applications. No matter what I threw at SV-517—including vocals, electric bass, acoustic guitar, kick drum, and full mixes—it always sounded great.

Common Ground

Thanks to the sky-high headroom that their 64-bit floating point internal processing provides, the plug-ins don't need an input-gain control to prevent clipping. Output levels, however, can clip if the usual precautions aren't taken. Mac users can Command + click (Control-click with a PC) on the Over indicator in either plug-in's GUI to automatically trim output level(s) just enough to prevent clipping—a great timesaving feature. You must click on the Over indicator before its peak-hold time expires, however, which usually precludes using that function to tweak headroom after a mix has run through to the end of the song. Furthermore, that headroom function attenuates only signals that are clipping; it cannot add makeup gain to bring weak output levels up to 0 dBfs. The plug-ins' output-level meters don't have numeric readouts, and they top out a few decibels above 0 dBfs, making manual adjustments more difficult. Those are all fairly minor issues.

Many of the controls in both plug-ins' GUIs have numeric readouts to guide your edits. You can click and drag on the readouts to edit their values. Both plug-ins give you buttons for setting up useful A/B comparisons or for automating switching between two different control setups. Automating both plug-ins' various controls—including global bypasses—in Digital Performer (DP) v4.52 was a breeze.

PRODUCT SUMMARY

SONALKSIS SV-517 Equalizer

equalizer software plug-in
$227.99

OVERALL RATING (1 THROUGH 5): 4.5

PROS: Smooth, analog-like sound. Multiple filter models. Allows simultaneous shelving, highpass, and lowpass filtering. Toggling of individual EQ bands.

CONS: Automatic headroom adjustment is available only during the peak-hold interval.

MANUFACTURER
Sonalksis/GSF Agency (distributor)
www.sonalksis.com or
www.gsfagency.com

Efficiency Experts

SV-315 and SV-517 are efficient—with three instantiations of each plug-in (six total) running in DP v4.52, only approximately 25 percent of my dual 867 MHz G4's CPU resources were consumed. The plug-ins' global bypass buttons worked completely glitch free, without introducing any dropouts or pops. Both plug-ins have useful presets, but they aren't graphically checked when you choose them, forcing you to sometimes guess at which preset is currently in use.

Sonalksis's SV-315 and SV-517 deliver convincing emulations of analog processing. Neither plug-in sounds completely transparent or precise, but that's not their *raison d'etre*. If you're looking for that elusive analog sound in the digital domain, these plug-ins deliver the goods with finesse.

EM contributing editor Michael Cooper is the owner of Michael Cooper Recording, located in beautiful Sisters, Oregon.

FIG. 1: Taylor's K4 Equalizer operates on either two C batteries or the included external power supply. A front-panel power LED changes from green to red when battery power is running low.

TAYLOR GUITARS K4 Equalizer

A sweet tone machine for stage and studio.

By Michael Cooper

The Taylor K4 Equalizer was designed by pro-audio legend Rupert Neve to process the direct output of Taylor acoustic guitars fitted with the Taylor Expression System. The latter consists of three internally placed transducers and their associated active electronics, a system available only to Taylor guitars (300 Series models and higher). The K4, however, can be used with any guitar with a pickup or any other electric instrument. Some studios, in fact, are reportedly using the K4 as a combination mic preamp and equalizer to record instruments other than guitar. (The K4 does not offer phantom power for condenser mics, and Taylor emphasizes that the unit's chief function is as a preamp/EQ for acoustic instruments that have passive or active electronics.)

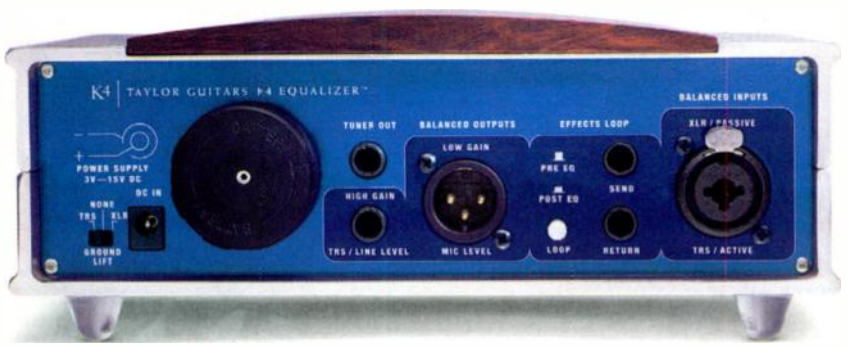

FIG. 2: The K4's transformer-balanced input section can accommodate instruments that have either active or passive electronics, as well as dynamic microphones. The tuner output is always on, even when the main outputs are muted.

Pretty and Portable

The compact K4 is designed for tabletop use. The unit can also be mounted in a rack tray and is sturdy enough to sit on the floor when used as a DI. The K4's recessed front panel has three center-detented, continuously variable rotary gain controls, each providing up to 10 dB of boost or cut for the unit's three bands of EQ (see Fig. 1). The low and high bands have shelving filters. The low band's corner frequency is fixed at 450 Hz, and the high band is fixed at 1.6 kHz. The widely overlapping midrange EQ is parametric and has a frequency range that can alternately be set at 80 to 800 Hz or 800 to 8,000 Hz. Two other continuously variable rotary controls adjust the midrange EQ's center frequency and the Q (a bandwidth control), respectively. A highpass filter that is always active has an 18 dB-per-octave rolloff below 30 Hz.

Kelly Clarkson · Jason Halbert
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Also on the front panel are a mute button and center-detented, continuously variable main- and headphone-volume rotary controls. These rotary controls are attenuators that completely silence audio when in the fully counterclockwise position. When the Mute button is pushed in, the K4's main outputs are silenced, but signal at the front-panel headphone-output jack and rear-panel tuner output are unaffected. (The tuner output sends a pre-EQ signal to your external tuner.) That allows you to tune your guitar or warm up your chops in a live setting without your practicing being amplified. The K4 is a single-channel device; the headphone output has monaural output to left and right channels, which sounds great.

Rounding out the K4's front panel are buttons for phase-inversion, power, and activation of an effects loop. Pushing in the Loop button sends the signal to access an external signal processor (such as a compressor or delay unit) connected to separate TRS send and receive jacks on the K4's rear panel (see **Fig. 2**). A push-button switch next to those jacks selects either pre- or post-EQ for the loop's send jack.

On the K4's rear panel are a combo (TRS and XLR) input jack and separate TRS line-level and XLR mic-level outputs—all transformer-balanced but compatible with unbalanced lines. Taylor recommends using the K4's TRS input jack to connect instruments with active electronics and the XLR input (which has a higher sensitivity than the TRS input) for instruments with passive electronics or for dynamic microphones. It ships with a 15-foot-long balanced cable fitted with TRS plugs on each end for use with Expression System–equipped Taylor guitars.

A ground-lift switch, DC-power connector (for use with the provided wall-wart power supply), and battery compartment complete the K4's rear panel. The K4 can operate on two C batteries without interruption for up to ten hours when the external power transformer is disconnected.

K4 SPECIFICATIONS

Analog Inputs	(1) balanced TRS/XLR combo, (1) balanced return
Analog Outputs	(1) balanced XLR, (1) balanced/unbalanced TRS line, (1) balanced TRS send, (1) ¼" TS tuner out, (1) ¼" headphone out
Output Level (main outs, 600Ω load)	+20 dBu, ±1 dB
Low EQ (±1.5 dB)	shelving, ±10 dB at 450 Hz
Mid EQ (±1.5 dB)	fully parametric, 80–800 or 800–8,000 Hz range, ±10 dB, continuously variable Q control
High EQ (±1.5 dB)	shelving, ±10 dB at 1.6 kHz
Frequency Response (+6 dBu output)	35 Hz–20 kHz, ±2 dB
THD & Noise (1 kHz, +15 dBu output)	<0.006%
Equivalent Input Noise (main outs, EQ flat)	< –86 dBu, XLR in, 150Ω load < –125 dBu, TRS in, 40Ω load
Dimensions	3.25" (W) × 6.75" (H) × 8.5" (D)
Weight	4.3 lbs.

PRODUCT SUMMARY

TAYLOR GUITARS K4 Equalizer

preamp/equalizer
$ 898

OVERALL RATING (1 THROUGH 5): **4**

PROS: Beautiful-sounding EQ and headphone circuit. EQ bands overlap. Highly portable. Lots of bells and whistles included.

CONS: Corner frequencies for low and high EQ bands cannot be adjusted. Weak fixed gain complicates use with +4 dB nominal digital systems.

MANUFACTURER
Taylor Guitars
www.taylorguitars.com

With the Expression System

For all of my tests of the K4, I routed the unit's output to my Apogee Rosetta A/D, with the latter's calibration trims maxed out to give considerable extra gain. I first directly patched a Taylor 30th Anniversary Grand Concert XXX-MS acoustic guitar fitted with the Taylor Expression System into the K4's TRS input. The Expression System produced a far more natural and realistic reproduction of the instrument than any DI I'd ever used.

For recording, however, the K4's output level was problematic. On an arpeggiated guitar arrangement played with a flat pick, the K4's fixed gain initially couldn't output enough level to attain 0 dBfs at the Rosetta—even with mild EQ boost in two bands and all attenuator controls in the signal path set for maximum output. On a subsequent project in which a guitar was strummed aggressively, the K4 registered 0 dBfs on a couple of isolated peaks.

The K4's EQ sounded beautiful, though I would have preferred EQ bypass buttons and adjustable low- and high-band corner frequencies to work with. Because I couldn't apply shelving EQ to the top octave, I often

used a little midband EQ with a broad Q setting to boost or cut highs centered around 8 kHz, while nulling the high-band EQ to avoid affecting mids. I wish that the midrange band's frequency control were marked to indicate frequency settings between its extreme values.

Other Studio Applications

I got good results patching my passive Kramer Pioneer electric bass guitar into the K4's XLR input (using a custom-wired cable with the cold signal shunted to ground). The sound was big, with a slightly pillowy rather than present timbre. The fixed 450 Hz corner frequency on the K4's low-shelving EQ was too high to allow pumping up the bottom end on the bass-guitar track without also introducing midrange mud. That wasn't an issue for me, however, because I always record electric bass flat.

Plugging my '62 Strat directly into the K4's XLR input, the sound lacked sparkle. The top end sounded dull and rounded off, probably because of excessive pickup loading. The XLR input's impedance is roughly 500Ω, which is very low for DI duties. Yet plugging a passive electric guitar or bass into the K4's TRS input, which has a 15 kΩ input impedance, wasn't a solution for recording because that signal path doesn't supply enough gain for amplifying passive instruments. You can, of course, use external gear such as a compressor to provide extra gain as needed, as long as the track needs such processing to sound right.

I also used the K4 as a preamp for a Royer R-121 ribbon mic to record my Strat through a Roland Micro Cube amp. Even with the amp cranked to the max (producing 95 dB SPL at the mic's position) and the K4's main volume also fully turned up, the K4's output signal still fell a few decibels shy of registering 0 dBfs on my similarly cranked Rosetta. Even so, the sound was incredible—warm, present, and chunky, with nicely rounded transients.

Express Yourself

The Taylor K4's gain structure works best with –10 dBV systems. If you're running a +4 digital setup, you'll probably be frustrated with the K4's limited fixed-gain design. The restricted functionality of the K4's low- and high-band EQ also makes the unit an unrealistic choice for an all-purpose front-end box for recording applications.

But in its primary role as a complement to Taylor guitars that have been fitted with the Expression System, the unit shines. Owners of that system will love what the K4 does for their instrument's tone. And the K4's ability to serve as a DI for bass and a preamp for miked electric guitar tracks is sweet icing on the cake.

EM *contributing editor Michael Cooper is the owner of Michael Cooper Recording, which is located in beautiful Sisters, Oregon.*

FIG. 1: The Apogee Rosetta 200 has two channels of high-grade A/D/A conversion and a multitude of routing options.

APOGEE Rosetta 200

A flexible, excellent-sounding A/D/A converter.

By Nick Peck

Apogee's Rosetta 200 is a 2-channel A/D/A converter that is capable of resolutions as high as 24 bits and 192 kHz. It can be used as a standalone converter with fairly sophisticated audio-routing capabilities or as part of a front end for digital audio workstations. The Rosetta 200 could be considered a sibling to Apogee's 8-channel Rosetta 800 (reviewed in the April 2005 issue of EM). The Rosetta 200, however, has a couple of tricks up its sleeve that set it apart: built-in sampling-rate conversion; 24-bit to 16-bit dithering; and an automatic level control, called Aptomizer, that maximizes gain structure during analog-to-digital conversions.

Button-Down

The Rosetta 200 is a heavy and sturdily constructed unit (see **Fig. 1**). All of its main controls are accessed from seven buttons, and holding the buttons down for a couple of seconds accesses the unit's auxiliary functions. Parameter settings are indicated by LEDs, including separate, spiffy 12-stage meters for the analog- and digital-output paths.

FIG. 2: The Rosetta 200's rear panel has two sets of XLR analog I/O, AES, S/PDIF, word clock, ADAT, and a pair of MIDI jacks for use with the company's FireWire extension card.

The Sample Rate button allows you to select one of Rosetta's six internal sampling rates or to engage external sync. The Sync button chooses the external sync clock source from the digital inputs. The Source button selects the master audio signal, which does not have to be the same as the master-clock source. The selected signal is then routed to all digital outputs simultaneously.

The Process button engages automatic sampling-rate conversion (to be added in a future firmware update) and 24-to-16-bit dithering. The Aptomizer button engages the analog level-control maximizer. Finally, a separate Source button routes a selected input source to the analog outputs. That means that Rosetta can simultaneously route different signals to the analog and digital outputs—a nice touch.

Out, In, Extend

The Rosetta 200's rear panel (see **Fig. 2**) features all the connections that you'd expect, such as two sets of balanced +4 dBu XLR stereo pairs for analog I/O. Two AES digital ins and two outs can operate in single- or double-wire format at rates as high as 192 kHz. S/PDIF in and out are included on RCA jacks, and word-clock in and out are on BNC connectors. Toslink optical connectors offer ADAT, S/MUX, and S/PDIF in and out. As an added benefit, a pair of MIDI jacks make Rosetta 200 a MIDI interface when used in conjunction with the company's FireWire extension card.

The Rosetta 200 can interface directly with your computer or DAW through a series of optional cards.

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Apogee's X-FireWire card, the logical choice for a native-based system, features two FireWire 400 ports. Drivers currently exist for Mac OS X Panther (10.3.7) and Tiger (10.4) and Windows XP Service Packs 1 and 2. Apogee also has a utility called FireMix, which has low-latency monitoring and various utility functions for the Rosetta. FireMix is free and available from Apogee's Web site.

The company also has extension cards for connecting a Rosetta 200 directly into Pro Tools|HD and Mix system core cards, offering an alternative to Digidesign I/O units. Giving consumers that type of choice is an excellent idea. Kudos to Apogee for selling a card that supports Pro Tools Mix-era hardware.

ROSETTA 200 SPECIFICATIONS

Analog Inputs	(2) XLR
Analog Outputs	(2) XLR
Digital Inputs	(2) AES; (2) S/PDIF; (2) Toslink (ADAT, S/PDIF, or S/MUX); (2) Pro Tools|HD, Pro Tools Mix, or FireWire on optional card
Digital Outputs	(2) AES; (2) S/PDIF; (2) Toslink (ADAT, S/PDIF, or S/MUX); (2) Pro Tools Pipe HD, Pro Tools Mix, or FireWire on optional
Word-Clock Ports	In, Out (BNC connectors)
MIDI	In, Out (acts as MIDI interface only when optional FireWire card is installed)
Resolution	16 to 24 bits (with 24- to 16-bit dithering)
Sampling Rates	44.1-, 48-, 88.2-, 96-, 176.4-, 192 kHz
Frequency Response	10 Hz–20 kHz (±0.2 dB) @ 44.1 kHz
Dynamic Range	114 dB A-weighted (A/D/A)
THD + N	–105 dB (AD), –103 dB (DA)
Dimensions	1U × 11.75" (D)
Weight	12 lbs.

Coda

Apogee's Coda processing involves a trio of functions that enhance Rosetta's capabilities as a digital audio processor. Its current sampling-rate conversion is a high-quality real-time process for translating the rate of a selected digital input to the target rate of a digital output. (An automated sampling-rate conversion process, which will query incoming digital audio streams and convert them to the target rate, will be added in a future firmware update.) The UV22HR dithering

THE TIMES OF BIG BEN

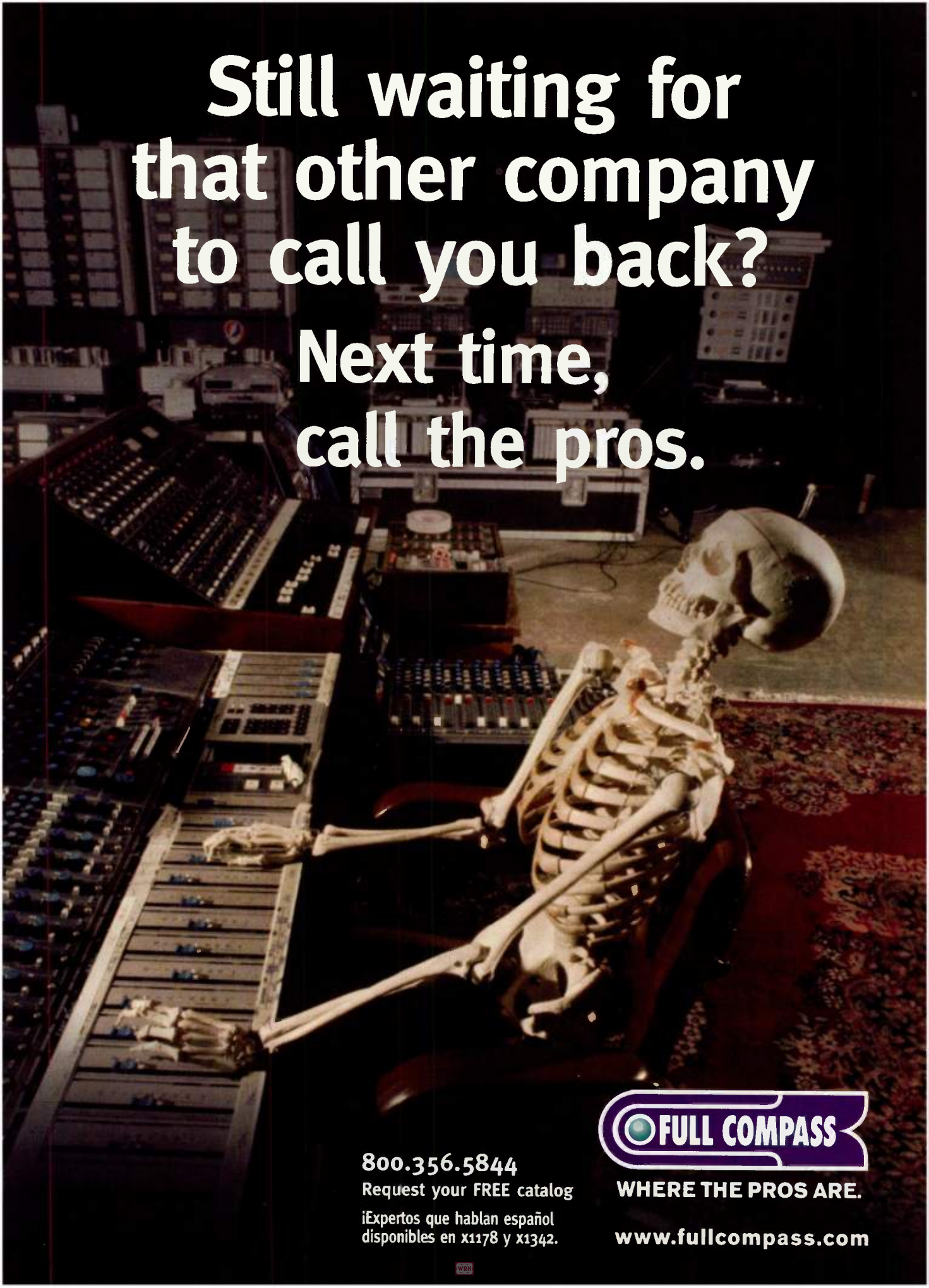
One necessity of the all-digital recording studio is a stable, high-quality reference clock that all devices slave to. If you have a complex, multidevice digital system, then Apogee's Big Ben may be a useful solution (see Fig. A). Big Ben features Apogee's most stable digital reference clock yet and offers a clean, virtually jitter-free clock source at sampling rates as high as 192 kHz. Big Ben has film pull-up/pull-down rates and variable rates in increments of as little as 1 Hz.

Big Ben features two AES/EBU inputs and outputs (operable in single or double-wide mode), coaxial S/PDIF in and out, Toslink optical in and out (S/PDIF, ADAT, or S/MUX formats), a video/word-clock in, and six word-clock outs on BNC connectors. Big Ben can slave to any incoming clock signal, creating a stable, refreshed version that it passes to all its digital outputs. If Big Ben is slaving to a signal that contains audio information, such as AES/EBU, it will pass along the refreshed audio signal along with the clock to all outputs that support audio. For maximum flexibility, two of Big Ben's word-clock outputs can transmit signals at ½, ¼,

FIG. A: Apogee's Big Ben has a jitter-free clock source at sampling rates as high as 192 kHz for multidevice digital systems.

2, 4, or 256 times the master-clock source.

There has been much talk in recent years about jitter from poor clocking being a prime source of digital distortion. While internal clocks have been getting progressively better, Big Ben is a product specifically oriented toward providing the best reference clock. If you have a modest DAW and are looking to improve the sound of your I/O, can Big Ben make a difference? Probably so. But using Big Ben to improve the sound of an inexpensive A/D card might be like attacking a mosquito with a howitzer. You could be better off investing in a top-flight I/O unit. If, however, you have a complex digital setup with multiple devices slaving to each other, Big Ben is worth a serious look.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process gracefully downgrades 24-bit signals to 16-bit. Sampling-rate conversion and dithering can be used in tandem to convert high-resolution masters to CD resolution in real time.

Coda's third function is called Aptomizer. This nifty feature allows you to maximize gain structure within the analog-to-digital conversion process, without worrying about digital "overs." In Learn mode, Aptomizer analyzes the incoming analog source signal and automatically calibrates the line input level so that the peak signal is encoded at –0.5 dBfs. Turning off Learn mode and recording the signal during a second pass guarantees a robust digital signal that is free of digital distortion.

Rosetta also has Apogee's soft-limit technology, which applies a near-instantaneous limiter to signals above –4 dBfs. While soft limit is useful for real-time recording, I'd avoid that type of process for capturing preexisting analog material and use Aptomizer instead.

In Operation

Integrating Rosetta into my Pro Tools|HD system was a straightforward process. Rosetta appeared to my Pro Tools software as a Digidesign 192 I/O unit, and aside from some confusion around the labeling, it worked well. I plugged the analog outputs through a minimal monitoring chain into my Genelec 1031 monitors and listened to a variety of material at different sampling rates.

I enjoyed what I heard. The Rosetta 200 sounded glorious. I was able to pick out minute details in the music that I had not noticed before. The music felt smooth and unhyped across the frequency range, with clear highs and tight, focused lows. The stereo imaging was crisp and distinct; with my eyes closed, I could effortlessly place every instrument across the stereo spectrum. I even felt a sense of vertical height. Rosetta brings out what is best about digital audio: a clean, precise replication of the original signal.

In A/B tests between the Rosetta 200 and the Digidesign 192 at high sampling rates, I was able to notice subtle differences. Both units were routed directly into the monitoring section of a Digidesign Control 24, then into a pair of Genelec 1031A monitors in an acoustically tuned environment. Each unit was evaluated in internal sync mode,

PRODUCT SUMMARY

APOGEE Rosetta 200

A/D/A converter
$ 1,995
OVERALL RATING (1 THROUGH 5): 4

PROS: Excellent sound quality. Flexible routing architecture. Great sample rate conversion and dithering. FireWire connectivity as well as direct support of Pro Tools TDM.

CONS: Relatively expensive.

MANUFACTURER
Apogee Digital Inc
www.apogeedigital.com

using high-quality reference material mixed on the scoring stage at Skywalker Sound.

To my ear, the 192 sounded less focused; however, it also sounded bigger and glossier, with a high-end sheen that I preferred. The Rosetta had a tighter sound, particularly in the low end, and the stereo field was razor sharp. But the material sounded slightly more pinched and constrained than it did on the 192. My personal conclusion is that the Rosetta 200 and the Digidesign 192 are excellent sounding I/O boxes, and choosing one over the other is a matter of personal taste.

I experimented with Rosetta's Coda sampling-rate conversion and 16-bit dithering by prepping some mixes from a recent recording session for CD. The recordings were of a funk jazz group produced with high-end gear and minimal processing.

I fed a version of the material from Pro Tools to the Rosetta, which converted the file from 24-bit, 192 kHz to 16-bit, 44 kHz. I printed the result to a DAT recorder and then fed the recording back into Pro Tools through the Big Ben's reclocking mechanism (see the sidebar "The Times of Big Ben"). I compared the Rosetta's version to tracks that had been sampling-rate converted using Digidesign's bounce-to-disk command, as well as the excellent shareware application, Amadeus II.

The differences were subtle yet unmistakable. The Amadeus-converted version felt flat and 2-D. The Pro Tools–converted version was better, with more depth and a wider sound stage. The Rosetta-converted version had significantly more front-rear depth and was more enjoyable to listen to, though it was still a noticeable downgrade from the 24-bit, 192 kHz masters. Nonetheless, there is definitely something to Apogee's sampling-rate conversion and bit-dithering algorithms; if I were a mastering studio in pursuit of aural nirvana at 16-bit/44 kHz, I'd take a close listen to this box.

Final Conversion

There's no doubt about it, Rosetta 200 is a fine piece of gear. It has solid, excellent-sounding A/D/A conversion; decent digital-signal routing; and great conversion routines. Aptomizer is a cool feature, and the external card connections to FireWire and Pro Tools|HD/Mix offer great flexibility. At $1,995 for a 2-channel box, Rosetta 200 is not for everyone. But for a stereo mastering facility, a live-concert recordist, or an "in-the-box" computer musician who wants a taste of the good life, the Rosetta 200 should be on the short list of converters to check out.

Nick Peck is a father/composer/keyboardist/sound designer/engineer in the San Francisco Bay Area. He can be reached at nick@perceptivesound.com.

FIG. 1: The PreSonus BlueTube DP now offers VU meters instead of LEDs and independent tube stages that can be turned off on each channel.

PRESONUS BlueTube DP

A handy dual-channel input stage.

By Rusty Cutchin

PreSonus recently replaced the popular BlueTube stereo mic and instrument preamp with the BlueTube DP (DP stands for dual path). The unit has separate solid-state and tube preamp stages for each of its two channels. The tube stage, which is driven by a single 12AX7 tube, can be addressed in percentages or defeated by a Tube Drive control on each channel.

The original BlueTube turned heads with its price and versatility—the unit functioned as microphone preamp, instrument DI, phantom-power supply, polarity reverser, distortion box, signal splitter, and signal amplifier for long cable runs. With the defeatable tube circuit and an improved signal-to-noise ratio, the BlueTube DP promises even more value. The street price of the newer unit costs roughly the same as the original version: about $100 per channel.

FIG. 2: The BlueTube DP's rear panel hosts Neutrik combo connectors for mic and instrument input and separate balanced XLR and unbalanced ¼-inch connectors for output.

Blue on Blue

The BlueTube DP's front panel (see **Fig. 1**) differs from its predecessor's dramatically because of the addition of lighted VU meters, which replace the eight-segment LED meters of the original BlueTube. The Neutrik combo connectors have been moved to the rear panel, which might be inconvenient for those who want to mount the unit in a rack. Used as a tabletop or a portable unit, however, the BlueTube DP is easy to work with. The dark-blue lettering on the unit's face makes settings easy to see from a distance, and the well-spaced knobs and buttons are easy to grasp and push.

An inch-wide gap in the middle of the front panel provides a clear separation between the controls of the two channels—an improvement on the original design. On

each channel a Gain knob and a Tube Drive knob anchor the controls. Above those is a row of buttons to engage phantom power, polarity reversal, a –20 dB pad, and an 80 Hz low-cut filter. All buttons glow bright blue when engaged.

Each Gain and Tube Drive pot has subtle detents, making settings somewhat easier to reproduce when necessary. The Gain pot is labeled to indicate a range of 0 to 60 dB. (The manual says it's 0 to 54 dB.) The Tube Drive knob provides 100 percent of the circuit's effect when turned fully clockwise, and it clicks solidly into an off position when turned fully counterclockwise. Between the two knobs is a clip LED.

The 12AX7 tube is visible through seven slots in the top panel. The BlueTube DP's manual comes with instructions for users who want to replace a worn tube or experiment with other compatible tubes. Like some other units in its price range, the BlueTube DP does not have a power switch, and so the tube is always on when the unit's wall-wart adapter is plugged in and connected. If you keep the unit on a tabletop, use it occasionally, and are concerned about tube lifespan, then you can easily disengage the power supply from the rear of the unit as needed.

The BlueTube DP's rear panel (see Fig. 2) hosts only input and output connections. Two combo connectors give you mic and instrument inputs for channels 1 and 2, while the output section consists of separate balanced XLR (+4 dBu) and unbalanced ¼-inch (–10 dBv) outputs for each channel.

BLUETUBE DP SPECIFICATIONS

Analog Inputs	(2) balanced/unbalanced ¼" XLR/TRS combo connectors
Analog Outputs	(2) balanced XLR, (2) unbalanced ¼"
Input Impedances	Mic: 1.3 kΩ; Instrument: 1 MΩ
Gain	0 dB to +54 dB
Signal-to-Noise	>90 dB
THD + Noise	Solid-state stage: < 0.005% (unweighted); Tube stage: 0.01% to 30% (unweighted)
Output Impedance	51Ω
Dimensions	8" (W) × 1.75" (H) × 5" (D)
Weight	4 lbs.

Blue Velvet

I used the BlueTube DP with a variety of pro and budget mics. I listened to the effects of the preamp on condenser mics (a Neumann TLM 103, an AKG C 414 B-XLS, and a Samson C01) and dynamic mics (a Shure SM57, an AKG D 112, and a Blue Kickball). As soon as I plugged in the first mic, it was apparent that the BlueTube DP had retained its predecessor's primary attributes; the mic pre was clean, quiet, and convenient.

Throughout a series of music and spoken-word recordings, I compared the BlueTube DP's performance with other mic pres in my studio, a group that currently includes a twin-tube dbx 386, a MindPrint En-Voice MK II (with a "dial-in" tube stage), and the solid-state XDR preamps on a Mackie Onyx 1620 mixer. Although those units have more features and higher price tags, the BlueTube DP held its own on preamp performance alone, offering up as clean a signal as any of the other preamps and a superb noise level.

The solid-state section of each channel performed exceptionally well on every mic that I connected to it, from the Neumann and AKG condensers to the Shure dynamic. (The BlueTube DP exhibited no special fondness for the Blue microphone, despite the color coordination.) My favorite vocal mics performed as expected, and the unit had more than enough headroom for the dynamic mics when I used them on guitar and bass cabinets. The highpass filter worked well on a male spoken-word vocal, and no increase in background noise was apparent when disengaging the –20 dB pad.

(Blue) Sky's the Limit

The BlueTube DP's versatility was its most attractive quality. The unit sounded particularly good as a bass guitar DI, driving a player's amp in my small live room while sending a beefy signal to my console. The clean sound was one of the best I'd recorded with this particular player, who likes to hear a deeper midrange from his amp. The BlueTube DP's heft made me curious about how it might sound on electric guitar.

Although the unit was okay for certain rhythm-guitar parts, it's much better suited for bass and keyboards. Mic and instrument pres can't give you the variety of overdrive tones that today's guitar processors and amps do. The higher range of the BlueTube DP's Tube Drive control imparted a thin and reedy distortion to my Fender Strat's bridge pickup. At lower settings, however, the control added a subtle crunch to rhythm parts.

When I returned to the clean preamp settings, I was again impressed with the overall sound of the BlueTube DP for recording clean guitar for the purpose of re-amping later. The quieter pickup combinations of my Strat were almost silent, and I could control the buzzing single-coil pickups by changing my playing position. The BlueTube DP was able to handle those signals and raise and lower them without adding noise. It

PRODUCT SUMMARY

PRESONUS BlueTube DP

two-channel mic/instrument preamp
$229.95

OVERALL RATING (1 THROUGH 5): 4

PROS: Clean and quiet. Tube Drive, phase reverse, and VU meters on both channels. Stereo DI capability. Excellent value.

CONS: No power switch. Tube Drive thin and harsh at higher percentages.

MANUFACTURER
PreSonus
www.presonus.com

also maintained the snap and bite necessary for country and funk songs without an amp.

The Tube Drive control was at its best when adding subtle, velvety shades to a female jazz vocalist's mic and rounding out the high-end content of some frosty all-digital stereo mixes that I had completed a few years before. The detents on the Tube Drive controls were helpful in applying equal amounts of subtle distortion to each stereo track.

Chasing the Blues Away

The BlueTube DP has no digital interface, as each of my other mic pres do. The BlueTube DP, however, was quieter and better sounding than two other desktop USB interfaces with mic pres that I often use for quick demo projects. The BlueTube DP's portability, sound, and low price should make the purchase of a separate, basic digital interface for your computer—especially a laptop—worth the extra expense.

PreSonus has enhanced the original BlueTube without significantly raising the price. It is a versatile and excellent sounding mic pre for the money, functions as an enhanced DI, and has the potential to add warmth to a variety of sounds that are too-cool-for-school at home or on the road.

Rusty Cutchin is an associate editor of EM. He can be contacted at rcutchin@comcast.net.

FIG. 1: The Kenton MidiStream wireless MIDI system sports a second antenna-and-receiver system. Should reception weaken over one antenna, the second can receive the signal.

KENTON ELECTRONICS MidiStream
CLASSIC MIDI WORKS MIDIjet Pro

Two systems bring wireless MIDI up-to-date.

By Marty Cutler

Wireless technology permeates our existence: wireless phones, computer networks, and audio-system controllers are everywhere. Wireless MIDI systems are a boon for onstage performers who want to free themselves from as many encumbrances as possible. Wireless MIDI is useful in the personal studio, where recording near a workstation can be noisy and impractical.

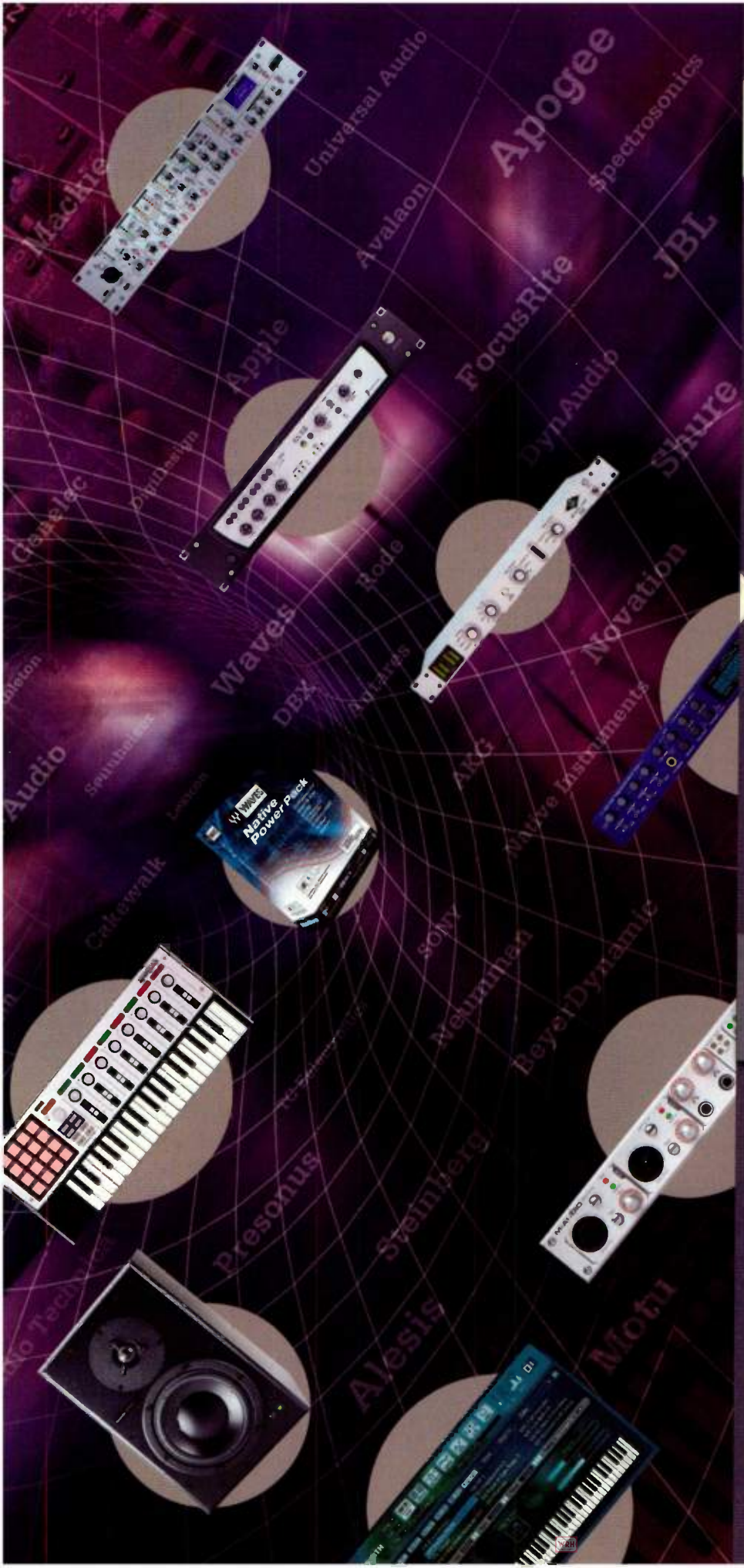
Although well-implemented wireless MIDI control can simplify complicated MIDI cable runs, it doesn't eliminate them. MIDI output from your controller requires a cable to route data to a transmitter, which may be connected to an external power supply or powered by batteries. You will no longer be tethered to the receiving devices, which could be anything from a single synthesizer to a complex, computer-driven DAW. And therein lies the wireless system's appeal—performers are free to wander anywhere within the system's transmission range.

Celebrate Diversity

Two of MIDI's newest wireless systems are the MidiStream, from Kenton Electronics, a London-based firm, and MIDIjet Pro, from Classic MIDI Works (a division of Artisan Classic Organ), a Canadian manufacturer. Kenton's MidiStream receiver comprises two receiver and antenna systems in one housing, which is often referred to as a diversity system (see **Fig. 1**). The redundant antennas help to ensure that either one or the other will receive

MIDISTREAM SPECIFICATIONS

Frequency Band	914.5 MHz
Channels	1
Range (according to mfr.)	260 ft.
Power	transmitter: 9V battery; receiver: AC adapter
Dimensions	transmitter: 2.76" (W) × 3.94" (H) 1.18" (D); receiver: 9.49" (W) × 1.26" (H) × 4.53" (D)
Weight	transmitter: 0.63 lb.; receiver: 1.87 lbs.



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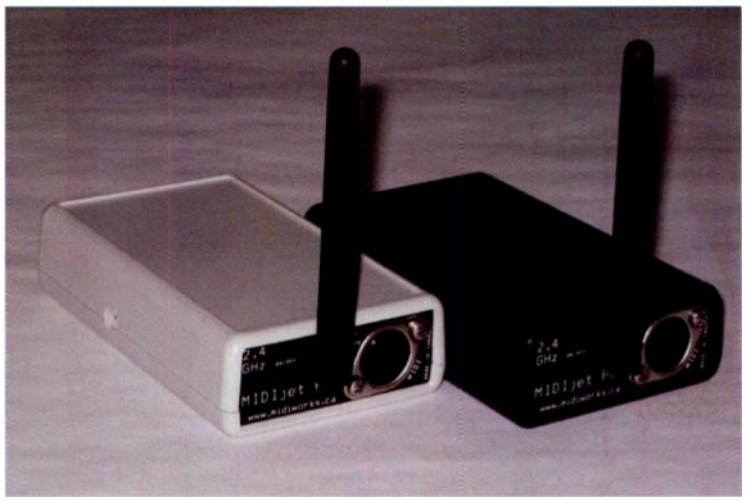

FIG. 2: The Classic MIDI Works MIDIjet Pro lets you set unique transmitter and receiver channels for as many as 31 separate wireless MIDI systems working in close proximity.

the signal under most circumstances. Antennas attach to the receiver's rear by way of BNC sockets.

The MidiStream operates on a single frequency of 914.5 MHz. Consequently, you can't use one system if it is too close to another. The manual doesn't specify what that exact range is, but you should probably avoid using more than one system on stage at the same time. Kenton plans to make additional frequencies available in the future.

A wall-wart AC adapter powers the MidiStream's receiver. Of the four LEDs on the front panel, one indicates when the power is on, another shows whether the MIDI signal is present, and the other two indicate reception on either of the antennas. The receiver has a single MIDI Out jack, and you connect your controller to the transmitter's MIDI In jack. Next to the transmitter's jack, an LED indicator flashes when the battery power is low. A thumbscrew at the transmitter's base opens the well that holds its included 9V battery.

According to Kenton, battery life is between four and five hours. Kenton provides a list of hexadecimal SysEx strings that you can send to the transmitter to conserve battery power by powering down when it stops transmitting. That allows you to customize the amount of time between MIDI messages before the unit switches to a low-power-drain mode. For the less hex-savvy among us, it would be more convenient to download a Standard MIDI File (SMF), which should be available on Kenton's Web site by the time you read this.

PRODUCT SUMMARY

KENTON ELECTRONICS MidiStream

wireless MIDI system
$649
OVERALL RATING (1 THROUGH 5): 3
PROS: Diversity system provides redundant receiver. Requires no setup.
CONS: Only one frequency available.

MANUFACTURER
Kenton Electronics/
Big City Music (distributor)
www.kentonuk.com or
www.bigcitymusic.com

Binding Arbitration

Classic MIDI Works MIDIjet Pro's transmitter and receiver look identical except for their color; the transmitter is black and the receiver is white (see Fig. 2). Both are single-antenna, high-impact plastic units about the size of a cigarette pack. The system operates at a frequency of 2.4 GHz and has spread-spectrum transmission tech-

nology, which the manufacturer says is inherently resistant to interference. You can program the MIDIjet Pro to work over a range of 31 channels, which lets you use as many as 31 systems in a single locale.

At the MIDIjet factory, each transmitter and receiver system undergoes a process called *binding*, which ensures that a unit pair will communicate only with each other, even if other units are operating at the same frequency. If you do have multiple units, you can assign each pair a unique channel with a DIP-switch setting. The transmitter and receiver house the DIP switches behind their battery wells. Although the batteries don't impede access to the switches, you should perform any last-minute changes to the settings in a well-lit area; the tiny, recessed switches are difficult to access and set.

Classic MIDI Works claims a battery life of 30 hours. The MIDIjet Pro includes a pair of AA alkaline batteries for each unit and a wall-wart AC adapter you can use with either unit.

Long-Distance Runaround

MIDI is not as data-intensive as audio. Because of MIDI's serial nature and limited bandwidth, all MIDI systems are somewhat limited in the capacity of what they can deliver. Wireless systems do introduce small but ideally imperceptible amounts of latency. To test both systems, I played several software synths with my MIDI guitar controller transmitting Notes, Pitch Bend, and various MIDI CCs over six channels—a triple-whammy for accurate MIDI timing—and the arrangement was quite playable.

PRODUCT SUMMARY

CLASSIC MIDI WORKS MIDIjet Pro

wireless MIDI system
$495 Canadian (about $395 U.S.)
OVERALL RATING [1 THROUGH 5]: 3.5
PROS: Extremely compact. Supports as many as 31 discrete wireless channels in one local area.
CONS: Recessed DIP switches difficult to access.

MANUFACTURER
Classic MIDI Works
www.midiworks.ca

Large SysEx dumps will not work without software that can apportion the data into smaller chunks with more time between transmissions. That said, you can transmit the full range of MIDI messages through both systems. For example, I was able to use a knob on my Korg MicroKontrol to remotely regulate the tempo of a sequence playing back in Cakewalk Sonar.

The MidiStream claims a maximum range of at least 260 feet, whereas the MIDIjet boasts as much as a 500-foot range. Maximum indoor ranges are significantly shorter; Kenton claims an indoor range of about 100 feet. In practice, I did not have the real estate to put the extreme end of the unit's specs to the test; these claims posit an outdoor, line-of-sight signal path, and no sensible user should rely on the maximum range claims in a working environment.

Monitoring the effectiveness of the units with my guitar controller was

MIDIJET PRO SPECIFICATIONS

Frequency Band	2.4 GHz
Channels	31
Range (according to mfr.)	500 ft.
Power (either unit)	(2) AA batteries or AC adapter
Dimensions (either unit)	4.4" (H) × 2.6" (W) × 1.1" (D)
Weight (either unit)	0.38 lb.

restricted to shorter runs of a maximum 30 feet, in which I could realistically assess an instrument's response without acoustic latency symptoms. I also transmitted MIDI sequences of varying density to a Roland SC-55 Sound Canvas connected to the receiver and monitored the results through headphones connected to the synth. An extremely busy 13-channel sequence with multiple tracks of Pitch Bend, Modulation, and Program Change messages played my old Roland SC-55 Sound Canvas at a distance of roughly 50 feet without a hitch, even through obstructions such as walls and closed wooden doors.

Both units automatically send All Notes Off messages if the signal goes out of range or becomes obstructed. To test that, I shut off the transmitter while playing back a MIDI sequence. The MidiStream and the MIDIjet Pro responded quickly with no hanging notes, only to resume playback as soon as I switched the power back on. When I deliberately dislodged the MIDI cable from the transmitter (the most likely way to accidentally disrupt the MIDI data stream), notes in an ongoing sequence hung momentarily. If I reconnected the cable immediately, the stuck notes stopped and the music righted itself. Again, the MidiStream and MIDIjet responded identically. To determine whether MIDI density was the culprit, I played back a 3-channel MIDI sequence with no data other than Note messages and got the same results.

Down to the Wire

Both systems worked right out of the box and without any complicated setup procedures. Both give you basic documentation, but not much more information is necessary; wireless systems are essentially set-and-forget devices.

Although the MidiStream's redundant antennas might be helpful in situations in which unexpected signal interference occurs, the MidiStream costs quite a bit more the MIDIjet Pro. If you require more than one wireless system to work in close proximity with others, the MIDIjet Pro is currently the logical choice, especially considering their difference in price.

Both units deliver solid performance at a price far below the cost of earlier wireless setups. In Geary Yelton's review of the $2,995 Gambatte MIDIStar Pro wireless system (see "First Take: Capsule Comments," in the June 1989 issue of EM), his article concludes with the wish that wireless systems were more affordable. I'm happy to report that simple, reliable, and affordable wireless MIDI systems are finally within reach.

Former EM assistant editor Marty Cutler's five-string banjo is completely wireless, except for the strings.

ROLAND

V-Synth XT

By Geary Yelton

In 2003, Roland applied decades of synth-design chops to an all-new DSP-based keyboard instrument, the V-Synth ($2,499). Its highlights were a unique and flexible architecture, user sampling, and the ability to process external audio (see EM's January 2004 review at www.emusician.com). The V-Synth's innovative Time Trip pad lets you stretch and freeze sample playback and control other parameters in real time.

The V-Synth XT ($2,599) is a 3U rackmount version an XLR mic input with phantom power, a vocal modeling, and D-50 emulation. It works as a MIDI interface and as a 44.1 kHz audio interface when connected to your computer by USB. You can use the XT on a tabletop or mount it in a rack. When rackmounted, it will tilt and lock at an angle that you determine.

This Year's Model

Like the V-Synth keyboard, the XT has coaxial and optical S/PDIF I/O and lots of analog audio ins and outs, as well as onboard USB 1.1, three MIDI ports, and a PC Card slot for storing additional data. The XT is missing some of the keyboard's buttons and knobs, all its sliders, and its twin D Beams, replacing them with a color touch screen and eight reassignable knobs. Rather than supplying a separate Time Trip pad, pressing a button turns the XT's touch screen into a virtual Time Trip pad. Regrettably, you still can't expand the sampling RAM without deleting factory samples.

The Roland V-Synth XT delivers features that the V-Synth keyboard lacks, including a color touch screen, a mic preamp with phantom power, classic D-50 emulation, and vocal-modeling capabilities.

Like its predecessor, the XT makes good use of Roland's outstanding VariPhrase Elastic Audio Synthesis engine, which stretches time and pitch further and with fewer artifacts than other techniques. Version 2 of the V-Synth operating system adds new waveforms, Sound Shaper, Multi Step Modulator, and Rhythm Kits, which let you assign a different sound to each of 61 notes. XT ships with version 2 installed, and previous V-Synth owners can download the upgrade for free. The XT also comes with V-Synth Librarian (Mac/Win) for transferring synth data to your computer, where you can rename, reorganize, and save it offline.

Sound Shaper offers new techniques for creating timbres—you select from a list of 18 groups such as Synth Bass or SFX Hits, and then select from a short list of templates. From there, you can alter synthesis and effects parameters manually and then save your creation as you would any other timbre. Sound Shaper is an enormous time-saver and a useful source of inspiration.

The Multi Step Modulator is a 16-step sequencer that works as a function generator you can apply to a long list of parameters. Four simultaneous tracks can modulate four destinations. Enter each step graphically by drawing with your fingertip, by turning a knob, or by entering a keypad value. You can also loop with sequence, change its direction, or create smooth transitions between steps.

V for Victory

The two installed V-Cards make the XT three synthesizers in one. (If you already have a V-Synth or a VariOS, you can buy either V-Card separately.) Pressing the V-Card button lets you choose from three completely different sound sets: V-Synth, VC-1 (D-50), and VC-2 (Vocal Designer).

VC-1 perfectly duplicates the linear arithmetic (LA) synthesis that made the D-50 one of Roland's most popular synthesizers ever, giving you complete access to all parameters. The sound is spot-on, if somewhat more sparkling than a real D-50. The 64 original factory presets are on hand, along with 64 new ones and all 256 from Roland's series of D-50 expansion cards. Twenty-eight cool new waveforms supplement the D-50's original 100 samples. The XT makes editing LA timbres much easier than previously, and its reverb is a vast improvement. If you're a D-50 fan, you'll love Roland's implementation of an old favorite.

Vocal Designer furnishes a dozen algorithms divided into five groups. The Modeling group synthesizes choirs, solo voices, and analog synth waveforms. The Vocoder group produces vocal sounds using the mic input as the modulator; its timbres range from traditional vocoded synthesizer to solo and choir voices that sing along with your vocal input (see **Web Clip 1**). Poly Pitch Shift uses MIDI notes you play to transpose and harmonize your audio input's pitch. The Keyboard group plays sampled vocals, and the Processor group imparts effects to your audio input and ignores any MIDI input.

Have Another Hit

Most of the XT's factory timbres are striking and playable, running the gamut from fresh instrument simulations and one-finger grooves (see **Web Clip 2**) to outrageous sound effects and ethnic vocal melismata (see **Web Clip 3**). Nonetheless, the XT is well suited to creating your own sounds. The user interface is easy to navigate and provides plenty of motivation to explore and experiment. In most modes, color graphics always make it obvious which soft knob controls what parameter.

Although the XT costs $100 more than the keyboard version, its color touch screen, XLR input, and two standard V-Cards make it well worth the difference. It brings together the best of hardware-based DSP and computer-based editing. EM WEB CLIPS

Overall Rating (1 through 5): 4

Roland U.S.

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EASTWEST/QUANTUM LEAP

Ra (Mac/Win)
By Marty Cutler

Whether you're looking for authentic bluegrass instruments or trying to program orchestral harp samples to sound like a kora, *Ra* ($995), by EastWest in collaboration with Quantum Leap, is a tool that you should check out. *Ra* features a 14 GB collection of beautifully recorded plucked, blown, bowed, and struck instruments from around the world. *Ra* is also an 8-part multitimbral instrument (in Native Instruments' Kompakt Instrument format) that works by itself or with AU, DXi, RTAS, and VST hosts. I tested the program as an independent instrument and as a plug-in for the Mac applications Steinberg Cubase SX3, MOTU Digital Performer 4.5.2, Ableton Live 4.1, and Granted Software Rax 1.2.3.

A relatively simple Web-based challenge-and-response procedure had *Ra* up and running in a few minutes. As with other Kompakt Instruments, the program has eight slots into which you can load sample programs. Each can have its own MIDI channel, transposition, key range, effects, and synthesis settings. The microtuning section is especially useful in this collection, because it has a number of presets for different styles of music, including Arabic, Chinese, Egyptian, Indian, and West African tunings.

World Class

Sounds are grouped geographically and by general instrument type, such as Bowed, Perc, Plucked, or Wind. If a particular instrument classification has more than one instrument, you'll find a subcategory for it. For example, selecting India and navigating to the Bowed category opens a subdirectory for baritone violin, esraj, and sarangi. Furthermore, each of these subcategories may hold multiple versions of the instrument that are tailored for different performance techniques, such as key switching or Velocity crossfading. Because of the nested submenus, it can be awkward to navigate to the instrument you need. Native Instruments should implement scroll buttons to aid in selecting samples.

Many of the Quantum Leap programs take advantage of round-robin programming, which lets subsequent strikes on the same note access similar but not duplicate samples. That technique creates more realism in sounds such as up-and-down strokes on a picked instrument or repeated percussion hits. *Ra*'s generous use of multiple Velocity levels makes instruments progressively brighter and louder without reliance on filters, which are available if you need them.

EastWest/Quantum Leap's *Ra* includes an 8-part multitimbral Kompakt Instrument player for independent triggering of the program's 14 GB collection of instruments.

Ra gave me considerably more than I'd bargained for. For example, the banjo category contains a round-robin version and neck- and bridge-positions instruments. The neck- and bridge-position instruments are a great addition, because expressive banjo players will vary their right-hand position between the bridge and the neck. The separate programs, however, could have been combined and used with a key-switching map or accessed by Modulation Wheel crossfades. Nevertheless, it's good that both groups are present.

If you love the sound of Indian percussion, the Tabla group will delight you. You can choose Tabla and Baya, which offer subtle and dramatic strike variations. (Authentic tabla actually consists of two drums: the dayan and the lower-pitched bayan.) According to the documentation, the sample map encompasses nearly the entire vocabulary of traditional tabla articulations. Variant sample groups include the higher-pitched instrument and a set peppered with finger rolls and flams.

Forget the cliché-ridden shakuhachi patches that you may have heard. The key-switched, Velocity-layered version in *Ra* is an immensely evocative instrument. The sound is full of breath with beautiful harmonics—the kind induced by overblowing the real instrument—swirling in and out. Triggering the notes C0 to C#1 in half steps lets you hear the wealth of varied playing techniques used to create the samples (see **Web Clip 1**). And I can now stop trying to simulate the sound of a kora with nylon-string guitars and orchestral harps; *Ra*'s Kora is mellow but resonant and responds to higher Velocity values with a satisfying snap of the string (see **Web Clip 2**).

World Wise

The decent complement of synthesis parameters in the Kompakt Instrument player lets you morph samples into unique sounds, a flexibility that's countered by the fact that in *Ra*, samples cover a limited range of the keyboard. If you own a full version of Kompakt or Kontakt, you can extend the map of the upper and lower sample ranges, but other *Ra* users shouldn't be shortchanged in this fashion.

EastWest/Quantum Leap *Ra* is not a comprehensive collection of instruments, but the program's designers have chosen a sensible balance of quantity and quality,

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and I hope that the company will develop additional volumes. For now, the instrument does what it does exceedingly well. *Ra* is easily the most expressive collection of the world's instruments that I have heard. Despite a few quibbles, I highly recommend it. EM WEB CLIPS

Overall Rating (1 through 5): 4
EastWest/Quantum Leap
www.soundsonline.com

METASONIX

TX-2 Butt Probe

By Gino Robair

Metasonix continues to reach into new areas of noise with the TX-2 Butt Probe ($549), a tube distortion effect that works standalone or mounted in an analog modular synth rack. The TX-2 uses three 4BN6 tubes, which are related to the BN6 tubes used in the TM-5 guitar preamp. According to Metasonix-mastermind Eric Barbour, the 4BN6 was originally used as an FM detector in inexpensive radios and televisions and is appropriately nonlinear for extreme audio waveshaping.

The tubes in the TX-2 are visible through the top window, and a small light illuminates them when the device is switched on. All three tubes are used in series as preamps, with the Fist and Ream knobs controlling the screen grids of the first two tubes, respectively.

The Metasonix TX-2 Butt Probe uses three tubes in series to create highly unstable distortion. The built-in bandpass filter gives you control over timbre.

The third tube has a fixed screen voltage, but it is part of a feedback circuit involving a "crude" bandpass filter with a range of roughly 1 to 5 kHz. (Barbour wouldn't speculate on the filter's roll-off characteristics.) An internal LFO, with a set rate, sweeps the filter frequency. You also can use a 10V peak-to-peak CV to do the job. To interrupt the LFO, insert a ¼-inch plug into the CV input and use the Screw control to set the filter frequency manually. The behavior of the Screw control is shaped like an inverted bell, while the Fist and Ream controls behave—and interact—unpredictably. The Level knob sets the audio input amount. The TX-2 has a power switch and a bypass button.

The Butt Probe's I/O is basic: ¼-inch jacks for audio input and output, and a CV input. Surprisingly, the TX-2 offers dual outputs if you use a ¼-inch insert cable (a Y-cable with a TRS plug on one end and two ¼-inch TS plugs on the other). The tip of the TRS plug provides the main output signal that comes after the third tube and filter.

The ring of the TRS plug captures the signal after the second tube. There's noticeable bleed through on that output, but for the most part, the ring channel is less distorted than the tip channel, and it's 10 to 12 dB lower in signal level. The bypass switch doesn't affect the sound of the ring channel, so it's always on, and a hint of distortion is always present. I found this "stereo" option to be most useful when the signals are panned apart slightly, and a hint of the unprocessed sound comes through.

Because of its high output, the TX-2 is intended for use with devices accepting line-level inputs, such as mixers and keyboard amps rather than guitar amps. And according to Metasonix, the output of the TX-2 is divided down and more compatible with solid-state devices than the TX-1 Agonizer was.

Ring of Fire

Operationally, the TX-2 is similar to other Metasonix tube effects: it loves a strong input signal with lots of edges, (particularly synth sounds), and to hear the full sonic potential of the device, you have to turn the knobs slowly and allow the tubes to catch up. You can create fill-like glitches by subtly adjusting the Fist and Ream controls near their lowest settings (see **Web Clip 1**).

On drum sounds, certain settings cause the distortion to ride the envelopes of sustained sounds such as booming bass drums or open hi-hats (see **Web Clip 2**). Overall, the TX-2 responded best to electronic percussion.

The TX-2 easily achieves the characteristic chirpy squeal of other Metasonix effects, but it also hums like crazy when the knob levels are set at low levels and no input is present. But that's to be expected when you have three distortion circuits in a row.

The one disappointing aspect of the TX-2 was the sound of the filter. Although I found it most useful in its static mode, a wider frequency range would be a welcome addition. Because a Vactrol is used to control the filter frequency, sweeping it with an external LFO or EG with a fast rate doesn't allow you to get into extreme FM sounds.

In the End

The TX-2 Butt Probe has a broad noise palette and is particularly useful on percussive and sharply defined line-level sources. Its chunky, crunchy sound is both musical and extremely useful, and anyone seriously into noise will enjoy it.

Three-tube satisfaction doesn't come cheap: The TX-2 is a hand-made, limited-edition item accompanied by a serious price tag. Nonetheless, if its predecessor, the TX-1 Agonizer, is any indication, the Butt Probe will be a hot item that moves quickly. EM WEB CLIPS

Overall Rating (1 through 5): 3.5
Metasonix
www.metasonix.com

LINPLUG VIRTUAL INSTRUMENTS

CronoX3 (Mac/Win)

By Len Sasso

CronoX3 is the latest brainchild of instrument designer Peter Linsener, and it's a significant advance over

previous versions of CronoX. CronoX3 is available in VST plug-in format for Windows and in AU and VST formats for Mac OS X. It can be purchased directly from the LinPlug Web site as a 400 MB download ($139) or on CD with a printed manual from your music retailer ($199). The download version comes with 750 presets compared with 2,000 on the CD.

Like its predecessors, CronoX3 has four types of sound generators: Oscillator, Time Sampler, Schrader, and Loop Sampler. Unlike its predecessors, a preset can use as many as four generators, and their outputs can be spread across two parallel multimode filters. The signal path ends in six effects slots—the first two are in parallel and feed the remaining four, which are in series.

CronoX3's Main page provides *x-y* controls for mixing its four audio generators and controlling each filter's cutoff and resonance. Performance and basic effects controls are provided as well.

Round and Round

CronoX3's Oscillator generator morphs between sawtooth and pulse waveforms with continuous control of symmetry. Morphing can be automated in real time with MIDI messages and built-in modulators. Extremely fat sounds can be achieved with any of the generators by using the Spread control, which detunes five oscillators assigned to each voice. Although it uses five oscillators per voice, activating Spread does not reduce polyphony, but deactivating it does save CPU cycles.

Time Sampler and Schrader play single samples. Time Sampler offers independent control over time and pitch, and the time setting can track the keyboard positively or negatively. Schrader treats the sample as a wavetable. When a note is played, Schrader proceeds through the wavetable at a rate determined by its Speed control. Start and End controls, which can be automated, allow you to restrict the wavetable to part of the sample.

Loop Sampler is a looping multisample player that supports both key and Velocity zones. Although it's somewhat tedious to set up, Loop Sampler

has all the features of conventional sample players and extensive modulation possibilities.

Add a Little Subtraction

The output of each active generator (you can deactivate generators to save CPU cycles) can be spread between CronoX3's two filters. In Standard mode, the filters can be switched between lowpass, bandpass, and highpass filtering. In Free mode, a rotary control allows you to morph between lowpass, bandpass, highpass, and notch filtering, and morphing can be automated. As you might imagine, the effect can be subtle or extreme.

CronoX3's effects cover the bases with three brands of delay (standard, stereo, and ping-pong); phase, flange, and chorus; multimode and parametric EQ; reverb and stereo enhancement; gating; and bit crushing. Although they don't push the envelope, and their parameters aren't modulation-matrix targets, the effects are high quality. With all else that's going on in CronoX3, that's good enough.

Hold That Thought

As is probably clear by now, CronoX3 shines in the modulation and automation departments. For MIDI remote control and plug-in host automation, a slick system called Easy Controller Setup (ECS) makes it a snap to assign MIDI messages to any of CronoX3's controls (including effects parameters). Furthermore, messages can target more than one control.

CronoX3's seven ADSFR envelope generators, four multiwaveform LFOs, and variety of MIDI messages can be routed with variable amount to any of 56 targets using a 10-row modulation matrix. A flexible 32-step arpeggiator is also available as a modulation source.

Out of Control

As complex as CronoX3 sounds (and is), its control panel is so well thought-out that CronoX3 is fairly easy to program. A Main page gives you access to critical generator, filter, and effects settings along with buttons to take you to more detailed settings pages. Some of the other pages have a lot of controls crammed in, but everything is clearly labeled and logically laid out.

CronoX3 is definitely a tweaker's synth, but its huge library of presets will keep you busy if you hate synth programming. The sounds, from a variety of top-notch sound designers, are as well thought-out as the synth. Presets range from ambient sounds and pads and cutting leads to acoustic and percussion instruments and myriad sound effects (see **Web Clip 1**).

A visit to the LinPlug Web site is well worth the trip. You can hear MP3 examples and download a demo version of CronoX3. You'll also find demos and examples of the company's other plug-ins, including the free synth, Alpha, and the previous (and less expensive) version of CronoX. EM

EM WEB CLIPS

Overall Rating (1 through 5): 3.5
LinPlug Virtual Instruments, GmbH
www.linplug.com

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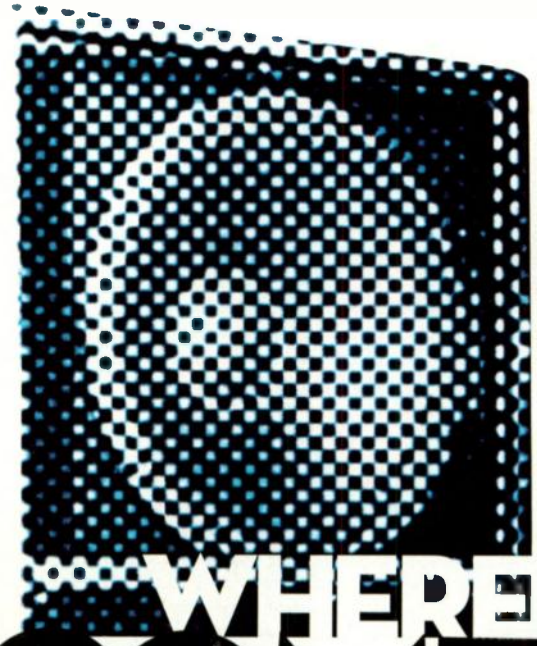

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Eggshells Are for the Birds

By Larry the O

In this business, we all know people who are sensitive: clients, bandmates, a bandmate's girlfriend. Knowing how to handle people delicately is one of the most valuable skills an audio- or a music professional can have. It requires that one use tact and restraint to avoid mishandling touchy situations, yet touchiness seems to be a quality that is endemic to creative types.

Some people, however, are so easily upset that tact and restraint are mandatory on a constant basis. You must analyze every word or deed for potential offense before you dare say it or do it. At that point, you had better trade your street shoes in for something softer, like moccasins, because you're going to spend your time walking on eggshells.

Eggshell syndrome differs from normal sensitivity—emotional or political—in that it is chronic. "Don't ever mention thunderstorms to him! His pet gnu was hit by lightning, and ever since then, just the mention of thunder is enough to set him off. Even talking about rain will do it sometimes. In fact, it's best if you simply never say anything about the weather."

A person quickly becomes reticent to say or do anything for fear of a meltdown. Obviously, that is counterproductive in creative work situations. The progression of responses to the eggshell syndrome can start with concern, move through fear, and continue into annoyance, eventually evolving into frustration, and finally ending up as pent-up rage, which is easily triggered into an explosion. Eggshell syndrome can thus be contagious.

But eggshell syndrome is in no way restricted to individuals. Support organizations for major artists frequently exhibit the same chronic touchiness. If you want anything from this sort of organization and are not properly obsequious, you might not only be rejected but blackballed.

Let me be clear, because I don't want to seem, well, insensitive. Being considerate of someone or compassionate about potentially hurtful subjects shows character, and there's certainly nothing wrong with that. It's also likely that a hypersensitive person has emotional issues that call out for psychological help. My comments are not intended as personal judgments; I am speaking strictly of the impact that this level of sensitivity can have on a professional working environment.

From that perspective, the eggshell syndrome amounts to a requirement for codependency, which, to be blunt, is bollocks. As frequently as it may be encountered, and as much a reality as it may be in our business, it is nonetheless an energy drain and a buzz killer in a creative situation.

So what's a mother to do?

In some cases, the situation can be handled by capitulating. I've worked with some people that were unflappable and could keep cruising right on through the minefield. Failing that, maybe you can just shrug it off and say "Whatever" to yourself. Other times, the problem might be sidestepped. Perhaps there's a good friend that can keep the syndrome in check and act as a buffer between the oversensitive person and the rest of the workgroup. Maybe the "problem child" doesn't have to be involved in every step of the job. There are many tactics that can be successful, even if most of them seem to be a silly waste of energy.

All of these solutions, however, illustrate the heart of the problem—that almost everything about the situation revolves around those sensitivities. Possibly the worst situations are those truly virulent cases when eggshell syndrome is a front for a control game in which the sensitive person's objective is to make everyone dance like puppets on strings. Accommodate one sensitivity, and another suddenly appears.

Sometimes the oversensitive person might not be crucial to the project, in which case simpler solutions become viable—specifically, telling the person to come back to Earth or hit the road, or even just pointing to the door. Such drastic action is not just viable but proper, given the difference between personal and professional contexts. If "tough love" works, so much the better, but one way or the other, in a professional (that is, business) situation, your imperative is to get the job done. There are limits to the amount of erratic behavior that you can tolerate—when you have a choice in the matter.

Whatever the causes, it's hard to see anything besides stress and frustration gained from encountering eggshell syndrome in a session, on a gig, on a project team, or during an essential professional contact. It is said that you can't make an omelet without breaking a few eggs. If that's true, then I guess you just have to hope that you don't have Humpty Dumpty on your hands. EM

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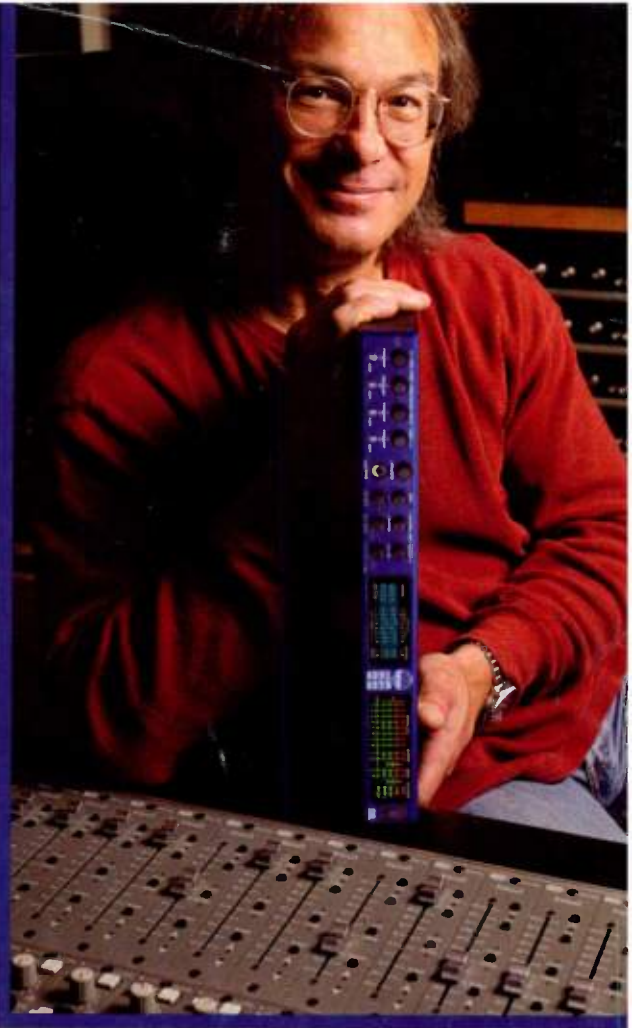

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