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August 1998

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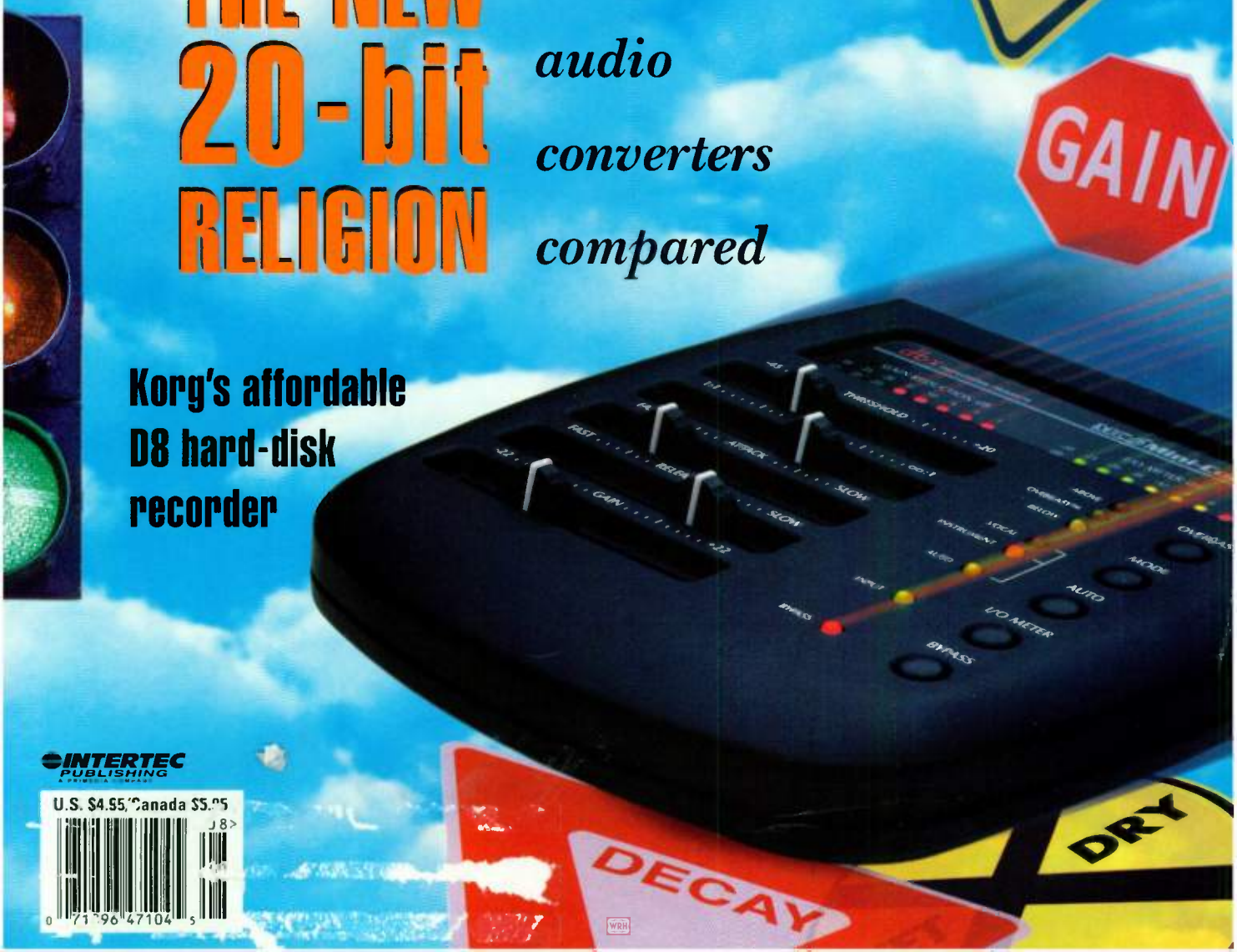

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HR824 ACTIVE NEAR FIELD

UNFLINCHING ACCURACY.

We've claimed it. Reviewers and power users are confirming it: the HR824 is the most accurate 8-inch 2-way near field monitor you can buy. It lets you hear exactly what was recorded — from microphones right through to your mixdown deck. You'll suddenly discern fine nuances of sonic texture, dynamics, equalization and stereo perspective that were sonically invisible before. As one owner put it, *"I am correcting a lot of mixes I have made in the past."*

HR824

According to *Mix* magazine's recent field test of the HR824...

"Frequency response was the flattest we have measured so far... *there can be no question... they speak the truth."*

"The HR824s performed admirably, allowing us to distinguish very fine shades of tonal color and to establish subtle timbral and harmonic relationships between sounds. When the mixes were played on other monitors, including some that cost more than twice as much, they translated very well. The overall imaging was extraordinarily clear and detailed."

Because the HR824 is active, we can precisely match each transducer's actual output. During final assembly, each HR824 is carefully hand-trimmed to ±1.5 dB, 39 Hz 20kHz. As proof, each monitor comes with its own serialized, guaranteed frequency response printout.

EXTREMELY WIDE SWEET SPOT.

Instead of a traditional, narrow "sweet spot" directly between the monitors, you'll discover that the HR824s have a wide, "sweet zone." They maintain a wide, coherent, stereo panorama that lets you move from side to side — and share what you hear with others.

Again, *Mix* magazine...

"[HR824s] also have a wide off-axis listening range, due to the high-frequency dispersion of the waveguide...*the mids and highs were tightly focused, and the stereo image well defined."*

EXTENDED LOW FREQUENCY RESPONSE (sub woofer is built in*).

The HR824 has the lowest frequency response of any 8-inch near-field monitor. It really IS capable of flat, accurate, articulated response below 39 Hz and usable response to 30Hz — low frequency accuracy that simply can't be achieved with passive speakers. Bass notes start and stop instantly, without overhang, distortion or "tubbiness."

*A large honeycomb composite piston mounted on the back of the cabinet couples with the front woofer, acting as a subwoofer.

AC power and input connectors (1/4" & XLR) extend directly from the bottom of the amplifier down, allowing the cabinet to fit flush against any surface.

***Mix* further states...**

"The HR824s handled the ultra-low bass remarkably well... *Mackie asserts that the HR824s are smooth from 39 to 20k Hz (±1.5 dB), and our tests corroborated the claim. This is no mean feat for monitors this size, and at this price."*

BRING ON THE HR824s. HOLD THE ICEBERGS.

Simon Franglen and his cohorts worked on the blockbuster hit Titanic at Castle Oaks Studio in Calabasas, CA. The studio was equipped with expensive studio monitors (one each for left, center and right) and a matched sub woofer. When Simon received three Mackie HR824s, he immediately did a series of rigorous listening tests against the old monitors. The unanimous decision: replace the studio's previous near field monitors with the HR824s.

"The difference was extremely pronounced," explains Simon. *"Three HR824s gave us better bass response than the larger monitors with a sub woofer. The HR824s were louder, had more dynamic response, and the imaging throughout the room [was incredible]."* Simon says the HR824's sweet spot is much larger, which made listening to things easier, *"when you were off to the side of the room."* *"Apart from very expensive speakers,"* says Simon, *"I've not come across any other speakers that sound as good. They absolutely tell me what I'm putting on tape."*

One person who's taken Mackie to heart is British-born synth player/producer SIMON FRANGLEN. You may not know his name, but you most certainly know his work. Simon Franglen's curriculum vitae includes work with Grammy winners Eric Clapton, Madonna, and Celine Dion (including the single from the blockbuster movie *Titanic*), rockers Yes and Crash Test Dummies, and legendary performers such as Michael Jackson and Barbra Streisand. Simon's done work in the movies, too, including Titanic, The Client, Dances With Wolves, Mission Impossible, Seven, and Contact. He's won seven Clio Awards for his work in television commercials—his clients have included Nike and Lee Jeans. His talents as a session synth player and programmer, as well as producer, are well-known throughout the entertainment world. With such credits, you'd think the guy was using incredibly esoteric, expensive gear. How else could he get such award-winning results? Well, Simon will be the first to say: you don't have to spend wads of money to get tough, quality sound gear. Not with Mackie.

MONITOR—WELL WORTH DISCOVERING.

How much is unflinching accuracy worth to you?
As we talk to more and more professional engineers who have converted to Mackie HR824s, one thing is becoming especially apparent — our near field monitors can uncover nuances that other speakers miss. In fact, one Very Prestigious Major Los Angeles Studio Complex has now installed HR824s in its Quality Control Department — because our monitors can uncover miniscule audio flaws that were undiscovered during the tracking and mixdown process on "big studio monitors." When you value the quality of your creative product, HR824s should be in your studio, too.

HUMBERTO GATICA, TRIPLE GRAMMY AWARD-WINNING ENGINEER/ PRODUCER

Being at least nominally humble we thought it would take years for mixing/producing legends like Humberto Gatica to publicly admit — much less proudly proclaim — to prefer our HR824 near field monitors.

We're delighted the esteemed Mr. Gatica proved us wrong. After being turned on to HR824s by Simon Franglen, Humberto now uses them at his private facility and has carrying cases for a second pair so he can get the same accuracy in studios that haven't yet become HR824 converts. Talk about a traveling ad!

Humberto's stellar ear for mixing has served him well as a producer: Grammy awards and nominations for engineering (Chicago, Michael Jackson, Streisand) led the way to a Grammy for producing Celine Dion's "Falling Into You" and mixing/producing her 18X platinum album "Let's Talk About Love."

Mix Magazine quotes from Mix Magazine Field Test by Barry Cleveland, April 1998. Reprinted by permission. And this isn't the only glowing review we've gotten. Check out the February 1998 issue of Recording Magazine, beginning on page 30; the April issue of Pro Audio Review, page 16; and the October 1997 issue of Audio Media, page 46.

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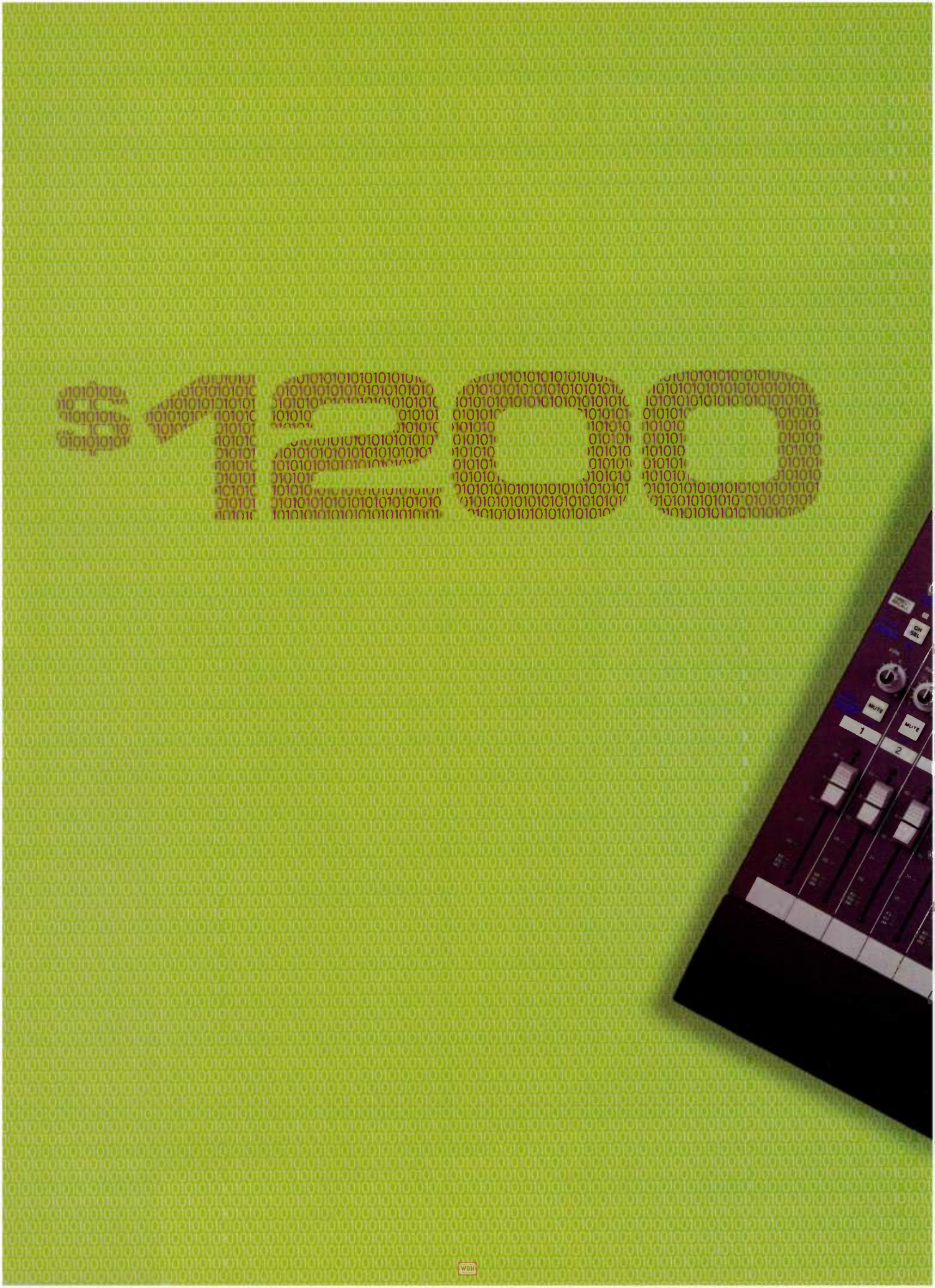
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I N S I

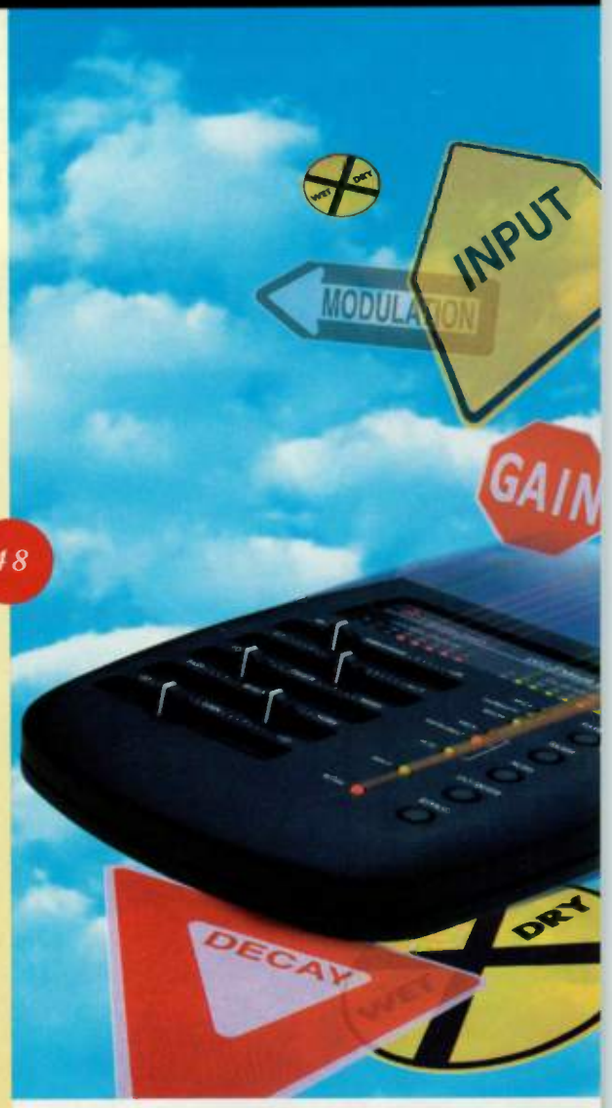
FEATURES

36 DIGITAL AUDIO EVANGELISTS
In the audio realm, conversion takes more than a leap of faith: you need the right box for the job. Fortunately for personal-studio owners, high-quality, 20-bit A/D and D/A converters are finally within reach financially. We compare five converters under $600 that are vying for your studio's soul.
By Erik Hawkins

48 COVER STORY: PROCESS THIS!
Are you lost in space when it comes to reverb parameters? Do you spend more time modifying muddled mixes than modulating delay time? Get back on the digital processing path with our exclusive effects processing primer.
By Jeff Casey

64 PRODUCTION VALUES: IF YOU KNEW SUZIE
Suzie Katayama isn't a household name, but this dynamic arranger, conductor, and musician has worked with the likes of Madonna, Michael Jackson, Alanis Morissette, Michael Bolton, and Seal. In this interview, she clues us in to how she approaches her vast array of projects and how she has learned by doing.
By Rob Shrock

75 JAM: THE EM GUIDE TO GIGGING
Our live-performance supplement takes a look at wireless systems, offers gear-saving tips for road musicians, provides tips on how to care for your voice when touring, and presents the latest gear.



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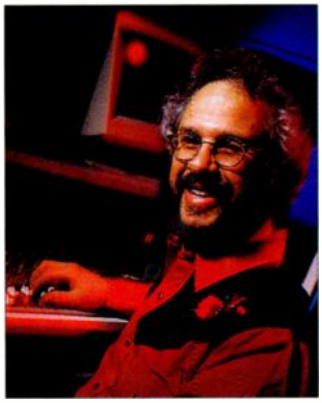
Cover: Photo Illustration by Mark Snyder.

What's the Plan?

Dealing with the business of music.



ANTHONY PIDGEON

When we first envisioned this month's cover story ("Process This!" on p. 48), we projected an article of effects-processing "dos and don'ts." But as Associate Editor Jeff Casey worked on the article, it became obvious that there are few "don'ts" when it comes to effects. Oh sure, you could lose a part by burying it in too much reverb or clip the internal stages of a multi-effects processor by being careless about gain structure—but maybe that would create exactly the sound you seek. So rather than give advice about how to avoid "mistakes," Jeff decided to offer a series of tips that you can adapt to your purposes. After all, when it comes to creativity, breaking with tradition is part of the game.

However, the business of music is a different story. When you're running a business, you need a plan that states long-range goals and specifies the steps necessary to achieve your aims, including intermediate, short-range objectives. This blueprint helps keep you on course, and the short-range goals give you a benchmark with which to measure your progress. They can also provide a certain amount of satisfaction in and of themselves. Over the years, you will probably modify the plan several times; these are normal course corrections. But if you have no plan, any success you've achieved could be frittered away due to lack of follow-up.

Most musicians focus their energy on writing, arranging, performing, and producing. Business administration, marketing, and sales are rarely our strengths. One can think of exceptions, but the Kenny Rogers types who set practical goals and plan carefully to reach them are rare. Some of us lack the self-confidence to plan for success, and those who have faith in their own abilities often don't have the patience to mess with the business aspects. The idea of writing down plans and signing contracts with friends and bandmates seems scary and distasteful. It means you are *committed.*

This month's "Working Musician" column, which deals with organizing and booking tours, provides some good examples of why you need to plan ahead. Although author Anne Eickelberg focuses on planning road tours, it is instructive to apply her concepts to building a band's following and record sales, or developing a recording business around a personal studio. Eickelberg explains why it's important to assess the situation in advance, set clear goals, determine what resources you will need, decide what sacrifices you are willing to make, and agree on each person's responsibilities—and then write down the agreement. In short, she advocates making a business plan.

Speaking of planning one's career, this is the last issue that features the byline of Assistant Editor Diane Lowery, who is departing for greener pastures after contributing to our pages for almost five years. **EM** authors know Diane as the person who handled contracts and got them paid. But Diane is best known to readers for her monthly "Pro/File" column, which she leaves in the capable hands of Editorial Assistant Rick Weldon. We wish her well in her new endeavors.

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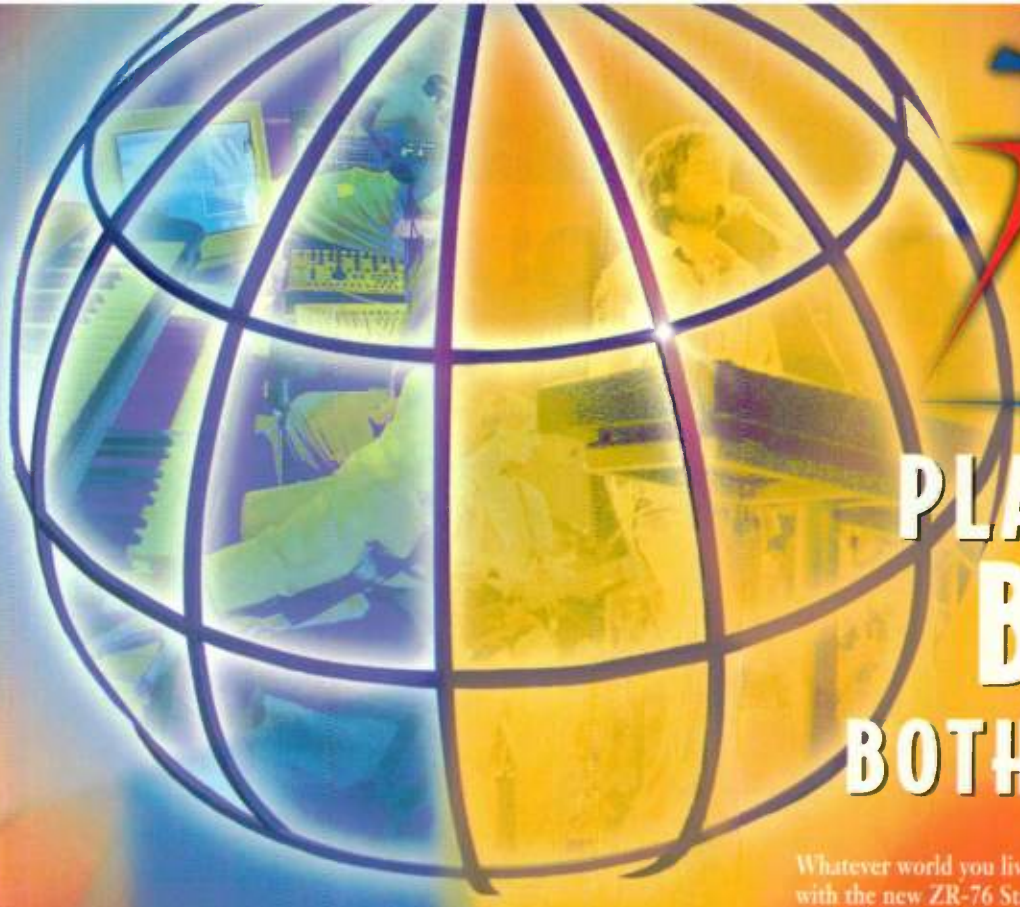

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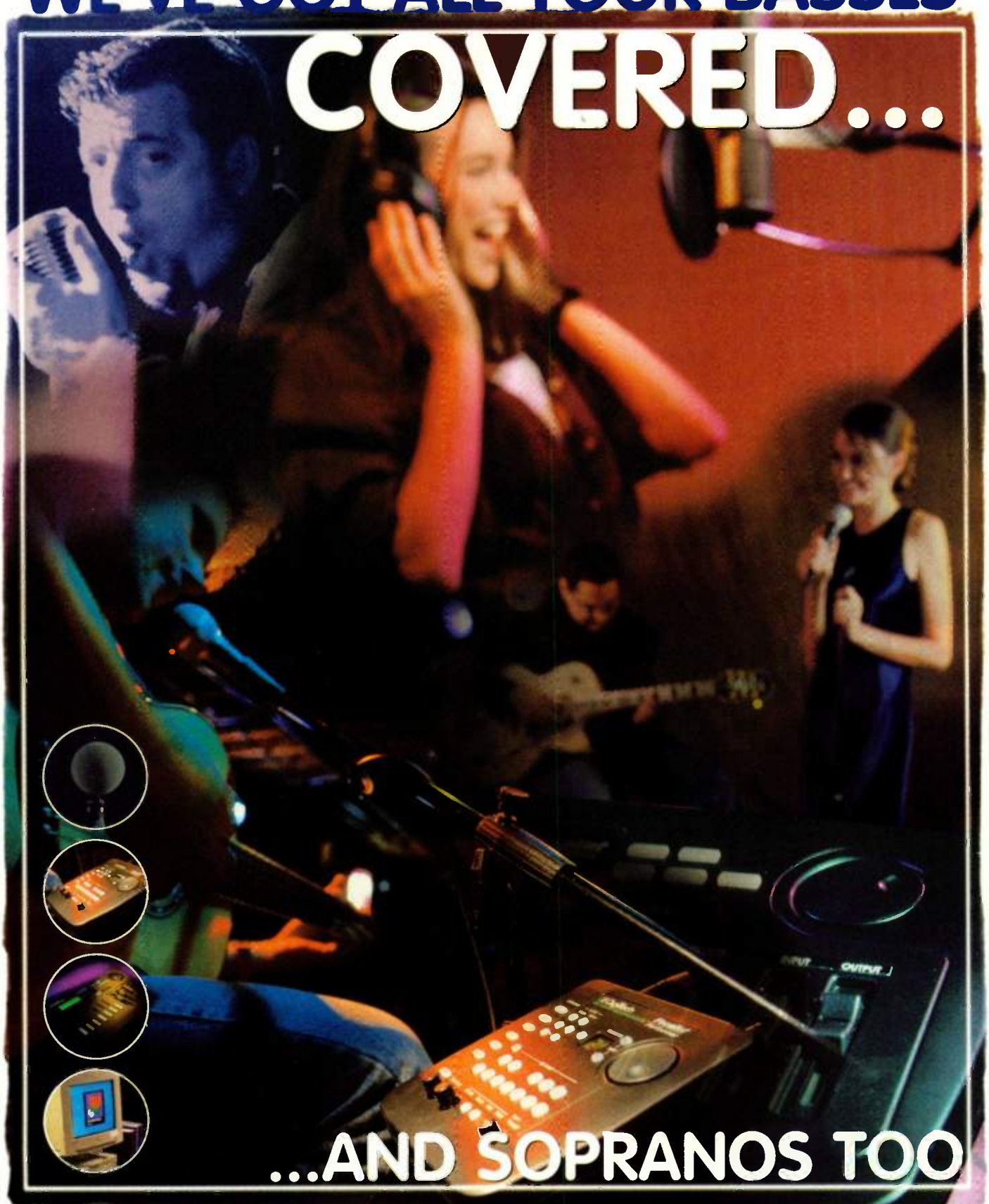

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FIE! DELTA SIGMA!

I just read the "Final Mix" column in the June 1998 issue ("What's in a Word"). It's great overall, but there seems to be some confusion over exactly what "PCM" means. Larry the O states that "PCM encoding is the old conversion standard" and that "many...converters...now use a technology called delta-sigma modulation." Thus, he implies that new hardware designs have junked PCM in favor of delta-sigma.

PCM (pulse code modulation) means the encoding of a signal in the digital domain for storage or transmission. It does not define how one implements the conversion from analog to digital. There are many ways of creating a PCM datastream. These include flash conversion, successive approximation (the technique which I believe Larry is referring to as "the old standard"), and delta-sigma (also known as sigma-delta). In addition, there are a few more esoteric techniques, such as multipass subranging. Each technique has certain pluses and minuses, and it's the job of the engineers to figure out the best technique for the problem at hand. Whether they choose successive approximation or delta-sigma, the output datastream is still PCM (i.e., the IC chip is *not* spitting out the 1-bit data Larry mentions).

The confusion may have risen from some alternate encoding techniques such as adaptive delta PCM (ADPCM). This technique uses (and stores) fewer bits, making it somewhat more efficient than "standard" PCM. The bit patterns are not the same as in PCM and are incompatible without further conversion.

Jim Fiore
support@dissidents.com

Jim—You are absolutely right in everything you say (including the fact that it was successive approximation to which I was referring). In the process of trying to squeeze a complete thought into my little "Final Mix" space, I did, indeed, commit the sin of inaccuracy. I am very concerned with being as accurate as possible, so I thank you for correcting this goof and will endeavor to avoid same in the future, even when space is at a premium.—Larry the O

SILENCE IS GOLDEN

In your June 1998 "Letters" column, a reader was complaining about excessive noise from a new PC ("Turn That Down"). The gist of David Rubin's response was "experiment with new power supplies or move the computer to another room."

I recently had this same problem when I bought a new PC case and came up against a deafening power supply. I found out about a company called Silent Systems, in Woburn, Massachusetts, that specializes in making computers quieter for recording studios and other places where ambient noise is a concern. It sells not only quieter power supplies but also a "drive-muffler kit" that fits around your hard drive *inside the case* and reduces disk-access noise. Part of the trick with the power supply is that it uses a ball-bearing fan, which will always be quieter than the cheaper ones that ship with most PCs.

While its not totally silent, I'd estimate my computer is now about one-quarter as noisy as it used to be, and I have no problem recording acoustic instruments to my Jaz drive with big condenser mics sitting four feet from my CPU.

Paul Saitta
Brookline, MA

Paul—Thanks for reminding us about Silent Systems, which first came to our attention when Steve Ouimette wrote in to tell us about it ("Letters," April 1997). We contacted the company and discovered that it has several products that can indeed reduce the clamor generated by noisy CPUs, while maintaining the proper cooling specs. Of particular interest to most PC-oriented desktop musicians is the Silent Systems Hushkit. It comes in several models for use with Pentium, Pentium MMX, AMD, and Cyrix microprocessors, and retails for about $114 to $150.

The Hushkit includes a power supply with a high-quality, low-speed, ball-bearing fan and a high-efficiency heat sink, combined with another low-speed fan for the microprocessor. To quiet drive noise, the Hushkit includes a SilentDrive hard-drive enclosure, which dissipates heat as it blocks noise. The SilentDrive accommodates 3.5-inch drives with speeds up to 5,400 rpm and installs easily in a standard, 5.25-inch drive bay.

The components in the Hushkit are designed to be user-installable if you're handy with tools and know your way around a CPU. Silent Systems can be contacted at tel. (781) 932-8444; Web www.silentsystems.com.—David R.

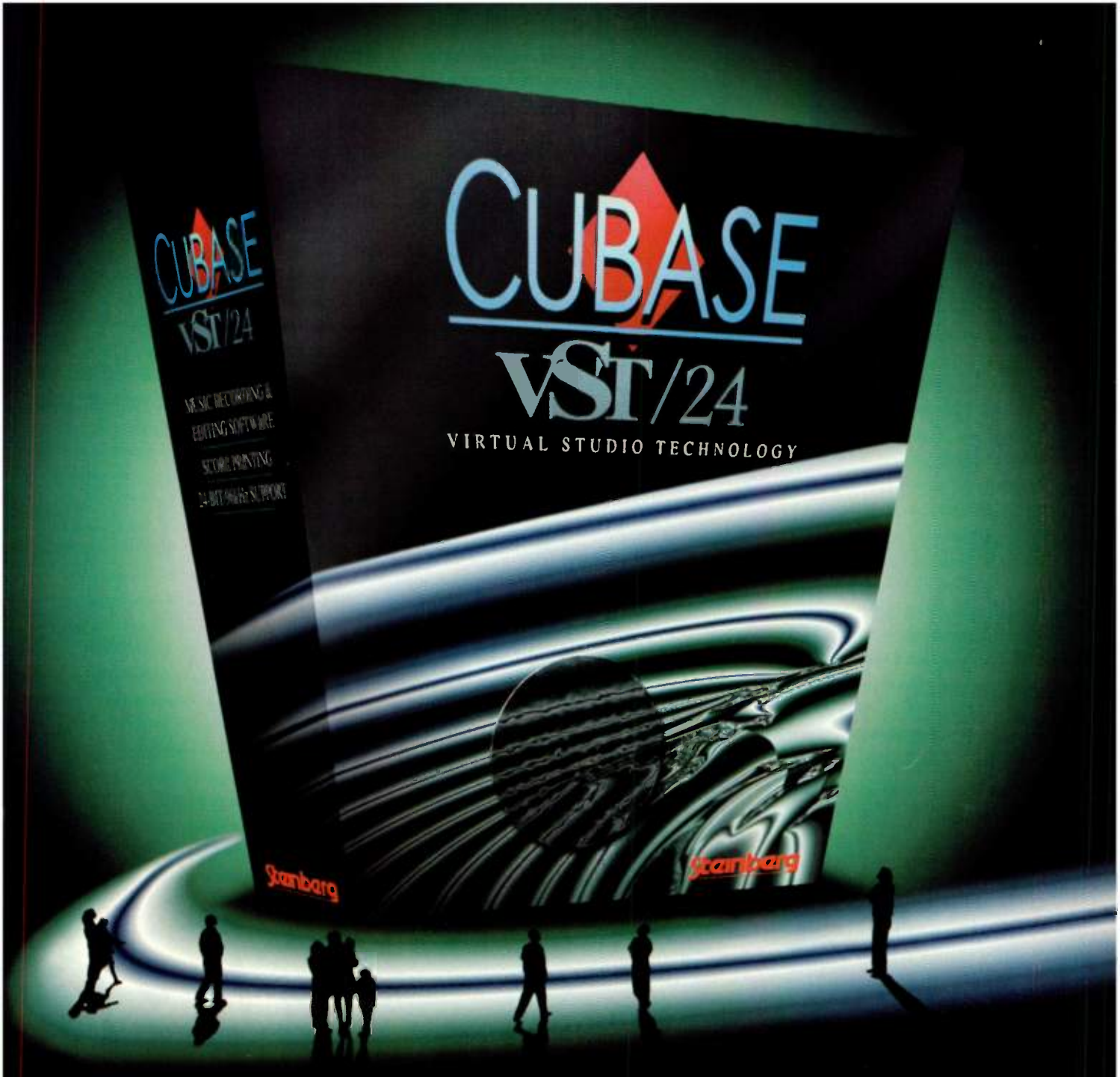
JOIN THE CHORUS

Have you had any recent articles on vocal effects? I need some advice on which effects the pros use for background vocals and how they use them. I've found some pleasing ones for lead vocals, but I have run into a brick wall trying to play with chorus.

Brian C. Sanders
briansanders@csi.com

Brian—Although we haven't run anything specifically on effects for harmony vocals, you might want to read "Recording Musician: Mixing Background Vocals" in our January 1997 issue, which discusses doubling, panning, and some effects-processing techniques. By the way, if you want a few more ideas for lead vocals, check out "Recording Musician: Classic Vocal Enhancements" (November 1997 issue). In that article, Brian Knave explains how to emulate famous vocal effects used on recordings of Patsy Cline, Elvis Presley, Jimi Hendrix, John Lennon, Otis Redding, Margo Timmins, and Robert Plant.—Steve O.

BOB DAHM



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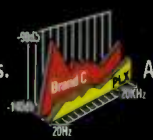
3002	1500	900	550

Our exclusive PowerWave™ Technology used in our PowerLight™ Series for chest pounding bass and crystal clear highs.  A hum-free noise floor of -108 dB (20Hz-20kHz) and ultra-low distortion of .03% THD.

An advanced thermal management system  for true 2-ohm performance. And not to mention QSC's 30 year reputation for reliability. They're called PLX. And at a low impact price, you'll definitely want to find a dealer near you. Call (800) 854-4079.

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AUDIO

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circle #507 on reader service card

NO XENA ALLOWED

Sorry guys and gals, but *JAM* is not making the grade. Editorial content is weak, weak, weak. It seems to have been dumbed down. Come on—how to wind a string around a post? "I would strap on my Xena outfit and set out to defend the honor of Clan Vocalista..."? Come to your senses: this is not *Guitar Player*. You don't have to pander!

Steve Klingaman
s.klingaman@aol.com

Steve—Thanks for your feedback. As you will discover, this month's issue of JAM *is much more "***EM***-like" than the June issue was. For a discussion of the changes we have made and our plans for* JAM*'s immediate future, see this month's "Opener" column on p. 78.—Steve O.*

EXPIRED PASSPORT?

Does anyone know what happened at (or to) Passport Designs? I attempted to reach its tech-support department regarding *Master Tracks Pro* 6.5.3, but my attempts have been in vain. Hopefully, Passport will resurface, even if under another name or entity.

Mike E. Dee
Palmatic Music
mikedee1@pipeline.com

Mike—According to published reports, Passport Designs has filed for bankruptcy under Chapter 7. That type of bankruptcy often leads to liquidation, but it is not clear what the outcome will be in this instance. Presumably, Passport's programs (such as Master Tracks Pro, Encore, Memphis, *and* MusicTime*) will be sold off eventually, but we have no solid information on this. All we know for sure is that, for now, the company is gone, and no support is being provided for its customers. —Steve O.*

EM ONLINE
http://www.emusician.com

The debate continues in eMusician.com's "Perspectives" forum. Last month, readers wrote in to share their views on whether fans' Web sites should pay royalties for posting short music clips.

Of course, there's also "The Biz," our online exploration of the music business, written by Taxi's Michael Laskow. Not to mention Karen Dere's "Re:Views" column, our monthly crop of CD reviews. And you can search for articles from past issues in our article archive. All this, and more, awaits your Web browser at **www.emusician.com.**

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

digidesign®

A division of Avid

Credits:

Garbage

Beck

Smashing Pumpkins

Nirvana

Sonic Youth

U2

"Pro Tools takes our music into the next dimension"

– Butch Vig

Butch Vig has a few ideas about turning Garbage into platinum.

"Garbage records a lot of garbage...loops, guitar effects, vocals, and noise... With Pro Tools, we track everything into the system...then go in and tweak it out. We use a lot of Plug-Ins like D-Fi, GRM Tools, and TC Tools. The flexibility of the automation allows us to be extremely creative. As we work up a song, we're processing and mixing all the time, because it's a lot easier to experiment than with an analog board or tape."

No rewinding. No take limits. No wasted time on session recall. No wonder creativity soars.

"Recording should be fun, and Pro Tools has brought back the excitement of working in a studio again. I can't really see us ever turning back."

For more information about Pro Tools and Third-Party Development products, call 1.800.333.2137 ext. 358 for a free Pro Tools video or to schedule a free demo.

www.digidesign.com
www.avid.com

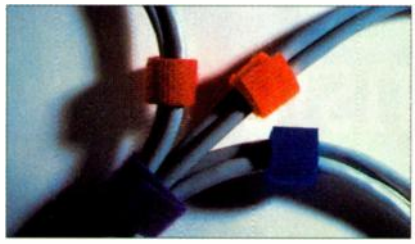
Butch Vig, Producer|Drummer
Garbage

Foreground Photo: ©1998 Stephane Sedat...
Background Photo: ©1997 Ellen Von Unwerth

circle #509 on reader service card

WHAT'S NEW

By Carolyn Engelmann and Rick Weldon



▲ RIP-TIE LITE AND WRAPSTRAP

It's fairly common to see personal studios and practice spaces in which cables are woven into a rubber fabric across the floor. Rip-Tie products can help rid your space of hazardous pratfalls and shorted cords and make your studio or music room a more comfortable place to get things done.

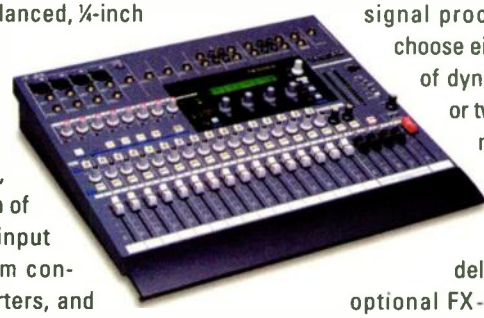
The new Rip-Tie WrapStrap and Rip-Tie Lite ($5.95 to $19.95) are light-duty versions of the company's CableWrap. The WrapStrap is a strip of double-sided hook-and-loop fastener that can be wrapped around several cables to form a bundle. The Rip-Tie Lite adds an eyelet so that you can loop the strip semipermanently around a single cable and attach it temporarily to other cables. The ScrewMount version comes with a metal fastener for attachment to walls, racks, and so on.

There are ten colors and seven sizes, and a flammability-rated version (black only) is available. The Rip-Tie Company; tel. (800) 348-7600 or (415) 543-0170; fax (415) 777-9868; e-mail mfennell@riptie.com; Web www.riptie.com/velcro.

Circle #401 on Reader Service Card

▼ TASCAM TM-D1000

TASCAM's TM-D1000 ($1,199) 4-bus, 16-channel digital mixer is aimed at users of the company's DA-series MDMs. The mixer has eight analog inputs and one 8-channel TDIF digital input. Four mic/line channels have balanced, XLR and balanced, ¼-inch inputs; 48V phantom power; and channel inserts. Four line channels have unbalanced, ¼-inch inputs. Each of the eight analog-input channels have trim controls, 20-bit converters, and three sweepable bands of EQ. All sixteen channels include solo and mute buttons, pan pots, and four group sends. There are two dedicated stereo returns. An optional interface card adds eight more channels of TDIF I/O, configured the same way as channels 1 to 8, and four channels of AES/EBU or S/PDIF I/O. A TDIF-to-ADAT optical converter is available for $349.



The main outputs are on balanced, ¼-inch connectors and use 20-bit DACs. You also get AES/EBU and S/PDIF digital I/O; balanced, ¼-inch monitor outs; a headphone out; and a footswitch jack. Settings are displayed on a 24-character by 2-line LCD, and levels are on two 12-segment LED meters.

The mixer has four channels of signal processing; you can choose either four channels of dynamics processing or two channels of dynamics processing and one stereo effect, such as reverb, chorus delay and flange. The optional FX-1000 board adds four more channels of processing.

You can store up to 128 scenes and recall them from the front panel or through MIDI, and most of the board's features can be dynamically automated by means of MIDI. The mixer also offers MMC for transport control of recording devices. Audio specifications were not available as of press time. TASCAM; tel. (213) 726-0303; fax (213) 727-7635; Web www.tascam.com.

Circle #402 on Reader Service Card

▼ OPCODE STUDIO 128X

Opcode's Studio 128X MIDI interface/patch bay ($429.95) provides eight independent MIDI Ins and Outs, for a total of 128 MIDI channels. Any channel or combination of channels can be routed to any output or group of outputs, and you can filter the datastream to remove selected data types. Filtering options can be set for each port, and the included Mac software can set filtering options by channel. Eight patchbay setups can be stored in nonvolatile memory and recalled from the front panel or from a computer.

The Studio 128X can be connected to PC or Mac serial ports and accessed via OMS. You can daisy-chain a printer, modem, or other device and access it with a Peripheral Thru switch. The unit has ¼-inch I/O jacks for LTC and reads and writes SMPTE at all major frame rates. It also routes MIDI Time Code, MIDI Clock, and MMC.

Studio 128Xs can be linked, and the unit can also be networked with an Opcode Studio 64 XTC or Studio 4 interface. Other features include a footswitch/trigger input and two extra pairs of In and Out jacks on the front panel for easy access. Opcode Systems; tel. (650) 856-3333; fax (650) 856-0777; e-mail info@opcode.com; Web www.opcode.com.

Circle #403 on Reader Service Card

KOBLO VIBRA9000

Koblo of Denmark has entered the market with its first product, a software synthesizer. *Vibra9000* ($350) is available now for Macintosh, with a Windows version expected soon.

Vibra9000 is a monophonic synth, but depending on your CPU power, you can run up to ten copies at once. The synth can be played in real time via MIDI. Every button and knob in the program's display sends MIDI controller data. You can save an unlimited number of patches.

You get two 32-bit, stereo digital oscillators, each of which can generate a ramp down, saw, square, sine, or random waveform. You can do amplitude and frequency modulation with Oscillator 2 as the modulator, detune the two oscillators away from each other by 0 to 100 cents, transpose by an octave or by ±12 semitones, set key track amount, and adjust the mix of the two oscillators.

A single 2-pole, 4-pole, or 2+2-pole filter can be applied, which can be comb, lowpass, highpass, or bandpass, with or without resonance. You also get three assignable ADSR envelope generators (EGs), which are high-resolution and adjust the volume on every sample point. All three EGs have adjustable velocity tracking.

There are two 32-bit LFOs, each of which can generate ramp up, ramp down, saw, square, sine, or random waveforms, with adjustable frequency (0 to 30 Hz) and a dedicated, 2-stage EG (attack and decay time). Six additional modulation sources can be used simultaneously, with up to three sent to the same destination. Modulators can even modulate other modulators.

Vibra9000's arpeggiator has six programmable parameters and can sync to MIDI Clock. The set of global parameters includes Main Volume, Main Tune, Pan, Portamento, Pitch Bend Range, and a panic button, and there's a level meter with a clip indicator. The synth's output can be recorded as a stereo SDII file.

The Mac version requires, at minimum, a Power Mac running OS 7.0 with 24 MB RAM. Windows requirements have not been announced yet. Koblo; tel. 45-7680-1040; fax 45-7680-1041; e-mail max@koblo.com; Web www.koblo.com.

Circle #404 on Reader Service Card

NOVATION SUPERNOVA

Intending to emulate analog technology but to surpass it in sound quality, Novation has created the Supernova. This polyphonic synth utilizes Novation's Analogue Sound Modelling technology, designed to produce smoother waveforms than typical digital oscillators. This is achieved with superfast processing and 24-bit, 128x oversampling DACs.

The Supernova is 8-part multitimbral and is available with 16-note polyphony, 512 programs, and 256 performances ($2,495) or with 32-note polyphony, 1,024 programs, and 512 performances ($3,299). The 16-voice model can be upgraded with a user-installable expansion board ($899) to match the 32-voice configuration in memory and polyphony.

The Supernova has three independent oscillators, a variable noise generator, and two ring modulators per voice. Each voice can be modulated by two LFOs and three envelopes, and the unit features a mod wheel that can simultaneously control 31 parameters. You get up to 56 effects at once (seven per part), including distortion, comb filter, chorus, delay, reverb, panning/tremolo, and EQ. The resonant filter, configurable in lowpass, highpass, and bandpass modes, has cutoff slopes of 12, 18, and 24 dB/octave.

The built-in arpeggiator has 386 patterns, some of which are programmable. Up to eight arpeggiators can be applied at once. The LFOs and arpeggiator can be synched to internal or MIDI Clock in different time signatures.

Each of the eight voices can be routed to any of eight ¼-inch outputs. The front panel on the 3-rackspace unit features 98 switches, 28 knobs (most of them dedicated), and a 2-line LED display. All knobs and switches transmit MIDI controllers and NRPNs. Novation USA; tel. (888) 782-3166; e-mail sales.novation@nova-uk.com; Web www.nova-uk.com.

Circle #405 on Reader Service Card

MIDIMAN AUDIO BUDDY

Midiman's Audio Buddy ($119.95) is a compact, 2-channel mic preamp that doubles as a direct-injection (DI) box and features phantom power. Each channel has a balanced, XLR input and an unbalanced, ¼-inch input, a gain pot, and LED indicators for signal level and clipping. A front-panel LED shows when phantom power is enabled. Outputs on the back are balanced/unbalanced, ¼-inch.

The Audio Buddy sports a frequency-response range of 5 Hz to 50 kHz. Maximum gain is +60 dB for mic signals and +40 dB for instrument signals. The steel casing is a mere 5½ inches wide and 3½ inches deep. Midiman; tel. (800) 969-6434 or (626) 445-2842; fax (626) 445-7564; e-mail info@midiman.net; Web www.midiman.net.

Circle #406 on Reader Service Card

CREATIVITY WITHOUT COMPROMISE

"BUT WHAT REALLY BLEW ME AWAY — UNQUESTIONABLY THE BIGGEST BARGAIN OF THE SHOW — WAS AKAI'S DPS12."

Mix Magazine
1997 AES Report

The concept seems so obvious. Combine a digital disk recorder and a digital mixer in one convenient box. Eliminate complex interfacing and keep everything in the digital domain. Add optional internal effects. **Creative heaven.** But **up until now,** buying anything that you could afford meant settling for almost enough tracks to record your music. Or a compressed data format that sounded almost as good as CD quality. Or a user interface that you could almost make sense of.

Now, finally, the concept of integrated digital recording and mixing lives up to its promise with Akai's DPS12 Digital Personal Studio. Designed for those unwilling to compromise their creative vision, the DPS12 combines a 12-track random-access digital recorder (with professional-quality uncompressed 16-bit sound and powerful non-linear editing) and a 20-channel MIDI-automatable digital mixer in one compact, incredibly easy-to-use package. All at a price that is nothing short of spectacular. It's **creativity without compromise.**

WRH

DPS12

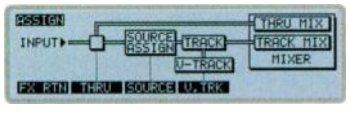
Since its founding in 1984, Akai Professional has consistently pushed the boundaries of affordable recording technology. From the original MG1212 12-track recorder/mixer, to the breakthrough A-DAM digital multitrack, to the DR4/8/16 professional disk recorders and the DD family of audio post-production tools, each Akai recording product has established new levels of performance and value.

Now, with the DPS12, Akai builds on this experience to bring professional-quality digital recording and mixing to the personal and project studio at a price that's truly unexpected. (Not to prolong the suspense, it's **$1499** msrp.)

More Is Better

At the heart of the DPS12 is a powerful random-access disk recorder capable of simultaneously playing 12 (that's **twelve**) tracks of uncompressed 16-bit linear audio from convenient removable JAZ cartridges or SCSI hard disks. More tracks for more recording flexibility. More control of individual parts. Less need for track bouncing.

And speaking of more tracks, the DPS12 also lets you record a whopping 250 virtual tracks. At mixdown, you can assign any virtual track to any of the twelve physical tracks for playback. This gives you the freedom to compare multiple takes, experiment with alternative arrangements, even combine parts of different virtual tracks on a single track.



At the front end, the DPS12 lets you record on up to 8 tracks simultaneously through six high-quality balanced analog inputs and a S/PDIF stereo digital input at sampling rates of 48kHz, 44.1kHz or 32kHz.

The Wait Is Over

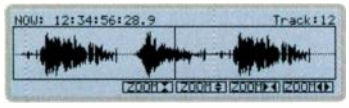
Since the DPS12 is a random-access recorder, waiting for tape to wind is a thing of the past. The DPS12's locating functions let you move instantly to any of 12 quick-locate points and 100 stack memory points. The stack points can even be named, so you can identify locations by the part of the song (FIRST VERSE, CHORUS, etc.) or even by specific lyrics.

An optional internal JAZ drive allows quick access to all your work.

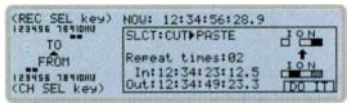
Easy Editing

Ever wonder how people managed to write anything before word processors? Well, after experiencing non-linear editing on the DPS12, you'll wonder the same thing about audio. Insert, Delete, Erase, Copy or Move sections of single- or multi-track audio from anywhere to anywhere within your project. This is stuff you just can't do with tape.

The DPS12's high-quality jogging and graphic waveform display let you zero in on your precise edit points.



Then call up an edit screen (complete with a graphic representation of your selected operation) and Do It.



Next, use the special Play To and Play From keys to confirm that seamless edit. Changed your mind? 256 levels of Undo are only a button press away.

Mix Master

The DPS12's digital mixer is a model of flexibility.

During mixdown, for example, the inputs can be used as an additional 8-channel Thru Mix, perfect for adding tracks from sequenced MIDI modules to the 12 recorded tracks for a true 20-channel mixdown. Two AUX sends and digital EQ are also included.

Found the perfect mix? Mix setups can be saved as snapshots and recalled at any time. And since all of the DPS12's faders and panpots generate MIDI controller data, you can record your mix moves into an external MIDI sequencer (like our MPC2000, for example) and play them back in sync with the DPS12 for a fully automated mixdown.

Effects Inside

If you want the added convenience of integrated internal effects (not to mention keeping your mix entirely in the digital domain), add the EB2M multi-effect processor board. The EB2M gives you two independent studio-quality effects processors with a wide variety of programmable effect types.

It Wants To Be Your Friend

It's one thing to give you all the tools you need to do the job, but it's another thing entirely to make them useable. Here, the DPS12 really shines. It is, quite simply, **really** easy to use.

At the heart of its friendliness is its informative graphic display. Backlit and easy to read, it always gives you a clear picture of what's going on with your DPS12. Frankly, it's all so simple that most of you may never have to take the manual out of the box.

Check It Out

There's a lot more to the DPS12 than we could fit in this ad, so head down to your local Akai Professional dealer for some quality hands-on time with a DPS12. And don't forget, that's

$1499.00 msrp.

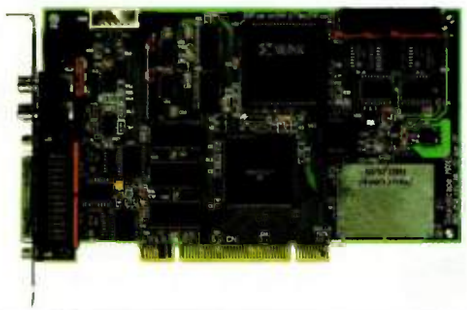
circle #510 on reader service card

AKAI professional

Akai Musical Instrument Corporation
4710 Mercantile Drive, Fort Worth, Texas 76137
[phone] 817 831 9203 [fax] 817 222 1490 www.akai.com/akaipro

SOUNDSCAPE MIXTREME

Soundscape's Mixtreme PCI card for Windows PCs ($550) provides sixteen channels of digital I/O via two 8-channel TDIF ports, making it easy to interface with TASCAM MDMs and TDIF-equipped digital mixers. The card is available with S/PDIF and word-clock I/O on RCA jacks for $700. Soundscape also offers an optional, 8-channel, TDIF-to-ADAT optical interface and a TDIF-to-analog interface that uses 20-bit A/D and D/A converters and unbalanced, RCA jacks. These interfaces are half-rackspace units and are available for $600 each.



The Mixtreme card comes with Soundscape's *V2 Mixer,* the same software used by the company's SSHDR-1 DAW. In addition to mixing and routing, *V2* includes a real-time plug-in architecture, and most of the plug-ins developed for the SSHDR-1 will work with Mixtreme, including those by TC Works, Wave Mechanics, and Soundscape. DSP power for these plug-ins comes from the card's Motorola 56301 chip.

Steinberg VST and Microsoft DirectX and Windows 95/NT multimedia drivers are planned, making the card compatible with most digital audio software. (Which drivers will be ready by ship date had not been determined as of this writing.) The card also has a full complement of MIDI ports. Soundscape Digital Technology; tel. (805) 658-7375; fax (805) 658-6395; e-mail ssus@west.net; Web www.soundscape-digital.com.

Circle #407 on Reader Service Card

PRESONUS VXP

All-in-one vocal processors are a hot item for the personal studio. The latest entry in this field is PreSonus's VXP Dynamic Voice Processor ($499), which packs a microphone preamplifier, compressor, expander, de-esser, and 4-band EQ into a single rackspace. The compressor, de-esser, and EQ sections can be individually bypassed.

The VXP processor has a Neutrik balanced, ¼-inch/XLR combo input jack for mic or instrument-level signals. Balanced, XLR and unbalanced, ¼-inch outputs are provided. An output-level control ranges from off to 10 dB gain, with a maximum output level of 28 dBu.

The Class A discrete mic pre features a Jensen twin-servo amplifier. It offers up to 60 dB of gain and features switchable phantom power and a 20 dB pad. The compressor offers eight preset curves tailored for vocals, and the expander has an adjustable threshold from off to +20 dB.

Both the compressor and expander sections have automatic attack and release times. Six-segment LED meters display input and output level and compressor makeup gain.

Next in line is the de-esser section, which gives you threshold and frequency controls. The 4-band EQ has low and high shelving bands and two semiparametric mids with frequency ranges of 100 to 700 Hz and 0.5 to 6 kHz. The mids have switches for wide or narrow bandwidth. All four EQ bands offer 12 dB cut or boost. There's also a switchable high-pass filter set at 80 Hz.

The unit has an internal power supply with an international voltage switch. The manufacturer rates the VXP's THD at <0.005%, signal-to-noise ratio at >96 dB, and frequency response at 20 Hz to 40 kHz (±0.5 dB). PreSonus Audio Electronics; tel. (800) 750-0323 or (504) 344-7887; fax (504) 344-8881; e-mail presonus@presonus.com; Web www.presonus.com.

Circle #408 on Reader Service Card

FOSTEX COP-2

The fiber optics used to carry S/PDIF and ADAT optical signals do not allow for long cable runs (the longest cable Alesis offers is five meters), but balanced, XLR cables are much more robust. That's why Fostex created the COP-2 ($438/pair), which can convert optical S/PDIF or ADAT signals to electrical signals on balanced XLR connectors.

The signal can then be routed through XLR cables to a second COP-2, which converts it back to optical format. A mode switch sets the unit to work with S/PDIF or ADAT signals. All eight channels of the ADAT signal are transmitted.

Using the system under ideal conditions, Fostex claims to have set up a successful connection between two of the company's D-90 hard-disk recorders located 320 feet apart. Fostex Corporation of America; tel. (562) 921-1112; fax (562) 802-1964; e-mail info@fostex.com; Web www.fostex.com.

Circle #409 on Reader Service Card

Twice the audio tracks. Half the price.

Introducing Cakewalk Metro 4 for the Mac, the new leader in professional MIDI and digital audio software for project studios.

The new Metro 4 provides up to 64 tracks of stereo digital audio recording and editing – twice as many as other brands. You get real-time audio effects processing, support for third-party Adobe Premiere and VST audio plug-ins, plus powerful multi-track MIDI sequencing. All for a price half that of competing products.

So if you want to produce more for less, put Cakewalk Metro 4 to work in your project studio today. Now available at music and computer stores worldwide.

For more information visit www.cakewalk.com or call 888.CAKEWALK.

Less than $200
(estimated street price)

Feature Highlights:

- Record and edit up to 64 tracks of audio along with MIDI
- Real-time audio effects processing
- Support for third-party plug-ins
- Professional MIDI recording and editing
- Unique MIDI compositional tools
- SMPTE/MTC support for film and video
- Import & export audio for QuickTime movies
- Supports optional Korg 1212I/O, Digidesign AudioMedia III, and Sonorus STUDI/O cards

BONUS

Includes BIAS SFX Machine Lite multi-effects audio plug-in. Comes with 20 unique special effects presets like Pitch-Shifting, Sitar Drone, and Swept Bandpass.

cakewalk

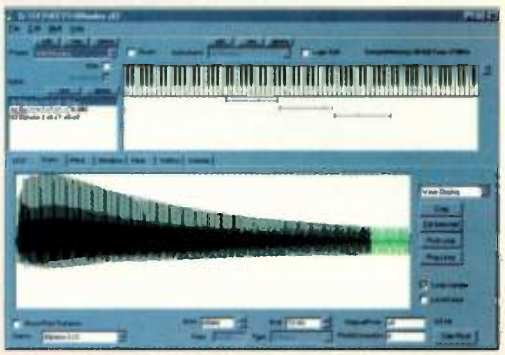
circle #511 on reader service card

SOUND ADVICE ▲ ▲ ▲ ▲

▼ TIME SIGNATURE

You get a veritable sonic tool chest with the new *Wavelt Gold* CD-ROM (Win; $99) from Time Signature. The package, made for use with AWE-32 or AWE-64 sound cards, includes a sound library, sound editor, and sequencer.

The sounds that come with *Wavelt Gold* are offered in SoundFont format. Three hundred sampled instruments are represented, from bass and woodwinds to synth pads, in addition to drum kits and a selection of programmed patches, for a total of over 1,000 available voices. Sound-file memory size ranges from 512 KB to 4 MB.



You can create your own patches or tweak the ones you have with *Wien*, *Wavelt Gold*'s SoundFont editor. *Wien* provides standard synth parameters (modulation, envelope, cutoff, etc.) and quite a few automated tasks, such as Auto Tune and Auto Keymapping.

Wavelt Gold also comes with a fully functional version of Emagic's *Micro-Logic Fun* sequencer program. *Micro-Logic Fun* gives you 960 ppqn MIDI resolution, an array of real-time MIDI parameter controllers, and lots of editing tools, as well as notation and printing capabilities.

Wavelt requires at least an 80486/66 PC with 16 MB RAM and an AWE-32 or AWE-64 sound card with 4 MB RAM. E-mu Systems (distributor); tel. (408) 438-1921; fax (408) 438-8612; e-mail info@emu.com; Web www.timesignature.com.

Circle #410 on Reader Service Card

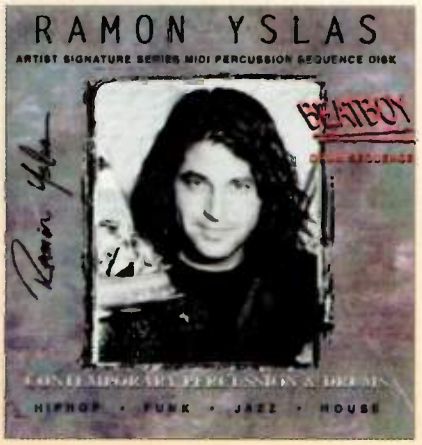
▼ BEATBOY

Beatboy has presented a new collection of MIDI files featuring percussion tracks performed by Ramon Yslas. Part of Beatboy's Artist Signature Series, *Contemporary Percussion & Drums* (Mac/Win; $69.95) consists of sequence files in the form of complete songs rather than isolated beat patterns, which gave the artist the opportunity to perform his grooves with fluidity and emotion.

Yslas, an accomplished recording and performing artist, recorded twenty songs, from 40 to 98 bars in length each, in several time signatures and in styles ranging from samba to trip-hop. Each song contains six to twelve parts (verse, bridge, chorus, etc.) featuring multiple percussion instruments in each sub-sequence. Instrument sets are programmed for General MIDI and Yamaha XG formats, and the sets include a variety of percussion instruments, such as triangle and timbale.

All sequences are editable Standard MIDI Files. The accompanying booklet includes detailed track sheets for all songs. Beatboy; tel. (800) 838-BEAT or (717) 685-1338; fax (717) 685-1573; e-mail beatboytec@aol.com; Web www.beatboy.com.

Circle #411 on Reader Service Card



▲ VAMTECH

Easy access to "real feel" rhythm is the name of the game with *Drumtrax* 3.0 (Mac/Win; $99.95), the new version of Vamtech's drum library. This comprehensive collection of Standard MIDI Files contains more than 25,000 measures of drum and percussion grooves.

The unquantized *Drumtrax* grooves are recorded by real drummers in fourteen style categories, including blues, Latin, hip-hop, country, and soft rock. The CD-ROM contains four complete libraries with files saved in various Standard MIDI formats, so the collection is compatible with any sequencing program or keyboard workstation.

In addition to the MIDI files, the package includes the *Drumtrax Librarian*. This database keeps MIDI files organized and offers a search function. The list screen shows the file name, description, and meter of each entry, with a field for user comments. You can look up a *Drumtrax* MIDI file in the *Librarian* and, with a mouse click, launch it in your MIDI sequencing program.

Drumtrax 3.0 requires Windows 95 or Mac OS 7.1 or later and at least 8 MB RAM. Vamtech Enterprises; tel. (800) 435-1889 or (978) 977-0570; fax (978) 977-0809; e-mail info@drumtrax.com; Web www.drumtrax.com.

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Alesis signal processing

A Different Slant on Reverb

As a new sports car beckons you to the open road, the Wedge's totally unique desktop design makes creating great reverb a breeze. It's the first reverb that's fun to drive.

Just push the Wedge's edit button and start adjusting your reverb with the four edit sliders. It's easy to get creative with the Wedge's powerful parameters like decay, frequency damping, swirl, early reflection room shape, width, density and diffusion.

For as long as effects processors have been bolted into racks, customizing your reverb sound has been about as much fun as setting the time on a digital watch. But the Alesis Wedge™ offers an ingenious new angle to the way you approach reverb and ambient effects.

Unlike racked effects, the Wedge is a dedicated Desktop Master Reverb, cleverly designed to be used on or near a mixing console where you do your most critical listening... in the sweet spot of your mix. And with four edit sliders to access several effects parameters at once, you'll find yourself tweaking aspects of your sound you would never dream of editing in a rackmount box. Result: more inspiration for recording and mixing, and less limitation on your creativity.

There's more to the Wedge than its great design, like all-new algorithms that represent the finest, most detailed, best-sounding reverb you've ever heard, especially in an affordable processor. Don't limit yourself to the rack; instead, think differently and try out a new slant on reverb. The Wedge. At your Alesis Dealer now.

Instead of using a snare drum to set up your reverb, the Wedge offers the innovative Impulse Audition™ feature, which sends a full bandwidth audio signal to help you get flawless reverb for every application.

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DESKTOP MASTER REVERB W/IMPULSE AUDITION

If you're on the net, check out the special Wedge page with audio files at www.alesis.com/wedge.
For more information on the Wedge Desktop Master Reverb, see your Authorized Alesis Dealer or call 800-5-ALESIS.

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ALESIS

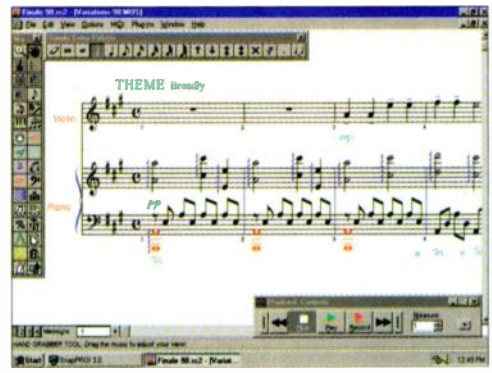
circle #512 on reader service card

KEY CHANGES

Soundelux products will no longer be distributed by Group One, Ltd. Customers may now order directly through local dealers. Consequently, prices for the company's U95 tube mic and U195 FET mic have been reduced to $1,995 and $995, respectively...**AKG** has announced another round of price reductions. The AKG C 480B mic will now have a retail price of $590 (was $819), and reduced Blue Line products include the C 391B combination system (was $692, now $554) and CK 91, CK 92, and CK 93 capsules (were $286 each, now $228 each). The SE 300B preamp is now $326 (was $408)...**dissidents** has announced the release of *Sample Wrench* 4.1 ($259) for Windows 95 and NT. Among the new features are redesigned menus, a Grunge processing algorithm, and a revised macro language. Users of version 4.0 can upgrade to the new version for $20...**Minnetonka** has added a Phase Flip feature to version 1.5 of the company's *MxTrax* software. The new feature is designed to correct phase problems when performing digital transfers from original Alesis ADATs to ADAT-XTs...**Waves** is shipping EasyWaves ($150), an entry-level plug-in bundle for Mac (Adobe Premiere format) and PC (DirectX format) that includes Waves' *AudioTrack* and *EZVerb* plug-ins...Roger Linn, famous for his Linn drum and Akai MPC products, has joined forces with Dave Smith, founder of Sequential Circuits and Seer Systems. Together, they have formed **Rave and Dodger** with the intention of producing innovative software applications for the PC... **Gibson Musical Instruments** has acquired Opcode Systems. The companies state that the merger will provide for better R&D and faster delivery of Opcode products in the future.

—Rick Weldon

CODA FINALE 98



Coda Music Technology has upgraded its notation program and is now offering *Finale 98* ($545), which has many new features. The new version allows multiple levels of undo, even after you have saved your document, with the number of levels limited only by your hard-drive space. Scores can now be printed in color, so different parts or markings can be made to stand out. The layout creates neater notation of close intervals (e.g., seconds and unisons) between layers, as well as other configurations that previously caused cluttered, hard-to-read staves.

Quantization algorithms have been improved to assist intelligible entry of music, whether played in real time or imported as MIDI files. Settings for quantization control are more accessible, including a function for minimizing rests and new options for grace notes.

Eighteen new plug-ins are included to streamline editing and formatting. Among these are Staff Setup (automatically sets up a score with staves for the instruments you select), Rhythmic Subdivisions (divides selected notes by a user-specified value to save time on repetitious note entry), and Automatic Barlines (in one step, adds double barlines in all appropriate places).

Available now for Mac OS 7.0 or higher and Windows 95/98, *Finale 98* will soon be available for Windows NT, as well. Eight MB of RAM are required. Coda Music Technology; tel. (800) 843-2066 or (612) 937-9611; fax (612) 937-9760; e-mail finalesales@codamusic.com; Web www.codamusic.com.

Circle #413 on Reader Service Card

KEYFAX PHAT.BOY

As excited as electronic musicians become over smaller chassis and sleeker designs for their instruments, they still love the tactile experience of a user interface stocked with real knobs and buttons. Keyfax's first hardware device, the Phat.Boy MIDI performance controller ($249), is designed to act as a physical interface for Roland GS– and Yamaha XG–compatible synth modules and Creative Labs' Sound Blaster AWE sound cards, allowing users of these devices to tweak the most common performance parameters in real time.

There are thirteen knobs for changing filter cutoff and resonance; vibrato depth, rate, and delay; reverb level; chorus amount; envelope attack, decay, sustain, and release; portamento; pan; and volume. A detented knob is included for choosing the MIDI channel you wish to modify, and a Snapshot/Reset button sends all current parameter values to the MIDI Out or resets the current patch to its default values. A 3-mode switch configures the unit for use with GS- and XG-compatible devices, an AWE card, or MIDI devices that can create their own continuous-controller assignments, such as E-mu samplers or Steinberg's *ReBirth RB-338.*

MIDI In and Out ports are on the rear panel, and the unit is powered by an included 9 VDC adapter. Keyfax sells Phat.Boy with a disk containing "MIDI samples" (short single-track sequences) from the company's Twiddly Bits product line and 16-bar Phat.Jams, all saved as Standard MIDI Files. Keyfax Software; tel. (800) 752-2780 or (408) 460-0172; fax (408) 460-0173; e-mail julian@keyfax.com.

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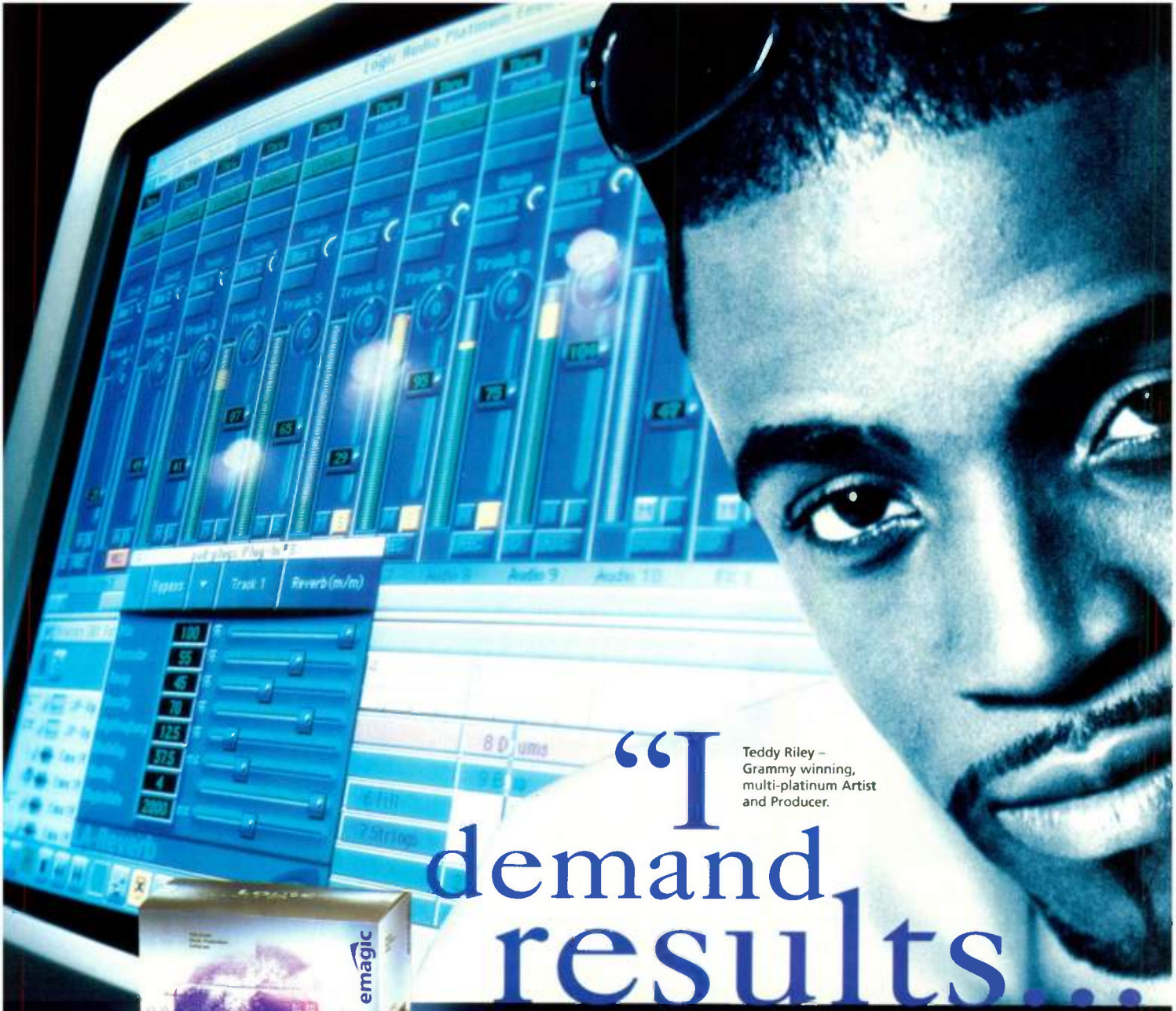

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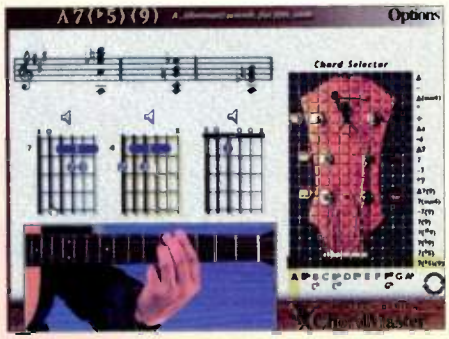
GET SMART ▲ ▲ ▲ ▲

▼ ZENTECH

Learn new chords on your guitar, find alternative positions for the chords you know, and consult a guitar-chord sample library with *Zentech Chordmaster* (Mac/Win; $29.99) from Zentech Design. This interactive CD-ROM guitar-chord dictionary includes hundreds of common and uncommon chords. Each chord is shown in three different positions and is displayed in three ways: as standard notation, fingering diagrams, and color



photographs of finger placement, all of which can be printed. In addition to the visual display, each chord has an audio representation in the form of a 16-bit, 22 kHz AIFF or WAV file. You can hear the chord strummed and as an arpeggio.

Zentech Chordmaster is intended for use not only by beginning guitarists and teachers but also by songwriters, arrangers, and MIDI enthusiasts. The Chord Selector Grid allows you to quickly view, play back, and print out chords. Audio files can be exported for use with digital audio workstations and MIDI systems.

The Macintosh version requires at least Mac OS 7.0, 4 MB RAM, and a 4x CD drive. Minimum requirements for PC are an 80486 CPU, Windows 3.1 with 8 MB RAM or Windows 95 with 16 MB RAM, a 16-bit sound card, and a 4x CD drive. Future Sales, Inc. (distributor); tel. (425) 788-0766; fax (425) 788-4563; e-mail future@halcyon.com; Web www.zentech-chordmaster.com.

Circle #415 on Reader Service Card

▼ RISING SOFTWARE

Rising Software's *Auralia* 2 ear-training course (Win; $149 single-user; $995 multiple-user) offers aural exercises and drills with instant grading and feedback. Twenty-six topics are included, grouped under four categories: Intervals and Scales, Rhythm, Pitch and Melody, and Chords. You can select and combine content from any of the 26 subject areas to create customized tests.

Version 2 adds Sound2MIDI technology, which enables the program to respond to audio input. With a mic plugged into your sound card, you can sing an interval, arpeggio, or chord, and *Auralia* will grade your accuracy.

The program includes a built-in database so you can record test results for yourself or your students. (This database can also be shared with Rising Software's *Musition* music theory training program.) Data can be printed in 26 preconfigured report formats.

Auralia 2 minimum requirements are Windows 95 or NT and 16 MB RAM.

Thinkware (distributor); tel. (800) 369-6191 or (415) 777-9876; fax (415) 777-2972; e-mail sales@thinkware.com; Web www.risingsoftware.com.

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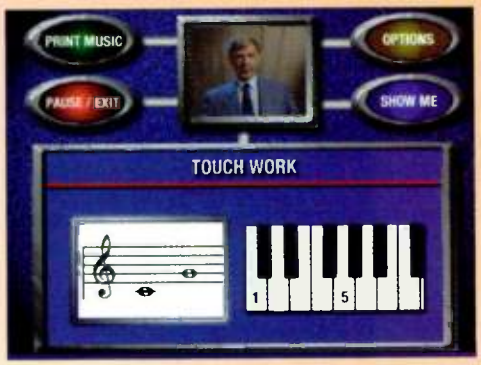

▲ RENARCO

Music Dynamics sight-reading system (Mac/Win; $249), a new instructional videotape and CD-ROM from Renarco, focuses on sight-reading skills. The course is taught by pianist, recording artist, composer, and arranger Paul Renard, who developed the techniques and methods employed in *Music Dynamics* from his own experience in learning to sight read.

For beginners, Renard's course includes training in fundamental music theory and basic notation-reading skills. Musicians who already read music may benefit from the portions of the course designed to eradicate bad reading and playing habits and enhance sight-reading ability.

The course is intended for use with a MIDI-compatible keyboard (not included), enabling you to go through most of the learning process with hands-on practice at the keys. Included on the CD-ROM is a printable library of music at graduated levels of difficulty. The program can track the progress of multiple users and will give feedback and suggestions based on their performance.

The *Music Dynamics* sight-reading system requires Windows 95 or Mac OS 7.0 or higher and 8 MB of RAM. Windows users must also have a sound card. Renarco; tel. (800) 549-7323; e-mail info@sightreading.com; Web www.sightreading.com. ●

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KORG

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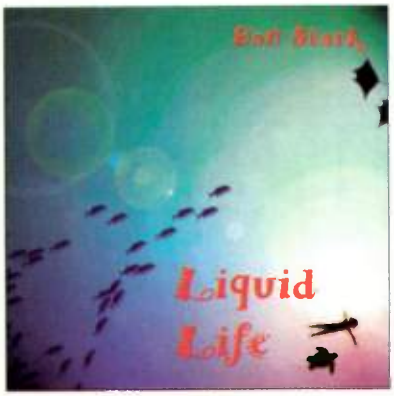
PRO FILE



Water World

Dan Stark drinks up a liquid life.

By Diane Lowery

In 1928, the great bluesman Tommy Johnson sang the "Cool Drink of Water Blues." As his eerie falsetto trilled out the lyrics, the visual image he created had his listeners fishing through the icebox for liquid refreshment. Seventy years later, engineer–multi-instrumentalist Dan Stark again conjures up watery thoughts with *Liquid Life*, a collection of electronic new-age instrumentals.

It would be nice to report that Stark dangled off high cliffs to record ocean sounds or swam with whales to capture their voices, but he actually created most of the sounds at his Kite Bros. Studio using a combination of acoustic samples and electronic instruments. Finding the right acoustic "instruments" to produce the samples was a big part of the recording process.

For example, on the peaceful mood piece "Change of Seasons," Stark created beautiful, swirling bell tones using stainless steel bowls filled with water and struck with a wooden mallet. On the soothing "Whale Song," Stark had originally intended to use whale sounds from a relaxation tape. However, the tape's producer wouldn't give him permission to use them.

"I had to re-create those sounds by sampling all kinds of crazy things—from garbage trucks to a dentist's drill to this Hawaiian flute-like instrument made out of black bamboo, called a zaphoon," he explains.

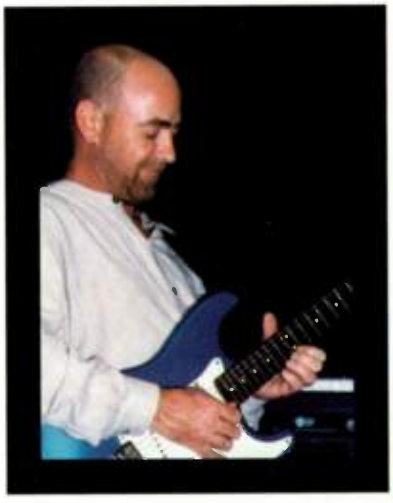
To produce electronic samples, Stark used an E-mu ESI-32. His favorite piece of gear to work with, however, was the Akai MPC-60 sequencer/drum machine. "On 'Reservoir,' I used a bell sound as the main groove," says Stark. "That was a Yamaha DX7 marimba patch I assigned to the pressure-sensitive pads on the MPC. I played that groove by hitting the pads—as opposed to poking keys on a keyboard—which created a more expressive rhythm."

Once samples were created, Stark imported them into Sonic Foundry's *Sound Forge* and used the company's *Acoustics Modeler* plug-in to create artificial ambient spaces (via impulse files). For example, on "Reservoir," instead of using a cathedral reverb from an effects processor, Stark used his wife's voice as the "cathedral" and then blended it with a tone from an old Casio CZ-101 synth. He then put that sound into the ESI-32 and processed it with the Doppler effect, creating an otherworldly touch.

The biggest challenge Stark faced was having the music retain an organic feel even though it was recorded with electronic instruments. To do this, Stark applied some basic tricks. "We didn't do any practice runs, which added a lot of spontaneity to the tracks," he explains. "If I used a sequencer, I tried not to quantize. If I did quantize a track, I would go over it with another track that wasn't quantized, such as drum fills. Overlaying the electronic instruments with acoustic instruments helped a lot, too."

Liquid Life has recurring themes, much like a symphony, which helps maintain an organic feel. "I would take a melody from one song and use it three songs later in a different key, with a different instrument. Or I would use the same instrument, like the water bowls, and play different melodies. Hopefully, by the end of the disc, you feel like it's an old friend."

For more information, contact Kite Bros. Music; tel. (703) 451-2935; fax (703) 451-8538; e-mail kitebros@aol.com.



Dan Stark

TECH PAGE

Whatever Floats Your Boat

Floating-point processing could be the new frontier.

By Scott Wilkinson

We've been hearing a lot lately about high sample rates and bit resolutions for digital audio; the most commonly discussed specs for the next generation of digital recording and storage devices are 96 kHz and 24 bits. But there is another aspect of digital audio that has enjoyed much less attention. Binary numbers can be stored and processed in one of two formats: *fixed point* and *floating point*.

Most of us are familiar with fixed-point representation. Each sample consists of a number of bits that represent a range of integer values. For example, a 16-bit word can represent values from 0 to 65,535. This is called fixed-point representation because the decimal point is always at the right end of the number. Each bit adds 6 dB of dynamic range to fixed-point samples; for example, a 24-bit system has a theoretical dynamic range of 144 dB.

When fixed-point numbers are processed (for example, attenuated, mixed, reverbed, boosted, and so on), the processor calculates and stores the intermediate results with greater resolution than the original or final signal because this form of mathematical processing often takes the numbers out of the original or final range. Before the signal makes its way out of the device, it is reduced to the proper resolution.

In floating-point processing, each sample is divided into two sections that represent different parts of an exponential expression (see **Fig. 1**). Specifically, each number can be expressed in the following form:

$$\text{mantissa} \times 2^{\text{exponent}}$$

In a 32-bit, floating-point number, 24 bits are used to represent the mantissa and 8 bits are used to represent the exponent.

Fixed-point processing is common in audio, but it has a well-known problem. As the audio level decreases, fewer and fewer bits are used to represent the signal, which makes the digital representation very inaccurate. The result is harsh-sounding reverb tails and fade-outs.

The floating-point structure allows a reasonable number of bits to represent a much wider range of values, because the mantissa's 144 dB of dynamic range is shifted up and down by the value of the exponent. As the signal level decreases, so does the exponent, allowing most or all of the mantissa's 24 bits to continue representing the signal. This is equivalent to a decimal number in which the decimal point can move to different locations within the number as the amplitude changes. In other words, the decimal point "floats" around; hence the name "floating point."

This type of processing can result in much more accurate digital signals at all amplitudes, and it provides a dynamic range of as much as 1,500 dB, which effectively eliminates any concern about clipping, as well. This approach is so promising that a number of companies, including Cakewalk Music Software, SEK'D, and DSP/FX (formerly Power Technology), are starting to use floating-point processing in their products.

However, not all digital audio design engineers agree that floating-point processing is better for digital audio. Michael Story, an engineer for the British digital audio company dCS, contends that errors in floating-point processing are proportional to the largest number used in the calculations. This can raise the quantization noise above the constant level of fixed-point errors, which are below any analog noise in the signal when using 24 bits. In addition, it takes much more silicon area on a chip to implement floating-point DSP, which translates into greater cost for hardware products.

Floating-point processing could become increasingly significant for digital audio as the cost of DSP hardware decreases and the speed and processing power increases. Only time will tell whether this technology can become an important aspect of digital audio, and it should be interesting to watch its progress in the digital audio marketplace. ❀

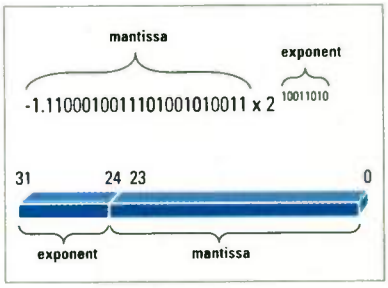


FIG. 1: Floating-point representation divides a binary number into two parts, the mantissa and the exponent.

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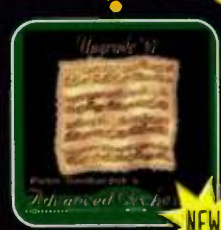

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To find the answer to this question, I field-tested and compared Frontier Design Group's Zulu ($598); Lucid Technology's ADA1000 ($599); Midiman's Flying Cow ($400), Flying Calf A/D ($200), and Flying Calf D/A ($150); and Zefiro Acoustics' InBox ($295). (Note that I did not perform bench tests; only field tests.) These units differ in size, shape, and connections, but all perform similarly to their pricier counterparts to provide improved audio through digital I/Os. They can improve the performance of older 16-bit gear and open the doors to software programs that support 20-bit formats.

Doing Your Bit

Before getting down and dirty with these converters, let's start with some basic concepts. There are three stages in the digital recording and playback process where bit resolution comes into play: input, output, and internal storage. Until recently, the standard resolution for all three stages has been sixteen bits. There have been a few deviations from this standard, but for the most part, 16-bit architecture has reigned supreme for the past five years.

You can use a 20-bit analog-to-digital (A/D) converter as the input stage to a 16-bit recording device, which increases the input resolution but not the storage resolution. If the signal is stored with sixteen bits of resolution, it's still a 16-bit recording, even if the input is 20-bit. The question then becomes "If the signal is stored at 16-bit resolution, what makes a 20-bit converter sound better than a 16-bit converter?"

The answer lies in the converter's *dynamic range*, which is the difference in decibels (dB) between the noise floor of an audio device and the highest undistorted level that device can handle. A 20-bit converter has more dynamic range than a 16-bit converter because of its higher resolution.

The increased dynamic range of a 20-bit A/D converter can be preserved to some extent when the signal is stored with 16-bit resolution through a process called *dithering* (see "Square One: Dithering Heights" in the December 1996 **EM**). Even if a 20-bit signal is truncated to sixteen bits by simply ignoring the four least-significant bits, the quality of the signal is generally better than if the original audio had been converted to 16-bit resolution to begin with. In this case, the cut-off bits represent mostly noise, so the inherent noise floor of a 16-bit truncated signal is lower than the floor of one that had been converted to a 16-bit signal in the first place.

▼ The Zulu and ADA1000 are clean and transparent.

At the other end of the signal chain, a 20-bit digital-to-analog (D/A) converter might not improve the sound of audio stored at 16-bit resolution because it can't create information that isn't in the stored signal. However, not all converters are created equal; some are simply sweeter or more musical sounding. Without mentioning names, most people will agree that some 16-bit devices used today have some pretty brittle-sounding converters. These units can benefit from better-sounding, external D/A converters, which might perform better in terms of noise floor, linearity, or distortion.

Two of a Kind

The Lucid ADA1000 is a 1U rackmount device that performs both A/D and D/A duties. It has two independent input channels that can be linked for stereo operation, which is a wonderful feature that lets you accommodate either mono or stereo sources. Each input channel has an associated level-control knob, an LED that indicates the presence of an analog input signal of -40 dB or greater, and a 7-segment LED meter (including a peak indicator). You can choose a sample rate of 48, 44.1, or 32 kHz, or you can lock the unit's sample rate to an incoming clock source. Another LED indicates a valid digital input signal. The ADA1000 has no power switch, but it does have a power-indicator light.

The ADA1000 accepts AES/EBU signals via XLR connectors or S/PDIF signals via RCA jacks. These connectors are on the rear panel, along with a button that selects the format. This button is inconveniently located if you have the unit rack-mounted and need to change formats regularly; I would have preferred it on the unit's front panel.

With a digital input, a signal is present at both output jacks simultaneously, letting the unit double as a digital audio splitter. Analog connections include balanced, XLR and unbalanced, ¼-inch inputs and outputs. Power is supplied by a proprietary, lump-in-the-line AC adapter.

Midiman's Flying Cow is radically different in appearance from the ADA1000, but it's identical in function. The Flying Cow is a ½-rack unit with a textured, gray finish, and it has a beautifully screened flying cow on its face and top. You might wonder what a flying cow has to do with a 20-bit converter. I prodded Midiman for an explanation, but they just mooed something about wanting to be different and kept on grazing.

The Flying Cow is a stereo unit with a single input-level knob on its front panel. The left and right input meters comprise six LEDs each, including a clip LED. A Mode Select button is used for toggling between AES/EBU and S/PDIF and selecting a sample rate: 48 kHz, 44.1 kHz, 32 kHz, or an external clock source. A series of LEDs indicates the Cow's current mode (e.g., AES/EBU at 48 kHz, S/PDIF at 44.1 kHz, etc.). But with only one button

Lucid Technology's ADA1000 provides two independent input channels that can be linked for stereo operation.

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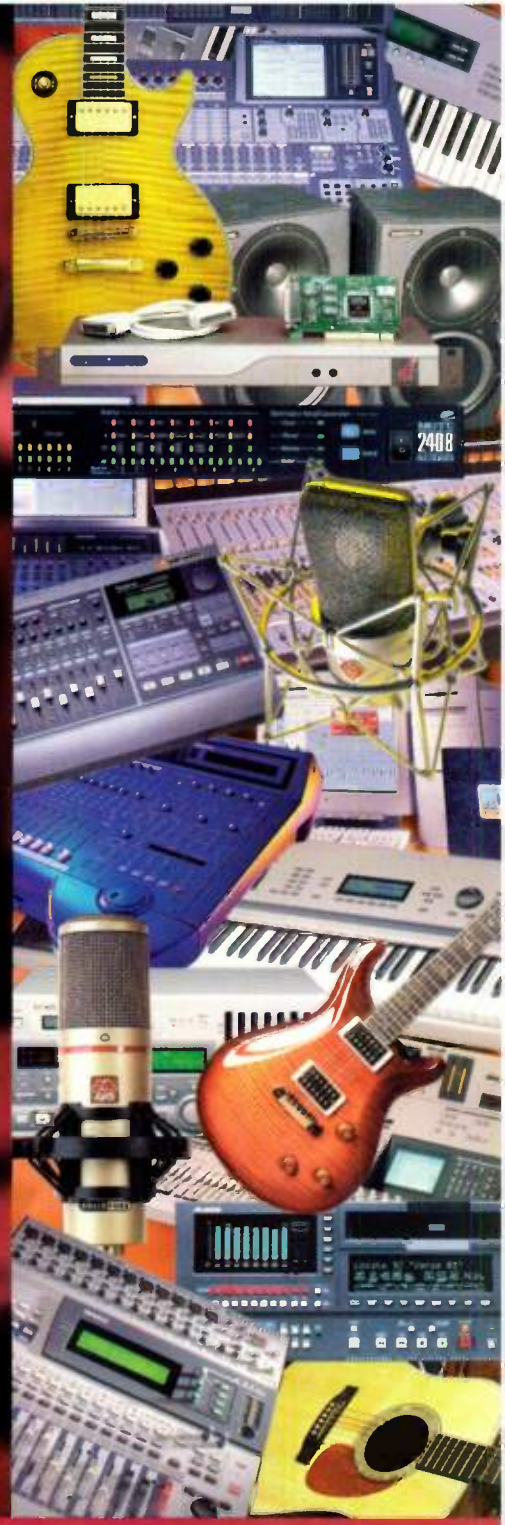

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The Midiman Flying Cow's analog inputs and outputs use those nifty Neutrik connectors that accept both XLR and ¼-inch jacks.

for selecting formats and sample rates, you're forced to step through several combinations before reaching the one you want. The unit remembers the last mode it was in, but employing separate clock- and format-select buttons would have made moving between modes much quicker.

The rear panel is equipped with standard AES/EBU and S/PDIF connections. The analog ins and outs are those nifty Neutrik connectors that accept both XLR and ¼-inch jacks. All analog connections are balanced; the inputs also accept unbalanced signals. I love these connectors, but be forewarned: they're all female. This means the standard rule of "inputs are female and outputs are male" doesn't apply. The Cow is powered by a 9 VAC wall wart.

New Frontiers

Frontier Design Group's Zulu is based on Alesis's proprietary ADAT Optical digital audio interface (commonly called the Lightpipe), which carries up to eight channels of information simultaneously on a fiber-optic cable. Unlike the other converters discussed here, the Zulu's intended market is primarily Lightpipe-equipped multichannel digital audio cards. The Lightpipe is quickly becoming a de facto standard and can be found on all sorts of equipment, including MDMs, DAWs, effects processors, synths, and sound cards.

As a result of Frontier's marketing goals, the Zulu's only digital connection is Lightpipe; in fact, it's the only converter in this group with multichannel (i.e., greater than stereo) capabilities. If you want to use it with AES/EBU or S/PDIF equipment, you must use a product that has both Lightpipe and S/PDIF or AES/EBU ports. (Examples include Alesis's AI-1 converter, the new Yamaha and Panasonic digital mixers, and the Frontier WaveCenter, Sonorus StudI/O, and Korg SoundLink 1212 I/O computer audio cards.) In fact, Zulu derives both its input (A/D) and output (D/A) sampling clocks from the ADAT Lightpipe datastream, so you must send it a Lightpipe signal at all times. Even the analog I/O relies on the ADAT clock.

The Zulu is a ½-rack unit. As with many such devices, two Zulus fit side by side on a standard rack shelf (e.g., Middle Atlantic Products' U1). It has four analog inputs and eight analog outputs on the rear panel. All jacks are ¼-inch unbalanced; balanced connectors would have been more professional. (Frontier's Tango provides eight channels of balanced analog I/O in addition to Lightpipe for $898.) Power is supplied by a wall wart, and the unit does not have a power switch.

The Zulu's front panel includes no controls, only LEDs; input-level adjustments must be done at the source. There's an LED that glows green to indicate the presence of an optical input. For analog metering, there are four multihued LEDs, one for each input

REALITY CHECK

Before deciding on whether these new boxes are worthy of purchase, let's take a hard look at a few facts. All consumer CDs use 16-bit resolution. No matter what resolution you use to record your material, it must be converted to sixteen bits if you want it on CD.

I wholeheartedly believe that tracks should be recorded using the best possible equipment regardless of where they will end up. And it's true that higher-resolution recordings reduced to sixteen bits do sound a tad better than straight 16-bit recordings. But does the incremental increase in sound quality justify the added expense of a 20-bit converter? In addition, will the average listeners be able to hear the difference on their boombox or car radio? Perhaps not.

Pairing 20-bit converters with 16-bit storage is not spectacular. On the other hand, using 20-bit converters with 20-bit storage starts to get the blood flowing, and using these converters with software that can handle 20-bit recording and playback is way cool.

But wait—since most of the programs slated to handle 20-bit recording are also expected to handle 24-bit recording (usually in the same version), why not just get 24-bit converters? Good question. In fact, most manufacturers I spoke with said 24-bit converters are just around the corner (Midiman expects to ship 24-bit products by the third quarter of this year), and one even said that those converters wouldn't cost too much more then the current 20-bit converters.

The best-sounding combination I've heard comes from pairing 24-bit converters with 24-bit storage. This is really mind-blowing sound. It won't fit on a compact disc, but it will fit on a DVD, the medium being touted to replace CDs (see "Tech Page: CD? No, DVD!" in the July 1998 **EM**). Many major studios are gearing up to handle 24-bit sound with an eye toward improving audio quality and being DVD-ready. This seems to provide a recipe for a new standard resolution that's greater than twenty bits.

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These LEDs change colors (green, orange, or red) to indicate the level of the associated input. This isn't a very accurate metering scheme, but I didn't find myself looking at them often. Usually, I was looking at the meters on my recorder. There is also a power-indicator LED.

One-Way Wonders

Zefiro Acoustics and Midiman make some handy devices for those who only need a D/A or A/D converter and don't want to spend the money to have both in the same box. Zefiro's InBox is an A/D converter, and Midiman offers both A/D and D/A converters, which are called Flying Calves.

All three units are about the same size, but Zefiro's InBox is the most portable because it can operate on a battery, has a mic preamp, and is equipped with a belt clip. It's constructed of blue, anodized aluminum and seems very rugged. The InBox can run for eight to ten hours on one 9V, alkaline battery, or you can power it with an external 9V, wall-wart adapter (which is sold separately for about $10). A patented, external battery clip lets you reverse the battery in lieu of a power switch (i.e., turning the battery around turns the unit off).

Zefiro Acoustics' InBox is designed for portable, field-recording applications.

On the top is a diagram identifying the controls and connections. The unit doesn't come with a user's manual, so this diagram is important. It's a stereo device with left and right XLR mic inputs located on the bottom (the side facing down when it's clipped to your belt). In fact, this unit has no line-level inputs, but you can obtain a line-level adapter cable from Zefiro. The mic-preamp controls—one for each input—are found on the side. These minipots are very small, making them difficult to set accurately. However, once they are set, you're not likely to bump into them, which is good for field recording.

Digital outputs include an optical S/PDIF (Toslink) connection and an electrical S/PDIF minijack connection. In order to turn the minijack into a standard S/PDIF connector, you'll need a minijack-to-RCA adapter. The folks at Zefiro opted for the minijack because they felt it provides a more secure connection; however, having dealt with minijacks in the field, I disagree with this view. Besides, an adapter is usually the least secure solution possible. Furthermore, there is a reason standards are adopted—to promote easy connectivity—and I think Zefiro should have used the standard RCA connector.

STRAIGHT TALK

When asked why a 20-bit converter is useful, manufacturers tend to downplay the limitations of 16-bit internal storage. If you push the subject, and the person you're talking to is either uninformed or just sales happy, they will invoke the "software connection." Twenty-bit converters are an excellent (and inexpensive) way to access the new software programs that handle 20-bit file formats. These programs promise high-resolution recording without Digidesign hardware (or Digidesign price tags).

But don't be fooled by fast-talking sales staff that would have you believe it's as simple as updating your software and plugging into some digital I/Os on an audio card. (Of course, not all manufacturers are so flip.) Digital I/Os are not created equal. All common digital formats support incoming resolutions up to 24 bits and sampling rates up to 48 kHz, but some audio cards have dithering built into them. For example, the inputs on Lucid's PCI 24 (a digital-only card) stop at 20 bits (not 24), even though its outputs go up to 24 bits. Making matters worse, a digital card that accepts 20-bit input but uses the Mac OS Sound Manager will have its performance impeded by this system's 16-bit limitation. (Windows has no such limitation.)

Be especially wary of software that claims 24-bit internal processing. This is not the same as the ability to handle 20- or 24-bit files. Make sure the program can *record* in 20- or 24-bit word lengths as well as play such files back. In order to avoid the limitations of the Mac's Sound Manager, make sure that your audio card's driver works directly with the audio software, circumventing Sound Manager. If you can select your audio card directly from within the program instead of the desktop's sound control panel, you are probably fine. But before you invest in an external converter, contact the software manufacturer to be sure.

If you manage to jump through all these flaming hoops without getting too badly burned, you're well on your way to the "software connection." Manufacturers pitch 20-bit converters as inexpensive ways to take advantage of high-resolution software using an old sound card's digital I/O. They can also achieve better S/N ratios because the converter is not subjected to fans and EMF inside the CPU. These pitches are true.

Unfortunately, things aren't as easy as buying a new converter and plugging it in. The industry is in the midst of changing standards, and until resolutions and sample rates settle down, watch your ones and zeros.

Between the digital outs and the level controls is a single LED that glows red when the battery is dying. The InBox is factory-set to record at 44.1 kHz (a 48 kHz version is available upon request).

The Golden Calf

In the words of Midiman, "The Flying Cow had babies." The Flying Calf D/A and A/D are housed in metal chassis with the same textured, gray finish as their mom. Both units have S/PDIF digital I/O, and the analog connections are ¼-inch unbalanced; again, balanced connectors would have been cooler. The Calves are powered by a wall wart.

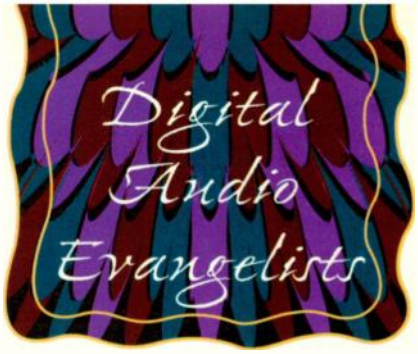
The Flying Calf D/A has no front-panel controls, only an LED that lights to signify a digital lock. Midiman claims that all standard sample rates below 50 kHz are supported. The Flying Calf A/D has a button for selecting the sample rate: 44.1 or 48 kHz. As with the Flying Cow, the last setting is memorized on power-down. Incoming levels must be adjusted at the source. There are two 6-segment LEDs (including clipping) to help you tweak the input levels.

The Calves contain the same converters as the Flying Cow, but the specs are slightly better for the Calves (see the table, "Converter Specifications") due to their simpler design (i.e., fewer components in each Calf unit). In addition, the analog electronics are optimized for unbalanced operation. Given the time constraints for this face-off, I was only able to test the Flying Cow. Other than the simpler design, however, the Cow and Calves are identical pieces and should sound and perform pretty much the same.

Rules of the Game

In order to compare these converters, I needed to create a level playing field. This was difficult, because the variety of formats made things tricky. Eventually, I decided on a set of tasks using similar equipment, recording techniques, and monitoring, regardless of format.

To hear whether the converters could perk up gear with less than 20-bit resolution, I connected their digital outputs to a Panasonic SV-3700 DAT (16-bit), an original Alesis ADAT (16-bit), and an E-mu Darwin (18-bit A/D and D/A, 16-bit storage, like the Alesis ADAT XT). None of these outboard converters provide any sort of dithering to reduce the resolution, so the signal is simply truncated by the recording device.



To evaluate their performance with higher-resolution gear, I also connected them with Digidesign's Pro Tools 24. Using various conversion boxes and hardware options, I was able to connect each converter to every piece of test equipment.

I first recorded material using the onboard A/D converters of the test equipment. Next, I recorded through the 20-bit A/D converters being evaluated. I then compared both recordings from the test equipment's onboard converters and the outboard 20-bit converters.

For the most part, the results were monitored on Hafler TRM8 powered monitors; a few things were played back on Meyer HD-1s and Genelec 1030s. I also double-checked everything through a pair of Sony MDR-V6 headphones.

Over the course of a few weeks, I recorded vocals, bass, drums, piano, and a Gibson semihollow-body guitar through each converter. I also tried some old 16-bit mixes to see if they sounded any better through the 20-bit converters.

Let the Games Begin

There was no question that 20-bit inputs sounded better than 16-bit inputs; this was true for every A/D converter. The recordings on the ADAT and SV-3700 seemed to have more space and body; vocals sounded breathier, drums sounded fuller, guitar and bass sounded beefier, and the piano had more depth.

On the other hand, there wasn't a noticeable difference between the Darwin's 18-bit A/D converters and the 20-bit A/D converters under evaluation. Comparing the external converters' inputs to Pro Tools 24's inputs was a tough call. All the frequencies and the dynamic range were present in both recordings, but the Pro Tools recordings had more air to them; they just seemed more alive and expansive.

Listening to the 20-bit D/A converters, I only heard a definitive sonic improvement with 20-bit audio files. When the audio was 16-bit (e.g., from the SV-3700 or ADAT), all I heard was differences in converter coloration (which I'll discuss shortly). The 20-bit outputs did not stack up to Pro Tools' 24-bit outputs for playback of 24-bit files. The Pro Tools outputs were significantly hotter and had more high-end definition. With 20-bit files, I really couldn't hear any difference between the 20-bit outputs and the 24-bit outputs.

As for coloration, the Zulu and the ADA1000 sounded identical to my ears;

Converter Specifications

These specs were provided by the manufacturers and might not be directly comparable due to differences in measurement techniques.

	Frontier Zulu	Lucid ADA1000	Midiman Flying Cow	Midiman Flying Calf A/D	Midiman Flying Calf D/A	Zefiro InBox
Price	$598	$599	$400	$200	$150	$295
Number of Channels	8	2	2	2	2	2
Digital Connections	ADAT Optical	S/PDIF, AES/EBU	S/PDIF, AES/EBU	S/PDIF	S/PDIF	S/PDIF (minijack and Toslink)
Analog Connections	¼" unbalanced	XLR, ¼" balanced	XLR, ¼" Neutrik	¼" unbalanced	¼" unbalanced	XLR (mic only)
Mic Preamp	no	no	no	no	n/a	yes
Sample Rates A/D	external*	32 kHz, 44.1 kHz, 48 kHz; external*	32 kHz, 44.1 kHz, 48 kHz	44.1 kHz, 48 kHz	n/a	44.1 kHz
Sample Rates D/A	external*	external*; 20–50 kHz	external*; up to 50 kHz	n/a	external*; up to 50 kHz	n/a
A/D Frequency Response	20 Hz–20 kHz, ±0.05 dB	20 Hz–20 kHz, ±1 dB	20 Hz–20 kHz, +0/-0.5 dB	20 Hz–20 kHz, +0/-0.5 dB	n/a	10 Hz–21 kHz, ±0.25 dB
D/A Frequency Response	20 Hz–20 kHz, ±0.1 dB	20 Hz–20 kHz, ±1 dB	20 Hz–21.7 kHz, +0/-0.5 dB	n/a	20 Hz–21.7 kHz, +0/-0.5 dB	n/a
A/D S/N ratio	99 dB (A weighted)	95 dBFS (A weighted)	98 dB (A weighted)	99 dB (A weighted)	n/a	102 dB (A weighted); 98 dBFS
D/A S/N ratio	99 dB (A weighted)	90 dBFS (A weighted)	99 dB (A weighted)	n/a	102 dB (A weighted)	n/a
A/D THD	0.002% (A weighted)	<0.002% @ 0 dBFS	0.006% (A weighted)	0.003% (A weighted)	n/a	0.0029% @ -0.1 dBFS; 0.0023% (A weighted)
D/A THD	0.002% (A weighted)	<0.005% @ -6 dBFS	0.003% (A weighted)	n/a	0.0018% (A weighted)	n/a

* locks to sample rate of incoming digital signal

For manufacturer information, please see Contact Sheet, p 163.

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they are both very clean and transparent. I'd describe their sound as similar to an ADAT XT but perhaps a hair closer to the Darwin.

The big surprise was the Flying Cow's sound, which was very pleasantly colored: fat, warm, and round. In listening tests, it was repeatedly selected as the best-sounding converter over its competition. In some ways, it is even more pleasing to the ears than Pro Tools' 24-bit converters. It isn't as harsh, especially in the high end, and it is less fatiguing, with an enhanced low/mid range.

The sound of Zefiro's InBox is affected by the D/A converters it's paired with. I could just call it a chameleon, but I'll step out on a limb and say its sound lies somewhere between the ADA1000 and the Flying Cow. It didn't seem as fat as the Flying Cow nor as transparent as the ADA1000. I'd describe it as having a TASCAM DA-38 sort of sound (i.e., flatter than the Flying Cow, without an enhanced low/mid range, and with some bite but not overly harsh).

Watch Out

Before moving on, I'd like to point out a couple of things that users should know. First of all, early versions of the Flying Cow had a reversed bit in the S/PDIF datastream. This causes certain DAT machines to incorrectly identify the incoming digital format, which results in lock problems. According to Midiman, the problem has been fixed for several months.

I mention this because it can be a bit bewildering; some DAT decks ignore the problem (e.g., TASCAM DA-30), while others are stumped by it (e.g., Panasonic SV-3700). It's one of those things that might lead you to suspect that something's wrong with your DAT deck when it's really the Cow. If you think you might have one of these afflicted bovines, call Midiman; a simple firmware swap will solve the problem.

Another point of some concern is that the Zulu will not work as an input device for the original ADATs without an external clock (e.g., a BRC). This is because the old ADAT must see a clock source when it uses the Lightpipe input. The Zulu does not generate its own clock and always looks for an external sync. Without an external clock, both units are hopelessly lost. If you have one old ADAT with no clock source, and you thought that buying a Zulu would be a quick sound improvement, think again.

The ADAT XT has a Clock Source setting that solves this problem by letting it lock to its internal clock despite being in digital-input mode. However, as I mentioned earlier, I heard no noticeable difference between 20-bit and 18-bit inputs.

To Frontier's credit, they discuss this problem thoroughly in the manual. In addition, this is not the primary application for which the Zulu is designed. Nevertheless, it is something you should be aware of.

Finally, the Zulu includes a function called Automute, which is turned on and off with a jumper on the main circuit board inside the unit. (The unit ships with this feature disabled.) When Automute is enabled, the analog output is muted whenever silence is encountered for 100 ms or more. In this case, silence is a stream of samples with zero amplitude. Think of it as a kind of gate with zero attack and zero release.

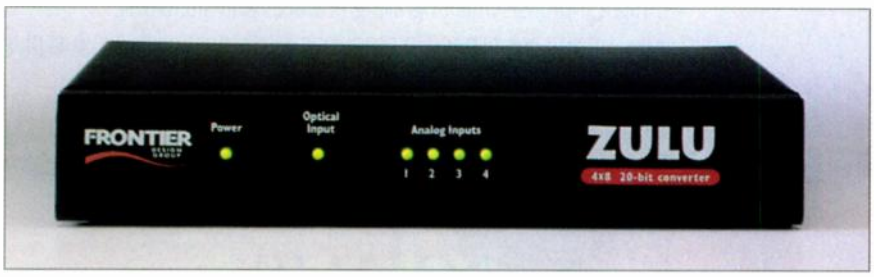
According to Frontier, Automute increases the Zulu's S/N ratio by about 10 dB. Unfortunately, there is a soft but audible pop that occurs whenever Automute turns on or off. Frontier doesn't try to hide this click; in fact, they mention it in their user's manual as an "effect" of the Automute function. I'm not sure what use this effect might have, but it isn't pretty. I hate listening to digital audio with clicks in it, no matter how subtle they are. The Zulu's S/N ratio is already great, so what's the point of Automute?

Final Call

Recording with 24-bit resolution isn't within everyone's reach, but it will be shortly. That's not hypothetical; it's reality. I never advise waiting for new gear, especially if it means putting off your music, but it seems more sensible to wait and make the jump to 24 bits instead of 20 bits. This would be wise not only for the sound quality but also because of the impending emergence of DVD (see the sidebar "Reality Check"). In the meantime, 16-bit gear still sounds okay, and most of us are still listening to 16-bit CDs. Certainly, these now-venerable discs are adequate for most of us to get our musical ramblings across.

If you just can't wait to get started recording at higher resolutions, I recommend the Zefiro InBox for professional, portable field recording. If you like a warm coloration to the sound, the Midiman Flying Cow or Flying Calf A/D fills the bill. However, if you believe that a converter should remain transparent and colorless, the Frontier Zulu and Lucid ADA1000 are excellent choices. Of course, if you're using a multichannel sound card or other gear with a Lightpipe interface, the Zulu is a great deal.

As for the D/A converters, they only make a major difference with material stored at 20-bit resolution. If your gear stores everything at 16-bit resolution, you might as well stick with your 16-bit outputs. However, if you can't stand the way your 16-bit outputs sound, I recommend the Midiman converters for a fat, warm sound and the Frontier and Lucid units for a clean, transparent sound.



The Frontier Design Group Zulu is the only converter in this face-off with multichannel (greater than stereo) capabilities using the Alesis Optical (Lightpipe) interface.

Erik Hawkins *hopes he's not attacked in the middle of the night by angry manufacturers who want to dither him down. But if they do, remember that, before they got him, he wasn't just another 2-bit punk.*

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By Jeff Casey

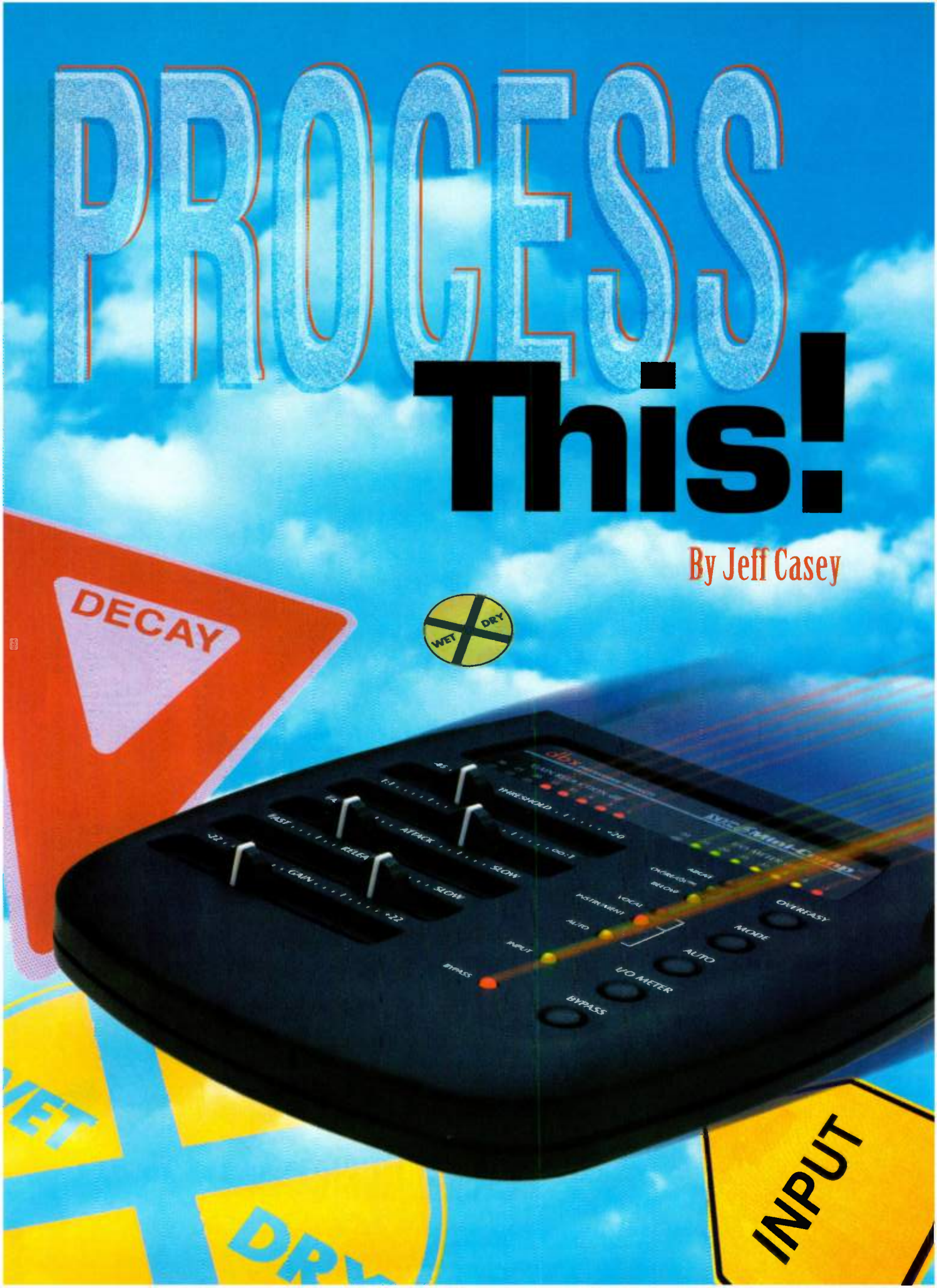

Illustration and photography by Mark Snyder

A road map for navigating the highways and byways of digital multi-effects processing.

There are two reasons to process a signal with effects. One is to place an instrument within an artificially created acoustic environment. The other is to create a new sound altogether. Some effects are essential; others are not. For example, a mix without ambient processing (reverb or delay) is like a painting with no chiaroscuro: it may have aesthetic appeal, but it has no depth of field. Enhancement or "special" effects like chorus and flange, on the other hand, merely spruce up a mix—a kind of sonic manicure for the tracks.

Most of the digital effects we use today are descendants of analog devices. For example, before the dawn of digital processing, reverb was either captured naturally with a performance or generated artificially by routing the signal through a reverberant acoustic chamber. Delays were created using analog tape decks: a signal was recorded on one head and played back from another head further along the tape path.

Because of the analog nature of these devices, parameter control was quite limited (it's rather difficult to adjust the physical size of a room!), and settings could not be stored or recalled.

At some point in the early 1980s, the first digital effects processor was born, and the landscape changed dramatically. Today, digital effects processors can be found in virtually every studio around the world, and for good reasons: they're cheap, they deliver pristine sonic quality, they allow full parameter recall, and they typically include a comprehensive array of effects. Many processors allow you to run multiple effects in series, and some units even have multiple inputs and outputs for processing two or three discrete effects simultaneously.

COMMON TRAITS

Effects can be divided into seven basic categories: delay, phase-based effects, flange, chorus, reverb, pitch shifting/harmony processing, and amplitude effects. (Some units also include overdrive sections and even dynamics processors, but for this article, we'll focus only on the standard effects.) Although each type of effect sounds different and typically performs a different function, all but two—amplitude and pitch effects—are created by time-delaying the signal in some fashion (see **Fig. 1**). In other words, most effects are variations on a theme.

Because most digital effects are poured from the same mold, multi-effects units don't typically employ discrete processors. Instead, they employ a single processing engine that can be configured in a variety of ways, using whatever components are needed to create the desired effect. You can usually tailor these effects however you want—or turn them into different ones altogether. Because delay is an integral part of many of them, let's take a look at it first.

DELAY

Natural delay can best be illustrated by the Grand Canyon routine in which someone yells "Hello!" into the chasm, only to be confused by an apparent reply. What the perplexed person hears is an acoustic delay, or echo: the single or multiple repetition of a sound as it bounces off of reflective surfaces.

When working with effects processing, many people confuse delay with reverb. Reverb is a much more intricate effect that simulates an enclosed acoustic space using multiple delays and complex reflections (more on this later).

How it works. Digital delays are generated by routing audio through an electronic buffer. The information is then held for a specific period of time (as determined by the user) before being sent to the output. Single-repeat delays process the sound only once, whereas those with multiple repeats process the signal over and over. To achieve this, audio is routed from the output of the unit back to the input. The signal is then delayed again, and the process is repeated a given number of times, providing the effect of successive repeats.

There are also multitap delays, which employ a single, long delay line that is "tapped" at various intervals to produce shorter, multiple delays. For example, an 800 ms delay might be tapped at 200, 400, and 600 ms intervals. The taps can then be routed to the delay output or fed back to the input for regeneration or multiple repeats. Some delays can also ping-pong repeats between the left and right channels. This is accomplished by incorporating an autopanning section into the processor (more on this later).

Important parameters. The two most important delay parameters to understand are delay time and feedback controls. Delay time regulates how long the buffer will hold a given sound. Adjusting this parameter determines the amount of time that passes between the original source sound and the first repeat (as well as subsequent ones). Feedback controls how much of that delayed signal will be routed back to the input. Turning up the feedback increases the number of repeats and the length of the decay; if you turn it down completely, you will hear only one repeat. Stereo delays usually employ two sets of parameter controls that can often be linked together.

In an acoustic environment, delayed sounds exhibit a noticeable high-end loss, which increases the longer they repeat, because higher frequencies dissipate faster than lower ones. To simulate this natural high-end loss, many delay units provide a lowpass filter on the feedback loop.

Some delays offer a tap-tempo button for setting the delay time. By rhythmically tapping this button along with the song, you can hone in on an appropriate setting. MIDI-compatible units also let you sync the delay time to the MIDI Clock of a sequencer or multitrack recorder.

Common applications. Delay is a very versatile effect. It can turn a mono signal into a stereo one or make a thin signal sound fatter. Delay is commonly used to process guitars and lead instruments, including vocals. Many straightforward rock 'n' roll songs sound better with stereo delays rather than reverb on the lead vocal. (Just listen to any Bad Company record.)

Perhaps the most recognizable delay application is the "slapback" echo that was often used on Elvis Presley's voice. A slapback delay employs a rather long delay time (around 80 or 90 ms) with a single repeat. This is typically a mono effect with the delayed signal panned in line with the vocal track. Long delays can also be used to loop material, and some units even offer an infinite loop feature so that sounds can be layered over each other—a common practice in the urban-music community.

Engineers often employ a delay to "double track" rhythm guitars: a medium mono delay (30 to 40 ms) using a single repeat and panned opposite from the source sound will provide this effect. Shorter delay times (20 to 30 ms) can often fatten up a track without sounding like a discrete repeat, provided that the effect is not returned to the mix in stereo. (Unless there is spatial separation, our ears have trouble discerning short delay times.)

Tips. It's usually critical to achieve a proper relationship between the delay time and the song's tempo. To do this, you can use the following formula: 60,000 ÷ tempo = time (in milliseconds). For example, if your song's tempo is 100 bpm, there are 600 milliseconds (ms) per beat. Therefore, a delay time of 600 ms will provide one echo for every beat, 300 ms will double the echoes, 1,200 ms will provide a repeat every two beats, and so on. Based on this formula, you should be able to calculate appropriate settings.

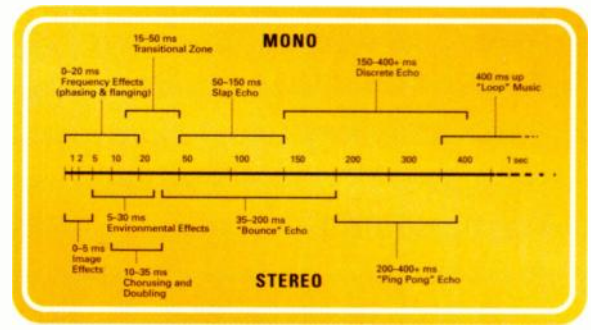

FIG. 1: Although different effects employ different algorithms and modulators, most are time-delay effects derived from delaying the signal to one degree or another.

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Keep in mind, however, that if you are working with live musicians, the tempo may vary throughout the song, so you may need to make minor adjustments occasionally.

Good left/right placement of the original sound and the delayed sound is also critical. Generally, you should keep an even spread between the two. For example, for a mono delay with the source sound positioned at two o'clock on the soundstage, you'll want your repeats to come either from the same position or from the same angle on the opposite side of the stage (i.e., ten o'clock). If you're using a stereo delay, your repeats should originate from ten o'clock and two o'clock or from equal distances around the source sound (e.g., twelve o'clock and four o'clock).

PHASE

Human hearing ranges from roughly 20 Hz to 20 kHz. The corresponding period of waveform oscillations for this range is 50 ms to 0.05 ms. Therefore, any delay in that range will directly interact with the periodic oscillations of pitched sounds. Three of the processor types that we'll be discussing rely on this kind of frequency-based delay: phase, flange, and chorus. These are differentiated by the length of the delay employed. For best results using these types of effects, try blending a nearly equal amount of the dry and processed signals.

How it works. Phasers employ very short delays somewhere in the range of 0 to 10 ms. When the dry signal is mixed with the delayed one, an effect known as comb filtering is produced. A comb filter occurs when frequencies whose oscillation periods directly relate to the delay time are alternately canceled and reinforced, yielding a frequency response that looks something like a comb. Moving these filters across a certain frequency range with a modulator (often an LFO) causes varying frequency-dependent phase cancellation, and the traditional phase effect is achieved.

Important parameters. Phasers have two parameters that control the modulation of the filters: rate (or speed) and depth (or intensity). Rate determines how fast the modulator will sweep between the minimum and maximum values of the frequency range, and depth defines the width of that range (the lowest and highest frequencies). Some phasers also offer a choice of filter types or a feedback loop, which recirculates the processed sound for a more resonant effect.

Common applications. Phase fits into the "special effects" category—it's not an essential effect like reverb, but it can definitely add a little zing to the audio cocktail. A simple rule of thumb applies: rhythm tracks sound very natural with subtle amounts of phase, but lead tracks will have a noticeably processed sound (simply because the average listener is paying more attention to these tracks). Listen to "I Am the Walrus" by the Beatles. The phase processing on the lead vocal is quite obvious. Synthesizers and guitars usually benefit the most from phasing; a slight amount of phase added to either of these instruments can give it an animated sound.

Tips. Phasers can start to sound pretty monotonous if used in excess. You can add some extra animation to the effect by using two phasers in series. Set the phasers' LFOs asynchronously: one to the minimum and the other to the maximum rate and depth. This will generate a slow, sweeping sound with a hint of tremolo.

FLANGE

Ah, the '60s retro effect! What better way to get a vintage sound? Flanging is an effect that was actually discovered by accident. Before the dawn of digital multitracks, there were analog tape machines. Anyone remember those? Well, one day someone was making a copy of an analog tape with two synchronized decks. After the material had been transferred, this rogue engineer put the levels up on both decks to check the playback. When his hand accidentally touched the flange on one deck, it slowed the tape down slightly, creating a delay in the range of 0 to 20 ms. Varying the time of that delay by pressing on the flange (while still monitoring the original signal), he generated the first example of what we now call flanging.

How it works. Digital flangers (see **Fig. 2**) are very much like phasers: they employ relatively short delays (between 0 and 20 ms) and a modulator. With a flanger, though, the modulator varies the delay time, in either a regular or random fashion, sweeping across a specified range. Flangers provide a more pronounced pitched effect than phasers because their delay times are slightly longer. Some feedback is also used to increase the sharpness of the effect.

Important parameters. Flangers typically provide delay time, feedback, rate, and depth controls. In this case, rate determines how quickly the oscillator modulates the delay time. This parameter is usually represented by a frequency. For example, a 0.1 Hz setting will perform one cycle sweep every 10 seconds. Depth, usually expressed as a ratio, adjusts the spread between the minimum and maximum delay times. For example, a setting of 6:1 could sweep between 1 and 6 ms or 3 and 18 ms.

Many flangers also let you set the delay feedback to either a positive (in-phase) or negative (out-of-phase) value. Positive feedback accents the even harmonics, producing a metallic sound, while negative feedback works on odd harmonics for a warmer tone. In addition, some units allow you to choose from a variety of modulation curves, including triangle, sine, and square waves. Triangle waves vary the delay time evenly between the minimum and maximum values, sine waves work like triangle waves but have a smoother cycle, and square waves switch back and forth between values.

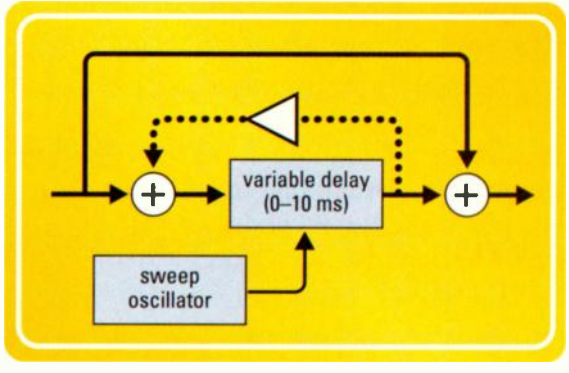

FIG. 2: The basic signal flow of a flanger is shown here. Some feedback is generally used to give the effect more of an edge.

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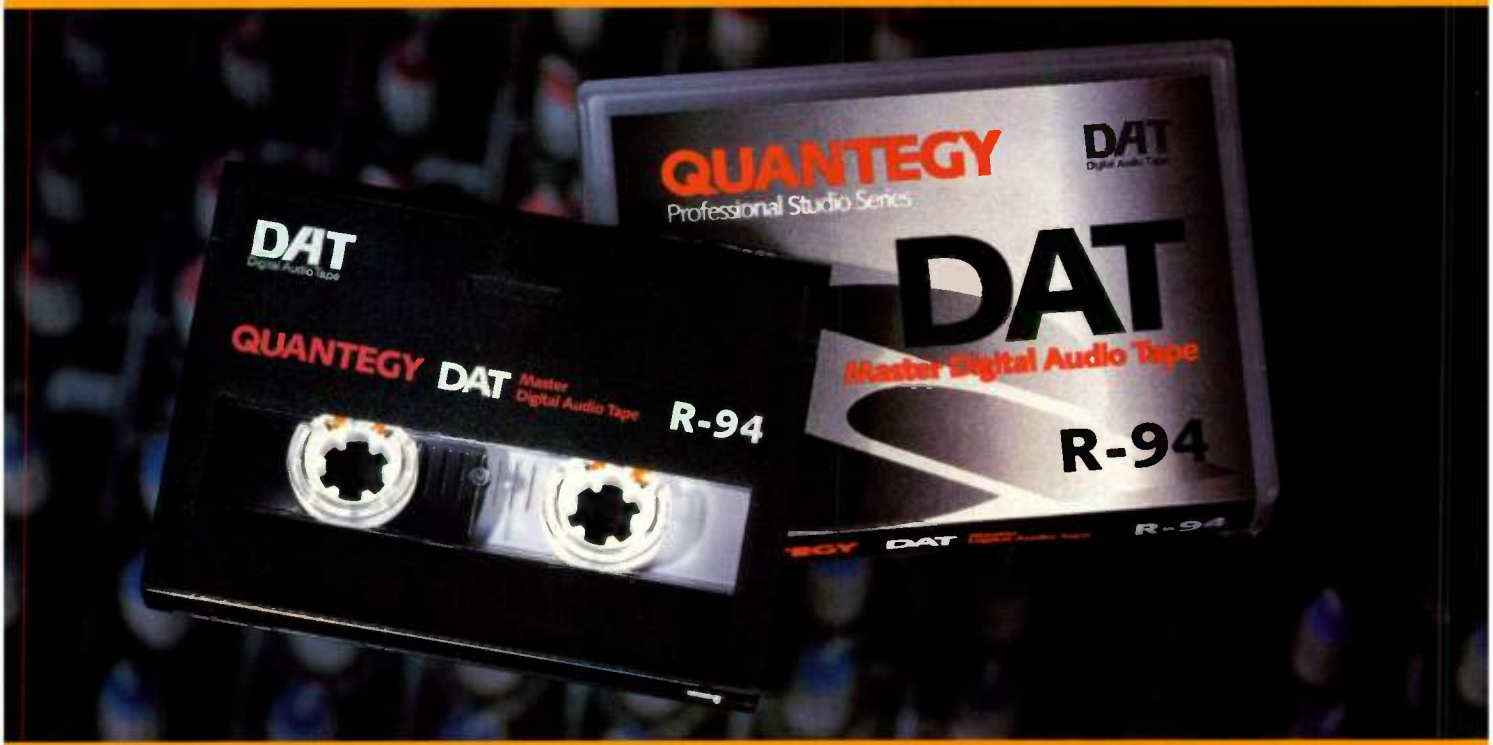

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Experimenting with these curves is really the best way to find one that's appropriate for a particular signal.

Common applications. It can be difficult to differentiate between flanging and phasing, and for all intents and purposes, their sounds are easily interchangeable. So, many phaser applications will also apply to a flanger.

However, there are certain instances when you would want to use a flanger rather than a phaser. For example, "underwater" vocals can be created with a flanger by selecting a smooth modulation curve, a slow rate, and a wide depth. Subtle flanging on a stereo drum mix can also be a brilliant complement to a song.

Flangers can also be used to create a vibrato effect. For this application, you'll want to listen only to the processed signal, not the dry one (more on console routing later). First, turn up the modulation depth all the way, and set the rate between 8 and 10 Hz. Then, adjust the delay time for shorter and shorter values until the desired vibrato effect is achieved. For best results, don't use any delay feedback.

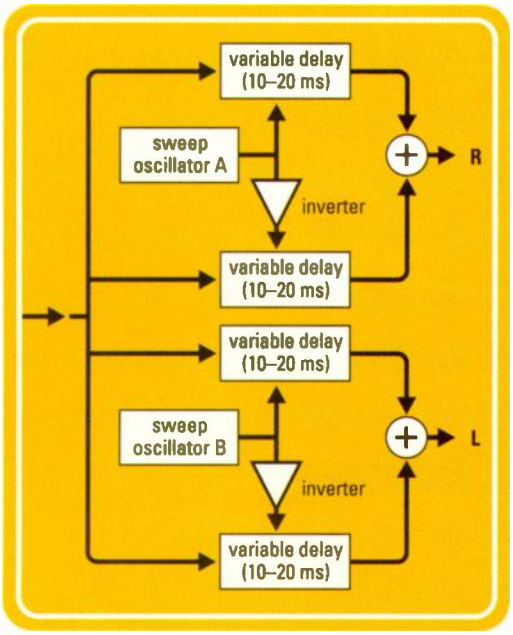


FIG. 3: Signal flow through a classic stereo chorus. This effect has been a favorite of studio engineers for years.

Tips. The only drawback to digital flangers is that they usually employ a minimum delay time (often 1 ms), whereas the delay time used in true tape-based flanging varies from 0 ms on up. Tape-based flanging is called *through-zero* flanging.

In order to achieve through-zero flanging in the digital realm, you need to use two discrete flangers. Set up one of the units with no flanging and the minimum delay time of 1 ms. You will use the delayed sound from this unit as the "dry" signal. Next, set up the second unit so it also has a 1 ms minimum delay, and adjust the other flange parameters to taste. Now set the feedback on both units to the same value and mix their outputs to a single, mono channel. When the second flanger reaches its minimum delay, there will be no time difference between the two units. Be sure not to mix in any of the original dry signal, as this will create a slight, unwanted delay.

CHORUS

Doubling tracks is a common studio practice for fattening up a sound in the mix, but you might not always have the time and track space to do it. Instead, engineers often employ an electronic chorus. Chorusing works by inducing very minor pitch changes in the signal using a delay—much like flange, but with a greater time variation—that provides the effect of a doubled part.

How it works. Although chorus and flange are closely related effects, they have two important differences: choruses use a longer delay time (10 to 30 ms), and they generally don't employ feedback routing (as this makes the chorus sound unnatural). The longer delay time still produces a pitched effect, but it also begins to sound like a discrete delay or doubled part. Typically, choruses are stereo effects and employ two single delays that are modulated by the same oscillator, but the oscillator output is inverted before being routed to one of the delays (see **Fig. 3**). This eliminates major pitch changes that may occur. If one delay is flat, the other will be sharp, and the shifts will cancel one another out.

Important parameters. For chorus, you generally have control over two parameters: rate and depth. These regulate the same values as they do in a flanger. Some advanced chorus processors include parameters for delay time and modulation type, but basic units usually operate with preset values for these.

Common applications. A stereo chorus on a background vocal can give the effect of two or three voices singing. Granted, it's not a pitch-changing device that generates multiple harmonies, but chorus can still fatten up the track. Acoustic guitars also sound great when processed with small amounts of chorus. As a matter of fact, if you're looking for ways to enhance an acoustic guitar or an a cappella performance, look no further than a light chorusing effect across the stereo mix. Bass players also commonly employ chorusing to fatten up their sound.

Tips. It's important to get a good balance between detuning and chorusing using the depth control. Too little depth will not provide the desired effect, and too much will make the signal sound out of tune. You also must be careful about the balance between wet and dry signals—usually a 50/50 blend yields the tastiest results.

REVERB

Reverb is unquestionably the most popular effect for processing individual tracks. Reverberation is made up of a complex series of delays occurring in an enclosed acoustic space. The first reflections (or delays) bounce around the room many times, causing additional reflections before fading out completely. When you listen to a sound in an ambient space, you are actually hearing three things: the direct sound from the source, the first reflections as the sound waves bounce off reflective surfaces, and the delayed reflections that linger in the room and create the reverb's "tail" (see **Fig. 4**).

How it works. Digital reverb units employ numerous stereo, multitap delays that create discrete echoes, followed by a wash of ambience that makes up the decay. The ambience is simulated by repeating the initial delays many times, with decreasing clarity and amplitude.

A very important part of reverb processing is predelay: the amount of time between the onset of the direct sound

and the appearance of the first reflections. Predelay is essential for creating a believable room ambience, because early reflections naturally arrive later than the source sound.

Important parameters. The fundamental parameters of a reverb patch are room type and room size. Type specifies the kind of space the reverb simulates; common ones include room, hall, plate, and spring. Size determines the overall cubic volume of the space, often denoted in feet or meters. Because reverb is a complex simulation that requires corresponding changes between different parameter values, room size will often affect other parameters as well. Although more-expensive processors provide individual control over room type and size, lower-priced units usually present the two as a combined parameter.

Hopefully, you'll also get a control for predelay. Usually set to a value below 50 ms, predelay can change the perception of a room size: a shorter time gives the feeling of a smaller space, and vice versa. The counterpart to predelay is reverb density, which determines the amount of time between the arrival of the early reflections and the beginning of the decay.

Decay time determines how long the reverb tail, or ambient wash, will be audible. Often, EQ controls are provided to tailor the characteristics of the decay. Many reverbs divide the decay into two frequency bands (with a selectable crossover point) and provide discrete time and EQ parameters for each.

You might also get separate level controls for the early reflections and the decay. Raising the level of the early reflections provides the sense of a smaller space. Turning up the decay does the opposite. The final parameter, diffusion, affects how close together the early reflections occur. Increased diffusion enhances the thickness of the reverb.

Common applications. Any track in a mix is fodder for reverb. But not every track will sound good with a small room, a medium hall, or a large auditorium program. The idea is to find individual reverbs that are suitable for each track.

Generally, rhythm tracks sound good with a small room reverb. Drums are the exception: a larger hall or plate on the snare and kick drum may sound better than a small room, provided the decay is gated. If you decide to use reverb, as opposed to delay, on the lead instruments, you must think about the nature of the song—is it a ballad, an industrial tune, or a rock song? Ballads typically sound best with a larger reverb program, whereas rock songs and other types of fast music work better with smaller reverbs.

Also, the size of the room (and the length of the decay) should complement the tempo of the song. For example, if you put a large reverb on the lead vocal of a fast country song, the decay will probably be too long, resulting in a muddy wash of noise. Conversely, a small room on a ballad vocal will likely leave it sounding too dry.

Tips. Although almost everyone uses reverb in their mixes, not many people actually spend time tweaking the parameters. Often, you might like the way a reverb patch sounds, but the predelay may not be long enough, or perhaps the decay is too loud. Experiment with the parameters as much as you can—who knows, you might create some great custom effects.

Also, take advantage of any onboard EQ the unit may offer. While it's common practice to employ outboard EQs for tweaking processed sounds (more later), a reverb's built-in EQ lets you readily filter particular parts of the reverb (e.g., decay, first reflections, etc.) This is usually more effective than simply applying EQ to the entire effect.

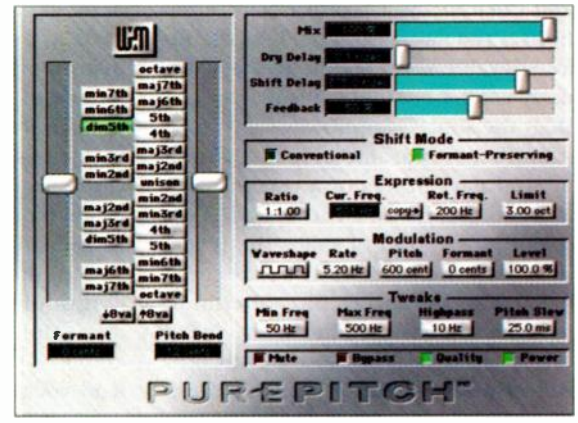
Careful reverb processing of stereo images is paramount—more so than with any other effect. If the track being processed is panned to the center of the mix, a mono input into a stereo reverb is generally sufficient. But if the instrument is panned off-center, it's usually better to process it in full stereo. Here's how to do it. First, place the instrument on the soundstage with the pan control, and then bus it to a stereo pair. This pair then becomes the dry signal for that track. Next, use one aux bus on the stereo pair as the left channel send and another as the right. Last, route the signals from the two aux sends into the left and right inputs on the reverb processor. This will give you accurate positioning in the stereo field.

Why go to all that trouble? Well, if you pan an instrument to an off-center location on the soundstage and then send a mono signal to the reverb, you won't get an accurate representation of that instrument's location because the reverb will see the signal as being panned dead center. Of course, there's no rule that says you have to heed this suggestion; but in my experience, it has been beneficial.

PITCH PROCESSING

Of the seven effects categories discussed in this article, pitch shifting requires by far the most complicated algorithms—and until recently, the results were not very convincing. Although we now recognize pitch shifting as a very useful effect for processing both instrument and vocal tracks, it has taken a while for it to be thought of as more than a gimmick.

The first pitch shifters needed to be given instructions while the signal was being fed to them. For example, you could specify that you wanted a minor-third harmony, but of course, that interval wouldn't be harmonically "correct" for each note of the diatonic scale. The only solution was to re-instruct the pitch shifter each time you changed notes.



Wave Mechanics' *PurePitch* plug-in for Digidesign's Pro Tools TDM system performs real-time pitch shifting on a mono track without changing the voice's character.

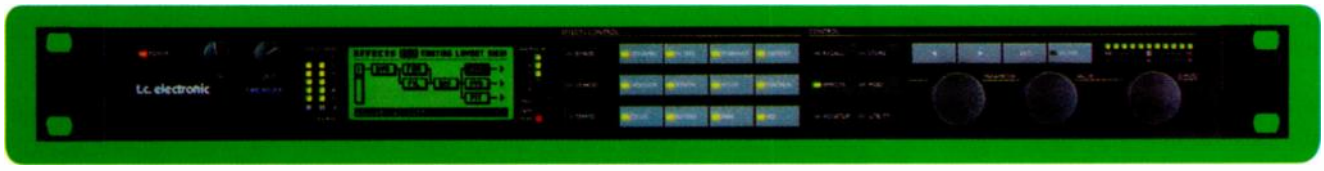
A new technology, developed a few years ago, allows you to simply select a key and scale type (major, minor, etc.), and the processor will then follow the input signal as it changes and generate the appropriate harmonies. Most modern units offer this feature, which is called "intelligent" pitch shifting.

How it works. Pitch shifters work by compressing or expanding audio data. To raise a pitch, the audio is compressed so that it runs faster. However, this process also shortens the audio segment, so a copy of the processed section is added to fill out the difference. To lower a pitch, the audio is expanded, which requires the removal of a section of the audio. In essence, the pitch shifter is rapidly cutting and pasting segments of data at varying intervals, depending on the nature of the audio. Delay lines and feedback are also employed to create some time delay between the processed voices so they don't sound unnaturally uniform.

Important parameters. The basic parameter for pitch shifting is transposition. Transposition sets the harmony-line interval, typically within a range of ±1 or ±2 octaves. The effect may also offer a fine-tuning adjustment (usually within a ±100 cents range). Feedback and predelay controls are usually provided for the delay line, as well. Moreover, in units that offer built-in chorusing, parameters for controlling modulation may also be provided.

Common applications. The most common pitch-shifting application is vocal harmony processing. Harmony processors are great for small personal studios, as they can give you vocal arrangements that would not otherwise be possible, particularly if your singing range is limited, you don't have a great ear for harmonies, or you simply can't afford the tracks for separate backup parts. More and more, even major artists on tour are incorporating these devices into their arsenals—and saving a bundle by replacing three or four backup singers with a rackmount box.

Pitch shifting is also used to process guitars; it's a quick solution for generating harmonies without spending time recording multiple parts. Another cool use is speech compression. Nowadays, this task is usually accomplished using a hard-disk workstation, but it was originally done using pitch-shift technology. Start by lowering the performer's voice one octave and recording it to an analog tape deck running at half the normal speed. When the recording is played back at regular speed, the natural pitch and timbre are restored but the playback speed is doubled.



In addition to the usual effects, TC Electronic's FireworX provides more extreme effects such as reverse delay, vocoding, and ring modulation.

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Tips. Keep it simple. Pitch transposition eats up a lot of processing power, and trying to harmonize by more than a few intervals can yield unwanted tremolo effects and glitches.

Pitch shifters with delay feedback controls can really expand your processing power. For example, try setting the transposed pitch slightly higher or lower than normal and employing some delay feedback. The processor then recirculates each note, producing a stepped, upward or downward glissando effect. This works great on percussion tracks, making them sound much bigger than normal.

AMPLITUDE EFFECTS

Changes in the amplitude of a signal can also create very useful effects. If used in mono, quick level changes create the classic, pulsating tremolo sound; in stereo, an autopanning effect can be achieved by employing a somewhat slower rate.

How they work. Of the effects covered here, these are the only ones that don't employ a time-based algorithm. Instead, they rely on a modulator that controls the signal's volume level. The output of the effect can be routed either to a single channel (for tremolo applications) or to two channels (for a panning effect).

Important parameters. Amplitude effects are pretty simple. Only two parameters really apply: modulation rate and depth. These determine how fast and how wide, respectively, the autopan or tremolo will be. If you're using a more full-featured multi-effects box, you might also get control over waveform type and pan center, which designates the center point for panning-type effects.

Common applications. Tremolo is mainly used to process guitar tracks and to generate vintage keyboard sounds (e.g., a tremolo with a slow modulation rate used to simulate a Leslie speaker cabinet). Autopanning can be a cool effect to use on a lead guitar or background vocal track. It gives the perception that the sound source is moving around on the virtual stage. Like tremolo, autopanning can also be used to create a Leslie effect. Sometimes autopanners are used with delays to ping-pong repeats between the left and right channels. This sounds especially good on guitar tracks.

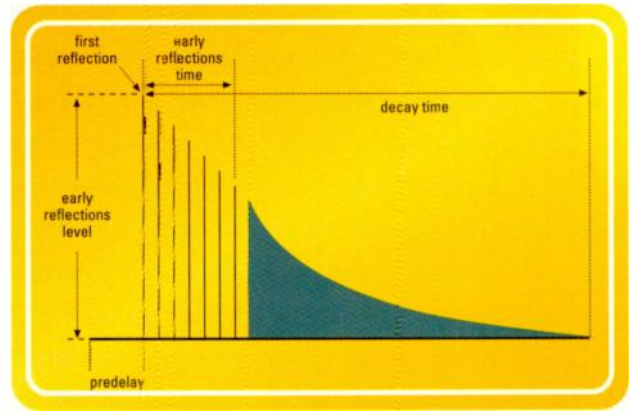

FIG. 4: An amplitude/time chart shows the various components of a typical reverb.

Tips. Have fun with these effects—that's what they're for! However, watch the stereo spread of an autopan: if set too wide, it will distract the listener from the other tracks. In addition, when using tremolo, make sure that your modulation rate is fast enough so that sonic information doesn't get omitted while the oscillator has the volume down.

SONIC POTPOURRI

A mix typically consists of many different instruments, each with a different sound, and the processing that you use on one track is often not appropriate for another. In a typical 24-track mix, you might use three or four different kinds of effects and maybe one or two variations of each. Blending these effects properly is as essential as blending the tracks themselves.

First, you have to determine what your sonic goals are. Are you trying to create a believable image, or are you looking for a unique sound that doesn't need to represent the instruments accurately? Or perhaps you're striving for a combination of these two approaches. For example, you may want the instruments to sound as natural as possible but the lead vocal to sound completely "out there."

Ambient effects, used to replicate an acoustic space, are pretty mundane; once the right blend is achieved, the results should go relatively unnoticed. Pitch shifting, flanging, and phase effects, on the other hand, have a different purpose. You're *supposed* to hear them. Believe me, when you put a flanger on a stereo drum mix, people will notice it.

Sometimes, standard effects like reverb can create an over-the-top sound. A large gated reverb on a guitar track in an otherwise ordinary mix will produce an effect whose purpose is obviously not to create ambience.

Basically, it all comes down to how you balance the mix. If you want someone to notice a tremolo guitar track, don't process anything else in the mix with autopanning effects. Likewise, chorus and flange are very similar effects, so if you want the listener to differentiate between the two, you might want to use a bigger-than-usual chorus with an extra-wide depth. Mix and match all you want, but make sure that the things you want to be noticed are audible and the ones that you want to blend in don't stick out like sore thumbs.

And here's a critical point: Because most of the effects we've been discussing involve delayed signals (and some of them are stereo), it's important that you check the mono compatibility of your mix periodically to be sure that no unwanted phase cancellation is occurring.

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THE PROCESSING PATHWAY

For most effects applications, it's standard practice to send the audio from a postfader aux send, where the level of the effect is directly related to the level of the fader. That way, you can establish a ratio between the dry and processed signal and control both levels with the track's channel fader. However, there are certain applications in which you'll want to send the audio from a prefader bus—for example, if you want to hear only the processed signal rather than a mix of the two (as with through-zero flanging).

Although many mixing consoles offer discrete effect returns (usually incorporated into the aux section), it's preferable to return processed signals into individual channel strips. This not only gives you EQ control over the processed signal, but it also lets you route the signal wherever you need to (e.g., to a subgroup, to a dynamics processor, or through an aux send to another multieffects unit).

GAIN STRUCTURE

One of the most important steps in successful processing is establishing a proper gain structure for the multieffects signal path. Everyone already knows the importance of proper gain staging during the recording process. Why, then, do people tend to overlook this issue when it comes to routing signals through effects processors?

The first step is ensuring interface compatibility between the console and outboard gear. Consoles typically put out -10 dBV, unbalanced signals from their aux sends, although some use balanced, +4 dBu connections. High-end digital processors often offer both XLR and ¼-inch I/O as well as switchable operating levels, whereas budget boxes may offer ¼-inch connections and -10 dBV operating levels only. Some processors even provide digital AES/EBU and S/PDIF I/O to accommodate the increasing popularity of digital mixers and hard-disk workstations.

Like any piece of gear in a studio, effects units should be operated at their maximum signal-to-noise ratios. Effects processors tend to generate more operating noise (manifested as hiss) than other studio gear, so it's imperative that you set optimal signal levels going into

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and out of each unit. This is done by following the signal flow. First, make sure you have a decent output from the aux section of your console. It's usually best to turn the master aux send up completely (effectively eliminating it from the chain) and use channel aux sends as effects levels.

If you're routing more than one track to a single processor, it's a good idea to solo the master aux send to make sure that nothing is clipping at the aux output. Once you've done that, adjust the input on the processor so that it is just below the clip level. Do the same thing at the output stage of the processor and also at the console input section where you are returning the effects. Be sure to solo the effects return channels to check for clipping.

Most multi-effects processors offer a wet/dry mix control so that live performers can control the effect level when running the processor in-line. In a studio, however, it's usually best to set this control to 100-percent wet, as you'll be using discrete console levels to control the wet/dry relationship. Whatever you do, *don't* use the mix control as a bypass. Audio sent through the unit—even when the processing is "dry" or disengaged—causes a slight delay in the signal as it passes through the circuitry. When this delayed signal meets up with the original, the result will probably be an out-of-phase signal. Most processors offer a dedicated bypass mode that you should use instead, because it routes the audio directly from the input to the output without going through the processing engine.

PROCESSING THE PROCESSING

Parametric and graphic EQs can be very useful tools for changing the character of an effect. This is particularly true with reverb. For example, adding low-frequency energy to the processed sound can make the acoustic space seem larger. Also, if you're working with an inexpensive reverb processor, you'll often find that the high frequencies it generates sound artificial. By filtering them out, you produce a more realistic ambient sound.

You can also use EQ to tailor the tonality of an effect so that it sits better with the source track. For example, vocals tend to have a big midrange presence. If you filter out the mid frequencies of an effect, the dry vocal track won't have to dynamically compete with the processed signal.

Dynamics processors are also often used to articulate, fatten up, or gate a processed signal. Often, compressing the decay of a reverb can give it more body. Compressors can also be used on flanging, phasing, and chorusing to enhance the effects.

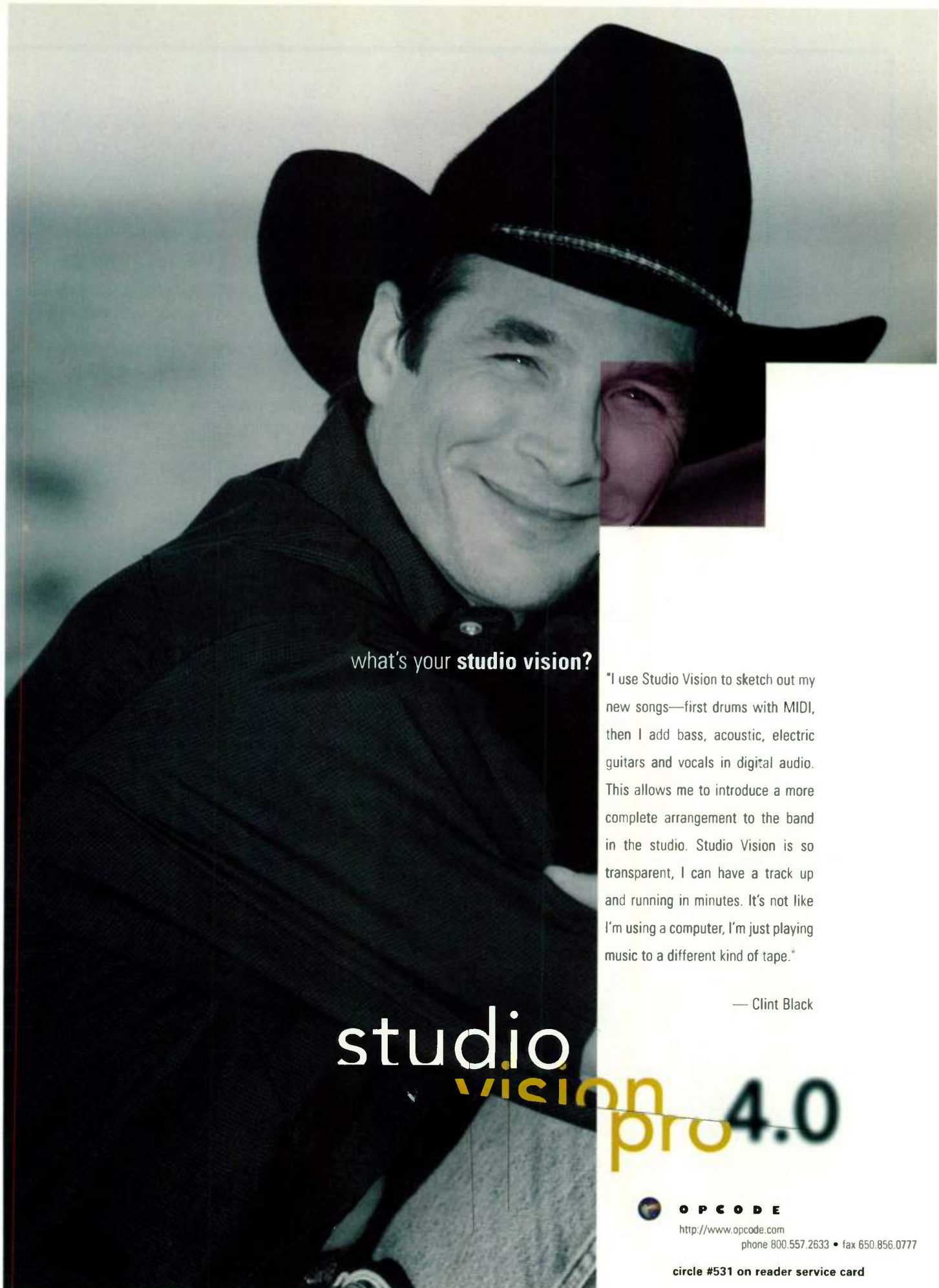
Gates are commonly employed on reverbs, particularly on tracks with a steady beat (e.g., kick and snare drum). Drums almost always sound great with large reverbs, but a long decay can be problematic if it carries over onto subsequent beats. Gating the effect lets you use a big room or hall reverb without the decay carrying over. This approach gives the illusion of a large space but doesn't muddy the track. Although many processors offer preset gated reverb patches, I prefer to work with outboard dynamics processors, as they offer more control and, often, a cleaner gate.

BREAK THE CHAINS!

As we've seen, digital effects processors are extremely powerful tools in the mix engineer's creative arsenal. The best way to advance your mastery of those processors, of course, is hands-on experience. Don't be shy about turning knobs, pushing buttons, and scrolling through menus. Read your manuals, too—they can be a great source of information. Most importantly, listen closely as you experiment so you can get accustomed to the various types of effects and their respective parameters.

Hopefully, the guidelines offered here will get you up and running with digital effects. Bear in mind, though, that this is not, by any means, the final word on effects processing. In fact, there *is* no final word. After you get a handle on the general rules for using digital effects, don't be afraid to *break* them. That may be necessary to achieve the sound you want.

EM *Associate Editor* **Jeff Casey** *takes advice on effects processing with a grain of salt. He has been known to pitch shift a tambourine.*



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If you knew Suzie

By Rob Shrock

One of the wonders of being a musician is the potential anonymity. Rock stars get celebrity treatment, but many other music practitioners—be they composers, arrangers, instrumentalists, or what have you—enjoy highly successful careers yet are not widely known outside their respective fields. Such is the case with musician, composer, arranger, and conductor Suzie Katayama.

You might not recoginize her name, but orchestrator, musician, and conductor Suzie Katayama is one of the busiest multitaskers in the music business.

The fact is, you have probably heard some of Katayama's work and not even known it. Perhaps you caught her orchestral arrangements for Alanis Morissette, Seal, Michael Jackson, or the Brand New Heavies. Or maybe you heard her movie cues in *Mrs. Winterbourne* (Patrick Doyle, composer) or *Austin Powers, International Man Of Mystery* (George S. Clinton, composer). Perhaps you've even seen her playing cello or conducting behind Seal *(MTV Unplugged)*, Prince (the "Raspberry Beret" video and several recordings), Madonna and Babyface *(American Music Awards)*, or Portishead *(Saturday Night Live)*.

I first met Suzie some twelve years ago while we were both playing with Dionne Warwick. I noticed how well she played cello; she heard me crash and burn while attempting to play the harmonica on "That's What Friends Are For." We had a good laugh after the rehearsal and have been friends ever since. (I immediately retired the harmonica after sampling it.)

As humble and low-key as she is, Katayama can't help but stand out. If you have ever seen her perform or conduct, you will never forget the experience. Not only is she a wonderful arranger and player, but she is also a brilliant conductor. And she does more than just write and play music; she *feels* it. And that, in turn, makes you feel it.

Katayama and I met recently at her house in Los Angeles for an afternoon of shop talk. It was the day after a long night's recording session of Katayama's string arrangements for singer-songwriter Jason Faulkner—and the day before the *American Music Awards*, where Katayama was scheduled to play cello behind Michael Bolton.

What is your background?

I was born and raised in Los Angeles. In junior high, I started taking Berklee School of Music correspondence courses and eventually took summer courses there in Boston. My father liked jazz. That, and living in L.A. with all the film music, exposed me to a wide variety of music at a pretty early age.

Who were your early influences?

I was into classical music that had a rock edge. While in grammar school, I loved Stravinsky, Jerry Goldsmith, and Leonard Bernstein. Later, I got into Darnell Persing, Bernard Hermann, Alex North, and Clare Fischer. I didn't start studying cello until I was in college but played "at it" in high school. I studied orchestration under a wonderful man named Les Taylor, and I took some cello lessons with Ingolf Dahl.

Burt Bacharach once told me you were quite a virtuoso at the accordion when you were a kid.

[*Laughs.*] My dad actually drove me to Burt's house one day when I was thirteen. Burt had heard about me and wanted to hear me play. Small world, huh? I do still play accordion on record dates.

In addition to arranging and playing, you also own a music-copying office. Has being involved on so many levels of the music industry helped open doors for you?

Well, so much of it is about being in the right place at the right time and meeting the right people. For instance, on the *Mrs. Winterbourne* movie, I was just the music librarian for the film dates. Patrick Doyle was the composer and Larry Ashmore was the orchestrator—and both are brilliant! On the last day of recording, Patrick told me that he would like to give a gift to the director and asked if I would write a simple cue of the main theme. The entire theme wasn't available as a separate short piece anywhere in the score, and he wanted me to write one before the date was over. "What about the orchestrator?" I asked. Patrick said to me, "He's busy in the booth right now. Can you do it?"

I had only a half hour at most to write the cue because the copyists needed time to copy it before the recording date ended. I rushed over to my copying office, called everyone in, and started frantically writing for piano and strings and handing pages off to be copied. I flew back to the scoring stage and the piece was recorded in two takes. The producer was there and later they asked if they could use my cue for the closing credits to the movie. All I could say was, "It's your movie!"

Have you learned a lot from other arrangers over the years?

Sure. I think Jeremy Lubbock, Paul Buckmaster, Clare Fischer, and Johnny Mandel are master arrangers. For what they do, nobody can touch them. There are so many other great arrangers, too, such as Bill Ross, Dori Caymmi, and, of course, the old vanguard: Marty Paich, Robert Farnon, Michel Legrand, and Hank Mancini.

What are some of the things you like about their writing?

Jeremy Lubbock's harmonic construction is some of the best I've heard. He's also a keyboard player, so his knowledge of chords and voicings is vast. He can really push the harmony and voicings to their limits within the context of the music and just sound so right.

Paul Buckmaster has a great sense of time and space. He knows exactly where to swell, drop out, move, or be still. I remember hearing Carly Simon's "You're So Vain" when I was a kid and loving how the strings copped the whole rhythmic feel of the band. I didn't know it was Paul at the time. Also, his early work with Elton John was brilliant. He was only a kid himself when he was writing for Elton.

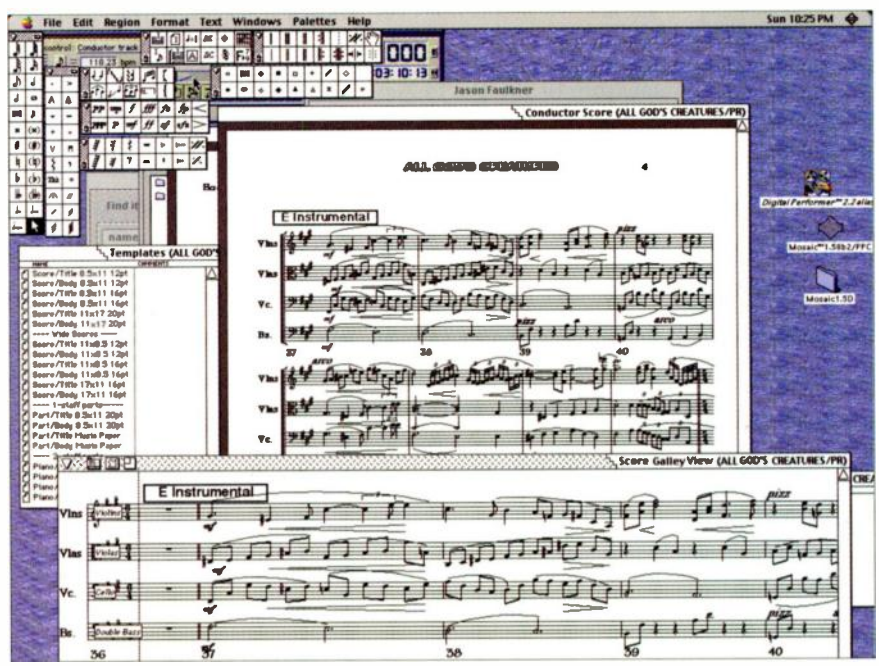

FIG. 1: This MOTU *Mosaic* screen shot illustrates a "right-handed," or linear-style, arrangement of Jason Faulkner's "All God's Creatures." Notice the rhythmic and melodic independence of each line.

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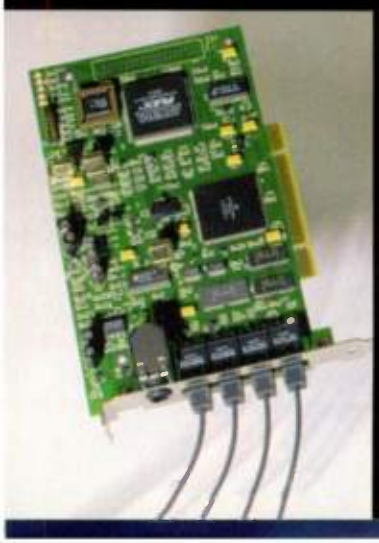

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Smaller sections can sometimes be a challenge to work with. What is your typical section?

It depends. I will use four to eight violins, sometimes two or three violas, and two to four celli. If there's enough money, I'll double everything if I can. Of course, bigger is better a lot of times. Sometimes I'll use a bass or two. It really depends on the situation.

I try to pay close attention to the number of players I have on each part. For instance, two cellos sound fine together, but sometimes I don't like the sound of two violins playing the same part. With a single player, or three or four violins, it works better. So when I'm dividing parts in an arrangement with a small section, I keep in mind whether or not I will get to double the players. That will dictate how I divide sections in an arrangement a lot of the time because the end number of players will be greater.

If I know the players I'm using on a recording date, then I'm not as concerned, because I can more easily make adjustments and balance the musicians' performances. But if it's an arrangement for a live act, I am much more careful about how the chart will translate to an average group of players.

With electronics and samples, however, size considerations are somewhat diminished because you can correct timing and envelopes to make everything sound right. Also, you can mix in some electronics to fatten up a small section, if necessary.

Have you had success combining electronics with live musicians?

Yes, but not at first. I had a bit of an aversion to it. With electronics, I miss hearing the overtones. I can hear the top end getting knocked off. It really bothered me when the Alesis ADATs first came out because I could hear the loss. But I thought there was some improvement when the TASCAM DA-88s showed up. I especially hear the high-end loss in string sample libraries. Of course, all of these sources are a lot better nowadays.

Paul [Buckmaster] told me to stop treating electronics like they're an enemy and instead to think of them as a friend. So I started, by accident, building a home studio.

One of the first electronic projects I did combined samples and synths with a small augmentation of live players. It was an arrangement based on a Boston Pops–type piece, with a full symphonic orchestra and a choir! I had Phillip Ingram [James Ingram's brother] sing the solo on it. After spending about a day on the arrangement, I started sequencing the electronics. To my ear, the string samples were out of tune, so I asked the producer/engineer to work with me to retune the samples. It eventually sounded great, and I was sold on the whole process.

Does combining equal-tempered samples with live players bother your ear?

No. I guess I've been lucky that the players I use are good at matching pitch references. Also, getting used to samples affects how you hear real orchestras. I notice this a lot now. Sometimes you want real sections to sound like your MIDI mock-up instead of vice-versa!

Has working a lot with samples affected your writing?

No, not as long as I bear in mind the idiosyncrasies of the orchestra. When I write on paper first—which I do probably 80 percent of the time—I make fewer mistakes. When I sequence as I arrange, I make more mistakes—like stretching the range of an instrument too far into an uncomfortable register or overlooking an instrument's unique characteristics. If the arrangement is for a live date, that can be bad. You get used to the electronics and things can get sloppy. When everything goes right, the electronics are your best friend—but when things goes wrong, they become your worst enemy.

So you do use mock-ups?

Yes, sometimes. It's much faster to write an arrangement on paper and have a real orchestra record it than to do a mock-up, because it takes a lot of time

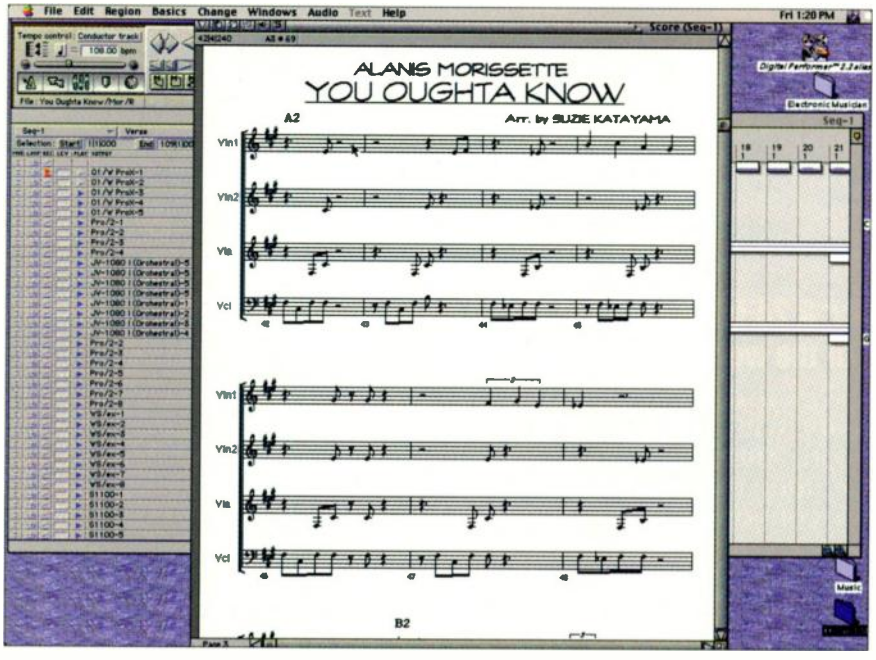


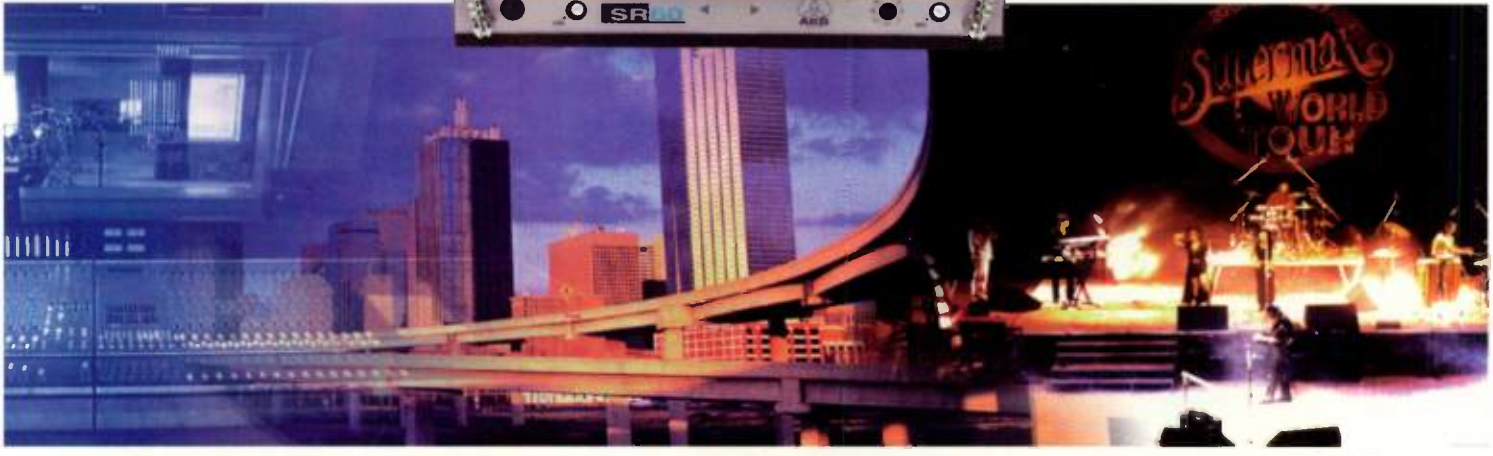
FIG. 3: To compose the string arrangement for Alanis Morissette's *Grammy* performance of "You Oughta Know," Katayama transferred the recorded version of the song into *Digital Performer* and wrote the string arrangement to the audio. The pizzicato strike in bar 46 and other articulations were notated later in *Mosaic*.

AFTER BECOMING A LEGEND IN THE STUDIO, WE´VE HIT THE ROAD.

WMS 60 VHF

Singers, guitar players, lecturers, clergy, in fact anybody who is standing in front of an audience, are discovering what top studio musicians, engineers, and producers have known for years: AKG, a leader in studio microphone and headphone technology for more than 50 years, now offers its amazing sound quality in affordable wireless systems. That´s because AKG has gone on the road with its new wireless system, the WMS 60.

The WMS 60 is a VHF system that offers microcontrolled antenna diversity for superior selectivity and reception. Available in handheld, portable bodypack and instrument configurations, its standard features include an LED battery strength indicator, an output volume control and adjustable squelch to eliminate interference. Best of all, the WMS 60 offers the most user friendly frequency selector for operating multiple interference free systems. So before you appear in front of an audience again, remember AKG studio quality wireless systems are priced light enough to carry on the road.



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to electronically build in all the nuances that an orchestra can do immediately. In the end, though, doing a mock-up probably saves time, especially if you have artists who don't read well. I'm not proficient enough on keyboard to play the whole arrangement "live," so doing a mock-up is helpful because it allows everyone to hear how the arrangement/orchestration is supposed to go.

Sometimes you'll have a great arranger, a great arrangement, good players, etc., yet the results are not what the artist, producer, or film director wants. Suddenly, everything stops. The writer is going through grief, and there's a lot of stress involved. That's where a mock-up really would have come in handy. Electronics have alleviated some of the pressures of going into a studio with real musicians when time is limited, because the producer or artist already knows what to expect.

John Debney, George S. Clinton, Paul Buckmaster, and Danny Elfman all do mock-ups brilliantly for their scores. If the producer or film director can hear something played back against picture, maybe he'll say, "I was hoping for less space in this section," or "I want something rubbing against it," or "I hear something more blue." [*Laughs.*] And it's better to know ahead of time than to find out on the scoring stage with the clock running.

But it does take more time to create a mock-up. In a way, the extra time should be included in your fees, but sometimes it isn't. If a writer is writing an arrangement and no one is going to hear it ahead of time, that's one thing. But it's quite another if you're going to spend six or seven extra hours making a mock-up. After all, the mock-up has to sound fairly decent or else they aren't going to buy it.

This issue came up recently with both Seal and Jason Faulkner. For Seal's *MTV Unplugged* show, there was one tune in particular that had some celli droning notes with bends in them, but the bends weren't there in the mock-up. I was using my MIDI mock-up in [MOTU's] *Digital Performer* (see **Fig. 2**) to also create my parts in [MOTU's] *Mosaic*, so I left out the bends in the sequence for the sake of better notation translation later. When Seal heard the mock-up, he said he wasn't sure if it would work until after he heard it with real musicians. But he wasn't hearing the bends, of course, which is what made the piece work.

A lot of times, the more nuance you put into your MIDI sequence, the less usable the sequence is for creating notation. It's always a balancing act between time and artistic imagination on everyone's part.

Normally, I'm not fond of mixing sequencing and notation programs, but I'm having great luck with *Digital Performer* and *Mosaic*. On the Jason Faulkner sessions, I imported my *Performer* mock-ups into *Mosaic*. The only thing I had to do to clean it up was put in dynamics, articulations, and phrasing. *Mosaic* is really smart at creating scores from MIDI files and extracting parts. At my copying office, we mainly use [Coda's] *Finale*, but for importing MIDI mock-ups, *Performer* and *Mosaic* can't be beat.

What I normally do—and did for Seal, Alanis Morissette, and Jason Faulkner—is have a DAT of either the rehearsal or the rhythm tracks sent over. I fly this into *Digital Performer*, align the bars and beats, and then I write and sequence my arrangement to the audio (see **Fig. 3**). I then have a mock-up of the arrangement for approval while being almost done with the copying at the same time. Of course, this approach might end up putting my copyists out of work!

As far as arranging goes, does hearing sampled sounds against the audio affect your sense of what will or won't work?
Sometimes it does, but not too much. Like I said, I write probably 80 percent on paper first. That keeps me more in the place of writing what I know will work rather than what just happens to sound good or bad based on a particular sample.

I remember that when Clare Fischer was arranging for Prince, Clare wanted to see every little nuance of the rhythm

Suzie Katayama

tion said he didn't like the sound of "high, scratchy violins." That was all I needed to hear. The main thing on the Seal arrangements was to listen to what the band was doing on the rehearsal DAT tape and fit in without stepping on what was going on. A cello has an incredibly useful range with a lot of control of color, so it makes a great instrument for both blending and cutting through. The eight celli worked really well.

What did you use on Alanis Morissette's *Grammy* performance of "You Oughta Know"?

That was a traditional string quartet: two violins, a viola, and a cello. Glen Ballard was playing piano right next to Alanis's rhythm section. The *Grammy* performance was very sensitive and exposed—quite different from the record. There were opportunities to respond to Alanis's emotion and lyrical content, for example, with the pizzicato strike after the line "It was a slap in the face." The strings helped convey the mood of the lyrics by either propelling the motion forward—as in the prechorus—or by digging in angrily and rhythmically during the chorus. I really liked that one.

section transcribed on paper, but he didn't want to actually hear the multitracked rhythm section until the recording date.

I forgot that you worked on some of those transcriptions. Clare is amazing, isn't he? He is a perfect example of knowing, on paper, what will work and what won't. If you're not experienced with real orchestras, listening to samples all the time can mess you up. You see this occasionally with young film composers who grew up on keyboards. If your orchestration chops aren't really there, it shows. Whether it's a cello, trombone, keyboard, guitar, or even a sample library, you need to learn the instrument's strengths and limitations and keep them in mind while writing. Otherwise, you're more likely to write something mediocre—or be prevented from writing something really creative.

On Seal's *MTV Unplugged*, you used an unconventional section of eight celli—that was it. No violas, no violins. How did that come about?

Someone high up in Seal's organiza-

What is your next project?

I'm going to London to conduct a string orchestra behind Madonna. She's doing some TV appearances to promote *Ray of Light*. After that, it looks like I'll be out on tour with Eric Clapton for his *Pilgrim* tour. I feel really fortunate for the jobs I get called to do. You know, being a girl, I never thought I'd have the opportunity to be doing any of this.

Composer and producer **Rob Shrock** *is the musical director for Burt Bacharach. He is currently writing symphonic orchestrations for Bacharach's live show. He has worked with Dionne Warwick, LeAnn Rimes, Al Jarreau, and a host of others.*

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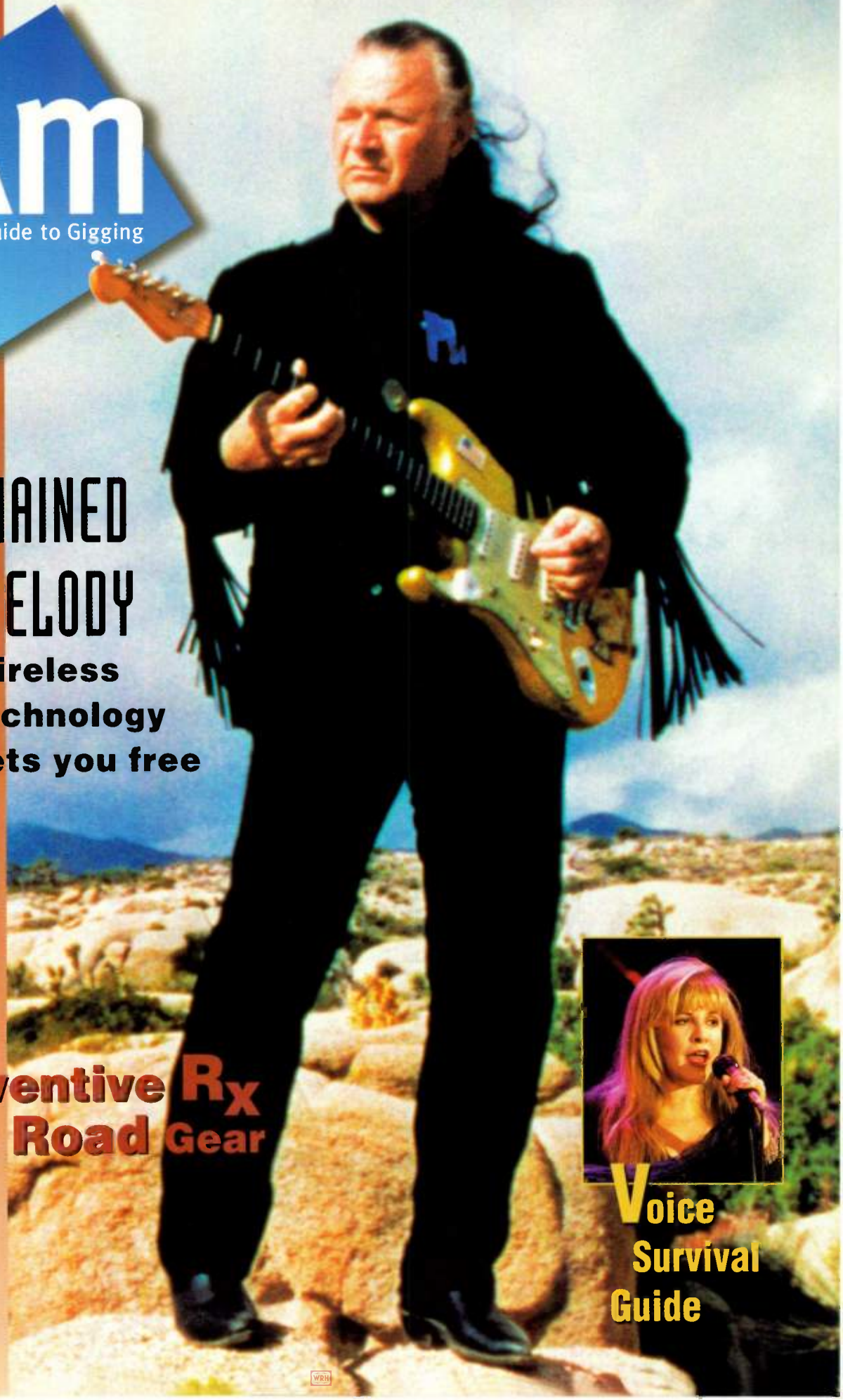

Unchained Melody

Wireless technology sets you free

Preventive Rx for Road Gear

Voice Survival Guide

Opener

In the June "Opener" column, I noted that *JAM* was undergoing significant changes, and I promised additional changes in the August issue. With this issue, the new shape of *JAM* is becoming clear, and it seems an appropriate time to discuss more specifically where it's going.

JAM was founded as a quarterly supplement because a large percentage of **EM** readers perform live. We began by running a "Headliner" feature and seven short, instrument-specific columns in each issue. Then, when *JAM* went bimonthly in 1998, we did away with the feature story and unified the columns around broader themes—soloing in February, warm-up routines in April, and tuning in June.

Even though it was still a theme-based issue, the June 1998 edition was the beginning of a larger transformation. To start with, we reintroduced the "Headliner" feature. We also launched "Tools," a new-products column for electronic musicians who perform live. At last, *JAM* began to cover broader topics and introduce products for live performance—but it was just a beginning.

To make room for more in-depth coverage, the "Keys," "Bang," and "Bottom" columns were sacrificed. Instead, the scope of "Riffs" has been broadened to cover topics of interest to a wide assortment of instrumentalists, which will change each month. "Vox" and "House" remain, providing tips for singers and sound techs, respectively. However, both columns won't necessarily appear in every *JAM;* for instance, "House" is absent this issue but will return in October. We will still run Bean's popular "Tech" column periodically, and her articles will sometimes appear in the form of **EM** feature stories. Eventually, we will add short field tests (product reviews) to round out *JAM*'s product coverage.

The revised *JAM* is designed to deliver information about live-performance applications of music technology, just as **EM** delivers personal-studio applications. The transitional June issue took a step toward this, and the August issue fully embraces our new direction. Don't get me wrong; sometimes our columns—especially "Vox"—will still discuss nontechnical issues. But this month's "Headliner" is a harbinger: an overview of wireless technology that should be of interest to anyone who performs live.

One more bit of news: this will be the last "Opener" column. Why? Because *JAM* is an integrated supplement to *Electronic Musician,* not a magazine within a magazine. The same staff that edits **EM** now edits *JAM;* there are no special *JAM* editors. So in the future, I will comment on *JAM* in the "Front Page," where I discuss what's going on in the rest of the magazine.

I believe that these changes will result in a live-performance supplement that delivers the type of information you want, just as **EM** serves your recording needs. Please write (emeditorial@intertec.com) and let us know what you think.

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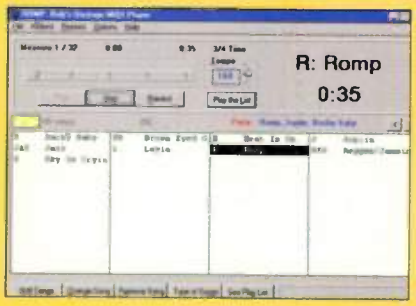
tools

By Rick Weldon



Time Hawk ROMP

It's becoming more common for performers to tote laptops along with their other instruments to gigs. PC-based musicians who want to cue up tunes quickly and easily from the stage should take a look at *Rob's Onstage MIDI Player (ROMP)* for Windows 3.1 and 95 ($39), available for download from the Time Hawk Web site. The inexpensive MIDI song organizer, patterned after Dr. T's *KCS,* includes adjustable tempo, MIDI file management, and selectable delay time between songs. A large countdown timer is provided for easy viewing from the stage, and the program can be navigated by mouse or keyboard.

Users can organize songs by type within the program, and a Quick Playlist feature lets you load numerous songs simultaneously. Songs can either be programmed to start automatically or be selected and started with a single keystroke. Reports can be generated to aid in song selection. In addition, Time Hawk offers "free upgrades forever" on the product. Time Hawk, tel. (800) 257-5503; e-mail rob@timehawk.com; Web www.timehawk.com.

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Studiomaster Club DSP

The Studiomaster Club DSP ($629.95) is an 8-channel, live-sound mixer with built-in digital effects processing. The six mono mic/line channel inputs have both balanced, XLR and balanced, ¼-inch jacks with onboard mic preamps, trim pots, and 48V phantom power. The 3-band EQ includes a low-frequency band set at 60 Hz, a high band set at 12 kHz, and a sweepable mid band (350 Hz to 6 kHz). All three bands offer 15 dB of boost/cut.

The two stereo channels each have two balanced, ¼-inch inputs that operate at +4 dBu or -10 dBV (switchable). These channels have 2-band EQ, fixed at 45 Hz and 12 kHz, with 15 dB of boost/cut. All channels have one prefader and one postfader aux send. Aux 1, which is postfader, is routed to the onboard effects processor and also to a ¼-inch output. All channels also have pan controls, 60 mm faders, and prefader listen (PFL). Each channel is on its own circuit board, so they can each be removed for individual servicing.

The 16-bit digital effects processor has 79 effects algorithms, including room, plate, gate, and reverse reverbs; multitap delays; and more, with control over the amount of each effect. You can assign your four favorite effects to dedicated buttons. A dedicated fader for the effects-return level and a footswitch jack for effects bypass are included.

Main outputs are on balanced, ¼-inch jacks. You also get a set of RCA ins and outs for connection to a tape deck. Aux sends and stereo aux returns are on ¼-inch jacks with individual level controls (switchable pre- or postfader), and there are 12-segment L/R level meters. Frequency response is rated at 10 Hz to 50 kHz (+0/-1 dB), mic EIN at -129 dBu (150Ω source), THD at 0.004% (at 30 dB gain), and S/N ratio at 84 dB (one fader at 0 dB, minimum gain, EQ flat). Crosstalk is listed as -81 dB @ 1 kHz. Studiomaster, Inc.; tel. (714) 524-2227; fax (714) 524-5096; e-mail sdmaster@studiomaster.com; Web www.studiomaster.com.

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EAW LA Series

The latest in Eastern Acoustic Works Linear Activation Series is the LA460 ($2,634), a 3-way, full-range loudspeaker consisting of a 15-inch woofer (in a vented subenclosure); a horn-loaded, 8-inch midrange cone; and a 1.4-inch compression driver on a 60 x 45-degree constant-directivity horn. The midrange speaker is designed to extend pattern control through the midrange frequencies for maximum vocal intelligibility.

The LA460's powering mode can be switched between passive (with a 3-way crossover) or biamplified (with a passive low/mid crossover and an active crossover for the highs). The loudspeaker delivers 500W of power. Full-range peak output is 130 dB SPL (@ 1m), and impedance is 8Ω for either passive or biamped modes.

Housed in a trapezoidal enclosure with a 10-degree angle on each side, the LA460 weighs in at 114 pounds. It is constructed of 15 mm, cross-grain laminated birch plywood, and there are three 3-position flytracks for use in hanging systems. Frequency response is rated at 62 Hz to 20 kHz (± 3 dB, 1W @ 1m). Input is on Neutrik NL4 Speakon connectors. Eastern Acoustic Works; tel. (800) 992-5013 or (508) 234-6158; fax (508) 234-8251; e-mail info@eaw.com; Web www.eaw.com.

Circle #420 on Reader Service Card

➢ Shure PSM 600

Shure's PSM 600-series stereo in-ear monitors are available in wired ($840) or wireless ($1,590) form. Each system can be used in mono, stereo, or the company's own MixMode setting. In MixMode (a 2-channel, mono configuration), the user chooses which signal is assigned to each channel and adjusts the relative levels. For instance, you could have the mono band mix on one channel and your instrument on the other, so that you could balance your instrument's monitor level relative to the band mix.

The P6HW wired receiver comes with a 12-foot input cable (5-pin to two female XLR connectors) and runs on a 9V battery. It has a frequency response rated at 20 Hz to 20 kHz, a THD of 0.18 (typical), and an S/N ratio of 85 dB. A 15 dB pad, stereo/MixMode switch, high-frequency boost, limiter, 5-pin cable jack, and ⅛-inch TRS earpiece jack are also on the receiver.

The P6TRE1 UHF wireless system consists of the P6T half-rackspace transmitter and P6R receiver. It has a range of up to 300 feet and offers two transmission frequencies. The system's frequency response is rated at 50 Hz to 15 kHz, THD at 0.8%, and S/N at 80 dB. On the receiver are stereo/MixMode, high-frequency boost, and limiter switches; a 5-pin cable jack; and an ⅛-inch TRS earpiece jack. Input to the transmitter is on two Neutrik ¼-inch/XLR combo connectors, and there is an effects loop on two unbalanced, ¼-inch connectors. The unit operates at -10 dBV or +4 dBu (switchable).

Both the P6HW and P6TRE1 come with a set of E1 earpieces that are configured as a tube surrounded by a replaceable foam tip (six pairs of tips come with a system). Through a deal with Ultimate Ears/Westone, the E1s can be converted to permanent, custom ear molds for approximately $80. The earpieces have a sensitivity of 114 dB SPL/mW. Shure Brothers, Inc.; tel. (847) 866-2200; fax (847) 866-2279; Web www.shure.com.

Circle #421 on Reader Service Card

➢ MiniFlex Innovations Microphones

There will always be the odd musician who has to hear his mandolin drenched in effects and screaming at full rock volume. The majority of performers who play acoustic stringed instruments, however, are content if the entire audience is able to hear the music at a comfortable level. Beyond that, many of these folks want the most natural reproduction of their instrument possible. Because pickups simply convert the mechanical motion of the vibrating strings (or, in the case of piezo pickups, a vibrating bridge) into electrical energy, some players feel this form of amplification lacks the ability to convey the complex sonics created by an acoustic instrument. For them, MiniFlex and Soundhole mics ($99.50 to $325) from MiniFlex Innovations may be the way to go.

The mics come in various forms, including uni- or omnidirectional, battery or 48V phantom powered, and with or without volume control. They're appropriate for classical and acoustic guitars, banjos, Dobros, violins, harps, mandolins, and hand drums.

The mics come in different styles. The internal MiniFlex models have a high-impedance mic element mounted on a flexible gooseneck that is attached to a ½-inch-diameter cylinder, which houses a power supply and ¼-inch jack. The entire assembly runs through the instrument body and acts as the endpin. On the Soundhole version, the gooseneck attaches to a power pack that can be secured to the outside of the guitar using an adhesive designed to avoid marring the instrument's finish. Still other versions use clips for attachment. There are stereo options with most models for combining MiniFlex and pickup signals.

Frequency response is rated at 80 Hz to 20 kHz for the omnidirectional mics, 50 Hz to 16 kHz or 80 Hz to 16 kHz for the cardioid, and 20 Hz to 20 kHz for hypercardioid. MiniFlex Innovations; tel. (800) 585-7659 or (530) 893-4845; fax (530) 893-4845; e-mail sales@miniflexmics.com; Web www.miniflexmics.com. ◆

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SIGNALS IN THE

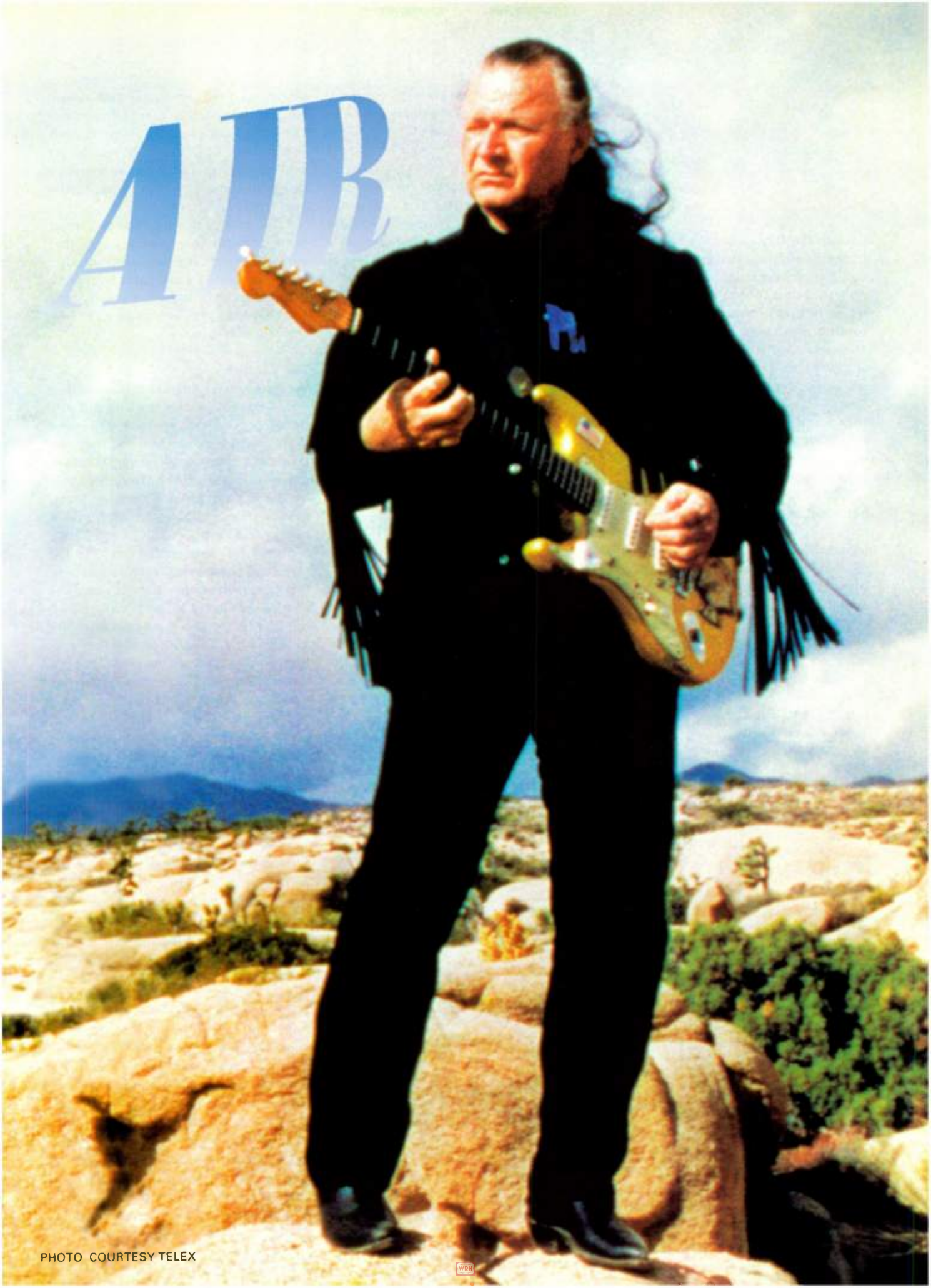
Do you remember that cartoon dog who chased the cat every episode only to get pulled up short by his leash just as he was about to go in for the kill? Even if you laughed, didn't you feel a little sorry for him? As performers, we can all relate; we're on pretty short leashes ourselves with the cables that connect us to our equipment. Cables keep us close to our amps, they clutter the stage, they get tangled up and wrapped around mic stands and band members, and, if someone spills beer on your amp, they can kill you. So why do we put up with them? Well, lots of reasons.

Set yourself free from the hassles of cabling with a wireless stage system!

For starters, cables are dependable. They're also the world's easiest piece of gear to troubleshoot, and you can always find a spare. But most importantly, they're standardized, which is a rarity in our industry. That's why we like them.

But musicians are never satisfied. Despite all the reasons we depend on cables, we still want the freedom to move around on stage. We won't be tied down! Even though we all complain about the restraints of cabling, very few of us are using the alternative: wireless stage systems. Why is that? Well, lots of reasons.

By Matt Blackett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Back in the Day

In the beginning, it was probably the cost that prevented many players from going wireless (not to mention our collective distrust of new things). Then, only touring pros could afford the systems. These days, price is no longer an issue with wireless gear. Several manufacturers—including Nady, Samson, Shure, and Telex—offer entry-level systems for less than you'd pay for a low-end condenser mic. Even so, it's still relatively uncommon to see them in use by musicians who haven't reached star status.

Rightly or wrongly, many musicians believe that wireless systems color the tone of a signal. Whether it's a vocal or (heaven forbid) a guitar tone, we all tend to be reluctant about messing with our sound. Guitarists are particularly quirky about this. We'll gladly plug into a dozen vintage stomp boxes, but we sanctimoniously steer clear of wireless systems because we think they "change the tone."

In addition, many musicians are leery of the interference that is commonly associated with wireless systems, although, as you'll soon see, this is an unwarranted fear. Perhaps a better understanding of wireless technology would help us liberate ourselves from the constraints of cabling.

What It Is

A wireless system consists of two components: a transmitter and a receiver. The transmitter uses frequency modulation (FM) to broadcast the signal from a microphone or guitar into the air, much like an FM radio station. Any receiver within the broadcast range that is tuned to the same frequency grabs this signal and converts it back into its original form. The signal can then be amplified to project the music or speech we hear. (For a list of resources about the inner workings of wireless technology, see the "Further Reading" sidebar.)

The VHF wireless system seemed a little more pleasant sounding than the UHF model.

When musicians use wireless sound systems, they become miniature radio stations, each with a unique channel (frequency). Any time you send anything over the airwaves, the Federal Communications Commission (FCC) gets involved. The FCC places limits on broadcast power and assigns frequencies specifically for wireless systems; it is illegal to use a frequency not licensed for such systems. (If you do get busted, you'll probably end up sharing a cell with some guy who removed the tags from his mattress.)

I wouldn't be overly concerned about getting caught; with the low power that wireless systems use, you won't be jamming any local TV broadcasts. But the TV broadcasts can certainly jam your system, and that is why it's important to choose the proper frequency.

VHF vs. UHF

Wireless systems operate at many different frequencies within the VHF and UHF bands. UHF systems are more expensive than their VHF counterparts. They can transmit with greater power, but they often have a shorter battery life. UHF units also boast a slightly greater transmission range, but for club gigs, that is really not an issue.

The VHF band extends from 30 to 300 MHz, and wireless units that operate in this range share airspace with cordless phones, walkie-talkies, and TV channels 2 through 13. The UHF band goes from 300 to 3,000 MHz. The UHF part of the spectrum is less cluttered than VHF, but it's steadily becoming more crowded thanks to the cell-phone boom.

The more crowded the spectrum, the greater the likelihood of radio-frequency (RF) interference. This interference is generally in the form of noise or a degraded signal, and it has always been one of the main reasons people avoid wireless systems. Practically speaking, however, these problems don't come up all that often. That's not to say that interference doesn't exist, but we needn't live in fear of it.

This Channel Ain't Big Enough

One sure-fire way to experience interference is to have more than one wireless setup tuned to the same frequency. This will definitely render your system unusable, so you need to coordinate your frequencies ahead of time. If everyone in the band is on a different channel, and none of those channels are being used by a local broadcaster, you will have no problem.

But suppose you travel to a different town. The frequencies that were free at home might be used in the next city. Is this the trade-off? Instead of being tied to your amp, are you now

High-band VHF systems, such as the Nady Silver Series, offer great performance at a fraction of the cost of UHF models.

IMAGINE THE POSSIBILITIES


A


B


C


D


E

F

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A: Z-726 double tier "Z" stand with Z-728 boom and Z-732 music holder and QL-400 locator stand **B:** ZM-WS44* mixer workstation – 44" wide (*available in 34" width) **C:** QL-746 super heavy-duty "X" stand with QLX-2 second tier, QLX-3 third tier, QLX-4 boom, and QLX-5 music holder **D:** Z-WS71L keyboard workstation with Z-730 locator option (holding mixer) **E:** RS-954 20 space rack stand **F:** BS-317 low amp stand

tied to your hometown? Once you select your frequency, are you stuck with it? The answer to all these questions is definitely not.

Multichannel Systems

Wireless systems are available in single- and multichannel models. Multichannel systems can operate at different frequencies, which can save you headaches when you're going from town to town. If you're getting interference with one channel, you can simply select another.

But what if your new channel is the same as your singer's or your bassist's? For a band using three or more wireless setups and playing in various towns, the potential for interference problems multiplies at an alarming rate. To help with this, most major manufacturers can provide you with a channel plan.

But here's the good news: this is only a *potential* problem that doesn't actually crop up all that often in the real world. According to friends of mine who play every state fair, casino, and airport gig they can get and use several wireless setups at once, interference problems almost never come up; maybe once in every hundred gigs. Broken strings and bad cables may still be problems for wireless users, but interference isn't really a big issue.

For those worried about interference, multichannel units are a must. The Telex USR-100 features 100 different channels, making it a great choice for touring musicians.

Diversity Training

When testing a wireless system, everyone seems to perform the same ritual: they take the transmitter about 300 feet away from the receiver to see if it still operates. Most systems work fine at this range if there are no obstructions, but this test only makes sense if the receiver will be located at the house mixing station, as with a wireless mic. If the receiver is attached to your stage amplifier, you probably don't need such a large active range (also called a service area). Furthermore, if you got that far away from your bandmates, you'd be playing to a delayed sound, and your performance would be out of sync with them. It's much better to test the system within your realistic performance area.

At any rate, a wireless system's active range is reduced by any obstruction in

Wireless Goes Digital

Until recently, microphone and instrument wireless systems were among the few things on the planet that hadn't gone digital. Seeing the digital revolution going on all around them, the people at Xwire decided it was time to get in on the action. They felt that the sound quality in existing systems was inadequate, so they developed the world's first digital wireless unit, the X905.

Xwire uses 20-bit A/D converters in its transmitter to capture a wide enough dynamic range for most voices and instruments. The digital signal is then sent on a UHF frequency. When it gets to the receiver, it meets up with 20-bit D/A converters. But that's not all: the X905's transmitter also stamps a digital signature on the signal, and the receiver rejects any data not containing this signature, thus eliminating outside interference. This is a great idea, and it's only possible with a digital processor.

The unit features Xwire's own Quadiversity technology to guard against dropouts. Four antennas are mounted stealthily under the front panel of the receiver, resulting in two complete diversity systems. The X905 offers five selectable frequencies, and the receiver includes a great display that shows data on channel selection, signal strength, and remaining battery life (typically eleven hours with a fresh set of four AAs).

Because the X905 is a digital unit, there is no need for companding or noise reduction. Xwire is conservative with its active range estimates: 150 to 200 feet is typical, and up to 300 feet is possible with no obstructions. Although this seems to fall short of most analog ranges, it is more than adequate for live-music applications.

Anyone who has seen Xwire's ads knows the company makes some bold claims about the transparency of the X905's sound. When I compared the instrument version of the X905 to a 10-foot guitar cable, the X905 sounded brighter and somewhat thinner to my ears, although the difference was very slight. Xwire offers patch cables with various levels of capacitance to combat this.

Compared to a couple of analog wireless units (one mid-priced VHF and one top-of-the-line UHF), the Xwire unit again sounded brighter and thinner. That's not to say it sounded bad, just different. In my opinion, the issue is not whether something changes the tone but whether it delivers a *good* tone. With some subtle tweaks to the EQ, I had no problem getting a satisfying sound. In fact, after using the Xwire for an hour or so, I found that the cable sounded a little "woolly" in comparison.

Some people who really know their stuff are raving about the X905's sound, and it might very well represent the future of wireless. I really dig all the cool features it throws in for $895, which is not much to ask for cutting-edge, state-of-the-art technology.

the line of sight between the transmitter and receiver. Such obstructions can cause dropouts in which the signal dies out or is momentarily replaced by noise. In addition, reflective surfaces can cause the RF signals to bounce around, and these reflections can arrive at the receiver at different times, creating phase anomalies. To combat this problem, most manufacturers of wireless systems offer models with *diversity*.

Nondiversity systems use a single receiver and antenna to pick up RF signals. If the signal is blocked, you're out of luck until you unblock it. Diversity systems use at least two receivers tuned to the same frequency, each with its own antenna. If one antenna becomes obstructed, the unit switches to the other. As a result, diversity systems can eliminate many common dropout problems.

Yeah, but How Do They Sound?

The biggest gripe with wireless technology is the sound quality, so how do these systems rate in this department? In making that assessment, we need to account for cable impedance and frequency response.

Most guitar pickups exhibit a high impedance that results in a noticeable loss of high frequencies when driving long cables (i.e., over twenty feet), which act as large capacitors. This means that guitars might sound brighter or thinner when used with a wireless system, because the capacitance of the cable is no longer there. You can reduce this brightness by simply connecting the wireless receiver to your amp with a long cable. Slight adjustments to the EQ will help, as well. No, it won't sound exactly like a cable, but the sound will be close enough to use for a gig. Once everyone is playing, the difference in sound quality will be unnoticeable.

Microphones typically have low impedance and don't suffer from high-end rolloff, even when used with longer cables, so they should (theoretically) sound as good over a wireless system as they do with a cable. I recommend that you audition the same mic element in a cordless version and a regular (cabled) model side by side. In particular, listen carefully for slight tonal differences due to the companding (compression/expansion) technology used to reduce noise in most analog wireless systems. Companding

Further Reading

If you really want to get into the nuts and bolts of wireless technology, check out these intense missives on the subject: "Cutting the Cord: Choosing a Wireless System" in the November 1989 issue of EM; "Look, Ma! No Cables: Wireless Systems Applications" in the December 1989 EM; and "The Age of Wireless" in the July 1993 EM.

The *Samson Wireless Installation Guide*, a very informative, unbiased primer on wireless technology, is available from Samson Technologies Corp.; tel. (800) 328-2882; fax (516) 932-3815.

can change the sound or feel of an instrument or mic. If adjusted properly, a compander shouldn't squash or gate the sound. If it does, the unit might need recalibrating, or you might have to try a different model or brand.

VHF vs. UHF II (The Rematch)

We already know that UHF systems are more expensive, but do they really sound better than VHF models? No one can seem to agree on this. One manufacturer's manual claims that UHF units sound slightly better, but another says just the opposite.

In my own tests, the difference between the two types of systems was very subtle, and if anything, the VHF model seemed a little more pleasant sounding. Of course, this could be due to many different factors, but the testing was still very revealing, especially considering the $2,000 difference in price!

The UHF model I tried offers many more features, including a truckload of different frequencies, much sturdier construction, cool indicator LEDs, and a bass boost feature (great for those who think that a wireless system thins out their sound). In the end, though, the single-channel VHF model did not exhibit any more noise than its UHF compatriot and sounded remarkably similar.

Who Gets What

With all this confusion, a couple of recommendations are in order. The first one is a no-brainer: try out as many different systems as you can, both in and out of your price range. Don't just compare them to each other; weigh them against your favorite cable. As suggested earlier, try plugging the receiver into the amp with a long cable and adjust the EQ. If you really think your tone is compromised, keep using your cable. But with a little tweaking, the sound should be pretty similar.

These days, price is no longer an issue with wireless gear.

Next, you need to ask yourself a few questions. For starters, how many wireless setups are you going to use at one time? If the answer is more than one, it makes sense to coordinate the channels ahead of time (and maybe get a discount for buying several setups at once).

How much traveling are you likely to do? If you plan to play in different geographic locations, multichannel units will save you some hassles. This is the reason major touring acts favor UHF systems with dozens of channels.

Think about how large an active range you need. Will you be walking to the back of the auditorium, or are you mainly concerned with not tripping over your cable on stage? This will settle the diversity versus nondiversity issue. Proper antenna placement will eliminate most signal dropouts on stage, so a nondiversity system should work fine for performers who don't move around too much. If you want to run all over the place, a diversity system might be required.

One other question—and it's a biggie—is how much you are willing to spend. After playing with these units for a while, I found that the lower end of the price spectrum sounds pretty darn good. The bottom line? Dollar for dollar, the VHF units rock! Although they lack the bells and whistles of their higher-priced UHF siblings, they deliver the sonic goods at a much lower price. Want to split the difference? A multichannel VHF unit definitely wins the bang-for-the-buck award and also works great in just about any situation.

Over and Out

Wireless systems are not for everyone. If you don't move around on stage, you obviously don't need to spend hundreds of dollars to replace a cable. But if you want to put on any kind of show, it's great to have some room to move without worrying about yanking the kick-drum mic with your cable! Once you go cordless, the singer can walk out front to check the mix during the show (but watch out for feedback!), the guitarist won't get shocked by the vocal mic anymore, and the look of the stage will be cleaned up in a big way (a major bonus for weddings and corporate gigs).

Perhaps that dog in the cartoon would have gotten his prey if his master had equipped him with a wireless electronic fence instead of a clumsy leash. In the words of Austin Powers, it's freedom, baby! Yeah!

Diversity systems, such as the Samson UHF Series One, use two or more receivers. They constantly monitor the incoming signals and choose the strongest one, thus reducing or eliminating dropouts.

Northern California guitarist/instructor ***Matt Blackett*** *has never removed tags from a mattress or gone wireless without a license. He would like to thank Fred Sampson for his assistance in preparing this article.*

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Vox

By Joanna Cazden

Planes, Trains, and Vocal Fatigue

Musician's Log, Tuesday, 7 p.m. Twilight. Drizzle. Been driving all day. Three frustrating hours stuck behind a bad accident put me way behind schedule. Played a vegan coffeehouse last night; tomorrow I have a radio promo and a full-length concert in the back room of a music store.

Pull off the Interstate, fumble for my cellular phone and itinerary. Let my host know I won't make it for supper. Get out to stretch my legs, and then grind down the highway for three or four more hours. But I'll keep the radio turned off for a while and spend some time on vocal maintenance.

Vocalist Stevie Nicks took speech lessons in the 1970s to protect her voice while talking as well as singing on tour.

PHOTO BY STEVE JENNINGS

Traveling is an inevitable part of life for performing artists. But for a singer, grueling days and nights cramped in a car, bus, or airline seat, along with erratic nutrition and lack of sleep, can put the voice itself at risk.

You know the drill. After the first day on the road, you are tired and wired but trying to enjoy yourself. Another day or two and your back is seriously stiff. You ignore it. Within a week, your high notes start to disappear, you sound rough instead of ready, and you're convinced you've caught a sore throat. Most likely you're not sick, just exhausted, and the fatigue is showing up—where else?—in your voice.

So be prepared. Whatever you do at home to protect and strengthen your voice, you'll need extra doses on the road. (See "Vox: Singer's Tune-Up" in the April 1998 *JAM* for specific exercises.) A vocal warm-up tape can be especially helpful for travelers. Some are generic, while others are specifically designed for high or low male or female voices. Look for them at sheet-music or karaoke stores, and use them in your car's tape deck or a portable tape player with headphones. (Don't use headphones while driving, though!)

You can also try the Vocal Function Exercise principles developed by Dr. Joseph Stemple. Sing very quiet, long, single tones on the vowels "ah," "ee," and "oo," staying in your midrange and keeping each note smooth and consistent throughout the length of a full breath. Then, slide through your entire range a few times, from bottom to top and back again. Stemple has clearly demonstrated that sustaining a quiet tone actually engages more of the vocal muscles than a sudden or loud sound, thus providing a more thorough, efficient vocal workout.

Whatever warm-up techniques you choose, practice them at home first under travel-like conditions: seated, facing one direction, and without visual cues. You'll eventually develop a routine you can do anywhere.

Before leaving home, prepare additional precautionary measures. For sleep

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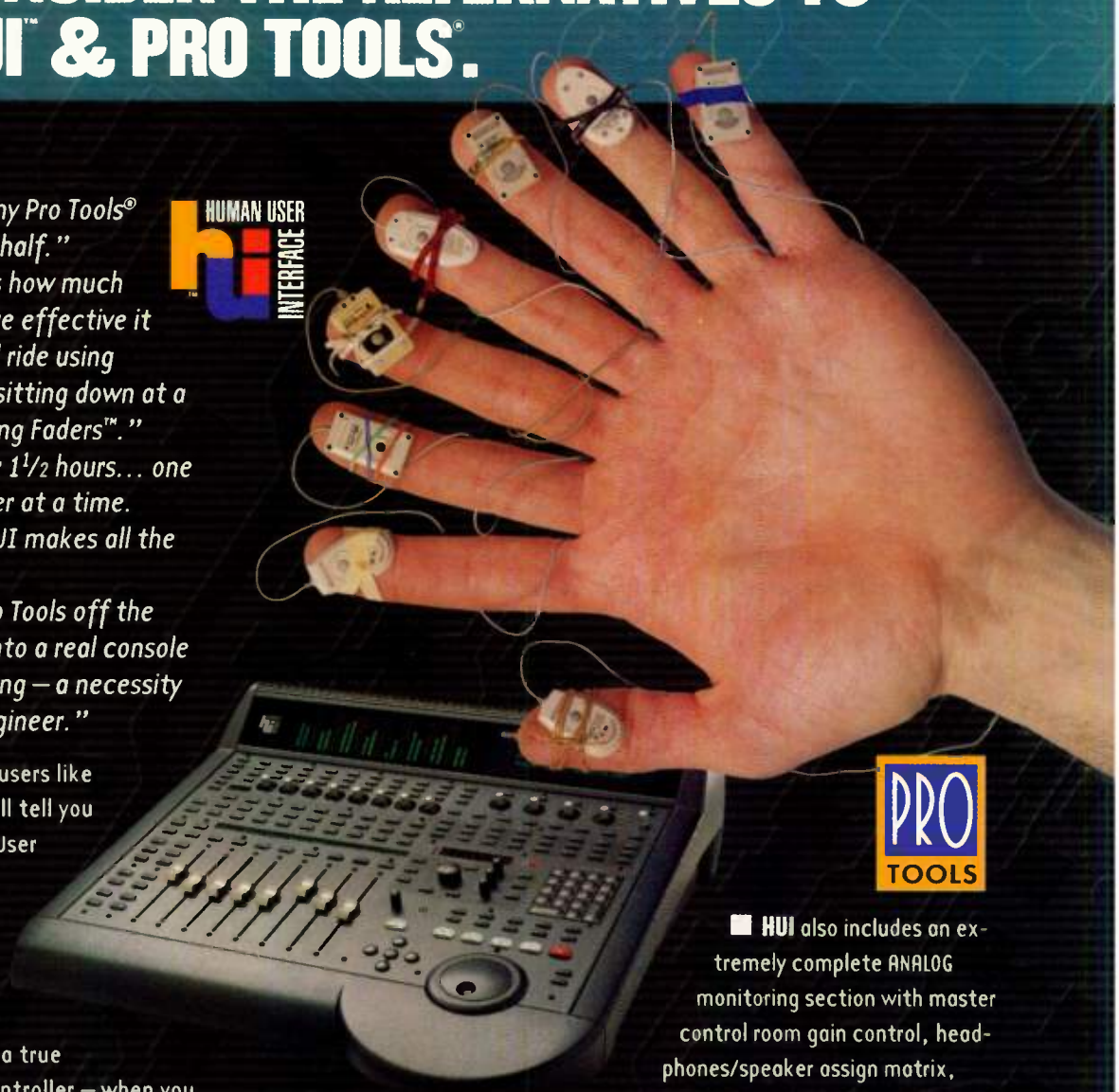

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insurance, pack earplugs, an opaque sleep mask, and a pillow that suits your neck. Stock up on protein bars, dried fruit, and whole-grain munchies at the health-food store so you won't need to rely on fast food. Plan to drink two quarts of water per day to keep the vocal tissues healthy. Drink more than that if you're traveling by air or to especially dry destinations.

Midnight, at the oasis (finally!). *Found a parking place only a block away from where I'm staying. Got my gear lugged up to my friends' third-floor apartment. Played with their new dog while they briefed me on the schedule for tomorrow. Looks like I'll be able to catch some decent sleep and then have time for yoga stretches and a good warm-up between brunch and the radio broadcast. Later, I'll swing by the music store for sound check and then back to base camp for a shower, light supper, and performance attire.*

Schedule time for exercise and warming up every day to counteract the effects of travel stiffness on your posture and breath. Take extra-long showers to humidify and soothe your airway. Try not to be embarrassed or defensive about self-care: this is your career we're talking about!

And no matter how burned out you feel after a day in the saddle, no matter who invites you to socialize after a gig, *don't eat a big meal late at night.* Heartburn and acid reflux can irritate the voice while you sleep, and you won't sleep as well, either. It's better to make breakfast your time for serious chow.

Wednesday, 5 P.M. *I've just met the mic stand from hell: an aging gooseneck that droops out of position on a whim. Fixing it and finding a buzz-free monitor took longer than I'd planned. But a functional P.A. and monitor are part of my survival plan, so the time crunch is necessary. It just means I can't take half an hour to dress.*

Beg, borrow, lug, whine, do whatever you can to get at least one onstage monitor. Not being able to hear what the audience hears can seriously strain your voice as well as your nerves. By helping you sing at safe rather than extreme levels, monitors also serve as insurance for the gigs still waiting down the road.

The final challenge for the vocalist on tour is to limit how much you *talk*. Sure, you want to shmooze up the fans, the media, and the folks who booked your gigs. But extended periods of talking—especially over noise—can hurt your voice as much as singing carelessly. So do your business in quiet surroundings whenever possible, and use down time (including set breaks) to rest your voice completely.

Thursday, 10 A.M. *The gig drew well, despite bad weather. The guy at the coffee bar next door donated a thermos of herb tea, and my voice stayed clear throughout my range. Sold almost as many CDs as I'd hoped, and then celebrated (quietly) with the local pals who made it all happen.*

Now I'm back behind the wheel. Today's distance quota is like that old railroad ballad: 500 miles. Despite my best efforts, I'm definitely more tired than when I left home two weeks ago. If I stay disciplined, I will finish this marathon. But please, no more traffic accidents! I want that in my contract!

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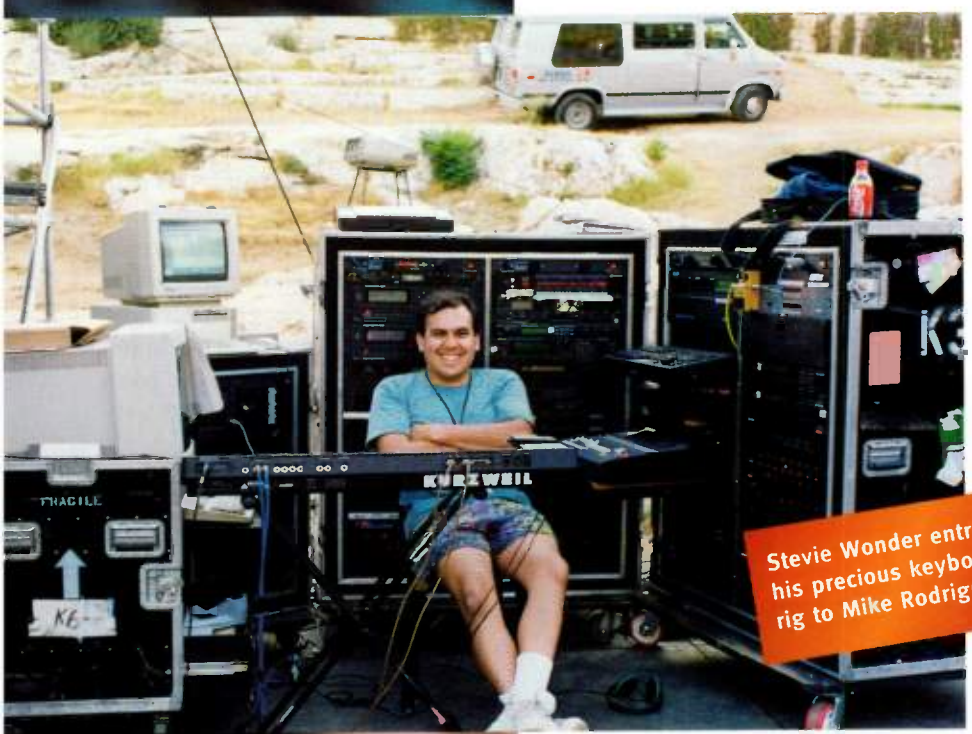
riffs

By Sam Molineaux

Preventive Medicine for Road Gear

I HATE TO BE THE BEARER of bad tidings, but if you have a keyboard or other MIDI-related gear that you move regularly, it's probably only a matter of time before disaster strikes. While there is no cure for plain bad luck, you can employ some preventive measures to help you deal with equipment adversity.

At the least, you should be familiar with your equipment, know what to do if unexpected hazards arise, keep important spares at hand, and know where to get help. But even the most conscientious road musician can't know how to deal with every eventuality. We asked three of the hardest working keyboard techs in the business to share their secrets for looking after gear on the road. Many of these tips apply to nonkeyboard electronic gear, too, so if you are a guitarist, bassist, sound person, etc., stay right here—don't touch that dial!



Stevie Wonder entrusts his precious keyboard rig to Mike Rodriguez.

Preventive measures. It should be obvious that throwing unprotected gear into the back of a vehicle is a dumb idea, but all too often that's exactly what people do. Pack the equipment truck carefully, making sure things don't shift around or sit upside down or on their ends if they shouldn't. And make sure your gear is protected.

"The number one rule is that there's nothing more valuable than good road cases," says Mike Rodriguez, the man behind Stevie Wonder's rig. "Get the best you can possibly afford and forget about soft bags."

Once you have the gear loaded in and set up, it is time to test and troubleshoot everything. Terry Lawless recently toured as a keyboard technician with David Bowie, Phil Collins, and Boston. A keyboard player himself, Lawless has two modes of operation when preparing for a gig: technician and player. "When you are looking after your own rig, you have to divide yourself," he explains. "First go into technician mode and run through trials of everything that is going to be used in the show. Make sure everything is in good working order and that it is absolutely clean. Secure any cables to the stand so that if someone trips over a cable, it will pull on the stand first and the instrument last. Keep cable runs away from the center of the stage where all the traffic is, and make sure everything is taped in place. I also put duct tape over any inputs or outputs that aren't being used

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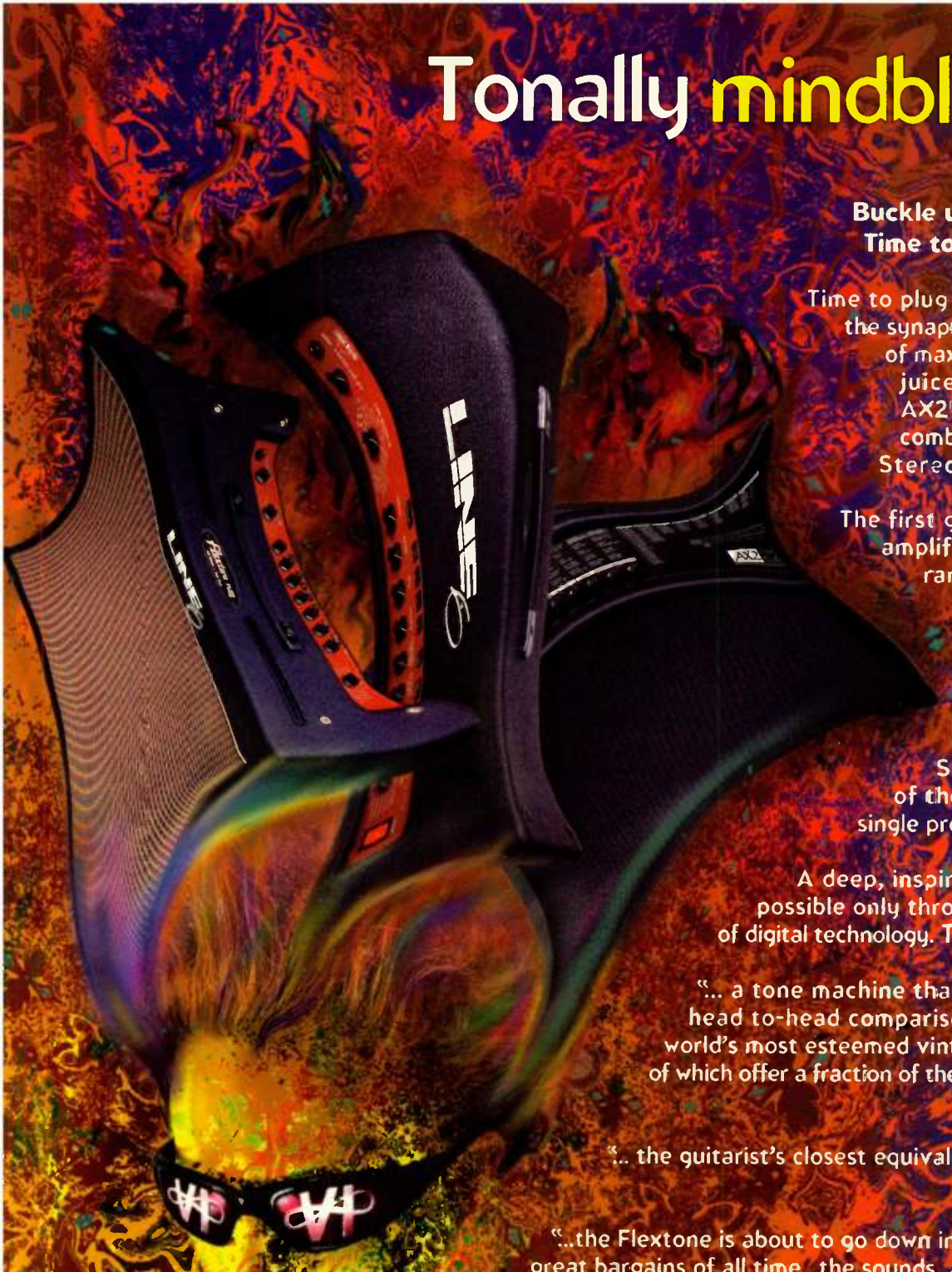

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so that nothing can be plugged into the wrong socket.

"Run a chromatic scale on every keyboard you're going to be using, just to ensure you don't have any surprises later on," Lawless continues. "Then, after everything is checked, you can go away and come back as the musician and just think about making your music."

Power problems. When it comes to protecting electronic devices and ensuring reliable performance, clean power is a major consideration. "One of the first things I do is take a multimeter out and meter the power on every outlet before I plug anything into it," says Lawless. "I also check the wiring on every outlet. There's a little tester plug you can use to check whether the wiring is correct; it's very handy to carry around when you're playing clubs." These testers, which are available at Radio Shack and many electronics supply stores, indicate phase and grounding problems.

Incidentally, if you discover that the club's outlets are not properly grounded, do not use them; contact the manager or owner of the venue and request an immediate repair or access to a properly grounded outlet. Otherwise, you not only risk damage to your equipment—and be aware that most power conditioners do not protect your gear when connected to an ungrounded outlet—but you also might be exposed to dangerous electrical shocks.

No matter how prepared you are or how reliable your gear, if a power blackout occurs in the middle of your show, there is little you can do to prevent your rig from being taken down with it. However, you can take measures to ensure that you are back up and running as quickly as possible after the power returns. "I always use an Apple PowerBook to control the rig because it'll revert to its battery backup if there's a power outage. It's one less thing to wait for to reboot," says Genesis and Metallica tech Justin Crew.

Lawless prefers to rely on an uninterruptable power supply (UPS) to power the rig. "I try to use a UPS on anything with volatile memory, such as samplers or computers," he says. "I use one that can power an entire rig for around 45 minutes, and it also conditions the power so that, if there's a spike, it'll still output even power. It's worth putting your samplers on one, at least."

Back up the backup. Protecting your equipment is the easy part. Much more difficult is coping with the unexpected breakdowns, particularly if they occur minutes before (or worse, during) the show, when your nerves probably aren't in the best shape. A wise keyboard player will be prepared and bring along backups.

"If you load samples during the show, I recommend having a spare hard disk with the same ID number, containing all your samples, should anything go wrong," says Rodriguez. "Make sure you keep backups of all the sounds on two different media," adds Lawless. "For example, if you have a synthesizer that you can back up with a RAM card, you should do that as well as backing it up to a computer program, just in case one or the other should fail."

The aptly named Justin Crew has worked as a tech for Genesis and Metallica.

Regardless of how diligent you are in backing up your sounds, though, if your software crashes and you're synth's as dead as a dodo, it'll help to have an effective last-minute action plan. "I try to keep a spare of every keyboard that's being used in the show, but if that's not possible, I program vital sounds on whatever spare keyboards I do have," says Lawless. "For example, say your Roland D-70 goes down right before the show; if you've preprogrammed the D-70 sounds on another instrument, such as a D-50, you can use that as a substitute."

"If you don't need a dedicated MIDI controller as your master keyboard, I would say control your rig from a keyboard with onboard sounds," suggests Rodriguez. "You just never know when your rack's going to die, and that keyboard may be the only sound source you have left."

Environmental hazards. Without a doubt, playing outdoor gigs is the ultimate test of a keyboard player's nerve. Even if you're in a climate that's not prone to rain, there are still things you need to watch out for.

"Dust is usually the biggest problem," notes Lawless. "If you're doing outdoor gigs, you should clean your gear much more than usual. Then there's heat. I've seen gear quit functioning just because of heat, and LCDs stop working if they get too hot. You should always protect your gear from extreme temperatures. I always keep space blankets on all the gear, and then right before the show we pull them off."

Here are a few words of wisdom for those who are crazy enough to go on stage in the rain: "When you play outdoors, you need to make sure you have enough plastic to cover all your keyboards and racks if you have to get off the stage," advises Rodriguez. "I did a show with Martin Page in Germany where it was pouring rain, but they decided to go on with the show. So I just made sure that everything was plugged in, and then I put gaffer tape around the MIDI plugs and the outputs on the keyboards. Anything that wasn't being used, I covered up; I taped plastic on the back of the racks to make it all as leakproof as possible."

"A little bit of rain on the outside of a keyboard isn't a problem," says Crew. "But if it starts filling up, it'll short things out inside, and that's when you've really got to be careful. I've actually drilled holes in the underside of keyboards so the rain runs out!" (Don't try this at home, kids.)

Pranks and cranks. Weather isn't the only potential hazard; the law of averages dictates that if you get a group of musicians together in an enclosed area, it won't be long before at least one of them does something really stupid. "I had to fix a Sequential Prophet VS on a Robert Plant tour because someone threw an orange at the keyboard player, and it snapped off four of the keys," remembers Crew. "It's not easy getting keys for a Prophet VS in a hurry; I ended up having to glue them back together with epoxy resin."

"I once had to clean up after a band who had a water fight on stage halfway

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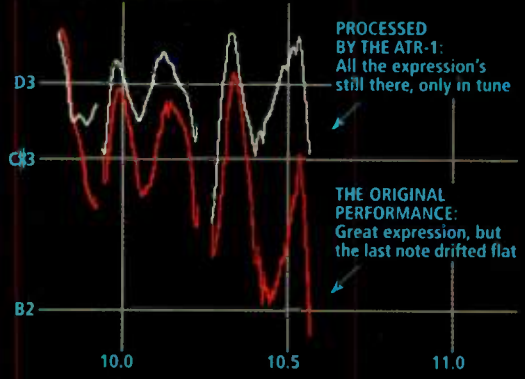

Here's what some ATR-1 users have to say:

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through the show," says Rodriguez. "At times like that the only thing you're thinking is 'Good thing I'm making good money.' Because you just want to slap somebody!"

Food, water, and cigarette ash are generally things you want to keep away from your keyboards, but should disaster strike, a can of compressed air, some clean cloths, and a hair dryer are useful items to have at hand. "The best thing you can do if anything gets spilled inside your keyboard is to shut it off immediately and then dry it carefully with a hair dryer and swabs," advises Lawless. "A travel hair dryer is a good thing to carry around. I've also used a hair dryer on Hammond organs that came out of the cold and needed the oil warmed up a little bit. Compressed air is good for cleaning out dirt or dust."

Emergency surgery. Manufacturers usually recommend that you not try to effect repairs yourself, but if you're in a crisis situation and it's something easily identifiable (such as a broken key or pitch-bend wheel), and you happen to have a spare handy, then performing emergency surgery might be your only possible solution.

"I wouldn't suggest that people open up their synths, but if you really have to, make sure you do it in a nice, big area where you have plenty of room so that you can keep track of all your screws and parts," says Rodriguez. "Something like a key popping out is about the easiest thing you can fix yourself. I once used a paper clip and a toothpick to fix the spring on a broken key, and since then I've always kept paper clips with me. They're handy if you need a little tension or want to create a spring."

"Replacing your pitch-bend wheel is just a matter of opening the back of your keyboard and locating the wheel, which usually has a bundle of wires that sockets together. You just unplug the old wheel and flip a new one in," explains Lawless. "I also recommend keeping a selection of fuses in your tool kit; there's nothing worse than having a blown fuse and not having a spare.

Keyboardist Terry Lawless has toured as a keyboard tech with David Bowie, Phil Collins, and Boston.

"The big problem is that, if you make a mistake, you will lose your warranty on the machine," he continues. "However, if you really feel qualified and confident enough to do your own repairs, go ahead and do it—but take a few precautionary steps. Always make absolutely sure that the instrument is unplugged; always wear a grounding strap so that any of the integrated circuits inside can't be damaged; and make sure when you turn a keyboard face down that you have padding underneath it."

Reseating chips that have worked their way loose, fixing a bad cord, and touching up solder points to fix an intermittent jack or eliminate a buzz are common repairs that do not require specialist knowledge, providing you take the necessary precautions. But remember, you do this work at your own risk.

If you're unsure, sometimes a call to the manufacturer will help. "Manufacturers are extremely good about taking care of people on the road. They know that, if their product is being shown, that's the best advertising they can get," confirms Lawless. "Usually, if you call the service department and tell them that you're on tour and have an emergency repair, they'll help you out, even on older, discontinued instruments."

"If you can get the keyboard open in front of you and you're by a phone, then you can often get someone to talk you through a simple repair," agrees Crew. "But sometimes it's better to just rent another one as quickly as possible. If you manage to get your instrument fixed before the gig, that's all well and good, but if not, at least you have the spare. Ask the sound guy or one of the locals; they'll usually know where the nearest instrument rental shop is."

Road Musician's Tool Kit

Based on interviews with Justin Crew, Terry Lawless, and Mike Rodriguez, I've assembled a plan for a basic road musician's tool kit. You can supplement this kit, of course, but make sure you have these basics.

- Alligator clips
- Assorted cables (all types; include extra long cables)
- Assorted connectors
- Assortment of fuses
- Assortment of screws and nuts
- Assortment of wrenches and screwdrivers
- Batteries
- Cable checker
- Cleaning agent
- Compressed air
- Duct tape
- Flashlight
- Fuses for keyboards (according to user manual)
- Grounding strap
- MIDI data indicator
- Multimeter
- One octave of spare keys for each keyboard
- Paper clips
- Pitch-bend wheel for each keyboard
- Soft cloth
- Soldering iron and solder
- Spare disk drive (for samplers and computers)
- Spare external power supplies (where necessary)
- Spare parts
- Spare sustain and volume pedals
- Swiss Army knife
- Travel hair dryer
- User manuals for each piece of gear

Vintage gear. The best advice regarding older equipment is to steer clear of taking it out on the road. "Wherever possible I'd try to duplicate the sound on a newer piece of gear," advises Lawless. "There are too few centers that can repair older gear and too few places to get parts, and older gear tends to be unpredictable under adverse conditions. Many newer machines do great analog duplications, such as the Yamaha CS1x, the Studio Electronics analog gear, even the JD and JV series from Roland. By the time you've got it going through the P.A., you're going to get very close."

"You have to understand that vintage gear must be looked after very carefully," warns Crew. "If you're going to take, say, a Prophet on the road, then take two with you, and be sure to fire up the spare every day. Don't even think of going out without the manual, and if possible, get hold of the service manual with a schematic diagram."

The show must go on. So your middle C has broken off, you're only getting sound out of one output, that delicate piano sound you spent hours perfecting has turned into bluegrass banjo, and your drummer has just spilled his Coke down the back of your sampler. *Now* what do you do?

"The very first thing I do if things are behaving strangely is turn the equipment off and on again. More than once, that has been the masterstroke of genius!" quips Rodriguez, who strongly recommends remaining calm as the key to most problem-solving operations.

In fact, staying calm is one skill that all three of our keyboard techs have developed—along with the ancient art of manual-reading. "The keyboard player who has learned his or her gear is always going to have more flexibility and be able to react in crisis situations that much better," says Rodriguez. "The main piece of advice that I would give would be not to panic. The show still has to go on, and it's going to finish. You're either going to finish like a hero, or you're going to finish like a chump. But if you panic, it'll only make things worse."

Sam Molineaux *became semiproficient on violin, viola, and cello before she reached puberty, at which point she switched to the synth, which was far more rock 'n' roll. She'd like to thank Matthew Brubeck, Nate Tschetter, Terry Wilson, and Tom Zink for their invaluable help with this article.*

Movin' On Up

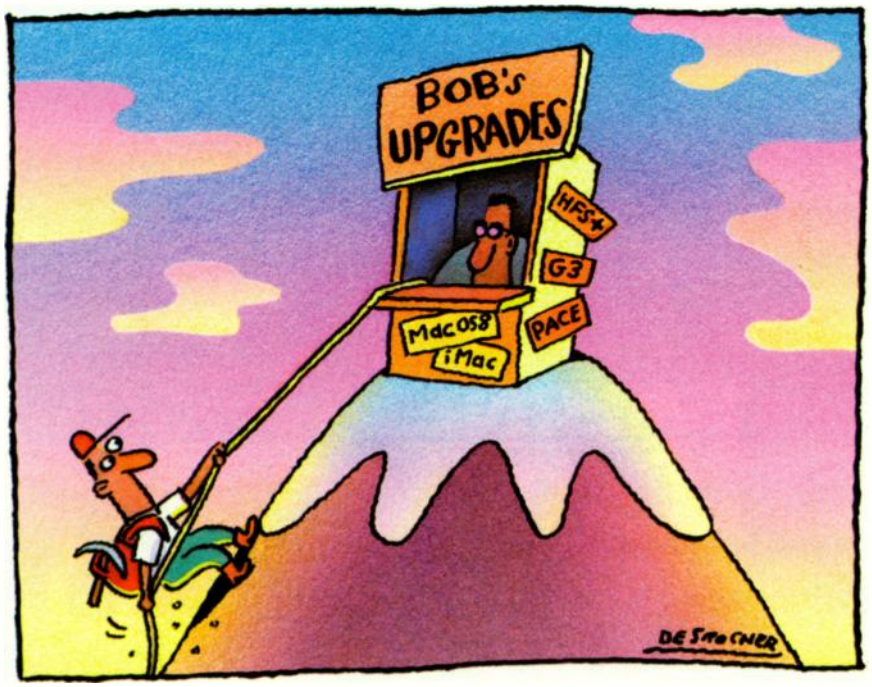
What you need to know before upgrading to Mac OS 8.

By Dan Phillips

I have a recurring nightmare: I'm hooking up a bunch of gear in a new studio. I spend weeks, maybe even months, slaving over the interconnections and software settings until all the components work seamlessly together. At last, the perfect computer-music studio! Then, just as I lift my finger to play the first note, each device sends a secret alarm signal to its manufacturer. Notices instantly arrive in the mail, ads appear in magazines, and warning messages start sprouting up onscreen—all to inform me that everything I have is now obsolete. It's time to start over again.

Fortunately, in the real world, things aren't usually that bad. (Generally, I get to play at least three or four notes before the new ads begin to arrive.) But upgrades *are* inescapable in the world of studio technology, and it definitely pays to be prepared.

Being prepared is especially important when upgrading to a new computer or a new operating system; snafus in those areas can cause significant down time. In this month's column, we'll look at an assortment of issues concerning Mac OS 8.0 and 8.1, as well as Apple's new, high-powered G3 machines. None of these issues are show-stoppers, but knowing about them beforehand may help you to avoid an inconvenient stumble when your upgrade alarm goes off.



JACK DESROCHER

PICK UP THE PACE

To make sure that musicians aren't too, uh, "generous" with their friends, most commercial Macintosh music software uses the PACE key-disk copy-protection system (see **Fig. 1**).

PACE's effectiveness depends on very low-level interactions with the operating system, so it's not surprising that major changes to the OS generally require an update to PACE, as well. Mac OS 8 is no exception: older versions of PACE are partially incompatible.

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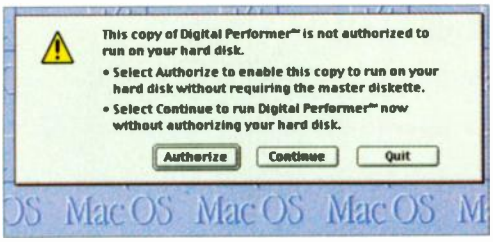

FIG. 1: Like it or not, copy protection helps to keep software developers in business. PACE's low-level operation means that it must be updated to match new OS releases.

If copy-protected software that uses the older PACE has been installed under System 7.x, it will continue to run with OS 8. However, if you need to reinstall the software—when reformatting a disk, say, or restoring from a backup—the older PACE will not allow you to do so.

Fortunately, a new, compatible version of PACE was released right on the heels of OS 8, so all the current versions of the major music-software packages should install under OS 8 with ease. If you haven't upgraded your software recently, check out the following OS 8–compatible music-software versions listed by manufacturer.

Keep in mind that, if you do need to upgrade, PACE is tied to the floppy disk itself, so you can't simply download a new version of the copy-protected software; you must get a new key disk.

Berkley Integrated Audio Software (BIAS). Because *Peak* uses the PACE copy-protection system, you'll need version 1.5 or later to install *Peak* under OS 8. *SFX Machine*, BIAS's modular effects-processing plug-in, also uses PACE, but *SFX Machine* is new enough that even the first release is OS 8–compatible.

Cakewalk Music Software. Cakewalk's recently acquired *Metro* sequencer does not use PACE, so compatibility is not an issue with versions 3.5 and higher. The company's *In Concert* 1.0 is also OS 8–compatible.

Digidesign. Most of Digidesign's products use PACE, so the following versions (or higher) are required for installation under OS 8: *Pro Tools* 4.0.1, *Sound Designer II* 2.8.3, *D-Verb* 1.2, *DINR* 2.2, *Focusrite d3* 1.0.1, *Focusrite d2* 1.1, and *MasterList CD* 1.4. *DFX* and *D-Fi* are new enough that all versions are compatible. As of this writing, the current versions of *Turbosynth* and *Session* are not yet compatible.

Digidesign also recommends that OS 8 users disable the Appearance control panel's "System-wide platinum appearance" option, because it can cause cosmetic glitches.

Emagic. *Logic* and *Logic Audio* use a dongle-based copy-protection system, so they are not affected by the PACE issues; neither are the new *Silver*, *Gold*, and *Platinum* versions of *Logic*. Emagic's *Sound Diver* editor/librarian program does use PACE, and version 2.0 is required for installation under OS 8 (a $39 upgrade from version 1.5x).

Macromedia. *Deck II* version 2.6.1 is required for System 7.61 or later, but no changes are necessary for OS 8. *SoundEdit 16* version 2.0.7 is required for OS 8 compatibility. Free updaters to the most recent versions of both programs are available for download from Macromedia's Web site.

Mark of the Unicorn. When running *Performer* version 5.02 under OS 8, users will experience a cosmetic problem in the MIDI Event List window. This is fixed in *Performer* 6. (The problem also appears when using the Aaron shareware control panel with OS 7, which allows you to alter the appearance of the Mac windows and desktop to resemble OS 8.)

All of Mark of the Unicorn's software uses PACE, so for installation under OS 8, you'll need the following versions or higher: *Digital Performer* 2.2, *Performer* 6, *FreeStyle* 2, *Unisyn* 1.5, and *Mosaic* 1.5.

Opcode Systems. Most of Opcode's software uses PACE, so for OS 8 compatibility, you'll need *Vision* or *Studio Vision Pro* 3.56 or higher, *MAX* 3.5.8, and *Overture* 2.03. *Galaxy* and *Galaxy Plus Editors* no longer use copy-protection, but versions 2.5 or higher are needed for OS 8.

Steinberg. Several of Steinberg's products use PACE. The company has released the following updated versions for compatibility with Mac OS 8: *Cubase VST* 3.52, *ReCycle* 1.61, and *Time Bandit* 2.52. These updates are only available directly from Steinberg North America. Steinberg's *Spectral Designs* audio plug-ins also use PACE; the current versions have all been updated for OS 8 compatibility. *ReBirth RB-338* doesn't use PACE, so it's not affected by OS 8.

FILE AWAY

Mac OS 8.1 still supports the previous Mac OS file system, called *HFS* (Hierarchical File System), but it also adds a new file system, nicknamed *HFS+* (in proper Apple parlance, *Mac OS Extended* format), which provides a foundation for future file-system enhancements. Regular HFS format is now called *Mac OS Standard*.

When a disk is formatted as Mac OS Standard, the amount of disk space used by a given file does not necessarily reflect the actual amount of data in the file. A Mac hard disk is divided into sections called *allocation blocks*. A file always uses at least one allocation block on the disk, regardless of how small the file is.

With standard HFS, the size of these blocks varies according to the total capacity of the disk; larger disks are divided into larger blocks. For large files, this is no big deal because the files take up several blocks anyway. But much space can be wasted when files are smaller than one block. For example, on a 4 GB hard drive, a file containing only 4 KB of information requires 64 KB of disk space in Mac OS Standard format.

In contrast, HFS+ optimizes the storage capacity of hard disks by decreasing the minimum amount of space required to store a file. It does this by increasing the number of allocation blocks on the disk so that a 4 KB file only requires 4 KB on the hard disk. The new format also allows more than 65,000 files on the hard disk.

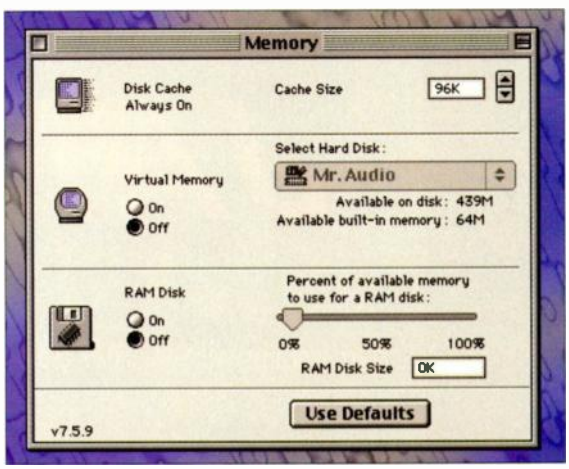

FIG. 2: When using digital audio programs, be sure to disable virtual memory and set the disk cache as low as possible.

For manufacturer information, please see Contact Sheet, p. 163.

FIG. 3: Our old friend the Options button is now grayed out. The Sound control panel is still essential for use with third-party audio cards.

One immediate benefit of HFS+ is that, for disks that have lots of small files (such as text files, MIDI files, applications and their support files, System Folder items, etc.), HFS+ can save a good deal of disk space in comparison to HFS. On the other hand, it doesn't make much of a difference for disks which contain mostly large files, such as dedicated digital audio drives.

Because HFS+ is a brand-new system, it doesn't yet have universal support from disk backup and troubleshooting utilities. This alone is a reason for conscientious computer users to hold off for a bit, unless your particular disk utilities are already HFS+ compatible.

Another important point is that HFS+ volumes are incompatible with Mac OS 8.0 or earlier. If you mount an HFS+ volume while running an earlier OS version, the disk will mount, but you will not be able to access its contents. Instead, you will see a document explaining that your files are still on the disk but are inaccessible.

As a result, you should not format a removable cartridge as HFS+ if it might be used with a Mac that is not running OS 8.1—say, in a friend's studio. You also should not format your boot volume as HFS+ because you will be unable to repair it or recover data from it while running an earlier Mac OS (e.g., booting from the *Norton Utilities* 3.5 CD-ROM, which uses OS 7.61).

Music software manufacturers are adopting a cautious approach to HFS+. Most have not noted any specific problems, but all agree that more testing is needed before they can recommend its use. In particular, Digidesign, Emagic, and Mark of the Unicorn do not yet recommend HFS+ for use with dedicated audio drives. Furthermore, Digidesign's DAE software (which is required when using the company's Audiomedia and Pro Tools hardware) is definitely incompatible with HFS+.

CACHE AND CARRY

One of the strange things about digital audio, video, MIDI, and other real-time applications is that they sometimes require very different system settings than non-real-time applications, such as word processors, photographic editors, spreadsheets, and so on. What is healthy for Adobe *Photoshop* may be poison for MOTU *Performer* and vice versa.

Apple's Memory control panel (see **Fig. 2**) is one of the places where these differences pop up with a vengeance. Two of the three main sections, Disk Cache and Virtual Memory, need to be set differently for optimal performance with audio applications.

Most Mac-based musicians probably already know that virtual memory is not a good idea for MIDI and digital

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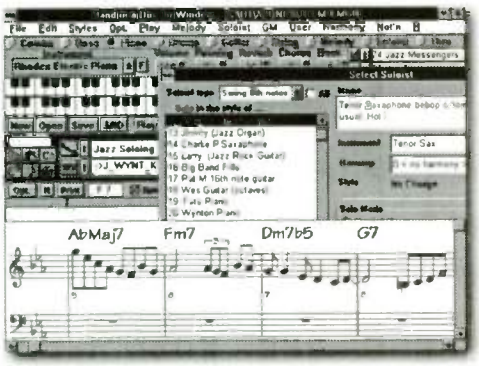

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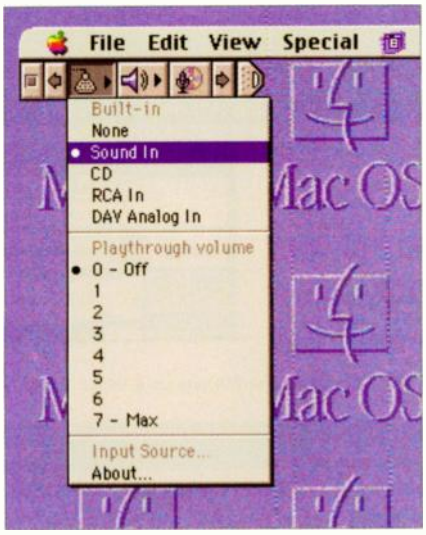

FIG. 4: Neal Hickox's freeware *Sound Input Strip* enables you to set the Sound Manager input source and play-through level.

audio. Indeed, many music applications will refuse to start up if virtual memory is enabled. The Disk Cache parameter may be less well-known, however. Disk caching increases system performance by loading frequently used data into RAM, where it can be accessed more quickly by applications. For general use, a good-sized disk cache will enhance system performance. This system-level caching, however, can interfere with the playback and record buffers of digital audio programs. This is especially true with multichannel programs, such as *Deck II* and *Pro Tools*.

Because of this, most digital audio programs recommend that the Disk Cache in the Memory control panel be set as small as possible: 96 KB in OS 8.0/8.1. During the OS installation process, the disk cache is automatically set to a much higher amount, so you need to remember to scale it back and then restart before using any digital audio programs.

SOUND OFF

In OS 8.1, Apple removed the Options window for the built-in audio I/O, which had previously been used to select the input source (microphone, line inputs, CD, etc.) and turn play-through on and off. This window was brought up by the Options button in the Sound control panel (see **Fig. 3**) and by similar buttons in software such as *Peak* and *Digital Performer*. Under OS 8.1, these buttons no longer do anything. *Digital Performer* 2.4 addresses this issue by providing a new Sound Input menu in its own Sound Manager driver-configuration window.

Apple's ultimate goal is to have all programs individually select the sound-input source, which will be cool in the long run but is inconvenient for now. While software developers are updating their products to match the new OS, there are a few workarounds. The Monitors & Sound control panel and the Sound Source Control Strip module can both be used to select the input source.

Neal Hickox's freeware *Sound Input Strip* does these one better by allowing you to set the play-through level, in addition to the input source (see **Fig. 4**). It's available for download from www.csun.edu/~hbcsc224/SOFTWARE.HTML or www.macintouch.com/files/sis.hqx.

Note that these issues affect only the built-in audio hardware and not third-party sound cards. In fact, even though the Sound control panel no longer has much control over the built-in audio, it

THE IMAC AND USB

Near press time, Apple announced a new consumer-level, all-in-one Macintosh, the iMac. With its futuristic design, zippy 233 MHz G3 processor, and low price ($1,299, including a built-in monitor and a pile of bundled software), the iMac seems poised for success.

One of the forward-looking aspects of the iMac is that it abandons the Mac serial and Apple Desktop Bus (ADB) ports for a new, cross-platform standard called the Universal Serial Bus (USB). USB provides higher data-transfer rates than ADB and serial ports, so it offers some interesting possibilities for the future.

In addition to simply hooking up keyboards and mice, for instance, USB is designed for low-bandwidth audio, primarily for telephony applications. This capability might also allow for a few channels of professional-level digital audio. Perhaps we'll start seeing little S/PDIF-to-USB widgets in the not-too-distant future. Only time will tell.

The more immediate issue, however, is the use of serial ports with MIDI interfaces. All of the current Mac MIDI interfaces depend on the printer and/or modem serial ports. They cannot be directly plugged into a USB port. Theoretically, you could use a USB-to-serial-port converter, but no such devices have been announced yet for the Mac, and there is still some question about their feasibility for MIDI applications.

It has long been evident that Apple has been moving toward USB, however, and it appears that Mac MIDI-interface developers have been preparing for this eventuality. No companies have publicly announced products, but according to an industry insider, three manufacturers are currently working on Mac USB MIDI interfaces, and at least two are expected to be shipping as of the iMac's August release date. Opcode has stated that it has plans for a USB MIDI interface, but it has not announced a shipping date. Just keep in mind that, if you plan to purchase a USB-based computer, your old MIDI interface and some of your old music software will have to be replaced.

Finally, the issue of copy protection once again enters the picture because the iMac has no floppy drive. A recent announcement in *MacWeek* describes an upcoming USB superfloppy drive, but the article specifically notes that copy protection might not be compatible with this drive.

In addition, companies that use dongles for copy protection, such as Emagic and Waves, rely on the presence of ADB ports. Because the iMac replaces ADB with USB, that may cause problems. Presumably, the companies that depend on dongles will eventually offer USB-compatible dongles as an option. But as of this writing, there are still several issues that are not fully resolved. It would be wise to see how things settle out before upgrading to an iMac or other USB-based model for music production.

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is still the recommended method for selecting third-party audio cards to use with Sound Manager. This control panel is no longer automatically installed with the operating system, but it can be found in the Apple Extras folder on the OS 8 CD.

MODEL PERFORMANCE

While there's generally some trepidation with the arrival of new CPU models, the G3s appear to be relatively trouble-free. Opcode Systems states that the G3s "work as well as any Mac we've tested." Most other software developers, including Emagic, Mark of the Unicorn, and Steinberg, are also quite positive regarding the G3s. Some companies, however, are withholding judgment, pending further testing. Digidesign, for example, has qualified the G3 266 tower and desktop models for use with its products, but other models have not yet been fully tested as of this writing.

▼

Music software manufacturers are adopting a cautious approach to HFS+.

Apple's new *Audio Tune-Up* 2.0 fixes a few minor, audio-related problems with G3 CPUs, PowerPC PowerBooks, Power Mac 4400/5400/5500s, and the Twentieth Anniversary Mac. Problems addressed include recording into QuickTime from external microphones, feedback when using the PowerBook built-in microphones, and PowerBook audio playback when running off the battery.

The update can be downloaded at the following (very long) URL: ftp://ftp.info.apple.com/Apple.Support.Area/Apple_SW_Updates/US/Macintosh/System/Other_System/AudioTuneUp_2.0.img.bin.

BRIDGE PLAYERS

Mac clones seem to be compatible with music products for the most part, but one particular issue bears mentioning. The Umax J700, S900, and S910, and the 5-slot models of Motorola's StarMax line, use a PCI bridge chip for all but the first two PCI slots (the ones closest to the motherboard). Audio, SCSI, and video-capture cards should be placed in those first two slots, because they may not be compatible with the PCI bridge chip.

For more on Umax PCI compatibility, visit www.online1.supermac.com/cgi-bin/kbsearch, and for StarMax info, see www.starmax.net.

GO FORWARD!

There are a few issues to be aware of when upgrading, but as long as you update your copy-protected software, set your disk cache correctly, and hold off on HFS+ until disk utilities are upgraded, you should be fine. What a relief! There should be a little time to make some music before the G4 and OS 9 arrive.

Dan Phillips *is a singer-songwriter-producer and a member of the team at Korg R&D. He is now fully OS 8 compatible.*

Rules of the Road

Before you put the pedal to the metal, make sure your tour plan is solid.

By Anne Eickelberg

Perhaps you're thinking that it's time your band hit the road. You've spent long, thoughtful hours writing amazing songs; you've practiced together until playing music feels like the most natural thing in the world; and everyone is capable of changing strings, patches, or drumheads quickly and can keep their cool during minor technical difficulties. In other words, your act is tight and polished, and you want to get out there and play.

Planning and booking a tour requires more work than gassing up the van and stocking up on road maps. To make a tour successful, you'll need to deal with a lot of logistics and anticipate many situations before you leave home. And if you've never toured, even regionally, you're courting disaster if you try to set out without a game plan.

Following are some tips on how to go about formulating your tour plan and getting the dates secured. I'm assuming that at the very least your band has already created a demo tape of your material or, better yet, released a tape or CD, written a one-sheet (bio), and assembled a press kit.

A picture is worth a thousand words. Shown above is the kind of luxury touring accommodations you can probably expect when you hit the road. This is Pavement's van, photographed during a 1994 tour.

GAIL BUTENSKY

ASSESSING THE SITUATION

Before you begin the actual booking process, make sure your band agrees upon all aspects of the tour. Avoid communication breakdowns by putting your final agreements in writing, which ensures that everyone has the same information. This helps circumvent nasty surprises like your keyboard player throwing a fit because you've planned to leave town before his softball season is over.

Once the departure date is set, you will have to stick to it, so get it right the first time. Nothing's worse than having to call back promoters who have given you a hold on a date to tell them

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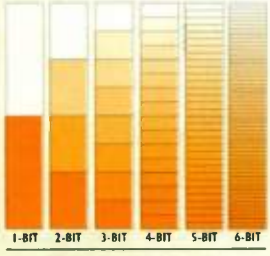

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that you'll actually be coming through town two weeks down the line. It can cost you some gigs and foul up your routing.

Geography lessons. Look at a map and decide which regions of the country you want to try to cover. It's imperative to calculate distances between your desired destinations to make sure you really can cover *x* amount of ground in *y* number of days. You'd be amazed at how many bands pile into their vans without even bringing along an atlas. If you already have a CD that's getting airplay on college or public radio stations, you'll have a huge head start; you can base your tour around cities where there's a chance that people have heard of you. Otherwise, you should base your decision around which areas are most likely to be responsive to your type of music. Of course, you could also just throw the I Ching or let the Ouija board decide.

Length of time on the road. Is everyone willing to take time off work for this endeavor or even quit their job? Is everyone in agreement that this should last for a week, two weeks, a month, or longer? The vacation or leave-of-absence arrangements must be made before you start setting dates. Of course, if you are a professional band, the tour *is* your job, but even so, you have to consider how long the band members can be away from home without destroying marriages, relationships, and so forth.

Workload. Determine the number of shows you will play per week and whether you want or need days off between shows for drive time or sightseeing. Obviously, when you're just starting out, you have to take what you can get, but make sure everyone is up to playing ten nights in a row or, conversely, is able to cool their heels for four or five days between the gigs you *can* get.

Of course, when you are cooling your heels, you are losing money. Part of booking a profitable tour is making sure you don't stay idle for long, so if you can't book enough dates to work steadily, maybe you should reconsider the whole tour. You might decide that the publicity you can get from a few key dates makes overall financial loss worthwhile, but if you make that choice, do so consciously, with your eyes open. You don't want infighting later on because some band members expected to make a monetary profit from a tour that was intended to be purely promotional.

Another aspect of figuring out workload is how basic duties will be handled. Is everyone going to take turns driving? Who's going to handle the money, the loading and unloading of the vehicle, making phone calls? In my band's case, it worked out that one person was great at accounting, another was mechanically inclined, another was good at selling merchandise, another was able to find his way effortlessly around cities he hadn't been in before, and another was good at chatting up promoters. This type of job assigning might seem anal-retentive, but it made touring smooth. It's up to you if you want to constantly get lost, show up late, carry your pay around in a paper bag that you keep losing in the van, or get stopped short by something as simple as a flat tire.

Financial survival. What if your guarantee falls through, or your 50-percent-of-the-door comes to $17 five shows in a row? Will you be able to spend your own money to feed yourselves, buy gas, and pay for repairs or even the occasional motel room? Hopefully, you have a band fund that can cover these expenses or are lucky enough to have at least one solvent member who can bankroll you through tough times. Credit cards, used judiciously, can be real lifesavers in these situations.

Gimme shelter. Figure out whether you can afford to stay in motels every night or are willing to sleep on strangers' floors or camp. Ask whether the club has a discount deal with a nearby motel or sets up accommodations for bands (e.g., a band house).

Everyone should have adequate bedding, just in case. Do all band members agree that it's okay to announce during your set that you need a place to sleep? It's a time-honored tradition that usually works out fine, but it's not particularly professional to solicit lodging from the stage. And it can lead you into some pretty odd or annoying situations—like all-night parties occurring right next to your sleeping bag.

Also, agree on food arrangements. Are you going to eat at fast food joints, truck stops, or cafes, or will you bring along a cooler (even a camp stove) and stock up at grocery stores along the way? If you are playing a club that serves food, you might be able to get a break on meals.

Finding food on tour is tough for vegetarians, even these days, and it can be extremely difficult for those on macrobiotic or special diets. Plan accordingly and bring what you need. Check your local bookstores for guides to vegetarian restaurants across the country.

Think about how many other people, if any, you will bring along. Can you afford to bring a roadie, sound person, or someone who can sell merchandise for you? Or is having extra space in the van more desirable? It's also important to agree beforehand whether significant others can come along. (Remember what happened in

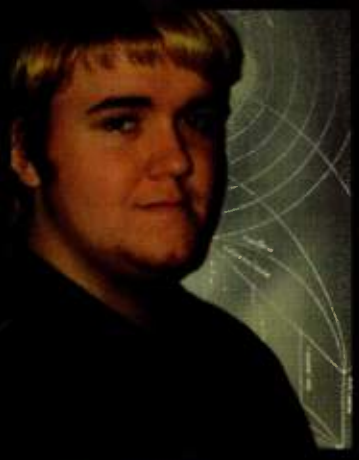
MUSICIAN HEAL THYSELF

Almost everyone gets sick on tour. Changing climates, hanging out in less-than-sanitary environments, meeting all kinds of people, and staying up too late are unavoidable situations. But you can try to keep a cold from turning into bronchitis or walking pneumonia by building up your immune system. Make sure you're in good physical health before you hit the road. Do all those common-sense things like eating well and getting plenty of exercise.

You should maintain your healthy habits on the tour, too. Drink plenty of water, try to take naps, and definitely get exercise when you can: bring a jump rope, skates, or a skateboard along; go running; bring a basketball; stop to swim in the summer; or take walks. Herbal and homeopathic medicines like echinacea and goldenseal are becoming popular ways of strengthening the immune system. You might want to consider researching these types of options when putting together your tour "medicine kit."

Lastly, think ahead about what the weather will be like and pack accordingly: rain gear, wool socks, and warm hats are lifesavers, even in the summer, if you end up in the mountains at night.

Real words from a Reality™ user



Ethan Eves
Reality User
Performer/Studio Musician
Toolbox
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Roland® MC-505, Boss® SE50,
Novation™ BassStation

Works with most soundcards!

"Most of my shows...

...are pretty heavily dance oriented. I do the break beats with Reality™ and also throw in a lot of samples, like different vocal samples and weird, B-movie, sci-fi samples. I can do break beats on top of slow beats on top of weird, sort of eerie, background ambience on top of vocal samples. I've done gallery openings and fashion shows where I have done more ambient-type stuff.

"I have a rather portable computer with an LCD screen and stripped-down Windows 95. I run Cakewalk™ with Reality. Cakewalk can loop, so when I do live shows, I have it loop and I mix live by muting and un-muting parts of the song, using Reality as the synthesizer.

"Reality is very straightforward. Having had even minor experience with other synthesizers, you pretty much know what everything is. The filters are really responsive—that's another good thing. You can get the resonance up real high. I use Reality primarily as a sampler, just because it works so well that way. I use a set of MIDI sliders with it.

"Recently I have been getting into making a lot of weird atonal sounds, pushing the FM stuff as far as it will go. You can get some really insane sounds out of that. The frequency response with [Reality] allows you to do stuff that is pretty complicated and textured, but still sounds good.

"With a lot of the digital synths, when you try and do a hefty bass, you don't get it. I have never run into that with Reality—I've been able to get really enormous bass sounds.

"At shows, I let people see what's going on. A lot of people are into break beats and they sound a lot more complex than they really are, so they want to see how I'm doing it. Having it on the computer screen, you can see everything. You get to see where everything is. It also makes it much easier to manipulate it, set the different sliders to different things. When you're dealing with Reality, it's all sitting right there."

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FINDING THE GIGS

Once you've planned your route and agreed upon the time frame, the real work begins. How do you get the attention of venues across the country? Mark Greenberg, a booker at Chicago's eclectic Lounge Ax, offers up this sobering reality: "Clubs could book twelve bands a night every night for the next seven years without you. You have to do something to get their attention. Hopefully that means having a really good record and playing really good music."

Your first task is to find out where the clubs are and how to contact them. Peter Davis of Minneapolis-based Creature Booking and Talent Agency advises, "It can be really frustrating for beginners. You have to have a lot of patience, and you have to be prepared to make repeat phone calls. Expect to spend money and waste a lot of materials; also be ready to accept the word 'no' a lot. But by persistence and hard work, people usually do come around." He adds that networking is key. "One good phone number can always lead to one more or even to a dozen more."

Many resources are available to help you with your venue search, such as regional newspapers for the areas you plan to visit, books, and magazines like *Pollstar* and even that punk mainstay *Maximum RockNRoll*. Every month *CMJ (College Music Journal)* does a city scene report that lists everything of interest to touring bands, along with phone numbers. Get a hold of all the back issues and use them! (For more on researching venues and booking shows for your band, see "Working Musician: Booking Basics" in the July 1998 **EM**.)

You can also try calling college radio stations. (Obviously, this works best if they already have your music and like it.) If they aren't inundated with calls, music directors and deejays may be able to tell you which clubs might actually take your calls, which ones should be avoided, and whether there are "alternative," non-nightclub venues such as warehouses, storefronts, record stores, theaters, college organizations, places like Borders Books, coffee houses, or even private houses.

Search on the Internet for each city you'd like to play. You'll often find listings for all sorts of venues for each genre of music, along with reviews of the clubs or various scenes. Keep in mind that this information will be opinionated and possibly in need of updating. Even lurking around in music-related chat rooms may uncover some leads.

If you are acquainted with a band who's gone on the road, pump them for their contacts. Most people are willing to share information. Go to your local club and approach touring bands who seem similar to yours and are just slightly above your level of recognition. Don't bother talking to bands who play huge venues, because that's probably out of your league at this point.

Assemble a list of potential clubs in each city you hope to visit. Make calls before you send anything so you'll know whether your music fits into the club's format. Also, find out which nights they feature live music. Sue Miller, co-owner and long-time booker at Lounge Ax, says, "Bands should know what the club is like when they're trying to get a gig. We get a lot of completely inappropriate bands trying to get shows here." Miller is kind enough to refer bands to other clubs, but not all promoters will take the time to do this.

When you have tracked down a venue that looks promising, *then* send the tape, remembering to put your name and phone number on everything. Make sure you budget for postage costs, which can add up quickly. Is it worth it to send your packages via UPS, or do you want to use registered or First Class mail? You should begin this process at least three and a half months before you hope to start the tour. Many promoters start filling in their calendars two

THE BAND VAN

If you have played locally for a while, you probably have a van or other large, gear-lugging vehicle. Make sure it's up to the rigors of hauling you, your bandmates, and your gear from town to town. It's more than a vehicle; it'll be your home, office, and storage facility for the duration of your tour.

When planning your tour budget, you should factor in the costs of fixing, maintaining, and even customizing your vehicle. You'll certainly want new tires and a full tune-up, and you'll have to have any existing problems repaired. You might want to make special upgrades such as building a loft or a secure equipment-storage box. Also, if you don't have it already, you should get emergency road-service coverage (e.g., AAA's Plus package).

Here are some must-have items when outfitting your vehicle for a tour: spare tire; heavy-duty hydraulic jack; tool box; flashlight and batteries; rags; large, unbreakable water container; chains and padlocks to keep spare tire and battery from being ripped off; plenty of strong rope; tire chains, if you are going into snow country; cooler; crates for all the junk you'll acquire along the way; garbage bags; reading light; atlas; city maps; and last, but not least, the indispensable Swiss Army knife. If you plan to tour for extended periods, you also would do well to have a CB radio so you can monitor road conditions and get help in an emergency. Cell phones are *de rigeur* for traveling salespeople nowadays, and they're handy for bands, too, if you can afford them.

Taking two or more vehicles considerably increases your overhead, but it also increases your payload and flexibility. And it keeps the band at least partially mobile if one vehicle breaks down. If you do travel in tandem, it's important to develop car-caravan skills; just for starters, stay fairly close together (preferably in visual range), with the slowest vehicle in the lead. CB radios or cell phones are especially handy in this scenario for communications between vehicles. Tow chains and ropes come in handy if you are caught in the middle of nowhere and have to tow a crippled vehicle to the nearest shop.

GAIL BUTENSKY

George Hurley, D. Boon, and Mike Watt (left to right) of the Minutemen toured incessantly in the early '80s. Their motto was "If you ain't playin', you're payin'." When that punk work ethic began to pay off, they welded a safe to the floor of their van.

or more months in advance, and these are minimum estimates.

RATIONAL ROUTING

Get a calendar with plenty of room for scrawling, and pencil in your tentative route. When you start making calls, your routing should be fairly loose; don't say you're only available on October 15. You're more likely to get a show if you give promoters a window of opportunity. Tell them you're looking for something in the October 13 to 16 range. This part can be tricky. It's about strategy. One tactic is to start really early, get one major show confirmed, and work around that solid date.

Before getting on the phone, consider alternate scenarios you can fall back on if your ideal routing isn't panning out. You may end up having to drive more than you'd prefer: for example, going from Minneapolis to Ann Arbor and then backtracking to Chicago. Always keep your atlas handy so you'll know if it's physically possible to zigzag from one city to another in a few days. First tours often involve driving in triangles rather than perfect linearity.

PHONE TAG: YOU'RE IT!

You'll spend a lot of money on long distance phone calls. It can take a dozen calls to solidify one gig. Promoters are swamped with tapes and press kits and often won't return calls, especially to unknowns. It's imperative to be persistent, professional, and genuinely friendly. If you leave accusatory, whining, "why won't you call me" messages on their voice mail, you're *never* going to hear from them.

"A big mistake that a lot of bands booking themselves make is to have an attitude," says Miller. "Also, bands should figure out which member is best at talking on the phone. It's unbelievable how unintelligible some people can be."

You will run into promoters who say they never got your package. Be prepared to send out replacement packs via priority mail. You must try to determine whether talent buyers are lying to you. If they brush you off a third time, saying the tape never arrived or was "lost," it may be their way of bowing out. If you think this may be the case, it can't hurt to ask them point blank. You should also ask them if there's another venue that might be more open to your music.

You must keep an organized, detailed log of all this. In addition to the calendar, get a durable notebook, electronic organizer, or laptop computer (depending on your budget), and make notes about each call. For example, *7/18: Bob hasn't listened to tape yet, says to call back in 2 days. 7/20: He listened to tape but sounds unsure about what kind of bill we'd work on. I suggested blah blah blah....Call back early next week.*

NAILING THE DATE

If talent buyers seems to be waffling, you have to convince them that your band is worth a risk. If you know any bands in that area that are willing to vouch for you, now is the time to call in favors.

There's also the type of talent buyer who doesn't listen closely to your tape. They may put it on, then become distracted with calls, and not know what they heard. You should be prepared to describe your music and appeal over the phone. This can be abhorrent, but sometimes they need to hear you compare yourself to a band they're familiar with. Think like a music critic and tell them you are somewhere between *x* and

z. Tell them exactly what bands you'd be a perfect opener for and why, but go easy with the hard sell. They get that all day long from professional booking agencies who have the rosters to back it up. Pro booking agencies sometimes force venues to take on one of their unknown acts before the venue is "allowed" to host a well-known sure bet. You don't have that kind of leverage.

You can also trick them. Not that I approve of this, but you can lie and claim you're from a real booking agency. Or maybe you find out that this particular talent buyer hates talking to men on the phone but is a sucker for women. What you do with that information depends on your idea of integrity.

If the talent buyer still sounds unsure, you must decide whether this particular gig is worth playing for "gas money" or even for free. (Remember, you should keep your expectations realistic when it comes to how much money you'll be making.) Bands that bring lots of tapes, CDs, cool-looking T-shirts, and other "product" will often take these kinds of shows, knowing that if luck is on their side, they can sell enough merchandise after their set to get to the next town *and* keep themselves fed.

While on the road, you'll probably get tips about venues that are open to trying out new acts. It might be worthwhile to cancel a scheduled day off in favor of driving all day to make that extra show. It's also helpful to leave yourself open to end-of-tour possibilities. Any such tips you receive should go right into your tour notebook. Don't count on remembering what a number scrawled on a matchbook means.

CONTRACTS

When my band, Thinking Fellers Union Local 282, first started touring, we wondered whether promoters would take contracts from unknown, "unrepresented" bands seriously. We slapped together a simple, 1-page contract that listed our name, date of show, and how much of a guarantee or percentage of the door we'd talked about with the club, and we left a space for the official signature of the talent buyer. For the hell of it, we included a few lines about how we'd like to get a food buy-out (the club gives you some money for dinner, a very common practice) and some free beer.

Amazingly, it worked sometimes, even on our first time out. It doesn't hurt to ask for these things, as long as you are low-key and don't come off like you expect royal treatment. The clincher is to get the talent buyer to sign and return the contract (send it with an SASE) before you leave for the tour so you can use it as proof that someone really agreed to pay you.

For the most part, I have assumed that you are the average band scuffling around with no connections. However, if you are a local union band, the situation is a bit different. For a start, you must use a standard union contract, and you get a certain level of protection against contract breaches. You also can take advantage of the Musicians Union's (800) ROADGIG emergency phone line if you run into trouble on the road or at venues. Some union locals have services that help you with booking, and agencies that book union acts might advertise for bands in your local union paper or in the *International Musician*.

▼

Call ahead to confirm dates every time you stop for gas.

ADVANCING THE DATES

No matter what, you must call the promoter and verify that you really are booked for the date and that everything is in order. Do this at least twice before the show: once a couple weeks before and once two to three days before. If you're not traveling with a sound person, this is the time to make sure that the venue has someone available to do sound.

Find out exactly when they expect you to load in, when sound check is, and what your set lengths and times will be. Don't forget to ask whether the schedule is based on real time or bar time. (Many clubs set their clocks ten or fifteen minutes ahead to allow a margin of safety for clearing everyone out at closing time.)

Make sure you ask the promoter for all possible numbers for the club. Sometimes there's a direct line that

people will answer all the time and another line where voice mail kicks in after office hours. Get the promoter or stage manager's home number, as well. Remember that durable notebook or laptop you used for booking the tour? Bring it along on tour and continue to make notes, write down directions and all phone numbers, and definitely include your impressions of how the actual gig went. (For example, did the sound person show up? Did the monitors work? Were you paid fairly? Did they give you great food for free?) This will be a great reference tool for future tours.

If the promoter's not there, get directions from the bartender or whoever answers the phone. Ask when the sound person normally shows up. In fact, ask *exactly* what time the club opens and when the sound person *really* shows up. Clubs often take the offensive and tell bands to show up at 4 P.M., even though the place doesn't open until 5 P.M. and the sound person never gets there before 6 P.M. They just assume bands will be late.

If one day you *are* running late—you got lost, had a flat tire, or your drummer and bass player took off walking to a thrift store that's two miles away ten minutes before you were supposed to leave town—it's in your best interest to call ahead. That way they know you're still coming and can reschedule or cancel your sound check. In addition, the sound person gets to go eat dinner instead of waiting around for you to show up. Be assured, if you make Spike wait, he will punish you later. Some clubs actually have a policy that allows them to kick a band off the bill if they show up after sound-check hours are officially over.

A TRUE HORROR STORY

On our first tour, we didn't advance our shows. We drove from Lubbock, Texas, to Oklahoma City only to find out that the club where we were supposed to play had changed owners and was now a dance club. The slimy promoter hadn't bothered to call the acts he had booked before he skipped town. Our next show was in Albuquerque. We had driven for hours, basically in the opposite direction of our next show, for nothing. This could have been avoided with a couple of quick phone calls.

Advancing shows on the road means that practically every time you stop for gas, somebody has be on the phone calling ahead to the next two or three clubs or promoters in order to verify load-in and sound-check times and get directions to the club. It might work for band members to take turns doing this at each stop so that everyone has a chance to wander around the truck stop, play Frisbee, or call their sweetie. Or maybe just one of you is best at this task (in our case, *me*).

GETTING PAID

Somebody in your band has to keep it together enough to remember to track down the promoter and get paid. Promoters can be very elusive at the end of a long night, and unscrupulous ones will just go home or have the bartender lie and say they can't find them. That's why, when you first show up, you need to find the promoter, introduce yourself, and ask who settles up at closing time.

While we're on the subject of money, beware the road-band treasurer's hidden enemy: the bar tab. You don't want to get to the end of a week-long run at a club and find out that the drummer and lead singer ran up huge bar and restaurant tabs that are being deducted from the band's pay. For this reason, some band leaders have a hard pay-as-you-go rule, regardless of whether the bar is willing to allow tabs. At any rate, make sure the band rules are clear on this matter at the outset, and if you do allow tabs, keep track of them so that the bills don't exceed the musicians' ability to pay.

HIT THE ROAD, JACK

It's the potential payoff for all this planning and hard work that makes the endeavor worthwhile. If you plan it right (and roll with the inevitable problems you *didn't* plan on), you can gain new friends and fans all across the country. Also, if your band can survive all that togetherness, you've learned yet another survival tool on your road to success in the music business.

Anne Eickelberg *is* Mix *magazine's editorial assistant. She logged a total of 125,960 miles (equal to five times around the world at the equator) in four different vans on tour with her band, Thinking Fellers Union Local 282.*

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KORG

D8

A compact, low-cost, 8-track hard-disk recorder.

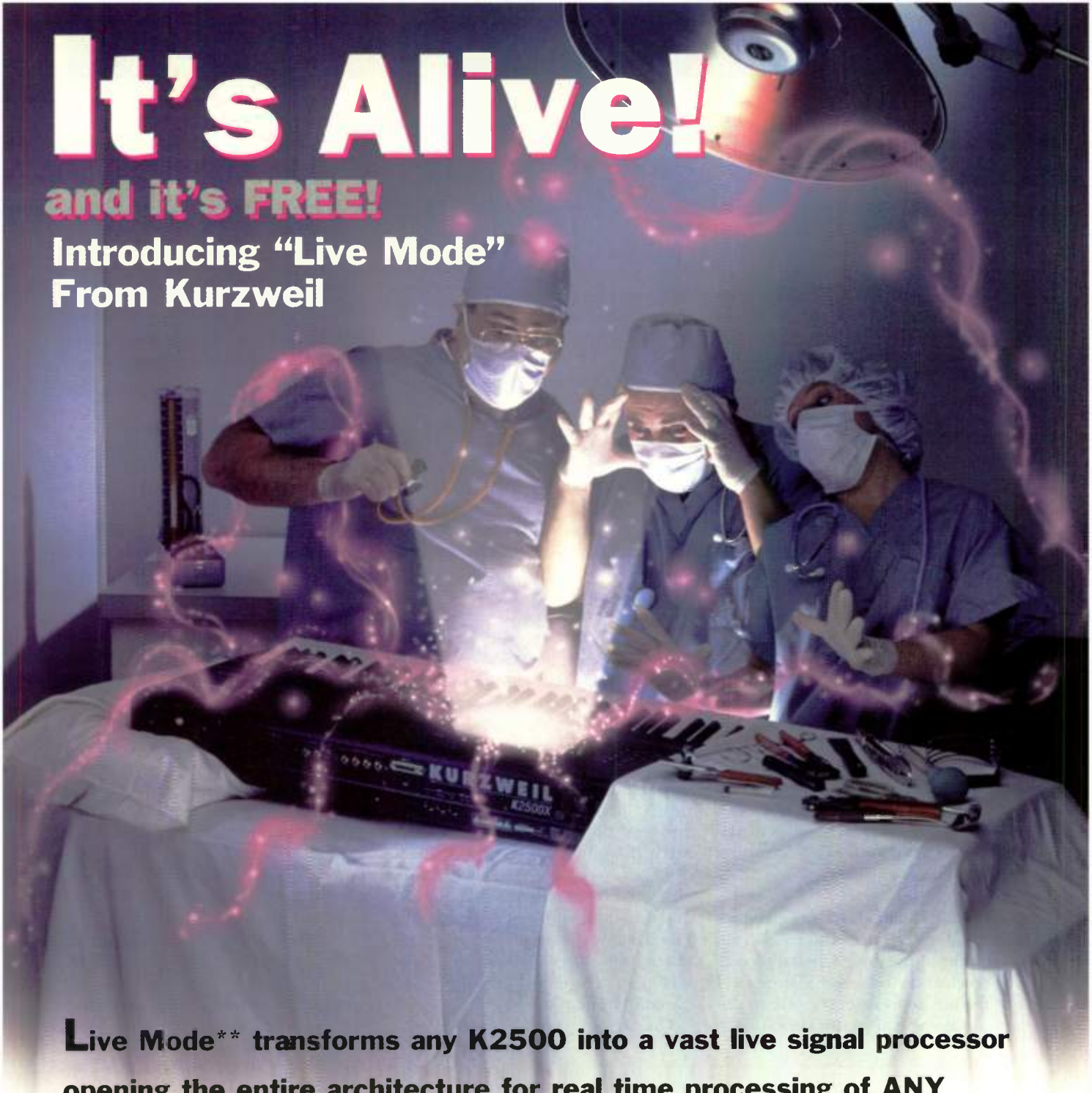
By Bob O'Donnell

Anyone who has followed the development of music technology over the last several years knows that the industry has been marching inexorably toward digital recording. But while digital recorders have been a reality for professional musicians and engineers for quite some time now, only recently have tools really been developed for those of us who can't quite afford to drop $5,000 on an MDM or modular HDR and a console. Sure, computer-based hard-disk recording systems are an alternative, but some people just prefer the relative simplicity and stability of hardware. I know, because I'm one of them.

In the meantime, people working on budgets have been slogging away with cassette or reel-to-reel ministudios, dreaming of the day when an all-inclusive digital product would really be affordable. Well, not only has that time arrived, it's arrived with a vengeance; there are a slew of portable, affordable hard-disk recorder/mixers on the market, many of which look and function like the analog machines that we have all come to love.

Korg's somewhat belated entry into this market is the D8, which, at a retail price of $1,250, is one of the most affordable devices of its kind. The D8's eight tracks of uncompressed digital audio (sampled at 44.1 kHz) are recorded onto a built-in 1.4 GB hard drive, providing a total of 270 track minutes. A 12-channel digital mixer, onboard digital effects, and a host of other goodies all fit into a compact, refreshingly lightweight box.

The Korg D8 portable hard-disk recorder plays back eight tracks of uncompressed 16-bit, 44.1 kHz digital audio but only records two tracks at a time. Its 12-channel digital mixer includes scene automation but not dynamic or MIDI automation.



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WHO'S IT FOR?

The D8's features are clearly not intended to appease all comers. The company has made a few design decisions that indicate the product is geared for the nonprofessional, 1-person studio. The most obvious of these are the 2-band EQ and the fact that the D8 only offers two ¼-inch, balanced analog inputs and can only record on two tracks simultaneously—forget about trying to track your entire band at once.

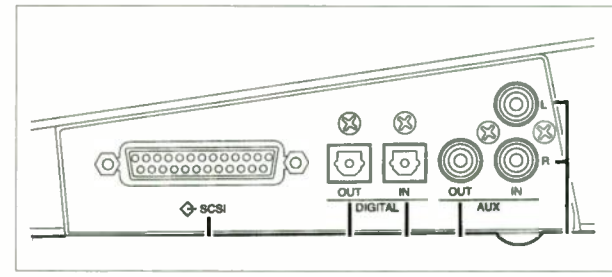
But, as limiting as that choice may be for certain applications, it does make the notoriously confusing process of signal routing much more straightforward than it is on other devices. Whatever is plugged into Input 1 gets recorded on the record-enabled track; if you use Input 2, it gets routed to the next consecutive, record-enabled track. It can't get much easier than that.

THE LOWDOWN

The D8 is a full-featured machine. It has all the things you would expect from a low-end, hardware-only hard-disk recording system, including the ability to cut, copy, paste, and delete either individual tracks or entire chunks of songs; a jog-wheel control with scrubbing for locating in and out points; and a 2-band fixed EQ on every track. If you make a mistake in the recording or editing process, the D8 offers a simple, single-level Undo/Redo feature.

For those of you who have been stuck with analog recorders and haven't yet experienced the joys of digital recording, even these common features will seem quite impressive. One minor disappointment is that the D8's display does not support any type of graphic waveform editing, so you will have to rely on your ears to get the edit points just right.

The built-in effects processor offers 130 different programs, 65 of which are user-definable. All parameters are editable, and each program can use up to four different kinds of effects. The effects include the standard array: reverb, chorus, delay, dynamics processing, 2-band parametric EQ, 2-band shelving EQ, and a bunch of guitar-specific distortion and amp simulations. Also included are some special effects, such as a pitch shifter, ring modulator, low-fidelity simulator, and center-channel canceller.



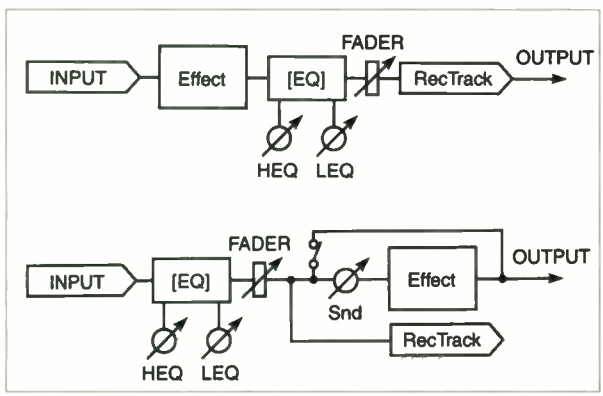
COURTESY KORG USA

FIG. 1: In addition to two balanced, ¼-inch analog inputs, the D8 has optical S/PDIF digital I/O, a mono aux send and stereo return, and a 25-pin SCSI interface.

As with most low-cost digital recorders, you can generally only use one effect at a time. However, the D8 offers a simple monitor delay that can be used on a record-enabled track while another effect is applied to the playback tracks. This is a really nice touch.

For interfacing with the outside world, the D8 offers digital I/O via optical S/PDIF connectors, a mono RCA aux send and stereo RCA aux returns, MIDI In and Out ports, and a 25-pin SCSI port (see **Fig. 1**). The digital input even offers a sample-rate converter for any incoming signal that's not 44.1 kHz. However, you cannot use the D8's effects processor on an incoming digital signal. (The digital output does not have this limitation.)

The SCSI port is designed to work with external hard drives and removable drives up to 4 GB in size. As you would expect, the D8 can initialize, format, and (if appropriate) eject any devices attached to that port. If you're working with a DAT drive, you can also use it to back up and restore your works in progress.



COURTESY KORG USA

FIG. 2: The D8 lets you record with effects (top) or record the tracks dry while listening to an effect (bottom). By recording dry, you can experiment with different effects later, but you're limited to using a single effect for the entire mix.

ALL MIXED UP

Although the company's claim of a 12-input mixer is technically true—it has some stereo channels—you can never actually have more than eight tracks and/or sources playing at once because there are only eight discrete faders. So if you take advantage of the D8's ability to control or slave to MIDI sequencers with MTC, and you have a bunch of synth parts playing alongside your digital audio tracks, you'll need a separate mixer to put everything together.

However, the onboard mixer is set up logically. Each track is fixed to a corresponding fader, which makes it easy to see what's controlling what. The D8 lets you turn tracks on and off while you're working on a mix (or recording, for that matter), but there is no Solo function. You can also group two faders together to control level, EQ, and effects-send settings from a single fader, and there is a great mastering playback mode for ordering the songs any way you choose.

The D8 offers some basic scene automation, which records the fader level, pan, channel EQ, and effects send settings for each track. Up to twenty scenes can be assembled into a song, and the D8's memory holds a total of 50 songs. The D8 doesn't offer onboard dynamic automation or MIDI automation, but you can store different scenes at different locations within a song. When this feature is enabled, the various levels will change relative to the scene settings as a song plays (although the knobs won't move to reflect those settings).

THE RECORDING PROCESS

Once you get the hang of it, the basic recording processes on the D8 are fairly straightforward: simply plug an instrument or microphone into Input 1, adjust the trim control, record-enable the track, and press Record. There is also a nifty Trigger Recording feature

For manufacturer information, please see Contact Sheet, p. 163.

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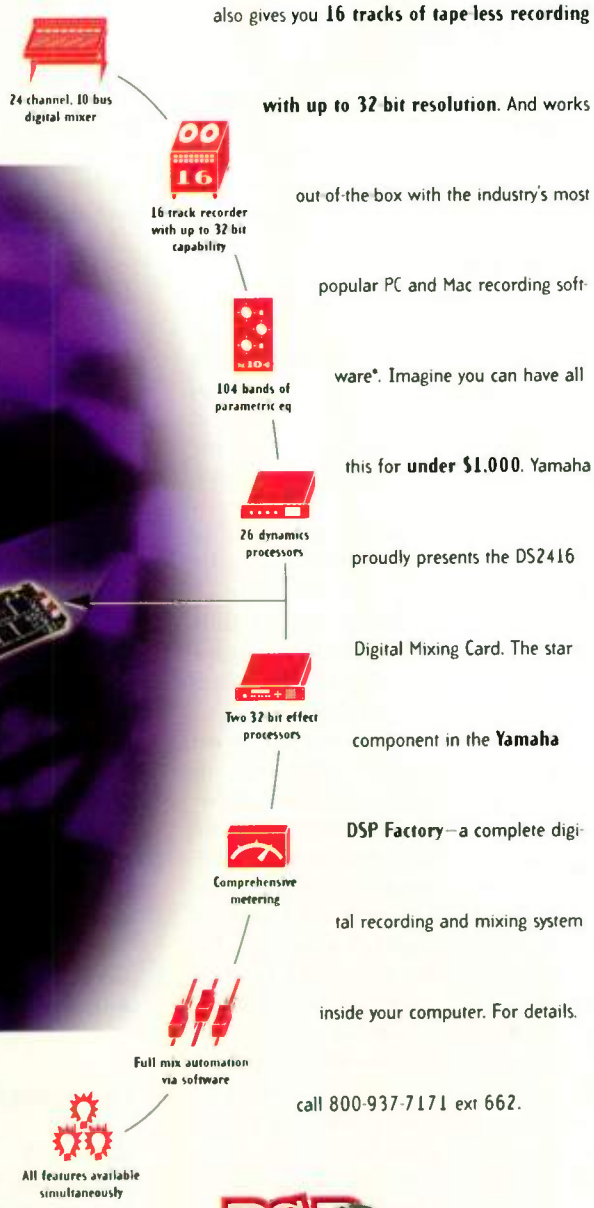

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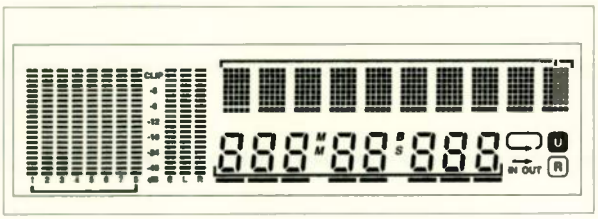

FIG. 3: The display crams a lot of information into a tiny space. Unfortunately, it's not backlit, and the main page and parameter information is limited to only ten characters.

that will automatically start recording as soon as it receives a signal above a user-definable threshold—great for working hands-free.

Unlike Roland's VS line of recorders, the D8 doesn't offer virtual tracks. However, the D8 does allow you to copy an entire song to another location on the hard drive. After doing that you can, for example, do a second pass on a guitar solo or re-record a keyboard track. During mixdown, the D8 lets you pick and choose from both takes. What really shines about this feature is that the copied audio doesn't eat up any hard-disk space—it simply adds additional song markers.

If you make a mistake while you're recording, you can either undo the take and start over or use the automated punch in/out function and handy Loop Play mode to make a few quick corrections. As I expected, the punches were completely glitch free.

Using the D8's effects as you record (or experimenting with different effects after you record) is pretty easy, and the functions are fairly flexible (see **Fig. 2**). The D8's multi-effects processor can be used in one of three modes: Insert, Master (Send Type), or Master (Global Type). If you select Insert mode, the effect is patched in-line with the signal, and you need to edit the parameters to adjust the wet/dry ratio. If you use it in Master (Send Type) mode, it works like a traditional aux send. In Master (Global Type) mode, the entire L-R bus is sent to the effects, but you do not have control over individual track levels. This is handy for things like applying stereo compression to the entire mix.

The sound quality of the D8's recordings is quite good. Again, if you're coming from the world of analog cassette multitracks—as I suspect many future D8 owners are—you're bound to be impressed. Uncompressed 16-bit, 44.1 kHz digital audio sounds pretty darn good. (The unit has 18-bit converters, but it records at 16 bits.) The wide range of built-in effects also sounded convincing, although some of them were noisier than I had expected. The reverbs sounded fairly smooth, and the guitar distortions had some nice bite to them, but some of the delay and EQ programs seemed a bit flat to my ears.

TIMING IS EVERYTHING

The D8 has several cool tempo/timing features. Chief among them is a metronome that, instead of just providing a boring click, lets you play along with any one of 131 preset drum patterns. This is such a great feature, it'll make you wonder why someone hadn't thought of it sooner. The drum patterns aren't recorded internally; they are mixed in along with the master outputs. Theoretically, you could record them on your master 2-track if you really wanted to. To be honest, though, the sonic quality of the drums isn't going to compete with even the simplest sound module.

The sound quality of the D8's recording is quite good.

The D8 also lets you create tempo maps that can designate separate time signatures and tempi at different points in the song. This can be really handy if you want to view your location with an accurate record of measures and beats or if you plan on synching the D8 with a MIDI sequencer.

You can also set and record a tempo with the Tap Tempo function by tapping on the Play button or a footswitch while a recording is playing. This is invaluable if you like to record audio tracks before MIDI tracks. Just use the Tap Tempo to create a tempo map of your existing D8 audio and sync your sequencer to the D8, and any recorded MIDI tracks will be in perfect sync with the D8 audio tracks. The D8 also responds to MMC messages, so you can control things from your computer.

DRAWBACKS

I do have a few gripes about the unit. First, the LCD is pretty small and isn't backlit (see **Fig. 3**). Frankly, the lack of a backlit screen is inexcusable in a machine of this type; even $200 effects processors have backlit displays, so why

Korg D8 Specifications

Converters	18-bit linear
Sampling Rate	44.1 kHz
Track Count	8
Hard Drive	1.4 GB
Analog Inputs	(2) ¼-inch, balanced channel (switchable mic/line or instrument); (2) RCA aux returns
Analog Outputs	(2) ¼-inch, balanced, main L/R; (1) RCA aux send
Digital I/O	S/PDIF optical
Simultaneous Record Tracks	2
Other Connections	MIDI In and Out, SCSI
Sync	Reads MTC and MMC
Mixing Section	12-channel digital mixer, scene recall, 2-band fixed channel EQ
Effects	reverb, chorus, delay, dynamics, guitar amp simulation, EQ
Frequency Response	10 Hz–21 kHz (±1 dB)
Dimensions	15.2" (W) x 9.8" (D) x 3.3" (H)
Weight	5.7 lbs.

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Gear Talk DIGITAL AUDIO SEQUENCERS

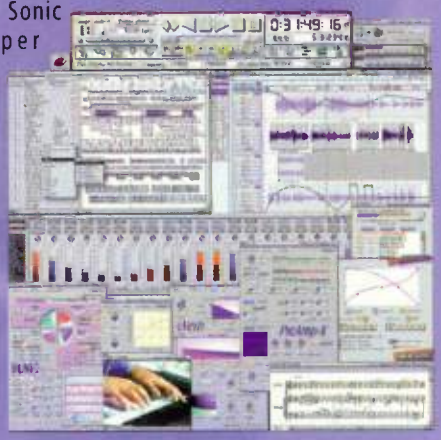
Audio sequencers combine two of today's hottest technological breakthroughs: MIDI sequencing and random access hard disk recording. Nothing beats the creative freedom of a computer-based MIDI/Digital Audio rig, regardless of your musical style. Here are four of the leading programs — all proven, multi-award winning, professional powerhouses!

Cakewalk Pro Audio 7

The undisputed leader in Windows based sequencing. **Cakewalk** is now pumped up with even more recording and effects processing power, on-screen consoles with aux sends and returns, Yamaha DSP Factory support, online tutorials, real-time MIDI control and beyond! Yet even with all this new power, the interface is easier than ever to use with dockable toolbars, streamlined menus and faster access to editing. Music, films, games or even for live performance . . . **Cakewalk Pro Audio 7** makes it easy!

Digital Performer 2.4

Years of hit records, film scores and concert tours are reflected in the design of **Mark of the Unicorn's Digital Performer.** Version 2.4 includes dozens of real-time audio and MIDI plug-ins including arpeggiator, tube pre-amp, eVerb, Sonic Modulator, 40-band EQ per track, Chorus, Flange, Echo, Dynamics, DC offset removal and more! Also plug-in grouping, 24-bit recording, stereo tracks, drag and drop audio transfers with samplers, PureDSP stereo pitch shifting and time stretching. **Digital Performer** offers the best combination of advanced features and power.



Logic Audio Platinum 3.5

960 PPQ! Simultaneous multiple hardware support! Stereo Sample Editor! Audio Cycle Record! Non-destructive realtime crossfades! 24-Bit support! New improved, easier to use user interface! Hit after hit is being made with **Logic Audio** from **Emagic**! A myriad of plug-in options from TDM to VST to Premiere, all with real-time DSP. BIAS Peak SE (for Mac) or Cool Edit Pro LE (for Windows) bundled at no additional charge! Want a configurable user interface that lets you choose how to work? Want professional score publishing? Have it all with **Logic**!

Studio Vision Pro 4.0

With over 100 new user-requested features and a streamlined interface, **Opcode** proves that powerful software can also be easy to use. The goal of **Studio Vision Pro 4.0** is first and foremost one of ultimate musicality and user friendliness. After literally inventing the category of integrated MIDI and Audio software, Opcode has refined the art in stunning fashion, winning many thousands of dedicated fans around the world. Now you're in control . . . so you set the course. What's your **Studio Vision**?

can't a $1,250 digital recorder? Worse, the level meters are so tiny you can hardly read them. I was also dismayed to see that there are no easy-to-read clip indicators on each channel. A minor issue is the absence of a "variable pitch" control for playback, nor are there options for time compression or expansion.

In addition, I found the D8's preamps to be a bit noisy. Input 1 has a level switch that selects between mic/line inputs and direct guitar signals, but on several occasions I found that I really had to crank the trim control to get a reasonable level. When I did, I inevitably got some hiss.

Finally, despite the fact that the D8 offers a fair number of dedicated buttons, some functions still suffer from the "multiple pages of parameters per function" syndrome that infects so many products. What I really would like to see is some kind of Escape button that would take you back to an initial state. Thankfully, the main function buttons are extremely easy to navigate, and the manual is well organized (which helps a bunch). Overall, the D8 is pretty easy to work with.

D FINAL WORD

Despite a few misgivings, I grew to really like the Korg D8. As long as you're not turned off by the 2-input, 2-track, 2-band EQ limitations, it has a lot of nice things going for it. The main recording controls are easy to get around, the built-in effects offer a nice variety, and the drum-machine metronome is great for getting your creative juices flowing. I also liked the Tap Tempo features and full complement of ports and connectors.

I would love the ability to run multiple independent effects for each of the different tracks, but that just isn't going to happen at this price level (at least not yet). I also think MIDI automation could and should have been included with an all-digital mixer, but it isn't there, and that's the way of it.

The bottom line? I think you'll find the D8 to be a fine machine that brings high-quality digital recording to an affordable level.

Bob O'Donnell, *former editor of* **EM,** *hosts the* O'Donnell on Computers *radio show, which you can hear via RealAudio on the Web at www.everythingcomputers.com. He also writes a weekly column for InfoWorld Electric, the online version of* Info World *magazine, which can be found at www.infoworld.com.*

KORG
D8 multitrack hard-disk recorder
$1,250

FEATURES ■■■■
EASE OF USE ■■■
AUDIO QUALITY ■■■■
VALUE ■■■■
1 2 3 4 5

PROS: Affordable uncompressed audio recording. Great tempo features. Logical mixer section.

CONS: Some confusing parameter pages. Meters are hard to read. Simultaneous recording on only two tracks. Effects can be noisy. Only two inputs.

CIRCLE #437 ON READER SERVICE CARD

U&I SOFTWARE

MetaSynth (Mac)

A new approach to synthesis, composition, and effects processing.

By Peter Freeman

It's rare that a product challenges conventional methods of doing something or presents an entirely new way of dealing with a particular task. U&I Software's new *MetaSynth* program does both of these and manages to present its transformative power in an appealing way. Unfortunately, *MetaSynth*'s fresh approach makes it difficult to cover thoroughly in a review with limited space. I hope I can leave you not only with a feel for the program's many capabilities but with some sense of the experience of using it.

PAINT IT BLACK

The simplest way of describing *MetaSynth* is "a paint program for sound." *MetaSynth* lets you use familiar paint-program–style tools to both create and manipulate sound. But it does even more: it's a compositional tool, a signal processor, a synthesizer, and resynthesizer, all in the same environment at the same time.

MetaSynth establishes a very specific relationship between timbre and visual image and lets you create and alter sounds both visually and through preset audio effects processes. (Not surprisingly, *MetaSynth*'s developer, Eric Wenger, was also the creator of the graphics program *Bryce*.)

The software requires a Power Macintosh 601/120 MHz or faster. It will work on slower Power Macs, but the real-time features like previewing and effects will be compromised. (Of course, there *aren't* many slower Power Macs than a 601/120.) *MetaSynth* is fully compatible with the new G3 Macs, as well.

SOUND BY DESIGN

MetaSynth's interface encompasses four main windows: Image Synth, Wavetable, Effects, and Filter. There is also a Sample Display area at the top of the screen that shows the current sample (if there is one) as a green waveform overview (see **Fig. 1**). The Sample Display can be hidden if you wish.

The Image Synth is the main *MetaSynth* window, where most of the action takes place. Here you import images (in PICT format) or create them from scratch, as well as filter, add to, and manipulate them. Another way to think of the Image Synth is as a "sequencer" or controller for the sound generators. These generators include the Wave Table palette, the Procedural Synthesizer, audio samples (the program reads AIFF and SDII samples), and *MetaSynth* instruments.

In the Image Synth window, time flows left to right; pitch is represented high to low, from the top of the window to the bottom; and color represents stereo placement (red is left, yellow is center, green is right). The luminance of each pixel represents amplitude, and each pixel is actually a pitched oscillator.

BRUSHING UP

The Image Synth window provides access to specialized tools for graphically manipulating sounds. There are so many of these that space doesn't permit a complete listing and description of each, so I'll just mention the general categories.

The Brush tool is perhaps the simplest (at least on the surface), offering not only many different brush shapes and sizes but also various brush types. Each brush provides different functionality, making this a potent tool indeed. The different brush types are Pen Brush, Air Brush, Filter Brush, Harmonics Brush, Attack Brush, Smoothing Brush, Spray Brush, and Decay Brush.

Filter Brush is particularly interesting, because its purpose is to adjust the intensity (amplitude) of preexisting pixels in an image, rather than adding new pixels. This affords an amazing degree of precision in adjusting sounds: you can see and emphasize or de-emphasize specific features in a sound, such as the relative volumes of specific timbral components or frequencies.

Among the other manipulation tools in the Image Synth are Visual Filter Presets, which modulate the current sound when chosen from a menu. There's also a local Edit menu that includes a host of functions, such as Max, Subtract, Add, Multiply, Merge, and Crossfade Pict. These functions are used to blend or modulate images in various ways. Mouse-operated Rotate, Offset, Scale XY, and Contrast Luminance adjusting tools are available from this window, as is a Processes submenu, which offers various Adobe *Photoshop*-like filters, such as Blur, Emboss, and Triangle/Saw filters. You can also use

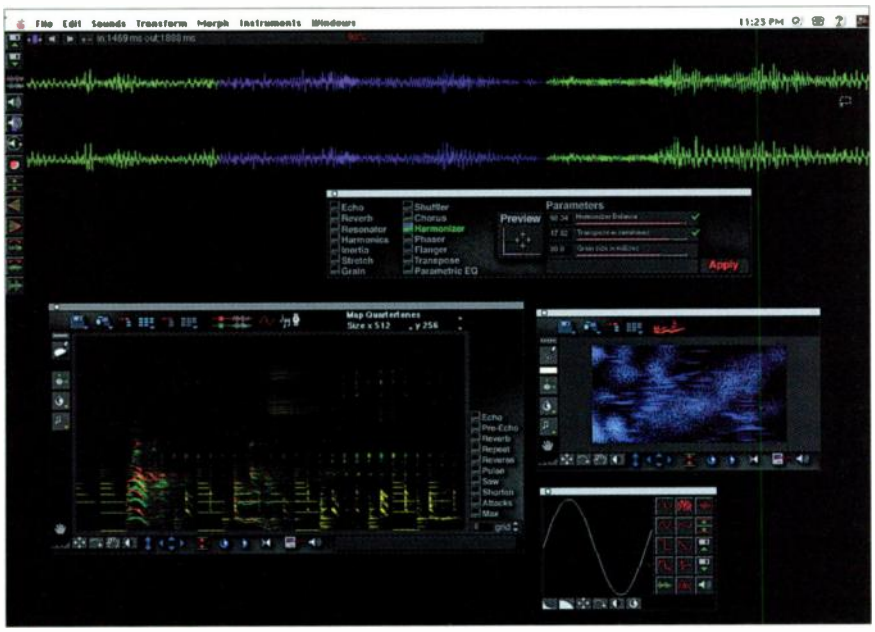


FIG. 1: U&I's *MetaSynth* interface comprises Image Synth, Wavetable, Effects, and Filter windows. A Sample Display at the top shows the current sample as a green waveform overview. The Sample Display can be hidden if you wish.

Hit record?

Hit "record."

The D8 Digital Recording Studio includes everything you need to record and mix your music. An 8-track recorder, a 12-channel mixer, onboard effects, a built-in 1.4GB hard drive and a whole lot more.

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KORG *D8 Digital Recording Studio*

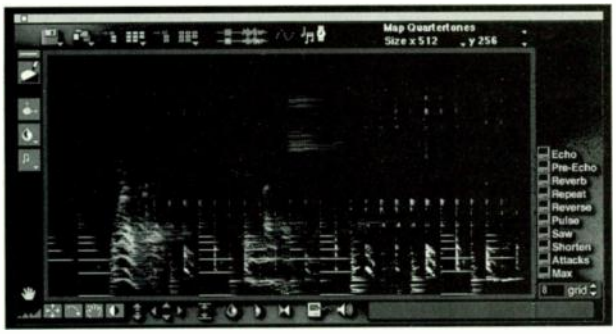

FIG. 2: In the Image Synth, you import PICT images or create images from scratch and then filter, add to, and manipulate the images, which affects the corresponding sound. The Hot Filters menu (right side of the window) provides ten additional effects processes that are always available. These processes affect the image in the Image Synth display, rather than the audio.

image-manipulation processes and tools from other paint programs.

To hear what the current Image Synth display sounds like, you can either get a quick 'n' dirty preview in nearly real time, using the Return key, or press the Synthesize Current Pict button to calculate the sound at high-resolution. This can take a few seconds or much longer, depending on the speed of your Mac and the length of your sound.

Perhaps the most important control in the Image Synth is the Source Select button. This chooses the source for the window's input, which can be the currently loaded sample, the program's FM (Procedural) Synth, or its Wave Table Synth.

ON THE TABLE

When "Use Wave Table" is selected, the image displayed in the Image Synth window uses the currently selected waveform in the Wave Table window for each single-pixel "oscillator." This produces a class of sounds—glassy, transparent, sometimes metallic—that will be familiar to those who have worked with other wavetable instruments, such as Waldorf's Wave and MicroWave, the PPG Wave, or Korg's Wavestation.

When Use FM Synth is selected, the *MetaSynth* Procedural Synth is the sound source. It is an FM synth that, although more powerful than its hardware ancestors, yields sounds reminiscent of Yamaha DX-series instruments. As with the Wave Table, every "oscillator" inherits the current wave shape.

When Use Sample or Crossfaded Sample is selected, each pixel/oscillator plays the currently selected sample at a pitch, stereo position, and amplitude determined by its position, color, and brightness, respectively. When you consider that this essentially means you have literally *hundreds* of virtual samplers playing your current sound file according to your brushstrokes, you begin to get an idea of how amazing this program really is.

It is important to note that you are able to store images you create or import as Presets, which appear in a pop-up icon list. This makes it easy to create a big library of instantly accessible images for use in creating or processing new sounds. Turnabout is fair play: you can also analyze any sound and create a sonogram that is displayed in the Image Synth window. The sonogram can then be manipulated or used as a filter, like any other image.

SOME LIKE IT HOT

Another feature of the Image Synth is the Hot Filters menu. Located along the right edge of the window (see **Fig. 2**), this is a palette of ten additional effects processes that are always available, i.e., "hot." These are purely "graphical" processes, meaning that they manipulate the image in the Image Synth display, not the resulting audio. Some of their names are a bit misleading: Reverb, for example, is not conventional digital reverb but rather a simulation done by extending the durations of all pixels in the current image by the current Filter Grid interval and then fading them. This creates a fake "reverb tail."

Similarly, the Pre-Echo creates visual "echoes" of the current image before its original start. I found these to be interesting sounding, even though in a crude way. My favorites were probably the Pulse and Saw effects, which create "holes" in the image at regular intervals, yielding rhythmic effects on any sound.

LOOK THROUGH ANY WINDOW

As its name implies, the Sample Display window is used to perform familiar editing operations such as cut, copy, paste, and looping, but it has some noteworthy interface features that differentiate it from conventional sample editors.

First, its scrolling mechanism has a nice "inertia" feature that lets you "throw" a waveform display left or right. Drag the mouse left or right and let go, and *MetaSynth* keeps scrolling in that direction at roughly the speed you dragged. There is also a nice dynamic-zooming feature, where Option-dragging the mouse will zoom in or out with the inertia I've described. At first, having to hold down Command to select a portion of the waveform is awkward (most other sample editors don't require a modifier key to do this), but one gets used to it quickly.

Aside from the Image Synth, the Filter window is my other favorite area of this program. You "paint" filters onto a sound with the Brush/Pencil tools. This sounds confusing, but in practice it's not: every brush/pencil stroke yields a blue line that "lets through" sound at a specific frequency (see **Fig. 3**). Unpainted black areas let no sound through. As in the Image Synth, time in the Filter window goes left to right, and frequency goes up and down. This is an elegant arrangement that lets you create mind-bogglingly complex filtering matrices with just a few brush strokes across a sound. Pressing the

FIG. 3: In the Filter window, you can "paint" filters onto a sound with the Brush/Pencil tools. Every brush/pencil stroke produces a blue line that passes sound at a specific frequency. Unpainted black areas let through no sound. Time is on the *x* axis and frequency is on the *y* axis.

For manufacturer information, please see Contact Sheet, p. 163.

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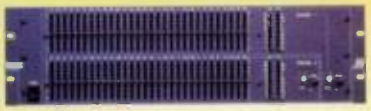

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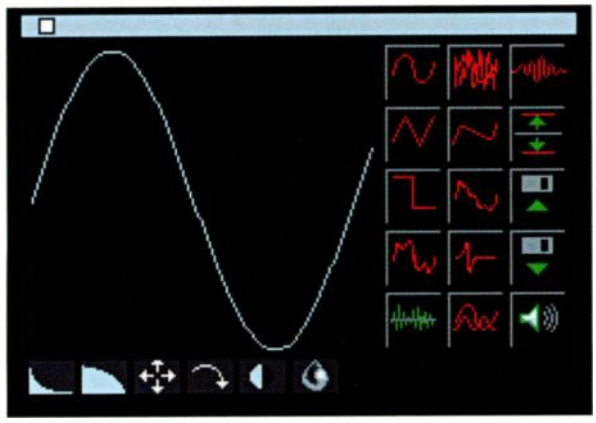

FIG. 4: In the Wave Table synth window, the wave shape can be stretched and modified in real time using any of eleven preset wave-shape modifiers and the modifier tools (bottom). If you click and drag the mouse on a waveform, the waveform starts playing continuously; drag the mouse to the right, and the current wave-shape crossfades into a new shape.

Apply Filter button calculates your filter and then plays the newly modified sound.

As with the Image Synth, you can import PICT files to be used as filters or choose from a list of existing ones. Using the Save Preset button, you can add your own filters to this list. I particularly liked being able to bring up a pop-up list of colorful squiggles, knowing that each had its own specific filtering characteristic. It's lots of fun!

The tools from the Image Synth window are pretty much all duplicated in the Filter window. So once you have learned the tools in the Image Synth, the Filter Window is quite easy. (There are some minor inconsistencies in the *MetaSynth* interface, which I'll discuss shortly.)

Overall, the Filter window is really impressive and lets you create highly convoluted filtering effects almost instantaneously, in an intuitive way. These processes would be pretty much impossible to create on a hardware effects device.

WAVETABLE SYNTH

As mentioned earlier, the Wave Table window sounds and acts like a conventional wavetable synthesizer, except that the wave shape can be stretched and modified by preset wave-shape tools in real time, allowing you to interactively design waveforms on the fly.

These preset wave-shape modifiers work in an interesting manner. Click and drag the mouse on one, and that waveform starts playing continuously. Drag the mouse to the right, and the current wave shape smoothly crossfades into a new preset shape (see **Fig. 4**). In other words, it's a "make it more like this shape" control. You can also alter the wave shape directly on the screen by clicking and dragging on the waveform representation itself.

There are eleven preset shapes to choose from, as well as modifier tools along the bottom edge that work as they do elsewhere in *MetaSynth*. In the Wave Table window, however, you can hear changes as you make them, because the modifier tools work in real time. As with the Image Synth, Filter, and Procedural Synth windows, there are Save and Load icons here, enabling you to recall previously stored wave shapes and save new ones to disk.

PROCEDURAL SYNTH

The Procedural Synthesizer is basically a 2-operator FM synthesizer that employs real-time interactive controls similar to those in the Wave Table window (see **Fig. 5**). The two operators can be carrier or modulator.

A neat graphic display called "Evolution" governs the transition from A to B. As with the Wave Table synth, all controls are editable in real time. The Evolution display has ten preset crossfade curves, as well as some of the now-familiar drag-controlled tools, such as the Hand and Rotate tools. As expected, sounds created here can be saved to and loaded from disk as samples.

Although I'm not a big fan of FM synthesis, using this window was fun and produced some interesting noises, especially when they were used as a sound source by the Image Synth.

META EFFECTS

MetaSynth's Effects window provides fourteen different effects processes that allow real-time preview using a nice gestural parameter-adjustment scheme (see **Fig. 6**). This bears some conceptual

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MetaSynth
Minimum System Requirements
Power Macintosh 601/120 MHz; 16 MB RAM; Mac OS 7.3; Sound Manager 3.1; QuickTime 2.0

similarity to programs like Arboretum's *Hyperprism* and INA-GRM's *GRM Tools* in that you have real-time, *x-y* mouse control over specific effects parameters. Once you've adjusted the current effect to your liking, you apply it, and it's permanently written to the current sound. And yes, there is Undo!

I particularly liked the sound of the Phaser, Harmonizer, and Grain algorithms (the latter being a real-time granular synthesizer), but all of the effects sound musical and are enjoyable to use, largely because of the *x-y* interface. It's especially interesting to hear what happens when you further manipulate sounds to which you've already applied these effects; exotic results are very easy to obtain by doing this with any of the other *MetaSynth* windows.

META INSTRUMENTS

MetaSynth allows you to construct multisampled setups called Instruments as a more comprehensive way of playing samples from the Image Synth. A single Instrument may contain up to eighteen samples that can be assigned to any range across the keyboard. Because *MetaSynth* is entirely RAM-based, however, these can be vicious memory hogs if you're using long samples.

Some nice features of the Instrument window are the Auto-Crossfade and Loop buttons, which are self-explanatory, and the Auto Ranges button. Auto Ranges automatically assigns a loaded sample to a range that corresponds to its name, if it has a pitch specified (for example, "Guitar E2"). This makes setup much easier.

Each sample in an Instrument can have independent looping and transposition, as with most samplers. I experimented with creating Instruments from a range of different samples, including orchestral strings and more abstract, electronic textures. Though some good sounds resulted, I found I preferred working with single samples; for my approach, this seemed to work better. However, it's not difficult to see how useful the Instrument concept can be in certain situations. For example, if one wanted to have a multisampled

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CONS: New paradigm results in long learning period.

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acoustic instrument as a starting point for something in *MetaSynth*, the Instrument option would really come in handy.

MICROTONALITY

For those interested in non-Western tunings, *MetaSynth* has the Map function, which allows completely user-definable scales to be imposed over the Image Synth window. It also offers a number of preset alternate tunings. In light of all the other features in the program, this is perhaps the icing on the cake. Beyond the obvious use for obtaining specific tunings, it's also an interesting tool when used as an effect.

For example, you might create a scale where all notes are very close together and then use the Image Synth in conjunction with microtuning. This could generate a subtly shifting, sound-sculpture effect that wouldn't be possible with traditional, equal-tempered tuning.

THE FREEMAN METHOD

The flexibility of this program is such that everyone's bound to work a bit differently. However, here's a view of my particular methodology, which I hope will provide some insight into the "*MetaSynth* experience."

Because my area of interest is more in the sampling and sample-processing camp than straight synthesis, I like starting with pre-existing samples in *MetaSynth*. At the start of a session, I might select and open a sound file, normalize it, experiment with the Filter brush in the Image synth, choose different Sound Sources, and then listen to the results. Next I might paint some filters, listen to the results, and resynthesize the sound using Analyze Current Sound in the Image Synth. I nearly always end up with something interesting and unusual. Finally, I save my results as both a PICT and a sound file and, if the filter I painted gave a good result, add it to the Presets menu.

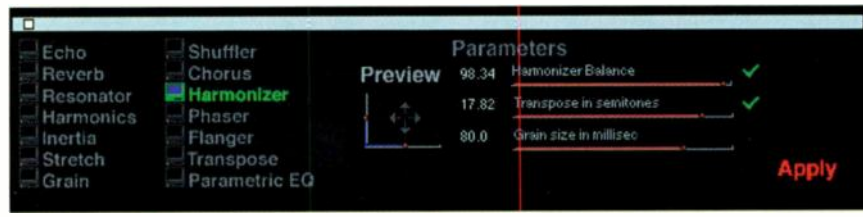

FIG. 6: *MetaSynth*'s Effects window provides fourteen different effects processes with real-time preview and a gestural parameter-adjustment scheme (right). The effect is written to the current sound when you click Apply (lower right).

Of course, this is just one way of approaching the program. Another might be to choose a sample you like, paint an image freehand in the Image Synth, and "play" the sample with that image. Alternatively, you could do the reverse and use a Sample to play an FM timbre and then filter the results into submission. The possibilities are endless.

MANUAL LABOR

I have decidedly mixed feelings about the *MetaSynth* manual. It explains the program's features, but it has no tutorials. (Although a "tutorial section" is referred to in the manual, the only tutorial included is really a software demo, rather than an in-depth, step-by-step series of examples.)

On one hand, if this program were packaged with a *War and Peace*–length tome, it would probably prove way too daunting for most people. On the other hand, the current documentation leaves much to be desired, particularly in the "how do I actually use these tools?" department. Although you get a set of demo presets consisting of sample images with embedded text, they don't really approach a comprehensive, printed tutorial section.

In the ten years I've been using and writing about them, I've observed that many software packages are lacking in useful tutorials. But this program presents such a radically different approach to synthesis and sound design that this omission is a definite shortcoming.

INDESCRIBABLE POWER

MetaSynth is a truly innovative program that provides a staggering degree of power. However, because *MetaSynth* presents a new paradigm to the user, it takes time to fully appreciate and control this power. *MetaSynth* allows any number of approaches to sound creation and processing, from broad strokes to super-detailed fine-tuning.

This program has more audio features and capabilities than several other software and hardware products put together. (The resynthesis and filtering are good examples.) Of course, this vast array leads to a lengthy learning process. Once one becomes familiar with the interface, however, there are virtually no limits on what can be done with sound using the program's arsenal of visual and sonic tools.

It's simply impossible to accurately and completely describe the sonic character of this program; you must hear it for yourself. If there was ever a sound-design environment in which genuinely new things were possible, this is it. If you are a synthesist, sound designer, composer, or just someone that enjoys creating and processing sounds, you owe it to yourself to check *MetaSynth* out.

FIG. 5: The Procedural window is a 2-operator FM synthesizer with real-time interactive controls. The two operators can be carrier or modulator. The Evolution display controls the transition from A to B, with ten preset crossfade curves. Note the drag-controlled tools, such as the Hand and Rotate tools (lower right).

Peter Freeman *is a bassist and producer based in New York City. Some of the artists he has worked with are Seal, Jon Hassell, Shawn Colvin, John Cale/Chris Spedding, Nile Rodgers, L. Shankar, Sussan Deihim, and Richard Horowitz.*

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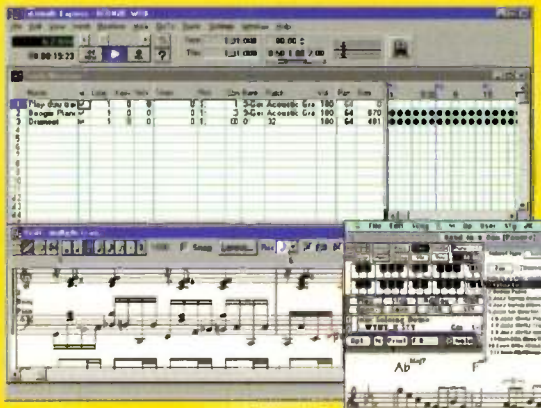

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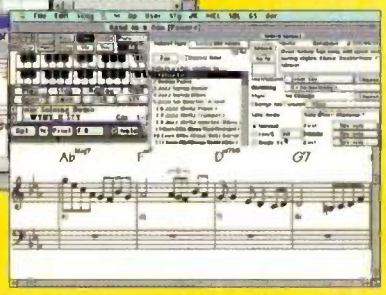

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PRESONUS

ACP-22

A clean, full-featured, inexpensive dual compressor/limiter/gate.

By Myles Boisen

What do you give the studio owner who has everything? How about more knobs to fiddle with and, hopefully, more control over the subtleties of the recording process? It seems everyone in the audio world is looking for more parameters, more options, and greater versatility—at least until the subject of compressors comes up. Dynamics control is loved or hated and endlessly debated by opposing camps, from the UREI LA-2A "set it and forget it" minimalists to the supertweakers who spend an hour fine-tuning attack settings one microsecond at a time.

For those who endorse the "more is more" approach, PreSonus, the maker of the highly lauded Blue Max "smart compressor," has launched the ACP-22, one of the most full-featured compressors I've encountered in over twenty years of studio work. Sixteen continuously adjustable rotary pots, thirteen switches, and 46 LEDs adorn its cool, twilight blue faceplate. The back panel is similarly loaded with connectors (see **Fig. 1**) and even has a few more switches that evidently wouldn't fit on the front.

Soon after its release, this profusion of potentiometers prompted one high-end audio dealer to opine that it actually offers too many options for the average personal-studio owner, suggesting that this much processing power is an invitation to disaster. As a recording instructor, I can't get behind that viewpoint, but I also can't overlook the glazed stares that creep across my students' faces as the lecture turns to thresholds, ratios, and hard knees. Perhaps if more novice engineers had access to well-appointed models such as this one, a lot of this compressor confusion could be avoided. Let's see what the commotion is all about.

BASIC BUILD

The PreSonus ACP-22 is a 2-channel, stereo-linkable compressor/limiter with frequency-dependent expander/gates, all packed into a smart, 1U-rackmount package. Until you catch a glimpse of the price tag, there is no outward indication that this deluxe unit is in competition with budget boxes from Alesis, dbx, Rane, and others. The chassis is solid steel; an internal power supply eliminates the need for an external, "wall wart" transformer; and both the design and feature set are worthy of placement in the swankiest equipment racks.

Both channels on the ACP-22 can be individually switched to operate at either -10 dBV or +4 dBu levels. Inputs and outputs have both balanced, XLR and unbalanced, ¼-inch tip-sleeve connectors. Separate compressor and gate sidechain jacks (for key-gating, de-essing, etc.) are available on each channel via ⅛-inch, TRS connectors. Also located on the back panel are the power switch and IEC power-cord connector.

The front-panel layout follows convention by placing the gate controls on the left for each channel and, to the right of these, rotary controls for the compressor threshold, ratio, attack, release, and output, in that order. These are, of course, standard features, but it is rare to find such a comprehensive selection of parameters offered in stereo at this price.

PARAMETER FEST

For gating, the ACP-22 offers a wide threshold control ranging from -60 (labeled as Off) to +20 dBu, along with 0.01- to 100-millisecond attack and 0.02- to 2-second release times governing a downward expander. This type of hybrid expander/gate is optimal for toms and kick drums, as it can be set to open instantaneously and then fade gradually with the drum's natural decay, rather than closing the gate abruptly and cutting off the end of a ringing tom hit.

The gate range (amount of gain reduction when the gate is closed) is switchable between -6 dB for soft gating and -60 dB for hard on/off switching, with neighboring LEDs indicating gate open/closed status and range selection. Most equivalent units do have some combination of these features, but PreSonus ups the ante by including a "spectral noise gate" equalizer in its gate-detection circuit. This switchable lowpass filter, which does not affect audio output, enables the gate to open only for midrange and low-frequency information, while remaining closed and immune to false triggering from high-frequency sources, such as cymbals. An additional LED illuminates when this feature is engaged.

Compressor threshold is adjustable from -40 to +20 dBu. Curiously, the ratio range, listed on the spec sheet as 1:1 to 20:1, is displayed on the panel as 1:1 to ∞:1. Over half of the dial is dedicated to ratios less than 4:1, with no calibration at all for ratios between 4:1 and ∞:1. If this arrangement encourages novice users to explore the smaller, gentler ratios, I'm all for it; on the other hand, it makes life difficult for those desiring accuracy and repeatability in the higher, limiting ratios. The attack control is especially useful, offering lightning-fast response times (0.02 to 2 milliseconds) over the first third of its sweep and more commonly used attack times (2 to 20 milliseconds) across the knob's middle range. Attack times are available up to an ample 200 milliseconds.

Considering the comprehensive range of attack-time offerings, the compressor section's 0.5 to 500 millisecond release control seems a bit chintzy. By comparison, similarly priced units typically offer release times of at least 2 seconds.

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A single-position, program-dependent Auto setting switch controls attack and release times only, leaving all other parameters adjustable by the user, and a soft-knee/hard-knee switch allows for further sculpting of the signal at the onset of compression. Both of these function switches are accompanied by status LEDs. Standard bypass switches, assigned to each channel with their own LEDs, defeat all compression and gating and also disable the stereo-linking switch (which, for some strange reason, lacks an LED to show when it is engaged).

A -20 to +20 dB output-level control, located below an 8-LED gain-reduction meter, allows for plenty of gain compensation. An additional multicolored LED array set along the top of the faceplate can be switched to display either input or output levels in 6 dB increments from -24 to +6, and then it jumps to +18 and +24. (As for why there is no +12 dB LED, your guess is as good as mine.) This dual-metering is very useful, though it would have been more logical to position the input/output level indicator above the output-level knob and to place the gain-reduction display closer to the threshold and attack controls. But minor quibbles aside, the sheer quantity and quality of control parameters offered on this unit are unparalleled. Here's how the ACP-22 performed during a month of critical use at Guerrilla Recording in Oakland, California.

GUERRILLA TACTICS

As far as gates go, I have yet to find a model that works perfectly on anything you throw at it. Most are well suited to some purposes and not to others. The ACP-22's expander/gates are certainly fast opening, but they're often temperamental and skittish on the unpredictable decay of toms and pitched percussion. I had no problems on the limited dynamics of numerous vocal and guitar tracks, but for resonant low drums, the maximum release time of two seconds was not always enough. On the other hand, the switchable lowpass filter worked well and is a handy extra that enhances the unit's usefulness.

First and foremost, the ACP-22 excels as a fast-attack compressor with a special flair for clamping down on troublesome transients. In a mix session for Pittsburgh's jazzy Watershed 5tet, I was pleasantly surprised to hear how smoothly it dealt with the thumb-heavy,

ACP-22 Specifications

Input Connectors	(2) ¼" unbalanced and (2) XLR balanced
Output Connectors	(2) ¼" unbalanced and (2) XLR balanced
Input Range	+4 dBu or -10 dBV (switchable per channel)
Maximum Input Level	+24 dBu
Maximum Output Level	+28 dBu
Dynamic Range	>115 dB
Signal-to-Noise Ratio	>95 dB
Headroom	+24 dBu (unbalanced); +22 dBu (balanced)
Frequency Response	10 Hz–50 kHz
Crosstalk	>82 dB @ 10 kHz
THD + Noise	<0.02%
Compressor Threshold Range	-40 to +20 dBu
Compressor Ratio Range	1:1–20:1
Compressor Attack Time	0.1–200 ms
Compressor Release Time	0.5–500ms
Compressor Auto Attack and Release	program dependent
Compression Curve Types	soft knee or hard knee
Gate Attack Range	10 µS to 100 ms
Gate Threshold Range	-65 (Off) to +20 dBu
Gate Release Time	0.02–2 seconds
Gate Attenuation Range	0 to -60 dB
Dimensions	1U x 4" (D)
Weight	7 lbs.

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popping electric bass—and I was also a little embarrassed that none of the other boxes in my rack was up to the task. The PreSonus also worked handily to tame thumpy basses and bright acoustic guitars in situations where rapid eighth notes mandated a combination of tight attack and exact release time. Don't even bother to try that with your vintage LA-2A!

My studio partner, punk recording legend Bart Thurber, reported a similar experience. He auditioned an assortment of pricey UREI and dbx modules on a bass track, but only the ACP-22 gave him the precise control he wanted. Thurber expressed additional admiration for the unit's transparent handling of vocals in auto mode—and registered a rarely seen expression of amazement when he was told the ACP-22's low price.

My experience with tracking vocals was also positive, although this is not the first compressor I would reach for in a critical mixing situation. For example, on one occasion I was quite happy with the gating on an up-front lead vocal. But then I noticed a lack of air and transparency in the compressor soft-knee setting, so I abandoned the unit in favor of a Focusrite Red module. On a positive note, for an overdubbing session with a particularly peppy French pop singer, the ACP-22 proved ideal, offering just the right amount of easily adjustable precision I needed to rein in an array of squeals, vocal sound effects, and dramatic fortes.

PERCUSSION STUFF

Percussion is the ultimate proving ground for an all-purpose compressor. When a set of tuned glass bowls sent my VU meters into uncontrollable spasms, the ACP-22 went on the job, smoothing out random peaks over a wide range of pitches and dynamics. Once again, though, I found the gates a little too touchy and unforgiving on these types of long decays.

On a nice, fat snare, the ACP-22 exhibited significantly less coloration than the dbx model I like to use, and it was also able to smooth out a particularly attack-heavy, intrusive snare that was under scrutiny by a group of students.

Bass drum tracks, however, yielded mixed results. The ACP-22's gate worked well when my standby Aphex gate wasn't tight enough for a busy rock pattern, and the compressor responded well to the piledriver dynamics of the same part. In a separate listening test, though, I noticed some undesirable mid-bass boosting, even with the bypass switch engaged. And despite all those parameters to choose from, it was still difficult to find a usable, light compression setting for the kick. Of course, I've probably been spoiled by the smooth characteristics of optical compressors for this specific application.

This brings me to the single major drawback of the ACP-22: when pushed to threshold and ratio extremes, the compressor can turn nasty, suddenly pummeling the life out of unsuspecting signals. In all fairness, though, it must be stated that this is true of any inexpensive VCA-based compressor—or at least those I've worked with. Which is to say, although I am very impressed with the general performance of the ACP-22—and absolutely floored that it offers so much for so little money—it obviously can't be expected to take the sort of abuse that you might heap upon a high-end unit such as a Neve or Fairchild.

STEREO STUD

The good news, though, is that you can pick up an ACP-22 for about one-tenth the cost of a vintage tube or class A opto-compressor. Moreover, by dialing in lower ratios, longer attack times, and

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PROS: Clean, colorless, and versatile. Independently switchable operating levels for each channel. Variety of I/O. Fast attack time. Internal power supply. Great value.

CONS: Gates' short release time and lack of hold function render them inadequate for some applications.

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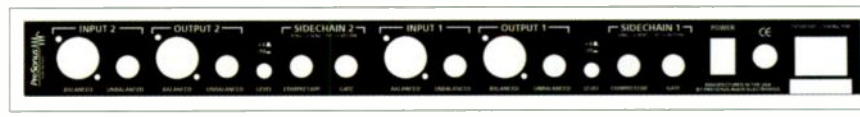
appropriate soft or hard-knee settings, you can almost always save your tracks from getting beaten senseless the moment they pass threshold.

The ideal application in this regard is using the ACP-22 as a stereo-bus compressor. I put the unit through its paces on a fairly dynamic mix for bluesman Clarence Sims's new CD. With some fiddling, I was able to achieve a decent 4 dB of compression overall. Some pumping on the drums, however, necessitated a lot of twiddling with the release time.

I did notice a slight dulling of the highs and loss of detail when the ACP-22 was strapped across the mix bus—even in bypass mode—as well as a negligible 2 dB signal loss. But again, I have to point out that several other pieces of rack gear at or above the ACP-22's price point imparted far more coloration to the same mix, added noise, or simply lacked the amount of control needed for a stereo mastering application.

In a separate test, I was disturbed to find that, when fed the same test tone, the ACP-22's left and right channel LEDs gave discrepant readings about 50 percent of the time, indicating a miscalibration of roughly 3 dB between the two sides. Signals passed through the unit did not reflect this imbalance, however, confirming that the levels within the unit are in spec. Therefore, the level meters themselves should not be relied on for critical stereo adjustments if, like me, you prefer to run stereo-program material through a compressor *without* using the link mode.



The rear panel of the ACP-22 provides multiple connector and operating-level options.

COMPRESS THIS

Based on its versatility, abundant features, and impressive specs, the ACP-22 is a winner, setting a new standard for 2-channel compressors priced under $500. The unit is clean sounding and relatively colorless on a variety of sources, especially when compared to competing units, and the variety of inputs, outputs, and operating levels is a big plus.

The ACP-22's informative, easy-to-read manual includes some basic setups and applications. However, it stopped short of issuing an essential caveat: that compressors are still one of the least understood and most abused tools of the trade, and a VCA-based unit with this much flexibility could, if misused, do irreversible damage to basic tracks or entire mixes.

In the proper hands, however, the ACP-22 has the potential to enhance any session or facility from bedroom to big-budget digs. Furthermore, given its low price and confident handling of low-frequency transients, I'll bet you'll also see this module showing up soon in onstage bass rigs.

Myles Boisen *is a guitarist, producer, composer, teacher, and head engineer at Guerrilla Recording and the Headless Buddha Mastering Lab in Oakland, California.*

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The bar has been raised for GM sound modules.

By Rob Shrock

Yamaha first introduced its XG format (an extended version of General MIDI) with the TG300 module in 1994. Since then, Yamaha has introduced several additional XG models, most notably the MU80 and MU90. (For a review of the MU80, see the December 1995 **EM**.) With the MU100R as its flagship XG sound module, Yamaha continues to build on a solid foundation by offering more sounds, drum kits, and effects, while adding other capabilities that aren't commonly found in GM modules.

The MU100R is a 1U, rack-mount sound module with 32-part multitimbral capability, 64-note polyphony, and six internal effects processors. The module's sounds and drum kits are stored in 20 MB of sample ROM. Also included is a set of monophonic sounds that use Yamaha's Virtual Acoustic Synthesis system (which is found in the VL1 and the VL70-m). Two ¼-inch analog inputs allow you to connect (and process) external audio sources and mix them with the internal Voices. (Voice is Yamaha's name for a sound or instrument.)

The sounds, DSP, and internal architecture of the MU100R have been designed from scratch, and they're completely different from those of the MU80 and MU90R. Nonetheless, Yamaha has maintained the surface operation of its previous GM modules while making improvements and adding some new features. For example, the headphone connection is now a ¼-inch stereo jack rather than the ⅛-inch minijack found on the MU80, and the standard stereo outputs are now joined by two additional outputs.

The backlit LCD uses icons to assist with operation, and the combination of icons and large letters makes it easy to find your way around. The six operating buttons and nine editing buttons retain the feel of the MU80, so if you're familiar with the earlier module, you'll fall right into the driver's seat of the MU100R.

MODES OF OPERATION

Just like the TG300 and MU80, the MU100R operates in either Multi or Performance mode. Multi mode provides standard multitimbral operation in which each Part has its own Voice assignment, MIDI channel, envelope, and effects settings.

The MU100R has three different Multi modes: XG, TG300B, and C/M. XG mode provides access to all of the XG Voices and drum kits and the VL Voices, as well as all the editing benefits of the XG format. The TG300B mode (compatible with Roland's GS extended General MIDI scheme) emulates the sounds found in the TG300. C/M mode emulates the Roland MT-32 sound set. Clearly, Yamaha has not forgotten those who need backward compatibility with old song data.

Performance mode assigns up to four Parts to a single MIDI channel for complex layering. Each Part maintains its own parameters, so you can create some great layers and splits in this mode. In Performance and Multi modes (except C/M mode), any Part can be set to either Normal or Drum instruments. In C/M mode, Parts 10 and 26 are assigned to Drums and all other Parts are fixed to Normal Voices.

DIGGING IN

As with Roland's Sound Canvas, the editable parameters in the MU100R only affect the individual Parts, not the actual Voices. If you replace one Voice with another in a Part, the volume, pan, chorus amount, and so on remain the same until you change them. You can't actually edit the Voice and save it as a new patch, as you can in some synthesizer modules, but the MU100R is definitely no slacker. From the main front-panel display, you can directly edit the MIDI channel, volume, expression, pan, reverb amount, chorus amount, Variation Effect amount (more on this later), and transposition. And you can solo or mute individual Parts, as well.

Panning can be set to a fixed position or random panning. The MU100R can also respond to dynamic panning via MIDI Control Change 10, which makes it possible to pan a note while it is being held. Unfortunately, the Scaling Pan feature from the TG300 (which let you set the pan position by MIDI note number) is not available. (Some users like this feature for piano and harp sounds.)

In Edit mode, you can access the parameters for each Normal Part, including filter frequency cutoff and resonance, pitch and amplitude envelope settings, low- and high-frequency EQ boost/cut (±12 dB), and much more. Drum Parts can be edited like Normal Parts, with all of the same parameters. In addition, four custom kits can be edited on an individual note basis. Each drum sound can have its own settings for a wide variety of parameters. (A complete list of Parts parameters is provided in the table "MU100R Part-Editing Parameters.")

The MU100R can have up to 127 Alternate groups. These groups allow you to assign different drum sounds to individual notes so that only one sound within the group can play at a time (typical for hi-hat sounds).

In general, the MU100R's drum editing is one of its greatest strengths. The unit's flexibility in handling individual drum sounds is greater than what you'll find in many samplers and synths, especially at the General MIDI level. Unfortunately, you can't mix and match drum sounds from different kits. You can, however, assign several different kits to separate Parts and thereby gain

The MU100R is Yamaha's newest and most powerful XG sound module, with 1,523 presets, including 256 Virtual Acoustic Synthesis Voices. Its feature set also includes plenty of onboard effects and a harmony processor.

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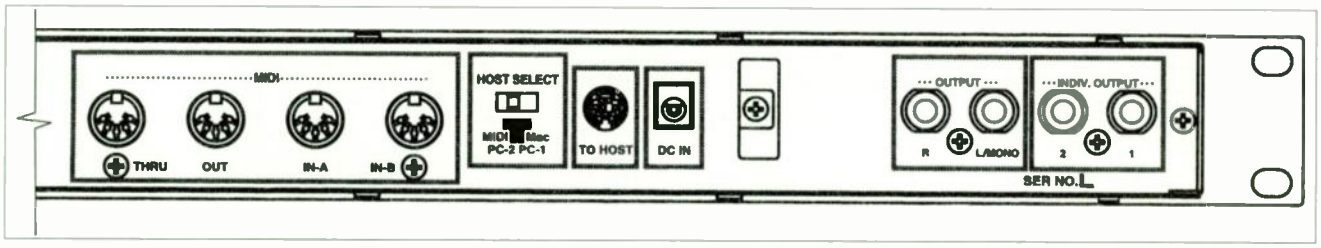

FIG. 1: The Host Select switch chooses whether the To Host (computer) connection is for Mac or PC. The PC1 setting is for Macs and for PCs with DB25 serial ports; PC2 is for PCs with 9-pin DIN ports. Note that the MU100R has two MIDI Ins for 32-channel playback.

simultaneous access to as many individual sounds as you want.

Aside from the parameters already mentioned, the MU100R provides a separate, editable EQ section for the stereo outputs. It consists of various templates similar to what you see on some home stereos: Flat, Jazz, Pops, Rock, and Concert. The cool thing about this EQ is that each "style" gives you different preset frequencies with a ±12 dB range. For instance, the Jazz preset provides frequency boost or cut at 50 Hz, 125 Hz, 900 Hz, 3.2 kHz, and 6.3 kHz. By comparison, the Concert preset frequencies are 80 Hz, 315 Hz, 1 kHz, 6.3 kHz, and 8 kHz. In addition to the EQ provided for each Part, this global EQ can further tailor the MU 100R to whatever kind of system is used for playback.

Some of Yamaha's early GM modules required SysEx editing software to access many of their internal parameters (see the sidebar "Editing XG"), but you can edit practically any parameter of the MU100R as long as you are brave enough to enter SysEx land. Double-pressing the Enter button displays the SysEx code for the current parameter. The parameter can then be edited. By pressing the Enter button again, you transmit the new setting of the edited parameter from the MU100R. (A cool little TV icon momentarily shows static on its screen when you transmit the edited SysEx data.)

This provides the knowledgeable user (or third-party developer) with access to the inner architecture of the MU100R while maintaining a simple user interface for those whose needs are less demanding. The MU100R's MIDI implementation is detailed and complete, and the documentation is thorough.

SOLID SOUNDS

The MU100R is a serious General MIDI sound module that rivals the best of the current crop. The enhanced capabilities provided by Yamaha's XG format allow for greater control over sounds and effects when used with XG-compatible song data, and any standard GM-compatible Standard MIDI File still works great. And the included *Sound List & MIDI Data* manual provides detailed information on the Voice contents of each Performance mode, drum map, and VL instrument.

The XG format (like Roland's GS format) provides several variations for each of the basic 128 GM sounds. So instead of just one fretless bass sound, for example, you get close to a dozen different Voices to choose from by selecting alternate banks. Some of the alternate Voices take advantage of different effects to create variations; others use different samples altogether. Some sounds only have a couple of alternative versions; it varies from Voice to Voice. On average, however, there are usually a half-dozen choices for each instrument. For those creating GM-style songs, this flexibility offers the potential for creating better-sounding files that are customized for each piece. (If you're creating GM song data for wide distribution, be sure to tweak the file until it sounds good in both XG and regular GM modes.)

Because there is no path for upgrading or adding to the sound set, the MU100R must appeal to users based solely on its existing Voices. The quality of the included instrument sounds, however, varies widely. I absolutely love several of the Voices, but many others have that typical GM sound: bland and not terribly realistic. In view of the fact that most GM modules are designed to sound generic enough to serve the intended purpose of General MIDI (and due to the

EDITING XG

In Yamaha's earlier XG modules, such as the TG300 and MU80, there were quite a few parameters that were not available from the front panel but could only be accessed through SysEx. Although this is not the case with the MU100R, the use of a software editor can still make editing easier and much more intuitive than hacking through lines of code.

There are currently two XG editors that can be customized for a particular Yamaha XG model. *XGEdit*, a shareware editor available at Yamaha's UK Web site (www.yamaha.uk.co) is available in both Mac and Windows versions. Using a drop-down selector, you select the particular unit (TG300, MU90R, etc.), and the appropriate parameters are displayed, with buttons and type-in displays for editing. Active Parts are displayed with a pop-up window for choosing the desired Voice. Although the current version is not yet custom-tailored for the MU100R, many of the parameters are the same as for the MU80.

XGWorks, newly available from Yamaha, is a commercial editor that is available only for Windows 95. I didn't get to use it, but Yamaha claims that it provides intuitive graphic editing to all parameters of the MU100R, including effects editing. *XGWorks* can be purchased directly from Yamaha.

For manufacturer information, please see Contact Sheet, p. 163.

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fact that most GM instruments consist of short loops crammed into a few megabytes of RAM), the MU100R actually sounds reasonably good. All the internal sounds are well recorded and clean. In fact, the MU100R is quieter and provides a hotter output than several of my professional-level (and expensive) modules and samplers. The frequency content is full and strong, and I have no complaints at all about the sonics.

As I mentioned, I really like several of the sounds. The "DX Legend" patch is a good, basic DX7-type electric piano, although I wish it would spank a little more in the higher Velocities. An electric piano Voice called "FliksDtd" would be perfect for mimicking the Rhodes in Whitney Houston's "Greatest Love of All." The glockenspiel program is absolutely gorgeous and realistic sounding, and the vibes are also very good. Unfortunately, the mod wheel defaults to LFO; if you want a good tremolo, you have to add it as an effect. A very interesting alternative sound called "PuffOrgan," from the Reed Organ bank, is haunting and unique, and the xylophone patch is quite nice except for a conspicuous split point between C5 and C♯5.

The harp sound is also quite good, although the envelope fades a bit too quickly. The single timpani hits are excellent, with a Voice containing a great roll when played at lower Velocities. The solo violin sound is nice, and the pizzicato strings are also good, although the sample-switch points are audible. I liked many of the synth textures, as well.

On the other hand, the solo cello is awful, and the solo viola isn't great, either. The ensemble strings are adequate in the upper and lower registers but are unnatural sounding in the middle register. Some of the acoustic, fretless, and synth basses are quite good, but most of the fingered and slapped basses seemed forced and unnatural. The same is true of the guitar sounds; none of them will fool you into thinking the guitar is real, although some are better than others.

MU100R Part-Editing Parameters

Single Part	MIDI Receive Channel, Bank Number, Program Number, Volume, Expression, Pan, Reverb Send, Chorus Send, Variation Send, Note Shift
All Parts (global)	Device number, Master Volume, Master Attenuator, Reverb Return, Chorus Return, Variation Return
Normal Part	Lowpass Filter (LPF) and Highpass Filter (HPF) Cutoff Frequency and Resonance; Filter EG Attack, Decay, and Release; Pitch EG Initial Level, Attack Time, Release Level, and Release Time; 2-band EQ Low and High Frequencies and Boost/Cut (±12 dB); Vibrato Rate, Depth, and Delay; Detune; Part Mode (Normal or Drum); Mono/Poly Mode; Portamento On/Off and Time; Element Reserve (ensures minimum Part polyphony); High and Low Note Limits (keyboard range); Dry Level; Velocity Sensitivity Depth, Offset, and Limit (upper and lower); Pitch Bend Range; Modulation Depth, Assignable Controller 1 (AC1) Control Change Assignment; AC1 Filter Control (affects LPF cutoff frequency); AC1 Amplitude Control; Output Select (Part goes to main, individual, or phone outs)
Drum Part	All Normal Part parameters and Coarse Pitch; Fine Pitch; Velocity Pitch Sensitivity; Level; Pan; Reverb Send; Chorus Send; Variation Effect Send; LPF Cutoff Frequency and Resonance; HPF Cutoff Frequency; Velocity LPF Cutoff Sensitivity; 2-band EQ Low Frequency, High Frequency, Low Gain,and High Gain (±12 dB); EG Attack, Decay 1, and Decay 2; Note On/Off Receive; Output Select

Most of the brass aren't terribly realistic sounding. In fact, many of the sounds just ride the fence between being clean and clear on the one hand, yet dull and lifeless on the other. I think this points to the whole generic issue of GM modules in general (pun intended). In the end, you'll just have to listen for yourself, because sound preferences are so subjective.

My two favorite sounds include the glockenspiel, which I already mentioned, and the accordion sound. In fact, I searched through my entire rig looking for the right accordion sound to use on the intro of a new song by Elvis Costello and Burt Bacharach for a recent television special. I ended up taking the MU100R with me to New York just to play that sound. And while it was there, I used the MU100R for the glockenspiel, too. If it's good enough for Elvis and Burt, it's good enough for me.

Although there are 36 drum kits, many of the percussion instruments appear in several kits. Even so, the MU100R has a ton of drum sounds. Most of the kits include a full range of GM percussion sounds, in addition to several snares and kicks.

As with the other Voices in the MU 100R, some of the drum sounds are better than others, but most are good. I wish the crash cymbals were longer and the ride cymbals smoother. There are a great set of brush toms and some killer Latin percussion samples. The analog drums are very good, and the kicks and snares run the gamut of styles and tones; some I like and some I don't. Considering the processing available in the MU100R, you would have to move up to a sampler with some serious external effects to beat the ease with which you can create great-sounding drum kits.

FILLING IN THE BLANKS

The MU100R has two internal slots (accessed from the bottom), which come loaded with the VL and VH plug-in cards. The VL card provides the same Virtual Acoustic Synthesis engine found in the VL70-m. The monophonic VL Voice is globally set to one Part (it defaults to Part 1), and there are two Preset banks for VL Voices: one optimized for playback from a keyboard and one designed for use with a breath controller. There is also a Custom bank with six locations for loading new VL

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configurations and an Internal bank for storing 64 edited versions of the two Preset banks and the Custom bank.

Perhaps the most notable aspect of this whole VL/XG combination is that the VL sounds have been added to the available set of Voices in the XG sound set. This is a significant advantage over other General MIDI systems. The modeled Voices use the same Program Change numbers as the sampled versions; they just use a different Bank Select command. For example, if you play a GM sequence file on a module that has VL capability, you'll get the VL Tenor Sax for Program Change 67; otherwise the unit will play a compatible, sampled tenor sax in the primary GM bank. The VL card does not provide every type of GM Voice, but when VL-XG mode is selected for a Part, you can substitute the available VL sounds for the sampled Voices.

As with the physical-modeling technology of the VL-1 and VL70-m, many of the sounds are difficult to master. But for those who want to try their hand at this type of synthesis, Yamaha has rolled out the red carpet. On first listen, many of the VL Voices sounded a bit cheesy to me (especially the bank that isn't designed for wind controller), but in fairness, I didn't dedicate a large part of my life to mastering them. Many users have been quite pleased with the VL technology and its capabilities, but the results you get depend largely on how you use the controllers. If you aren't willing to really dig in, you might have the same initial reaction as I did. MIDI wind players will be able to make good use of the VL sounds much more quickly than will guitarists and keyboard players who lack horn chops. For those who want to dig into the VL Voices in greater depth, there are several software editors available on the Yamaha Web site.

The MU100R can also accept one or two audio sources (microphone, CD player, guitar, etc.), which are digitized through the unit's two ¼-inch inputs and 16-bit A/D converters. The signals can then be edited with the same parameters and processed with the same effects that are available to the internal Voices. This is a very cool feature that opens up a great many possibilities for live gigs, play-along rehearsing, and integrating other sound modules or samplers. The inputs and a single input-level knob are conveniently located on the front panel. What's more, there are presets that configure the inputs as independent mono or a stereo pair and set the appropriate gain levels for a mic, guitar, keyboard, or line-level audio source (e.g., CD or cassette).

The second plug-in card is the VH card, which provides a really great harmony processor. I'm not kidding! Yamaha has just raised the bar for GM sound modules to a truly surprising level. The harmony processor, which is available to process both internal voices and the audio inputs, is nothing less than a full-fledged harmony generator with almost

MU100R Specifications

Synthesis Engine	AWM2 PCM sample playback; VL physical modeling
Polyphony	64-note AWM2 + 1-note VL
Multitimbral Parts	32 (dynamic voice allocation and reserve priority)
Sounds (ROM/RAM)	1,267 PCM-based + 256 VL models/0
Drum Kits	46
Performance Programs (ROM/RAM)	100/100
Effects	6 independent blocks and 147 total algorithms: 12 reverb; 14 chorus; 70 Variation; 43 Insertion; 4 Harmony; 4 EQ
Audio Outputs	(4) ¼" unbalanced (2 Main, 2 Individual); (1) ¼" TRS headphone
Audio Inputs	(2) ¼" unbalanced
Computer Interface	switchable Mac/PC RS-232C or RS-422 (cables not included)
Other Ports	MIDI In A, In B, Out, Thru
Display	Backlit LCD
Power Supply	"wall wart" AC adapter
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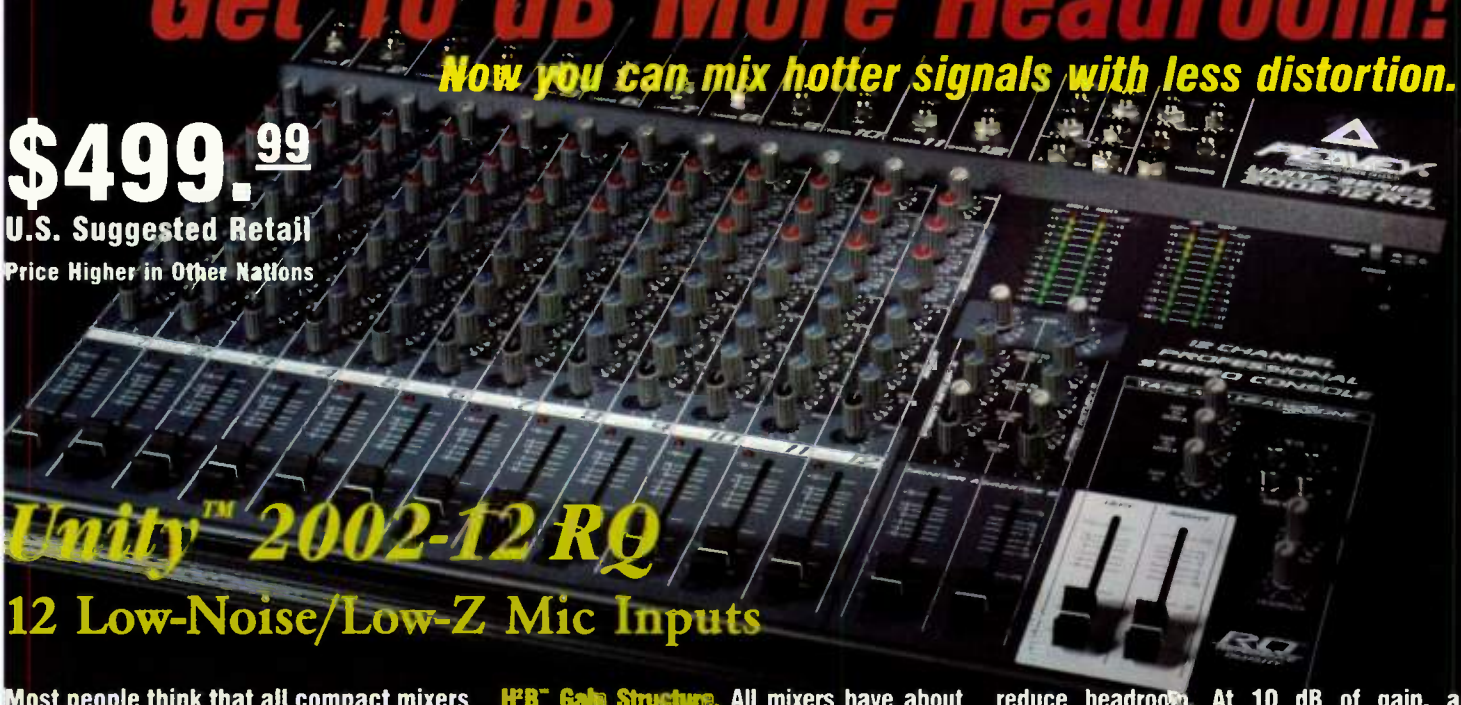

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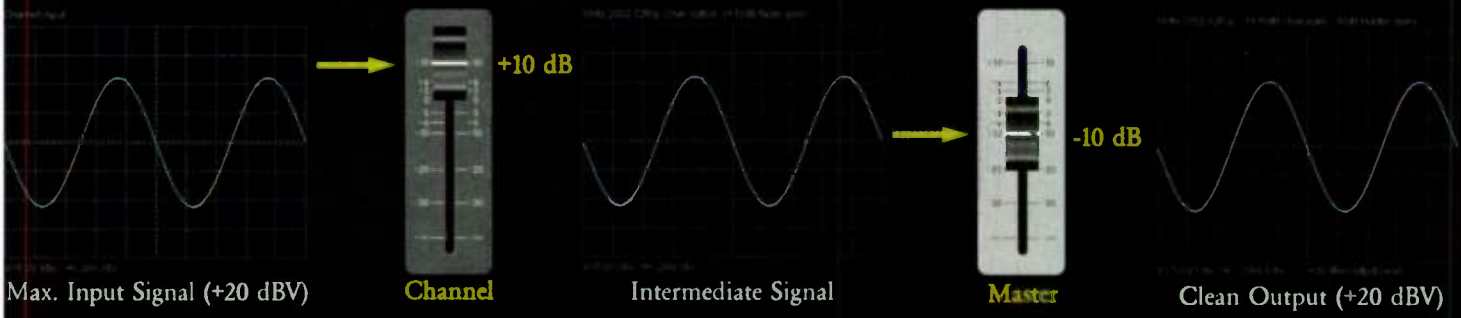
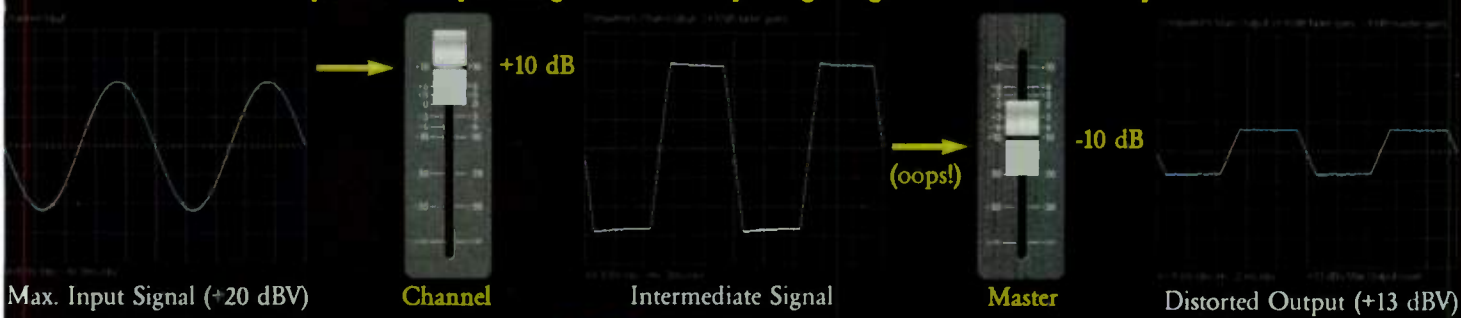


The other guys

(actual scope images from competing "high headroom" mixer)



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as many parameters as some stand-alone products. You can preprogram the pitch interval or play the desired harmony note from a keyboard. There are also vibrato effect and "gender" parameters for changing the formants of the input signal. In addition to coarse pitch changes, you can add left/right fine pitch changes for thickening a vocal spread. In general, the effect works well, within the reasonable limits of a harmony processor, although I noted some harshness in the processed signal.

FLAVORFUL SPICES

The MU100R is packed with so many features that it seems like several complete products rolled into one. To bolster that impression, the sound module offers a built-in multi-effects processor with six independent digital effects: reverb, chorus, EQ, Variation, and Insertion 1 and 2. The Variation effect can be applied to one Part or to all Parts (depending on the user-definable routing), and the Insertion effect is used for processing individual Parts.

The MU100R provides twelve different reverb types; fourteen chorus, phase, and flange effects; and high and

YAMAHA
MU100R sound module
$1,295

FEATURES ■■■■
EASE OF USE ■■■▮
QUALITY OF SOUNDS ■■■▮
VALUE ■■■■
1 2 3 4 5

PROS: Lots of sounds. Clean, quiet output. Plenty of polyphony and 32 multitimbral parts. Connects directly to a Mac or PC. High-quality effects processing. Two audio inputs for connecting and mixing external sources. Built-in harmony processor and effects also available to external inputs. VL physical modeling engine included. Extensive documentation.

CONS: A lot of sampled sounds suffer from short loops. Most of the physical-modeling sounds are cheesy in the hands of a novice. Edits must be made at the Part level. A bit expensive.

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low EQ. The Variation and Insertion effects contain duplicates of the reverb and chorus effects, which allows you to use different versions of the same effect simultaneously on different Voices. They also can produce a long list of other effects, such as rotary speaker, tremolo, auto pan, distortion, overdrive, compression, Aural Exciter (licensed from Aphex), compressor, and noise gate.

All of this seems overwhelming at first, as if you're working with a dedicated effects processor. Each effect provides two to fourteen appropriate editable parameters, and the effects in the MU100R sound great. Yamaha knows how to make effects processors, and it shows. The digital effects are excellent across the board. They help make some of the marginal sounds in the MU100R sound fatter and more professional. And of course, you can apply the effects to the audio inputs, as well.

▼

The VL card provides the same Virtual Acoustic Synthesis engine found in the VL70-m.

TOP HONORS

The MU100R looks deceptively simple, but the more you explore its capabilities, the more mind-boggling it becomes. As far as GM modules go, it is clearly a contender for top honors. The inclusion of a harmony processor, VL physical-modeling Voice, and stunning effects puts the MU100R in a league all its own.

For those seeking simplicity in a sound module as well as those looking for a challenging instrument, the MU100R delivers.

Composer and producer **Rob Shrock** *recently worked with Elvis Costello, Sheryl Crow, Wynonna, All Saints, Luther Vandross, Chrissie Hynde, and others at a televised tribute to Burt Bacharach. The most fun was playing sampled tuba while Mike Myers sang "What's New, Pussycat?"*

SYNTRILLIUM

COOL EDIT PRO 1.1 (WIN)

A popular shareware audio editor enters the big leagues.

By David M. Rubin

Over the past couple of years, *Cool Edit Pro*'s shareware predecessor, *Cool Edit 96,* has garnered a substantial following of loyal fans, especially among Web audio producers and game developers. The stereo editor's simple interface and ease of use, combined with its generous assortment of editing tools, have provided many users with a cost/benefit ratio that's hard to beat. Now, with the introduction of *Cool Edit Pro,* Syntrillium Software has entered the high-stakes commercial audio software race with a considerably more expensive, dramatically more powerful program.

Ever mindful of its past, *Cool Edit Pro*—now a multitrack recording and editing program—has kept its emphasis on simplicity. Even so, it boasts an impressive list of high-end features, including 32-bit processing and support for 32-bit sound files, multilevel Undo, DirectX plug-in support, SMPTE synchronization capability, single-sample waveform editing, and a raft of audio effects (some with real-time preview). Indeed, with its ability to play back and mix as many as 64 tracks of audio, this newer, bigger, and more powerful *Cool Edit* provides all the tools—right out of the box—to get you from start to finish on most multitrack recording projects. And you don't need expensive hardware to use *Cool Edit Pro.* The software works with just about any stereo or multichannel Windows sound card or combination of sound cards.

LOOKIN' AROUND

Cool Edit Pro's user interface is divided into two separate but well-integrated parts: the Edit View for individual waveform editing and the Multitrack View for mixing and editing multiple audio tracks. Unfortunately, you can't have both views open at the same time, but you can quickly toggle between views with the rectangular Edit Mode button in the upper left corner of each screen.

When in Edit View mode, *Cool Edit Pro* displays a single mono or stereo waveform in a large central area (see **Fig. 1**). Aside from the more traditional display type, the program can also show waveforms in a Spectral View display that uses colors to illustrate the frequency content over time and brightness to show different amplitudes.

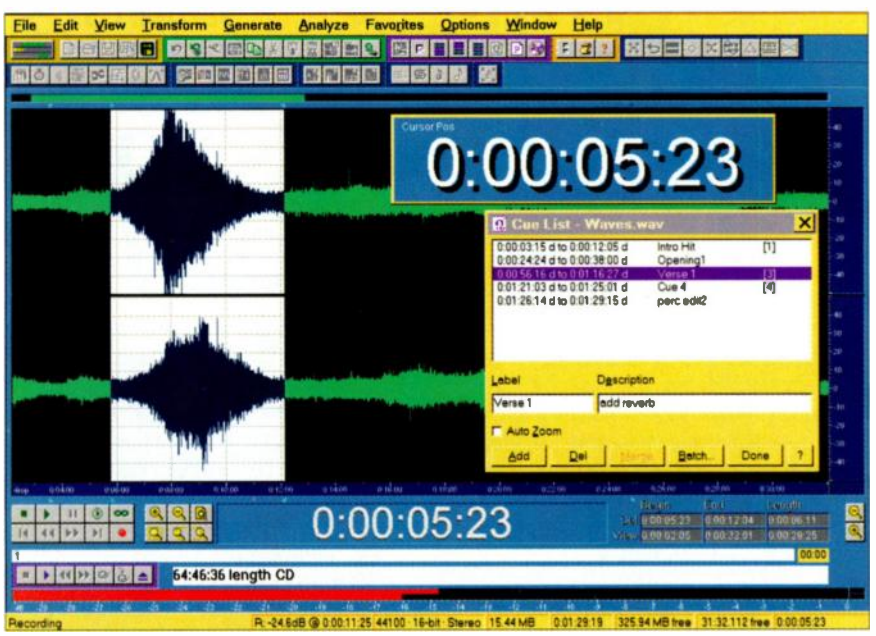


FIG. 1: *Cool Edit Pro*'s well-designed Edit View window is shown here with the audio-CD transport controls (lower left), the Time window (upper right), and the Cue List window.

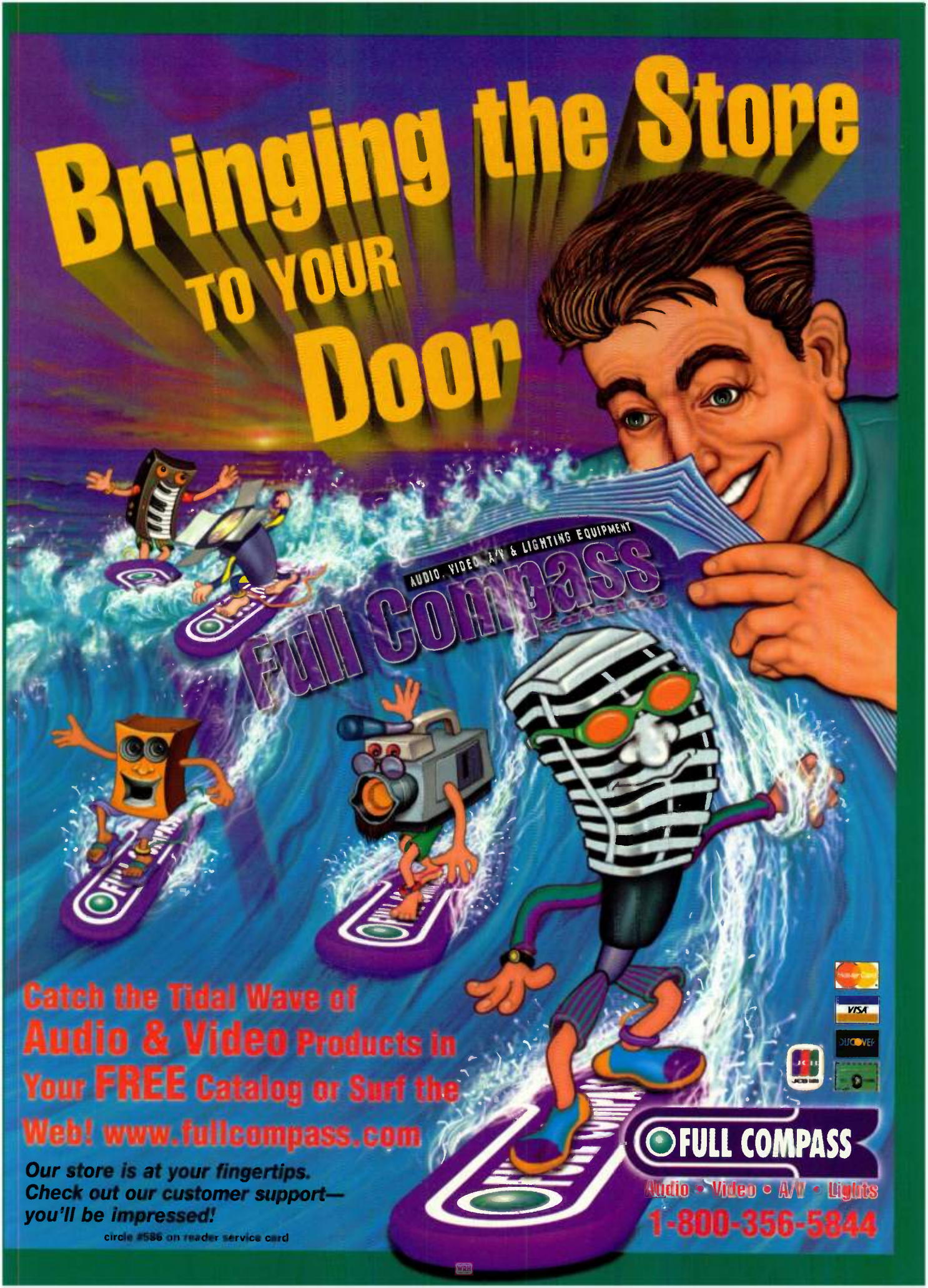
Directly above the waveform, a green bar called the Display Range bar (you can change the color) serves as an overview indicator by showing which part of the total audio clip (represented by the black strip) is currently visible in the waveform display. It's certainly helpful to have an overview indicator, but I'd prefer to see a miniature waveform in the overview area instead of just a bar. That would make it easier to navigate through long audio files and find specific locations, although it might also slow down your screen redraws. Perhaps an option to choose, as in Digidesign's *Sound Designer II,* would be better.

Left-clicking on the Display Range bar turns the cursor into a hand. You can then grab the bar and drag it left or right to scroll through the recording. You can also grab the time line beneath the waveform and drag it left or right to scroll through the recording. And in a similar manner, clicking on the amplitude ruler to the right lets you scroll up and down in the waveform.

At first, I thought that this system for getting around was less intuitive than the more traditional scroll-bar approach. But it didn't take long to get used to it, and ultimately, I found it to be much smoother, faster, and easier to use than a set of scroll bars. Dragging the Display Bar to the left moves the waveform toward the beginning. Dragging the timeline to the left moves the waveform toward the end. And by dragging the amplitude ruler up and down, you can precisely position the waveform vertically. Moreover, *Cool Edit Pro* provides plenty of other ways to move within a waveform and to scrutinize your recordings.

Just below the waveform display, a separate group of buttons enables you to quickly zoom in on, and out from, all or part of an audio file. With a single click you can zoom in or out at the center of the visible part of the waveform, zoom out enough to fill the display with the entire waveform, zoom in to fill the display with the currently selected region, or zoom in on the left or right boundaries of a region.

All of this zoomability is even more useful when combined with the transport buttons to the left of the zoom controls. Aside from the usual Play, Stop, Record, and Rewind buttons, *Cool Edit Pro* includes a button that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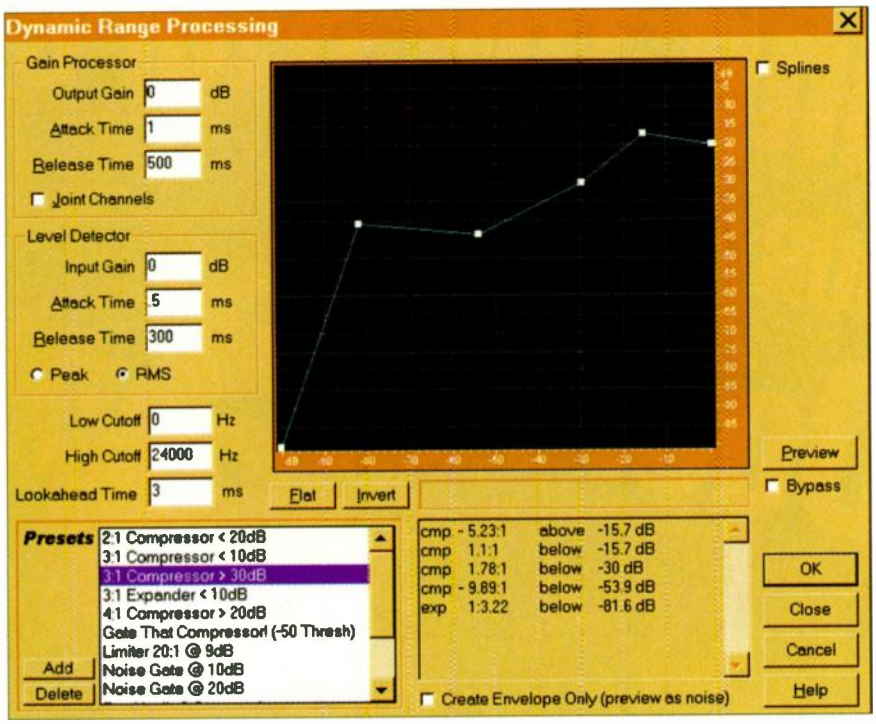

FIG. 2: With the graph in *Cool Edit Pro*'s Dynamic Range Processing dialog box, you can create a wide assortment of compressors, limiters, and noise gates.

plays the currently visible part of the waveform and then stops. Another button plays the same section in loop mode. Using both the zoom and transport buttons, it's easy to select an area in a waveform for editing, zoom the selection to fill the waveform display, and then play just that region as you make your edits. The whole process is quick and intuitive. *Cool Edit Pro* even includes a separate set of CD transport buttons so you can play audio CDs with your CD-ROM drive, without leaving the program or opening a separate utility.

Two additional zoom buttons in the lower right corner of the Edit View window enable you to zoom the waveform display vertically in and out. At the bottom of the window, several small numeric fields show the start time, end time, and length of the currently selected region. A large counter showing elapsed time can also be displayed at the bottom of the window (beneath the time ruler), or it can float anywhere on the screen as a separate, resizable Time window. Display formats include minutes and seconds, SMPTE time, bars and beats, and samples. The format chosen for the Time window is also used for the timeline ruler beneath the waveform display. Too bad you can't have a SMPTE readout in the Time window while you're viewing samples or bars and beats in the timeline or have more than one format at once in the Time window. That would be a nice touch.

Getting around in *Cool Edit Pro* is further aided by the program's handy Cue List window. As you work on an audio file, you can name different selected areas (or insertion point locations) and add them to the floating Cue List window with the Add button. (The window can hold hundreds of cues.) After that, you can jump instantly from one region to another by simply double-clicking on the appropriate names in the list.

The Cue List offers a great way to skip from place to place within a waveform and makes it easy to compare different parts of a recording. It's also a great way to mark a place for later editing. In addition, you can assemble cues from the Cue List in the Play List window. This floating companion window allows you to play back the specified regions in any order, any number of times. You can use it to try out different arrangements of a piece or simply to assemble a collection of sound effects. Unfortunately, you can't synchronize the Play List to incoming SMPTE time code, which limits its usefulness for post-production work.

Beneath the zoom and transport buttons, a set of peak-hold VU meters extends horizontally across the entire width of the Edit View window. You can begin monitoring your inputs by double-clicking directly on the meters. Resettable clipping indicators make it easy to avoid setting levels too high. In addition, right-clicking the meters opens a menu with several options: you can adjust for DC offset, include a Valley Hold (minimum amplitude) function as well as a Peak Hold function, change from a dynamic to a static peak-hold display, and change the meter range from 120 dB to 30 dB (in six steps) for more accurate monitoring of quiet passages.

The top of the Edit View window is reserved for one or more customizable toolbars that can be displayed in any combination for ready access to the program's many editing commands.

EDITING GALORE

In spite of its unassuming appearance, *Cool Edit Pro* is jam-packed with an impressive assortment of editing tools. Among the most important of these is the unlimited Undo feature. (Actually, the number of undos is limited by the available hard-disk space.) The program even allows you to set a specific number of undo levels to avoid using too much disk space retaining past commands.

Aside from the usual Cut, Copy, and Paste commands, *Cool Edit Pro* includes a powerful and flexible Mix Paste command. It mixes audio from a file, from the program's internal clipboard, or from the Windows Clipboard with the current waveform. Options allow you to adjust the volume or invert the waveform of the new audio before mixing. The new material is added at the current waveform's insertion point and can replace or blend with the existing audio.

A Modulate option multiplies the values, sample by sample, of the two waveforms, which can produce some nice FM or some pretty gritty sounds. You can also crossfade between the new audio and current audio or use the Loop Paste option to paste the new audio several times in a row. To reduce the likelihood of clicks at edit and splice points, *Cool Edit Pro* includes a Zero Crossings command that snaps the left and/or right region boundaries to the nearest zero crossing.

For manufacturer information, please see Contact Sheet, p. 163.

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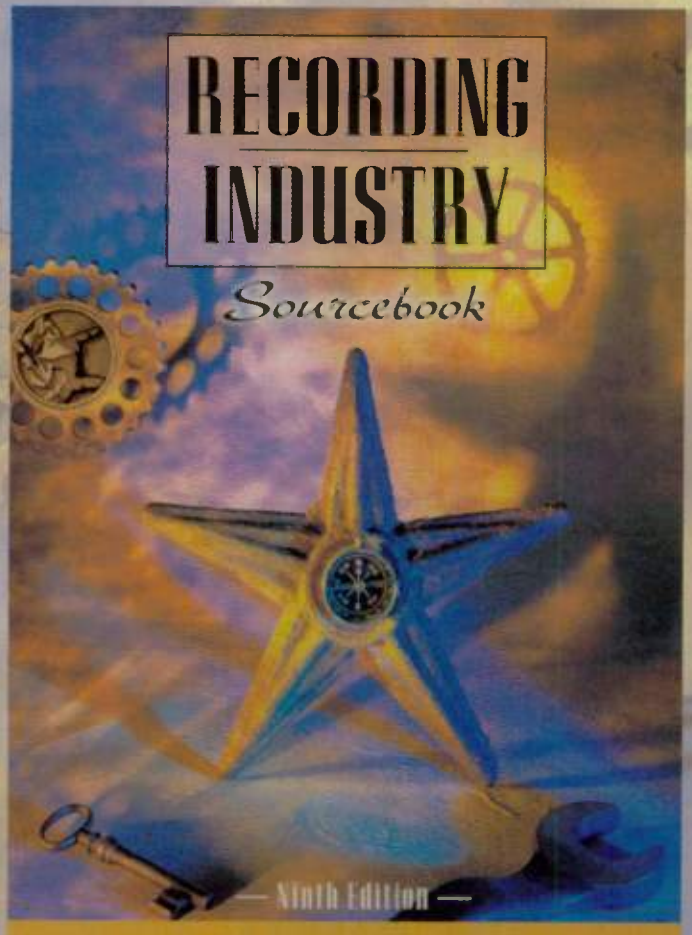

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TRANSFORMATIONS

The Edit View's Transform menu is where things really start to get interesting. Of course, the program includes the usual DSP commands, such as Invert, Reverse, Silence (converts all amplitude values to zero), and Normalize. The Transform menu also provides a full-featured Time Stretch/Pitch Shift function. I used it to compress a 16-second section of music down to 11 seconds, and the program worked without a hitch. The music sped up appropriately, but there was no change in pitch and no apparent distortion. I tried the same thing with a section of dialog, and the results were equally satisfactory: no chipmunk effects and no distortion. *Cool Edit Pro*'s Amplify command serves double duty: a single dialog box adjusts overall amplitude and creates linear and logarithmic fade-ins and fade-outs.

Most of *Cool Edit Pro*'s effects employ rather prosaic-looking dialog boxes, which are, nonetheless, clearly labeled, easy to use, and often include a Preview button. The dialog boxes typically offer several presets in a list to get you started, and you can easily add your own configurations to the list with the Presets Add button. It's too bad you can't have multiple dialog boxes open at once.

Several of the Transform commands open dialog boxes that include graphs for viewing and setting parameters. In many cases, clicking anywhere along the graph line creates a grab handle that you can drag with the mouse to alter the shape of the line and the corresponding parameters. (You can also right-click on a grab handle to enter values numerically.)

The Dynamics Processing command, for example, includes a large graph that depicts input level along the *x* axis and output level along the *y* axis (see **Fig. 2**). Separate parameter fields allow you to enter numbers for input and output gain, attack time, release time, and lookahead time. By combining the graph and the parameter settings, you can create a wide range of compressors, limiters, expanders, and noise gates, including many nontraditional dynamics effects. A list of thirteen presets makes it easy to get started with different processing setups, and the presets can also help less-experienced users better understand how the graph relates to specific effects.

As you might expect, the Envelope command also uses a graph-oriented dialog box, in this case with time along the *x* axis and output level along the *y* axis. Unlike familiar, ADSR-style envelopes, this graph allows you to create as many breakpoints as you want, anywhere along the line. You can then drag the breakpoints to create any shape necessary. There's even a Spline Curves option that effectively smoothes out curves to minimize abrupt changes at the breakpoints.

DELAY OF THE LAND

Cool Edit Pro is well stocked with plenty of delay-related effects. The Reverb dialog box is one of the simplest, with sliders for adjusting reverb length, attack

▼

Cool Edit Pro is a veritable Rosetta stone for audio files.

time, high-frequency absorption time, and wet/dry mix ratio. A Perception slider lets you adjust how "smooth" the reverb effect is by varying how many distinct echoes are present, thereby affecting the sense of spaciousness.

Fourteen presets are provided ranging from a shower stall to a large concert hall, and it's easy to modify these to create your own reverbs. Unfortunately, there's no Preview button for the Reverb effect. The presets themselves sound fine, but to push the limits a bit, I created some long cavernous effects with a very wet mix. The results were full, rich-sounding reverbs with smooth tails that dissolved slowly and cleanly without breaking up. You can further enhance your recordings with *Cool Edit Pro*'s new Pan/Expand effect, which can expand (or narrow) the stereo soundfield. Or you can use the effect to pan and shift the center of an audio file over time.

The Delay and Echo effects, each with a separate dialog box, are as straightforward and easy to use as the

Reverb. An 8-band graphic EQ section is provided with the Echo dialog box, so you can specify which frequencies are removed with successive echoes. Nineteen presets offer an assortment of entertaining effects with names such as "Taj Mahal," "Cheap Springs," and "50s Sheen." I especially like the "Robotic" preset, which adds a great metallic/techno character to music. With the Preview button on, you can switch from one preset to another to make comparisons as a sound file plays.

A separate 3D Echo Chamber effect makes it possible to create a variety of room ambiences by entering values for room dimensions, intensity, number of echoes, damping factors, and microphone placement.

The program also provides a Multitap Delay effect that draws on elements of the other delay-related effects. It allows you to create and combine up to ten virtual delay units to produce a variety of unusual effects. The ten presets (with dozens of variations) range from simple echoes to rhythmically complex, throbbing effects. To round out its palette of tools, *Cool Edit Pro* also includes a Flanger and a Sweeping Phaser.

Cool Edit Pro
Minimum System Requirements
80486 PC (80586 recommended); 8 MB RAM (16 MB recommended); Windows 95 or NT

FILTER ELEMENTS

When it comes to filters, *Cool Edit Pro* is no slouch. The program includes a range of options, some admittedly more obscure than others. For example, you get a DTMF (Dual Tone Multi-Frequency) filter for eliminating telephone touch-tone signals. (Bet you weren't expecting one of those!) You'll also find an FFT filter (with a 2-D graph for drawing filter shapes), a versatile 5-band parametric equalizer (with a graphic display), and an excellent graphic equalizer.

I really like the graphic equalizer because it's a breeze to use, and it offers a great deal of flexibility. You can space the EQ bands at 1-octave, ½-octave, or ⅓-octave intervals, producing a 10-, 20-, or 30-band EQ respectively. With 30 sliders at your disposal, you can quickly shape any sound with great precision. A graphic display above the sliders gives an accurate view of how the sound is being affected. An Accuracy setting allows you to trade off processing time against sound quality.

For the true filter geeks of the world, *Cool Edit Pro* also provides several "scientific" filters offering precise bandpass, notch, highpass, and lowpass capabilities. The filter types include such favorites as Chebychev types 1 and 2, Bessel, and Butterworth. A description of these filters and their applications is thoughtfully included in the back of the owner's manual.

NOISE ABATEMENT

Filters aren't the only tools that *Cool Edit Pro* provides for cleaning up audio. The Transform menu also offers several very handy noise reduction tools. The Click/Pop/Crackle Eliminator, for example, searches for spikes and other anomalies in a selected range of audio. It then excises them and smoothes over the repair points. You can apply the process to a large number of clicks *en masse* or use it to clean up your audio one click at a time. A set of Threshold, Detect, and Reject parameters enables you to adjust how aggressively the Eliminator pursues its quarry. With a little copying and pasting, you can even play back the clicks and pops that were removed from your original recording.

I used the Eliminator to clean up a recording made from a badly scratched LP. The "Old Record" preset did a remarkable job of cleaning up the sound file. The results weren't perfect, but at least 90 percent of the clicks and pops were eliminated outright. The remaining 10 percent were processed to the extent that they became much less noticeable. Overall, it was a significant improvement. As an experiment, I used the much more aggressive "Constant Hiss and Crackle" preset. It took about twenty times longer to process the file, but it removed virtually all of the clicks. Unfortunately, it also badly distorted the recording. Clearly, the secret to using the Click/Pop/Crackle Eliminator is in adjusting the parameters to

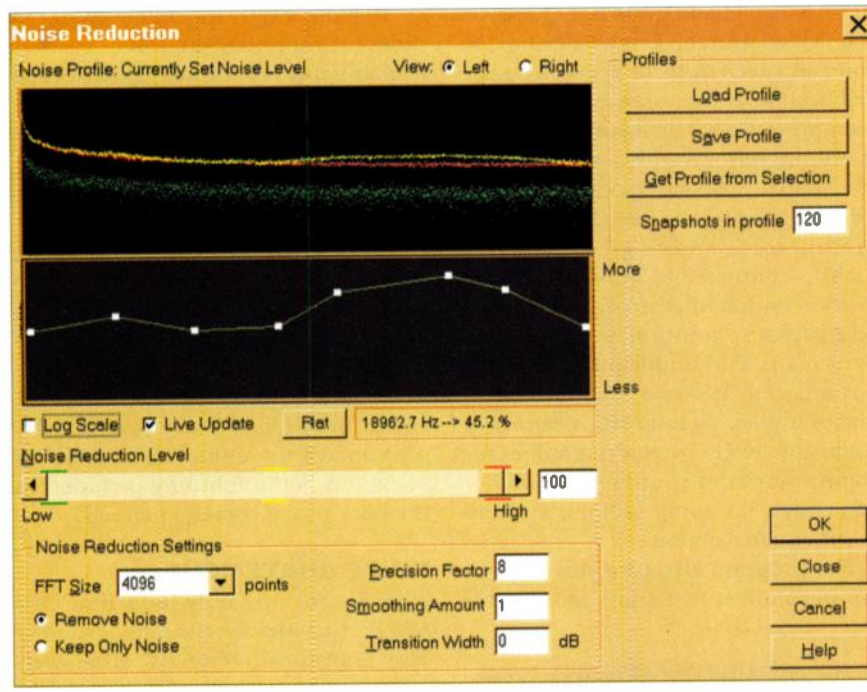

FIG. 3: *Cool Edit Pro*'s Noise Reduction command analyzes a sample of the unwanted noise before processing. The lower graph allows you to control the amount of noise reduction at different frequencies.

maximize the click-removal results without causing too much distortion.

Cool Edit Pro's Hiss Reduction function is little more than a fancy noise gate that removes all frequencies below a specified threshold level. It's based on the assumption that hiss and similar types of noise are typically well below the level of the recorded material. If it turns out that the hiss sounds better than the music, you can always select the Keep Only Hiss option to save the noise and wipe out the audio instead. I can think of a few cases where that might come in handy!

The Noise Reduction tool takes a much more sophisticated approach to eliminating hiss, as well as background noise, hum, and various types of broadband noise. Syntrillium claims that you can increase your signal-to-noise ratio by 5 to 20 dB, depending on the circumstances. To use the Noise Reduction function, you must first create a noise Profile by selecting an isolated section of the recording with only the noise in it. *Cool Edit Pro* then analyzes the noise and uses the resulting Profile to extract the offending audio.

The Noise Reduction dialog box (see Fig. 3) includes two displays: one giving a graphic representation of the noise Profile and another showing a graph of frequency (*x* axis) and amount of reduction (*y* axis). By dragging grab handles on the graph line, you can control the amount of noise reduction at different frequencies.

I created an extra-noisy file by mixing some broadband noise with an excerpt of music. I ended up with an audio file that sounded like a sax/guitar duet recorded in front of a waterfall. *Cool Edit Pro* had no trouble eliminating the noise that preceded the music (it was returned to near silence), and it did a remarkable job of extracting the noise that was mixed with the music. There was a slight bit of distortion that appeared in the cleaned-up music, but it was not readily apparent and was easily worth the price of eliminating so much intrusive noise.

Cool Edit Pro also offers two tools for adding and removing distortion. The handy Clip Restoration filter can actually remove clipping from a recording and "fill in" the clipped sections of the waveform. I tried it on a few clipped waveforms, and it did indeed work in most cases. The anti-clipping algorithm lowers the amplitude of the clipped section to a point below the threshold level and replaces the damaged part of the waveform with a best-guess reconstruction of the wave shape. The results aren't perfect, and it's definitely not a substitute for proper recording

technique, but it may get you out of a tight spot once in a while.

On the other hand, if you're looking for more, rather than less, distortion, you can use *Cool Edit Pro*'s very effective, graph-oriented Distortion function to generate a wide variety of distortion effects. And to produce your own noise from scratch (so to speak), you can use the Generate Noise command to produce any of three types of random noise: white, pink, and brown. (Brown noise has more low-frequency components than pink or white noise.) If you prefer less-random sounds, use the Generate Tones function to produce simple waveforms consisting of a fundamental frequency and up to five overtones. Waveform options include sine, triangle, square, and sawtooth.

BRAIN POWER

Cool Edit Pro's substantial list of processing tools includes many that are not commonly found in other audio editing programs. By far the most unusual and intriguing of the batch is the Brainwave Synchronizer (see **Fig. 4**). It processes any stereo audio file so that, when the result is heard through stereo headphones, it purportedly "will put the listener into any desired state of awareness."

Syntrillium claims that only 5 minutes or so of listening will do the trick but that 25 minutes works even better. And although you can use any waveform for the source, the company suggests creating some random noise with the Generate Noise command for optimum results. (Pink and brown noise seem to work best.)

So what exactly does this Brainwave Synchronizer do? Well, through the use of spatial cues, it creates the illusion that the left and right channels of the audio file are spinning around the listener's head at a frequency of about 3 Hz or above. In theory, the brain then attempts to synchronize with this frequency, and in so doing, increases its output of alpha, beta, delta, or theta brain waves (depending on the selected frequency).

Syntrillium makes a number of extravagant claims concerning the Brainwave Synchronizer's mind-altering capabilities, including, among other things, its potential for treating insomnia, replacing lost sleep, improving intuition, fighting depression, and alleviating headaches. The *Cool Edit Pro*

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CONTACT SHEET

A GUIDE TO THE COMPANIES AND ORGANIZATIONS MENTIONED IN THIS ISSUE OF ELECTRONIC MUSICIAN

Digital Audio Evangelists
pp. 36–46

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Zefiro Acoustics tel. (949) 551-5833; fax (949) 653-2260; e-mail info@zefiro.com; Web www.zefiro.com

If You Knew Suzie
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Coda Music Technology tel. (800) 843-2066 or (612) 937-9611; fax (612) 937-9760; e-mail finalesales@codamusic.com; Web www.codamusic.com

Mark of the Unicorn tel. (617) 576-2760; fax (617) 576-3609; e-mail info@motu.com; Web www.motu.com

Desktop Musician: Movin' On Up
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Berkley Integrated Audio Software tel. (800) 775-BIAS or (415) 331-2446; fax (415) 331-2446; e-mail sales@bias-inc.com; Web www.bias-inc.com

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Steinberg North America tel. (818) 993-4161; fax (818) 701-7452; e-mail info@steinberg-na.com; Web www.us.steinberg.net

Reviews
pp. 118–184

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Discovery Firm tel. (888) 544-3476 or (310) 781-1333; fax (310) 781-1330; e-mail dis@discoveryfirm.com; Web www.discoveryfirm.com

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Korg U.S.A. tel. (800) 645-3188 or (516) 333-9100; fax (516) 333-9108; e-mail product_support@korgusa.com; Web www.korg.com

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owner's manual includes a detailed discussion of the Brainwave Synchronizer and the theories upon which it is based, along with a warning, a disclaimer, and a 3-page bibliography. I didn't have time to test this processor thoroughly, but it certainly piqued my interest.

TRACKS WITH TRICKS

Cool Edit Pro's Multitrack View window incorporates many of the same design elements found in the Edit View window, including the transport controls, zoom buttons, toolbars, Time window, Display Range bar, and input meters (see **Fig. 5**).

The central waveform display shows two or more tracks, depending on the zoom level, which is set with the vertical zoom buttons in the lower right corner. Each track has its own set of controls, which allows you to solo, mute, record-enable, and select playback and record devices. The overall volume and pan position of each track are set by entering values in the adjoining numeric fields, or you can use the pop-up faders that appear when you double-click on the numbers.

One of the greatest features of the Multitrack View, however, is that the program enables you to graphically create real-time volume and pan changes for each track. When you select the Enable Envelope Editing command, two lines appear in each of the waveform displays: light green for volume and light blue for panning. You can then click anywhere along these lines to create as many grab handles as you want and drag them up or down to produce nondestructive volume and panning envelopes. I found that this system worked great for creating elaborate musical collages where individual sounds move back and forth across the stereo field as various tracks fade in and out. For more mundane projects, the nondestructive envelopes make it easy to experiment with different fade-in and fade-out shapes, and it's a breeze to crossfade between two or more tracks.

Many of the nondestructive editing functions in the Multitrack View are typical of multitrack editing programs. You can grab waveform "blocks" and drag them from place to place along the timeline or from track to track. Waveforms can, of course, be copied, pasted, crossfaded, and grouped. The confusingly named Splice command breaks a waveform into two separate blocks, but the Merge/Rejoin Splice command can glue them back together if you change your mind. *Cool Edit Pro* also provides a handy Snapping function that causes blocks to snap to a designated time location (to align several tracks at once, for example) or to another waveform's boundary.

Punch-in recording is especially easy. You simply select the part of the waveform that you want to replace, position the playback cursor somewhere before

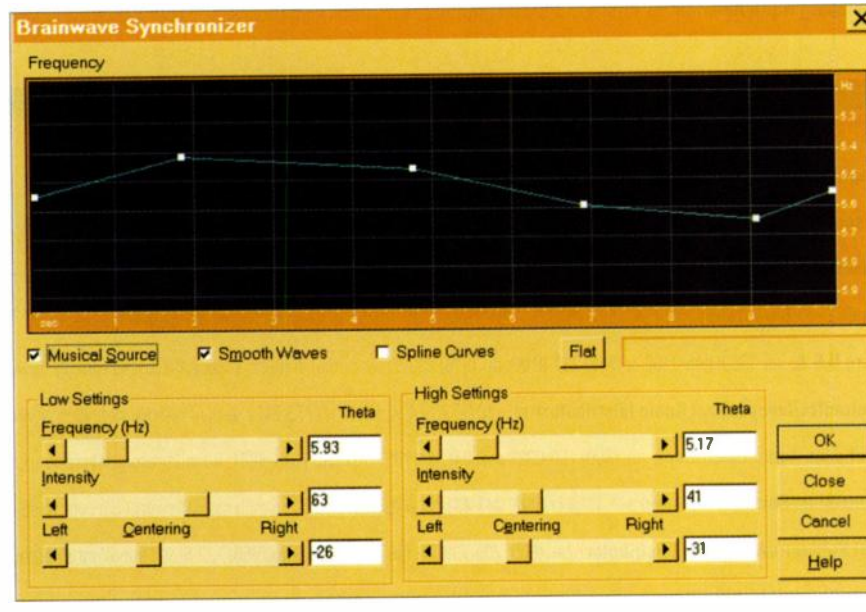

FIG. 4: Syntrillium claims that *Cool Edit Pro*'s intriguing Brainwave Synchronizer can have a positive effect on your mental state.

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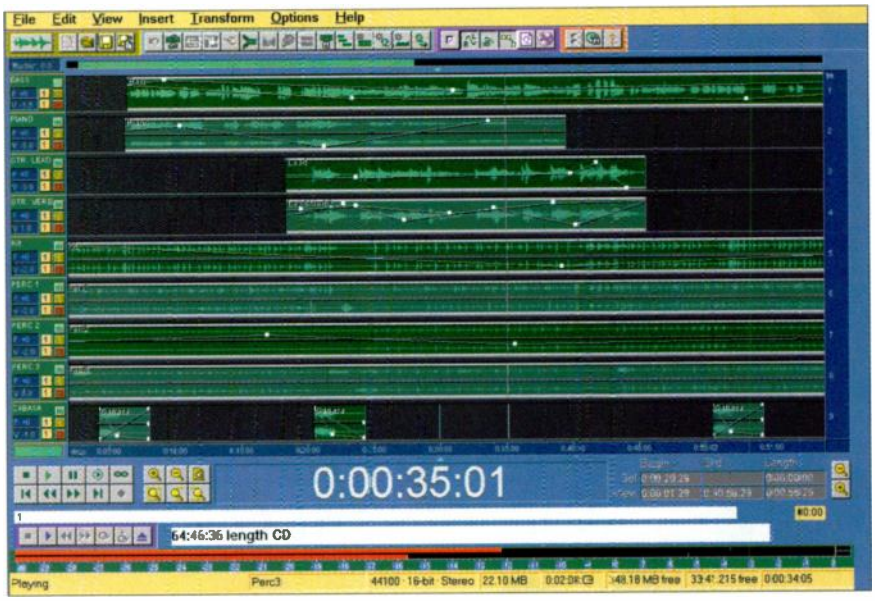


FIG. 5: The Multitrack View window contains many of the same buttons and displays as the Edit View window, but it also allows you to create nondestructive volume and pan envelopes directly over each waveform.

the selected area, and record. *Cool Edit Pro* keeps track of your different punch-ins, so you can revert to an earlier version if you want.

The Transform menu offers different commands in the Multitrack View than it does in the Edit View, including a Vocoder effect and an Envelope Follower. The Envelope Follower varies the output amplitude of one waveform based on the input amplitude of a second waveform. It also allows you to apply additional dynamics processing by adjusting parameters such as Attack Time, Release Time, and Input Gain. A large graph with grab handles depicts input level along the *x* axis and output level along the *y* axis.

FILE AWAY

Cool Edit Pro is a veritable Rosetta stone when it comes to handling audio files. The program supports more than eighteen different formats and variations, including raw PCM data, Sound Blaster (VOC), RealAudio 2.0 through 5.0 (export only), PCM-encoded AIFF, and several more-obscure formats. Naturally, the WAV format is well represented with support for more than half a dozen types of compressed and uncompressed files, including both Microsoft and IMA ADPCM files.

In addition to its versatile handling of audio files, *Cool Edit Pro* supports resolutions up to 32 bits with sampling rates as high as your sound card can go. (The dialog box includes options up to 96 kHz, but you can type in any number.) It can open files as large as 2 GB, so if you've got the disk space, you can use the program to master your next DVD project. If you're one of us still living in the world of 16 bits, however, don't despair. *Cool Edit Pro* has just added several new dithering and noise shaping algorithms to minimize distortion when converting from higher to lower resolutions. You can even control the depth and distribution of the dither to maximize the results.

YOUR DOCUMENTS PLEASE

When you open the *Cool Edit Pro* box, you may be surprised to find nothing more than a CD in a jewel case. The documentation is included on the disc in the form of an Adobe *Acrobat* file. If you're the type who readily grasps the subtle nuances of audio editing software, an online manual may work out just fine to clear up occasional questions. I still prefer a printed manual. Though it wouldn't have color screenshots or hyperlinks like the *Acrobat* manual, I could carry it around with me and read it without covering up my editing windows.

Fortunately, Syntrillium will send you its 236-page printed manual if you mark the proper box on your registration

SYNTRILLIUM
Cool Edit Pro 1.1 (Win)
multitrack recording and editing software
$399

FEATURES ■■■■
EASE OF USE ■■■■
DOCUMENTATION ■■■▌
VALUE ■■■■
1 2 3 4 5

PROS: Intuitive user interface. Excellent zoom tools. Lots of built-in effects. Multi-level Undo. Support for DirectX plug-ins. Locks to SMPTE time code. Handles many file formats. Supports most sound cards. Easy to use.

CONS: Must request hard-copy documentation. Not all effects have preview capability. Can't have more than one effect open at a time. Cannot synchronize Edit View playlist to SMPTE.

CIRCLE #441 ON READER SERVICE CARD

card. Both versions of the manual include helpful explanatory sections covering such topics as SMPTE time code, MIDI, digital signal processing, and filters. Furthermore, the program includes an extensive context-sensitive Help feature. My only gripe (aside from a weak index) is that there aren't any structured tutorials to help you explore the program's main features.

THE LAST BIT

Cool Edit Pro's ample audio editing and nondestructive multitrack mixing capabilities truly make it a jack-of-all-trades. With dozens of built-in editing functions and DSP effects along with support for DirectX plug-ins (several demos are included on the CD), this software lives up to its claim of being a complete multitrack recording studio for Windows.

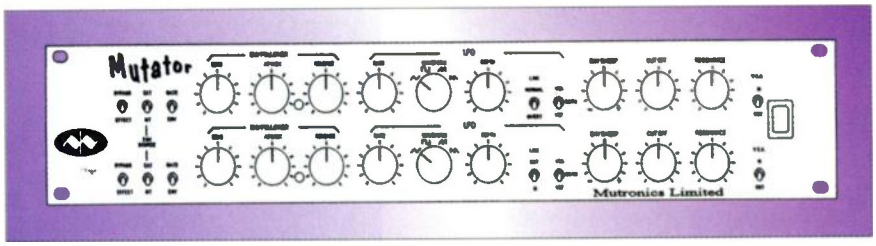
Best of all, the straightforward user interface makes working with audio files easy and fun. If you can't afford an expensive hardware/software digital audio workstation, consider using *Cool Edit Pro* with your current sound card. It may be all you'll ever need.

Associate Editor **David M. Rubin** *lives and works in the Los Angeles area.*

MUTRONICS

MUTATOR

A new analog filter is a welcome departure in this digital era.



The Mutator's front panel is laid out intelligently, providing direct, intuitive access to all functions except MIDI channel selection.

By Peter Freeman

The appearance of stand-alone analog filters as signal-processing devices is a welcome change from the morass of flangers, phasers, choruses, and the like, which currently dominate the world of digital-processing hardware and software. The Mutronics Mutator combines into a 2U, rackmount unit three types of modules that, in the past, would have been found mainly in modular synthesizers: an envelope follower, a low-frequency oscillator (LFO), and a voltage-controlled filter (VCF). One of each module is available for each channel. The VCA section can be switched between Envelope or Gate mode, allowing the unit to work much like a conventional noise gate with a filter on its output. The Mutator is available with or without MIDI implementation, and the non-MIDI box can be retrofitted with MIDI features. I tested a MIDI-equipped unit.

LAYOUT

The Mutator's densely populated front panel provides access to all functions except MIDI channel selection, which is done with a rear-panel rotary switch. The front-panel controls are arranged in two nearly identical rows, one for each channel.

The controls are as follows: Three toggle switches choose between bypass and effect; external and internal envelope modulation source; and gate and envelope VCA mode. To the right of these is the Envelope section, with Sensitivity, Attack, and Release controls and LEDs that flash to show the envelope generator's contour. Next is the LFO section, which includes Rate, Depth, and Waveform knobs (the four included shapes are triangle, square, ramp up, and ramp down) and two switches: Link/Invert (which links the LFOs of the two channels together in sync or with their sweeps inverted from each other) and VCA/VCF/Both, which selects the LFO's destination.

Finally, there is the filter section itself, which has a zero-center Envelope Sweep knob for controlling envelope-modulation depth, as well as Cutoff and Resonance knobs. All of these controls are duplicated on channel 2, with the exception of the Link switch. Instead, channel 2 has a Link In/Out select. VCA In/Out switches and a power switch round out the front panel.

Connections to the Mutator are made by way of rear-panel, unbalanced, ¼-inch jacks and MIDI In and Thru ports. Each of the two channels has an audio input and output as well as a Control Voltage input and external control-signal input, which can be routed to the envelope generator as a modulation source. The Mutator accepts 110 to 240V power via a standard 3-pin IEC connector.

Mutronics' Mutator combines a 2-channel, analog, voltage-controlled filter with an LFO and envelope follower.

MUTATION

Despite the wide range of control facilities it provides, the Mutator is a simple box to use. It's mainly a matter of "plug it in and go," which is exactly what I did. The unit showed its colors as soon as I sent some signals through it. I tested the box in my studio in a send/return configuration through Pro Tools' aux sends so that I could use the widest possible range of instruments and sound sources.

I tried the Mutator first on a stereo drum mix. Right away, I was pleased with the results: a bit of stereo-panning LFO modulation on the filters sounded great. The same treatment worked very well for sustaining textures from synths and on background vocals, where it added an extra bit of interest.

Curious about the quality of the envelope generators, I began experimenting with percussion tracks, using

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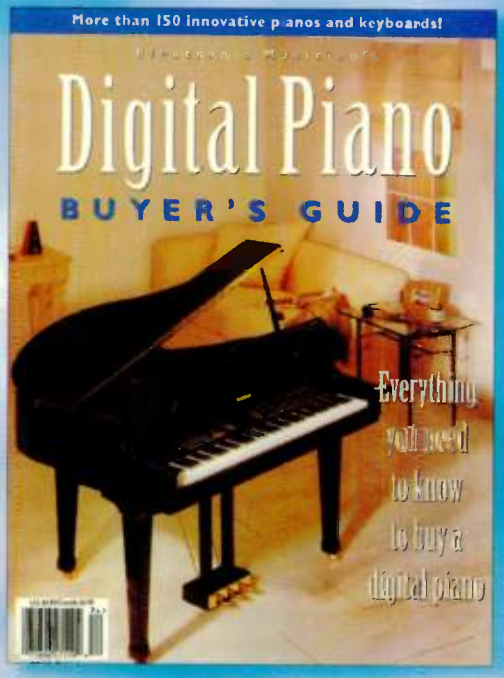

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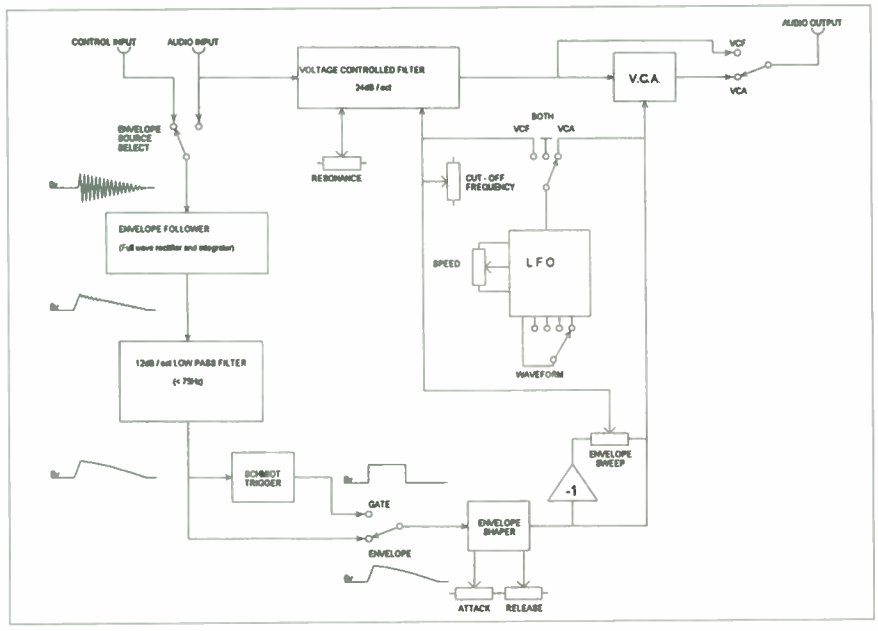


FIG. 1: The inclusion of a lowpass filter before the envelope generator's input makes the Mutator extremely tolerant of incoming signals.

lots of envelope modulation for triggered sweep effects. These were quite pleasing, especially with some LFO modulation and delay added.

The most noteworthy aspect of the envelopes is their smoothness. There is a very musical quality to the way the Mutator's envelope generator easily handles fast changes in input level without any "wobbling" or unpleasant artifacts. Looking at the block diagram of the box's circuit design (see **Fig. 1**), I realized that this was because of a 75 Hz lowpass filter placed before the envelope generator's input. The result is an evenness that makes the Mutator very tolerant of different types of input signals and thus very versatile.

One of the most fun and usable Mutator effects I came across was a stereo sweeping of the two filters. For example, the Invert switch allows one side to sweep up while the other sweeps down. This works great for sustained sounds. I also got great results using this effect on drums.

MIDI MADNESS

The Mutator's MIDI implementation is straightforward, and all MIDI functions work smoothly. Each of the two filter channels responds on a MIDI channel determined by the rear-panel rotary knob. The knob sets the receive channel for Mutator channel 1; Mutator channel 2 takes the next higher MIDI channel number.

The Mutator responds to MIDI Note On messages, Pitch Bend, Mod Wheel (CC 1), and Volume (CC 7), which govern Gate On/Off, Filter cutoff frequency, resonance, and VCA volume, respectively. Another interesting Mutator MIDI function I liked was using MIDI Note On messages to retrigger the LFOs—a great way to create unusual rhythmic effects. As far as I know, this feature is unique to the Mutator.

The inclusion of both MIDI and CV control allows the Mutator to function equally well as part of a modular synthesizer setup or in a conventional MIDI-sequencing environment. I especially appreciated being able to use my sequencer to program precise yet smooth cutoff and resonance changes at specific points in a track.

THE SOUND

Sonically, the Mutator is bright, lively, and musical. It's safe to say that you can put pretty much anything through this device and end up with interesting results. Down in the lower ranges, it works well for smoothing out bass instruments. Up high, it's good for emphasizing and adding resonance to specific ranges of an instrument. And of course, there is a whole range of exotic effects that can be created with the envelope generator and LFOs. For example, cranking up the resonance yields the reassuringly familiar "whistle" of oscillation, something essential to any good analog-filter design.

After working with the unit for a while, I noticed that the Mutator doesn't "sizzle" at the upper end of the filter sweep; rather, it stops short of sounding extreme. I certainly didn't find this to be a problem, though; it is the nature of different filter designs to exhibit different sonic characteristics.

THE MANUAL

The Mutator's short but informative manual provides all the information required to set up and use the unit, along with settings charts for specific, interesting effects (such as the stereo

Mutator Specifications

GENERAL	
Frequency Response	10 Hz–18 kHz
Signal-to-Noise Ratio	88 dB
Filter Slope	24 dB/octave
Audio I/O	(2) ¼" unbalanced inputs, (2) ¼" unbalanced outputs
Other Connections	(2) ¼" CV inputs; (2) ¼" external control inputs; MIDI In, Thru
Dimensions	2U x 11" (D)
Weight	14 lbs., 5 oz.
ENVELOPE PARAMETERS	
Attack	0–2 seconds
Release	0–5 seconds
Sensitivity	-25 dB to ∞
LFO PARAMETERS	
Rate	5 ms–25 seconds
Waveforms	triangle, square, sine, ramp up, ramp down

For manufacturer information, please see Contact Sheet, p. 163.

MUTRONICS
Mutator analog filter
MIDI $1,125
non-MIDI $1,025

FEATURES ■■■■
EASE OF USE ■■■■
AUDIO QUALITY ■■■■
VALUE ■■■■
1 2 3 4 5

PROS: Flexible parameter controls. Classic analog sounds.
CONS: Not programmable. No rate indicator for LFOs.
CIRCLE #442 ON READER SERVICE CARD

sweeps described above). There are plenty of illustrations, including one diagram of the Mutator's circuitry and others showing the output of the envelope follower with different settings.

MUTATION NATION

As hard-disk recording technology gets more and more affordable and software companies saturate the marketplace with endless plug-ins and processing applications, a box like the Mutator is a welcome addition.

There are virtually endless uses for this unit—it really comes down to your own creativity. I hasten to add that the Mutator would also be terrific in a live situation; it's something guitarists, as well as keyboardists and producers, should consider.

It's difficult to find fault with the Mutator. There are a few features I would like to see included, though. First, some programmability would be nice, as there are so many possible settings. Secondly (and less importantly, I admit), an LED rate indicator for the LFOs wouldn't hurt. And finally, it would be great to see a multimode version of the Mutator filter circuit, since bandpass and highpass filtering can provide some very interesting sounds.

Overall, Mutronics' Mutator is a well-thought-out, well-made unit that sounds excellent and offers enough control to be truly useful. It's more expensive than most similar devices out there, but it also offers much more sophisticated functionality as well as some great sounds.

BAG END

ELF INFRASUB-18

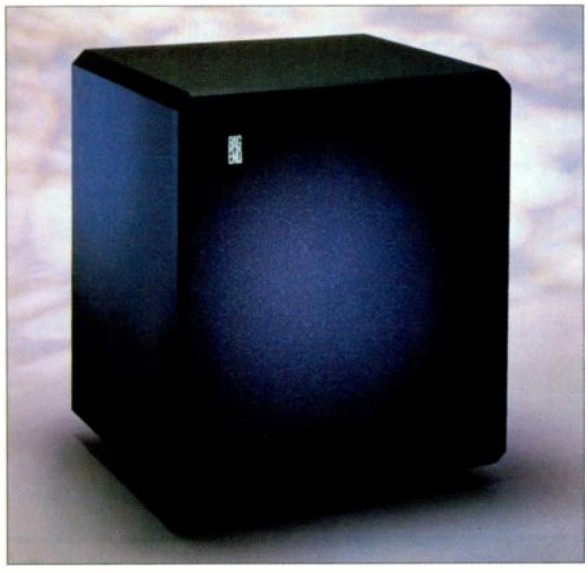
Get down to the infrasonic range by way of ELF technology.

By Stephen Webber

The acronym "ELF" has nothing to do with little guys making cookies in trees. Rather, it stands for Extended Low Frequency—and the Bag End ELF Infrasub-18 powered subwoofer definitely delivers on this promise, providing frequencies from 95 Hz all the way down to a subsonic 8 Hz!

Of course, humans don't typically hear much below 20 Hz. The lowest note on a pipe organ (C at 16 Hz), for example, cannot be heard so much as felt. I have personally felt this note coming from expensive custom monitor systems in multimillion-dollar mix rooms.

But is extended low end critical in the personal-studio environment? According to Bag End, yes. Bag End claims that the ELF Infrasub-18, by extending the frequency response down a full octave below 16 Hz, is able to "improve phase response and reduce delay throughout the entire audible bass range."



The Bag End ELF Infrasub-18 powered subwoofer extends the low-frequency output of any near-field monitoring system down to a remarkable 8 Hz while providing even, time-aligned bass response.

NATURE OF THE BEAST

Beyond its role as a subwoofer, the Infrasub-18 also functions as an electronic crossover for your whole monitoring system. Housed in a black, very attractive, sealed cabinet about the size of a compact refrigerator, the unit employs an 18-inch driver, a 400W Class A/B amplifier, an ELF Dual Integrator, and a unique protection circuit called ELF Concealment.

The Dual Integrator is a 2-way, active electronic crossover that produces a 12 dB/octave rise as frequency is decreased. The low-frequency output of the Dual Integrator is connected to the power amp, which in turn drives the subwoofer. Unlike conventional lowpass filters, which introduce a frequency-dependent phase shift that can make blending the bass into the upper frequencies difficult, the Dual Integrator produces a short, uniform delay that is relatively easy to compensate for.

The ELF Concealment is a protection circuit designed to prevent amplifier overload. It works by first detecting any signal that is sufficiently low in frequency or high in amplitude to overload the amp and then, upon detecting such a signal, dynamically reducing the bass extension. That is, the Infrasub-18 selectively reduces the subsonic bass frequencies without affecting the audible bass frequencies.

Even though the Infrasub-18 system doesn't produce subsonic frequencies at "audible" levels, having the response extended an octave below the audible range allows the Infrasub-18 to produce the audible bass frequencies without the ugly time smearing that is typically caused by speaker-box resonance and phase shift. The result is fully integrated bass that is in time with the rest of the spectrum.

REAR PANEL

Connections to the Infrasub-18 are made on the unit's metal rear panel (which also doubles as a heat sink) through left, center, and right RCA inputs and two speaker-level inputs on spring terminals. The RCA inputs each have high-pass-filtered outputs that are sent to your main speakers' amplifier. Also included on the back panel are a power switch, a level control, and a polarity switch. The level control is located near the top, which makes it easy to adjust by feel when you're standing in front of the unit.

The ELF Dual Integrator receives a summed mono signal from the left, center, and right inputs. This signal is then processed and sent to the power amp and driver. My only gripe here is that there's no way to defeat the Dual Integrator. This means that you can't easily switch from listening with the subwoofer to listening without it; to switch, you have to unplug the inputs and outputs.

Complete instructions for connecting the subwoofer, as well as a description of the operating principles of the ELF system, are silkscreened on the back panel.

LISTENING TESTS

Frankly, the Infrasub-18 sounds amazing. With the unit set to the proper level, I could hear what was going on in the low frequencies much more clearly than I could without the subwoofer. Also, the Infrasub-18 coupled very well with my Tannoy PBM 6.5 monitors. Boy, did I ever miss the subwoofer when I took it out of the chain!

BAG END
ELF Infrasub-18 powered subwoofer system
$1,495

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

PROS: Smooth, accurate, and powerful low-frequency extension. Couples well with conventional monitor systems.
CONS: Physically large for a small project studio. If used incorrectly, could make it harder to create mixes that translate well on other systems.
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For manufacturer information, please see Contact Sheet, p. 163.

The John Lennon

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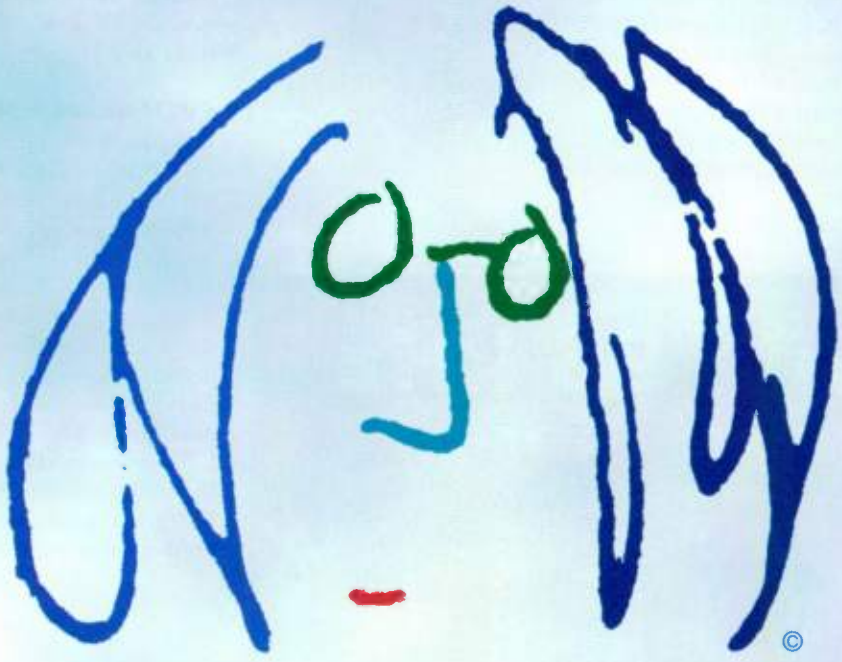

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Phone ( ) Age

Song Title

Check one: ❑ Lyrics included ❑ Instrumental composition

Circle one (if paying by credit card): VISA MasterCard

Card #

Exp. Signature

Make your check or money order for $30.00 per song payable to: **John Lennon Songwriting Contest**

Check one category only

❑ rock ❑ country ❑ jazz ❑ pop
❑ world ❑ gospel/inspirational ❑ rhythm & blues
❑ hip-hop ❑ latin ❑ dance ❑ folk ❑ children's

For more information: **www.jlsc.com**

Mail your entry to: John Lennon Songwriting Contest
One Haynes Avenue, Suite 105
Newark, NJ 07114

Please read all rules carefully, and then sign your name in the space provided. If entrant is under 18 years old, the signature of a parent or guardian is required.

Each entry must consist of:

- Completed and signed entry form (or photocopy). All signatures must be original.
- Audio cassette(s) containing one song only, five (5) minutes or less in length.
- Lyric sheet typed or printed legibly (please include English translation if applicable). Sheets not required for instrumental compositions.
- Check or money order for $30.00 per song (U.S. currency only) payable to John Lennon Songwriting Contest. If paying by credit card, $30.00 per song will be charged to your account.

Entries must be postmarked no later than August 31, 1998.

1. Each song submitted must be contestant's original work. Songs may not exceed five (5) minutes in length. No song previously recorded and released through national distribution in any country will be eligible. Songs may have multiple co-writers, but please designate one name only on the application. **Contestant may submit as many songs in as many categories as he/she wishes, but each entry requires a separate cassette, entry form, lyric sheet, and entrance fee. One check or money order for multiple entries/categories is permitted.** (Entrance fee is non-refundable. JLSC is not responsible for late, lost, damaged, misdirected, postage due, stolen, or unidentified entries.)
2. Prizes: Twelve (12) Grand Prize Winners will receive $2,000 in cash, $5,000 in Yamaha project studio equipment, and a $5,000 advance from EMI Music Publishing. One (1) Grand Prize Winner will receive $20,000 for the "Song of the Year" courtesy of Maxell. Thirty-six (36) Finalists will receive $1,000. Seventy-two (72) Winners will receive portable CD players.
3. Contest is open to amateur and professional songwriters. Employees of JLSC, their families, subsidiaries, and affiliates are not eligible.
4. Winners will be chosen by a select panel of judges comprised of noted songwriters, producers and music industry professionals. Songs will be judged based upon melody, composition and lyrics (when applicable). **The quality of performance and production will not be considered.** Prizes will be awarded jointly to all authors of any song; division of prizes is responsibility of winners. Void where prohibited. All federal, state, and local laws and regulations apply.
5. Winners will be notified by mail and must sign and return an affidavit of eligibility/songwriting rights/publicity release within 14 days of notification date. The affidavit will state that winner's song is original work and he/she holds all rights to song. Failure to sign and return such affidavit within 14 days or provision of false/inaccurate information therein will result in immediate disqualification and an alternate winner will be selected. Affidavits of winners under 18 years of age at time of award must be countersigned by parent or legal guardian. Affidavits subject to verification by JLSC and its agents. Entry constitutes permission to use winners' names, likenesses, and voices for future advertising and publicity purposes without additional compensation.
6. Winners will be determined by January 15, 1999, after which each entrant will receive a list of winners in the mail. Cassettes and lyrics will not be returned.

I have read and understand the rules of the John Lennon Songwriting Contest and I accept the terms and conditions of participation. (If entrant is under 18 years old, the signature of a parent or guardian is required.)

Signature Date

ELF Infrasub-18 Specifications

Subwoofer	18" pulp-paper cone driver
Amplifier	400W continuous sine wave
Frequency Response	8–95 Hz (±3 dB)
Inputs	3 (L, R, & C) line-level RCA jacks; 2-channel (L & R) speaker-level spring terminals
Highpass Filter Outputs	3 (L, R, & C) line-level RCA jacks, 12 dB/octave, factory preset -6 dB at 95 Hz
Enclosure Material	¾" medium-density fiberboard
Dimensions	23.5" (H) x 21.25" (W) x 18.25" (D)
Weight	92 lbs.

Listening to the brass, woodwind, and string tracks I recorded recently at Skywalker Sound, I could hear the character of the room almost as well as when I was in the studio conducting the live musicians. Of course, therein lies the danger: most rooms don't sound as good as the scoring stage at Skywalker Sound!

EVEN RESPONSE

Perhaps most impressive is the evenness Infrasub-18's bass response. On well-recorded, well-mastered recordings, the bass was extremely even over the entire spectrum, without certain notes "jumping out" of the mix. With no ports or other resonance peaks in the operating range, the Infrasub-18 does not favor any one note—a common problem with ported or "band-pass" designs.

A word of caution, though: while the Infrasub-18 may be flat down to the infrasonic region, most rooms are not. One must be extremely careful not to push the volume of the Infrasub-18 up to where any uneven subsonic-bass characteristics of the monitoring space become problematic. To set up the system accurately, I recommend that you use a real-time analyzer and a good test microphone placed at the mix position.

▼ **The Infrasub-18 sounds amazing.**

Be warned that, at two feet tall, nearly two feet wide, and 92 pounds, the Infrasub-18 is one beast of a box. The unit's sheer mass could present a problem for studios in cramped quarters.

BOTTOM LINE

Although designed primarily for home-theater installation, the Infrasub-18—when used correctly—could prove a very useful tool in the personal studio. And for those frustrated with the partial low-frequency picture given by most near-field monitors, it could be just what the doctor ordered.

Stephen Webber *is an Emmy-winning composer and an associate professor at Berklee College of Music.*

Multichannel PC Hard Disk Recording System.

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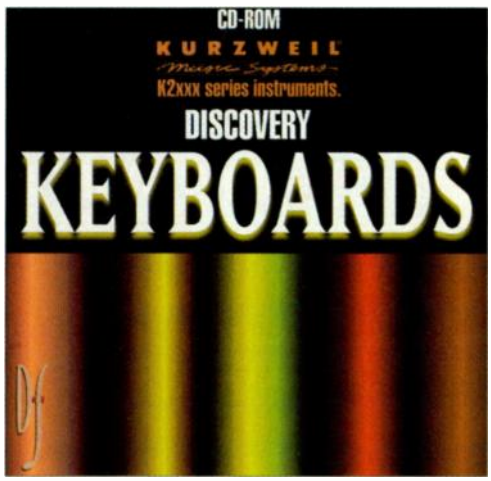
QUICK PICKS

DISCOVERY FIRM

Discovery Keyboards

By Jeff Obee

Many Kurzweil K2000 and K2500 owners know that sampling a vintage keyboard and processing it through the V.A.S.T. synthesis engine can breathe new life into classic sounds. The *Discovery Keyboards* CD-ROM for K2000/K2500–series synths ($199.95) from Discovery Firm does just that, presenting you with a multifarious selection of older keys.



Discovery Firm's *Discovery Keyboards* resurrects the sounds of vintage synthesizers on Kurzweil K2000/K2500–series synths.

All There in Black and White

The disc's 350 MB of sounds are divided into five directories: Electric Pianos/Clavs, FM Synths, Miscellaneous Keyboards, Organs, and Synths. Some files are as large as 15 MB, so you'll need to have a reasonable amount of memory available (32 MB RAM is recommended).

I was impressed with the disc's versatile menu of classic instruments. All the elements you need are here: basses, drums, pads, effects, comping patches, and so forth. Included are Rhodes, Wurlitzer, and Yamaha electric pianos; Roland TR-808/909/606 drum kits; Farfisa, Vox, Hammond, and Korg CX3 organs; Mellotron; terrific Yamaha DX7 patches; and an abundance of other analog programs from practically every pertinent manufacturer.

Peeking under the Keys

A couple of gorgeous textural patches are included, but the emphasis here is on tasteful sounds that are applicable to a variety of situations. A reasonable amount of MIDI control is assigned to the internal DSP and other parameters, and some patches make very effective use of panning.

The FM category is rich in sonic delights; it's the real standout in this collection. There are sweet pads galore, plenty of plucked patches, and pleasing percussion effects. For instance, "Ice Pad" is a slightly resonant, analog-sounding patch, full-bodied with a lot of depth. It would make a nice synth bed for background color. "Envelopment," another FM patch, is a fat, slightly "filter swept" pad combined with a resonant, square-wave LFO sound that pans for a nice atmosphere. Rich sounds like these are right up my alley. If you don't own an FM instrument, this disc provides you with an excellent cross-section of programs from that genre of synth.

I'm an analog buff, and I appreciated the juicy Prophet, Oberheim, and Moog patches. The Mellotron samples are another treat and, along with the Chamberlin and the rare Ondes Martineau, lend a truly vintage feel. More than 50 analog synth basses are provided for your low-end needs—an addition that rounds out this disc nicely.

I also dug the CX3 and Hammond organs. There was some "petering out" of the CX3 samples at the top end of the keyboard, but it's nothing serious. These organs, along with the top-notch Rhodes and crisp Clavinets, give you a solid base of traditional keyboards to work with.

I do have some minimal criticisms. I found that some samples, particularly the Clavs and organs, are "hot," meaning I encountered some distortion at high velocities if I didn't keep my levels in the channel assignments and my mixer lower than usual. Also, the documentation is lacking; I wish Discovery Firm would provide historic information on the synths used and more detail on controller routings.

Vintage Delight

Discovery Keyboards covers a lot of bases very well. Those of you shopping for vintage sounds will get your money's worth from this varied selection of thoughtfully programmed patches.

Overall EM Rating (1 through 5): 4

CIRCLE #444 ON READER SERVICE CARD

EAST WEST

Drum 'n' Bass Construction Kits

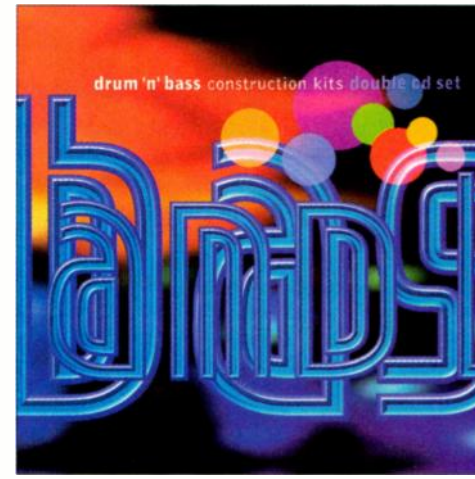
By Jeff Obee

The beginnings of jungle/drum 'n' bass music can be traced to the breakbeat techno styles of the U.K. in the late '80s and early '90s. This pulsing, intriguing style of dance music is marked by busy, syncopated drum rhythms; deep, loping bass lines; and synth ambiences and effects that float over the mix.

With *Drum 'n' Bass Construction Kits* ($99.95; audio CD), East West, purveyors of numerous cutting-edge sample CDs, dish up a hot double-CD set of drum 'n' bass that will have you dancing around your studio, guaranteed.

Sampled Electronica

No doubt about it, these are very hip samples of dance-oriented sounds. James Bernard of Korg did the production and programmed the synths and drum rhythms. Most of the audio is very good, but I did hear some crackling at the end of some of the elements on occasional tracks. The kick and snare samples were rendered



***Drum 'n' Bass Construction Kits*, a 2-disc set from East West, offers up hip samples of techno dance music.**

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TESTA INTERACTIVE

practically useless on track 13 because of this noise. Some hiss is audible in some of the samples, as well.

The Elements

The sounds consist of full musical loops followed by separate samples of the musical elements that make up that loop. For example, track 2, "Pushing," is a minicomposition of drum 'n' bass music that can be sampled and looped; track 3 contains all the elements that make up "Pushing," including the drum loop, bass sound, various synth sounds, and kick, snare, and hi-hat samples. You pick and choose what you want to use from each short piece of music, which makes for a diverse palette of sounds.

This approach gives you a lot of creative options, but because you are faced with ten or twelve elements on the same track, you have to search for the desired element on your CD player. Of course, with something like 1,000 elements and only 99 tracks on a CD, the developer couldn't possibly have given each element its own track. Still, if you want to sample an element that is toward the end of a track, the process is a pain.

Nonetheless, *Drum 'n' Bass Construction Kits* offers loads of great techno-style drum and synth sounds. You get a cool amalgamation of drum samples and loops, and stacked synth and synth-bass sounds. Be aware, however, that many of these are not generic sounds that would be useful in a wide array of contexts: most of the synth sounds change pitch or chord progressions, are chords, or contain more than one element. The only rule here is that there *are* no rules, so explore and tweak away.

Peeves and Praise

In the documentation, East West just lists the basic tracks, the title of each piece, the tempo in beats per minute, and the patch names of the elements. I would encourage East West to go beyond the contemporary, minimalist design and to put in-depth data in the sleeve, such as the instruments used or information on drum 'n' bass music.

Although I have some criticisms of *Drum 'n' Bass Construction Kits,* this collection is great fun. You get a lot of material on these two CDs: wild, exciting drum tracks, vintage synth patches, and electronic drum samples. Furthermore, many of the mini-compositions themselves are fantastic and stand as excellent examples of the genre. Whether you are deep into drum 'n' bass or you are just starting to explore this type of music, you should check these discs out.

Overall EM Rating (1 through 5): 4

CIRCLE #445 ON READER SERVICE CARD

EQUI=TECH

ET1R Symmetrical Power System

By Alex Artaud

Clean power is one thing that every studio owner craves, especially in this noise-revealing era of 24-bit digital recording. Yet how many personal studios have been able to afford it? Sure, plenty of power conditioners are available; they are standard fare for serious musicians. What I'm talking about, though, is a power system that dramatically lowers the noise floor and increases the dynamic range of your

(continued on p. 184)

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DIGITAL MIXERS

MACKIE.

New

Digital 8 Bus Mixing Console

Well, it's finally here and just like the analog 8 bus a few years back, it's everything you've anticipated! Great sound quality, full recording and mixdown capabilities, motorized faders and an array of digital features geared to take you flying into the next century.

FEATURES-
- 48 channels of automated compression, gating, EQ and delay
- Built in 3-way meter display keeps you on top of your mix.
- Built-in meter bridge.
- Ultramix II automation for complete control, hook up an S-VGA monitor and you'll feel like you spent a lot more money.
- All functions can be automated, not just levels and mutes. Store EQ, reverb, compression, gating and even Aux send information.
- Fast SCENE automation allows you to change parameter snapshots on every beat.
- Reads Standard MIDI tempo maps, displaying clock info on the built-in position counter.
- Truly the cutting edge of mixing technology.

Panasonic.

New

WR-DA7 Digital Mixing Console

Stop dreaming about your digital future, it's here! The Panasonic WR-DA7 digital mixer features 32-bit internal processing combined with 24-bit A/D and D/A converters as well as moving faders, instant recall, surround sound capabilities, and much more. Best of all, it's from Panasonic.

FEATURES-
- 32 Inputs/6 AUX send/returns
- 24-bit converters
- Large backlit LCD screen displays EQ, bus and aux assignments, and dynamic/delay settings
- 4-band parametric EQ
- Choice of Gate/Compressor/Limiter or Expander on each channel
- 5.1 channel surround sound in three modes on the bus outputs
- Output MMC
- Optional MIDI joystick

TASCAM

New

TMD1000 Digital Mixing Console

You want to see what all the digital mixing buzz is about? The NEW TMD100 from Tascam will have you smilin' & automatin' in no time. It features fully automated EQ, levels, muting, panning and more in an attractive digital board with an analog 'feel'. Your digital future never looked, or sounded, so clear.

FEATURES-
- 4 XLR mic inputs, 8 1/4" balanced TRS inputs.
- 20-bit A/D D/A conversion, 64x oversampling on input, 128x on output.
- Store all settings, fully MIDI compatible.
- Optional **IF-TD1000** adds another 8 channels of TDIF and a 2-channel sample rate converter.
- Optional **FX-1000** Fx board adds another 4 dynamic processors and another pair of stereo effects.

MIC PREAMPS

Focusrite

New

Green 3 "Voicebox MKII"

The Voicebox MKII provides a signal path of exceptional clarity and smoothness for mic recording, combining an ultra-high quality mic amp, an all new Focusrite EQ section optimized for voice, and full Focusrite dynamics. The new MKII now includes a line input for recording and mixdown applications.

FEATURES-
- Same mic pre section as found on the Green Dual Mic Pre includes -48V phantom power, phase reverse, and a 75Hz high-pass filter. Mute control and a true-VU response LED bargraph are also provided
- EQ section includes a mid parametric band with frequency and gain control as well as a gentle bell shape to bring out the character of the voice.
- Dynamics section offers important voice processing functions of compression and de-essing combined with a noise reducing expander
- Single balanced Class A VCA delivers low distortion and a S/N ratio as low as -96dBu

EFFECTS PROCESSING

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ULTIMATE SOUND MACHINES

New

Finalizer Plus

Improving on the multi-award winning Finalizer platform, The Finalizer Plus delivers an unprecedented level of clarity, warmth and punch to your mix. Inserted between the stereo output of your mixer or workstation and your master recording media, the Finalizer Plus dramatically rounds out your material, creating that "radio ready" sound.

FEATURES–
- Balanced Analog as well as Digital outputs including AES/EBU, S/PDIF, & TOS.
- 24-bit precision A/d & D/A Converters
- 5-band 24-bit stereo EQ
- Enhance - De-essing, stereo adjust or digital radiance
- Real-time gain maximizer
- Variable slope multi-band expander
- Mult-band compressor
- Word Clock Sync
- MIDI section useful for controlling sequencer fades or any of the Finalizer's parameters from a remote MIDI controller

lexicon

PCM81 Multi-Effects Processor

New

The PCM-81 has everything that made the PCM80 the top choice among studio effects processors, and more. More effects, more algorithms, longer delay and full AES/EBU I/O.

FEATURES–
- 300 Presets include pitch, reverb, ambience, sophisticated modulators, 20 second stereo delays, and dynamic spatialization effects for 2-channel or surround sound applications
- 2 digital processors including Lexicon's Lexchip for the reverb and a second DSP engine for the other effects.
- 24-bit internal processing
- Dynamic patching matrix for maximum effects control.
- PCM card slot

EQUALIZERS

Focusrite

New

Green 2 "Focus EQ"

The Green 2 Focus EQ is suitable for a variety of applications combining a Focusrite equalizer section with a multi-source input section. Use it as a high-quality front end for recording applications or patch it into the send/return loop to upgrade a single channel of console eq, either way, it sounds great.

FEATURES-
- XLR & 1/4" inputs are similar to the Dual Mic Pre but have been adapted to cope with a wider range of levels.
- VU metering via a 10-LED bargraph
- EQ section derived from the Red and Blue range processors for superb audio quality.

COMPRESSORS

JOE MEEK

VC1 Studio Channel

got meek?

The Joe Meek Studio Channel offers three pieces of studio gear in one. It features an excellent transformer coupled mic preamp, a great compressor and an enhancer unit all in a 2U rackmount design. Find out why more and more studio owners can live without one.

FEATURES-
- 48V phantom power, Fully balanced operation
- Mic/Line input switch
- Mono photo-optical compressor
- High pass filter for large diaphragm mics
- Extra XLR input on front makes for easy patching
- Compression In/Out and VU/compression meter switches
- Twin balanced XLR outputs with one DI XLR output for stage use
- Enhancer In/Out switch and enhance indicator
- Internal power supply 115/230V AC

dbx

Blue Series 160S Stereo Compressor

The dbx 160S combines the best features of all the great dbx compressors in a well-built unit where the craftsmanship is as stunning as the engineering is innovative. This is truly a desirable compressor.

FEATURES-
- 127dB dynamic range • Program dependent "Auto", or fully variable attack and release
- Hard knee/OverEasy switchable.

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MIDI HARDWARE

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MIDI Time Piece™ AV
8x8 Mac/PC MIDI Interface

The MTP AV takes the world renowned MTP II and adds synchronization that you really need like video genlock, ADAT sync, word clock sync, and even Digidesign superclock!

FEATURES–
- Same unit works on both Mac & PC platforms
- 8x8 MIDI merge matrix, 128 MIDI channels
- Fully programmable from the front panel
- 128 scene, battery-backed memory
- Fast 1x mode for high-speed MIDI data transfer

Digital Time Piece™
Digital Interface

Think of it as the digital synchronization hub for your recording studio. The Digital Timepiece provides stable, centralized sync for most analog, digital audio, and video equipment. Lock together ADATs, DA-88's, ProTools, word clock, S/PDIF, video, SMPTE, and MMC computers and devices flawlessly. It ships with "Clockworks" software which gives you access to its many advanced features and remote control of some equipment settings such as record arm.

OPCODE

Studio 64XTC
Mac/PC MIDI Interface

The Studio 64XTC takes the assorted, individual pieces of your studio-your computer, MIDI devices, digital and analog multitracks and even pro video decks, and puts them all in sync.

FEATURES–
- 4 In / 4 Out, 64 channel MIDI/SMPTE interface/patchbay with powerful multitrack & video sync features
- ADAT sync with MIDI machine control
- Simultaneous wordclock and Superclock output, 44.1kHz or 48kHz for perfect sync with ADAT, DA-88 and ProTools
- Video and Blackburst in (NTSC and PAL)
- Cross-platform Mac and Windows compatibility

SAMPLING

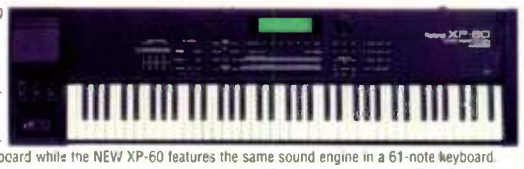
AKAI
S-Series
Rack Mount Samplers

Starting with 64X oversampling, Akai's S-Series Samplers use 28-bit internal processing to preserve every nuance of your sound and the outputs are 18- and 20-bit to ensure reproduction of your sounds entire dynamic range. These three new samplers add powerful capabilities, ease-of-use, expandability and affordability to set the standard for professional samplers.

KEYBOARDS & SOUND MODULES

Roland

XP60 & XP80 Music Workstations



The XP-80 delivers everything you've ever wanted in a music workstation. An unprecedented collection of carefully integrated features provide instant response, maximum realtime control and incredible user expandability. The XP-80 features a pro-quality 76-note weighted action keyboard while the NEW XP-60 features the same sound engine in a 61-note keyboard.

XP80 FEATURES–
- 64-voice polyphony and 16-part multitimbral capability
- 16 Mbytes of internal waveform memory; 80Mbytes when fully expanded (16-bit linear format)
- 16-track MRC-pro sequencer with direct from disk playback. Sequencer holds approx. 60,000 notes
- New sequencer functions like "non-stop" loop recording and refined Groove Quantize template
- Enhanced realtime performance capability with advanced Arpeggiator including MIDI sync and guitar strum mode and Realtime Phrase Sequence (RPS) for on-the-fly triggering of patterns
- 40 insert effects in addition to reverb and chorus
- 2 pairs of independent stereo outputs; click output jack with volume knob
- Large backlit LCD display

SR-JV80 Series Expansion Boards

New

Roland's SR-JV80-Series wave expansion boards provide JV and XP instrument owners a great-sounding, cost-effective way to customize their instruments. Each board holds approx. 8Mb of entirely new waveforms, ready to be played or programmed as you desire.

Boards Include–
Pop, Orchestral, Piano, Vintage Synths, World, Super Sound Set, Keys of the 60's & 70's, Session, Bass & Drums, Techno & Hip-Hop Collection.

KURZWEIL

K2500 Series Music Workstations

The K2500 series from Kurzweil utilizes the acclaimed V.A.S.T. technology for top-quality professional sound. Available in Rack mount, 76-key, and 88 weighted key keyboard configurations, these keyboards combine ROM based samples, on-board effects, V.A.S.T. synthesis technology and full sampling capabilities on some units.

FEATURES–
- True 48-voice polyphony
- Fluorescent 64 x 240 backlit display
- Up to 128MB sample memory
- Full MIDI controller capabilities
- 32-track sequencer
- Sampling option available
- Dual SCSI ports
- DMTi Digital Multitrack interface option for data format and sample rate conversion (Interfaces with ADATs or DA-88s)

KORG

Trinity Series Music Workstations DRS

Korg's Trinity Series represents a breakthrough in sound synthesis and an incredible user interface. It's touch-screen display is like nothing else in the industry, allowing you to select and program patches with the touch of a finger. The 24MB of internal ROM are sampled using ACCESS which fully digitizes sound production from source to filter to effects. Korg's DSP based Multi Oscillator Synthesis System (MOSS) is capable of reproducing 5 different synthesis methods like Analog synthesis, Physical Modeling, and variable Phase Modulation (VPM).

FEATURES–
- 16 track, 80,000 note MIDI sequencer
- Flexible, assignable controllers
- **DRS (Digital Recording System)** features a hard disk recorder and various digital interfaces for networking a digital recording system configured with ADAT, DAT recorder and hard disk.
- 256 programs, 256 combinations
- Reads KORG sample DATA library and AKAI sample library using optional 8MB Flash ROM board

TRINITY — *88 Weighted-key/Solo Synth*
TRINITY — *76-key/Solo Synth*
TRINITY — *61-key/Solo Synth*
TRINITY — *61-key*

(Digital IF, SCSI, Hard Disk Recorder, and sample Playback/Flash ROM functions are supplied by optional upgrade boards)

MONITORS

Hafler

TRM-8

Winner of Pro Audio Review's PAR Excellence Award in 1997, Hafler's TRM8s provide sonic clarity previously found only in much more expensive speakers. They feature built-in power, an active crossover, and Hafler's patented Trans•nova power amp circuitry.

- 45Hz - 21kHz, ±2dB
- 75W HF, 150W LF
- Electronically & Acoustically matched

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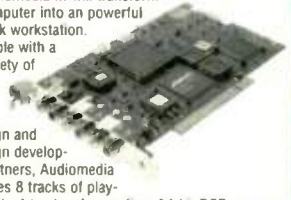

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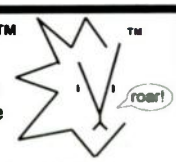

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FINAL MIX

By Larry the O

Getting Down in Surround

Six-channel surround mixing is a reality. DVD players are already on the shelf at your local electronics store, and your audio dealer can sell you a digital mixer with 5.1 capability for less than $4,000. It seems obvious that music DVDs are just around the corner. So are you ready to take the plunge and mix your next project in surround? Before you answer that question, a little rumination is in order.

For a start, just getting equipped for surround takes some doing. You'll have to add three more speakers and amplifier channels to your room—which is bad enough from a cost and space standpoint—and for surround mixing, those speakers and amps will have to bear at least a good sonic resemblance to your existing monitors. Of course, lots of living rooms have mismatched center, surround, and L/R speakers, but it's really hard to mix that way.

Next, you need a mixing console that can do surround mixing. In actuality, pretty much any console capable of generating six separate mixes from masters, groups, or even aux sends can be used for a surround mix. However, with surround mixing, a lot depends on the means by which you control panning.

Positioning a sound in a surround mix requires defining the level sent to each of the buses. Just obtaining static positioning for each sound is already quite a bit of work, but adding movement requires some method of controlling all of a channel's sends simultaneously and in concert. In a setup that uses the stereo master outputs and four groups for the six buses, and where there is no automation, it is extremely difficult to do all but the simplest movements. Fader and mute automation make it possible to create complex motion, but they require a lot of time to program.

An onscreen panner is a big step up, but the ideal tool for this purpose would be a joystick. Unfortunately, I don't know of any commonly available, inexpensive MIDI joysticks. I hope and expect this to be something we'll soon see, but until we do, surround mixes on the new breed of digital console will be a real pain. All that's needed is the joystick itself, with its *x* and *y* axes mapped to two user-selectable MIDI controllers. The tricky part is that the joystick would have to offer several different controller curves, and figuring out the most useful curves could also be a pain.

Beyond that, the mixer of choice has to be able to accept standard MIDI Control Change messages for external control of surround panning. That also seems obvious, but it is not the case with currently available, low-cost digital mixers. If the joystick's talking and nobody's listening, your sounds aren't moving.

However, once you get all of the required equipment in place, you face the toughest problem of all: what do you do with all this stuff? Multichannel mixing is certainly not new, but it is just as certainly not established as a consumer delivery format outside of films and a handful of TV shows. Will you place all the instruments statically, or will some sounds move around? Is your idea to place the listener more or less in the center of the band, or are you shooting for some "realistic" concert experience?

These are big questions, and mulling over the options doesn't cost a farthing. Sooner or later, you have to try out any technique to find out whether it really works, but it's a worthwhile exercise to ponder what you might do differently with a recent or current project if you were doing it in surround. One thing I realized is that I would want to add a bunch of tracks of tight mics to the primary room mics in the recording I'm about to do of an acoustic ensemble. That would give me more placement options if the CD we're making were to get surround mixed for DVD.

Sussing out surround mixing is the best sort of challenge we, as electronic musicians, can hope for: a new frontier. Life can be a bit rugged out on the frontier, but few things are more rewarding.

ILLUSTRATION BY STEVE CURL

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