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Electronic Musician

August 1996

Music to Go

Pack up the best portable keyboard for your musical journeys

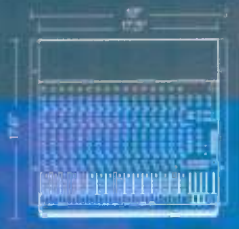
MIDI tools for Windows multimedia projects

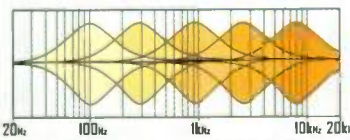
DigiTech Studio Quad review

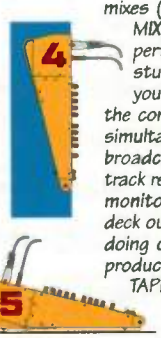
MORE BUSES, MORE PREAMPS, INTRODUCING THE NEW 16-CH.,

Four submix buses, swept mid EQ, AFL/PFL, new materials, new technologies and the soul

The original CR-1604 defined the modern compact mixer. Now we've "raised the standard" by adding over 20 new features like true 4-bus design with assign switches on every channel, 16 high-headroom/low noise mic preamps, separate stereo Control Room/Phones bus, effects return to monitors — for just $100 more* than the original CR-1604! No matter where you mix or what you mix, you'll find a lot to like on the new CR1604-VLZ. Call for a free 40-page brochure and applications guide today.







NEW TRIM *control (on the channel strip) with 60dB total mic gain & –10dB "virtual pad" for line inputs.*

6 AUX SENDS *per ch. Aux 1 & 2 switchable pre/post. Aux 3 &4 (post-fader) become 5 & 6 via Shift switch.*

HI EQ. *±15dB shelving at 12kHz.*

NEW SWEEPABLE MIDRANGE. *Wide, musical peaking EQ with 100Hz to 8kHz range. ±15dB range.*

LO EQ. *±15dB shelving at 80Hz.*

NEW LOW CUT FILTER *is a must for live sound and acoustic (microphone) recording. Sharp, 18dB/octave @ 75Hz high-pass filter lets you add Low shelving EQ to vocals without boosting undesirable mic thumps, stage rumble, wind noise, P-pops, etc.*

PAN *control with constant loudness to maintain stereo perspective.*

MUTE *switch.*

NEW MUTE & OVERLOAD *LED.*

NEW –20dB SIGNAL PRESENT & SOLO *LED.*

SOLO. *In-place AFL or PFL (pre fade listen).*

NEW BUS ASSIGN *for Subs 1-2, 3-4 & Main L/R.*

NEW 60mm FADER *with true log taper, special lip seal & long-life wiper material.*

Stereo **AUX RETURNS 1 & 2** *with 20dB gain above Unity for boosting weak effects.*

NEW AUX SEND 1 & 2 MASTERS.

NEW AUX SEND 1 & 2 SOLO *switches with LEDs.*

NEW *Aux Return 3* **ASSIGN SWITCHES** *to Main Mix, Subs 1 & 2 or Subs 3 & 4.*

NEW *Aux Return 4* **ASSIGN** *to Control Rm/Phones.*

NEW PHANTOM POWER *LED.*

NEW CONTROL ROOM/PHONES *level control.*

NEW TAPE INPUT LEVEL *control and* **TAPE TO MAIN MIX** *switch.*

NEW CONTROL ROOM/PHONES SOURCE MATRIX. *Just like our 8•Bus monitoring system, this creative feature lets you route any combination of Tape, Subs 1 & 2, Subs 3 & 4 or Main Mix to Control Room/Phones bus. Lets you create custom headphone mixes (press MAIN MIX and let performers in the studio hear what you're hearing in the control room), run simultaneous broadcast or live 2-track recording mixes, monitor 2-track tape deck output (if you're doing commercial production, press TAPE and share it with VO talent in the studio), route a cue/click track to phones or create a second stereo main output with its own level control.*

MORE THAN JUST SWEPT MIDRANGE. *Most mixers (except very expensive ones) have narrow EQ bandwidths — OK for drastic corrections but not very useful for gentle tonal changes. The CR1604-VLZ has wide, midrange EQ bandwidth that is far more musical-sounding and can be used more generously than narrow mid EQ.*

5-WAY PHYSICAL CONFIGURATION *via our famous rotating input/output "pod." Out of the box the CR1604-VLZ comes in with jacks to back. Use on a tabletop ❶ or rack-mount it with the free rack rails included ❷. In minutes, with just a screwdriver, you can rotate the pod for an ultra-compact 8-rack space configuration ❸. Optional RotoPod-VLZ bracket places the input/output jacks on same plane as the controls (rackmount ❹ or tabletop ❺).*

***THE BIG ASTERISK**: *Suggested U.S. retail for the CR1604-VLZ is $1199. This is actually LESS than the combined price of the old CR-1604 and XLR10 mic preamp expander (needed to get a full 16 mic preamps). Priced higher in Canada.*

BNC *lamp socket.*

NEW EFFECTS TO MONITORS *controls fold Aux Return 1 & 2 back into Aux Sends 1 & 2 so that on-stage performers can hear outboard effects.*

Stereo **AUX RETURNS 3 & 4** *with 20dB gain above Unity for boosting weak effects.*

Global **AUX RETURN SOLO** *with LED.*

LED **METERS** *with –30 to +28 range.*

NEW LEVEL SET *LED. In conjunction with individual channel Solo lets you quickly and accurately set input levels to Unity Gain, minimizing noise and maximizing headroom.*

Global **SOLO** *level control.*

RUDE SOLO *light.*

NEW *Global* **AFL/PFL SOLO** *switch.*

HEADPHONE *output.*

NEW BUS ASSIGN *to Left and/or Right Main Mix.*

NEW *60mm* **SUB-MASTER & MAIN L/R** *faders with accurate, 8•Bus log taper.*

BUILT-IN *power supply.*

PHANTOM POWER *switch.*

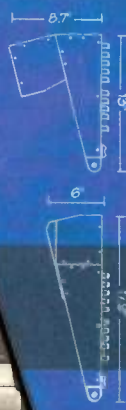
nps ■ -20dB signal present LEDs ■ Control Room/Phones section w/switching matrix

MORE EQ, MORE FEATURES, MORE EVERYTHING.** 4-BUS CR1604-VLZ MIC/LINE MIXER. JUST $1199.*

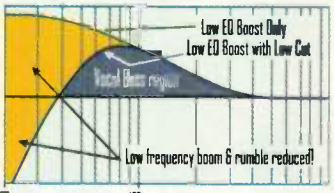
of our 8•Bus...we packed the new CR1604-VLZ with a 5-year "wish list" of the most-requested mixer features.

NEW VLZ *(Very Low Impedance)* **CIRCUITRY** *developed for our 8•Bus consoles, reduces noise and crosstalk in critical signal path areas.*

** *Everything except noise... There's even LESS of that thanks to VLZ circuitry.*



SOLID STEEL *main chassis.*



NEW MONO OUTPUT *(bal./unbal.) has separate volume control.*

NEW RCA TAPE *inputs & outputs (unbalanced).*

NEW *Separate* **CONTROL ROOM OUTPUT** *(bal./unbal.) so you don't tie up your headphone output with an amp.*

NEW INSERTS *on every channel.*

SUBMASTER OUTPUTS *(bal./unbal.).*

SEALED *rotary controls resist dirt, smoke and diet cola.*

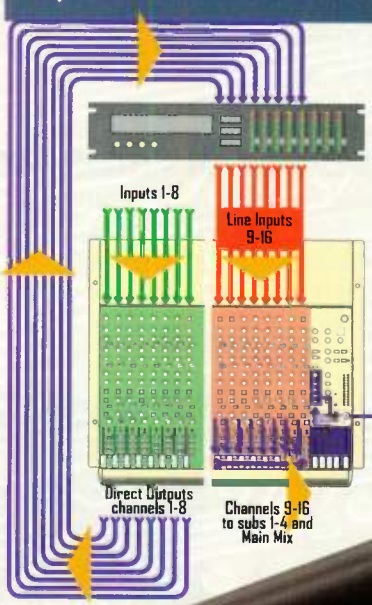
Maximum **RFI INTERFERENCE PROTECTION** *via metal jacks, blocking capacitors, etc.*

NEW LOW CUT FILTERS *on all channels. Low Shelving EQ can be very useful on vocals. But adding Low EQ also boosts stage rumble, microphone thumps and wind noise that aren't good for your PA system. Our sharp 18dB/octave filter cuts out the bad stuff below 75Hz and leaves the good stuff (unlike the shallow 6dB/octave or 12dB/octave "low cut" filters on some mixers that also slice off audible low bass & don't fully cut out subsonic stuff).*

NEW 16 STUDIO-GRADE MIC PREAMPS *with –129.5dBm E.I.N. — the same ones as on our acclaimed 8•Bus consoles that are regularly used to record platinum albums.*

DIRECT OUTS *(bal./unbal.) channels 1-8.*

The perfect mixer for use with 8-track digital recorders.



Record on chs. 1-8, routing tracks to your 8-track recorder via post-fader direct outputs (separate inserts let you add compression or other effects as you record) — and/or combine chs. to tape using the 4 sub-masters. Monitor and then mixdown via chs. 9-16.

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I N S I

FEATURES

DEPARTMENTS

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Electronic Musician®

ten! AUGUST 1996 VOL. 12, NO. 8

COLUMNS

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66

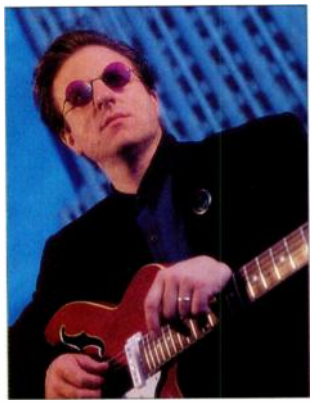
REVIEWS

Cover: Photography by Barry Muniz.

Special thanks to Kawai America Corp., Roland Corp. US, and Yamaha Corp. of America.

Uncomplicated Joys

Simple tools can lay the groundwork for masterworks.



ROBERT PERRY

A fully loaded personal studio is a beautiful thing. It is a nurturing techno womb where a musician can devise stunning aural vistas, clatter-bang symphonies, and other sonic exotica. Heck, you can even slam down a three-chord country lament or a one-riff funk tune. Anything is possible. There's just one problem: the fuel that propels all this technology toward creative conception is an unreliable muse called *inspiration.*

It's a frustrating reminder of our feeble control of destiny that great ideas can happen anywhere and anytime. You can't scribble "date with inspiration" into a day planner, wire yourself into your studio at the appointed time, and reap the (well-timed) benefits of genius. Nope. Inspiration is frightening in its unpredictability. For example, I've sent fellow commuters swerving toward the shoulder when a melodic theme attacked me in my car and caused me to furiously search for my portable cassette recorder. (I guess I should have left at least one hand on the wheel and one eye on the road!) In addition, I've jumped up in the middle of an action flick to run to the lobby telephone and sing an idea into my answering machine. And I can't count how many times I've been compelled by some nocturnal sprite to rise out of a sound sleep, grab my acoustic guitar, and flesh out a chord progression.

Ideas being but fragile wisps of neural energy, it would have been a tragic move to try and imprison these "gifts" until I could power up my studio. When dealing with inspiration, the critical goal is to document the idea at all costs, *not* to wait until you can sit comfortably in your technical wonderland and play "Where's Waldo?" with your memory cells. Unfortunately, I know many musicians who *will not* commit an idea to tape/sequencer/hard disk unless they can use all their tech tools. I'm sorry—that's just dumb. Why risk losing a brilliant musical idea to technological snobbery when a simple, compact tool can freeze-dry the idea for posterity?

For example, check out the self-sufficient, portable keyboards that Technical Editor Scott Wilkinson surveys in this month's cover feature "Traveling Companions" on p. 46. Many pros mistakenly pooh-pooh these instruments as "consumer toys," but a battery-powered keyboard can salvage your creative assets when inspiration drops in unannounced and you're miles away from your favorite MIDI controller. And, anyway, musicians who can only create in a "perfect" environment may be tuning out the haphazard gift of divine inspiration. Think about it.

In **EM** staff news, I'm very happy (and proud) to announce that Mary Cosola has been promoted to managing editor. Hurray! Mary is one of the true stars of this magazine, and her administrative skills will definitely improve copy management, thus giving all of us a little "headroom" to develop better content, snazzier graphics, and more comprehensive reviews.

We also welcome Joe Humphreys as our new editorial assistant. Joe is an extremely talented copy editor and proofer. In addition, he is making **EM** history as the first staffer with a shaved head. (I think he did it because the smooth surface affords a more inviting target for inspiration.) Please feel free to e-mail "congrats" to Mary and Joe at emeditor@aol.com.

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How often have you had a great inspiration that somehow got lost on its way to the sequencer? Meet the MR-61 and MR-76, two new keyboards designed for the songwriter in all of us.

Capture your inspiration here.

The Idea Pad™ records everything you play, all the time. Noodle around a bit. Try out a few ideas. Yeah, that last one was a keeper! Don't worry, your inspiration has already been captured.

Here's your drummer,

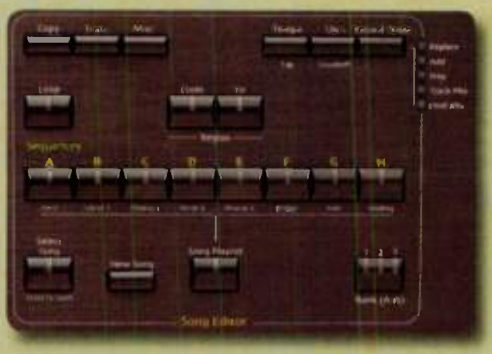
complete with 8 variations and 8 fills. Load in new rhythms from disk, creatively exploring how the patterns can change by trying different drum kits.

Use the Drum Machine on your live gigs, or to jam with to find your next inspiration. When you use it together with the Idea Pad, all of your Drum Machine activity is captured as well!

Send your ideas on to the 16-track sequencer to develop them further.

Arrange it here.

The Song Editor gives you a natural, easy-to-use interface for arranging your sequences into songs. Make a playlist by choosing the order of your sections. Trying a new arrangement is as easy as A, B, C, (or A, C, C, B, D, or A, D, C, B, E, ...).

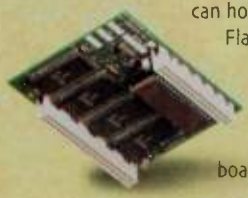


Mix it here.

The FX / Mixdown strip gives you direct access to each of the effects sections – reverb, chorus, and any of the 40 insert effects. Plus control over panning, volume, solo, and muting – use it just like a mixing board.

Here are your expansion options.

The MR Series have 3 expansion slots, which can hold either wave expansion or Flash memory for loading samples. Expand your wave ROM with up to 24 MB per board, or add 4 MB of sample memory per board, in any combination you need.



We wanted these great new concepts to be easy to use, so we put all the right controls on the front panel. Arranged in sensible groups so you don't waste time searching through complex menus.

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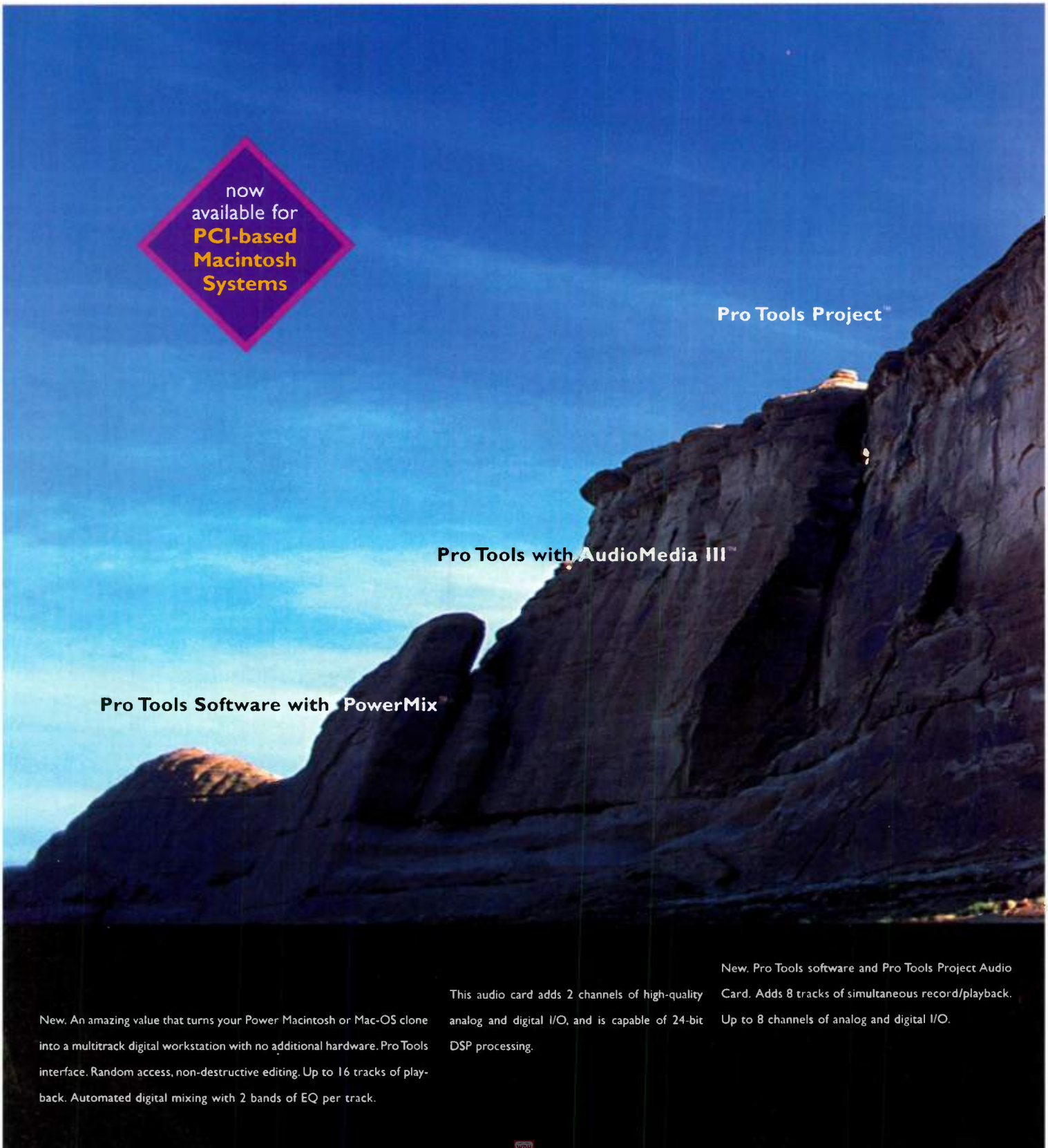

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New. Pro Tools software and Pro Tools Project Audio Card. Adds 8 tracks of simultaneous record/playback. Up to 8 channels of analog and digital I/O.

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PATCH IT UP

The article "Burn, Baby, Burn!" (June 1996) was quite possibly the best feature I have ever read in **EM**—simply outstanding. In fact, the entire issue was full of good stuff. As a recording musician with a surplus of knowledge about the recording process and a questionable amount of knowledge about electronic music and its possibilities, I find your magazine an invaluable asset, and I look forward to it each month.

But I do have several questions after reading Brian Knave's excellent article "Recording Musician: Patch-Bay Profiles." When using a patch bay in a normaled or half-normaled format, does splitting the signal degrade the signal in any way? Audio signals are of a minute size on the signal scale, so does adding yet another load bring the split-signal levels down? Does it really make a difference whether the signal is analog or digital?

IC2 Michael O. Libby
USS Independence
Yokosuka, Japan

Michael—The answer depends on what you mean by "degradation." Any time the path of an audio signal is interrupted, a tiny amount of signal is lost and some noise might be picked up, resulting in minute signal degradation. In fact, signals are degraded by virtue of simply traveling through audio cable and connectors—a fact that underlies disputes over cable and connector quality and their effect on audio.

Are these infinitesimal "degradations" audible? Generally, no. But it's worth noting that many major studios avoid connectors whenever possible and often specify exotic brands of cable. (For a close look at some of these issues, see "The Great Cable Debate" in the January 1994 **EM**.*)*

When you mult a signal with a patch bay or Y-cable, the signal level necessarily drops because it is going to two different inputs. If both inputs are high impedance, this generally isn't a problem. But if one or both are low impedance, the split signal may prove insufficient because a low-impedance input draws more current than a high-impedance input.

Usually, the risk of signal degradation comes when you're trying to compensate for the insufficient levels. Remember, current is flowing between all three points: the source output and both destination inputs. If you raise the input level on one device, it will pull more current and thus diminish the signal at the other input. This requires you to either also raise the second input level or increase output at the source. Either approach could add noise to the signal. So yes, unless you are using a transformer-balanced splitter box (which keeps signal levels constant), adding another load brings the signal-level down and could lead to signal degradation. As for digital signals, digital patch bays and splitter boxes are active and do not degrade the digital data stream when sending it to multiple destinations.

An excellent text to consult on these and on many other audio issues is the Yamaha Sound Reinforcement Handbook *available from Mix Bookshelf (tel. 800/233-9604 or 908/417-9575; fax 908/225-1562). —Brian K.*

I'M THINKING OF A NUMBER

Ya know, it's kinda funny. When I bought my CD-ROM drive, I thought to myself, "Hmmmm. I wonder whether I can extract audio directly off a disc onto a WAV file," and *boom!* My next issue of **EM** had a complete section on this topic ("Audio Abduction," January 1996). Just recently, I said to myself, "Hmmmm. I think it's about time I incorporate CD-R into my studio," and *whammo!* The June issue falls in my lap, with CD-R on the cover ("Burn, Baby, Burn!"). Those psychics you hired are really paying off. Nice job!

Matt Portune
http://www.lm.com/~mportune

AS YOU HEAR IT

Our collective hats off to **EM** and Diane Lowery for the article "Hear No Evil" (June 1996). Educating your readers about how our ears operate and the damage that can occur from exposure to high sound levels is an effort that we all favor.

However, giving your readers the impression that a custom-molded personal monitor is the only possible solution to the stage monitor–level problem is inaccurate and misleading. Additionally, showing a photograph of the Garwood Micro Monitors without mentioning other suppliers of this kind of technology anywhere else in the article shows either a strong bias or less-than-thorough research.

Not everyone is comfortable or satisfied with a custom-molded earpiece. At CMCI, we manufacture the ITE-20 personal monitor. It does not require a custom mold to fit properly, yet it provides an average of 24 dB of outside-world isolation with great fidelity and smooth high-frequency response.

Larry Droppa
President, CMCI
Columbia, MD

Larry—The focus of my article was how to prevent hearing loss if you are a musician or sound engineer. It was not a survey or review of personal-monitor systems, and therefore a comprehensive manufacturer's listing was not warranted. However, because some musicians I interviewed consider personal monitors as a hearing-protection option, I included a brief paragraph on the topic. The Garwood photo was selected merely to illustrate what this type of monitor looks like.

MICHELE ALANIZ

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Furthermore, Steve O. specifically covered CMCI in our "What's New" column (p. 32) in the same issue. Your products, including the ITE-20, were profiled alongside similar products from Aquila and Garwood. —Diane L.

BELL-TOWER RESOURCES

In "A Day in the Life: Ring My Bell" (June 1996), I included a resource list that didn't appear in the final article. If any readers are interested in learning more about programming in *Visual Basic,* here are some additional contacts: Apex Software Corporation (tel. 412/681-4343); Crescent Software (tel. 617/280-3000); Crystal Software (sales@crystalinc.com); Dart Communications (tel. 315/655-1024); Mabry Software (fax 206/632-0272); Media Architects (tel. 503/639-2505); Microsoft Press (tel. 800/677-7377); Stylus Innovation (tel. 617/621-9545); VideoSoft (tel. 510/704-8200); and Whippleware (tel. 617/242-2511).

Phil Cochlin
Oakland, CA

NEW NAVIPRESS INFO

Scott Garrigus' article ("Desktop Musician: Home, Home on the Web," May 1996) is the clearest, most straightforward piece I've seen in any periodical on designing a Web page. However, I followed his instructions and tried to download *NaviPress* via AOL only to find that *NaviPress* is no longer available. Would it be possible to recommend an alternative route? Without step one, the rest of the article is somewhat useless.

Justin Miller
basie22@aol.com

Author Scott Garrigus responds: *AOL decided to make some changes to their Web service at the same time the article was published, but you can still download* NaviPress *(now* GNNpress*) software for free. If you type in the keyword* navipress*, the browser will take you to the new GNN Hosting Service Web page. From there, click on the word* announcement*. This will take you to the press release describing all the changes. Scroll down to where it says* free software*, and you can download* GNNpress*. In addition, the software is available for free to anyone (not just AOL users): just hop on the World Wide Web, and surf to http://www.tools.gnn.com.*

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ROOS PRAISE

Thanks so much for your article on Randy Roos ("Creative Space: Primal Guitar," February 1996). I had the opportunity to meet Randy a few weeks ago and found him to be not only an amazing musician, but a great person.

His music has helped me through some rough times in my life. (If you listen to *Primal Vision*, you'll know what I'm talking about.) Thanks, **EM**, for a job well done. Let's hear some more on Randy in the future.

Ed Vivenzio
Manlius, NY

HISS BLISS

How does one convert (via a computer) old analog music recorded on cassettes to digital, remove hisses and noises, rework it, and re-record it to DAT? I have some songs that I recorded twenty years ago, and I would like to explore the possibility of using them commercially. I am a beginner, and I don't know whether what I am planning is even feasible. I would appreciate it if you would guide me in the right direction.

I bought a '486DX/66 with an 850 MB hard disk, a Roland sound card, *Cakewalk* 3.0, and a Casio CTK-650. These purchases were based on suggestions by people in the business and on some research I did. I am also planning to buy *Sound Forge* 3.0 from Sonic Foundry to complete all that I may need to make music by computer. Any suggestions you have about other equipment needed and/or other programs to purchase would be greatly appreciated.

Pierre Rodriguez
Killeen, TX

Pierre—Yes, you can get there from here. First of all, I suggest you upgrade to Cakewalk Pro Audio, *which will let you record your multitrack cassette masters into the computer (albeit two tracks at a time) via your sound card. Then you can reedit them and process them.*

Sound Forge *would be a sound purchase. Sonic Foundry (tel. 800/577-6642 or 608/256-3133; fax 608/256-7300; e-mail sales@sfoundry.com; Web http://www.sfoundry.com) even offers a noise-reduction plug-in ($249) that should help you take out the hiss and clicks.*

Alternatively, check out Tracer Technologies' DART Pro *noise-reduction program for Windows ($399), an enhanced version of the original* DART, *which we reviewed in our January 1996 issue. You can reach Tracer Technologies at tel. (717) 843-5833; fax (717) 843-2264; e-mail info@tracertek.com; and Web http://www.tracertek.com. —Steve O.*

ERROR LOG

February 1996, "DIY: Build the EM Theremin": Author Bob Moog has found three minor errors. In the Voltage Controlled Amplifier section of the schematic (Fig. 2, p. 89), the value of C24 is shown as 0.01 microfarad but is listed as 0.0033 microfarad (3,300 pF) on the parts list. The latter is correct.

In the Fixed Pitch Oscillator section of the same schematic (Fig. 2, p. 89), the voltage at the emitters of Q6 and Q7 is shown as -0.6V. (See the arrow at the top of R6.) No value should have been given here because the actual voltage varies depending on tuning and is too small to be significant.

Finally, in Figure 4 (p. 97), there should be a jumper at the bottom of R24 similar to the one below D4.

June 1996, "Motion Sound Pro 3," p. 134: We inadvertently ran a photo of a prototype that is missing a few features described in the text. (We reviewed a final production unit, not the prototype.) Here's a photo of the real Pro 3.

WE WELCOME YOUR FEEDBACK.

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

HAVE YOU HEARD THE NEWS ABOUT CAKEWALK PRO AUDIO?

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"The unchallenged reign of the Mac in the pro audio world may be ending."

—Electronic Musician

"Awesome! Cakewalk Pro Audio takes top honors for its excellent all-around feature set and easy learning curve."

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—Music and Sound Retailer, April 1996

THE WORD IS OUT.

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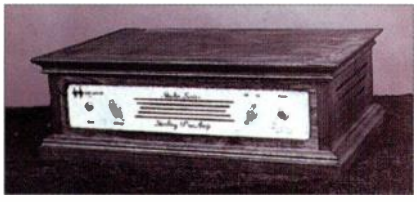
WHAT'S NEW

By Steve Oppenheimer



C.A.E. STERLING PREAMP

Although retro seems to be "in" at the moment, the vintage sound of the Leslie rotating speaker system has never really gone out of style. It's such a cool sound that you probably would like to use it for lots of different applications, but the Leslie was built specifically for use with a Hammond organ.

C.A.E. Sound's Sterling Preamp addresses this problem. The unit's front-panel, ¼-inch, mono input jack accepts instrument-level and line-level signals, amplifies them using two 12AX7A tubes and one 12AU7 tube, and routes them to a Leslie 122 or 122A via a standard 6-pin Leslie connector. The connector routes not only audio, but power, drive, and control signals to the Leslie tone cabinet. Rotation speed can be controlled with a latching or momentary footswitch, which connects to the rear panel.

The LPT-122 ($1,195) is housed in a wood cabinet for tabletop operation; the LPT-122R ($950) is a 2U rack-mount version. The two models are functionally identical. C.A.E. Sound; tel. (415) 348-2737; fax (415) 348-2034; e-mail magicman35@aol.com.

Circle #401 on Reader Service Card

A.R.T. EFFECTS NETWORK

Multi-effects processors are mighty handy to have, but sometimes you can get better results with a dedicated processor that puts all its horsepower into one effect. A.R.T.'s Effects Network ($449) lets you choose which approach you prefer.

In one mode, the unit dedicates all its muscle to just reverb or delay. But like A.R.T.'s FXR series, the Effects Network also can be a discrete-stereo multi-effects processor that can deliver preset combinations of reverb, delay, pitch shift, flange, tremolo, pan, and chorus. Alternatively, it can operate as a dual processor, giving you a different effect on each channel.

The reverbs include a variety of room, hall, plate, and chamber simulations. The unit includes a Tap Time input for the delay algorithms that lets you set the delay time by tapping on an optional footswitch. An LED shows the tempo.

The unit has 100 editable presets. All parameters can be controlled via MIDI Control Change messages, with three simultaneous MIDI controllers available per preset, not counting the global MIDI Volume control.

Applied Research and Technology; tel. (716) 436-2720; fax (716) 436-3942; e-mail artroch@aol.com; Web http://www.artroch.com.

Circle #402 on Reader Service Card

PASSPORT RHAPSODY

If Passport's *Encore* notation software is overkill for you and *MusicTime* is not quite powerful enough, you're a likely candidate for *Rhapsody* 1.03 for Windows or *Rhapsody* 1.0 for Macintosh ($249; upgrade from *MusicTime* $99). The midlevel program's user interface is essentially the same as *Encore*'s.

Rhapsody allows you to enter music in real time or step time via MIDI or by typing with the computer's QWERTY keyboard. It also can transcribe *Master Tracks Pro, MusicTime,* and *Midi Workshop* files as well as SMFs.

Rhapsody supports up to 32 MIDI channels and can display 32 staves per system and eight voices per staff. It can automatically "guess" note durations and beam the notes accordingly, and you can adjust beam angle and height. Individual parts can be extracted, with control over lyrics and markings, and you can split notes from one staff onto two staves according to pitch or voice.

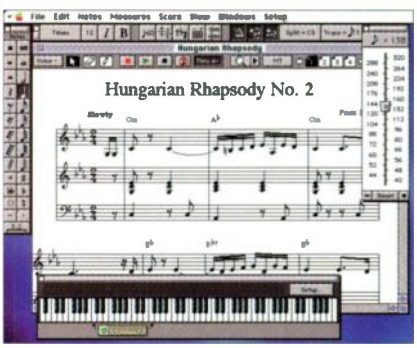
Lyrics and text can be placed anywhere in the score, in any font, size, or style, including dashes and melismas. You get markings for sustain pedals, dynamics, endings, repeats, and measure numbers. When you transpose into any key, chord symbols and guitar-fret diagrams change accordingly. You get a variety of symbols, including slurs, ties, tuplets, accents, and ornaments.

Rhapsody can play back repeats and endings and offers key commands to change note durations, accidentals, enharmonic note names, and Velocity values. Tempos can be changed at any point in the score.

TrueType and PostScript versions of Passport's Anastasia music font are included with the program, and you can use any TrueType font in your system for text, lyrics, chords, staff names, and measure numbers. You can print the entire score, extracted parts, or individual pages.

The PC version runs under Windows 3.1 or Windows 95 and requires 8 MB of RAM. The Mac version will run on a Classic II or better with at least 8 MB of RAM and requires System 7.0 or later. Both diskette and CD-ROM versions are included. Passport Designs; tel. (415) 349-6224; fax (415) 349-8008; e-mail passport@aol.com; Web http://www.passportdesigns.com.

Circle #403 on Reader Service Card



Actual Size

Actual Price

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Introducing the new Alesis NanoVerb™ **18 Bit Digital Effects Processor.**

We packed sixteen of the best sounding, most usable effects into a compact, one-third rack space package.

NanoVerb offers lush reverbs, powerful delay, shimmering chorus and flange, stunning rotary speaker simulation and big, fat multieffects.

Plus, you can tweak each program to perfection with the front-panel Adjust knob.

Oh yeah...NanoVerb costs $179*, so it's actually the most affordable Alesis digital effects processor ever made.

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ALESIS

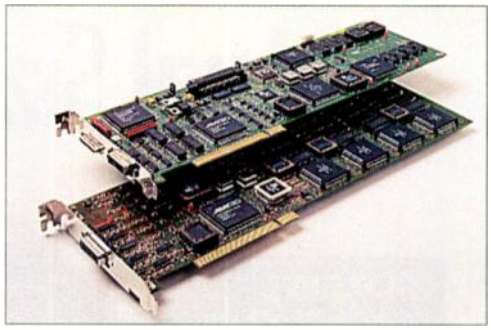
▶ DIGIDESIGN PRO TOOLS III PCI

Digidesign recently started moving its audio-card line to the PCI bus with the Audiomedia III card. But Pro Tools users, who are usually among the first to buy the fastest available Mac, have had to be patient. With the release of the Pro Tools PCI product family, the wait is over.

Leading the way is Pro Tools III PCI ($7,995/core system). Other than being PCI-based, the new hardware is functionally similar to the NuBus version of Pro Tools III. However, Digidesign has enhanced the product in several ways. The new system's internal processing is 24-bit, although it does not currently record 24-bit audio. (It seems obvious that 24-bit recording will be added someday, though.) DSP processing is 50% faster thanks to the superior PCI bus and a more efficient design.

The redesigned DSP Farm connects directly to the I/O box. Because you no longer need a Bridge I/O card to make this connection and the DSP power has been increased, an expanded 16-channel system consists of two cards instead of four. The Core System includes one Disk I/O card, which provides SCSI support for up to sixteen independent record and playback tracks on one or more hard disks. The system can be expanded to 48 disk-based audio tracks and up to 64 analog or digital I/O channels. Also included is the TDM high-speed digital bus and virtual digital mixer, one DSP Farm card, the DAE audio operating system, and *Pro Tools* software. Initially, the system will ship with *Pro Tools* 3.21, but version 4.0 (discussed in a moment) is imminent.

As before, you have a choice of audio I/O interfaces (not included in the Core System). The 882 I/O ($995) offers eight balanced ¼-inch inputs, eight balanced ¼-inch outputs, and stereo S/PDIF I/O. The 888 I/O ($2,995) has eight balanced XLR analog inputs, eight XLR analog outputs, one stereo pair of S/PDIF I/O, and four stereo AES/EBU digital inputs and outputs, also on XLRs.



Digidesign also is shipping Pro Tools Project PCI ($2,495), which includes *ProTools* software and a Project Audio card capable of eight tracks of recording and playback. The system is not expandable. As with Pro Tools III PCI, you purchase the 882 or 888 I/O box separately. However, Pro Tools Project does not include a DSP Farm or TDM.

Digidesign also announced version 4.0 of *Pro Tools* software, which can run on 680X0-based Macs or Power Macs. The software can address any current Digidesign hardware card for the Mac, including Pro Tools Project, Audiomedia II/III, and Pro Tools III.

New automation features include mute automation, dynamic automation of TDM plug-ins, and separate Touch and Write automation modes. The relative levels between grouped faders is maintained, and fader groups can be nested within larger Mix groups to allow fast group level changes.

The updated program supports multiple edit playlists per track. It also integrates the company's AudioSuite plug-in architecture, which offers many *Sound Designer II*–style file-based processing features. (Several third-party developers are expected to release AudioSuite plug-ins in the near future.) *Pro Tools* 4.0 also offers a new graphic interface for crossfades, including variable custom fade curves and new S-shaped fades.

Digidesign has written version 4.0 in native PowerPC code. One of the advantages of this is faster screen redraws. You can do searches and sorts in the Region List and create custom categories to organize sounds in the Region Bins. You can batch-process Regions, and noise-shaped dither is available in the Crossfade dialog box to maintain top audio quality during fades.

In addition, *Pro Tools* 4.0 can share the Pro Tools III PCI hardware with Avid's (Digidesign's parent company) *AudioVision* 4.0. This combination provides a complete desktop sound-for-picture studio with integrated, broadcast-quality digital picture. Sessions created in one application can be transferred to the other. Digidesign; tel. (415) 842-7900; fax (415) 842-7999; e-mail digimkt@digidesign.com; Web http://www.digidesign.com.

Reader Service Card not available

▲ ROLLS RA53

If you want to use multiple headphones for artists and guests but your mixer just has one or two headphone outputs or its headphone amp just isn't loud enough, you need an external headphone amplifier. Rolls' new RA53 headphone amp ($159.99) can drive five sets of headphones of almost any impedance and provides individual level control and plenty of gain. A ¼-inch Link input/output jack allows you to chain two RA53s so you can use up to ten pairs of headphones.

The RA53 offers a variety of input options. It has discreet L/R inputs on both ¼-inch and RCA connectors; a separate ¼-inch TRS jack that routes a stereo signal to the left and right channels; and a ¼-inch mono (TS) jack that feeds the same mono signal to both channels.

Stereo ¼-inch insert jacks are supplied on channels 1 and 2. These interrupt the main L/R inputs, so you can send separate mixes to the first two headphone channels while the main L/R mix is still routed to the other three channels.

The RA53 delivers 300 mW/channel into 8 ohms, typical. Its frequency response is rated at 20 Hz to 30 kHz (±1 dB), and signal-to-noise ratio is >90 dB. Rolls Corporation; tel. (801) 263-9053; fax (801) 263-9068; e-mail eric@rolls.com; Web http://www.xmission.com/~rollsrfx.

Circle #404 on Reader Service Card

It took 10 years to get this one note perfect.

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Large, easy-to-use buttons provide instant access to several dedicated functions including independent control for eight keyboard zones.

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Foot controller and footswitch inputs, hold pedal input and a unique total volume pedal input, left and right outputs, headphone output and even a breath controller input will make you one of the most well-connected players anywhere.

We've spent a lot of time looking for the perfect piano sound. You could too. Or you could simply look at the A-90EX Expandable Controller. With sound, feel, action and control perfectly combined, you'll discover an emotional connection you haven't experienced since playing your favorite acoustic piano.

By combining our all-new stereo grand piano sound with our proprietary award-winning PA-4 hammer action, the A-90EX has become our most dynamic keyboard ever.

20 assignable controllers include sliders, wheels, a bender/modulation lever and aftertouch for unsurpassed realtime performance control. The A-90EX even has four independent MIDI outs to control 64 MIDI channels and patch names for selecting sounds from many of Roland's expansion boards and sound modules.

The A-90EX is also available as the A-90, without the VE-RD1 Voice Expansion Board. Try one for yourself. And see how long it takes before you have to have it.

Roland®

A-90EX Expandable Controller

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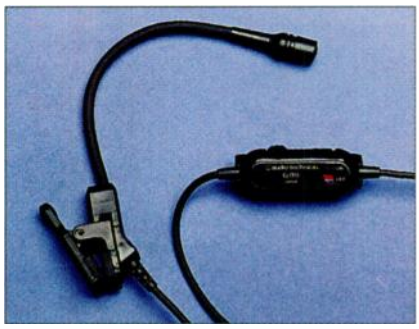


▲ AUDIO-TECHNICA PRO 95

We may be electronic musicians, but most of us still record acoustic guitars. Audio-Technica's Pro 95 ($149) cardioid condenser microphone is optimized for this application. The Pro 95 includes a nonmarring "rubber-grip" spring clamp and flexible boom that lets you mount the mic inside your favorite acoustic guitar or other acoustic stringed instrument and point it away from the strings. This helps isolate the guitar sound from other instruments and provides lots of gain before feedback.

The microphone has a permanent charge on its fixed backplate, rather than using a moving element. This approach allowed the manufacturer to employ a gold-vaporized diaphragm just four microns thick, reducing the moving mass. According to Audio-Technica, the result is improved frequency response and transient response and reduced distortion.

The element is protected in a rugged housing with a low-reflectance finish. The flexible 24-foot cable is strain-relieved to minimize the chances of cable damage. It terminates in an unbalanced ¼-inch phone plug rather than an XLR, so it can be plugged into either a stage amp or a mixer. The in-line power module is located just over four feet from the mic. It operates on a 1.5V LR44-type battery and includes an on/off switch.

A power-module clip, battery, and windscreen are included. An end-pin jack and ¼-inch phone jack are also provided for use in permanent installations. The mic's frequency response is rated at 80 Hz to 13 kHz (±3 dB). It can handle acoustic levels up to 105 dB SPL. Audio-Technica; tel. (330) 686-2600; fax (330) 686-0719; e-mail pro@atus.com.

Circle #405 on Reader Service Card

▼ AKG MICROMIC SERIES II

It seems that miniature microphones are increasing in popularity as they decrease in size. Perhaps it's time you, too, met the incredible shrinking mic. Among the most recent entries into this field are AKG's MicroMic Series II clip-on condenser mics, which feature a new transducer element and a new shock-mount system that provides 10 dB better isolation than the Series I shock mount. According to AKG, the new transducer offers a superior S/N ratio (>63 dB).

Seven models have been introduced. The lightweight (3.6-ounce) C411 ($109) is designed for use on all types of stringed instruments, including violin, guitar, banjo, and mandolin. It is attached via a reusable adhesive on or near the instrument's bridge. Its sealed enclosure reproduces only the instrument's vibration, minimizing feedback. Its frequency response is rated at an impressive 10 Hz to 18 kHz (±3 dB).

The C416 ($249) is designed for low-profile close-miking of speaker cabinets and instruments (e.g., piano, autoharp, accordion, and hammer dulcimer). It comes with an external shock mount and offers a relatively flat frequency response (20 Hz to 20 kHz, ±3 dB) except for a slight high-frequency peak. The C416 can handle up to 131 dB SPL.

For speech and vocals, check out the C417 ($119), a tiny, omnidirectional lavaliere mic, and the C420 headset mic ($259), which comes with a behind-the-head band. Both vocal mics offer a wide frequency response (20 Hz to 20 kHz, ±3 dB).

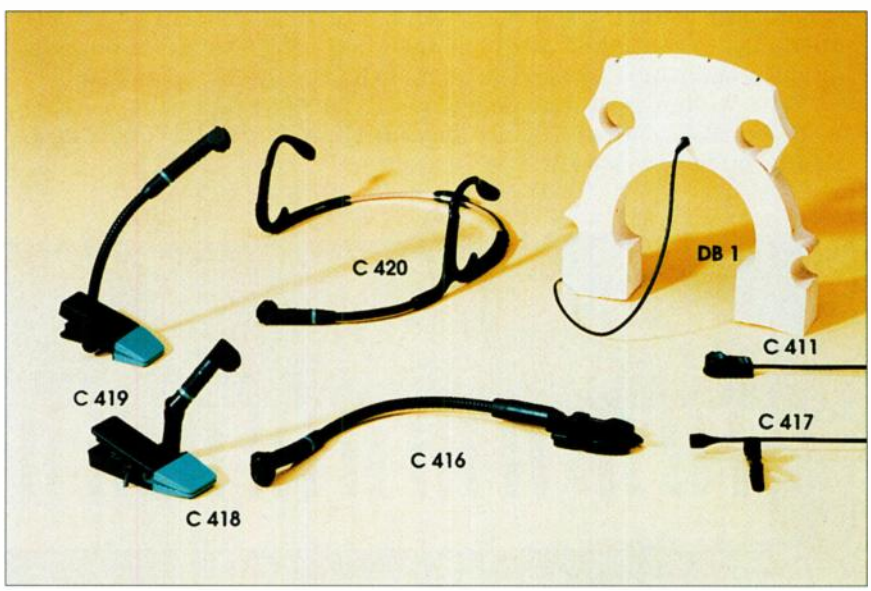
The C418 drum and percussion mic ($249) has a frequency-response curve that is tailored for percussion. A 4 dB low-frequency rolloff optimizes it for large drums. It comes with an external shock mount that protects it from stick blows and an adjustable angle joint on the boom arm. It offers a frequency response of 50 Hz to 20 kHz (±3 dB) and handles up to 140 dB SPL.

The C419 ($249) is optimized for brass and reed instruments. It features a gentle high-frequency peak and has a tight hypercardioid pattern, so it won't feed back when the performer approaches the monitors. Its frequency response is rated at 20 Hz to 20 kHz (±3 dB).

AKG's Double-Bass Bridge Pickup ($399) completes the series. Its piezoelectric transducer is integrated into a wooden double-bass bridge that fits every standard double bass on the market. Its frequency response ranges from 5 Hz to 5 kHz (±3 dB).

You can get phantom-powered (9V to 52V) and battery-powered versions of all models. The optional MPA II adapter ($89) delivers up to 52 volts of phantom power for wired connections, and the B29 dual-battery power supply ($79) is useful for wireless setups. The B29 has two gain controls for mixing up to two MicroMics. AKG/Harman Pro; tel. (800) 878-7571 or (818) 227-1800; fax (818) 884-2974; e-mail drahn@harman.com.

Reader Service Card not available



It's not p o l y p h o n i c
p o l y p h o n i c .

It has only 37 keys.

NO sequencer? **NO** drums? **NO** piano?

Yet, it's oddly compelling. A little scary. W i l d .

But even with mondo chops like yours, you're skeptical about the idea of monophonic, one-handed soloing.

Until you *play* it.

And you **[listen]**...

And you realize you're going to need your other hand to

pick your jaw up off the floor.

And all of a sudden, you sense that *your music* isn't about

88 weighted keys.

Or PCM ROM.

Or polyphony.

Or bells.

Or whistles.

Your music is about *you.*

*FREE Prophecy video featuring Jan Hammer and Joe Zawinul, Send $3.95 for shipping and handling to:
Prophecy Video Dept. K5, 89 Frost St., Westbury, NY 11590. ©1996 Korg USA, Prophecy is a trademark of Korg.

Prophecy
SOLO SYNTHESIZER

REV UP! ▲ ▲ ▲ ▲

▼ SYMBOLIC SOUND

Symbolic Sound's Kyma (last reviewed in the July 1995 **EM**) has long been among the most powerful sound-design systems on the planet, combining advanced synthesis, sampling, and effects processing with an object-oriented, graphical user interface. Now, it's even more powerful, as the company has optimized its version 4.1 software and doubled the card-based workstation's clock speed. The system works with Windows PCs or Macs with NuBus slots.

The new Capybara-66 external 3U rack-mount processor module runs at 66 MHz and offers more than twice the polyphony of the 33 MHz Capybara-33. The Capybara holds the motherboard and up to eight Motorola 56002-based signal-processing cards that do the number crunching.

The entry-level Kyma system ($4,400) has two cards, yet it is one-third more powerful than the old 3-card, 56001-based system, and it costs 12% less. (The old system listed for $4,995.) Each card now has 3 MB of sample RAM; in contrast, the old cards had just 756 KB of RAM. Expansion cards still list for $595 each. All earlier Capybaras can be upgraded to the new model.

Kyma includes the same 16-bit A/D and D/A converters as before. The digital I/O option ($395) provides both AES/EBU and S/PDIF I/O. Symbolic Sound; tel. (800) 972-1749 or (217) 355-6273; fax (217) 355-6562; e-mail info-kyma@symbolicsound.com; Web: http://www.symbolicsound.com.

Circle #406 on Reader Service Card

▶ STEINBERG

Not content to make piecemeal changes, Steinberg launched a coordinated upgrade to its entire *Cubase* product line for Macintosh and Windows. *Cubase* ($349), *Cubase Score* ($549), and *Cubase Audio* ($799) have all been upgraded to version 3.0 for both platforms. Upgrades from the most recent previous versions are $99. The prices are identical for Mac and Windows.

All versions of *Cubase* 3.0 for Macintosh are PowerPC-native and can record and play up to 32 tracks of CD-quality digital audio on the Power Mac using the Apple Sound Manager without requiring additional hardware. The programs include up to 128 EQs, total automation, four multi-effects processors, and a plug-in architecture. Virtually all processing is in real time.

In addition to supporting Sound Manager–based audio, *Cubase Audio* 3.0 XT supports the full line of Digidesign audio cards with or without TDM and can run TDM and Sound Designer II plug-ins. This Digidesign support is a primary difference between *Cubase Audio* and the other two versions. (Extensive professional scoring features separate *Cubase Audio* and *Cubase Score* from regular *Cubase*.)

In addition, *Cubase Audio* 3.0 for Mac now comes bundled with *Time Bandit* 2.0, Steinberg's amazing time-stretching and pitch-shifting software. *Time Bandit* also runs in native PowerPC code.

On the Windows side, digital audio support has also been added to all versions. Up to eight tracks of audio are available using any Windows 3.1–compatible sound card. The Windows programs are bundled with Steinberg's *WaveLab Lite* audio editor and *Studio Module* MIDI-device patch editor. *WaveLab Lite* requires Windows 95 and gives you 32-bit audio processing, sample-rate conversion, dynamics processing, parametric EQ, fades, and much more.

The main difference between the audio capabilities of *Cubase Audio* for Windows and those of the other Windows versions is that the former supports Digidesign's Audiomedia III and Session 8 audio cards and Yamaha's CBX-D5 and CBX-D3 recording hardware in addition to regular Windows sound cards. (The CBX-D5 and CBX-D3 are not supported in the Mac version.)

All Windows versions of *Cubase* are fully Windows 95–compatible. *Cubase* will run on a '486DX2/66 with 8 MB of RAM and Windows 3.1, but a Pentium 90 or better with at least 16 MB of RAM and Windows 95 is highly recommended.

There are plenty of other enhancements—in fact, too many to list them all. For example, Style Trax provides auto-accompaniment, and Cue Trax is a graphic tempo editor. See "Cubist Art" (p. 66 of this issue) for in-depth coverage of some of the program's coolest MIDI features. Steinberg North America; tel. (818) 993-4091; fax (818) 701-7452; e-mail steinberg@aol.com; Web http://www.steinberg-us.com. ●

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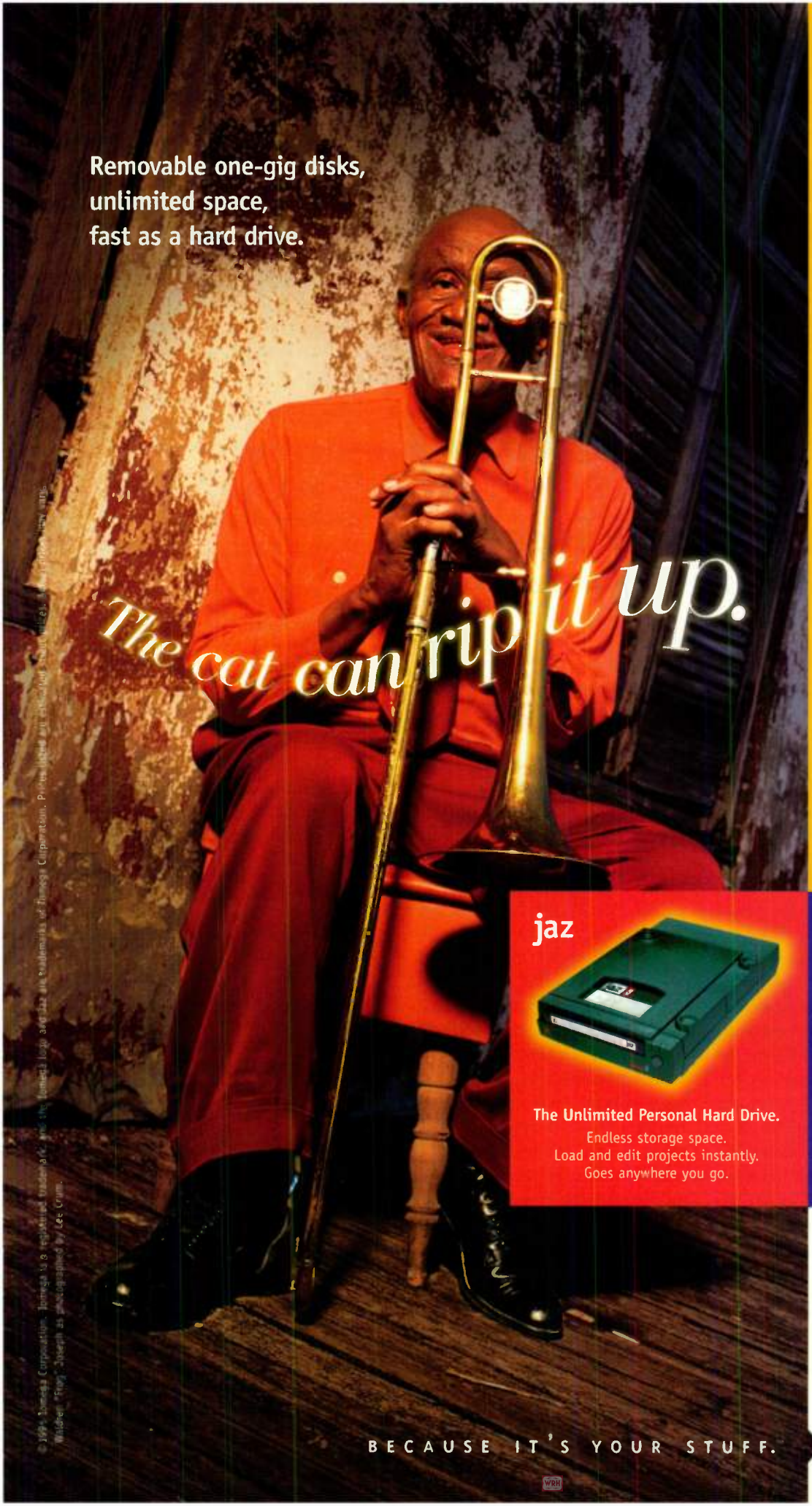

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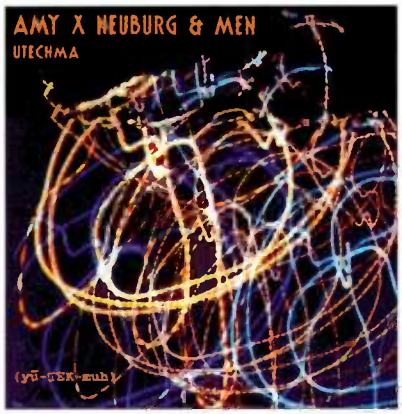


PRO FILE

Twisted Sister & Misters

Neuburg and Men wreak electronic havoc.

By Mary Cosola

For many composers, the allure of creating electronic music lies in exploring new, uncharted realms of self-expression. These musicians use current technology to break from the molds of the past: they program new sounds, work in different tunings, and often abandon traditional song structures. On her new album, *Utechma,* Amy X Neuburg embraces the infinite possibilities of electronic music but does so with a knowing nod to the past.

Neuburg's group, the Men, are a microcosm of her artistic bent for combining new technology with old roots. She sings and plays drumKAT, and the Men—Herb Heinz, Joel Davel, and Micah Ball—play a variety of electronic instruments, including Chapman Stick, Buchla Lightning, and malletKAT. (Micah Ball has replaced Tim Root, who played on the album.) Vocally, the Men are unleashed for what she calls a "Gilbert and Sullivan or Kurt Weill–type effect." They even have their own quirky and often riotous song snippets, called "Man Jams," that are sprinkled throughout the album. It's certainly not a sterile, more-techno-than-thou approach to electronic music.

"This album has helped define the personality of the band," explains Neuburg. "We use a lot of humor, making fun of things like the concept of the Men. The cool thing musically is we all play electronic instruments, so we can trigger anything. We take advantage of our setup by switching bass lines around and having different band members play the rhythm and the chords. Herb and Micah both play Chapman Stick, which allows them to play either bass sounds or guitar sounds."

The result is a style that manages to be both understated and frenetically off-kilter. On many of the songs, Neuburg's vocals are mixed at the same level as the instruments and backing vocals, ensuring that no one element stands out above the others. "It's a very dense sound," she says. "True, it's artificial and there's a lot of production, but that's my aesthetic."

Although Neuburg intentionally pursued a heavily produced sound, she admits that she took it a little too far on some occasions. For instance, as a beta tester for Digidesign's Session 8 software, she had to learn the program inside and out. She got to know it so well, in fact, that she had a hard time knowing when to stop editing.

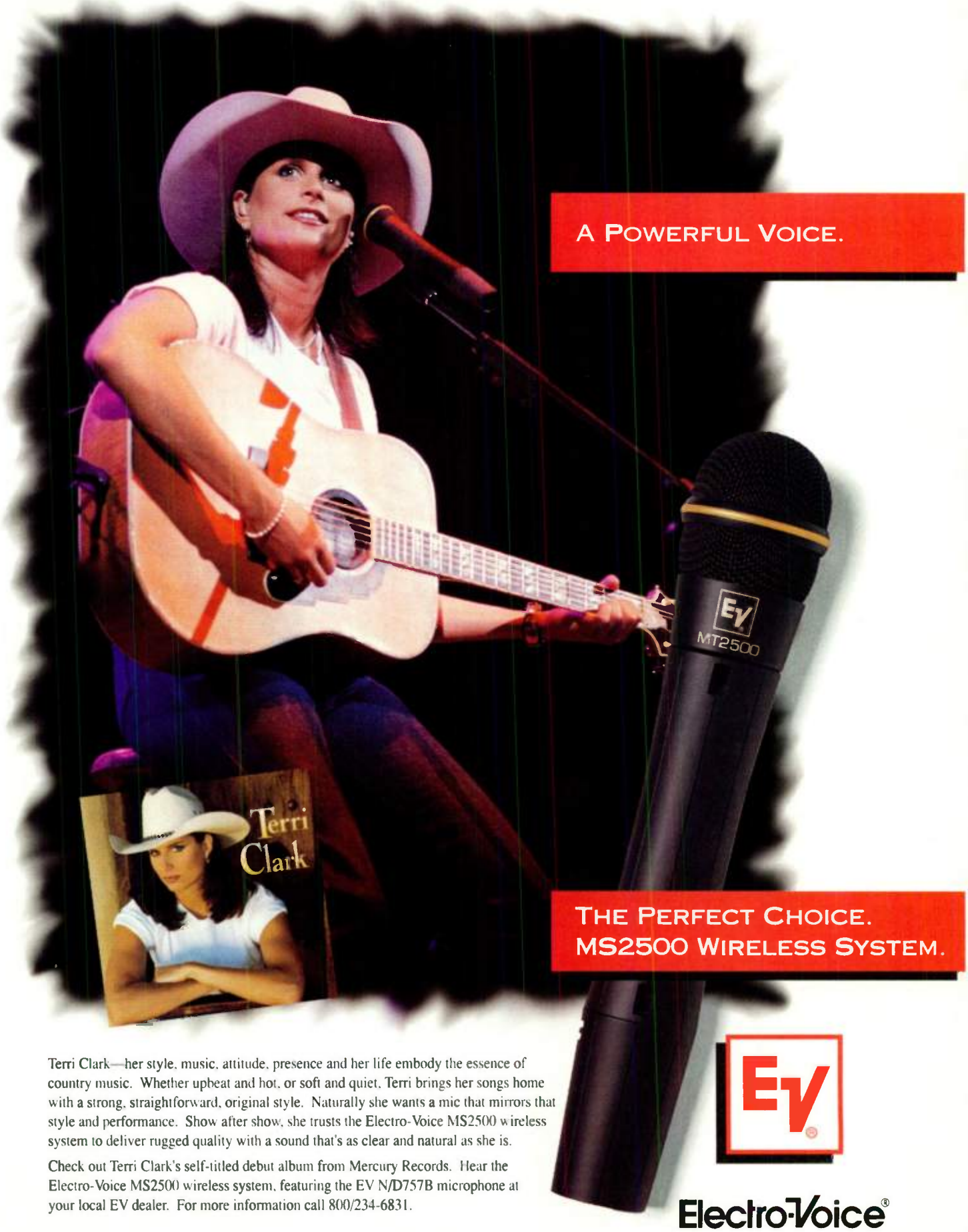
"By the time I mastered the software, I could edit my pieces so meticulously that I would just go crazy editing," she says. "If the Men sang a word that ended in a tee and all the tees weren't together, I would move them so they all lined up. I worked forever on things like that."

Neuburg mentions the track "Hunger for Heaven" as another example of her editing zeal. "I spent days editing my vocal part to make it sound like I never breathed while I was singing," recounts Neuburg. "I don't think anyone else has noticed it, but when I listen to it, I feel like I'm going to suffocate."

As is the case with all artists worth their salt, Neuburg is picky about those subtleties that only someone intimate with the compositions would notice. She and the Men do a great job of creating an interesting interplay of music, technology, and humor.

For more information contact Racer Records, 2443 Fillmore St., #202, San Francisco, CA 94115; tel. (800) 5-RACER-5.

Amy X Neuburg



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BY BRIAN KNAVE

So you're *down* with the home-studio thang. Cool. You've amassed the requisite gear: a multitrack recorder, some choice microphones, a quality mixer, a kickin' pair of close-field reference monitors, and a rack full of signal processors. You've dialed in your synths, samplers, and software. You've even isolated your studio's power supply from the rest of the house. Finally, all systems are go.

The only problem is that you've installed this bounty of equipment in a bedroom. Blow a horn or smack a drum in there, and the sound ricochets around like popcorn in a hot-air popper. Equally

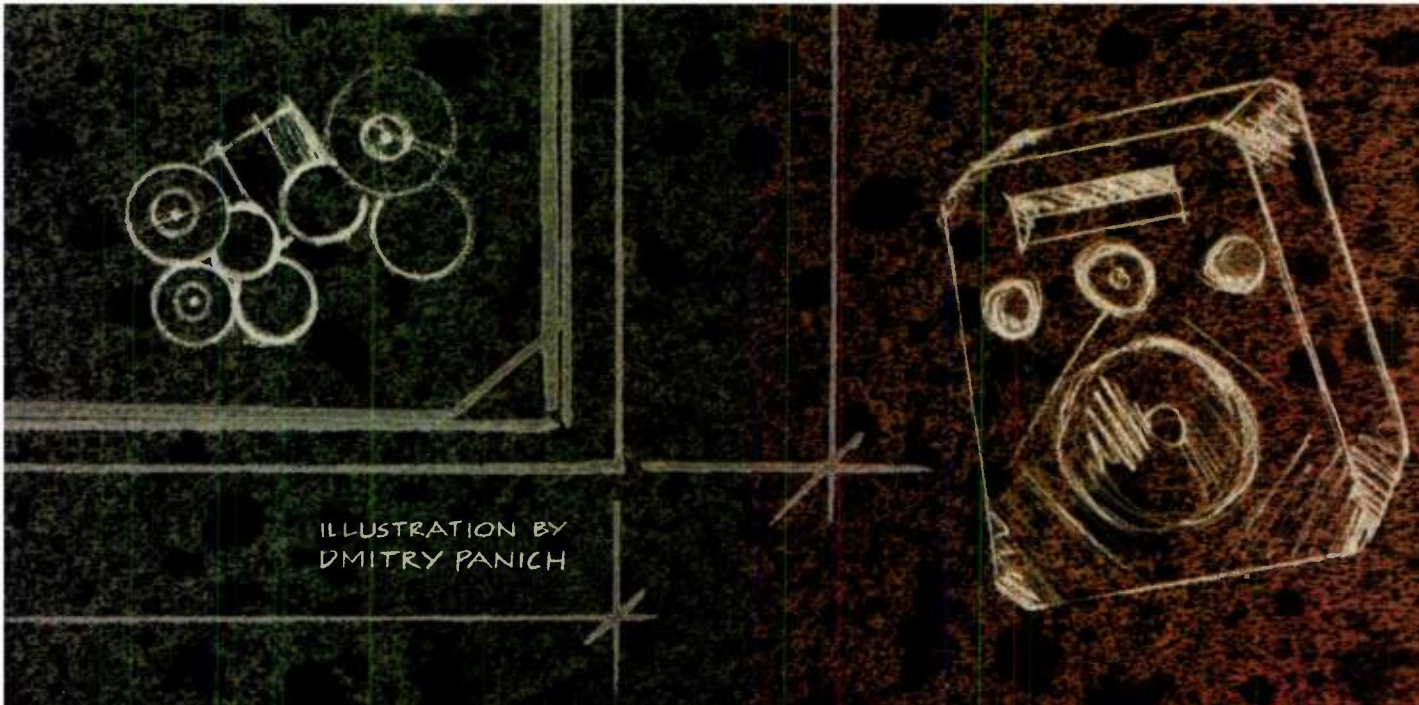

ILLUSTRATION BY
DMITRY PANICH

scary, every time you hit a particular low note on your bass or synth, the room rattles and hums. You can't even listen to some favorite CDs without wincing at the lopsided sound: smeared highs, muddy mids, and enough low end to kick start a Harley. How are you supposed to record, much less mix, in this acoustical nightmare?

Throw out the egg cartons and treat your studio to a sonic makeover.

The answer, of course, is to improve the room's acoustics. This is usually done by treating the room with various materials that balance the sound by minimizing wayward reflections and absorbing problematic frequencies. If you were trying to accomplish this goal twenty years ago, you might have gone dumpster diving for empty egg cartons, scraps of carpet, or abandoned cushions and mattresses.

Fortunately, times have changed. Today, there are ample sources of new and improved acoustical materials that can help tame your room's savage acoustics. So it's probably time to drag down the salvage and treat your home studio to a less haphazard sonic fix.

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To assist you in this endeavor, we've surveyed different types of products to document how—and how *well*—they solve typical acoustic problems. But before we delve into the products, let's review a few basic acoustical principles, particularly as they relate to recording and mixing.

SOUNDS ABOUND

Acoustics is a heady, mathematical science complete with uppity experts and esoterica. Fortunately, making the right acoustical improvements to your home studio should only require that you grasp the following basic terms and concepts.

When you listen to instruments in an enclosed space, there are three basic components to what you are hearing. First is the *direct sound*, which is clear and immediate. Next are the *early reflections*, which are signals that reflect off the surfaces close to the source sound. (These help the brain define immediate spatial relationships between instruments, performers, the floor, etc.)

The last component is *reverberation*. Reverberation is made up of countless random reflections from the walls, ceiling, floor—in fact, all surfaces in the room—and is therefore the most complex of the three components. The brain uses reverb to determine the dimensions and material properties of an enclosed space. (For example, is it a cave or a closet?) Thus, reverberation provides the listener with the sonic "signature" of a space. This identifying signature is known as the room's *ambience*.

Obviously, if you are recording in a huge warehouse, it will take longer for reverberating sounds to die out. Tracking in such a space is often problematic due to the difficulty of isolating source sounds from the cavernous reflections. What typically happens is that the reflections are recorded along with the source sound, producing a wet (extremely ambient) signal that can sound washed out and indistinct. On the other hand, producer Steve Lillywhite used exactly this type of ambience to great effect when recording the thunderous drum sounds on U2's *Boy* album.

Of course, reverberation is also present in small, reflective areas, such as tiled bathrooms. If you clap your hands in one of these spaces, you will hear a number of discrete echoes, commonly referred to as *flutter echoes* or *slap back*. Although some producers and engineers love the "bathroom echo" produced by tracking vocals in such tight quarters, the flutters can smear the clarity of source sounds.

The bottom line is that, in order to ensure ambient imps do not sabotage your recordings, you must tame the acoustical environment of your recording space.

Basically, there are two approaches to modifying ambient sound: *absorption* and *reflection*. The goal of acoustically tuning a room is to effect an appropriate balance between the two. The particular balance depends on the type of recording you do. Many engineers, for example, like to record signals relatively dry (with minimal ambience) to allow for maximum signal-processing options during the mix.

To create a suitable space for multipurpose recording—where both dry and live areas are available—you need sufficient absorption to render a room sonically balanced. Of course, sound absorption can be taken too far. A completely absorptive room, such as an anechoic chamber (a space with no sonic reflections), would produce excessively flat, unnatural sound. As our brain expects to hear *some* ambience associated with source sounds, a few reflections within the recording environment are desirable.

Some reflections, however, are less desirable than others. For example, floor-to-ceiling reflections in a control

Studio Traps from Acoustic Sciences Corporation are an increasingly popular way to manage sound in home, project, and pro studios.

Fabric-covered fiberglass panels, such as these Alpha-Sorb Panels from Acoustical Solutions, are an industry standard. Though usually recommended for installations where decorum is paramount (e.g., churches, boardrooms, etc.), they are equally effective sound absorbers in small studios.

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room can color the sound projected by your speakers, messing with the monitors' clarity and imaging. (One helpful remedy is to lay thick carpet on the floor as well as to have some absorptive material placed on the ceiling above the monitoring area.)

Wall-to-wall reflections can also be deleterious, particularly between parallel walls. Sufficient absorption can alleviate the problem, but sometimes a better solution is to redirect reflections. By causing reflections to bounce and spread in many directions at once (rather than straight back to an opposite wall), you break up and randomize the sound, producing many quiet reflections rather than a few loud, discrete ones. This is called *diffusion*.

A typical combination of absorption and diffusion is embodied in the Live End/Dead End (LEDE) approach to studio acoustics. (The LEDE concept, developed by studio designer Chips Davis, has highly technical specifications; I use the term here in a more general sense.) This approach is commonly seen in control rooms where the area behind and adjacent to the monitors is deadened with absorptive material and the opposite or back wall is left "live." Ideally, reflections at the live end are diffuse rather than discrete.

As suggested earlier, parallel surfaces are frequently responsible for a host of acoustical maladies. One such

SECOND OPINIONS

Obviously, there are more companies that offer acoustical-treatment solutions than those tested for this article. Here is a brief listing of some other manufacturers and products for getting your studio in sonic shape.

Markertek Video Supply
tel. (800) 522-2025 or (914) 246-3036; fax (914) 246-1757
Markertek carries a wide array of Sonex materials as well as their own products. Their Markerfoam starts at $19.99 for a 54 × 54 × 2-inch panel with discounts for large orders. They also sell sound-absorbing blankets ($19.99 per 72 × 80-inch blanket), Blade sawtooth-pattern foam (starting at $3.49 per 16 × 16 × 2-inch tile), and Soundforms sound-booth kits ($595) that can be assembled as booths, sound walls, or individual gobos.

Netwell Noise Control
tel. (800) 638-9355 or (612) 939-9845; fax (612) 939-9836
Netwell offers a wide variety of sound-control materials for industrial as well as audio applications. Products include acoustic foams, fiberglass panels, enclosures, barriers, damping materials, fabric panels, ceiling tiles, and more. They also offer acoustic materials resistant to flame or moisture, and they even have odor- and stain-resistant Vet Panels, in case you need to keep Cujo quiet during a session.

Silent Source
tel. (800) 583-7174 or (413) 584-7944; fax (413) 584-7944; e-mail silent@crocker. com; Web http://www.crocker.com/~silent
Silent Source carries an extensive line of products, including acoustic foams and fabrics, ceiling and wall panels, bass traps, diffusors and absorbers, portable isolation booths, and more. They feature their own products as well as brands such as Illbruck's Sonex foam, RPG's Melaflex and Acoustic-Tools, SDG's Art Diffusor and Cutting Wedge, ASC's Tube Traps, and Whisper Room enclosures.

Studio Pro
tel. (714) 841-4227; fax (714) 841-4227; e-mail studiopro@msn.com
Catering to home and project studios, Studio Pro offers quarter-round absorptive/diffusive wall panels in 4-foot × 7.5-inch (10 units for $300) and 4-foot × 20-inch ($90) sizes; wideband and lowpass Helmholtz resonators ($180); gobos with optional cymbal shield ($330); free-standing (tubular) bass absorbers ($280) that can also be used (with rubber dampening strips) as acoustically sound monitor stands; corner-mounted bass absorbers ($330); and diffusion panels ($200).

Systems Development Group
tel. (800) 321-8975 or (301) 846-7990; fax (301) 698-4683; e-mail 2114988@mcimail.com
SDG manufactures Cutting Wedge acoustic foam and various models of the Art Diffusor. Cutting Wedge foam is cut in a sawtooth pattern and is available in five sizes, four depths, and four colors. The 15-inch square, 3-pound Art Diffusor Model E ($55) offers two-dimensional diffusion through five octaves. The Art Diffusor Model C ($130) is designed to replace a 2 × 2-foot ceiling tile and offers diffusion over a 4-octave bandwidth. Variations on Model C include wall-mountable models and one with a cut-out for a light fixture.

Tatrix
tel. (201) 222-2826; fax (201) 222-5457
Tatrix offers a modular, "stackable" gobo system called Stackit that can be erected in many configurations and easily broken down for tight storage. Panels come in many sizes and can be customized upon request. Features include absorptive and reflective capabilities, Plexiglas windows, rounded corners, and casters.

Whisper Room
tel. (423) 585-5827; fax (423) 585-5831
Whisper Room sells portable, modular sound-isolation enclosures and practice/vocal booths. Units are constructed of standardized panels held together with seam seals and quick-release straps for easy assembly, disassembly, and reconfiguration. Units with floors can be mounted on casters. Standard features include a door window, quiet ventilation system, and 2-inch cable passage. These enclosures are designed to offer substantial noise reduction but are not completely soundproof. Prices for isolation enclosures start at $4,975. Practice/vocal booths start at $2,250.

—Joe Humphreys

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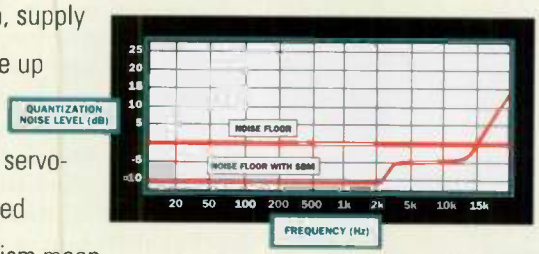

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phenomenon is known as a *standing wave*. A standing wave is an unnatural-sounding peak or dip in bass response caused by sound waves as they bounce back and forth between parallel surfaces. The sound waves both collide and align, canceling some frequencies and reinforcing others. Again, absorption is the common cure for standing waves, but acousticians might also recommend *bass traps*—devices that are "tuned" to absorb bass frequencies. These are commonly placed in corners (where low-end sounds tend to collect) but can be located elsewhere in a room, as well.

Recordists should also take into account a room's susceptibility to *resonant frequencies*. Any object—a drum, a door, a chair—exhibits a distinctive resonant frequency, or range of frequencies, where that object resonates with like frequencies. Anyone who has attempted to record a bass amp in a home studio has probably experienced resonant frequencies whenever the bassist hit a certain note that caused a window frame or doorjamb to rattle.

Absorption is a common and effective way to diminish such annoyances, although many pro studios head off severe resonance problems by dealing with them during construction. In these instances, walls and floors are often separated from each other, or "floated," by installing rubber or other absorptive materials between the framing and the floor boards.

It is critical to understand that sound treatment is not the same as soundproofing: absorptive materials will not adequately control sound transmission. (Sound transmission is the leakage of sound in or out of a room.) For example, you might completely cover the floor, ceiling, and walls of your apartment bedroom with 2-inch foam yet barely diminish the sound that passes into your neighbor's dwelling. Though the foam will stop the transmission of many frequencies to some degree, the really low notes will pass right through and drive your neighbor nuts.

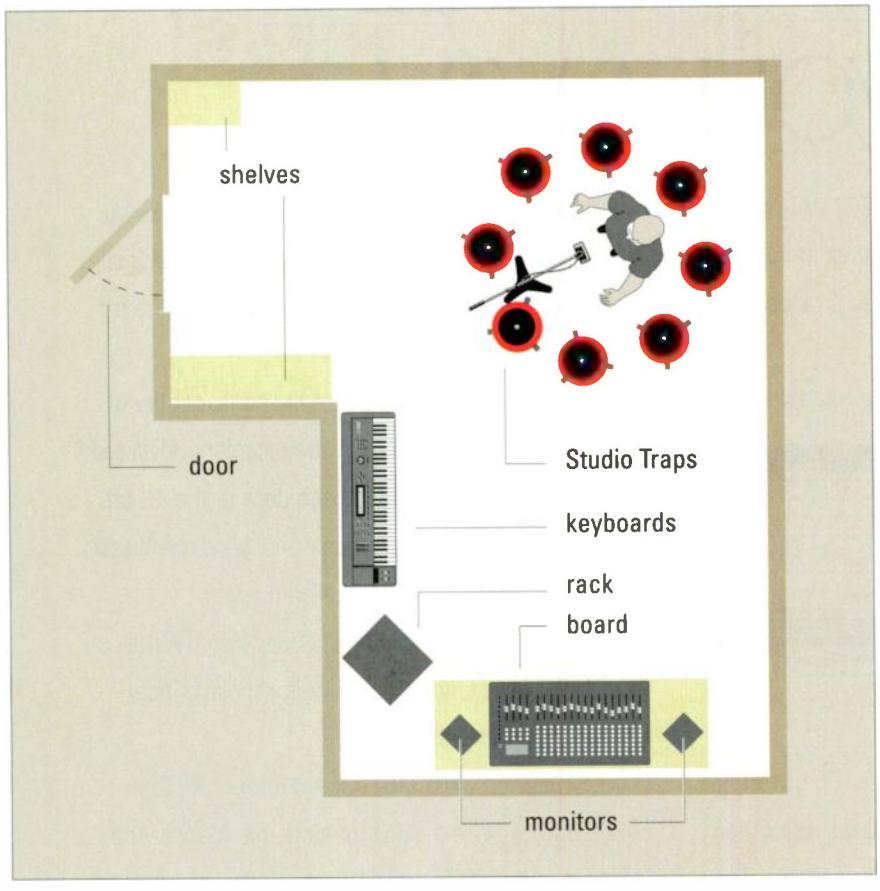

FIG. 1: One approach to taming the sound of your studio is to erect a modular SubSpace around the source sound using ASC's Studio Traps. The traps can be rotated and raised up or down to provide variable amounts of absorption and diffusion.

REAL-WORLD ROOM

I used my own room as a guinea pig for these acoustic-treatment tests because my home studio is fairly typical: it's small (being situated in a one-car garage), cheaply constructed, and chock full of sonic horrors. My own attempt at solving the room's acoustic problems involved covering the walls with an assortment of blankets, quilts, hospital-bed foam, and one large, wool rug. I also installed a homemade, plywood bass trap in a corner.

For the tests, I stripped everything down to bare walls. The room immediately became a hell pit of resonating walls, standing waves, and obnoxious flutter echoes. Then I sent each participating company a diagram of my studio. The floor plan included a detailed description of construction materials, the location of equipment, and some of the more egregious sonic difficulties I had been experiencing. Based on that information, company representatives offered solutions, and the test was on!

Basic evaluations were conducted by recording (and listening to) instruments and vocals in the treated space and then doing a quick mix. I also played some familiar CDs to see whether I could determine differences in sound from one setup to the next.

The great news is that each commercial arrangement was a decided improvement over my homegrown efforts. Each treated space produced the balanced room tone that is crucial for critical recording and mixing. I can honestly say I liked *all* the products I tested. However, there were also numerous differences worth noting. Hopefully, the data I compiled will help you determine which approach is most suitable for exorcising your studio's sonic demons. Here are my findings.

ACOUSTIC SCIENCES CORPORATION

In business since 1983, Acoustic Sciences Corporation (ASC) of Eugene,

Oregon, is an acoustics research, design, and development team best known for their Tube Traps. The Tube Trap is a free-standing, cylindrical bass trap that resembles a tall cat-scratch post. It is finished with an acoustically transparent fabric (called Guilford FR701) that is wrapped around a woven wire frame. Inside is a patented sequence of absorbing surfaces and air chambers. The traps function as broadband absorbers when rotated one direction and as mid-high frequency diffusors when rotated the other. A seam on one side (absorptive) and silver button on the other (diffusive) denote which side is which.

The original Tube Trap is available in diameters from nine to twenty inches. (The larger diameters absorb lower frequencies.) It was designed primarily as a bass trap but offers diffusion above 400 Hz, as well. The company also makes Tube Trap monitor stands, fractional Tube Traps (half-round and quarter-round models for mounting on walls and in corners), studio wall panels, Studio Towers (a less expensive, "semipro" Tube Trap), and Studio Traps, which are 9-inch × 4-foot tubes that are counterspring mounted on a tripod base.

I tested eight Studio Traps in a variety of configurations and fell in love with them immediately. Intended for recording, mixdown, and playback applications, the Studio Traps are the most versatile of the ASC line. Not only can they be rotated to provide different amounts of absorption or diffusion, but their height is easily adjustable between four feet and six and one-half feet. This makes them ideal for creating what ASC calls a Modular Acoustic SubSpace—a moveable, adjustable miniroom.

The remarkable thing is the degree of acoustical independence the SubSpace exhibits from the rest of the room. When you stand inside seven or eight Studio Traps set up in a circle (see **Fig. 1**), the amount of isolation is impressive. By raising the traps to ear level and rotating them absorptive-side in, you can create a dry vocal booth that will sound virtually the same in any room. When you reverse the traps, rotating the diffusor sides in, the sound becomes brighter and less dry.

Surprisingly, leakage between the traps helps rather than hurts the overall sound. This is because the spaces provide ventilation for excess bass frequencies while allowing room ambience to filter through in adjustable amounts. The result is a well-balanced, musical sound. And unlike traditional, opaque gobos, the spaces between the traps allow for eye contact between players when you're recording several musicians at once.

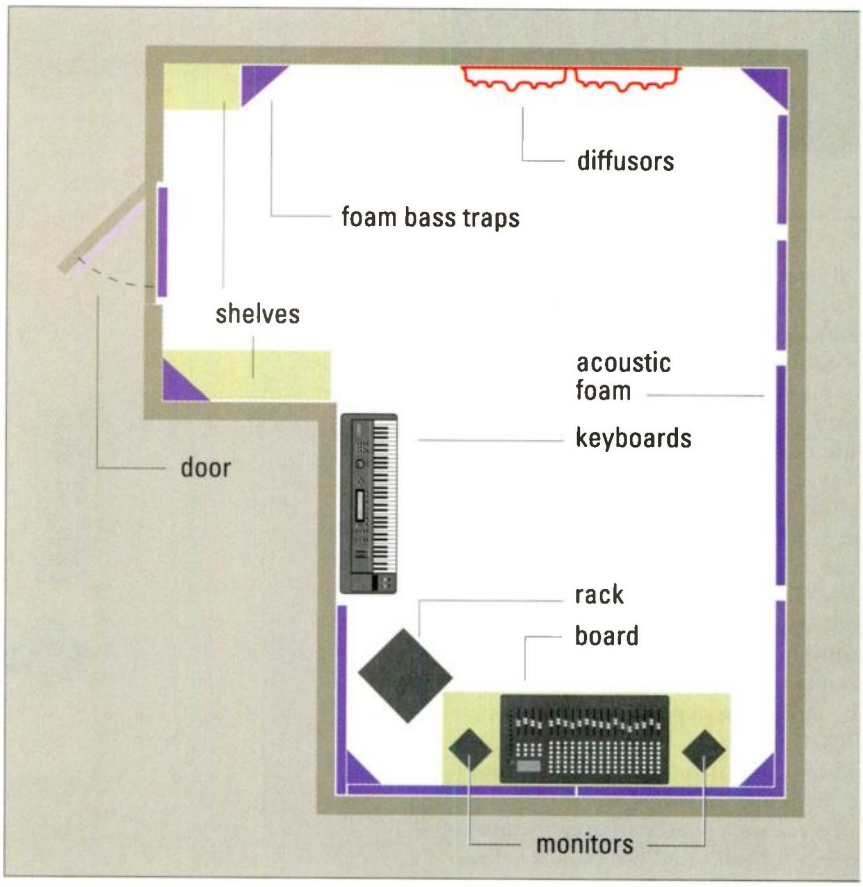

FIG. 2: The Live-End/Dead-End approach to monitor-room acoustic design is shown here with sixteen 2 × 4-foot sheets of Auralex 2-inch Studiofoam, eight foam bass traps (in the corners), and four diffusors (two above, two below) on the back wall. The foam is concentrated around the monitors to provide a reflection-free zone, and the back-wall diffusors help scatter remaining reflections.

The Studio Traps did an equally fine job of creating an isolation-booth effect around a drum set. With the absorptive side in, they helped tighten up the sound and greatly reduced irksome room reflections. Of course, they can also be placed in corners as bass traps or spaced evenly around the perimeter of a room to create a good playback environment.

All Tube Traps and ASC panels come stock in five neutral colors: black, charcoal, medium gray, silver papier, and quartz. (Custom colors are available for an extra $8 to $10 per unit.) I quite liked the looks of the medium-gray traps I tested and found them easy to work with, even in a tight space. At $315 each, Studio Traps are not cheap (and you need seven or eight of them to build an effective subspace), but their portability, flexibility, and excellent functioning makes them a very attractive sonic solution for project studios or well-funded home studios.

ACOUSTICAL SOLUTIONS

Based in Richmond, Virginia, Acoustical Solutions is a distributor of a full line of noise-control products for the recording, broadcast, educational, teleconferencing, and industrial markets. The company was the first distributor to introduce Sonex foam to the recording and broadcast industries, and they currently carry name-brand products along with some of their own designs. They also feature a number of acoustical foams, fiberglass wall panels, wall-covering materials, vinyl sound barriers (for reducing sound transmission), and modular recording and broadcast booths.

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Because I wanted to try something other than foam, I asked Acoustical Solutions to suggest an alternative approach for my room. They recommended their two-inch-thick fiberglass AlphaSorb Wall Panels and even provided a drawing to suggest how I might best arrange them. I tested eight 4 × 4-foot panels, which were covered in an attractive gray fabric. On the backside of each panel were two Velcro strips for quick mounting along with a well-secured, metal mounting plate. Because my installation was temporary, I simply hung the panels on nails using the mounting plate. A box of four panels was quite heavy, but handled individually, the panels were light enough to maneuver easily.

To create a dead-end area for monitoring, I positioned two panels behind my monitors (they fit nicely along the eight-and-a-half-foot-long wall) and one on either side wall. I hung the other four panels about six inches apart on the two remaining, empty walls, positioning them so they met in the far corner. The results were dramatic. With no tweaking, I quickly achieved a controlled-sounding space that worked well for both recording and monitoring.

The panels looked great, as well, and lent an orderly vibe to my cramped quarters. Because of their unobtrusive appearance, fiberglass panels are more often recommended for conference rooms than home studios. But if you have a housemate or spouse who is averse to the specter of wall-to-wall foam and wants your workspace to at least *resemble* the domestic suite it once was, these tidy panels could be just the ticket. They can be ordered in custom sizes and colors to fit any decor.

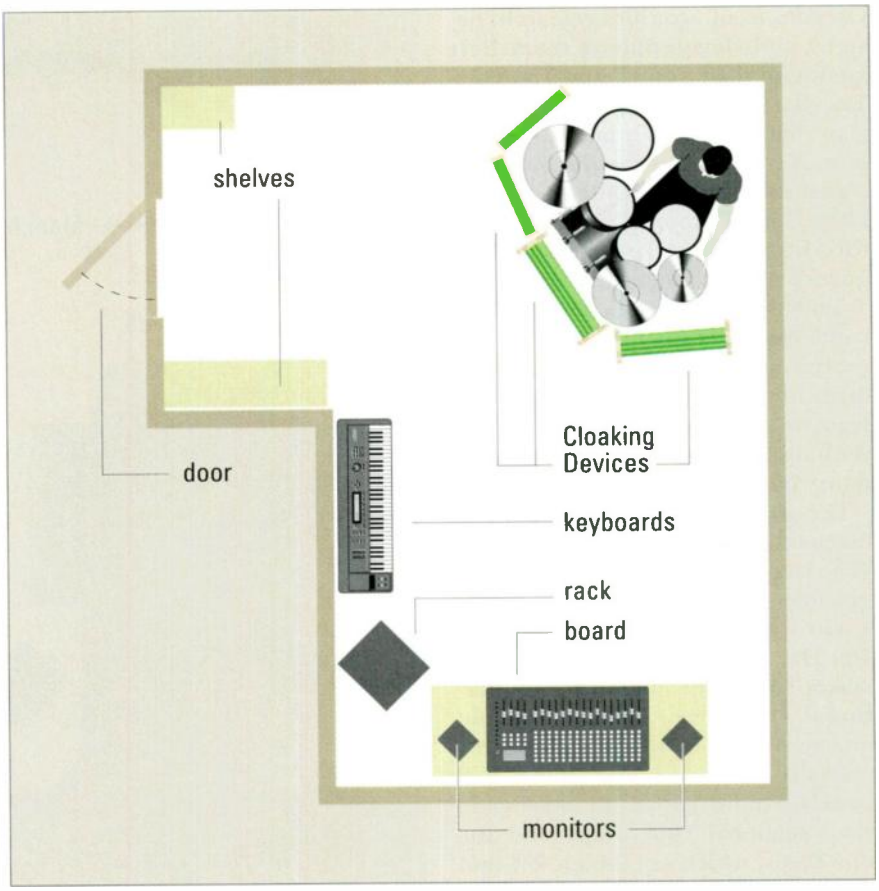

FIG. 3: Another approach to building a miniroom is to use Folded Space Technologies' foam-fitted Cloaking Devices. Here the absorptive walls of the miniroom are moved in tightly around a drum set to reduce room reflections (as well as other instrument sounds) that would otherwise leak into the drum mics.

AURALEX ACOUSTICS

Formerly known as USA Foam, Auralex Acoustics is distinguished by their aggressive low prices and relentless approach to marketing. The Auralex line is broad and continues to expand: not only do they boast a generous selection of foam, diffusors, and bass traps, they also sell U-Boat Floaters (rubber

Brian's Acoustical Adventure

Manufacturer	Products Used	System Price
Acoustic Sciences Corporation	Eight Studio Tube Traps	$2,520
Acoustical Solutions	Eight fiberglass panels	$982
Auralex Acoustics	Twelve 2 × 4-foot sheets of 2-inch foam; eight LENRD bass traps; four T-Fusors	$507
Folded Space Technologies	Two swivel-mounted panels; one bifold panel; two 2 × 4-foot sheets of 2-inch foam	$295
Illbruck, Inc.	Sixteen 2 × 4-foot sheets of 2-inch foam	$430
RPG Diffusor Systems, Inc.	Twelve sheets of Soundwave foam; eight Skylines; four BASS Traps	$2,449

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Mac OS

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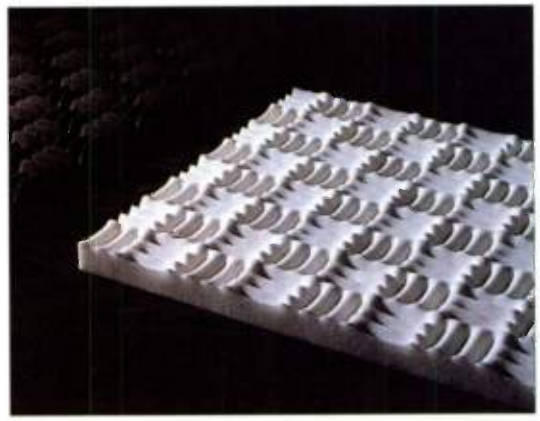
2 1/8"

decouplers for isolating studio floors) and Vel-X Mounting Panels (so you can take the foam with you, unscathed, when it's time to move on).

Auralex sent me a load of goodies: 24 sheets of 2-inch Studiofoam, eight LENRD (Low End Node Reduction Device) Bass Traps (a node is a resonance bump in a room's frequency response), and four of their latest diffusors, called T-Fusors. I secured the foam and LENRDs to the walls, corners, and ceiling with standard T-pins (available at remnant shops), which worked great. Initially, I put up all 24 pieces of the foam, but the resulting sound was a bit dead for my tastes. After some experimentation, I ended up using sixteen sheets—including two on the ceiling over the monitoring area and two over the drum corner—plus all eight bass traps and four diffusors (see Fig. 2).

The results were exceptional. I especially liked the LENRDs, which contributed to a noticeable tightening of the sound produced by my monitors. Stereo imaging was improved, and both low and high frequencies were more distinct. The room also exhibited a tighter, drier sound for recording. Of course, this is probably also attributable to the fact that, of the foam products I received, I installed the most square footage of Auralex.



The new generation of Illbruck's Sonex foam is made of fire-resistant melamine and is offered not only in custom colors but also with the option of four-color art or graphics laminated onto the foam.

I liked the T-Fusors except for their odd appearance—they resemble giant hot-rod air scoops. I would be exaggerating, though, to say I discerned a marked improvement in sound after putting them up. Properly positioned, diffusors can reportedly make a small room sound larger. The sound was brighter, but I'm not sure I got the sense of a larger space.

Of the three foam types I installed (Auralex, Sonex, and RPG), the Auralex seemed the sturdiest—a worthwhile consideration if you expect to be relocating your studio in the near future. I can make no bones about prices either: clearly, Auralex is the most affordable of the bunch. They're also the most colorful. Studiofoam is available

in red, blue, green, purple, plum, orange, brown, tan, and standard charcoal gray. And, for large custom orders, Auralex can match most any color.

FOLDED SPACE TECHNOLOGIES

Of the companies profiled here, Folded Space Technologies, founded in 1994, is the new kid on the block. But rather than take on the big guys, they've aimed their cost-effective product line at other new kids on the block—the growing ranks of home-studio engineers and producers.

Folded Space Technologies' essential offering is the Cloaking Device. This is a free-standing, easily moveable device that can be used to construct a miniroom acoustically independent from the rest of a space. The concept is similar to ASC's SubSpace, but the devices themselves bear no resemblance to Tube Traps. The central building block is a 2 × 4-foot wood panel that is inset on one side (the absorptive side) with a sheet of 2-inch Auralex Studiofoam. The other side of the panel is ¼-inch hardwood ply and thus quite reflective.

There are two basic mounting stands for the panels, and each can be configured in a variety of ways. One is a swivel stand that allows a regular panel (or two small ones) to be tilted at any angle and positioned either low or high. The other, called a *bifold*, consists of two panels linked together with heavy rubber hinges. The bifold can be positioned with the absorptive or reflective sides in or out, or it can be assembled to provide a combination of the two surfaces. It can also be elevated on stilts and linked or stacked with

JEFF CHOY

The walls and ceiling of Archer Onouye's project studio in Hawaii have been completely covered with Auralex Studiofoam, resulting in an extremely dry recording space.

2½"

other panels to create trifolds, quadfolds, stacked quadfolds, etc.

Panels and all parts are available individually, but I tested the small-room kit, a very affordable setup consisting of two swivel-mounted panels, one bifold with stilts, and two extra slices of 2 × 4-foot wedgefoam. The kit arrived unassembled in two boxes and took me about an hour to put together. The wood is pine with a natural finish. Fully assembled, the units are quite nice looking. They're also lightweight, which makes them easy to move around.

My only complaint was that the stabilizing crossbar on the bottom of the swivel stands was flush with the floor, making the units difficult to position over mic cords and impossible to place over tripod and cymbal-stand legs. I pointed this out to designer/owner Roger Brainard and recommended that he simply raise the crossbar. He acknowledged the problem and intends to incorporate the revision in future models.

I experimented with the small-room kit in a number of configurations and found it both effective and easy to use. The basic miniroom wasn't quite as balanced sounding as the ASC SubSpace, but with the absorptive foam turned in, it provided a remarkably well-isolated, albeit small, vocal booth. Considering that Folded Space Technologies' small-room kit costs less than a single Tube Trap, it's clear that the Cloaking Devices are a great value.

I also got good results using the units around a drum set (see **Fig. 3**). While recording a demo tape for a three-piece band, I positioned the singer/acoustic guitarist directly behind (and therefore facing) one of the swivel-mounted panels and miked her with a cardioid-pattern dynamic mic. Both the acoustic guitar and bass were recorded direct. The idea was to capture the instruments playing together live and then re-record the "scratch" vocal track.

The Cloaking Devices did a good job of minimizing vocal and guitar bleed into the drum mics. During mixdown, the drum leakage into the vocal track was so minimal that I was able to diminish the signal bleed to an almost nonexistent presence by using an expander. (And one of the dummy vocal tracks sounded so good that we ended up keeping it.) The Cloaking Devices provided more drum isolation than I had expected and helped the kit sound tighter, too.

RPG DIFFUSOR SYSTEMS, INC.

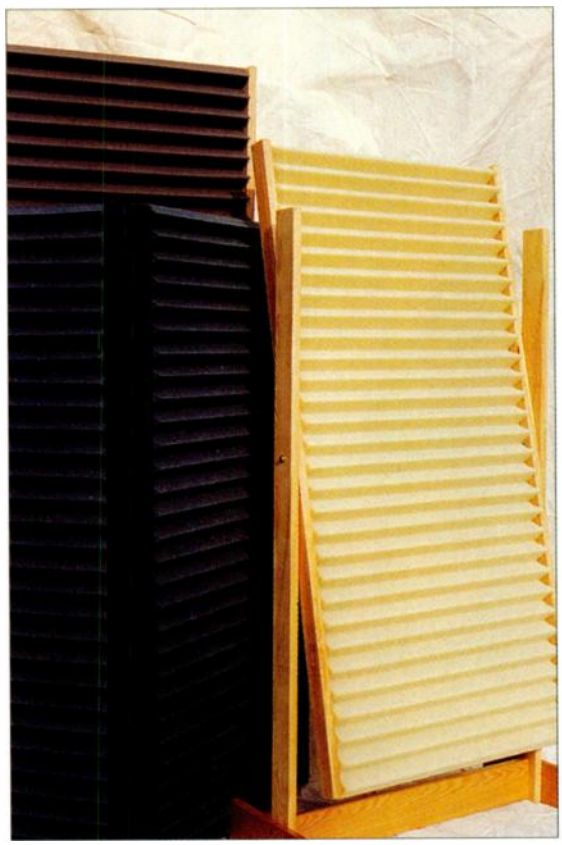
Founded in 1983 by physicist, musician, and acoustician, Dr. Peter D'Antonio, RPG Diffusor Systems is an acoustics company with an extensive line of innovative products and a client list that reads like a Who's Who of the music, broadcast, and entertainment industry.

Experts on diffusion, RPG has outfitted hundreds of major rooms worldwide, including recording studios, concert halls, airports, casinos, and movie theaters. Their product line, which is based on what they call "mathematical number theory," includes absorptive foam and panels, BASS (Bass Absorbing Soffit System) traps, Abflectors (variable-depth, air-cavity, reflection-control panels), and more than a dozen varieties of diffusors that are available in numerous materials. RPG even carries a line of acoustical concrete masonry called Diffusorblox.

So what does such a high-end acoustics company have to offer the humble home-studio market? "Due to an overwhelming request from project-studio owners for more affordable RPG technology," says D'Antonio, "we have developed two new product lines: AcousticTools and Melaflex." The AcousticTools setup includes Skyline diffusors, Abflectors, and BASS Traps. Melaflex is a line of foam that comes in three designer shapes: SoundWave, SoundRound, and SoundFlat.

RPG sent me twelve 2 × 4-foot sheets of SoundWave foam, eight Skylines, and four BASS Traps. Seen from the side, SoundWave foam resembles sine waves, with 3-inch deep crests and troughs. Using T-pins, I put up seven sheets (including one on the ceiling) to create a dead-end monitoring area and spaced the other five equally apart on the remaining sidewall areas. Sound absorption was excellent. There was a nice visual bonus, too: I hung some of the SoundWave foam vertically, with each sheet directly abutting the next, which gave the effect of a giant, lush, cathedral curtain.

The Skyline diffusors are also very hip looking. Each Skyline is a 2 × 2-foot chunk of Styrofoam molded so the front, a calculated hodgepodge of variable-depth rectangles, resembles the skyline of a crowded metropolis. Although the skylines in the photograph that RPG provided are misleadingly installed on the dead-end wall behind the monitors, I put mine in the recommended position, which is on the back wall at the other end of the room. With all eight Skylines in place, the results were a definite improvement. For example, when I shouted into the Skylines, the sound was neither muffled



Cloaking Devices from Folded Space Technologies are ideal for low-budget studios where it is not desirable to retrofit the walls with foam, fabric, or other acoustic treatments.

Experience

Engineers, producers, and recording artists with extensive commercial recording experience will tell you that a recording console has to be functional when the clock is ticking, but must also have superior auditory performance. That experience created the PS™ 2482. Peavey's Audio Media Research division has made "in-studio" functionality and auditory performance key objectives in the PS 2482 production console.

To get the best signal performance, input levels need to match. The PS 2482 meets that challenge; and with this console, you won't need a drawer full of adaptors. 1 Tape inputs include RCA -10 dB unbalanced and 1/4" TRS + 4 dB balanced connectors, in addition to XLR mic and 1/4" line-in and direct outputs. 2 Phantom power, polarity reverse, and pad switches are functions that experienced engineers will not do without, so we've incorporated them into our discrete preamp's gain section. A channel/tape switch allows you to "flip" between channels and tape (like every good in-line console should), and we also give you a high pass filter.

Routing is paramount to any recording console. The PS 2482 offers more flexibility with routing and features, available to each path, than its closest competitor. 3 EQ and AUX sends can be made a part of the MIX B path.

4 The PS 2482 is the industry leader when it comes to providing a flexible AUX/Matrix, which allows you to have what you want, where you want it.

5 With eight stereo AUX returns including EQ, four AUX sends, pan, solo, mute, full-bus routing, and 60 mm faders, the PS 2482 leaves other consoles "out-in-the-cold."

Other functional niceties that make this console a gem to use in the studio are 6 bi-colored LEDs on all signal paths, so you can see the signal status at a glance, in and out of the console. 7 All eight buses have a mute switch, a bus/L-R switch, and a pan for stereo placement in the mix path. 8 Peavey's exclusive Delta Vu™* metering gives you the most accurate measurement of levels to the stereo mix.

Experience will tell you that the PS 2482 is designed to perform in the studio. Your auditory senses will enjoy the *experience*.

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nor reflective. Instead, it was controlled but still "live" sounding.

RPG's BASS Traps are well constructed with a fiberboard-type material, and the faces are covered with an attractive fabric. The traps are designed to tame frequencies in the 80 Hz range, but I couldn't verify this claim with any accuracy because RPG recommends that you place the traps behind your monitors. Unfortunately, the BASS Traps are the size of a small end table and were too large to fit behind my mixing console. The traps are obviously not an ideal fit for cramped home studios.

Most products and materials from RPG are available in a variety of materials and colors. Melaflex foam, Skylines, and BASS Traps can also be painted to suit any decor.

Designed for project studios, the AcousticTools setup from RPG Diffusor Systems, Inc., consists of Abflectors (on the left wall), BASS Traps (stacked in the corner), and Skyline diffusors (the white structure on the right wall).

ILLBRUCK, INC.

Sonex is arguably the most recognized name in studio foam. Illbruck's new generation of Sonex products, though similar in appearance to the classic stuff that has adorned recording studios large and small for years, is made of a new Class-1, fiber-free, fireproof material

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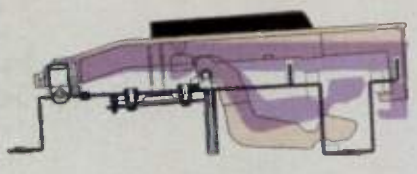

The tan area in the illustration shows the QS8's keyboard at rest. The purple area demonstrates the QS8's remarkable piano action when a key is depressed. Note that the key tilts to an ergonomic 10° draft angle while the weighted hammer mechanism makes contact with the bottom of the key for an incredibly realistic feel.

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ALESIS

2½"

called *melamine*. Sonex foam is available in the familiar "modified anechoic" cut as well as a variety of others, including wedgecut and pyramid patterns. The company also makes a colorful line of ceiling tiles and acoustic fabrics.

I received two boxes of SONEXclassic, each containing eight 2 × 4-foot sheets of 2-inch foam in a rich charcoal color. I installed eight sheets around the monitoring area, four on the empty side wall, three on the back wall, and one on the wooden door. As with the other foams, sound absorption was excellent.

Sonex is very lightweight and therefore easy to mount with T-pins, Velcro, or construction-type adhesives such as Max Bond or Liquid Nails. However, the new melamine material, designed to achieve a Class-1 fire rating (the safest), is also quite fragile. Illbruck therefore recommends that Sonex not be handled by the corners. I would also be wary of mounting it where people are likely to brush up against it repeatedly. One solution would be to mount the sheets on pieces of framed plywood (or some other rigid material) to protect the edges. This would also reduce the risk of damage if you needed to relocate the foam.

All SONEXclassic panels and baffles should be available in custom colors by the time you read this. More impressive, though, is the new SONEXgraphics option, which allows four-color photographs or artwork to be laminated onto the foam. Talk about customizing your studio!

SOUND CONCLUSIONS

Although the products tested represent only a fraction of the room-treatment materials currently on the market, this article should still give you a good idea of the different absorption and diffusion options available and how these products can be employed to improve the sound of your studio.

As for comparing like products, I'll start with foam. Frankly, I would be

TECH TOOLS

Acoustic Sciences Corporation
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e-mail ttrap1@aol.com
Web http://www.continet.com/bdcrow

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tel. (800) 782-5742 or (804) 346-8350
fax (804) 346-8808

Auralex Acoustics
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fax (317) 842-2760
e-mail auralex@auralex.com

Folded Space Technologies
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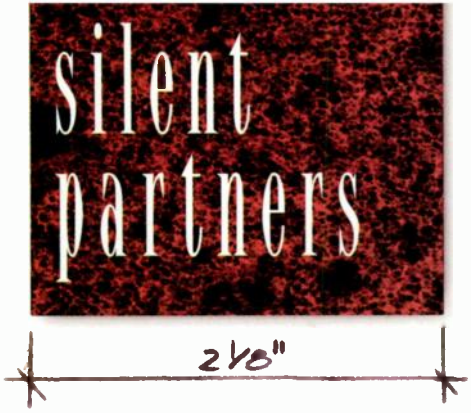

remiss to claim that one company's foam sounded better than another company's. Rather, I can say that they all did a great job of absorbing sound. Each brand of foam I tested solved the horrific acoustic problems my room exhibited when the walls were bare. Perhaps more importantly, each system made my room sound much better than it had sounded after my own homemade treatments.

It's possible that a scientific analysis would show improved absorption with one foam over another, but practically speaking, they all performed about the same. The more critical variables are the thickness of the foam (the thicker it is, the better it absorbs low frequencies), how much of it is put up, and where it's placed. For that reason, unless you favor the look of one brand over another, I would recommend simply shopping around for the best prices.

As for diffusors, I favored the RPG model—which produced a very controlled, yet natural, ambience—over the Auralex. I have less to report, comparatively, about bass traps, as the Auralex LENRDs were the only ones I was able to test according to manufacturer recommendations. The BASS Traps from RPG were simply too big to fit in the corners of my monitoring area. It's not that they were huge; it's just that my room is quite small. This scenario is worth keeping in mind if your space is similarly cramped. The LENRDs, however, are low-profile, lightweight foam and are much easier to fit into tight corners.

The size of your room should be a key factor in determining how best to treat acoustics. For example, if you work in a huge warehouse space, putting enough foam on the walls to sufficiently deaden the room might be prohibitively expensive. In that case, you'd probably be better off with one of the products designed to create a miniroom, such as the ASC Studio Traps or the Cloaking Devices from Folded Space Technologies. On the other hand, if your room is terribly small, such traps or panels might only get in your way, especially if you don't have the space to store them. In that case, foam is probably your best bet, with perhaps the addition of some bass traps and diffusors.

An important issue not to overlook is fire retardancy. Just because a product is "fire rated" does not mean it rates as a Class 1, 2, or 3. If you have or intend to obtain fire insurance, check your policy before installing foam or other acoustical materials in your studio to determine whether the policy specifies a particular fire rating. Class-1 materials offer the highest fire resistance and are commonly required for commercial facilities. Currently, all foams manufactured by Sonex and RPG are Class-1 fire rated. Auralex foam is rated Class 2.

Be sure to compare the materials and prices listed in the table "Brian's Acoustical Adventure" on p. 34. As every room is sonically unique, it's likely that you will need more or less of a given product for your studio than I did for mine. And don't be shy about querying sales reps thoroughly. Ask for samples and diagrams, and don't hesitate to get second and third opinions from alternative sources. Also, remember that some companies offer semipro versions of their products at lower prices, such as the Studio Towers from ASC or SONEXvalueline foam from Illbruck.

Finally, when your shipment of acoustical-treatment materials arrives, don't install it too hastily. The guidelines offered here should serve as a good starting point, but it takes careful and patient experimentation to determine optimal positioning of foam, diffusors, and other acoustical products.

Whether you have separate control and recording rooms or you multitask in one space, your studio's acoustical properties play a primary role in the quality of your recordings. That's one of the reasons that big-league musicians insist on recording in studio rooms that, to their ears, sound smashing. By investing a bit of time and money tuning your studio, you can move one step closer to capturing awe-inspiring sounds—all in the privacy of your home.

Assistant Editor **Brian Knave** *had never before reflected so much on absorption.*

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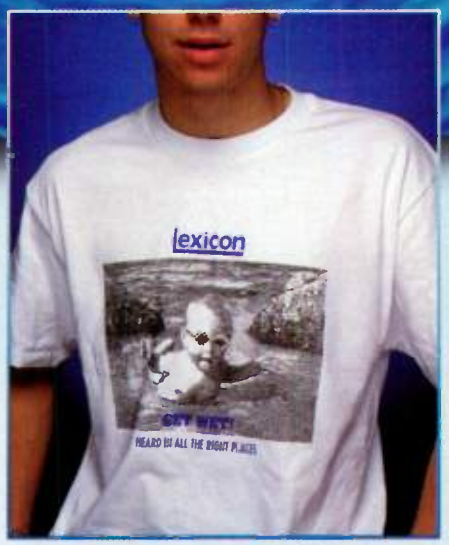

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Portable keyboards capture inspiration on the go.

Traveling Companions

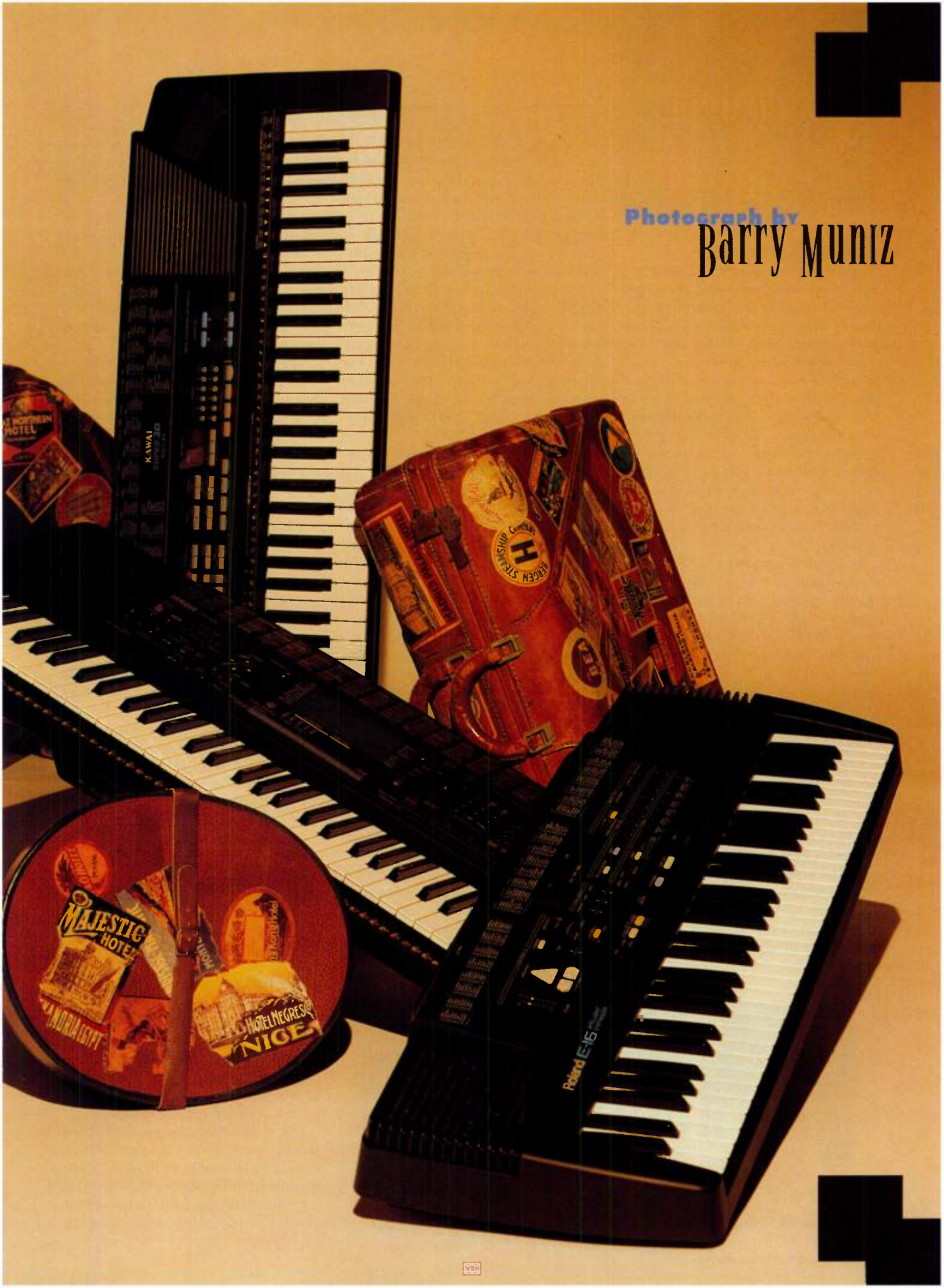
It's 3 A.M., and you've just flopped onto your hotel bed after a long night of playing for a bunch of drunken cowboys in—what town is this, anyway? It hardly matters; your gear is all packed up and ready to roll to the next stop on your band's tour soon after the sun makes its daily appearance in this part of the world.

Your body is tired, but your mind is working overtime. In fact, a new tune just popped into your head, and you'd better jot it down somehow before sleep obliterates it from your memory forever.

Unfortunately, you have no music paper handy. Not that it would help; you haven't written musical ideas directly from your head to paper since college. If only your gear was set up in your hotel room, you could play what you hear in your head and record it into the sequencer.

Sound familiar? Perhaps you've experienced a similar situation at home. I know I have. Some of my best ideas come to me as I'm falling asleep. But the prospect of booting up my computer and the rest of my gear is daunting enough that I usually roll over and let the idea fade into oblivion. Wouldn't it be great if there were a way to quickly and easily record musical ideas without hassling with your entire studio?

By Scott Wilkinson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Roland E-16
MAJESTIC
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HOTEL NEGRESCO
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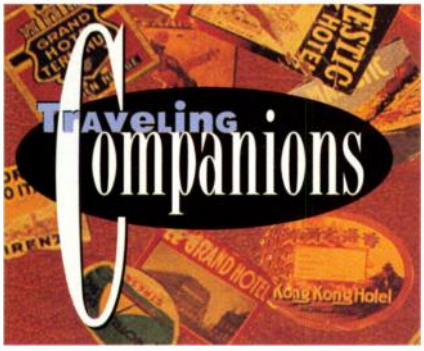

PORTABLE DREAMS

Happily, there is, and it's offered by a type of product that is usually scorned by serious musicians: portable keyboards. The mere mention of this product category conjures up images of piano/organ stores in shopping malls with tired-looking guys wearing bad toupees and playing roller-rink music to a cheesy "boom-chick-boom-chick" accompaniment. However, recent models belie this reputation, offering excellent sounds and musically satisfying automatic accompaniment in a self-contained, lightweight package with keyboard, sequencer, power amp, and speakers.

As a result, I decided to take a look at several portable keyboards with two specific applications in mind. First, I wanted to evaluate their potential as musical scratchpads. Do they facilitate the creative process? Is it easy to get your ideas into the machine? If so, these devices would be great for musicians on the road and for those who experience midnight inspiration.

When you're not on the road or counting sheep in your own bed, can these portable keyboards serve as another sound module in your main studio? Most of the portable keyboards on the market these days are compatible with General MIDI (GM), so they might be able to do double duty. After all, you want to get the most bang for your buck with any equipment purchase, and you can never have too many synth modules.

I examined the Generalmusic CD30, Kawai X65-D, Roland E-16, Technics SX-KN501, and Yamaha PSR-620. (See the table "Portable Keyboard Specs" for the basic specifications of each unit.) All of these products list for around $1,000, and the synthesis technology they use is preset PCM with no sound-editing capabilities. All units include at least two effects processors.

The keyboards include 61 full-size keys with Velocity but no Aftertouch. (With the exception of the Kawai X65-D, none of these products recognizes Aftertouch via MIDI, either.) Typically, the keyboard can be split into two zones with a different sound assigned to each zone, and the level of each sound is independently controllable.

These devices also include various prerecorded "styles" that play several additional sounds automatically (see sidebar "Stylin'"). In some cases, you can adjust the volume of each accompaniment part separately, but in others, you can only adjust the level of the accompaniment as a whole. A list of available sounds and styles appears on the front panel of each instrument, which lets you select them by number.

The internal sound system consists of a small power amplifier and two 5-inch speaker drivers. (The Kawai X65-D includes two additional 3-inch drivers.) Naturally, the sound from these units is not as good as most studio systems, but it should suffice for the applications I have in mind. In addition, all units can be connected to an external sound system; the Kawai X65-D uses RCA jacks for this purpose, and the rest of the models use ¼-inch jacks.

With the exception of the Roland E-16, these units can be powered by batteries. However, they don't last long; make sure you get a power adapter if the keyboard you want doesn't come with one. Not only does this save on batteries, it also increases the power output of some of the amps. With or without batteries, these keyboards are very light; compared to a typical pro keyboard, they're almost weightless.

All of the units in this survey (except the Roland E-16) are GM-compatible, and all come with a music stand that attaches to the instrument. I wish pro synths included this seemingly trivial accessory; how many times have you had to precariously balance a sheet of music on your main controller?

Two of the products I examined—the Generalmusic CD30 and Yamaha PSR-620—include a floppy-disk drive that reads and writes double-density (720 KB) DOS-format disks. The disk drives provide offline song storage and allow easy delivery of additional songs and styles from the manufacturer.

In addition, both devices can read Standard MIDI Files (SMFs) from disk. However, they can't save internal sequences as SMFs, which is a shame. This would greatly facilitate the transfer of sequences from the keyboard to a computer sequencer for further development. As it is, you must transfer your sketches to your main sequencer in real time via MIDI if you want to refine them. In this process, you must be sure to set certain parameters in the keyboard to enable the machine to send the accompaniment and other sequenced data to the MIDI Out port.

Now that you understand some of the basic attributes of these products, let's take a closer look at each one. Please keep in mind that these are not comprehensive reviews. I evaluated each keyboard only with respect to the applications mentioned earlier. (See the sidebar "What I Did During Spring Break" for a summary of my testing procedures.)

The Generalmusic CD30 includes a sophisticated sequencer and well-organized controls.

GENERALMUSIC CD30

Italian manufacturer Generalmusic has lots of experience making consumer-oriented keyboards for the European market, so it's no surprise that the company is now setting its sights on America. The CD30 is the top of a new line of portables called HyperKeyboards.

The CD30 has a floppy-disk drive (mentioned earlier) and provides a spring-loaded trackball in place of the traditional pitch and mod wheels. This is better than most similar products, which provide only one pitch wheel.

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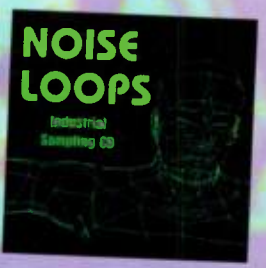

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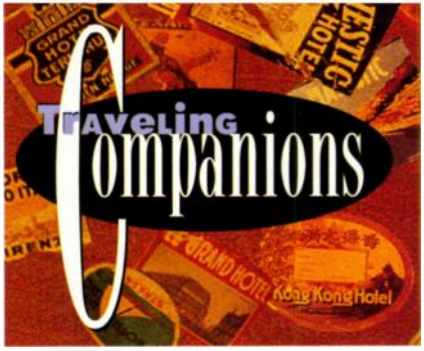
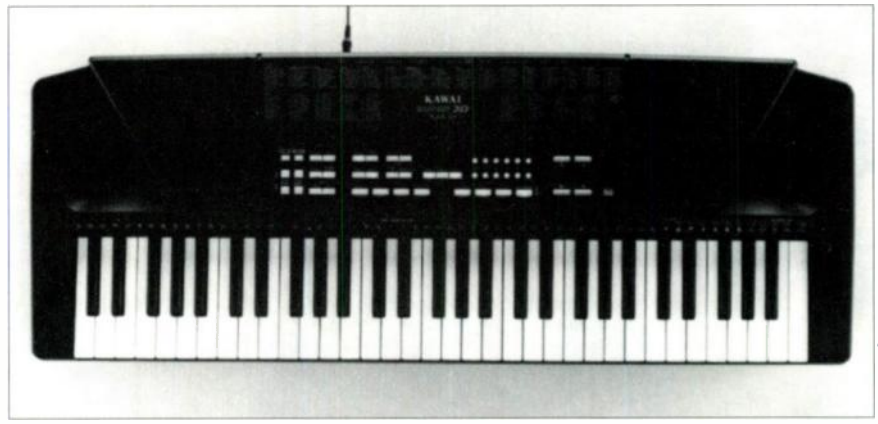


In addition, the CD30 includes a pair of ¼-inch audio inputs, which lets you mix an external signal with the keyboard's output, and a tap-tempo feature lets you establish the tempo by tapping on a front-panel button.

Above the regular keyboard is a Touch Keyboard, which consists of thirteen pads arranged in a standard keyboard layout. These pads play different sounds as determined by the drum kit used in the selected style or song; they are not user assignable. However, you can load new PCM samples from the Generalmusic CD-series disk library to be played by the Touch Keyboard. This capability is not offered by any other unit in the same class. Finally, the notes played in the right hand can be harmonized according to the chords played in the left hand.



The Kawai X65-D offers Super 3D sound and buttons that light up.

The display is a 16-character by 2-line LCD, which is better than most. It displays a surprising amount of information, including the names of the upper and lower keyboard sounds, the name of the selected song or style, and the tempo of the song or style. The current chord is indicated momentarily when it is first played, but I wish it would remain on the display in the tempo area rather than replacing and then reverting to the name of the style or song. Another quirk of the display is that the upper keyboard sound is located beneath the lower sound!

The front-panel controls are relatively simple, well organized, and clearly labeled. A standard 10-key pad with telephone-style letters for naming is excellent. Unfortunately, you must hold the Lower button to change the lower sound; I would prefer that the Sounds button toggled between the two sounds in the display.

INSIDE THE PL4.0

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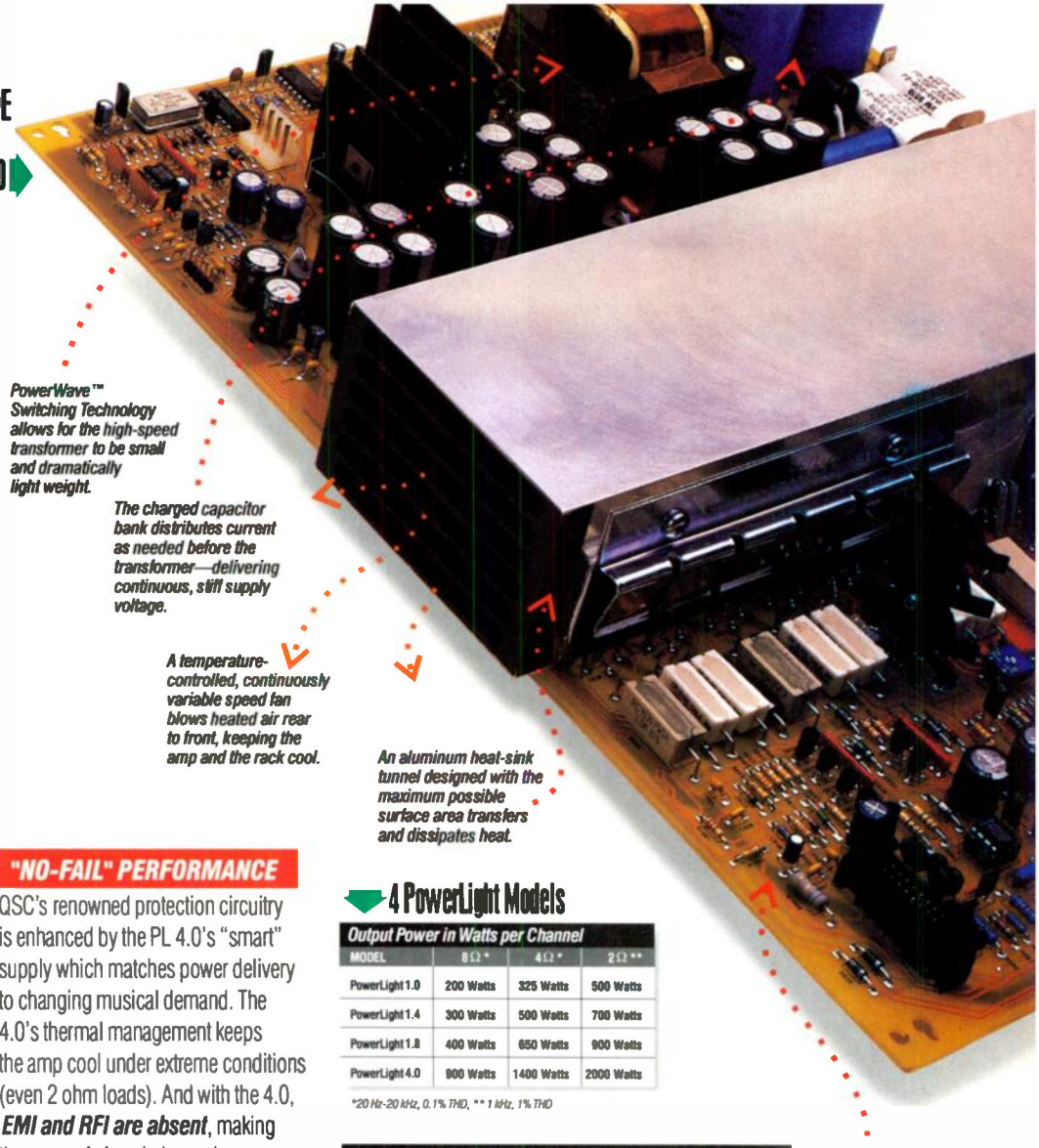

The new PowerLight 4.0 introduces massive power to a series of amplifiers that have already become a benchmark for excellent audio performance and reliability. *PowerWave™ Switching Technology* (patent pending), at the heart of the PowerLights, is ***the power supply technology for the future***. *The 4.0 clearly demonstrates why...*

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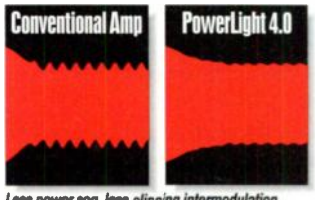

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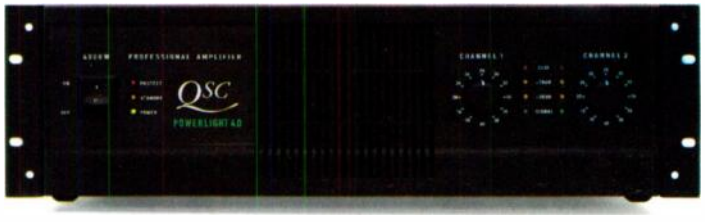

The front panel of the PL 4.0 features comprehensive LED status arrays, detented gain controls with soft touch knobs and 2 dB steps for easy resetting.

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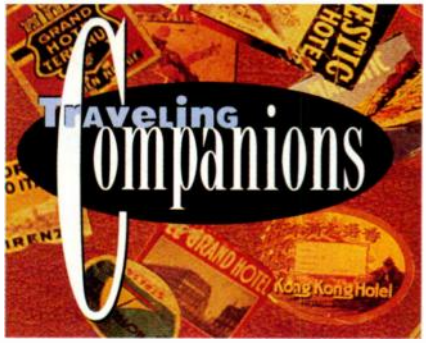


The sequencer offers two modes: SongStyle and RealSong. In SongStyle mode, you record a sequence of style riffs in one accompaniment track and two additional parts (typically lead lines) on two other tracks. In addition, the Touch Keyboard pads are recorded on their own track. Each style plays four musical parts: Drums, Bass, Accompaniment 1, and Accompaniment 2. In RealSong mode, you get six independent tracks that operate much like a standard sequencer, which is a wonderful option offered by none of the other products in this survey.

The CD30 includes no obvious sequencer controls, such as a Record button. To begin recording, you must press the Chords button, which is not intuitive. After selecting SongStyle or RealSong mode, you press Chords again. In either mode, the internal memory can hold up to four songs; other units in this survey have enough memory for only one song.

After enabling SongStyle mode, the keyboard is inactive until you actually begin recording, which is a drag. When you do start recording, the sound assigned to the lower portion of the keyboard is audible; I wish it were disabled during accompaniment recording. In addition, there is no indication when the intro ends and the main beat begins. The intelligent chord mode plays a major chord based on a single note, a minor chord if you play the root and minor third of the chord, and so on.

In RealSong mode, you can record one track at a time. You must press the Copy button to change the time signature, but this mode is pretty straightforward otherwise.

The styles are a mixed bag. Some variations of the main beat sound very similar, and some endings trail off without a strong finish. Among the better styles are Funk, Fusion, and many of the rock and Latin styles. On the down side, the pop styles are pretty cheesy, and Rap sounds like bad reggae. The ethnic styles are labeled Ethnic 1 through Ethnic 8, which isn't very helpful, and they don't sound like any ethnic styles I've ever heard. The one exception here is Ethnic 5, a cool Middle Eastern groove in 9/8. Twenty-four "CD Styles" are labeled CD 01 through

STYLIN'

Virtually all portable keyboards include a selection of Styles that play automatic accompaniments in various musical genres. Each Style includes short riffs that are assembled into the framework of a song. These riffs typically include an intro, two variations of the basic beat, two transitional fills, and an ending. As you might imagine, these styles are oriented toward pop, rock, and jazz forms, which typically include an intro, verse, chorus, bridge, and ending in some combination.

You select each riff by pressing the appropriate button on the front panel. The selected riff begins immediately when you press the Start button, or you can tell it to wait until you play a note on the keyboard; this is normally known as Sync mode. As you select different riffs by pressing their buttons, the previous riff finishes before making a smooth transition to the next one. In many cases, selecting either variation of the basic beat plays a fill during the transition.

The chords played by the riffs depend on the note or notes you play to the left of the split point (which is user-definable). Typically, there are two options for specifying Style chords: you can play the entire chord manually, or you can elect to specify chords with only one or two notes. In the latter option, the device "intelligently" determines the chord. For example, if you play a single note, the Style plays a major chord based on that note as the root.

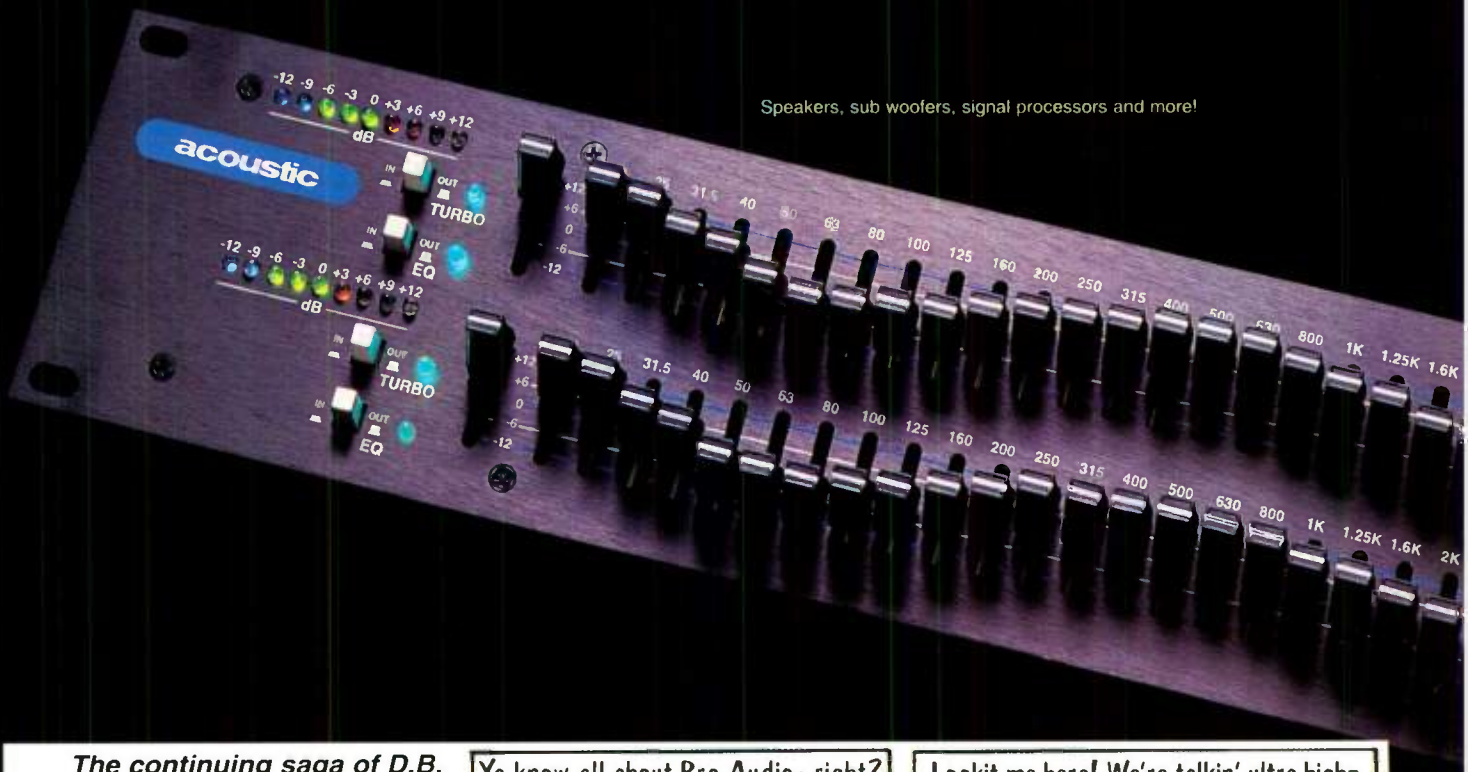
To play other types of chords in this intelligent mode, different units implement one of two techniques. In one case, you play just the notes you need to specify a chord. For example, if you play B and D, the Style will play a B-minor chord; if you play G and F, the Style will play a G7 chord. To specify a minor-seventh chord, play the root, minor third, and minor seventh of the chord. You can also specify augmented, diminished, and any other type of chord you want.

The other technique requires less musical knowledge, but it's less musically intuitive and less flexible. To specify a minor chord, play the root and any black key below it; to specify a dominant-seventh chord, play the root and any white key below it; to specify a minor-seventh chord, play the root and any white *and* black key below it.

Each style plays several musical parts. These parts typically include drums, bass, and two or more chordal instruments, such as piano, guitar, strings, and/or horns. When you select a style from the onboard list, it can automatically call up the most appropriate sounds for the accompaniment and split keyboard parts. In all cases, you can override the keyboard sounds and choose your own. Occasionally, you can even select any sounds you want for the individual accompaniment parts.

Using styles to create the framework of a song is generally pretty easy. You begin by selecting the style and sounds you want and then selecting the riff you want to start with (usually the intro) by pushing its button. Select the accompaniment track for recording, hit the Record button, and specify the first chord of your song in the left hand. After a count-in, the intro plays and then automatically transitions to one of the basic beats. (I prefer to engage the Sync function before recording, which tells the machine to wait until you play a note to begin.) Continue to specify chords with your left hand, and press the buttons for fills and basic beats with your right hand. When the song is done, press the End button.

Once the song structure is complete, you can usually overdub one or more parts from the keyboard to other sequencer tracks. These parts are not automated; with the possible exception of parallel harmonization, what you play is what you get.



The continuing saga of D.B. Hertz, that retro, kinda 70's kinda guy with a 'tude about Pro Audio and a rep for goin' head-to-head with any and all competition!

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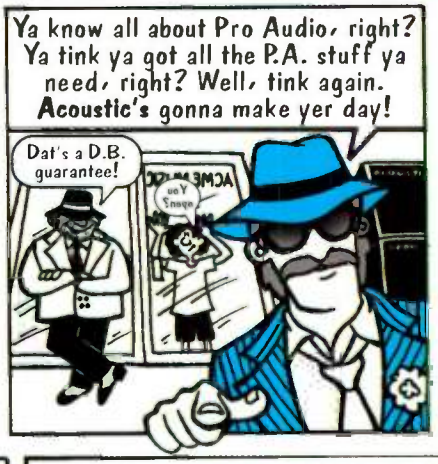

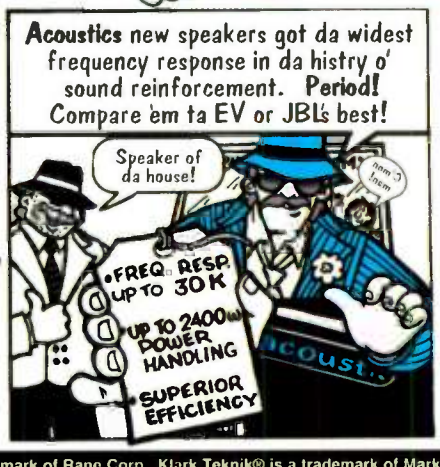

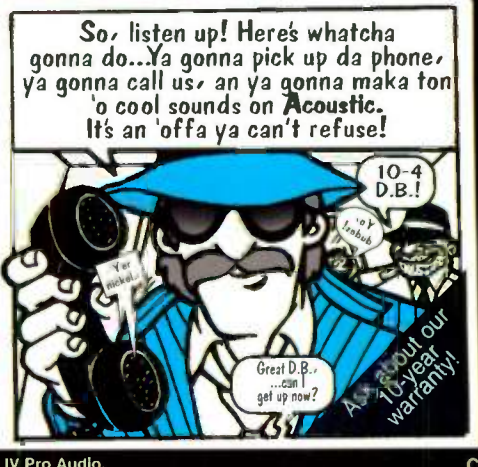

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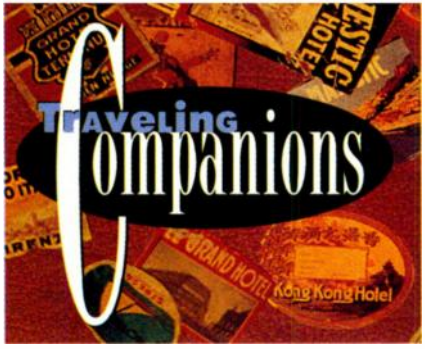


CD 24. This makes it difficult to know which one you might want to use. Besides, they are similar to other styles in the machine.

Unlike most portable keyboards, the CD30 lets you create your own styles and store them in one of eight memory locations or on disk. However, this is a rather complicated procedure, so I won't go into it here. Also unlike most such units, the CD30 offers some rudimentary track, song, and style editing functions, including Quantize, Clear, Erase, Copy, and Name.

It's easy to put the CD30 into GM mode: Bank 2 includes the entire GM sound set. The sounds in Bank 1 are similar, except that many of them use two oscillators. This improves the quality of the sounds but cuts the polyphony to sixteen voices. Among the better GM sounds are the drums, basses, clavinet, organs, some guitars, and strings. Those that don't fare as well include the brass, winds, pianos, and ethnic sounds. In addition, "Clean Guitar" isn't very clean.

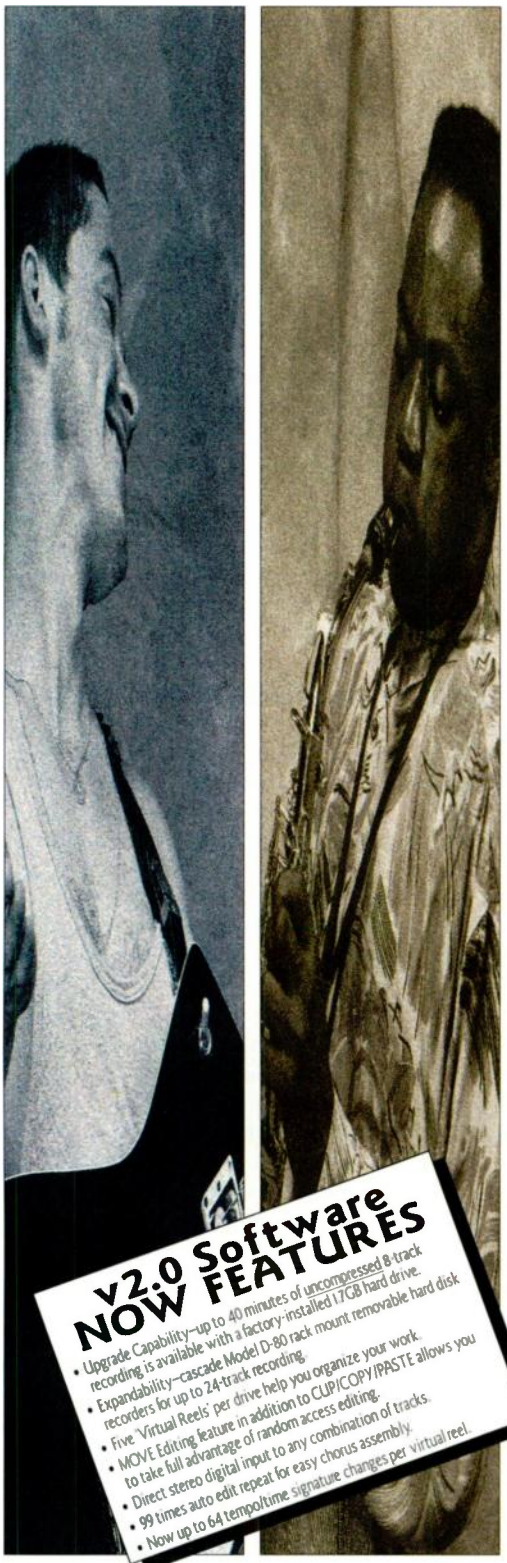
As a MIDI sound module, the CD30 recognizes Bank Select (CC 00), Modulation (CC 01), Foot Controller (CC 04), Volume (CC 07), Sustain Pedal (CC 64), and three additional Control Changes (CC 112, 118, 119).

The Roland E-16 includes many excellent styles and sounds, but it's not GM-compatible and the sequencer can't overdub.

KAWAI X65-D

The Kawai X65-D is the only keyboard in this survey with a nonstandard speaker complement, combining two 3-inch drivers with the normal 5-inch drivers. This is part of a feature called Super 3D Sound, which is activated with a front-panel button. Other aspects of this feature include porting in the bottom of the case and some digital signal processing. Pressing the Super 3D button makes a big difference in the

CD-QUALITY MULTITRACK RECORDING



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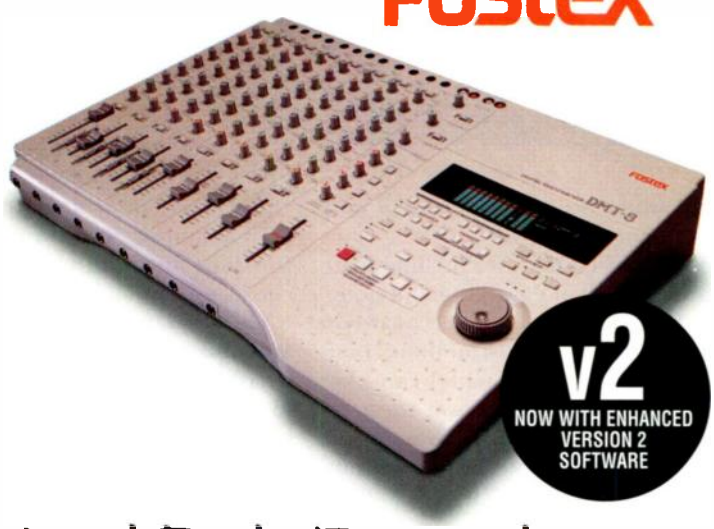

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INPUTS
The channel strip has two inputs, main and SUB. SUB enables monitoring of recorded tracks during recording or can be used as a line input during mixdown. Channels 1-4 also have the addition of a 'wide-range' trim fader (-10dBV -50dBV) for perfect mic level matching.

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Two parametric EQ's. High Mid (1kHz - 16kHz ±15dB) and Low Mid (60Hz - 1kHz ±15dB).

AUXILIARIES
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ROUTING
Each channel can be routed to Groups 1/2 or 3/4

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Backing vocals great on the first chorus, but a bit shaky in the second? Why waste time recording them again? With simple copy and paste editing you can take those great vocals on chorus 1 and paste them over the less than perfect ones in chorus 2.

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The DMT-8 is ready for total integration into your Midi studio. It's all there. Midi Time Code output (with up to 6 hours of offset time between ABS and MTC), MIDI Machine Control (control the transport direct from your software sequencer), non-linear editing based on MTC or MIDI clock and 'after the event' synchronisation of recorded CD-quality audio to sequenced Midi using the built-in tempo map.

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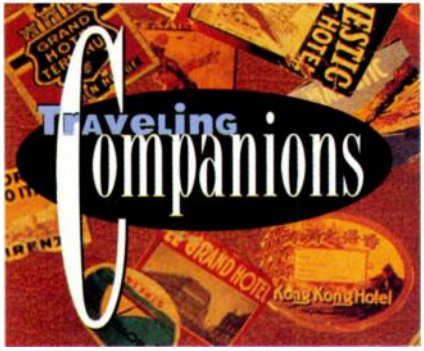

sound, which becomes much fuller with this enhancement.

Other special features include duet harmonization of the right-hand notes and the ability to split the keyboard or layer any two sounds. In addition, four buttons on the front panel can play user-assignable notes from the currently selected drum kit. All front-panel settings can be stored in one of four memory locations, which makes them easy to recall.

Finally, there are two pairs of audio outputs and one pair of audio inputs. The inputs are mixed with the output from the keyboard. There's even a dedicated input-level control, which is way cool. Unlike the other products in this survey, however, these connections are all on RCA jacks; this is less convenient in a home studio than ¼-inch connections would be.

The unit's display is a standard 3-character, 7-segment LED. It normally indicates the number of the selected sound or style. When you manipulate a front-panel control, the new parameter value is momentarily displayed. Things get a bit hairy when you enter System/MIDI mode, in which a cryptic abbreviation of the selected parameter quickly flashes out of phase with that parameter's value. This can quickly become confusing.

Like most portable keyboards, the X65-D includes only a spring-loaded pitch wheel. However, this wheel can be assigned to send nine different MIDI messages, which is great. The front-panel buttons are translucent, and most have an LED beneath them so that the entire button lights up when you press it. Separate Fill and Variation buttons let you play a fill without changing the basic beat; the Variation button plays a different fill during the transition, as well.

This scheme is very flexible, but there is one problem: with the exception of the Variation button, the style buttons don't light up when you press them. This makes it difficult to know when the intro is finished and the main beat begins. It's also impossible to tell whether you've pressed the Sync button, which tells the instrument to wait until you play a note before starting the style. I think that both the Intro and Sync buttons should flash when activated.

The intelligent chord mode works as I prefer. For example, it plays a major chord based on a single played note, a dominant-seventh chord if you play the root and minor seventh of the chord, and so on.

The sequencer lets you record one accompaniment track and up to three overdubbed parts. The styles play up to five different parts: Drums, Bass, and Chord 1, 2, and 3. The Chord 1 and 2 parts can emanate from the large or small speakers; the Chord 3 part is played on the small speakers only. You must record the accompaniment track first if you want to use it. This track can include melody parts as well as layered and duet parts in addition to the automatic accompaniment.

It's quite easy to record a song in this manner, but the manual says nothing about how to select different sounds for each overdub. This turns out to be simple: just select any sound while the sequencer is stopped. The Sound 1 button remains illuminated during all overdubs. This is confusing because it appears as if Sound 1 can be three independent sounds at once. One nice feature is the ability to erase previous takes by pressing the Rec/End and Play/Stop buttons together; press once to erase the last take and twice to erase everything.

In general, the intros and endings are quite good, but many of the basic beats and variations are not so great. The dance styles are fine, but the jazz styles sound very "straight," and Light Pop sounds more like a hard shuffle. You can create your own styles, but there are only two memory locations.

The X65-D can be placed in a standard GM mode or a Pro multitimbral mode. Pro mode retains auto accompaniment and all front-panel functions, and you can transmit the accompaniment from the keyboard. It responds to all sixteen channels, but channels 10 through 14 are reserved for drum parts. These drum channels can be collapsed to channel 10 if you want. Use this mode to transfer sequences from the keyboard to a computer.

Standard GM mode disables auto accompaniment and all front-panel controls except the numeric and Sound 1 and 2 buttons. In this mode, you can send from the keyboard on one user-selectable channel and receive on all sixteen channels.

Overall, the quality of sounds for General MIDI applications is mixed. Among the better examples are the pianos, organs, electric basses, and drums. However, the brass, winds, strings, guitars, and acoustic bass don't cut it in my book. The X65-D recognizes Aftertouch when it's in Pro mode but not in standard GM mode. Both

WHAT I DID DURING SPRING BREAK

To evaluate these portable keyboards as musical scratchpads, I started by listening to most of the styles in each one, including intros, both variations of the main beat, fills, and endings. (As you might imagine, this took many hours.) Then, I sequenced a short tune using the intro, main beats, fills, and ending of one of my favorite styles in each unit. During these tests, the instruments were not connected to external equipment in any way; after all, they're supposed to be self-contained idea machines, so that's how I used them.

To evaluate their performance as MIDI sound modules, I played some Standard MIDI Files from my computer on each one. I connected the instrument's audio outputs to my studio mixer and disabled the internal sound system by inserting a dummy plug into the headphone jack. This allowed me to hear each unit as I would any other sound module in the studio. In addition, I had to explicitly enable GM mode in each instrument (except the Roland E-16, which is not GM-compatible).

After that, it was a simple matter to hit Play, sit back, and listen to "On the Road Again," "California Dreamin'," and "In the Midnight Hour" one more time.

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Every mixer setting, including virtual tracks and effects, can be saved as a scene. Store a snapshot of a mix when you're bouncing tracks. When you need to re-bounce the tracks to adjust some of the levels, you still have the originals saved on virtual tracks.

Just a few of the effects that can be added during recording, bouncing or during final mix in realtime are reverb, 3D RSS® stereo delay, chorus, flanging, phase shifting, Roland's COSM-based distortion/overdrive and guitar amp emulation, vocoder, pitch shifter and more.

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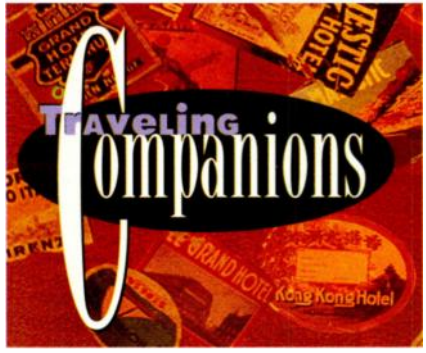

modes recognize Modulation (CC 01), Data Entry (CC 06), Volume (CC 07), Pan (CC 10), Expression (CC 11), Sustain (CC 64), NRPN and RPN LSB and MSB (CC 98, 99, 100, 101), All Notes Off (CC 120), and Reset All Controllers (CC 121).

ROLAND E-16

Roland is very well known for its home-keyboard products, but the E-16 is actually from the company's professional product line. Like the Generalmusic CD30, this keyboard includes a tap-tempo feature. In addition, the instrument can intelligently harmonize the melody with one additional note, creating a duet effect. A large selection of sampled sound effects can spice up your music, as well. Finally, this is the least expensive product in this survey, which is beautiful music to every struggling musician's ears.

The E-16 includes modulation and pitch-bend controllers, but these are nonstandard, to say the least. The "mod wheel" is actually a large, triangular button that sends Modulation messages at a fixed rate. The "pitch wheel" is actually a pair of buttons that send Pitch Bend messages at a fixed rate. This scheme is pretty lame.

Like many other such products, the E-16 includes a 3-character, 7-segment LED display. The controls are laid out in typical Roland fashion, with lots of multifunction buttons with multiple labels, LEDs, and lines connecting various buttons and labels, which I find pretty confusing.

The styles play five musical parts: Drums, Bass, and Accompaniment 1, 2, and 3. In addition, the intelligent chord mode plays a major chord based on a single played note, a minor chord if you play the root and minor third of the chord, and so on.

However, the sequencer doesn't allow you to overdub lead lines after recording a series of style riffs; you must record all parts together in one pass. It's impossible to establish the basic chord pattern and form of the song and then overdub lead lines. As a result, the E-16 is less suitable as a scratchpad for professional musicians.

This is doubly frustrating because the styles are generally excellent. Except for the Rap style, I like just about every one in the machine. They are musically sophisticated and make good use of the onboard sounds. If you select the intro riff, an LED next to the Intro button flashes until the intro is over.

As mentioned earlier, the E-16 is not GM-compliant; it receives on only six fixed channels. However, the internal sounds are arranged in GM fashion, so sending GM Program Changes should call up the correct sound. If you want to use it as a MIDI sound module, you must align the parts you want it to play on the appropriate channels. It does recognize a variety of Control Changes, including Bank Select (CC 00), Modulation (CC 01), Volume (CC 07), Pan (CC 10), Expression (CC 11), Sustain

Portable Keyboard Specs

	Generalmusic CD30	Kawai X65-D	Roland E-16	Technics SX-KN501	Yamaha PSR-620
Seq. Capacity (songs/total notes)	4/10,000	1/3,000	1/2,500	1/2,800	1/1,500*
Independent Seq. Tracks	3 (SongStyle); 6 (RealSong)	4	1	2	3
Accomp. Parts	Drums, Bass, Accomp. 1, 2	Rhythm (Drums), Bass, Chord 1, 2, 3	Drums, Bass, Accomp. 1, 2, 3	Drums, Bass, Accomp. 1, 2, 3	Rhythm 1 or 2 (Drums), Bass, Chord 1 or 2, Pad, Phrase 1 or 2
Onboard Styles (ROM/user)	88/8	100/2	64/0	100/0	100/0
Polyphony	16 (Bank 1); 32 (Bank 2)	28	24	32	32
Onboard Sounds	256	128	223	129	141
Onboard Drum Kits	8	4	8	1	8
Effects Processors (types of effects)	2 (reverb/delay, modulation)	2 (reverb, stereo chorus)	2 (reverb, chorus)	2 (reverb, chorus)	3 (reverb, chorus, DSP)
Amplifier Power (watts per channel)	5	7	3	1.5 (batteries); 3 (SY-AD9 power adapter); 5 (SY-AD6/AD6B power adapter)	4.5 (batteries); 6 (PA-5B power adapter)
Weight (pounds)	13.9	12.8	11.4	12.8	17.2
List Price	$999	$899	$795	$1,195	$995

* In melody tracks or 750 chords in accompaniment track (or any combination thereof).

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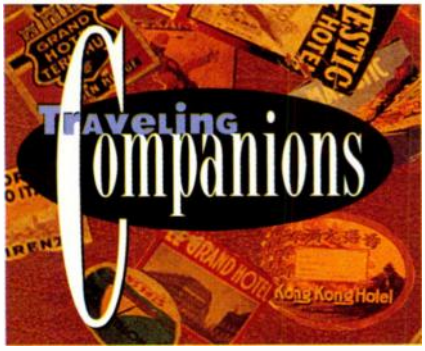

(CC 64), Reverb Depth (CC91), Chorus Depth (CC 93), and Reset All Controllers (CC 121).

The quality of the sounds is quite good overall. In particular, I like the pianos, organs, guitars, basses, and strings (of which there is a better-than-average selection, including pizzicato and tremolo). The brasses are better than usual, too. I don't like the saxes, double reeds, and sitar. The bari sax is especially humorous, but it sounds little like a bari sax.

TECHNICS SX-KN501

Technics is another well-established manufacturer of home keyboards. Unlike any other product in this survey, the SX-KN501 includes several alternate tunings, including several Arabic scales as well as Indonesian Slendro and Pelog. It even includes one octave-based user tuning. The right portion of the keyboard can be assigned two layered sounds, and a feature called Techni-Chord harmonizes the right-hand part according to the chords played in the left hand.

Four Manual Sequence Pads play short, preprogrammed phrases appropriate to the selected style, but you can't record your own phrases for this purpose. The Sound Arranger function lets you assign any sound to any accompaniment part, and you can store the front-panel settings in ten memory locations. Unlike the other products in this survey, the SX-KN501 lets you enter the chord progression you want the styles to follow in step time. This is very handy if you're not a keyboard player.

As usual, the 3-character, 7-segment LED display offers cryptic abbreviations and momentarily displays parameter values as you manipulate front-panel controls. The controls are laid out logically and cleanly, and there are not many multifunction buttons. If you need to push a button to do something, its LED flashes, drawing your eye to the appropriate button. Unfortunately, you must enter leading 0s when selecting styles or sounds by number.

The styles play five parts: Drums, Bass, and Accompaniment 1, 2, and 3. However, the sequencer offers only two independent tracks: one for the accompaniment and one for all other user parts. The user parts can include the left and right portions of the keyboard—and remember that the right side can have two sounds layered. In addition, you must record all user parts in one pass, which is rather limiting.

The fills and basic beats are selected independently; pressing the Variation button doesn't automatically play a transition fill. Instead, you must press the Fill button followed by the Variation button. Of course, you might not want a fill during a transition, so this approach is flexible. However, if you want a transition fill, it's somewhat cumbersome to manipulate the buttons. In addition, pressing the Fill button sometimes stops all parts but the drums (and maybe the bass); this can be a bit abrupt in some styles.

The intelligent chord mode operates differently from those described up to this point. It uses the "play any white key below the root for a dominant-seventh chord" approach. I prefer the other method, which seems more musically intuitive.

Overall, the styles are quite good with excellent variety. A few endings even ritard. In particular, I like the 8- and 16-beat styles and the jazz styles (except Dixieland). The so-called traditional styles (waltzes, marches, fox-trots) are also good. The swing styles have a good groove, but the big-band versions sound cheesy because of the horn patches. On the down side, I don't like the funk, dance, or some of the rock styles, and the Latin styles seem a bit stiff (except the Bossa Nova).

It's simple to enable General MIDI mode. All GM parts (except channel 16) respond to Bank Select MSB and LSB (CC 00, 32), Modulation (CC 01), Data Entry MSB and LSB (CC 06, 38), Volume (CC 07), Pan (CC 10), Expression (CC 11), Sustain (CC 64), Reverb and Chorus Depth (CC 91, 93), RPN LSB and MSB (CC 100, 101), All Notes Off (CC 120), and Reset All Controllers (CC 121).

The SX-KN501 includes only one ¼-inch, TRS jack for audio and headphone output, so you need a Y-cable to send a stereo signal into a mixer or amplifier. Among the sounds I like are the pianos, organs, accordion, vibes, and distorted guitar. Those that don't make my grade include the brasses, winds, and strings. In addition, the bass drum sounds very boomy.

YAMAHA PSR-620

Yamaha has long been known for its portable keyboards. The PSR-620 includes a disk drive that can read Type 0 SMFs, Diskclavier PianoSoft disks, and ESEQ files (Yamaha's proprietary sequencer format). A cartridge slot accepts Yamaha ROM cartridges that include additional songs and styles.

The Technics SX-KN501 includes good styles and sound, and it uses blinking LEDs to indicate which buttons are important for any operation.

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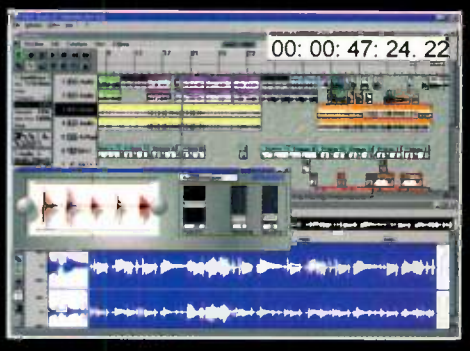

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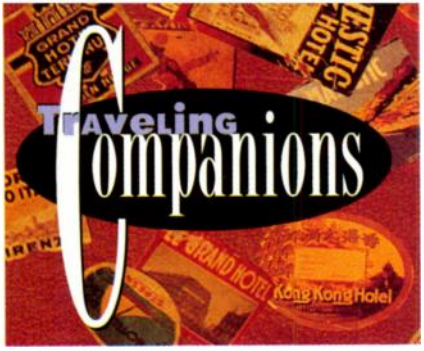

The Minus One feature lets you mute the right, left, or both keyboard parts or any accompaniment part and play along with any song or style.

Four Multi Pads play short phrases, much like the pads on the Technics SX-KN501. However, the PSR-620's pads can be programmed with your own phrases. Registration Memory stores up to 128 groups of panel settings, which is far more than any other keyboard in this survey. In addition to the standard reverb and chorus, an additional DSP processor provides a wide variety of effects, including more reverbs, delays, chorus, flanging, phasing, rotary speaker simulation, tremolo, auto pan, auto wah, and distortion.

The display is a large, backlit LCD with several distinct areas and a number of preset icons. It is the best of this bunch by far, and it reveals lots of useful information, including the name and number of the selected sound, song, or style as well as tempo, transposition, measure number, current chord, and effects status. In addition, the number, on/off status, and volume setting for each accompaniment and user part is always visible. During recording and playback, the volume settings become real-time, bar-graph level meters, which is way cool.

The controls are well organized and laid out, and there are virtually no multifunction buttons. The controls include a data wheel, standard 10-key pad, and cursor diamond, all of which make this unit easy to navigate. Dedicated sequencer and riff-selection buttons make recording easy, although the Sync button has no LED to indicate that it has been engaged.

All functional modes are listed on the right side of the display, and dedicated arrow buttons let you select the desired function. Keyboard-split and intelligent chord modes are listed on the left side of the display with their own dedicated selector button. The disk functions are also listed on the left side of the display along with yet more dedicated buttons.

The styles play up to five musical parts: Rhythm (drums), Bass, Chord, Pad, and Phrase. The Rhythm, Chord, and Phrase parts each include two selectable versions, which provides greater variety than most units. In addition, you can assign any sound to any accompaniment part, and you can mute any accompaniment part with a dedicated button. Another button lets you select a small (3-part) or large (5-part) accompaniment. The sequencer offers three independent tracks: Accompaniment, Melody 1, and Melody 2.

The manual does not describe how to overdub the two Melody parts with different sounds, and it's not trivial. After recording the accompaniment track in Single (intelligent) or Fingered chord mode, select Normal or Split keyboard mode, enter the Voice function, and select the sound you want to use. Go back to Song mode, press Record, use the data wheel or +1/-1 buttons to select the Melody 1 or Melody 2 track for recording, press Play/Stop to begin playback, and play the part. Repeat this procedure for the other track. You can also record over any track by selecting it for recording. However, remember that to record the accompaniment track, you must be in Single or Fingered chord mode, and to record a Melody track, you must be in Normal or Split keyboard mode.

Each style includes two intros, two versions of the basic beat, four fills, and two endings. Again, this provides more variety than any other unit in this survey offers. Fortunately, the Intro button's LED remains lit until the intro is finished. Each version of the basic beat includes its own intro, ending, loop fill (back to the same version), and transition fill (to the other version). The fills are played whenever you press either of the Main buttons, and the intro and ending depend on which Main beat button is active. As with the Technics SX-KN501, the intelligent chord mode in the PSR-620 uses the "play any black note below the root for a minor chord" approach.

The styles are generally excellent, with good variety and organization. I especially like the pop, rock, dance, contemporary jazz, Latin, country, and ballroom styles. Even the disco styles are well crafted. The so-called world music styles are also good, but they should have been called traditional European because they include polkas, waltzes, and other traditional European dance styles. Some styles appear to be derived from well-known tunes. For example, Detroit Pop sounds like the Supremes' "You Can't Hurry Love," and Funk sounds like Tower of Power's "Down to the Nightclub."

The traditional Jazz styles sound a

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The Yamaha PSR-620 provides a large LCD display, excellent styles, and great sounds.

FOLIO SX

SPIRIT

THE FACTS
& no Bull)

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- **12 mono inputs with UltraMic™ preamps** giving 60dB of gain range and +22dBu of headroom, allowing any mic or line device to be plugged in.
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APPLICATIONS

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Bands, small venues, conferences, schools, places of worship

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Digital and analogue multitrack (4 & 8 track), small or home studios, pre-production, video post production

SUBMIXING

LOCATION SOUND

TYPICAL SPECIFICATIONS

Mic EIN	-129dBu
Crosstalk (1kHz):	
Channel Mute	<95dB
Fader Cutoff	<90dB
Frequency Response (20Hz to 30kHz)	<1dB
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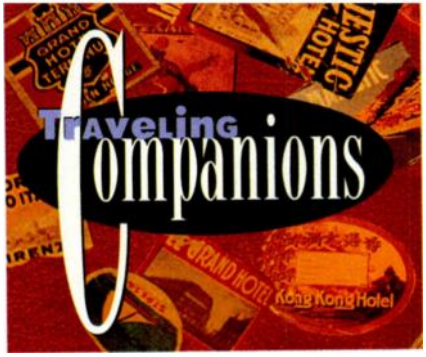

bit stiff to me, except for Dixieland. In addition, Light Pop sounds more like a country style. Finally, the last note in many endings cuts off rather abruptly, leaving only a cymbal ringing.

To enable GM mode, you must send a GM On Universal SysEx message from an external device or computer; this is less convenient than on most units. On the other hand, the PSR-620 recognizes many more Control Change messages than the other instruments (in fact, too many to list here).

The quality of the sounds is excellent. In particular, I like the pianos, organs, chromatic percussion, basses, guitars, ensemble strings, and drums. As usual, the brasses and reeds are not great, but they are better than those on most units of this type. I was surprised by the "Jazz Tenor Sax," which is quite acceptable.

GOOD NIGHT

So, which one of these portable keyboards makes the best musical scratchpad? This comes down to the one with the best styles and sequencer. The Roland E-16 has great styles, but you can't overdub in its sequencer. The Technics SX-KN501 also has good styles, but its sequencer offers only one overdub track in addition to the accompaniment track. On the other hand, you can enter your chord progression in step time, which could be of great benefit to nonkeyboardists.

The Generalmusic, Kawai, and Yamaha products all offer good sequencers, especially the Generalmusic CD30, which gives you the option of recording six "normal" tracks or an accompaniment track with two overdub tracks. It also provides some rudimentary sequence-editing tools, a disk drive, and enough internal memory for four songs. If your music tends towards funk, fusion, rock, or Latin styles, the CD30 is an excellent choice. However, I just don't like many of the other styles in this unit.

The Kawai X65-D is fine for the so-called dance styles, but I like a higher percentage of the styles in the Yamaha PSR-620. When you consider the large display, disk drive, cartridge slot, and flexible sequencer, Yamaha clearly comes to the fore.

As a sound module, I like the sounds in the Roland, Technics, and Yamaha keyboards over the others. Given my original premise to evaluate this capability as an adjunct to the scratchpad application, I must give the nod to the Yamaha PSR-620, which fills both applications admirably.

Now that I have a portable keyboard next to my bed, I need never worry about losing another midnight inspiration. According to Shakespeare, sleep knits up the raveled sleeve of care. However, if the creative juices start to flow as sleep descends, I'm ready to sketch a new song with the push of a button. Then I can sleep peacefully, knowing my inspiration will not be lost in dreamland.

EM *Technical Editor* **Scott Wilkinson** *doesn't travel much, but he gets lots of midnight inspiration.*

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By Dennis Miller

CUBIST ART

Prepare to paint your musical masterpiece with Steinberg's *Cubase*.

Okay, so learning how to get the most out of a professional-caliber sequencer won't automatically turn you into a genius at the level of Braque and Picasso. But even the greatest artists must master the use of their tools before they can create a masterpiece. This holds true for painters, sculptors, and musicians alike.

Among the most powerful music-production tools is Steinberg's *Cubase*, which includes some very cool tricks you won't find anywhere else. In addition to an enormous range of real-time capabilities, *Cubase* provides a number of unique processing tools that let you radically alter MIDI data. Learning to master these software tools can help you move closer to achieving your lofty goals.

The processing tools found in version 3.0 are among the more unusual and perhaps unfamiliar aspects of the program, so we'll focus on them. Most of these tips and tricks apply to *Cubase* for both Windows and Mac. In some cases, however, they apply only to newer versions.

Steinberg now offers several versions of *Cubase* (see the table "EM Covers the Cubases"). The program is available at two levels: *Cubasis* and *Cubase*. *Cubasis* and *Cubasis Audio* are entry-level products that offer sixteen tracks of sequencing. *Cubase*, *Cubase Audio*, and *Cubase Score* are professional-level programs. All versions of *Cubase* accommodate audio using Windows sound cards on the PC and Sound Manager–based native audio on the Power Mac. If you're using Digidesign hardware, you need *Cubase Audio XT*.

ILLUSTRATION BY VICKI RABINOWICZ

No Compromise CD Recording

Think about it. You spend hours tracking, editing, and mixdown on your projects. And, you've spent a small fortune on your mixing console, mikes, tape recorders, and all that outboard gear. So why settle for just any CD recorder when you can get the best—the new, very affordable Ricoh RS-1420C?

A third generation CD-R recorder and player, the Ricoh RS-1420C is the true choice for music professionals. The RS-1420C can write a CD at double speed (2X) or single speed (1X). It sports a generous 2MB buffer to ensure reliable recording across a wide range of systems.

Making a one-off Compact Disc is easy when the RS-1420C is mated with a Digidesign® Inc. system* such as Pro Tools®, Sound Tools,™ or Audiomedia™ along with Digidesign's MasterList CD™ software. Whether your application is creating a master for replication, or just burning a few demo discs to pass around, the Ricoh RS-1420C is an ideal addition to your studio.

The RS-1420C can also do double duty as a CD-ROM recorder/reader. It can read CD-ROMs at quad speed (4X) and record them at 2X/1X. Ideal for backing up sound files when a project is done, the RS-1420C frees up your hard disk for the next job. What's more, the RS-1420C can be used to digitally bounce tracks from a music CD to your hard disc in several different file formats.

The RS-1420C, an external model, is compatible with both PC and Macintosh based systems. It is very easy to use. And, at an attractive $1095 list price, you can afford to have the best! Internal models are also available at lower prices.

Photo shows the internal version, the RO-1420C.

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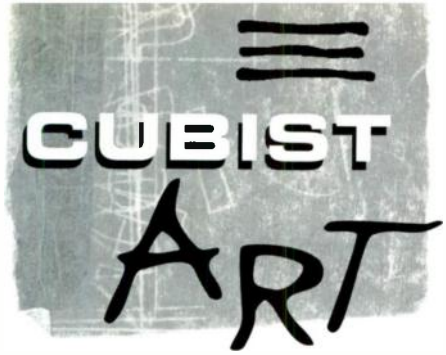

All new versions of Steinberg's *Cubase* include several Modules that add significant functions to the program. For example, the Studio module is a patch librarian, Style Trax provides auto-accompaniment, and Cue Trax is a graphic tempo editor. The Modules are also available as options for many earlier versions of the program, so if you own one of those versions, you can still join in the fun.

MIDI PROCESSOR

Like an effects processor, a MIDI processor accepts an input, modifies it in some way, and sends the result as output. For example, an arpeggiator is a form of MIDI processor that accepts one or more Note On messages as input and generates a stream of note messages as output.

Cubase includes several modules that perform various types of MIDI processing. If you use a PC and haven't yet installed the MIDI Processing module, pull down the Module menu, select Setup, and double-click on MIDI Processor. Select the Preload option so the module loads every time you start *Cubase;* then select Exit. (None of this applies to the Mac version, in which all Modules are always available.)

To work with the MIDI Processor module, pull down the Module menu and select MIDI Processor. (On the Mac, select MIDI Processor from the Options menu.) A window containing six faders will appear (see **Fig. 1**). Specify appropriate MIDI input and output ports and a MIDI channel to work on, and then click on the Status check box to enable the Processor.

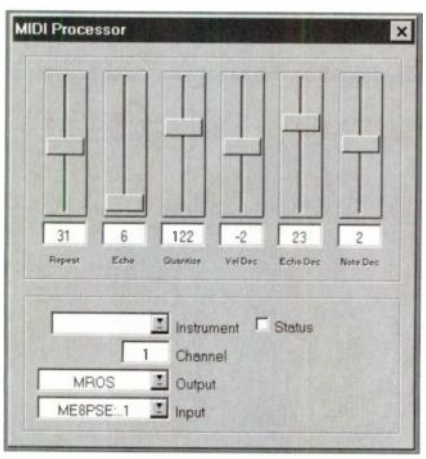

FIG. 1: The MIDI Processor module enables you to apply a wide range of delay effects to MIDI notes.

Let's begin by creating an arpeggiator with the MIDI Processor module. Call up a harp or acoustic guitar patch on your synth, and then set the MIDI Processor's fields to the values given in the Arpeggiator column of the table "Processor Parameters." You can double-click on a field and type in the value or use the faders.

Next, specify a tempo of 120 bpm in the Transport Bar, and disable MIDI Thru in the MIDI Setup menu. If you're using a MIDI interface that merges your controller with the output from your computer, make sure that only the computer can talk to the synth. Disable Remote Control from the Options menu so your keystrokes don't trigger other program functions.

Now, play middle C on your controller, and listen to the results. You should hear an upward arpeggio in minor thirds. Play a quarter-note sequence of descending minor thirds (C, A, B, G♯, etc.) at a tempo of 120 bpm for another nice effect.

Look at the parameters from left to right in **Figure 1**. Repeat determines the number of echoes that will be produced by the MIDI Processor, from 1 to 64. The Echo parameter specifies the time between the original note and the initial echo, with values from 1 to 192. The meaning of these values is not obvious; each increment of the Echo value represents eight clock pulses. (The default resolution is 384 ppqn; see the table "I've Got Rhythm" for the relationship between the Echo value, number of clock pulses, and standard rhythmic values.)

Quantize ensures that echoes land on the nearest division of the beat as specified by the Quantize value, which ranges from 0 to 192. As with Echo, each increment of the Quantize value represents eight clock pulses. The VelDec (Velocity Decay) parameter specifies the Velocity value that is added to or subtracted from each echo note. Use a positive number for a crescendo and a negative number for a diminuendo.

The EchoDec (Echo Decay) parameter adds additional time to each successive echo. Again, each increment represents eight clock pulses. A negative number in this field accelerates the echoes. If you set the number too low (e.g., -3), all the notes play at once. Change EchoDec to 2, and notice how the arpeggio ritards as it ascends.

NoteDec determines the interval of transposition for each echo. For example, if you change the 3 to a 4 in this field, the minor third becomes a major third; changing it to a 7 creates a chain of perfect fifths, which is great for new-age effects, especially at a slow tempo.

To create a delay effect that slows down with each iteration, enter the values given in the Slowing Delay column of the table "Processor Parameters." When you play a note, you'll hear it repeat exactly twenty times. The initial note and the first echo are separated by 80 ticks; the next repeat occurs 96 ticks later, followed by the next repeat 112 ticks after that, and so on.

Try changing the Repeat parameter to 50, Echo to 7, EchoDec to 0, and NoteDec to 2. This produces a rapid, whole-tone sweep upward. It works well with an analog synth patch, xylophone, or marimba.

Finally, for an effect I call "Groove Maker," set the parameters as specified in the last column of the table "Processor Parameters." Select a General MIDI drum kit on your synth, and play a single A above middle C. You'll hear a long sequence of drum sounds that lasts about 40 seconds. Now play two

NUCLEAR ACCIDENT SHRINKS PROJECT STUDIO TO SIZE OF TOASTER

In a dramatic accident that has profound implications for the music industry, a nuclear "incident" decimated a project studio and shrunk its entire collection of recorders, sequencers and tone generators—worth millions of dollars—into a size slightly larger than a pair of Pop-Tarts. Fortunately, no one was hurt since the incident occurred at 10:00 am.

"It's a miracle, really," said Shizzy Rock, the studio owner. "All the equipment still works fine, it's just all really small. Now that's helpful, 'cause I'm going to have to move around until I find a new place to live."

In his insurance report, Shizzy listed the following equipment involved in the carnage: an XG tone generator with 480 voices and three effects blocks; an 110,000 note sequencer with battery backup and 1/480 quarter note resolution; 3,800 ready-made musical phrases (and thousands of his own) used for professional composition and a large screen TV.

"I thought I was really screwed. I mean, I create everything in my project studio: from composition to production. But now I can take it all with me."

After the detonation, Yamaha engineers rushed to ground zero to record the affects of the blast. They were then able to duplicate the effects of the nuclear nightmare and package the newly configured studio as the QY700 music production studio in a box. "Funny how a disaster of biblical proportions can actually turn out for the best," Shizzy declared.

QY700

Evil Spirits Inhabit New Yamaha Piano Tone Generator

Beelzebub. Mephisto. Satan. Gossip says Yamaha must be selling out to this dark source—how else could it take over 100 years of keyboard manufacturing and shrink it into an 8 inch box.

Yamaha sources say their P50-m piano tone generator is simply a matter of advanced electronics and acoustic piano know-how. But who believes those corporate types anyway.

No, this reporter is witness to some peculiar activity outside the Yamaha plant late at night. Deep, evil laughs have accompanied frenzied piano solos emitting from the Yamaha R&D lab. While Yamaha claims that it has compressed over 11MB of wave ROM into 6MB of space and added 3-band EQ and 40 types of effects, this newspaper has evidence suggesting that by using the P50-m's simple panel switches, you are actually awakening the undead who would just as soon steal your soul as play your music.

P50-M Piano Tone Generator

original, it's better than the (more expensive) competition. "And get this, it even has professional XLR mic inputs and phantom power. You can do everything you need to do with the MT8XII. Except live in it," notes Juan.

MT8XII 8-Track Recorder

CLINTON GIVES UP SAX FOR NEW SYNTHESIZER

Friends of Bill Clinton's saxophone report the horn has been teary-eyed since the president gave it the heave-ho in place of a Yamaha VL70m tone generator and a Yamaha wind controller.

VL70M

WX11 Wind Controller

"Basically, the sax just doesn't have as much to offer the president as the tone generator," a White House aid said in a prepared statement. "With the VL70m and the wind controller or a keyboard, the president can switch from sax to flute to just about any instrument he wants—even guitars, basses or instruments that don't really exist. The VL70m has no samples; the music is created by running the signal, either the President's breath and a note played from a keyboard or wind controller through a computer model of an instrument. So every note is unique and completely musical. And there's 256 different voices inside."

Hilary Clinton was not available for comment.

"I'm going to look at Yamaha very carefully in the future," said the president. " The fact that I could buy this Virtual Acoustic synthesizer for only $799.95 tells me these Yamaha people know how to balance the budget. I want them on my team."

"The VL70m is where music meets the information superhighway," enthused Al Gore. "In the future...*(continued on page 18)*

FLESH EATING PETUNIA LIKES NEW RBX

While devastating a small urban community in Des Moines, the large carnivorous flower stopped for a brief moment outside a local music store. "I just had to check out one of the new RBX basses." "After reading the reviews I couldn't believe that those boy's over at Yamaha could deliver so much bass for so little cash!" The flower was last seen...

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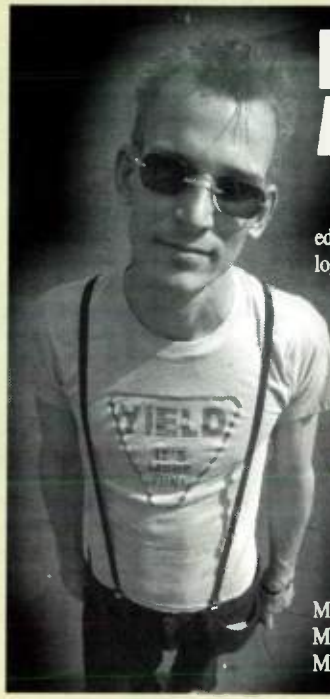

REGULAR GUY BUYS DIGITAL MULTITRACK RECORDER!

"It cost the same as some 4-track cassette recorders!!" Guy exclaims.

It's unbelievable, but true. This reporter has uncovered evidence that regular musicians — not just cash-encrusted music moguls — can now afford digital recording. Yamaha, those same crafty devils famous for their technological know-how, now brings digital to the masses. Yamaha's MD4 is the lowest cost digital multitrack recorder available anywhere. According to Joe Jones, musician, "I got my MD4 for around a thousand bucks while most digital multitrackers are going for $2400 and up!"

MD4 4-Track Multitracker

Eager to blow the lid off this story, we visited Guy as he recorded a demo with his band, Psychic Poodle. We verified the facts... using the MD4 4-track multitracker, Guy's audio quality was incredible (even if the Poodles don't have the best licks.) With digital audio storage, there's no audible noise, 0% wow and flutter and full range frequency response. The MD4 recording was so good, it could be used as final product — not just a scratch pad — even for professional composers.

It gets even juicier. Because the MD4 is digital, the sonic performance doesn't degrade with track bouncing. And you can even bounce to the same track — you don't have to keep an open track like you do with cassette recording. And get this. You can locate an exact (and we mean exact) place in your tune easily. According to Guy, "That means you can find, hear, and re-record even a short passage without erasing any of the good stuff. If only Nixon had had this instead of tapes."

Still, we were skeptical. What was the secret of the MD4? Our inquiring minds found out when Guy popped a MiniDisc out of the MD4. That explains why he could record for 37 minutes per track instead of the 22 maximum that's normal with cassettes.Those MiniDiscs are small and portable, but then again, so is the entire MD4 system. After revealing his story, Joe packed up his Poodles, his MD4 and left *(Cont. on Page 24)*

NATIONAL

The Inquisitioner

Nobody Expects The Inquisitioner. Vol.1 Issue 1110

WOMAN CHANNELS 39 SPIRITS: STILL BEAT BY YAMAHA'S O2R!

Dozens of lonesome or distraught spirits use psychic Junebug Jones to channel to the living world. That's quite a feat ... but that's still not as many channels as Yamaha's O2R offers! The O2R Digital Recording Console offers an incredible 40 channels for input/output capacity that's out of this world! Miss Junebug's powers are nothing compared to the extraordinary signal processing power of 40 input channels, 8 output busses, 16 direct outputs, and 8 auxiliary sends. That means it can handle digital mixdown of up to 32 tracks while the psychic can only track down one spirit at a time. • Junebug also helps clients recall exciting past lives. If only she had the O2R, she could instantly recall 64 memories of all mix settings, that is. The instant recall can save EQ. effects and even settings from the 50 on-board compressor/limiter/gates units. Both the psychic and the O2R will take you back in time ... but the O2R can be synchronized to SMPTE or MIDI time-codes for mixdown automation. • And while MIDI control is supported by all parameters, Miss Junebug is supported by paranormal amateurs. Her psychic readings require an open mind. The O2R features an "open system" so it can be directly connected with digital multitracks like ADAT, DA88 and a variety of digital audio workstations! • Huffs Junebug, "I was using crystals long before Yamaha started using a large liquid crystal display to make learning the O2R easy. Sure, the O2R offers powerhouse 32 bit signal processing in a very compact dimension... but I deal in a different dimension altogether."

02R Digital Recording Console

MOM UNDERSTANDS RAP, DISOWNS SON

"Yamaha 8-track cassette recorder saved my career and $300 bucks but mom hates me," rants man.

Last week, the career of Juan Bon and his rap group Shrivel closely resembled wet quicksand. But Shrivel's live concert tape — recorded using the Yamaha MT8XII eight-track recorder — has record execs drooling and bidding millions for Shrivel's next album.

Juan bought the MT8XII because it's the most affordable way to have 8-track recording and mixing. "Playing bowling alleys and bingo gigs, we weren't exactly getting rich. But we needed 8 tracks because our work was getting really deep. So we got Yamaha's MT8XII cassette multitrack for about $1500, compared to others which run nearly two grand," ranted Juan.

This story may seems like deja vu. This is the second generation of the MT8X, which earlier swept the audio scene. Now, Yamaha, the powerhouse of digital and cassette recording and mixing, has upped the ante by adding a score of new features—and a price—the competition can't match.

The biggest feature, the dramatically improved sonic quality, has created a major problem for Juan. "Due to the better sound quality, my mom could finally hear the lyrics," lamented Juan, who quickly found himself out on the street.

However, Juan enthused, "There are more inputs in the MT8XII than the Jacksons and Osmonds combined." With the addition of 3 stereo input systems, there are now 16 total mixable inputs. What's more, there's 3-band EQ on all channels. And the improved sonic quality—the result of new tape heads and circuit design—not only makes the MT8XII better than the

A's as sequential quarter notes at a tempo of about 120 bpm.

While that sequence is still grooving, play three more quarter-note A's, and then play A-B♭-A as eighth notes. Before long, you'll have a conglomeration of percussion sounds grooving with a nice, syncopated effect. Keep it going by repeating the A's, or try other notes to see what they trigger.

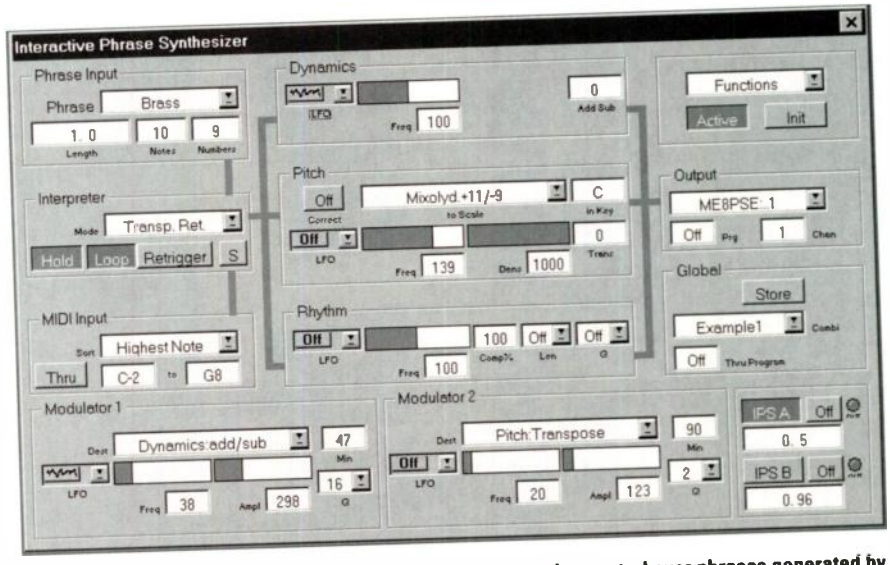

FIG. 2: The Interactive Phrase Synthesizer (IPS) offers extensive control over phrases generated by the program.

IPS YOURS

One of the earliest applications of computers for generating music occurred at the University of Illinois in the late 1950s. Researchers programmed the computer to select sequences of notes that were transcribed into standard notation for performance by musicians. The computer's choices were governed by certain rules, which are called *algorithms*. This particular application of computer music became known as algorithmic composition, a name that still holds today.

Cubase includes extensive tools that facilitate a similar type of compositional approach. The most prominent of these is the Interactive Phrase Synthesizer (IPS), which transforms previously recorded data as you specify. If you haven't tried this option before, you'll be surprised at how much you've been missing!

The basic concept behind the IPS is that you load a phrase of any length into the IPS and then use the available functions to determine how the phrase plays back. Simple, right? Well, maybe in concept, but in practice, a vast number of controls can be used in nearly infinite combinations to alter the output. And like so much of the program, these controls work in real time.

Start by selecting the Phrase Synthesizer from the Options menu (see **Fig. 2**). Locate the Functions field in the upper right of the screen, and select Load All Combis from its list of options. Select the file called example.cmb in the IPS directory within the main *Cubase* directory.

Select a nice brass patch on your synth. Click on the Active button to start the IPS, and play middle C on your controller to start it playing. If you don't hear anything, check the settings in the Output box to make sure they're assigned to a valid MIDI Out port and channel.

The phrase from the IPS is a nice riff that transposes well; try taking it up a minor third by playing E♭ above middle C or down a major third by playing A♭ below middle C. For a real treat, call up a General MIDI drum kit (e.g., Program 44 on a Kurzweil K2000), and you'll have an excellent groove.

The tempo in both the IPS and the MIDI Processor is tied to the main program tempo, so you can change the groove simply by increasing or decreasing the tempo value in the Transport Bar. You can also automate tempo changes in the IPS by drawing a curve in the Graphic Mastertrack window. The IPS follows the tempo changes you've drawn while it plays back.

You can also sequence a few notes that you want to trigger the IPS phrase and then select MROS (*Cubase*'s virtual MIDI cable) as the output for the track they are on. When your sequence is played, the IPS responds to the sequenced notes as though you had played them from the keyboard.

MODULATING MIDI

Playing a phrase in the IPS is useful, but it hardly stretches the capabilities of this feature. You can make many alterations to the phrase data, and it's easy to manipulate note, Velocity, and rhythm independently. It's also possible to change settings manually while a phrase is playing, and the program can make changes automatically using one of the IPS's two Modulators. Finally, everything that comes out of the IPS can be recorded back into *Cubase* by setting the IPS's Output to MROS and enabling a track for recording.

Processor Parameters

Enter the values given below into *Cubase*'s MIDI Processor to produce the effects described in the text.

Parameter	Arpeggio	Slowing Delay	Groove Maker
Repeat	32	20	31
Echo	7	10	148
Quantize	1	1	20
VelDec	-64	-2	-29
EchoDec	0	2	-45
NoteDec	3	0	2

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the ENSONIQ DP/2 the biggest selection of the best tools

When it comes to equipping your studio, your list of effects needs can grow pretty long. Probably longer than your budget. So make the right choice – one that will cover all of your signal processing needs from tracking to final mixdown. The DP/2 from ENSONIQ.

What makes the DP/2 so special? To start, it offers sixty-five great-sounding algorithms – the most complete selection available anywhere. Take a look at the list – you'll find all the tools you'll need to record and mix your music.

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Small Plate	8 Voice Chorus	Guitar Amp 4	Inverse Expander	EQ-Flanger-DDL
Large Room	Flanger	Digital Tube Amp	Ducker/Gate	EQ-Panner-DDL
Small Room	Phaser-DDL	Dynamic Tube Amp	De-esser	EQ-Tremolo-DDL
Gated Reverb	Rotating Speaker	VCF-Distortion 1	Rumble Filter	EQ-Vibrato-DDL
Reverse Reverb 1	Speaker Cabinet	VCF-Distortion 2	Van der Pol Filter	EQ-DDL with LFO
Reverse Reverb 2	Tunable Speaker 1	FuzzBox	Vocal Remover	Sine/Noise Generator
NonLinear Reverb 1	Tunable Speaker 2	Guitar Tuner 2U	Vocoder 2U	ADSR Envelope Generator
NonLinear Reverb 2	Parametric EQ	Pitch Shifter	No Effect	Distortion-Chorus-Reverb
NonLinear Reverb 3	EQ-Gate	Fast Pitch Shift	Plate-Chorus	Distortion-Roto-Reverb
MultiTap Delay	EQ-Compressor	Pitch Shift-DDL	Chorus-Reverb	Wah-Distortion-Reverb
Dual Delay	Guitar Amp 1	Pitch Shift 2U	Flanger-Reverb	Compressor-Distortion-Flanger-Reverb

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CUBIST ART

Let's take a look at the two Modulators, which are located at the bottom of the IPS screen (see **Fig. 2**). These Modulators provide a cyclic variation of parameters, much as LFOs do. In fact, let's use them to vary the Velocity of incoming notes. Start by reloading the example.cmb file; if it's still running, click on the Init button to reset all the values. The brass phrase should still be loaded, too. Call up a GM drum kit on your synth; then restart the IPS by playing middle C on your controller.

Set Modulator 1's destination to Dynamics:add/sub (the default setting), which tells the Modulator to add and/or subtract values from incoming Velocity values, and select the Triangle wave for the LFO. (Descriptions of all the LFOs are given in the *Getting into the Details* manual.) Of course, the Frequency parameter determines the rate at which the LFO progresses through its cycle, and the Amplitude parameter determines the range of values it produces. The Q (Quantize) parameter constrains the output of the Modulator to the specified rhythmic value. You can create a wide range of dynamic effects with these settings.

By the way, the Modulators can even modulate each other, which changes the type of LFO or the Frequency and Amplitude values of the destination Modulator over time. With this option,

EM Covers the Cubases

Steinberg's *Cubase* has undergone many incarnations, and EM has been there to evaluate many of them. Here's a list of our reviews over the years.

Review	Issue
Cubase (Atari)	January 1990
Cubase 2.0 (Atari)	February 1991
Cubase Audio (Mac)	December 1992
Cubase Score 1.0 (Mac)	July 1993
Cubase Audio 2.0 (Mac)	January 1995
Cubasis Audio (Win)	February 1996

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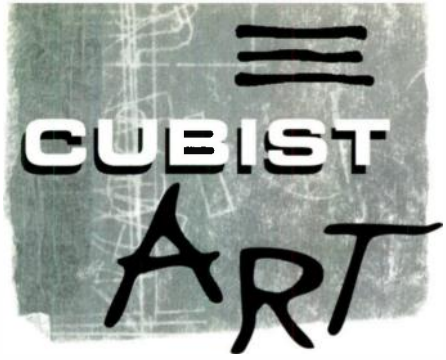


the "shape" of the output or the range of values can be altered in real time.

SCALING THE HEIGHTS

Let's look at some other aspects of the IPS. Hit the Active button to stop playback; then select the phrase called Prel. 1 from the Phrase window list. Call up an acoustic guitar or keyboard patch on your synth, and listen to the whole phrase by pressing a key on your controller to reactivate the IPS.

Once you've listened to the whole segment, change the Phrase/Length field to 2.0, which limits playback to the first two measures. You'll recognize this phrase as Bach's Prelude in C Major. However, we're going to use the IPS to turn it into Prelude in an Unknown Key.

With the Length field set to repeat the first two bars, click on the Pitch button to activate this section of the IPS, and then change the scale type from major to harmonic minor. Now try the Blues 2 scale. For a real change of pace, try the Arabian scale. (Be sure you have the Hold and Loop buttons enabled in the Interpreter section of the IPS so that the phrase continues to play as you make your changes.)

For a more dramatic effect, assign Modulator 1 to change the scale type. To do this, select one of the shapes in Modulator 1's LFO window—Random is a good choice—and set the Destination to Scale-Type. Play with the Frequency and Amplitude values, and turn off the Quantize (Q) setting so the scales don't change with any regularity.

To alter the phrase even further, set Modulator 2's Destination to Scale-Key, select an LFO, and set both the Amplitude and Frequency values to very high numbers. Next, change Modulator 2's Destination to Pitch:Transpose, and set the Frequency to 180 and the Amplitude to 450. The resulting notes cover a huge range, but the rhythm is a bit static, so change the Destination of Modulator 1 to Rhythm:Time-Compr. to generate variations of the phrase's duration. (I wonder what Bach would have thought.)

SPLITSVILLE

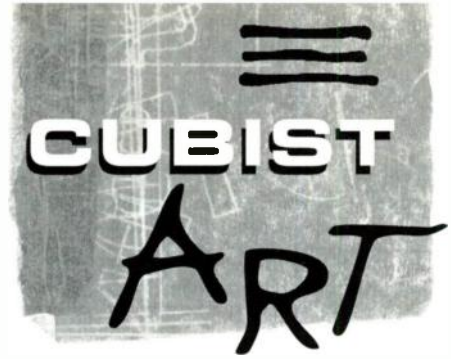
By now, you should be getting some idea of the IPS's flexibility, and you might want to consider loading your own music into the Phrase Input. To do so, highlight any segment from a track, and then select Send to Phrase from the Edit menu. The number of the track from which the phrase comes appears in the active Phrase list.

You can also create a keyboard split with the IPS using both IPS A and B. (You knew there are two separate

I've Got Rhythm

The relationship between the Echo, Quantize, and EchoDec values in the MIDI Processor and the number of clock pulses they represent is not intuitively obvious. Each increment of these values represents eight clock pulses, as illustrated in this table.

Echo, Quantize, or EchoDec Value	Number of Clock Pulses	Rhythmic Value (at 384 ppqn)
192	1536	whole note
96	768	half note
48	384	quarter note
24	192	eighth note
16	128	eighth-note triplet
12	96	sixteenth note
8	64	sixteenth-note triplet
4	32	32nd note
3	24	32nd-note triplet
2	16	64th note
1	8	64th-note triplet



phrase synthesizers in *Cubase*, didn't you?) First, record a 4-bar bass line into track 1 at a tempo of 120 bpm. Make sure IPS A is active by clicking on its button in the lower right corner of the IPS screen; then use the Copy to Phrase command in the Edit menu to send the clip to the IPS. When prompted, select the next "Empty" phrase slot in the Copy Part to Phrase dialog box. Then select Track 1 from the drop-down list in the Phrase Input section to make your phrase active.

Now record a lead line on Track 2 that fits your bass part. Click on the IPS B button; then copy the new line to the IPS, and make it active by selecting Track 2 from the Phrase Input list. Toggle between A and B by clicking on their buttons in the lower right of the window to make sure you've got a different phrase in each one.

Set the Interpreter Mode to Transp. Cont, and click on the Retrigger button for both IPS A and B. Then set the MIDI Input Sort value to Highest Note for both IPS A and B. Set the MIDI Input range so it reads C2 to B2 for IPS A and C3 to C8 for IPS B. Make sure both IPS A and B are on; then play on your controller. Low notes trigger the bass part in IPS A, and high notes trigger the lead line in IPS B.

For one final effect, select IPS B by clicking on its button, select an LFO for Modulator 1, and set its Destination to Program Change (at the very bottom of the list). Start with fairly low Frequency and Amplitude values, and experiment with higher values when you feel daring. If the rapidly changing Program Changes are too wild, try setting the Destination to MIDI Out Channel, and call up some of your favorite patches on channels 3 and up. Call this a poor person's wave sequencer, but I've gotten some cool effects using both of these methods.

INPUT TRANSFORMER

Let's take a look at one more feature of *Cubase*—the Input Transformer. This function is much simpler than the others, although it provides a unique approach to processing MIDI data. The basic concept is this: what goes in is not necessarily what comes out. The incoming data can be scaled, offset, rechannelized, and completely transformed into different MIDI messages altogether.

Here's an example that lets you trigger bass-drum notes with the mod wheel on your controller. Make sure that MIDI Thru is on in the Options menu. Then open the Input Transformer, which is also found in the Options menu (see **Fig. 3**). The top half of the window is the Filter section, where you specify the types of events you want the Transformer to watch for. The bottom of this window is the Processing section, where you indicate the desired transformations.

In the Event Type field of the Filter section, select Equal as the top value and Control Change as the bottom value. Next, move to the Filter section's Value 1 parameter, and select Higher from the list; 0 appears in the box below this field by default. Now, move to the Event Type field in the Processing section, and set it to Fix. Just below that field, select Note from the pull-down menu.

With these settings, you have told *Cubase* to watch for Control Change messages with values greater than 0 and to transform them into Note On

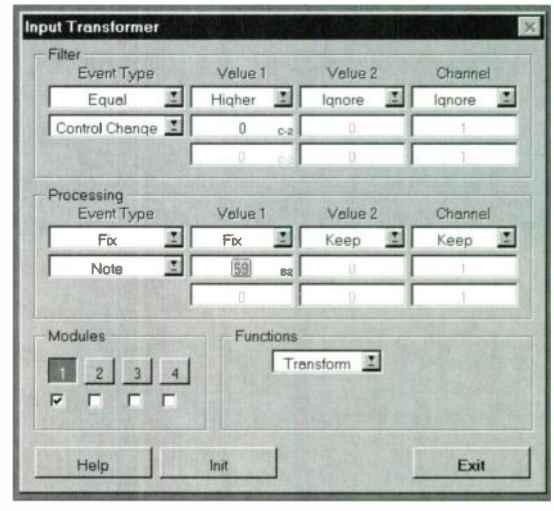


FIG. 3: The Input Transformer converts one type of MIDI message into another. Up to four transformations can be performed simultaneously.

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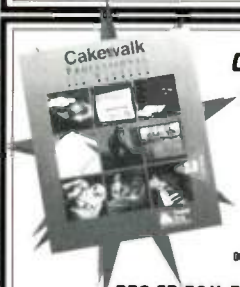

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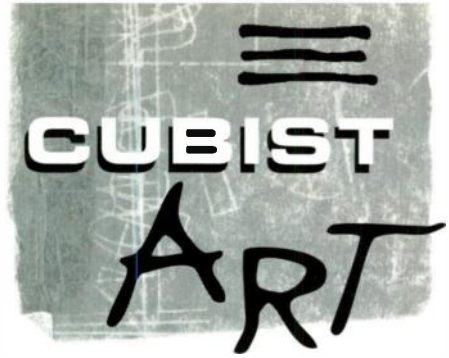

messages. The notes that result from this transformation are determined in the Processor's Value 1 box. For example, if you select Fix in the top box and note number 35 in the field immediately below it, every CC message will trigger a bass-drum sound in a GM drum kit, so use that value for now.

Leave the other parameters at their default settings, and click on the button marked "1" in the Modules area of the window. This button should become gray, and the box beneath it should have a check mark in it. Then try the Processor by moving the mod wheel on your controller, slowly at first. You should hear the bass drum playing repeatedly as you move the wheel.

Experiment with different note numbers in the Processor's Value 1 field, such as 38 or 40 for a snare drum; then reset the field to 35 and try using your controller's footpedal to trigger the bass drum (which should feel a lot more natural).

You can also create interesting effects by triggering pitched instruments this way. However, you must be aware that the Input Transformer doesn't add Note Off messages to the Note On messages derived from the Modulation messages. As a result, you can end up with lots of stuck notes if you trigger a sustaining sound.

If you intend to record the Transformer's output into *Cubase,* there are several ways to fix this stuck-note problem. For example, you could use the Legato function to trim the notes with no overlap. You could also use the Fixed Length function or quantize the length of the notes. Finally, you could use the Logical Editor to fix the note lengths to any value.

As you probably noticed, four Transformer modules are available from this screen. These modules work in parallel: if you transform data in Module 1, it doesn't show up for further processing or filtering at Module 2.

However, you can transform four different datastreams at the same time. Click on the Module 2 button, and change the Event Type parameters in the Filter section to Equal and Program Change. Set the Filter's Value 1 parameters to Higher and 0; then set the Processing section's Event Type to Fix and Note. Set the Processor's Value 1 to Fix and a note number (e.g., 60). Now, every time your controller sends a Program Change, the designated instrument plays a middle C.

THAT'S ALL FOR NOW

I've just scratched the surface of *Cubase*'s MIDI-processing capabilities, but I hope you've collected enough ideas to begin exploring these techniques on your own. There's really nothing quite like the IPS in any other sequencer I've seen, and the MIDI Processor and Input Transformer also offer a wide range of possibilities for generating interesting effects. Get to know this side of *Cubase.* You'll be glad you did.

Dennis Miller *is a composer living in a suburb of Boston. Thanks to Patrick Strenge and the entire Steinberg crew for their help with this article.*

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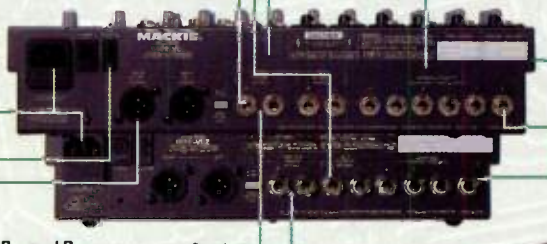

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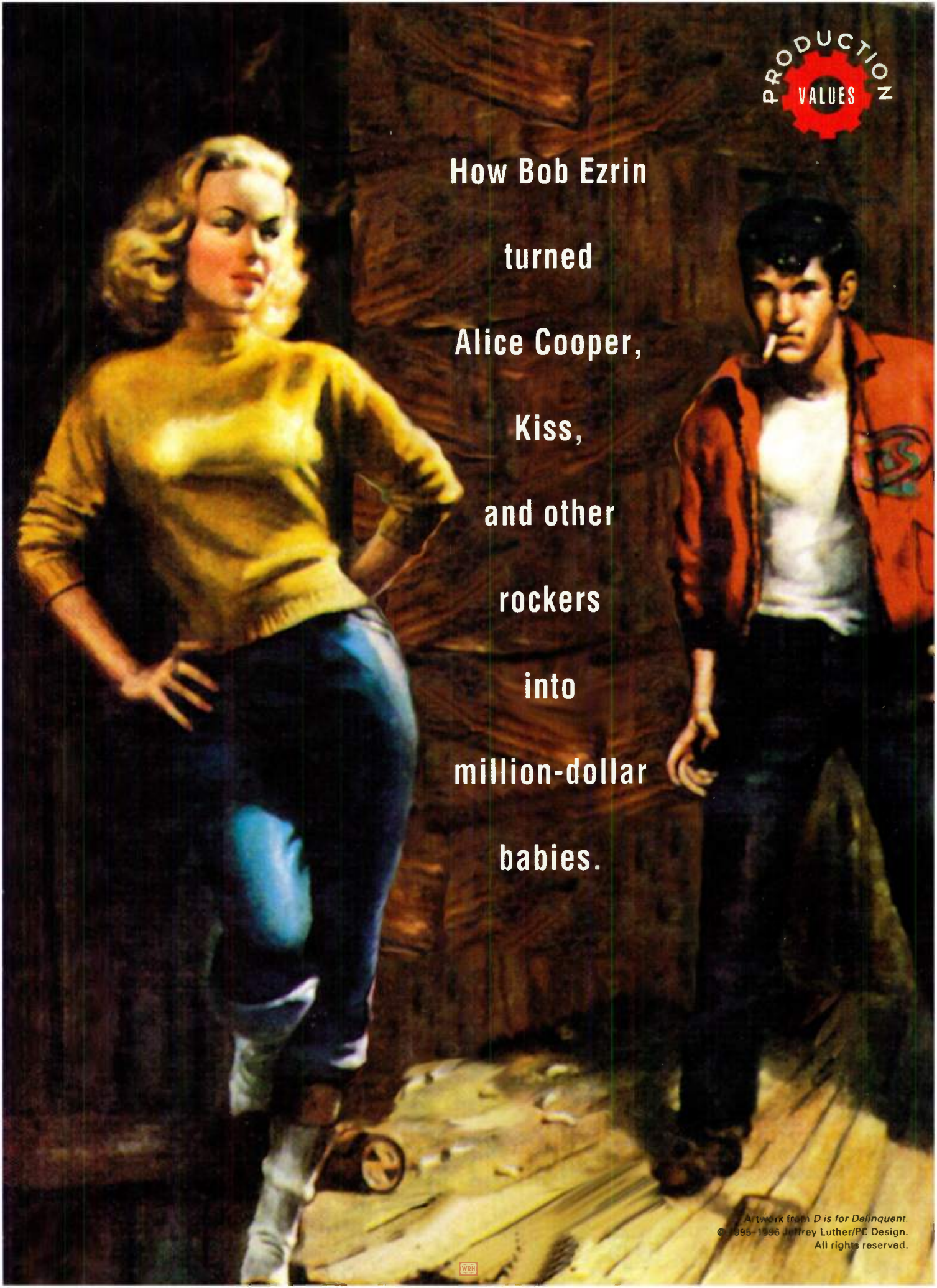
BY GREG PEDERSEN

During the early 1970s, Alice Cooper's teen anthem "Eighteen" proclaimed the frustration of being thrust into the first terrifying stages of adulthood. While millions of teens identified with Cooper's angst, one teenager in particular was not, as the song stated, "living in the middle of doubt." That confident teen was Bob Ezrin, who at nineteen years of age, was the coproducer of not only "Eighteen" but Cooper's entire debut album, *Love It to Death*.

Surprisingly, Ezrin's chart success owed little to the fact that he was a teenager producing records for other teenagers. His ears proved to be much more versatile than those of the stereotypical "with it" pop producer of the day. The young Ezrin possessed a vast knowledge of music theory and developed formidable engineering chops. His production style exhibited a yin-yang approach, as he rebelled against standard recording practices but adhered to traditional songwriting structures and classical orchestration techniques.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ELECTRONIC MUSICIAN 1996 EDITORS' CHOICE

Art rockers Pink Floyd didn't care about scoring hits until Ezrin remodeled "Another Brick in the Wall (Part II)" into an FM radio smash.

Ezrin was also a master at exposing his clients' unexplored creative sides. For example, he convinced Cooper that the "devil's house band" had a softer side and scored massive hits with the ballads "Only Women Bleed" and "I Never Cry." Ezrin pulled the same trick with rock's Kabuki Kids, Kiss, by producing a lushly orchestrated ballad entitled "Beth." The song became their first smash single. His golden touch even benefited the esoteric, art-rock troupe Pink Floyd when he rearranged "Another Brick in the Wall (Part II)" into an accessible hit-single format.

These days, however, the only knobs Ezrin is likely to twist are the ones on his car stereo. He is currently president and cofounder of 7th Level, an interactive-software company that produced, among other consumer titles, the tremendously popular *Monty Python's Complete Waste of Time* CD-ROM. Despite the successful career change, Ezrin has not taken a permanent vacation from the record business. He doesn't discount the possibility of future production projects, and he is seriously considering starting a record label with his partner in 7th Level, saxophonist Scott Page.

Ezrin graciously interrupted his hectic schedule to share some production secrets with **EM** readers and recount a selection of fascinating stories behind the making of some of the '70s biggest FM hits. Here's what went down.

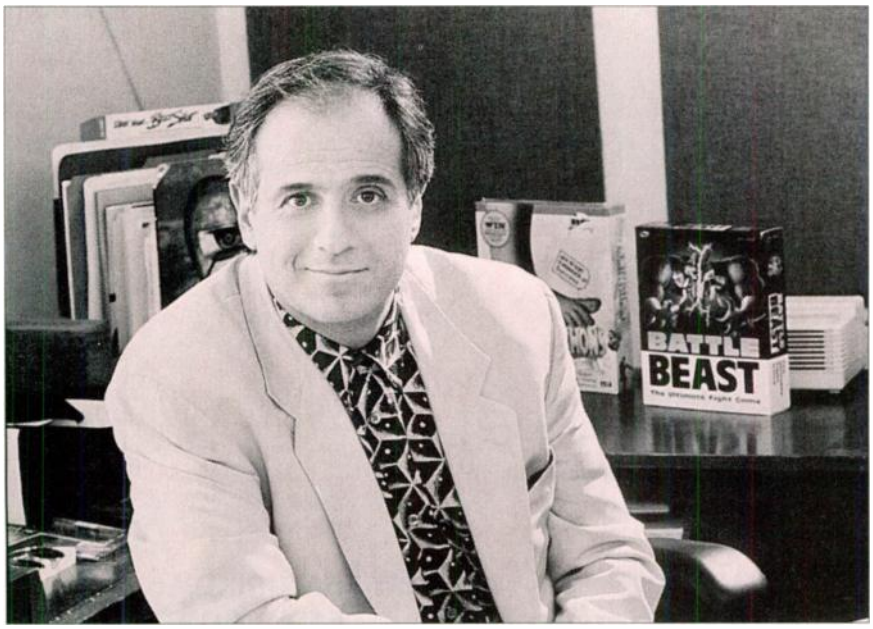
Coproducing Alice Cooper's *Love It to Death* seems like an awesome responsibility for someone who was only nineteen years old. Did the album's executive producer, Jack Richardson—who had produced all of the Guess Who's smash hits—give you much creative latitude?

I was an idea guy, an arranger, and, to a certain extent, a performer, but I wasn't allowed to be very hands-on. The actualizers, from a technical point of view, were Jack and engineer Brian Christian.

However, every production or engineering technique that I used throughout my entire career was discovered while doing that first Alice Cooper record. After that, I was only refining what I had already learned. Jack taught me about the physics of sound, the characteristics of different microphone capsules, the importance of mic placement, and even the reasons why instruments are constructed in certain ways. He impressed upon me that true creativity must be built on a certain understanding of the craft, but what I didn't learn until later was that rules are made to be broken.

So when was it that you started breaking the rules?

It was during the recording of the album *School's Out* by Alice Cooper. I had moved to New York and was working with Roy Cicala, who owned the Record Plant. Roy used to set up these incredibly complex signal paths and



Producer Bob Ezrin behind a different type of desk at 7th Level, his successful interactive-software company.

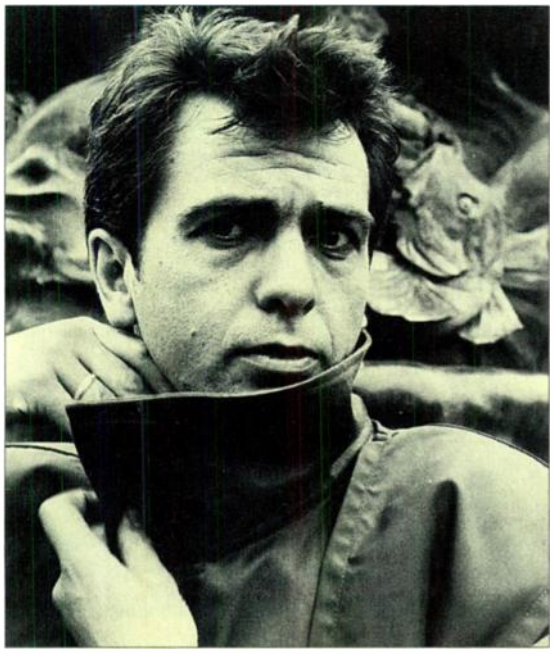
effects chains, and he would train me by starting something and then leaving me alone. He'd say, "I'm going to get a drink of water," and he wouldn't come back! I'd be confronted by a snare drum track that was routed through a series of Pultec, Altec, and Urei compressors and then back into an input channel for some additional EQ. If I wanted a different snare sound, what was I supposed to do? He had left the room! Eventually, I learned that nobody would die if I turned a knob. So I became fearless and started turning knobs until I found what I liked.

The vocal tracks on that record sound very energetic and aggressive. What were some of the techniques you used to produce such an in-your-face sound? Initially, I had followed all the rules about recording vocals the "correct" way, but when I listened to the tracks, they didn't sound real to me. I went reaching for whatever I could find to give the vocals some sense of power and space. The only things available were EMT plate reverbs and tape echo. I ended up combining tape slap and the EMTs to produce a long, thick reverb sound. I really started getting into playing games with slap and reverbs on *School's Out*.

I actually got a lot of my sounds out of really cheap stuff—I just used it right! For example, I almost always used a Shure SM57 to record Alice's voice. The trick to using the SM57 on vocals is compressing it to even the sound out and then getting gross with equalization. I would dial in some real tough-ass midrange and a lot of top end. If you stick that in your mix, you'll get a compelling, gut-wrenching rock vocal sound.

However, I learned never to EQ the vocals until *after* I had compressed them. You see, there are certain frequencies that are naturally predominant in everyone's voice. When I tried equalizing before patching in compression, I'd often bring out some of the low-end stuff. At certain parts of a singer's range, this EQ would produce a low-frequency hump that hit the compressor like crazy and caused the signal to sound squashed and dull. I discovered that it's better to first let the compressor level out the overall quality of the voice and then go in and start tweaking the specific frequencies I wanted to emphasize or de-emphasize.

On an emotional level, it's difficult to get vocalists to deliver exciting performances if they feel uncomfortable wearing headphones. I'd typically have them sing without headphones and let them monitor the tracks through some huge speakers. To diminish leakage from the rhythm tracks into the vocal mic, I'd use the old trick of putting the speakers out of phase. Somewhere between those two speakers will be a point at which the sound-pressure level is close to zero. All you have to do is have someone move the mic around while you listen in the control room for the spot where there's almost no leakage. Leave your mic in that spot. Now, your



Peter Gabriel found himself gaffer-taped to a pillar when he couldn't deliver the passionate vocal Ezrin wanted for the song "Modern Love."

vocalist can stand in front of this great big PA system and feel the music surround them, just as if they were singing onstage.

The electric guitar tones on the single "School's Out" really evoke the larger-than-life sonic quality of a rock anthem. How did you record them?

We drove the signal paths crazy! On "School's Out," we didn't put the guitars through an amplifier at all: we just plugged them directly into a Spectrasonic mixing console and absolutely creamed the mic preamps. I really wanted the guitars to be bratty sounding, so we went for ultradistortion. The preamp level was turned up to infinity, so you'd hear this fuzz guitar as soon as the channel fader was brought up.

On the other side of the coin, how did you track those beautiful acoustic guitars on Pink Floyd's *The Wall*?

The key was microphone placement. Whenever I recorded an acoustic guitar, the first thing I would do is stand in front of the guitarist and listen to the performance. Then I'd plug one ear—because most microphones only hear from one pinpoint source—and move around, listening with my open ear, until I found the spot where the guitar sounded best. In that sweet spot, I would really pay attention to the tonal contour of the guitar. Is it rich in the midrange? Does it have a big, boomy sound on the bottom and very little presence? The trick is *not* to use a microphone that has the same tonal qualities as the guitar. For example, a Neumann U 47 would sound too muddy on a guitar with a boomy low end.

Your love of classical music usually managed to sneak into your production style. How did you convince hard rock acts such as Alice Cooper and Kiss to incorporate string orchestrations into their records?

First of all, my enthusiasm was always relatively infectious. I think the bands got caught up in the excitement of trying something that was new for them. For me, however, it was fundamental to apply basic music theory and classical orchestration techniques to rock and roll. That didn't necessarily mean putting strings on a track; I could also orchestrate for the basic rock-band instrumentation. I would say things like, "This sounds like a cello part to me. Of course, it's a guitar, but we're going to treat it like a cello and play a cello line."

On Alice Cooper's "Eighteen," for example, the guitar, bass, and drum parts were arranged so that there was a rhythmic bed, a counter melody, a basic guitar-riff melody, and a vocal melody. The four- or five-part orchestration was a very classical approach to arrangement that produced a thick, moving sound without anyone having to do anything too fancy.

Pink Floyd's "Another Brick in the Wall (Part II)" is one of rock radio's most successful singles. Did you know it was going to be a huge success?

I was sure that "Another Brick in the Wall (Part II)" could be a hit single, but Pink Floyd basically refused to do singles. Initially, I was concerned because the song was only one verse and one chorus long. I asked [Pink Floyd songwriter] Roger Waters for a second verse and a second chorus, and he basically told me to bugger off. So I ended

up cloning the tracks and splicing the two parts together to construct a basic track composed of two verses and two choruses. Then I spliced in a combination of two drum fills to get into the song's climactic guitar solo. When I played it for Roger, his eyes lit up because he knew it was going to be a hit.

What are some of the wilder things you have done to elicit a great performance from an artist?

Well, we gaffer-taped Peter Gabriel ten feet up a pillar to get a vocal take for the song "Modern Love" [from Gabriel's 1977 solo debut *Peter Gabriel*]. The chorus went, "Oh, the pain. Modern love can be a strain." I just wasn't believing him, so I said, "Look, if you don't make it believable, you're going up the pillar!" We gave him three or four takes to try it, and then up he went. I turned to the engineer and said, "Mic him!" And that's how we got the performance.

There were so many other things we did! For example, we were having a particularly rough couple of days during the sessions for Cooper's *Welcome to My Nightmare* album, so I brought a traveling circus into the studio. This little troupe of jugglers, magicians, and dwarfs interrupted the session and did this fun routine. Cooper's band immediately started playing circus music, and it really brought everybody up. Immediately following that, the band cut the master take to "Only Women Bleed."

Ezrin ringmastered Alice Cooper's rock 'n' roll circus through a couple of certified classic albums and several hit singles.

Considering that you cut your teeth during the golden age of analog recording, it must be amusing to watch all these digital audio zealots scrambling to find old tube gear to warm up their tracks.

The reason people like to use old Neve consoles and other tube processors is because tube technology has a tendency to bend as opposed to break. There is a physical component to a tube sound; it's almost like a stretching muscle. You can push and push the signal toward the breaking point, and you can actually feel the strain. Then, when you hear the signal start to break up, you can control the amount of distortion by how hard you hit the device with the input signal.

Having said that, I must say that I love the digital domain—I just hate what the audio business did to it. The market has frozen technology at a certain level. We've doomed ourselves to deal in an audio standard so far inferior to everything else that it's laughable. I recently flew to London with a guy from a telecommunications company. He said, "Your top-end sampling rate is 48 kHz? That's a joke! We have switches that operate at 300 kHz, and we're only talking about telephones! I thought you music guys were supposed to be into high fidelity."

But doesn't the 44.1 kHz sampling rate cover the 20 Hz to 20 kHz range of theoretically perfect human hearing?

Theoretically, yes. The 44.1 kHz sampling rate delivers an "on" and "off" for every frequency between 20 and 20,000 cycles, which *should* give you everything. But it really only covers the fundamental sound. It doesn't offer critical resolution for harmonically rich source sounds. And these harmonics are what give a sound a real sense of density.

You can hear an example of how today's digital technology fails to document these types of sounds when you listen to a digital reverb. Toward the very end of the reverb decay, the sound just drops off. It's gone. However, when you hear the end of a note in an acoustical space such as the Notre Dame cathedral, the reverb will slowly fade until it disappears into a thick soup of audio interference. There is a warmth and a density that gives the sound life. This is what's missing in digital.

BARRY LEVINE

Tons of makeup and lots of noise made Kiss a concert favorite, but they didn't crack Top 40 radio until Ezrin guided them through a ballad called "Beth."

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But just because a sound is reproduced using numbers doesn't mean it can't be "real." You can produce very warm and organic sounds in the digital world, but you need to have enough digital information available to do it properly. A 44.1 kHz sampling rate just doesn't cut it.

WARING ABBOTT

Ezrin walked on the dark side of pop while producing Lou Reed's *Berlin*.

What is your primary goal when making a record?

My primary responsibility is to make the recording experience as productive and constructive as possible for the people involved. My secondary responsibility is to ensure that there is some empirical quality level in the product. If all you care about is the product and you don't care about the people, the product will suffer because the people are what make it great.

Freelance writer **Greg Pedersen** *is content being a Million Dollar Baby.*

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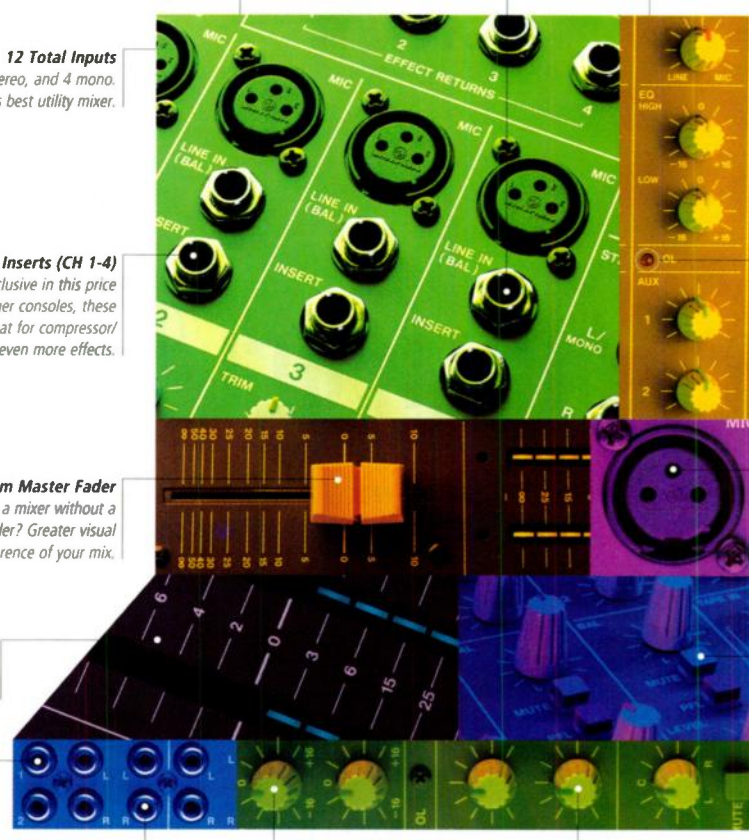

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Windows Multimedia Tools

Peek into a professional composer's multimedia toolbox.

By Scott R. Garrigus

There is so much music software available for the PC these days that it's sometimes hard to know what to buy. Obviously, cost, features, reliability, and support are issues that should be taken into consideration. The most important considerations, however, should be whether a program does what you need it to do and whether it does it without adding a full menu of hassles to your plate.

When composing for multimedia, the "hassle factor" becomes a critical issue because multimedia musicians must play many different roles. These multiple responsibilities often include finding ways around the limitations of composing General MIDI files for FM sound cards, creating digital sound effects from scratch, and converting batches of MIDI files from one format to another.

As a PC user in the multimedia field, I've spent more than a fair amount of time searching for programs that could help me easily deal with the above scenarios (and many others). So, this month, I'd like to share some of the PC tools that I use to produce multimedia scores, the reasons I chose a particular program, and some of the ways that I use the tools. Keep in mind that these are *my* choices; there are many other fine programs that can also do audio-for-multimedia duty.

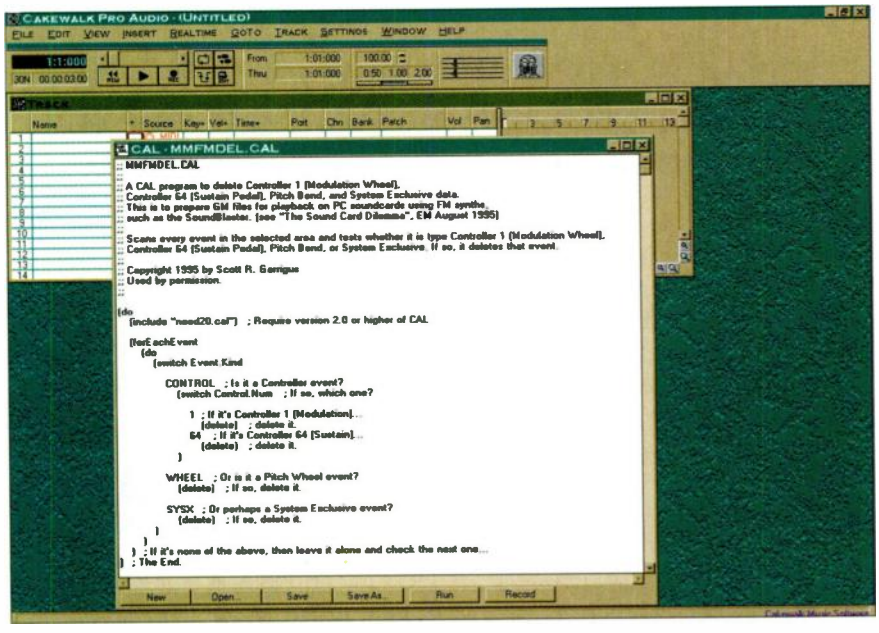
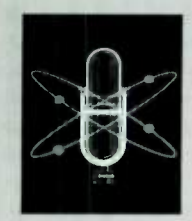


FIG. 1: Here's the CAL program I use to delete Controller 1 (Modulation), Controller 64 (Sustain Pedal), Pitch Bend, and SysEx data from my GM sequences.

PIECE OF CAKE

In my opinion, Cakewalk Music Software's *Cakewalk* (reviewed in the April 1996 **EM**) is one of the best MIDI sequencers available for Windows. Its intuitive user interface and comprehensive range of features make it stand out from the crowd, but the Cakewalk Application Language (CAL) really makes it an indispensable tool.

CAL is *Cakewalk*'s own macro language—which is loosely based on Pascal programming—that lets you create



OK, so you saved up your pennies and managed to get that Modular Digital Multitrack machine that you've had your eye on for what seems like forever. You eked out enough cash for a super-cool 8-bus console to feed your new deck, and if you were smart you even got an A R T MDM-8L Eight-Channel Limiter to keep the danger of digital clipping a non-issue. But after tracking your current opus, you can't help but think that there's something missing when listening back to your digitally-pristine new tracks. No smooth tape compression. No subtle coloration or mild distortion that you're used to hearing. No warm fuzzies. And you wonder...

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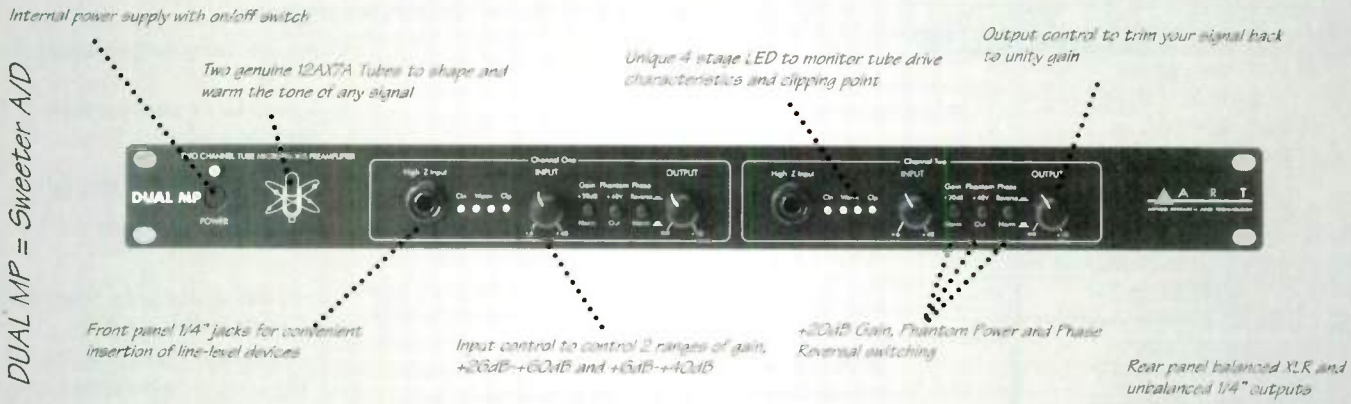

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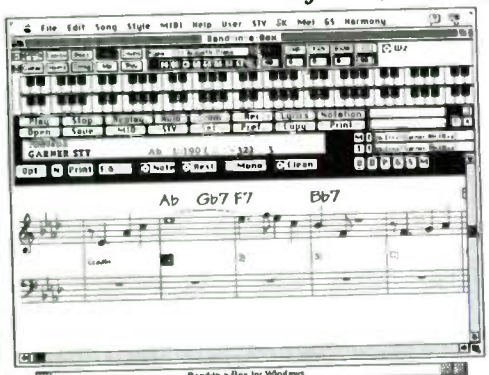

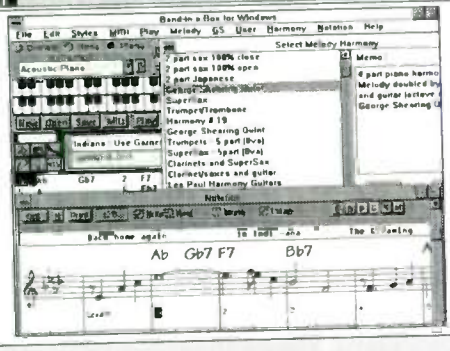

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unique, custom editing tools. CAL can be used to control all MIDI data parameters as well as many of *Cakewalk*'s own processing functions.

For example, some of the restrictions a composer faces when composing GM files for FM sound cards are a limited number of available synth voices, the lack of standardized Pitch Bend and Modulation Controller ranges, and no support for SysEx messages. (For more information, see "The Sound Card Dilemma" in the August 1995 **EM**). Because of these restrictions, the use of MIDI Controller 1 (Modulation Wheel) or Pitch Bend can cause a great guitar-solo emulation to sound like a whale's mating call. Futhermore, use of Controller 64 (Sustain Pedal) can cause voice stealing to occur. Finally, SysEx is not available, so using it just wastes MIDI bandwidth.

Now, even if you make a deliberate effort to keep your tracks clear of these messages, they can sometimes sneak in. I sometimes use a Roland JX-8P and, by design, this keyboard spews out System Exclusive messages every time you press a button. To ensure that none of these messages are lurking within my sequencer tracks, I must search for them and delete them. Doing this one track and one message at a time takes a minimum of 13 steps *per track*. Fortunately, CAL reduces this process to a simple two-step function (see **Fig. 1**).

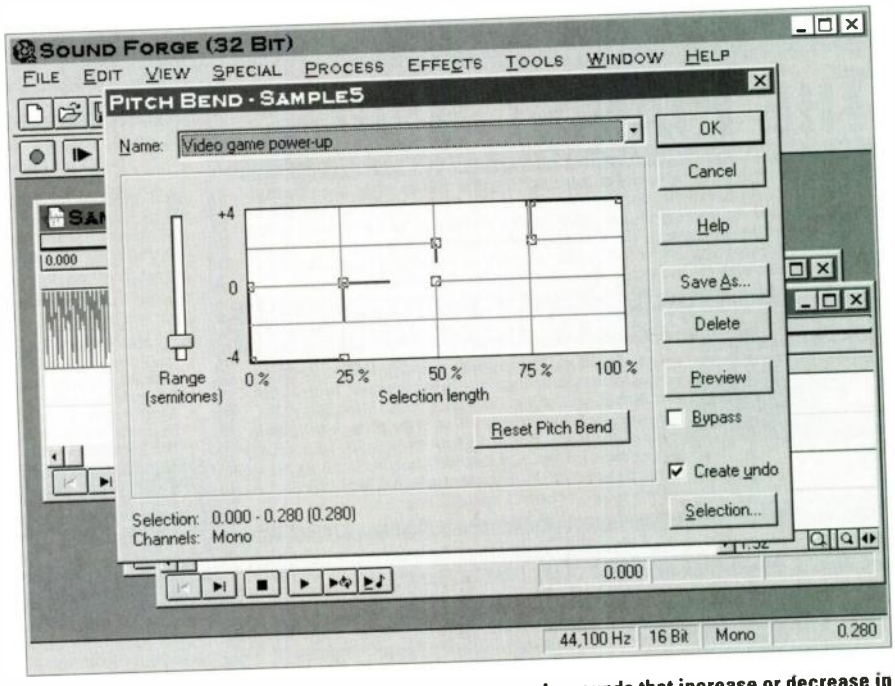

FIG. 3: Using *Sound Forge*'s Pitch Bend effect, you can make sounds that increase or decrease in pitch over time.

If you're a *Cakewalk Pro Audio* user, CAL can also be used to control the software's digital audio tracks. I often integrate digital sound effects into my MIDI sequences, and CAL allows me to animate these effects *and* save file space. For example, I can avoid space-gobbling stereo sound effects by simply moving monaural sounds around the stereo spectrum. I just use CAL to program some random Controller 10 (Pan) events into the sequence. *Voilà!* The monaural sounds come alive.

USING UNISYN

Synthesizer programming is also an issue when composing for multimedia, and Mark of the Unicorn's *Unisyn* (reviewed March 1996) has helped me develop many original synth patches. *Unisyn* is a universal editor/librarian program that supports more than 200 MIDI devices. Its patch database can locate all your favorite patches quickly and easily, and *Unisyn* even allows you to save the current state of your entire MIDI studio with the click of a mouse so that the next time you power up, everything is set the way you last left it.

One of *Unisyn*'s coolest features, however, is its Programmable Patch Generator. The PPG allows you to create new patches based on two already existing ones by morphing between them. Some of my favorite combinations for spicing up interactive musical scores are piano and strings (see **Fig. 2**), organ and horns, and woodwinds and synth pads. However, you can create truly unique sounds by experimenting with seemingly bizarre combinations.

The key to developing patches that don't result in a random combination of settings is *Unisyn*'s Parameter Mask. This option allows you to select which parameters (such as Velocity, Sensitivity,

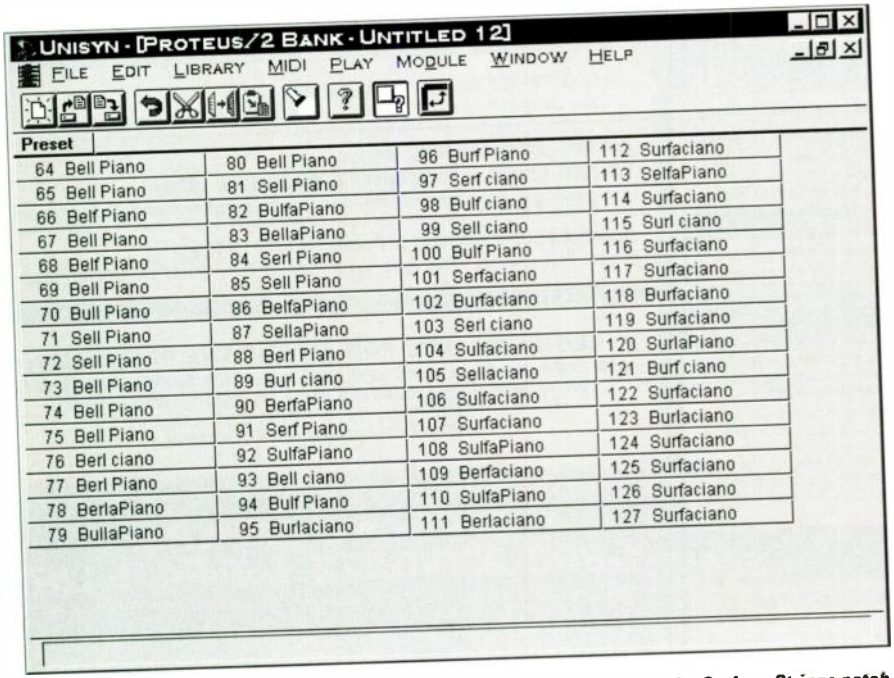

FIG. 2: This bank of patches was created by blending a Bell Piano patch and a Surface Strings patch with *Unisyn*'s Programmable Patch Generator.

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etc.) of each patch are to be blended. On my E-mu Proteus/2, I like to select both the Primary and Secondary Instruments and Envelopes as Parameter Mask settings. This creates patches that are different but close enough to the originals to be recognizable.

FORGING SOUNDS

In addition to composing musical scores, multimedia composers are often asked to produce sound effects. For this chore, a digital audio editor is essential. My favorite Windows editor is Sonic Foundry's *Sound Forge* (reviewed April 1995) because it provides almost every tool imaginable for massaging digital audio. In addition, the audio quality of the processed sound files is excellent.

Sound Forge also includes a feature called Simple Synthesis that is great for making sounds from scratch. Simple Synthesis lets you create basic sound waves such as Sine, Square, Sawtooth, Triangle, Noise, and Absolute Sine. Combining this tool with some of *Sound Forge*'s other processing functions and effects produces a wide variety of sounds.

For example, I recently had to create a "power up" effect—typically, the "boo bid ee boop" sound you hear when a game character acquires increased energy by running over a flashing object—for a video-game project. The producer wanted a classic arcade game sound but did not want to invite any copyright hassles by simply copying a classic beep. Luckily, it was a fairly simple task for me to produce an "old but new" sound using *Sound Forge*.

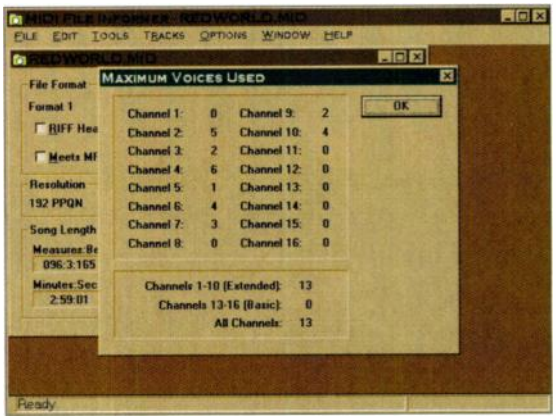

FIG. 4: The maximum number of synth voices needed to play a MIDI file can be found by using the Count Voices feature in *MIDI File Informer*.

First, I created an absolute sine wave using the Simple Synthesis tool. I made the sine wave 0.500 seconds long with an amplitude of 90 percent and a frequency of 261.63 Hz (middle C). Then I used the Time Compress/Expand function to cut the length of the sine wave in half.

At this point, you may be wondering why I didn't use a shorter waveform in the first place. Well, when you use the Time Compress/Expand function on a pure waveform, it produces a slight warbling sound. This warbling would normally be an unwanted artifact, but in this case, the audio blemish helped "perfect" the classic 1970s arcade tone I was after.

After Time Compressing the waveform, I ran it through *Sound Forge*'s Amplitude Modulation effect. I selected a Dry Out setting of 100 percent, a Modulated Out setting of 57 percent, a square waveform, and a modulation frequency of 3 kHz. The modulation added an appropriately tinny timbre to the waveform.

Finally, I needed to produce the rising-pitch effect common to classic arcade audio. For this, I used *Sound Forge*'s Pitch Bend option to draw an envelope that increased the pitch of the waveform over time (see **Fig. 3**). Thanks to *Sound Forge*, I was able to produce my own custom version of the classic beep.

RESOURCES

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Cakewalk Music Software
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USING UTILITIES

No multimedia composer's toolbox is complete without a set of MIDI utilities. My pick is Artic Software's *MIDI Music Utilities* package—a collection of nine complete programs, each covering a different aspect of MIDI management.

The utility that helps me the most is MIDI File Informer (MFI). This deceptively simple utility makes managing MIDI files for multimedia a snap. Upon loading a MIDI file, MFI displays all vital information such as file format, resolution, song length, track names, and copyright notice. You can get even more information by clicking on a track name. MFI will reveal the selected track's initial settings for Modulation, Volume, Pan, Expression, Patch, and Port Number. The utility will also tell you what channels are contained within the track and whether the track contains SysEx data.

Two of my favorite tools within MIDI File Informer are Count Voices and Stretch Song. Count Voices determines the maximum number of voices required to play a MIDI file and displays this information for each individual MIDI channel and all channels together (see **Fig. 4**). This is essential information when you're composing for PC sound cards that offer limited polyphony. Stretch Song allows you to specify how long a MIDI file plays by inputting a set length in minutes, seconds, and hundredths of a second. All of the tempo events in the file are then scaled by the amount necessary to play the song in the specified time. This is great for when you need a MIDI file to play for an exact length of time, such as during a start-up theme for a video game.

▼

No multimedia composer's toolbox is complete without a set of MIDI utilities.

Another of my favorite MFI tools is Batch Operations. With this option, you can change the copyright notice and file format, and you can remap channels and ports to a whole list of selected MIDI files with a single keystroke. This definitely saves a lot of time, especially when you have a bunch of files in MIDI File Format 1 and your producer needs them to be in MIDI File Format 0.

THE RIGHT TOOL

Choosing the right tool for the right task can be difficult with so many companies vying for your business. Luckily, composing for multimedia requires very specific tools for certain tasks—which often narrows the choices a bit. I hope that my detailing a few of the tools I use will make it easier for you to recognize which programs fit best with your working methods and job requirements.

Scott R. Garrigus *loves finding new uses for his musical tools. You can visit his Web site at http://users.aol.com/scottg68 or e-mail him at garrigus@pan.com.*

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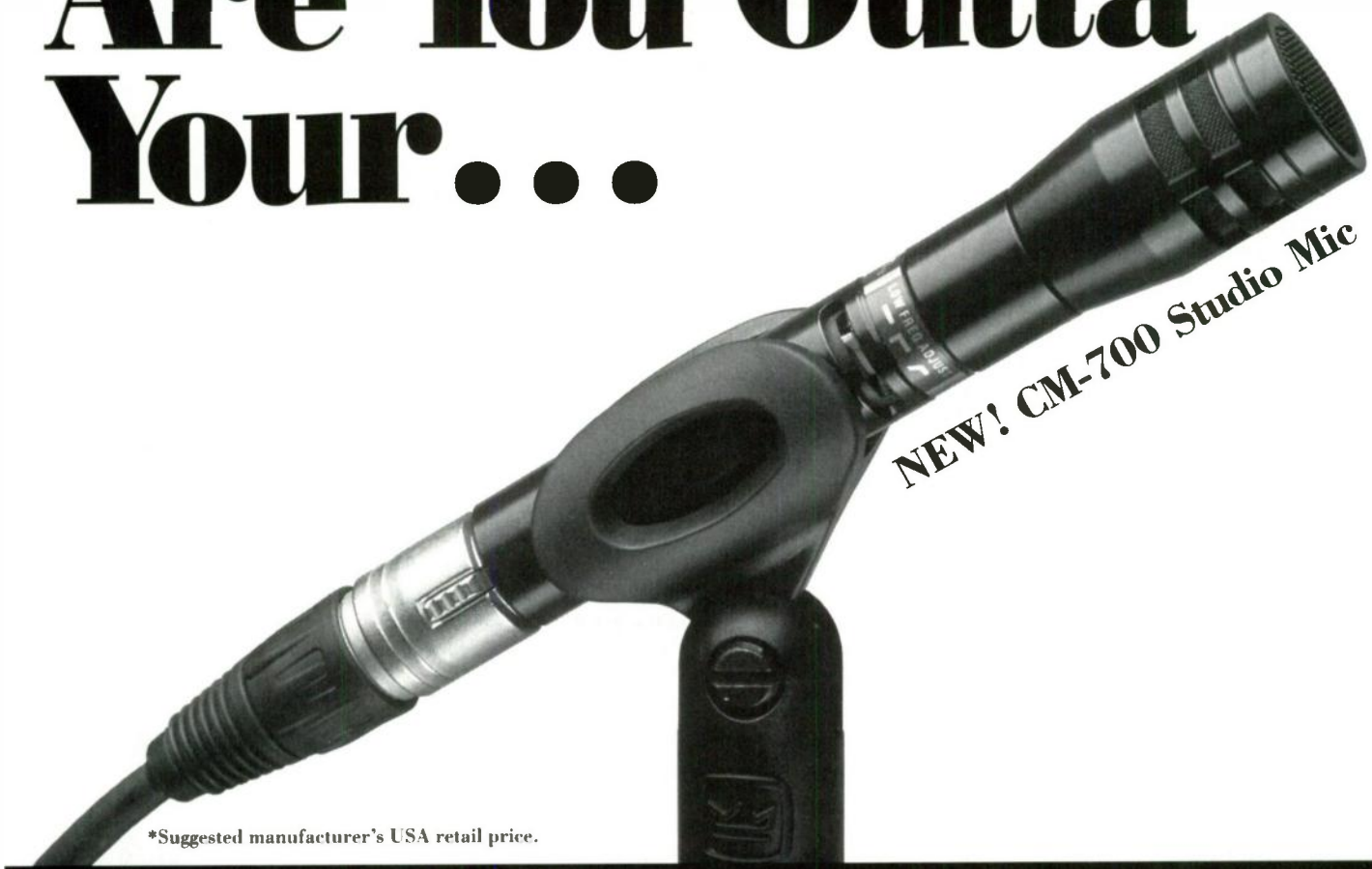

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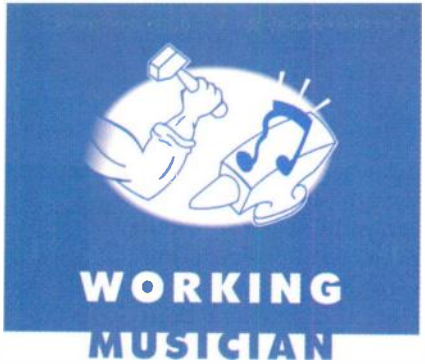


Publishing Your Praise

How to make your contemporary Christian worship music heard.

By Jennifer Conrad Seidel

Church worship music hasn't been the same since folk and rock music were introduced into Sunday worship services during the 1960s and '70s. Church music has always reflected the musical trends of its culture: Many of the songwriters who wrote the songs we now call "traditional" took melodies that were popular during their time (including some drinking songs) and changed the lyrics. Even the hymns written by famous classical composers are reflections of their generations' musical styles.

Contemporary worship songs are used in a variety of settings, from Sunday-morning church services to worship-music conferences. (Photo courtesy of People of Destiny International)

But today's "contemporary" worship music is different from previous trends in one important way: it's commercially viable. Hundreds of new praise songs are published each year, and thousands of churches worldwide use contemporary worship songs in their church services and small-group gatherings every week. And according to Integrity, which is one of the largest contemporary Christian worship record labels, 11.8 million praise-and-worship tapes and CDs were sold in 1995.

TODAY'S PSALMISTS

How does a song get introduced in this new worship genre? For many praise-and-worship songwriters, the process starts when their songs spread to congregations other than their home churches. This was the case for Clay Hecocks, minister of music at Calvary Chapel, Fort Lauderdale, Florida.

"Our music ministry grew and eventually became an example of praise-and-worship services in our community," explains Hecocks. "People from other churches were asking us why our worship services are so successful, and they wanted to do our songs."

With financial backing from his church, Hecocks set up Kenaniah Music (tel. 954/977-9673; fax 954/977-9774; e-mail mail@calvaryftl.org; Web http://www.calvaryftl.org) and recorded the original songs being used by CCFL, most of which he had written.

When these tapes and CDs received airplay on local Christian radio stations, Christian bookstores started calling to order them. As his music became well known, so did Hecocks. He was invited to teach worship leaders at out-of-state conferences and workshops, which led to his songs being used across the country and beyond. Some tapes even made it as far as Australia and France.

Because the music was so well received, Hecocks decided to record more songs. At one point, he sent tapes to several worship labels for their critique. Although some companies did not even acknowledge that they had received his tapes, Integrity's Hosanna! Music liked the tapes enough to want to record two of his songs. Hecocks agreed to a publishing deal, and now those two songs, "Doxology of Jude" and "O Most High," can be found on Hosanna!'s *Power of Worship* CD.

THE PUBLISHER'S ROLE

The role of a publisher in the praise-and-worship genre is more extensive than in most other genres. For one thing, the major praise-and-worship publishers are also major record labels. When a publishing company assumes the rights to a song, it gains control over the song's administration: it collects and distributes any royalties generated; it "exploits" the song by producing and distributing it in as many formats (e.g., print) and on as many projects as possible; it protects the song by filing legal forms, licensing it to other projects, and registering it with the appropriate agencies; and, because the record labels and publishing companies are one and the same, they decide who records the song and the style in which it's recorded.

Collecting and distributing royalties. Royalties are generated when the song is photocopied by a church, broadcast on the radio, or sold on a recording. Under the standard contract, the songwriter receives all the songwriting royalties and the publisher receives all the publishing royalties, each of which is 50 percent of the total royalties collected. If the songwriter and the publisher are one and the same, one person gets all the royalties. But as Hecocks puts it, "It's the difference between 50 percent of a lot or 100 percent of a little."

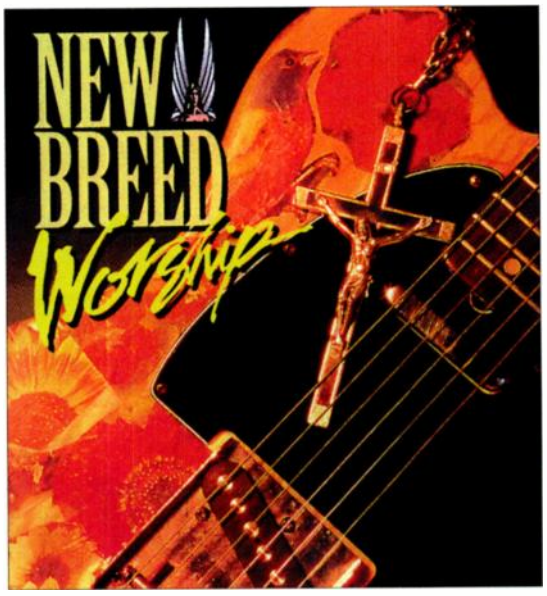
Obviously, the publisher needs to be compensated for its efforts. As Tommy Coomes, the leader of the Maranatha! Praise Band and the executive director of Maranatha! Music, explains, "The publisher really earns its share by investing money in the song: recording it, promoting it, and maintaining a staff to administer it. And the income generated gives the publisher the financial incentive to keep reinvesting in the song."

Holland Davis, a songwriter and worship leader who has more than 25 songs published by companies such as the Vineyard Music Group and Maranatha!, says that working with a worship-music publisher can be different than working with publishers in other parts of the music industry. "The worship-music publisher owns all the publishing rights, so your song becomes its property. In most secular companies," says Davis, "the publishing rights are split evenly between the writer and the publisher. VMG told me worship-music sales are so low that the publishers need to take all the rights in order to recoup their financial investment in the project."

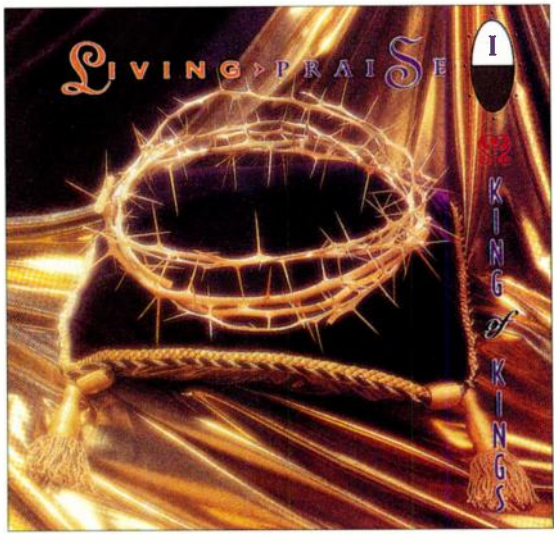
If you record a song that you've written but someone else has published, you may find getting permission to record and paying royalties to your publisher a little awkward. "I've recorded one of my songs that's under contract," relates CCFL's Hecocks, "and I'm paying royalties to Hosanna!. There's an ironic twist to that."

David Estes, director of A&R for Word's HeartCry label, explains what it would take for a publishing company to let a writer keep the publishing copyright to a previously self-published song. "We have about 30 full-time employees to develop, exploit, manage, and administer copyrights," he says. "If a songwriter who was actively developing and exploiting a song catalog were to come to us, there would be some validity in splitting the publishing rights. But there's more to publishing than getting a song on a record: in the praise-and-worship genre, we're working to get the song sung by the church at large."

Distribution. The most obvious incentive for a worship songwriter to consider publication—especially if it includes being recorded as part of a major release—is that his or her songs

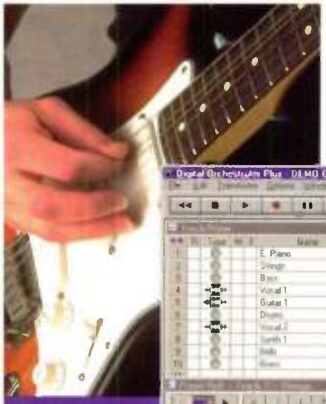


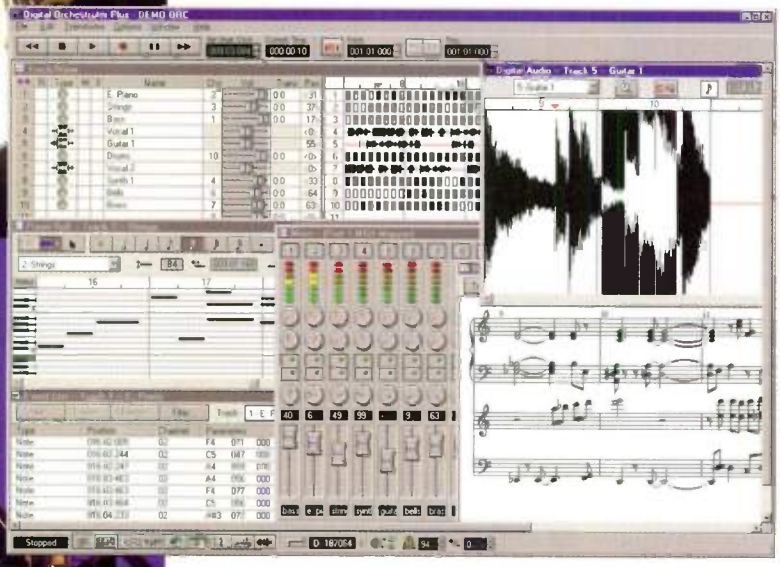
VMG's *New Breed Worship* was coproduced by the New Breed Worship Band, which included Holland Davis, a worship leader and songwriter who has more than 25 songs already published. This CD, aimed at youth, features popular Vineyard songs in classic rock 'n' roll arrangements.



Clay Hecocks, minister of music at Calvary Chapel, Fort Lauderdale, started Kenaniah Music and produced worship CDs with support from his church. This CD, *Living Praise I: King of Kings*, includes the Hecocks' song "O Most High," which was also published and recorded by Integrity's Hosanna! Music.

Awesome Features!





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then have the potential to be heard by millions of people.

Why did Hecocks go with a major label when his own project was already doing well? "Exposure," he says. "They have the vehicle to get stuff out there. Even if people hear your songs on the radio, they have to really work at it to find out who recorded it and how to order it."

Speaking of exposure, Promise Keepers, a Christian men's movement based in Boulder, Colorado, worked in partnership with Maranatha! Music to distribute custom recordings to men registered for PK conferences. In 1995, Maranatha! sold 800,000 *Raise the Standard* tapes to PK directly, and more than one million units of that recording have been sold to date. Even though those are significant numbers for the praise-and-worship market, the real importance lies in the fact that the PK tapes are sold to men whereas the typical consumers of praise recordings are women. Not only did Maranatha! and PK work together to distribute a large number of tapes, they also opened up a previously untapped portion of the market.

Protection. The publisher is responsible for protecting the song's copyright. Sometimes the publisher acts as a policing force to preserve the song's original form and intent, something a songwriter might not be able to do as effectively alone. For example, someone can't claim partial rights to your copyrighted song by writing a new verse or coming up with a new arrangement without express permission from the publisher. Writing additional lyrics to a song may seem unusual in other genres, but it isn't uncommon to encounter an additional verse to a song such as "Seek Ye First," a praise "standard" that's so well known, it often gets treated like it's in the public domain even though it is a copyrighted song. (Worship songs should be registered with the Library of Congress whether or not they are picked up by a publisher. See "Working Musician: Comprehending Copyright" in the February 1992 issue of **EM**.)

A worship-music publisher usually registers its songs with performance-rights organizations so that performance royalties can be collected. Churches, however, have certain performance exemptions when the performance takes place in the course of a religious service, so publishers often enter into an agreement with Christian Copyright Licensing, Inc. (tel. 800/234-2446 or 503/257-2230; fax 503/257-2244). CCLI licenses churches to copy songs for congregational use (for example, giving lyrics in church bulletins or on overhead transparencies) and collects royalties for publishers and songwriters based on the frequency with which their songs are duplicated.

Recording. For many songwriters, giving up the right to determine how a song is recorded is the hardest part of the publishing agreement. A publisher will strive to maintain a good working relationship with its songwriters, but it may still decide, with little or no input from the songwriter, which projects the song will be included on, who will perform it, and how it will be arranged and produced. This is why the songwriter needs to be familiar with and approve of the publisher's projects before a contract is signed.

For example, "Lord, I Lift Your Name on High" (published by Maranatha! Music) has been recorded in several different styles on a variety of projects. *Raise the Standard* features the song with one of its verses sung in Spanish. Because Maranatha! Music has gotten the

Every 1995 Promise Keepers' registrant received a *Raise the Standard* cassette. Promise Keepers' products and conferences have brought worship music to hundreds of thousands of men, a group previously considered only a marginal part of the praise-and-worship market.

CCLI's Top 25 Praise & Worship Songs

Rank	Song	Songwriter	Year of Copyright	Publisher
1	Lord, I Lift Your Name on High	Rick Founds	1989	Maranatha! Music
2	Majesty	Jack Hayford	1981	Rocksmith Music
3	I Love You, Lord	Laurie Klein	1978, 1980	House of Mercy Music
4	Give Thanks	Henry Smith	1978	Integrity's Hosanna! Music
5	As the Deer	Martin J. Nystrom	1989	Maranatha! Music
6	He Has Made Me Glad	Leona Von Brethorst	1976	Maranatha! Music
7	Glorify Thy Name	Donna Adkins	1976,1982	Maranatha! Music
8	We Bring the Sacrifice of Praise	Kirk Dearman	1984	John T. Benson Publishing Co.
9	This Is the Day	Les Garrett	1967, 1980	Scripture In Song
10	He Is Exalted	Twila Paris	1985	Straightway Music/ Mountain Spring Music
11	All Hail King Jesus	Dave Moody	1981	Glory Alleluia Music
12	Awesome God	Richard Mullins	1988	BMG Songs, Inc.
13	I Exalt Thee	Pete Sanchez Jr.	1977	Pete Sanchez Jr.
14	I Will Call upon the Lord	Michael O'Shields	1981	Sound III, Inc.
15	Holy Ground	Geron Davis	1983	Meadowgreen Music Co.
16	Open Our Eyes, Lord	Bob Cull	1976	Maranatha! Music
17	Jesus, Name above All Names	Naida Hearn	1974,1978	Scripture In Song
18	Praise the Name of Jesus	Roy Hicks Jr.	1976	Latter Rain Music
19	Because He Lives	William J. & Gloria Gaither	1971	William J. Gaither
20	We Will Glorify	Twila Paris	1982	Singspiration Music
21	Great Is the Lord	Michael W. & Deborah E. Smith	1982	Meadowgreen Music Co.
22	His Name Is Wonderful	Audrey Mieir	1959 1987	Audrey Mieir/ (renewed) Manna Music
23	Lord, the Light of Your Love	Graham Kendrick	1987	Make Way Music
24	How Majestic Is Your Name	Michael W. Smith	1981	Meadowgreen Music Co.
25	What a Mighty God We Serve	Unknown		

Rankings as of February 15, 1996. © CCLI.

song so much exposure, it has climbed to the number-one spot on the CCLI chart despite the fact that it was written and recorded so recently. (See the table "CCLI's Top 25 Praise and Worship Songs." The average copyright of these 25 songs is more than sixteen years old.)

Although giving up creative control can be difficult, it may be in the song's best interest. Few praise songwriters have the financial resources to record, produce, manufacture, distribute, and market their songs the way a publisher can. Many of the publishers include their songs in widely used songbooks, and some publishers are recording worship music in different languages and distributing these recordings across the globe.

Hecocks, who has both published songs himself and had songs widely published, says of his experience with Integrity's Hosanna!, "Of course I had no say as to how they recorded my song. I didn't necessarily care for the way they arranged it, but some people did. It's a little shortsighted of me to say that my way is the only way."

GAINING WEIGHT

Having a song published and recorded by a praise-music label can have unforeseen advantages. Since Integrity's Hosanna! published and recorded his songs, Hecocks' other projects have been picked up by Five Minute Walk Records, an independent label that has a distribution agreement with the Diamante Music Group.

"Having a song accepted by a major label creates an element of credibility," he explains. "The fact that a major institution picked up some of my songs has helped us get distribution for the music we've self-published. So even though there was some income and exposure derived from the Integrity deal, the biggest plus was how it opened the doors for our other projects."

The ministry with which a songwriter is associated often benefits from the attention generated by his or her worship music. For example, People of Destiny International, an organization that works to establish (or "plant") new churches, started making Song Service tapes for their churches when it became clear that some members of their congregations were writing songs worthy of distribution throughout the movement. Some of the songs included on these tapes were picked up and recorded by major-label publishers. The organization now has a contract with Word's HeartCry imprint.

People of Destiny's songwriters—including Steve and Vikki Cook ("Great Are You, Lord") and Mark Altrogge ("I'm Forever Grateful")—have given the organization their publishing rights, and PDI was able to negotiate

a copublishing deal with the major publishers. The income generated by their share of the publishing royalties goes into the overall PDI budget and helps support its church-planting efforts.

MAKING IT HAPPEN

The worship-music industry is hard to break into. A few companies accept unsolicited submissions, but many don't. In fact, some companies have songwriters under exclusive contracts, so they already have more songs than they can use. On rare occasions, they will acquire a song they "couldn't live without" from an outside writer.

Here is some insight into the acquisition process for those of you who want to send songs to the companies that do accept unsolicited submissions. (See the sidebar "Tackling the Submission Issue." You'll also want to check out the songwriting tips in the sidebar "Writing for Worship.")

Think demo. Make every effort to comply with the publisher's submission guidelines. You may think that sending three songs when they only ask for one will increase your chances of getting heard, but it only makes it more unlikely that they'll actually listen to your music.

If the publisher doesn't specify a preference for either a studio recording or a live recording (usually done with a small group or a congregation), you can choose whichever presentation you think best fits the song. A live recording gives the publisher a chance to hear the song in its context, which is extremely important. (Your song can look great on paper and sound wonderful in the studio but still flop in a church service.) A recording that illustrates how the song facilitates worship in a congregational setting can make a powerful impact. Be aware, however, that a more spontaneous performance can also be a longer performance: a congregational recording can last six or seven minutes—an eternity to a busy A&R rep.

A studio recording doesn't have to be extravagantly produced to make an impression. HeartCry's Estes reminds songwriters that most A&R people can hear what isn't there. "I prefer a nice, simple demonstration; I can hear a piano/vocal demo of a song once and know whether it's something I rise to," he says. "If someone has the ability to do a rhythm section and harmony vocals well, that's great. But it isn't necessary."

Whether live or Memorex, the demo must be good quality. People of Destiny's Cook has been on both sides of demo tapes. (As "in-house" producer and song-development manager, he is one of the people responsible for choosing which songs PDI publishes and records.) "Quality does make a difference," Cook emphasizes, "especially if what you're presenting is a *good* song—not a great song, but a good song. If your good song is put next to somebody else's good song and your demo is better, you'll definitely have the advantage. A great song will stand out even on a bad demo."

You shouldn't confuse good quality and simple presentation with dullness,

WRITING FOR WORSHIP

The following songwriting tips are suggestions from Andrea Tucker of The Song Shop (tel. 714/256-4009; fax 714/256-0214; e-mail 74652.1657@compuserve.com), a business that provides critiquing and consulting for songwriters.

Emotional impact. The song should move a person in worship to the Lord.

Familiarity. Advises Tucker, "Write about what you know, what your experience with God has been."

Simple structure and repetition. A difficult arrangement or too many parts (verse-chorus-bridge-verse) can disorient the congregation. Repeated lyrical and musical hooks make your song easy to sing and remember.

Marriage of music and lyrics. Make sure the mood of the music complements the intention of the lyric. "Don't have people sing, 'Out of the depths we cry,' to an upbeat tune," advises Tucker.

"Singability." A common problem with worship music is that it is difficult to sing. "Keep the melody within an octave," advises Tucker. "It needs to be accessible to both male and female vocal ranges. And be sure it is short and worded carefully. Someone once submitted a song that said, 'We grew weary raising our hands.' Say *that* three times fast."

Focus. Stick to one idea and write with one narrative voice. Don't start with an image of the bride of Christ and then make a jump to the crucifixion. And if you begin by addressing the congregation ("Let us..."), don't switch into the first-person voice ("I will..."). It's also important to decide whether you will sing *about* God ("He is...") or *to* him ("You are..."). If there has to be a change in narrative flow, make sure it's an obvious one.

Accessible imagery. Metaphors and pictures help people understand the truth being presented.

Appropriate use of scripture. "Don't be afraid to paraphrase or use current terminology," says Tucker, "especially if you're drawing from the King James Version, which is the only version without a copyright. Just make sure you remain true to what the scripture is saying." (Remember to get permission for quoting copyrighted translations of the Bible, such as the New International Version. Check your Bible or contact the Bible's publisher for guidelines.)

Originality. The songwriter faces the same dilemma that the preacher does: how to present a familiar truth in an engaging way. As Tucker puts it, "Same truth, different perspective." She sometimes encourages writers to pretend they are writing to someone from outside the Christian community.

Transparency. Above all, a praise song needs to be transparent. It should facilitate worship, not draw attention to itself or the musicians.

Test your songs in various settings. A song needs to be thoroughly "congregationally tested" before it gets submitted to a publisher. Make sure your song has been tried in both large-group and small-group settings, with people of different ages and genders, and, if at all possible, in more than one denominational setting. You might even seek counsel from other worship leaders, a songwriting coach, or people from musical and church backgrounds that are least like your own.

however. The success of a praise song depends mostly on its ability to stir someone into worship. "It needs to have an emotional impact," says Cook. "Even a well-rehearsed recording needs a passionate vocal."

Davis, too, urges that you go for passion more than technical excellence. "The studio process can be very tiresome," he notes. "It may mean singing one line over and over. Yet the recording has to re-create an environment of worship for the individual listeners because they can't look around the room and see the Lord ministering to others as they sing the song."

Finally, make sure that what you're putting on the demo is really ready and worthy to be published. "The demo should be the by-product, not the focus, of your songwriting," says Maranatha!'s Coomes.

Think locally. A&R reps find most of their songs not on demos but through word of mouth and even by accident. They are just as likely to stumble upon a great song when they are visiting a friend's or relative's church as they are to find one at a worship leaders' conference.

Sometimes they can't get away from a song: it's being performed everywhere they turn, and it takes some effort to track it down. According to Coomes, "A good song blows around like the wind. It can go all around the world, and those of us in the publishing industry are asking everyone, 'Where is this song from? Who wrote it?' You have to be a super sleuth to find the songwriter."

Being faithful in your home church, where your songs are regularly being used in the worship service, may be just as likely to lead to a publishing deal as sending out a demo. Andrea Tucker, who was creative director of publishing at both the Benson Music Group and Maranatha! before founding The Song Shop, a service that provides critiquing and consulting for songwriters, says, "A company may hear about a worship leader before the leader knows they know. One of the best ways to get known as a songwriter is to just bloom where you're planted. They'll come looking for you."

Think relationship. And as in other parts of the music industry, it often comes down to who you know. Davis says that he approached the publishers in nearly every case. "I noticed, however," he says, "that the publishers with whom either I or someone I knew had developed a personal relationship were the ones that ended up using my material.

"I've learned," Davis continues, "that they're not only picking songs, they're deciding to support individual ministries and writers. That is why building a positive relationship is key."

OTHER OPTIONS

What if you aren't interested in getting published by a major worship-music label—or they aren't interested in your songs? You still have a few other options to consider.

Other labels. You could try to shop your songs to "artist oriented" labels (i.e., labels whose individual artists record worship music). You can do this on your own—which is extremely difficult—or you can do it through professional A&R representatives and companies such as Taxi (tel. 800/458-2111 or 818/888-2111; fax 818/888-8811; Web http://www.taxi.com).

Other publishers. A few independent publishers sign songs with the intention of pitching them to a label that needs material for its artists. Tucker says of this approach, "Sometimes independent publishers are the way to go because they can provide great relationships and insight into the industry—especially as the bigger companies may not have time for the lesser-known writers."

Do it yourself. Individuals and worship teams throughout the Christian community are putting out their own recordings for their congregations and other interested people. As mentioned above, independent projects are what got CCFL's Hecocks and PDI's Cook published by major labels in the first place. (For more on starting your own label, see "Working Musician: Label Machinations" in the May 1996 issue of **EM**; for more on self-publishing, see "Working Musician: The Road to Self-Publishing" in the June 1996 issue.)

Davis has not yet self-published, but he is looking to do so for several reasons. "No single publisher can or will use all the material I write," he says, "and I'd like an avenue for releasing material that is not signed."

TACKLING THE SUBMISSION ISSUE

Each publisher has a unique sound and approach to worship, so make every effort to familiarize yourself with a publisher's projects before you submit material. Your song is more likely to be picked up by a publisher if it fits in with the company's particular songwriting style. For example, if all of their songs' lyrics are taken directly from the Scripture, make sure the songs you submit do the same.

Good research will also reveal whether a publisher only uses a few select songwriters (e.g., HeartCry) or whether it only records songs that are already published (e.g., Star Song). These are dead ends. And it will save you a lot of effort if you know in advance whether a publisher even takes unsolicited submissions.

It's a matter of timing. Because the major praise-and-worship publishers are also recording labels, they usually only sign a song that they plan to record on an upcoming project. The advantage to this is that they won't tie up a song unless they think they can really get it out. The disadvantage is that whether your song appeals to them has a lot to do with their current projects. So if you really think your song is worth publishing, you may want to submit it more than once.

Those with ears to hear. Some companies review submissions in committee. Others have one or two people who do all the selecting. By giving this responsibility to a select few, the publisher ensures that its acquisitions will be consistent with the company's trademark approach.

As of this writing, the following companies were not receiving unsolicited submissions: Benson Music Group, Brentwood Music, Integrity, The Sparrow Corporation, and Word Record's HeartCry. For publishers not listed here, contact the companies directly. (You can usually find addresses and phone numbers on CD and tape inserts. You can also access a list of publishers on the Web at http://www.getnet.com/~musicmin/publish.html.) Most companies have a voicemail recording that states their submission policy.

When you do submit your work, take the time to label everything clearly (with your name and phone number), and present it in a professional manner. For example, if you don't have access to a printer, use your best (or someone else's) handwriting for your labels and lead sheet.

The companies listed here accept unsolicited submissions.

People of Destiny
tel. (301) 926-2000; fax (301) 948-7833; e-mail pdi7881@aol.com
Submit no more than three songs per tape. (If you include a CD, indicate which three songs you want to submit.) Include a lead sheet with lyrics and chords. A letter of recommendation from your pastor is encouraged.

Maranatha! Music
tel. (714) 248-4006; fax (714) 248-4001; e-mail mm@corinthian.com; Web http://www.christcom.net/mm
Submit no more than one song—make it your best, "congregationally tested" song—per tape. (If you include a CD, indicate the one song you want to submit.) Include a lead sheet with lyrics and chords. A letter from your pastor describing how this specific song is received in the congregation is required.

Vineyard Music Group
tel. (714) 777-7733; fax (714) 777-8119
Submit no more than three songs per tape. (If you include a CD, indicate which three songs you want to submit.) Include a lead sheet with lyrics and chords. Live recordings are preferred. A letter of recommendation from your pastor is encouraged.

If you do decide to publish your own song—even if you don't have plans to record it—you should register it with CCLI and a performance-rights organization like ASCAP or BMI. (The table "CCLI's Top 25 Praise and Worship Songs" includes a few self-published songs.) Tucker suggests that you file as soon as you know your song is being used in another congregation. This will help protect your copyright and possibly lead to royalties.

Your church and even individual church members may help finance a project if they see the fruit of your music. This kind of financial commitment, however, is not something to enter into casually, especially when you are using money that has been given to your church. When Hecocks decided to produce some music for CCFL, he wanted to be sure the project wouldn't become a financial drain on the church. "I could spend $50,000 in a year on two good projects using an outside studio," he says. "I couldn't start, maintain, and staff a studio for that price, especially with all the changing technology. With our last CD, we spent about $18,000 in the studio. The total with manufacturing, printing, and everything came out to about $27,000. We made that money back within a month."

An overwhelming investment also threatens to compromise the songs you write and record. When you're under pressure to recoup a large investment, you might start thinking about what will sell instead of what you feel God has called you to write.

SET APART

Worship musicians are unique. For them, music is more than a hobby or even a profession—it's a calling. Money and commercial viability have to take the backseat. Hecocks has learned how to persevere in ministry despite rejection from publishers. "That's where God comes in. If you're called to do this," he challenges, "you do it whether ten people hear it or ten thousand people hear it."

Davis also reminds praise-and-worship songwriters to keep their perspective. "Your focus should be on serving the needs of the church," he emphasizes. "The defining element of your gift is whether it ministers to the church and, ultimately, whether it ministers to God."

EM *Editorial Assistant* **Jennifer Conrad Seidel** *was part of a worship team featured on VMG's* Touching the Father's Heart #19: Everlasting Grace. *She could not have written this article without the generous assistance of Phil Christensen and Melissa Riddle.*

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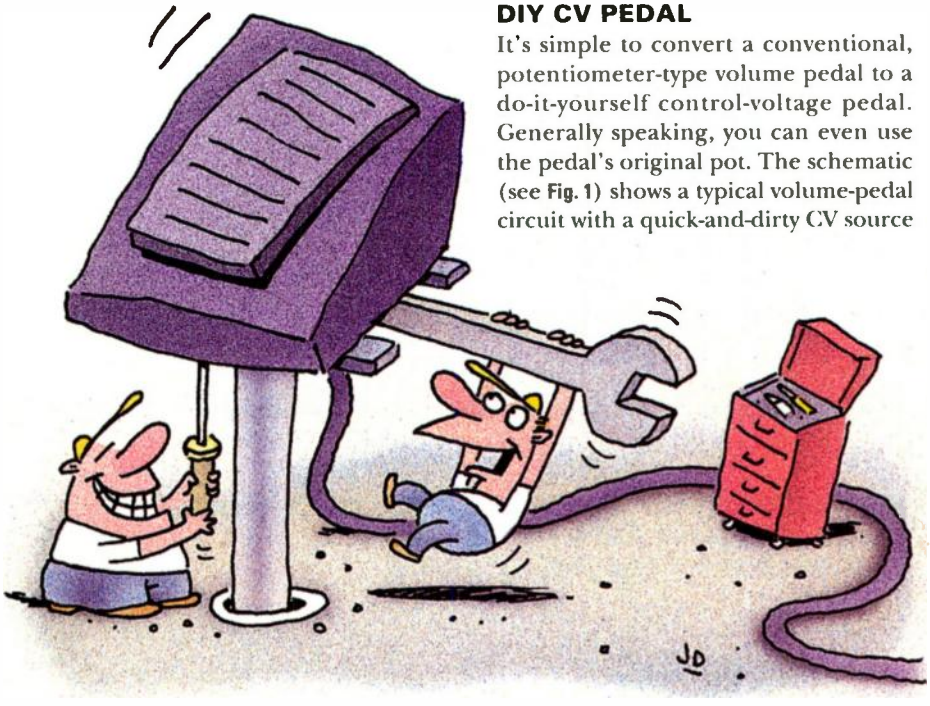
Analog Mods

Our favorite analog architect presents practical DIY projects.

By Alan Gary Campbell

In recent "Service Clinic" columns, we have delved into troubleshooting and servicing analog-synth circuits. It seems appropriate to wrap up our analog-synth coverage with a trio of commonly requested modifications.

We'll start out with an easy method of converting a standard volume pedal to a CV pedal, and then we'll progress to a couple of modifications for the ever popular Minimoog. So heat up your soldering iron, and let's get to work!



JACK DESROCHER

DIY CV PEDAL

It's simple to convert a conventional, potentiometer-type volume pedal to a do-it-yourself control-voltage pedal. Generally speaking, you can even use the pedal's original pot. The schematic (see **Fig. 1**) shows a typical volume-pedal circuit with a quick-and-dirty CV source (a battery, capacitor, and resistor) added. This scheme provides a roughly 0- to 5-volt CV output range.

Use the indicated value for Rx if the pedal has a 50 kΩ pot; use an 82k value for Rx with a 100 kΩ pot. For other pot values, make sure that the ratio of Rx to the pot resistance is approximately 4:5. If the pedal pot is less than 50 kΩ, replace it with a 50 kΩ or 100 kΩ audio-taper pot. (A linear-taper pot also works, but it gives a less positive feel.) The capacitor value is not critical (1 to 22 µF); the working voltage should be 12 volts or higher. Use a rectangular 9-volt alkaline battery. You can screw or epoxy a battery holder in place as required.

Typically, you disconnect (and possibly remove) the volume-pedal input jack, as indicated by the X's on the schematic (see **Fig. 1**). Alternatively, the battery, capacitor, and resistor could be housed in a project box with a standard ¼-inch phone-jack output. In this case, there's no need to modify the pedal; just plug the voltage-source output into the volume-pedal input. Simply unplug the voltage source if you want to use the volume pedal for its original purpose.

To adjust the pedal offset, loosen the tensioning device that secures the linear drive gear attached to the pedal face. Then turn the pot shaft so that the attached rotary gear is at its minimum position. With the pedal face all the way back (at minimum position),

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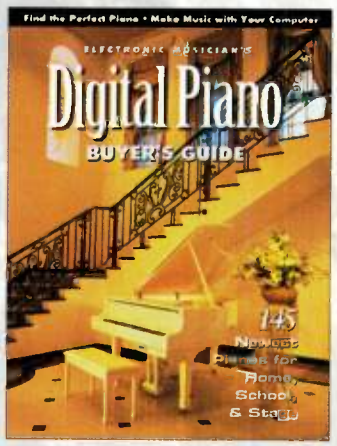

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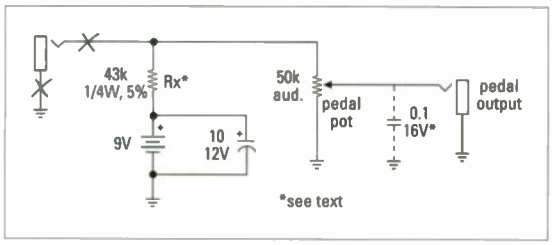

FIG. 1: You can easily build a quick-and-dirty volume-to-CV converter into the volume-pedal housing.

reengage the linear gear. Commonly, the alignment will be slightly off, so the rotary gear must be turned a few degrees before it will mesh with the linear gear. This can cause some voltage "bleedthrough" when the pedal is at minimum. To correct this, loosen the mounting nut on the pot, reorient the pot body slightly until the alignment is corrected, tighten the nut, reengage the linear gear, and then reassemble the pedal.

There are two principal disadvantages to this quick-and-dirty version: the lack of output filtering may cause mild CV "jitter," and the maximum output voltage level decreases as the battery ages. If the pedal will not be used for audio, a capacitor across the output (as indicated by the dashed lines in **Figure 1**) will eliminate most of the jitter. A ceramic-disc capacitor is fine; its value is not critical.

To stabilize the maximum output voltage, you'll need to use a regulated voltage source (see **Fig. 2**). This replaces the battery, capacitor, and resistor in our first design and connects to the circuit ground and node A, as indicated. The 3-terminal regulator IC uses more current than the simpler circuit does, which is the price you pay for stability.

The 1N4148 diode protects against inadvertent polarity reversal when the battery is replaced, but it also reduces the voltage available to the regulator, and therefore, the effective battery life. You may want to omit the diode. Use a standard electrolytic or tantalum capacitor at the regulator input and a standard ceramic-disc capacitor at the output; the values are not critical. The input capacitor should have a working voltage of no more than sixteen volts, and the output cap should have a working voltage of sixteen volts or higher.

There is room inside most pedals for the added circuitry, and perf-board construction is fine. No regulator heatsink is needed in this application. All the parts are available from Radio Shack. (The 7805, 5-volt, 3-terminal regulator is catalog number 276-1770.)

MOOG SWITCH-TRIGGER CONVERSION

When Moog Music developed its early synths, there was no industry standard

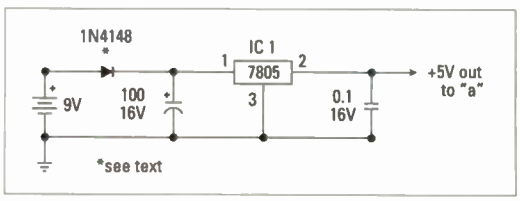

FIG. 2: The output is rock solid on this regulated CV pedal, but battery life is reduced.

for triggering. (For that matter, there was virtually no synth-manufacturing industry.) The company implemented a simple, robust scheme referred to as the "switch trigger" or "S-trigger." Unfortunately, practically everyone else opted for the voltage gate.

If you have tried to hook up a MIDI-to-CV converter to a Minimoog or have merely attempted to achieve electronic *detente* among Moog and other analog gear, you have probably discovered this incompatibility the hard way.

Fortunately, a simple circuit can be used to convert a gate to an S-trigger (see **Fig. 3**). The components are sufficiently small and the parts count is sufficiently low that the converter can be wired "point to point" across the terminals of a gate-output jack or an S-trigger input jack. With a phone plug that has an oversized ("jumbo") shell, it is even possible to wire the converter inside the plug shell, assuming your wiring is *very* precise. Of course, for more general use, you can house the converter in a project box.

Almost any medium-power, NPN, switching transistor can be used. The 2N3904 (shown in **Figure 3**) and the 2N2222A are good choices, and Radio Shack carries both (catalog numbers 276-2016 and 276-2009, respectively). Note that some Radio Shack parts carry the Motorola MPS prefix instead of the generic 2N.

Radio Shack also carries the retro-looking Cinch-Jones plugs and sockets that Moog Music used for S-trigger connectors on its early synths. Radio Shack calls these "polarized connectors." The Shack offers only the inline, 2-conductor plug and socket (catalog numbers 274-201 and 274-202, respectively). However, you can "fake" a panel-mount version by epoxying a plug or socket in a panel hole. It's cheesy, but it works.

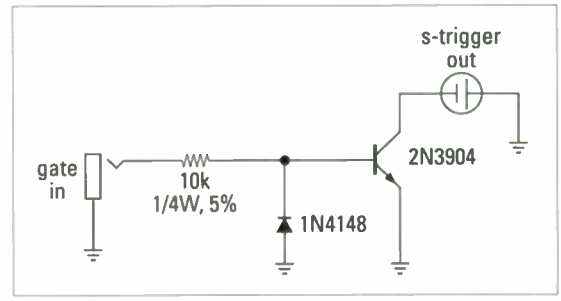

FIG. 3: This circuit, which converts a gate to an S-trigger, is small enough to mount behind a jack or even inside the shell of a large plug.

MINIMOOG CV INPUT REVAMP

Few synth-oriented studios on the planet lack a Minimoog or a solid sample of one. But the Minimoog was not designed with external control in mind. In addition to the interfacing problems posed by its S-trigger system, the Mini's CV input is merely a summing node and does not disconnect its keyboard circuit. This is fine for use with a CV pedal or another secondary CV source, but it is bad news for use with a MIDI-to-CV converter, as the Minimoog's keyboard sample/hold circuit droops rather quickly. Unless you constantly rekey a specific note on the synth's keyboard, the external control will get progressively and painfully out of tune.

It is fairly straightforward to modify

the Minimoog so you can disconnect the keyboard, though the procedure requires partial disassembly of the instrument and assumes a working knowledge of the synth's service manual. If you don't have the requisite Minimoog moxie and considerable do-it-yourself experience, refer the job to a qualified technician. But if you are confident that you are up to the task, read on.

Remove the rear panel to access the oscillator card. Carefully desolder and lift the input side of the summing resistor that receives the keyboard control voltage. On the old-type oscillator card, this is R27, 51.1 kΩ; on the updated oscillator card, this is R4, 102 kΩ. (See the July 1996 "Service Clinic" for more information on Minimoog oscillator-card types.) Be certain that you lift the side that connects to the PC-board edge connector, not the side that connects to the op-amp summing node. Tack-solder one end of a length of 20- or 22-gauge, insulated hookup wire to the resistor. Connect the other end to the center pole of an SPDT toggle switch.

Using two additional lengths of hookup wire, tack-solder one of the outer switch poles to the PC pad below the raised resistor lead, and connect the other outer pole to the Minimoog's system ground. You can intercept the system ground at the External Filter Control input-jack ground connection. Use a small dab of silicon sealer to secure the resistor and tack-soldered leads and to prevent a short circuit. The toggle switch can mount at a convenient location on the top panel, near the CV inputs.

When the Minimoog is used with an external CV input, the keyboard control is switched off, as the resistor input has been grounded. When the Minimoog is used conventionally, the keyboard control is switched on because the resistor input has been reconnected

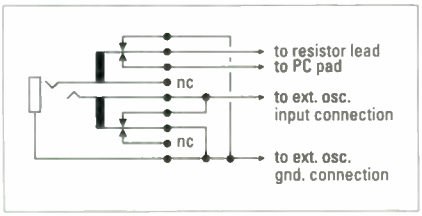

FIG. 4: Although the Minimoog wasn't really designed with external control in mind, you can modify its External Oscillator jack so that plugging in an external control-voltage source disconnects the synth's keyboard.

to the internal keyboard output.

If you don't want to drill a hole in the Minimoog's top panel to accommodate the toggle switch, you can replace the existing External Oscillator Input jack with an isolated-circuit, DPDT switching jack. With this scheme, whenever an external control-voltage source is plugged in, the Minimoog's keyboard control is automatically disconnected. The jack wiring is rather counterintuitive; the schematic in **Figure 4** should clarify things.

Isolated-circuit switching jacks are hard to find, but an appropriate part is available from Mouser Electronics (stock number 16PJ087). Note that this is a plastic-body jack. Take care not to overheat the jack when soldering.

Mouser also carries some obscure Switchcraft phone plugs that are a boon to Minimoog moguls. The first time you try to plug a footswitch with a standard ¼-inch plug into a Minimoog Glide or Decay footswitch jack, you may think the jack has shrunk. Moog used reduced-diameter, Switchcraft S-series jacks for the footswitch inputs to keep people from confusing the footswitch jacks with the audio inputs and outputs.

▼

The Minimoog was not designed with external control in mind.

You can replace each jack with a conventional phone jack, but if you wish to keep your Minimoog stock, you can replace the footswitch plugs instead. Mouser's stock numbers for the required Switchcraft 2-conductor, S-type plugs are 502-S-250 (black plastic sleeve) and 502-S-280 (shielded metal sleeve).

For a catalog and ordering information, contact Mouser Electronics; tel. (800) 346-6873 or (817) 483-4422; fax (817) 483-0931; e-mail sales@mouser.com; Web http://www.mouser.com.

EM *Contributing Editor* **Alan Gary Campbell** *is editor and publisher of the* New Music Journal *and owner of Musitech, a consulting firm specializing in electronic musical instrument design, modification, and service.*

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Reviews

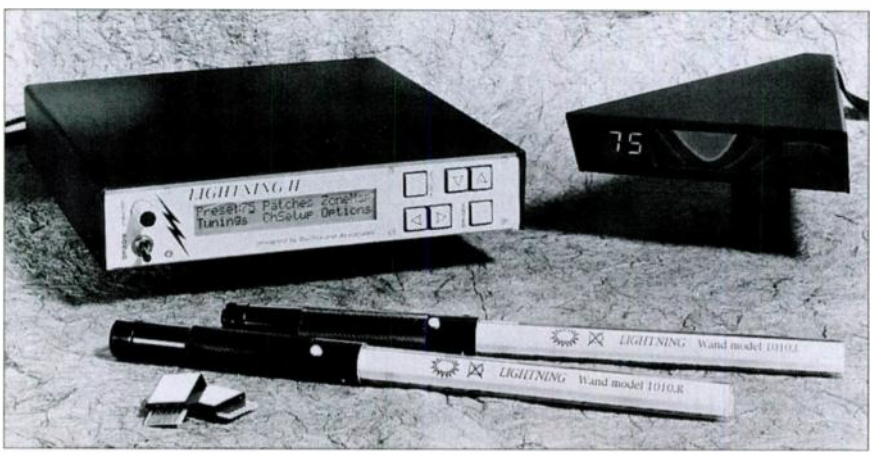
Buchla Lightning II

By Robert Rich

Go where no electronic musician has gone before.

Don Buchla has a history of creating unique, expressive electronic instruments that are optimized for the needs of adventurous musicians. As a pioneer inventor of early voltage-controlled synthesizers, he established his reputation as a maverick by resisting the temptation to attach a keyboard, opting instead for more expressive alternative controllers.

Throughout Buchla's long career, he has sought to establish electronic music as a unique medium of expression rather than as a means to mimic established forms. While larger companies have come and gone, Buchla's enterprise has remained small and independent. He's still a maverick after 30 years on the leading edge of electronic-instrument design.



Don Buchla's ingenious Lightning II enables you to trigger sophisticated, custom-programmed MIDI events using handheld wands that emit infrared light. A sensor tracks the wands' motions.

Buchla's product line currently includes two alternative MIDI instruments: Thunder and Lightning. Thunder (reviewed in the August 1990 **EM**) is a tactile controller that consists of a 2-dimensional array of pressure-sensing pads. Lightning (originally reviewed in the October 1991 **EM**) is a spatial controller that uses two handheld wands to translate hand gestures into MIDI events.

Lightning II improves upon the first version by adding internal sound, a better interface, superior wands, and new software features. However, the new version retains the same basic feel and concepts of the original Lightning.

IN A NUTSHELL

Lightning II's basic concept is simple: you create music by assigning MIDI events to various hand gestures, which you perform using wands held in each hand. A device attached to a base unit tracks the wands' motions.

Each wand contains an infrared-light emitter, a trigger button, a battery, and some electronics. Lightning II's detectors track the position and trajectory of each wand in space using a sensing region that is divided into eight zones. The half-rackspace base unit monitors wand motions within these zones, differentiating between left, right, up, and down striking motions and sensing their velocity. It can also trigger events when you press the buttons on each wand or step on either of two footswitches.

The results are delightful. You can bang on an invisible drum set, play air-marimba, conduct a phantom orchestra, or spew forth a dizzying cacophony of avant-garde noise while gesticulating like a street-corner Tourette's sufferer. Most importantly, you can do things with Lightning II that would probably be impossible with any other instrument.

Although Lightning II is based on a simple idea, its software makes it powerful. A typical Buchla creation, it has features that suggest so many possibilities, it's impossible to explore every avenue in a brief review. The operating system resembles a programming

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language, with functional modules that can modify each other's behavior. It includes myriad unique, musically useful features, such as slew generators and constrained randomness, and offers an openness that begs for experimentation.

The instrument's playing techniques are simple enough for beginners yet subtle enough to make room for mastery. Lightning could easily form the centerpiece for a whole body of performance-oriented composition.

MASS PRODUCTION

Lightning II adds several new features, most notably internal sound, to the original device. The new version contains a 16-part multitimbral, 32-note polyphonic, Kurzweil MASS sample-playback chip set that provides a General MIDI sound bank and two additional sound banks, which include eight drum kits. The 357-sound Kurzweil sound set includes 6 MB of compressed, 18-bit samples. If you wish, you can trigger the internal sounds from an external MIDI source.

The sound quality is surprisingly good for a preset sample player. The unit offers a predictably strong Kurzweil piano, lots of crisp percussion, and smooth orchestral sounds. As a General MIDI skeptic, I was pleasantly surprised, although I would prefer at least a modicum of programmability. (The basic sounds can't be edited.) The sound engine is rounded out by a simple internal reverb with eight settings that range from a short, studio ambience to a large hall with echoes. The reverb is slightly thin sounding but would be acceptable for most applications.

RED-LIGHT DISTRICT

Several physical changes make the new Lightning easier to use than the original. The original Lightning housed its infrared detectors in the base unit, leaving insufficient space for a large display to show the status of the wands. Now the detectors live in a separate triangular box that is cabled to the base unit.

The triangular detector box perches atop a mic stand so you can clearly see the red and green LEDs that show the location of the left and right wands relative to Lightning II's eight Stimulus Zones (discussed shortly). This visual feedback is a welcome addition. The left display shows the current preset number whenever you change it or when the left wand falls out of range.

Lightning II's new base unit features a large, 2-line, backlit display. Six buttons provide left/right cursor control, data increment and decrement, Enter, and Escape functions. To increase the scrolling rate through long lists, you can press the unused data button while you hold down the desired one, kicking the scrolling into high gear.

A volume knob and power switch share the front panel with the data buttons and display. On the back panel, you'll find left and right audio outputs and MIDI In, Out, and Auxiliary Out ports. (The MIDI Auxiliary Out allows you to save the sound-source parameters via SysEx.) There also is a power jack for the wall-wart transformer, a telephone-style connector for the external detector unit, and a memory-card slot.

Lightning II's proprietary memory cards hold 30 user presets, augmenting the 30 internal user presets and 30 factory presets. You can also back up and restore these presets using MIDI System Exclusive dumps.

THE MAGIC WANDS

The wands have been improved immensely over the early version. The original plastic transmitters had a home-brew feel: small, boxy, and a bit fragile. The new ones resemble high-tech drumsticks. The handle, which holds an AA battery, is made from a black metal flashlight tube that resembles a Mini-Maglite. Instead of a lamp at the end, there's a 6-inch, polycarbonate cylinder with indicator lights and the infrared emitter.

Two buttons rest under the thumb position. One button switches the power on and acts as a trigger while the user is playing, and the other turns the power off. These new wands feel great: they're properly weighted, easy to grip, and seemingly indestructible—all of which are important features for an object that might get dropped, tossed, or used as a drumstick in the line of duty.

Lightning II's wands can operate at two different ranges. At the normal setting, the wands work up to about eight feet from the detector. At this range, an alkaline battery lasts about 60 hours, and a nickel-cadmium battery lasts about fifteen hours. If you press both buttons while turning the wand on, you can double the operating range, but you cut the battery life by two thirds.

The wands show almost no directional characteristics, which is important given the vagaries of live performance. You can point them almost anywhere, and they still work.

PRIVATE LIFE OF A PRESET

A Preset defines the way Lightning II responds to your gestures. You could create a bunch of special-purpose Presets and switch between them within one piece of music, conceive each Preset as the basis for a composition, or simply tailor a few Presets for use as standardized musical interfaces.

Presets contain a variety of elements, including up to four Tunings (discussed shortly), which are user-defined scales employed when triggering notes. A Preset can also access the Conduct program, a feature that counts beats and generates MIDI Clocks in response to a definable pattern of wand movements. Each Preset also stores parameters relating to such things as Panning and MIDI Volume, Program Changes, Velocity Transforms, and internal reverb settings.

A Preset can hold up to 40 Patches, which represent the basic units of action. Patches establish the relationships between gestures and responses. A Patch looks for a certain type of Stimulus (i.e., a wand movement or triggered wand button) within a definable Zone and sends a definable MIDI message on one or two channels when it receives that Stimulus. These relationships are the building blocks of a Lightning II Preset.

Lightning II divides space into eight Zones: four across and two down. You can select any of these individual Zones or combinations of them, including rows, columns, left/right halves, and contiguous pairs. The editing display gives you a graphic representation of these choices to make the selection process easier.

Within each Zone, you assign a Stimulus from either the right or left wand. Choices include up, down, left, and right striking motions; entering or exiting the Zone; and clicking, double-clicking, or releasing the wand button.

Certain Stimuli, such as beat clocks from the Conduct program and pressing or releasing the left or right footswitch, function independently of Zones. Furthermore, you can choose to trigger a Patch via MIDI by sending it a note number between 36 and 47.

PLAYING WITH OBJECTS

You assign the output of a Patch to something called an Object. Lightning II provides four types of Objects: Notes, Controllers, MIDI, and System. The Note Object gives you many different ways to define the note you want to play. You can simply select a note number from 1 to 127. This note will then be played according to the velocity of your striking motion (if that's the selected Stimulus), or you can assign Velocity Transforms to invert, compress, or otherwise alter the Velocity response of a strike.

If you want to create a virtual keyboard within a Zone, you can derive the note numbers from the position of the wand along a vertical or horizontal axis. You then assign one of four Tunings (discussed shortly) to the Zone so that only the desired notes get played. The smallest Zone appears to have enough spatial resolution to squeeze in about twenty playable notes, meaning that you can cover more than seven octaves across four Zones. You can also choose to step through a tuning table once per Stimulus, cycling forward or

backward through the tables.

Yet another variable lets you define Transposition values for the notes you are playing. Lightning II keeps a Transposition register for each of the sixteen MIDI channels, and each Patch can add, subtract, randomize, reset, or ignore these registers. Using a combination of Tunings and Transpositions, you can trigger complex, algorithmically generated melodies and control their timing and Velocity with strikes of the wands.

Because most of Lightning II's Stimuli are percussive in nature, you must also decide how you want the notes to sustain. You can define a release time proportional or inversely proportional to the wand velocity, or you can simply select a duration from 0.02 seconds to 30 seconds. You can turn a note off with a second Stimulus, but you have to be careful, as you can leave notes hanging if you forget to make the required gesture. By default, Lightning II sends an All Notes Off message when it changes Presets, but you can override this function, too. Such options can be risky, but they are the very features that make Lightning unique and powerful.

If you want a Patch to send a MIDI-controller message instead of notes, you assign a Controller Object. Here you'll find some of Lightning II's most interesting features. Lightning II can send Control Changes 0 to 101, Pitch Bend, and Aftertouch. The instrument can also treat MIDI note numbers as though they were controllers, spewing dense streams of notes defined by the tuning tables. It's like running your hand up and down the strings of a harp or a piano keyboard but only hitting the notes you want.

Once you have selected a controller, you can modify it in a variety of ways. You can assign a value between 0 and 127 or make the controller follow your vertical or horizontal hand movements. You can make the controller slew up or down at a definable rate, or you can oscillate its value with one of several cyclical waveforms, including triangle and up or down sawtooth, with rates ranging from 0.1 to 60 seconds.

Lightning II also provides a random-number generator, with a choice of nine "wandering" rates, that sends the controller careening around in a drunken stagger. You can invert the controller output on one MIDI channel relative to another to create crossfades between two sounds. The features in the controller Object go on and on: Velocity tracking, sending the Conducting tempo as a controller, different ways to engage or disengage, and so on.

The MIDI Object deals mostly with sequencer-control messages and includes commands for Song Select and Clock Start, Stop, and Continue. The MIDI Object also has a feature for use with the Conduct program that allows you to lock the Clock tempo or follow the conductor. Basically this allows the clock to flywheel when you are unable to keep time with conducting motions.

Finally, the System Object lets you change Lightning II Presets with hand gestures instead of the front panel. You can use a Stimulus to jump to a new Preset or return to the previous one.

TABLING THE MOTION

It can be challenging to play accurate melodies while waving your hands in the air. For this reason, Lightning's tuning tables are indispensable. These tables define scales containing the notes that are played as you move your wand through a Zone. Each Preset holds four Tunings.

You get ten factory tunings: Chromatic, Diatonic, Whole Tone, Minor Thirds, Major Thirds, Tritone, Major Triads, Pentatonic, Black Notes, and Circle of Fifths. You can define the key, low note, and high note. I would like to have seen a wider variety of musical modes and fewer interval scales. However, I came to appreciate the interval tunings, as they make it easier to play chords within a performance. It's very difficult to play chords with only two wands, so you must build them by layering Patches, playing notes selected from tuning tables, and setting transposition values. In any case, if you don't find what you need among the Presets, you can always build your own custom tuning.

You can create four custom tuning tables, which can be either of two types. If these four tunings are not enough, you can probably program some fancy transpositions to help expand your pitch choices.

The two types of custom tuning tables are designated A and B. You can build a type-A tuning by scrolling up the list of MIDI note numbers and enabling the ones you want to use. A type-B tuning contains sixteen blank spaces, which hold any note in any order. As Lightning II cycles through

the B tuning, it plays a melody in a manner not unlike an old-fashioned analog sequencer. Of course, this melody is subject to all the perverse manipulations of Patch and gesture, as are all of Lightning's tuning tables.

FOLLOW THE CONDUCTOR

The Conduct program operates alongside all of the other features within a Preset. It watches the movements of your right wand and uses these movements to derive tempo and cycle through the beats within a measure. You program a conducting pattern by assigning a wand motion to each desired beat and selecting up, down, left, and right strikes. Beat events can also act as Stimuli within a Patch.

A display shows you how far you are straying from the selected tempo. A moving line stays close to the center when your timing is good and slides up or down to show up to ±30 bpm variation.

I found that the Conduct program worked best when I used only downward strikes of the wand, beating the tempo like a drum. If I tried to use fancier patterns, such as motions that resemble an orchestral conductor's, I had trouble making the motions clear enough to trigger the desired beat. If you miss a beat, the whole pattern gets messed up; it's not very forgiving. As with many of Lightning II's deeper features, practice helps.

DIGGING IN

With all these functions and more tucked away inside a Preset and with up to 40 Patches vying for your attention, you might imagine that you'd get confused while setting up a Preset. Indeed, there's a lot to keep track of. Hence, one of the best new features in Lightning II is one that lets you execute a Patch as you are editing it, which helps you understand your changes.

You can trigger the Patch every time you change a value or repeatedly trigger it once per second. Unfortunately, there is no practical way to solo a Patch because Patches can alter each other's behavior. This is not an idiot-proof system. It lets you do some pretty weird things, some of which may be meaningless to your synth. Personally, I welcome these sorts of problems, which stem from depth and flexibility.

Lightning II rewards those who spend the time to develop expertise in both playing and programming. Surprisingly, though, it also provides some instant gratification. It comes with a wide variety of factory Presets suitable for immediate noise making. These Presets also provide good examples of

Product Summary

PRODUCT:
Lightning II controller
PRICE:
$1,995
MANUFACTURER:
Buchla and Associates
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e-mail buchla@best.com
Web http://www.buchla.com
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FEATURES	● ● ● ● ●
EASE OF USE	● ● ● ●
AUDIO QUALITY	● ● ● ●
VALUE	● ● ● ●

Lightning II's versatility, and they can help you get started when building your own performances.

Some of the better Presets include a wand-controlled, dual theremin; a virtual table full of shakers and rattles; and a pentatonic, sequencer-style performance that kept some visiting German friends entertained for hours one night at the studio. Although some of these Presets sound like they use an internal sequencer, they don't: they just make creative use of the tuning tables.

LIGHTNING STRIKES TWICE

Lightning II seems to lend itself to percussive musical styles, but it also excels at generating enormously dense musical passages with simple gestures. Unlike a piano or guitar, it does not lend itself to complex chord construction, although you can construct chords with careful use of Tunings and Transpositions within a Patch.

The best thing about Lightning II is that it encourages completely new styles of playing. For example, imagine a marimba with keys that you play by hitting down, up, left, or right, with each direction tuned to a different scale. You can play dense 4-note trills with ease. Lightning II makes such an instrument simple to create, but it may take months to master the necessary playing techniques.

This is a theatrical instrument. It seems optimized for live performance, especially in concert settings where concept counts. If it weren't so deep, one might dismiss it as a novelty instrument. It seems to represent that rare blend: something exciting and fun yet complex enough to grow with you.

Buchla clearly respects his users' intelligence. He makes innovative instruments in small quantities, gives them features deep enough to suit the most experimentally minded musician, and adds a dose of that quirky, hipster logic that identifies these instruments as uniquely his. The result is an instrument that's fun to play yet challenging to master—an expressive tool that invites new approaches to music making. Lightning II is a worthy upgrade to an already strong product, and it upholds the Buchla tradition with aplomb.

Robert Rich *has a bunch of albums out, but he still spends way too much time in the woods looking under logs. Look for his new project,* Amœba, *in 1997.*

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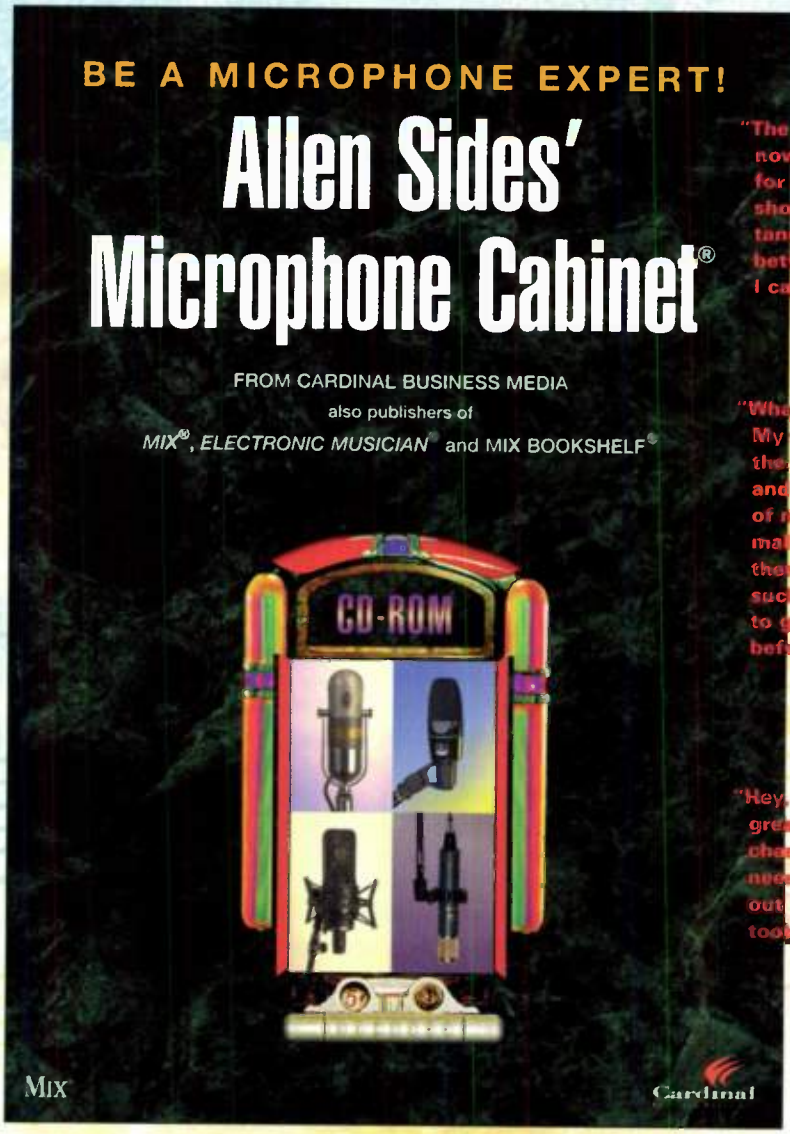

"The Microphone Cabinet is now a required reference tool for all of our classes. It really shows students the importance of subtle differences between mics, but best of all, I can secretly use it too!"

David Gibson
Founder and Chief Administrator
California Recording Institute

"What a great educational tool! My students can now learn the technical specifications and the sonic characteristics of microphones which normally aren't available to them. With studio time in such demand, it's a great way to get to know the mics before going into the studio."

Wesley Balla
Coordinator of Recording Studio Curriculum
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David Miles Huber
Author and musician

Allen Sides has recorded and mixed sessions for dozens of world-class artists such as Ry Cooder, Count Basie, Ray Charles, Sinead O'Connor and Brian Setzer.

David Schwartz, producer of this CD-ROM project, is the founder and former editor-in-chief of *Mix*.

This unique, fully interactive CD-ROM lines up the top classic and contemporary professional microphones for a series of audio comparison tests on dozens of instruments.The disc features:

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- A high-resolution color photograph of each microphone and the mic placement setup for each instrument.
- Complete specifications for each microphone.
- A color photograph and description of each musical instrument.
- A "Microphone Basics" section by noted author John Woram.
- A directory of the microphone manufacturers.

This amazing disc features tests of 66 mics and 33 different instruments. The microphones were chosen from the world-renowned collection at Sides' Ocean Way/Record One studios in Los Angeles. Sort by microphone to check out the best instruments for each, or sort by instrument to see which mics you should use. **Item MC) $69.95** plus $9.95 shipping and handling.

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Macromedia SoundEdit 16 2.0 (Mac)

By Geary Yelton

A popular, multipurpose sound editor reaches maturity.

If Macromedia had its way, *SoundEdit 16* would be the standard Macintosh application for manipulating sound files, and in the world of corporate multimedia, it has pretty much achieved that status. *SoundEdit* began in 1988 as the software component of an audio digitizer from Farallon called MacRecorder. This popular hardware/software combination allowed Mac users to record and edit 8-bit sound on almost any Macintosh.

Since those humble beginnings, *SoundEdit* has evolved into a mature, powerful program for editing large, 16-bit audio files at sample rates of up to 64 kHz. One reason it has such a strong foothold in multimedia is that it's published by Macromedia, a company that is best known for its *Director* interactive animation software for the Macintosh and *Authorware* multimedia authoring program. Even when the original *SoundEdit* was still published by Farallon, there was a period when it was bundled with *Director*.

SoundEdit 16 can be used on almost any Macintosh with a 68030 or better processor running System 7.1 or higher, but pre-Quadra Macs can't record without external hardware. Even with a MacRecorder or an Apple microphone, recordings and playback are limited to 8-bit sound on these older machines, and two MacRecorders are required for stereo recording.

BASIC FEATURES

With Power Macs and AV Quadras, *SoundEdit 16* can record in stereo at 44.1 kHz with no additional hardware. Version 2.0 requires Apple's Sound Manager 3.1, which lets you specify input and output sources. This means you can use third-party audio cards, such as Digidesign's Audiomedia II, for recording and playback. Sound Manager 3.1, AppleScript 1.1, and QuickTime 2.1 are included on the *SoundEdit 16* CD-ROM.

SoundEdit 16 can open, edit, and save files in a variety of 8-bit and 16-bit audio formats, including its native SoundEdit 16 format, original SoundEdit (8-bit), Sound Designer II, AIFF, Resource (for HyperCard and other programs), Instrument (an old Mac format), System 7 SND, uncompressed WAV, Sun.au (used on Sun/UNIX systems and the Internet), and most significantly for multimedia producers, QuickTime movies. The Open dialog includes a pop-up menu to select sound files, resource files, or movies.

The program also supports four types of 8-bit and two types of 16-bit file compression, including the Interactive Multimedia Association's ADPCM format. A new feature in version 2.0 lets you import tracks from audio CDs in the digital domain.

Because it can manipulate so many kinds of files, *SoundEdit 16* makes a good adjunct to audio-recording and sample-editing programs. For example, you can open a sound file that you retrieved from your sampler with Passport's *Alchemy*, add flanging and echo

▼

SoundEdit 16's suite of editing capabilities really shines.

in *SoundEdit 16*, save the file, and then reopen it in *Alchemy* and send it back to your sampler.

SoundEdit 16 isn't really aimed at electronic musicians, but because so many of us dabble in multimedia, it has entered realms once dominated by *Alchemy* and Digidesign's *Sound Designer II*. Unlike *Alchemy* and BIAS' new *Peak* sound editor, *SoundEdit 16* can't send sounds directly to your sampler. But unlike *Sound Designer II* and the original *SoundEdit*, it doesn't require proprietary hardware. Users of those programs and Digidesign's *Pro Tools* and *Session* multitrack recording programs should check out *SoundEdit*'s processing capabilities. So should users of Macromedia's *Deck II* (originally developed by OSC), which is now sold as a bundle with *SoundEdit 16*.

USER INTERFACE

SoundEdit has always offered an elegant and intuitive user interface. Despite the extra onscreen clutter that goes with additional options, the program remains easy to use.

If you've worked with prior versions, the first innovation you'll notice in version 2.0 is the use of toolbars. Two strips filled with icons appear across the top of the screen, which is reminiscent of recent Microsoft products. The specific icons that appear can be determined in the Toolbars page of

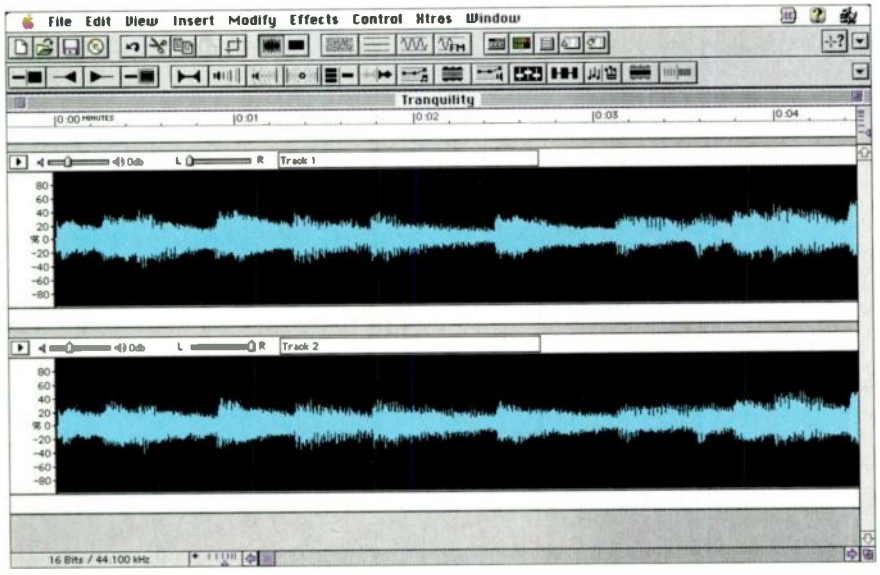

FIG. 1: *SoundEdit 16*'s Main toolbar (top) makes it easy to access frequently used menu commands. Below it is the Effects toolbar. The Sound window shows a waveform here, but it can be set to show solid rectangular blocks instead, which speeds up redraw time.

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The Eventide DSP4000 Ultra-Harmonizer® brand effects processor won this past year's TEC Award for signal processing. But when we asked the top professionals who inspired the DSP4000 what they wanted in version 2 software, they demanded even more:

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Billy Joel
THE RIVER OF DREAMS
Live set engineered by Kooster McAllister

KOOSTER McALLISTER "Make it faster and easier to use. That's what we need in the truck."

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the Preferences dialog, so you can customize the Toolbars to display only the icons you frequently use. The toolbars can be repositioned as floating palettes, but they always keep their horizontal orientation; they can't run down the side of the screen. As in Microsoft products, the name of each icon appears when you place the cursor over it without clicking. This is handy when you're learning your way around.

Macromedia calls this usage of toolbars and menu groupings the Macromedia User Interface (MUI). The company has implemented a similar system in *Director* 5.0 and presumably will offer it in other programs. This will allow users of Macromedia product suites to enjoy a familiar, consistent interface.

By default, the Main toolbar appears just below the menu bar (see **Fig. 1**). It includes icons for frequently used menu items such as New, Save, Cut, Copy, Paste, and Convert from CD. Other icons change the appearance of the Sound window, insert computer-generated sound, and change the windows that appear on screen.

Just below the Main toolbar is the Effects toolbar, which contains icons for such processes as amplify, fade in and out, normalize, flange, and delay. Either toolbar can be hidden to save screen space, but I wish it were possible to place icons from the Effects toolbar on the Main toolbar, which would also conserve space.

The Sound window can show a waveform, a tape display, or a spectral display. The tape display is a solid rectangle, which speeds up redraw time when you're editing, but you lose a graphic representation of amplitude changes. Considering that you typically need to see the waveform as you edit, I would anticipate using the tape display mostly when editing QuickTime movies and displaying movie frames or when copying tracks from one file to another.

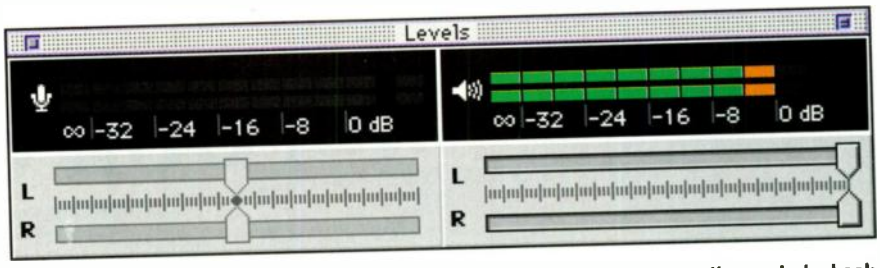

FIG. 3: In the Levels window, you can view and independently adjust recording and playback levels for the left and right tracks.

The lower left corner of the Sound window displays the bit resolution and sample rate. Sliders adjust the horizontal and vertical zoom, and a Fit in Window command adjusts the display so that the zoom magnification level automatically conforms to the available onscreen space.

Time and amplitude rulers, track controls, labels, and thumbnail movie frames can also be displayed in the Sound window. Track controls determine the fixed volume and pan position for each track. The Rulers page in the Preferences dialog changes the Time Ruler to measure minutes:seconds, seconds, milliseconds, samples, frames, or time code. An Amplitude Ruler displays amplitude in percentage, decimal, or hexidecimal units. A command in the Modify menu adds color to a selection in the Sound window using a palette of twelve colors.

The ads for *SoundEdit 16* claim that it supports SMPTE time code, which is misleading. If this claim leads you to expect some sort of external synchronization capabilities, you'll be disappointed. Apparently, it means that time can be displayed in time-code units. (If you look up SMPTE in the *User's Guide* index, you are directed to the glossary.) When you display time code, any frame rate you enter is accepted, up to 32,000 frames per second! The default is 29.97.

FIG. 2: In addition to showing transport controls, the Controls window shows how much disk space you've used and how much remains. A Loop feature (bottom right) plays a sound continuously until you press Stop.

The Controls window (see **Fig. 2**) offers the familiar transport controls, including Play, Record, Stop, Pause, and Loop. A Record Length meter shows how much disk space you've used and how much you have left. Loop plays a sound continuously until you press Stop, and if the start and end points match up, the loop is seamless. For example, this feature lets you repeat four measures of music over and over as if it were one continuous piece.

Stereo record and playback levels are displayed in the Levels window on a peak-reading, color-coded bar graph (see **Fig. 3**). The levels for each half of a stereo pair can be adjusted independently. The Selection window displays the position of the cursor in time and amplitude units as well as the start point, end point, and length of a selection in the Sound window.

The Cues and Labels windows display lists of user-defined locations within the waveform. The Cues window lets you name the insertion point (verse, chorus, end, etc.) and displays its location in time units. A Goto button moves the insertion point to the selected cue point, and the Play button plays from the cue point to the end of the file.

Any portion of the waveform can be selected and named in the Labels window. This is useful when you want to rearrange words or phrases while editing speech. To reselect the same portion, just click on its label at the bottom of the Sound window or double-click its name in the Labels window. Like the Cues window, the Labels window also includes Goto and Play buttons.

I have a couple of minor complaints about the way waveforms are displayed. Each track is shown on a strip of white, with empty gray space filling the bottom part of the window. You can minimize this gray space by manually resizing the window or by using the vertical scaling slider to make the waveform strips wider, but clicking the resize box just makes the window fill the display, usually increasing the amount of gray space. If your Controls and other windows are at the bottom of the screen, this may also hide the bottom scroll

bar and the horizontal scaling slider and file information.

It would be better if the resize box changed the window to conform to the size and shape of what's being displayed rather than just filling the display with empty gray space below the tracks. Other sound editors open a file with the waveform completely filling the waveform display, so why can't this one?

In addition, there's no command to automatically resize open Sound windows so that they all fit on the screen at the same time. Some sort of tile command would be especially useful for copying and pasting between files.

PLAYBACK AND RECORDING

SoundEdit 16's recording is disk based, which means the recording is written and read directly to and from the hard disk rather than RAM. This allows recordings of any length; the only limit is available disk space. The number of tracks you can record and edit seems unlimited, even on a machine that only records 8-bit sound.

However, if your computer system can't keep up with real-time retrieval demands, there are audible gaps in playback. Sounds may skip and break up, especially on large files. On my 90 MHz Power Mac 7200, *SoundEdit 16* seemed surprisingly slow, especially for a native-code application. An external, removable SyQuest 270 MB hard disk proved too slow for use with *SoundEdit 16*, and I had to forget about playback directly from CD-ROM for all but the tiniest files. Even with the internal Quantum Fireball hard drive that came with the 7200 and a second internal Fireball I added for sound editing, gaps occurred with most multitrack files and occasionally with stereo files.

But when I played the same files on a Power Mac 9500, there were no delays. Of course, the 9500 has a 604/132 MHz CPU that blows the doors off a 7200, so I was tempted to attribute its glitch-free performance to its faster CPU. But there seems to be more to this problem. (See sidebar "The Power Mac 7200 Blues.")

An unrelated speed problem crops up when a file is playing: there may be a delay between the moment you hit the Stop button and the moment playback actually stops. When playing a large, multitrack file, this delay is especially pronounced. For example, I recorded two minutes of music in

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AUGUST 1996

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stereo on the 7200, which played back beautifully. Then I added two tracks of bird sounds, and the file would play for only one second, pause, then play another second, pause, and repeat this cycle until the entire file was finished. All attempts to halt this jerky playback by pressing either the Stop button or the spacebar were ignored. In fact, pressing the spacebar was interpreted as a Play command rather than a Stop command because it was ignored until the first playback was complete.

With a little experimentation, I discovered that any file with more than three continuous tracks and with no breaks in the sound played in fits and starts. These files also delayed executing the stop command. This problem can't be blamed on the 7200, though, and Macromedia says they will fix it soon in an update.

If this were a multitrack-recording program, these problems would be completely unacceptable. However, *SoundEdit 16* is already unsuitable as a multitrack recorder because you can't listen to previous tracks as you record new ones. It's a sound editor, and if your computer can't keep up with its demands, you just have to play fewer tracks as you edit.

EDITING FEATURES

SoundEdit 16's suite of editing capabilities really shines. The program lets you offset and mix tracks, set loops, change track length, and alter pitch.

In the original *SoundEdit,* you could mix several files down to one file. In the current version, the mixer can bounce several tracks from one file into a separate mono or stereo file. If you're mixing an entire multitrack file down to stereo, everything works exactly as it should. If you want to bounce several tracks down to one track to conserve disk space, you must mix to a separate file, open the new file, copy its contents, go to the original file, add a new track, paste the mix into the new track, and then delete the source tracks. That's a lot of unnecessary work.

You must do a similar dance when combining several files into one, *à la SoundEdit* 1.0. You create a new file, open each source file, copy the contents to the Clipboard, add a track to the new file, paste the Clipboard's contents into the new track, and repeat this procedure until all the sounds are in the same file. Then you can use the mixer to combine all the tracks into one.

When mixing tracks, the levels and panning of each input track can be adjusted with handles in the waveform display (see **Fig. 4**), so dynamic panning is possible. If you don't create new panning data, the original panning is maintained. That is, if you mix two tracks panned hard left with another track panned hard right, the new file places the two combined tracks on the left and the other track on the right.

▼

Bender is one of the best tools I've seen for pitch correction.

BUILT-IN EFFECTS

The program includes seventeen types of effects processing. Most of these were available in previous versions of *SoundEdit.* Although there are plenty of effects, the lack of programmable parameters makes them less flexible than most third-party plug-ins. On the up side, all of them can be canceled with the Undo command.

Most of the effects are pretty straightforward. The Amplify effect lets you change the volume of a selection by any percentage. Backwards simply reverses file playback, creating a mirror image of the original. A 7-band graphic EQ provides the only means of filtering other than Smooth, which attenuates high frequencies, and Emphasize, which amplifies high frequencies. The Flanger offers no programmable values, and it works very slowly. The Noise Gate includes threshold and attack parameters.

There's no discernible difference between Delay and Echo. Both offer only delay time and strength as programmable parameters. The Reverb processor includes a slider that lets you select different ambient environments, from an empty room to outer space. Unfortunately, it's not real reverb; it sounds more like a diffused echo.

You can apply a complex amplitude contour to the sound with the Envelope effect, which provides a seemingly limitless number of breakpoints. The Fade In and Fade Out commands include adjustments to the slope curve.

One of the handiest effects is Bender, which displays the waveform with handles on a line to dynamically change pitch up to two octaves from the original. This is one of the best tools I've seen for pitch correction; if a vocalist sings a flat note, it's easy to go into the Bender and fix it. The regular Pitch Shift effect displays an onscreen, musical keyboard that alters both pitch and length, and Tempo changes the length without altering the pitch.

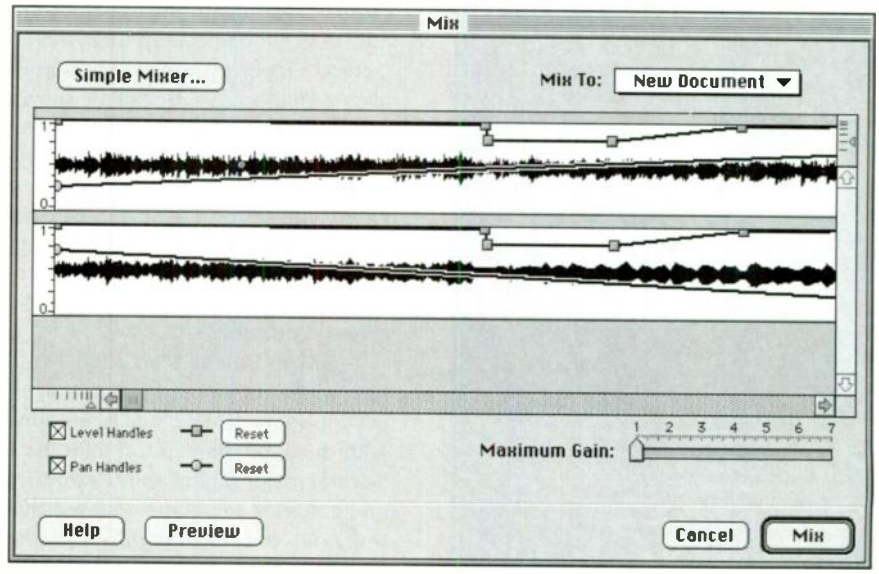


FIG. 4: *SoundEdit 16*'s Mix window lets you bounce down several tracks from one file into a separate mono or stereo file. The level and panning envelopes of each input track can be set by grabbing and placing handles with the mouse.

Several commands have moved from the Effects menu to the new Insert menu. These include Noise, Silence, Tone, and FM Synthesis. Tone inserts a sine, square, or triangle wave with the frequency, amplitude, and duration you specify. FM Synthesis lets you specify one carrier and two modulation frequencies (one for vibrato) as well as duration and amplitude. Of course, all these sounds can be shaped with the Envelope. The Insert menu also includes commands for adding and deleting tracks. When you give the command to delete a track, there's no "Are you sure?" dialog, but the most recent action can be undone.

INTRODUCING XTRAS

Plug-ins that extend a program's capabilities are a hot item not only in digital audio programs but throughout the software world. (For example, many graphics programs and Web browsers now support plug-ins.) Macromedia has followed suit by adding a new Xtras plug-in architecture to *SoundEdit 16* 2.0.

Like *Premiere* and *Sound Designer* plug-ins, Xtras are offline processors; however, the high-end TDM architecture

THE POWER MAC 7200 BLUES

According to Macromedia, *SoundEdit 16* and the company's *Deck II* 2.5 multitrack hard-disk recording software have problems with both the Power Mac 7200 and the Quantum Fireball hard drive, which could explain the poor performance reported by Geary Yelton in his review of *SoundEdit 16*. I've spoken with a variety of digital audio software and hardware manufacturers about both the 7200 and the Fireball. Most could only respond off the record, as their investigations are ongoing. (And of course, they have jobs and families to consider.) So to protect my sources, I have to be a bit vague about exactly who said what, for which I apologize.

With regard to the Quantum Fireball, especially, the results are not yet in, though at least three manufacturers reported performance problems with this drive. So little is known as of this writing that I can only recommend that if you're about to buy a new drive for hard-disk recording or video, you err on the side of caution and buy a different model. Macromedia openly suggests to new Fireball owners that they return the drives if possible.

The Power Mac 7200 situation appears to be even murkier, though more testing has been done with the 7200 than with the Fireball. Several major digital audio hardware and software developers stated that the 7200 is a problem child, citing performance headaches similar to those reported by Geary Yelton. I got many differing, and often inconsistent, explanations for this situation.

Everyone noted that Apple shipped the 7200 without Level 2 cache, the lack of which seriously impacts performance on all Power Macs. (Cache is included in higher-end models.) Yelton, a Mac veteran, was initially caught by this "gotcha." But even after he added a generous 512 KB of Level 2 cache to his 7200, the performance problems remained. Nevertheless, step one for all Power Mac users is to be sure you have Level 2 cache, the more the better. It's also important to make sure virtual memory is turned off—apparently some Macs ship with virtual memory enabled—and to eschew the use of Connectix' *RAM Doubler*. Opcode, for one, officially recommends using Connectix' *Speed Doubler* to improve disk-access speed, as its Speed Access disk-caching system is faster than System 7's disk-caching scheme.

These steps may be sufficient to make the 7200 operate fast enough for multitrack digital audio playback from disk. Although several manufacturers opined that there still appear to be inherent performance problems with the 7200, nobody convinced me they knew exactly why this was so. But if you are considering a new Power Mac for use in demanding applications such as digital audio and video, it makes sense in this era of increasingly affordable computing power to spend a bit more and get a faster model.

—Steve Oppenheimer

operates in real time. Unfortunately, Xtras are incompatible with the Adobe *Premiere* and Digidesign TDM and *Sound Designer II* plug-in architectures, so people who use more than one program must deal with yet another plug-in format. Fortunately, an Xtra is in development that will eventually allow *SoundEdit* users to make use of *Premiere* plug-ins.

Macromedia claims that the *Premiere* plug-in architecture is less robust and less extensible than *SoundEdit 16* Xtras. *Sound Designer*'s plug-in architecture is also generally considered superior to *Premiere*'s. Of course, marketing often proves more important to commercial success than technical quality, so the question of which plug-in architecture is superior could prove irrelevant when it comes to long-term survival.

Xtras include effects, sound generators, and data converters. Unfortunately, Xtras don't appear in toolbars like *SoundEdit* effects. A handful of Xtras are included with the software, including a Loop Tuner, Preverb, and modules for exporting and importing WAV files, along with utilities for creating your own Xtras.

One of the program's most essential Xtras is the Loop Tuner. It works much like the loop window in other sound editors, letting you zoom in on the loop points to align them. Unfortunately, the only way to visually scroll the loop point is to click on the scroll arrows repeatedly until the loop points match up. You can't hold down the mouse button to continuously scroll. Nonetheless, previous versions of Macromedia's *SoundEdit* had no loop-editing function at all, so this Xtra is a welcome addition.

InVision Interactive's *CyberSound FX* suite of effects plug-ins (reviewed for the Adobe *Premiere* plug-in architecture in the June 1996 **EM**) is also available as an Xtra, so I gave it a try. The plug-in includes several varieties of reverb along with chorus, compressor, multi-tap delay, parametric and shelving equalizers, phaser, dynamic filter, and pitch shifter with preset intervals. Oddly, the plug-in's normalize effect seems to do exactly what *SoundEdit 16*'s built-in normalization does, but it takes much longer.

Most of the effects offered by *CyberSound FX* include an impressive number of presets and lots of programmable parameters. You can even save your own

presets. In each Xtras dialog, there's a Preview check box that plays a preview of the sound when you click on a preset. All in all, *CyberSound FX* adds a great deal of functionality to *SoundEdit 16*, and I enthusiastically recommend it.

Third-party manufacturers Waves and RealAudio are also offering *SoundEdit 16* Xtras. If you are a regular **EM** reader, you already know that Waves makes some of the best *Sound Designer*, TDM, and *Premiere* plug-ins around, so its support for Xtras is a big boost for *SoundEdit 16*. (More information on Xtras is available on Macromedia's Web site; see the Product Summary.)

QUICKTIME SOUNDTRACKS

As mentioned earlier, *SoundEdit 16* lets you view and edit QuickTime movie soundtracks. In the Open dialog, you can see a preview of the movie before opening it. The QuickTime Soundtracks window shows the movie in a display much like Apple's *MoviePlayer*, but the Soundtracks window includes a frame counter that shows the location in time-code format. Below that are buttons labeled Edit, New, and Info, and a list of the soundtrack names appears below these buttons.

Movie playback is not smooth on the Mac 7200, even on movies that play perfectly in *MoviePlayer*. (Macromedia claims this is also a 7200-specific problem, but if so, why doesn't *MoviePlayer* have the same problem?) When you click Edit, the soundtrack is displayed as a waveform that can be edited like any other sound file. You can import other sound files to create new tracks in the QuickTime soundtrack and then Option-drag them into place to synchronize with the picture.

You can adjust relative volumes for each track with the gain controls in the Sound window. QuickTime doesn't support multitrack soundtracks, so when you save the file and close the Soundtracks window, all tracks are permanently mixed. Therefore, be sure to make all your final adjustments before closing the Sound window.

UTILITIES AND HELP

SoundEdit Automator is a new utility in version 2.0. It uses Apple Events to batch-process files so you can change their file formats and sample rates. To use it, you add the files to a list and enter the sample rate (from 5.564 to 48 kHz), sample size, type of compression, and format of the destination files, specifying an extension if necessary. All formats supported by *SoundEdit 16* are supported by *Automator*. If you use the Macintosh to create sounds for Windows applications or World Wide Web sites, *Automator* can be a real time-saver.

Other little bonuses on the *SoundEdit 16* CD-ROM include a folder full of AutoTypers and a utility for creating your own. An AutoTyper is a drag-and-drop utility that converts a file's type and creator. For example, the "Change any .WAV to SE16.WAVE" AutoTyper converts Windows WAV files into Macintosh files that launch *SoundEdit 16* when you double-click them. Have you ever converted generic PC Standard MIDI Files into SMFs your Mac sequencer can open? It's the same principle.

Special note should be made of *SoundEdit 16*'s Help files. They employ the excellent EHelpEngine used by *FreeHand* and other Macromedia products. The Help files include an index of topics and keywords, and a Sound Lab tutorial lets you explore effects processing with *SoundEdit 16*. There's also Spot Help, which works a lot like Apple's Balloon Help.

The program's manual is well organized, beginning in a tutorial format and

Product Summary

PRODUCT:
SoundEdit 16 2.0
PRICE:
$399
Bundled with *Deck II:* $499
SYSTEM REQUIREMENTS:
Macintosh with 68030 or better CPU, System 7.1 or higher, 6 MB of RAM, 15 MB of disk space
MANUFACTURER:
Macromedia
tel. (415) 252-2000
fax (415) 626-0554
e-mail macropr@macromedia.com
Web http://www.macromedia.com
CIRCLE #438 ON READER SERVICE CARD

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ◖
EASE OF USE	● ● ● ◖
DOCUMENTATION	● ● ● ●
VALUE	● ● ●

then becoming a reference book. The index is more than five pages long, but as often as not, the information I was trying to find wasn't referenced there.

CONCLUSIONS

SoundEdit 16 is a good choice for many users. The program has been around long enough to evolve into a mature software tool for both audio hobbyists and multimedia professionals.

Nevertheless, there's plenty of room for improvement. Although the user interface is intuitive and easy to learn, it still needs minor refinement. For instance, it should be easier to open and display multiple documents simultaneously. Waveforms should automatically fill the Sound window without so much wasted screen space. True external synchronization capabilities would be wonderful, but that probably goes beyond Macromedia's goals for the program.

The biggest problem for me was getting multitrack files to play without interruption on the Power Mac 7200. I can't prove definitively whether this is a problem with the 7200 or with *SoundEdit*, but if you are getting ready to buy a new Power Mac, I recommend you opt for a more powerful model.

At $399, *SoundEdit 16* is probably a bit overpriced. However, the *SoundEdit 16* CD-ROM contains a wealth of mostly high-quality sound effects and music beds, so it's not such a bad deal for those who care about these extras. But the big news is that Macromedia has now bundled *SoundEdit 16* with its *Deck II* 2.5 multitrack recording program for $499, which is an excellent deal. If you want to upgrade from version 1.0, you can do so for $129. Better yet, you can upgrade from any version of *SoundEdit* or *Deck* to the new combination package for $199.

I've always liked *SoundEdit*, and I'm sure I'll continue to use it, though I'll also use other audio editors. Its plug-in architecture makes it more flexible and more functional than previous versions. If you're serious enough about sound to make the investment, *SoundEdit 16* is an especially good program for the novice, and one you might never outgrow.

From his 28th-floor window in the creative services department of a Big Six firm in Atlanta, Georgia, **Geary Yelton** *can occasionally see all the way to North Carolina.*

Yamaha RM800

By Brian Knave

Move into pro territory with the lowest-priced 8-bus console ever.

One thing you can count on from Yamaha: when it comes to audio, they leave no niche unfilled. Consider their line of project-studio mixers. On one end of this modest spectrum, they broke new ground with the full-featured 02R digital console (reviewed in the July 1996 **EM**). On the other end, they cover the analog needs of the budget studio. That's both smart and cool.

The Yamaha RM800 is a case in point. Until now, the cash-strapped home recordist had two options: settle for a 2- or 4-bus, 16-channel, compact mixer that required a split-console arrangement for returning tape signals (seriously hampering expansion to sixteen tracks) or else cough up two to four times the money for an 8-bus, 16- or 24-channel console. Thankfully, this is no longer the case. Yamaha identified a missing link—an 8-bus mixer for under $2,000—and created the RM800 to fill the void.

Building a low-priced, high-quality mixer is no mean feat. The design team must determine what's essential and what's not—which is to say, the minimum number of premium parts required to get the job done—and still deliver maximum flexibility and the highest possible sound quality. That's quite a balancing act.

Does the RM800 fulfill its mission? Yes. Is it the right mixer for you? That depends on the type of recording you do and the number of amenities you can do without. Here's the scoop.

BRICK HOUSE

If nothing else, this board will impress your friends with its sheer bulk. I was originally sent the 24-channel version but upon witnessing its Brobdingnagian proportions, I had to send it back in exchange for the 16-channel board. And even that was a tight fit in my Lilliputian studio. Actually, it's not *that* big, but if you're graduating from a compact mixer and your workspace is already cramped, you'll definitely have to clear a space for this sprawling rig.

Make sure your back is in good shape, too: the RM800 is no featherweight. Except for having plastic knobs, switches, and sideplates, the unit is constructed entirely of steel. Add to that an internal power supply (along with the necessary shielding material), and the result is considerable heft. In a word, this board is built like a brick house. Crammed between my monitors and racks of gear, its hulking solidity lent a professional vibe to my humble studio.

The RM800 is not a modular console that allows you to remove individual channel strips for repair. That means if a channel goes down, you'll need to ship the whole unit.

NO MERE COPY

It's clear that Yamaha designed the RM800 from the ground up, as it doesn't resemble comparable boards on the market. In fact, with its putty gray finish and brightly colored knobs, it's quite the odd duck. After living with it for a while, though, I came to appreciate the functionality of the board's unique layout and color scheme. For example, the near-fluorescent vermilion, sky blue, and aqua green knobs really stand out against the light gray, making it easy to reach and twist in low-light situations. (Here's a bonus: the gray also hides dust.)

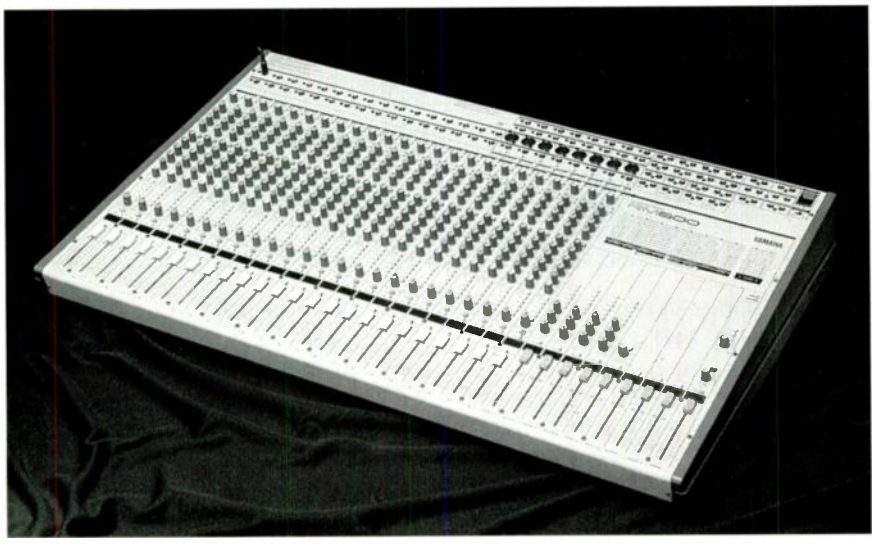
The 100 mm faders, though not exactly silky smooth, are plenty big and offer sufficient lateral space in between for pudgy fingers or strips of marker tape. Yamaha thoughtfully provided a space directly above the faders for channel-designation strips (those pieces of masking tape you jot instrument names on). This seems a trivial amenity until you've tried to live without it.

Ten 11-segment LED meters monitor signal levels for the eight subgroups and main mix. The dual-purpose subgroup meters can be switched to provide metering for aux sends, the stereo monitor section, and PFL/AFL signals. After calibrating the board to my DAT mixdown deck, I found the LED meters to be accurate and consistent. Yamaha does not offer a meter bridge for the RM800.

Clearly, Yamaha wasn't too concerned about packing the largest amount of features into the least amount of mixer. In fact, this board practically flaunts its wasted space. Of course, the generous dimensions could be viewed as a bonus. My guess is that the expanse of bare metal beneath the LEDs will prove to be a temptation for techies who like to add custom modifications. In my cramped quarters, it turned out to be a convenient resting place for a pair of headphones or a notepad and pencil.

GET BACK, JACK

A most welcome feature is the top-mounted jackfield, which puts all connections within arm's—and eye's—reach. The power cord, which is not removable, is the only thing attached to



Yamaha's RM800 in-line mixer was designed specifically for home and project studios and presently is the least-expensive 8-bus console on the market.

the back of the unit, which means you can shove the mixer up against the wall and never have to move it again. All jacks are clearly labeled with black silk-screened lettering. Furthermore, they are tidily grouped into separate, silk-screened "boxes." This makes orientation and repatching a snap.

Fortunately, there are enough dedicated jacks that frequent repatching isn't necessary. You get two regular sets of group outputs, one of which operates at -10 dBV and the other at +4 dBm. In addition, the Tape Send -10 dBV outs can be individually switched between group and channel direct outs (for channels 8 through 16), which allows you to record sixteen simultaneous tracks with the 16-channel RM800. Unfortunately, that's also the maximum number you can record at once on the 24-channel model.

There are also two sets of stereo 2-track outs (one at -10 dBV and one at +4 dBm), left and right control-room outs, and a stereo pair of monitor outs that can be switched to aux 5 and 6 outs. (The stereo monitor outs are great for setting up a headphone mix.) You get stereo insert points for the main mix and for subgroups 7 and 8, -10 dBV stereo inputs for patching in a 2-track mixing deck, and stereo inputs for returning +4 dBm signals.

Building a low-priced, pro-quality, 8-bus board requires careful compromises. Rather than simply delete a desirable feature, Yamaha usually opted to offer the feature on fewer channels. For example, the 16- and 24-channel models provide only eight XLR inputs. These XLR inputs accept balanced line-level signals as well as mics.

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The RM800 is a great match for an MDM.

The other eight (or sixteen) channel inputs accept mic- or line-level signals on balanced ¼-inch jacks. With the 16-channel version and the right assortment of cables, you can simultaneously record sixteen mic signals, sixteen line-level signals, or any combination thereof. Note, however, that the global phantom power feeds only the eight XLR jacks, which limits you to eight condenser mics (generally more than enough). Individual channel-insert points are also limited to eight channels, which again are those with the XLR jacks. Such "compromises" lead to occasional frustration (e.g., when trying to compress a line-level signal) but in general present few obstacles that careful track assignment, special cables, or creative repatching can't get around.

The layout of the jackfield is clear and logical. The only thing that initially threw me was the location of the eight XLR inputs, which are configured as the last, rather than the first, eight inputs. This is no big deal, of course, as you can assign any input to any subgroup and return tape signals wherever you want them, but it may take some getting used to, especially if you're accustomed to compact mixers that put the XLR inputs over the first four to eight channels.

AS THE SIGNAL FLOWS

The RM800 is an in-line console, so every channel can be switched between mic/line inputs or tape returns. Tape signals can be returned on any channel at -10 dBV as well as +4 dBm on the final eight channels. (You choose the level with a switch.) Among other things, the in-line design allows for easy "confidence" monitoring (monitoring directly from the recording medium).

The input channels on the RM800 are spacious and straightforward. Even without referring to the well-written *User's Guide* (which includes helpful recording and mixing tips as well as instructions in French, Spanish, and German), anyone familiar with mixer basics will be routing signals in no time.

Directly beneath the mic/line input switch is a 20 dB pad that works on mic/line inputs but not on tape returns. I found that most signals required the pad. Next down is the input gain control, which also works only on mic/line signals. Two LEDs—red for peak and green for signal—make it easy to set gain and verify that a channel is getting signal. The signal LED lights when the post-EQ signal reaches -10 dB, and the peak LED lights when the post-EQ signal reaches 3 dB below clipping. When setting gain for a channel, you simply make sure the green light is lit most of the time with occasional flickers of the red.

The 3-band channel EQ features sweepable mids. The high and low bands shelve at 12 kHz and 80 Hz, respectively, and the mid band is a peak filter that sweeps from 250 Hz to 5 kHz. All knobs have center detents except the midrange-sweep knob, which is slightly smaller than the others—a nice, visceral reminder of its different function. Just beneath the EQ knobs is a button that switches the EQ on or off. I really appreciate this feature, as it makes it a snap to do A/B comparisons of equalized and unequalized signals. It also allows you to maintain your EQ settings if you suddenly need to interrupt your current mix to record some tracks for another project. My only complaint is that I could hear a slight click when punching the EQ switch on or off. This was not only annoying but could be problematic at excessive monitoring levels.

STRONG AS AN AUX

The RM800's aux section is cleverly integrated with the board's in-line circuitry, a cost-effective approach that increases the unit's versatility and allure. You get six simultaneously available aux sends. Auxes 1 through 3 are dedicated post-fader, and aux 4 can be post- or pre-fader, depending on the position of the mic-line/tape switch just below the Aux 5-6 knob. Auxes 5 and 6 are pre-fader and share a level control and pan pot. This is not the best arrangement for addressing two separate effects units, but it works. On the other hand, it *is* ideal for setting up a monitor mix.

The monitor section is engaged by pushing down the mic-line/tape switches located below the Monitor/Aux 5-6 level controls. With the monitors selected, the Monitor/Aux 5-6 knobs control individual tape-return levels for the monitor section, and the aux 4 control lets you add an effect to the monitor mix without committing it to tape.

RM800 Specifications

Equivalent Input Noise	mic/line 128 dB
Total Harmonic Distortion (20 Hz–20 kHz @ +14 dB)	less than 0.1%
Channel Crosstalk (@ 1 kHz)	-70 dB
EQ	3-band with sweepable mid
Simultaneous Aux Sends	6
Dedicated Stereo Returns	4
Channel I/O	XLR (8 channels), ¼-inch balanced (remaining channels), direct out, insert points (8 channels)
Talkback/Onboard Oscillator	no/no
Faders	100 mm

Note, though, that *only* the aux 4 signal can be assigned to the monitor mix without printing to tape.

One of the central compromises on the RM800 is that access to the channel-strip circuitry—EQ, signal and peak LEDs, bus-assign switches, and faders—is limited to one signal (per channel) at a time. Is that a big hindrance? Not really. You get to use the EQ and other stuff while recording a mic or line signal, and you can use it again while returning multitrack tape signals during mixdown; it's just not available for monitoring in-line. Can you live without EQ in your monitor mix? For a mixer at this price, I sure can!

YOU SEND (AND RETURN) ME

The master aux send/return section of the RM800 is laid out in a convenient grid to the right of the input channel strips and just above the group faders. A standard switch matrix lets you assign aux signals to subgroups, the main stereo bus, and/or to Monitor/Aux 5-6. A master knob controls the level of signals sent to the Monitor/Aux 5-6 jacks.

A nice touch is the To Stereo switch above the Monitor/Aux 5-6 master. Engaging this button lets you monitor recorded tracks in the monitor mix while simultaneously recording new signals on the same input channels—routed, of course, to new tracks. The To Stereo button also allows you to mix extra signals (returned through the monitor section) into the stereo bus during mixdown. Keep in mind that the monitor section doesn't have EQ, so it's smart to return only signals that don't require channel EQ (such as synths with sufficient onboard EQ) via this route. By utilizing all inputs on the RM800, you can mix up to 40 simultaneous signals on the 16-channel model and 56 on the 24-channel.

Directly beneath the aux-assign switches are four Balance/Pan controls. For aux signals returned in mono, these knobs function as pan pots; for signals returned in stereo, they function as balance controls.

With the monitor section disengaged, auxes 4, 5, and 6 become available for effects or other signal processing. However, there are no dedicated return jacks for auxes 5 and 6, so you have to return those signals into the stereo sub-in jacks or to inputs on available channels. This slight inconvenience is more

than offset by the luxury of having six aux sends during mixdown.

SWITCH AND FADE

Directly below the EQ and aux/monitor knobs are five channel-assign switches that direct signals to individual groups or to the stereo main mix. The arrangement is standard: push the 1-2, 3-4, 5-6, or 7-8 button, and then turn the pan pot hard left or right for the odd- or even-numbered output channel you've selected. During mixdown, of course, the same pan pot is used to position instruments in the stereo field.

An On switch beneath each pan pot works like a mute switch but in reverse: rather than pushing in a button to mute the channel, you put the switch in the up position to turn the channel off. Just below that is a pre-fader listen (PFL) switch. I would prefer a solo-in-place button that lets you readily confirm stereo placement of a signal. Of course, if you don't mind the hassle of turning off (in effect, muting) the other channels, you can get the same result.

Group faders are equipped with after-fader listen (AFL) buttons. These let you monitor group outputs individually or several at a time. As mentioned earlier, the eight group faders feed 24 output jacks. They do not, however, have *input* jacks. But with the number of inputs this board offers and with each channel doing double duty, this usually won't present a problem.

More problematic is the inability to assign groups to the main stereo mix. I sometimes like to submix drums or backup vocalists to one or two group faders so I can easily fade them in and out of a mix. Can this be done on the RM800? Well, yes, but only by patching a set of group outs to unused channel inputs and assigning them to the main mix from there. This isn't really advisable, though, because you risk degrading the signal path. Although the RM800 is an 8-bus board, its subgroups are useful primarily for tracking, not mixing.

STEREO STRIP

Three indicator lights top the stereo module on the far right of the board: one each for power, phantom power, and PFL/AFL. The PFL/AFL indicator lights up when one or more PFL or AFL switches is depressed, which is a nice reminder during bleary-eyed sessions when you can't figure out why you're not getting sound. Below these are three mutually exclusive switches for choosing the source signal: 2-track in, Monitor/Aux 5-6, or stereo.

You also get separate level controls for the control-room outs and stereo headphone jack. I played drums while recording some moderately loud rock tunes and found the built-in headphone amp adequate for tracking. Of course, if you need blistering levels, you can feed a headphone distribution amp from the Monitor/Aux 5-6 jacks or the +4 dBV stereo outs.

A single, vermilion fader (which matches the board's pan pots and channel-on switches) controls the level of the stereo channel. And if the need ever arises to turn the stereo channel off, there's a switch for that, too.

Notice anything missing? That's right: there's no talkback mic. But then, if your situation is like most home recordists'—you track and mix in the same room—this is one amenity you won't miss. If you do have to speak with players in a separate room, it's easy enough to set up a temporary talkback mic through an unused channel.

SOUND AND THE JURY

I compared the RM800's mic preamps to those found on two comparable mixers, one more expensive, the other less expensive. I found them sonically indistinguishable from those on the pricier board and better sounding than those on the cheaper one.

I tracked on an ADAT XT and was impressed with the RM800's sound. The punchy realism of acoustic drums; the sparkling clarity of cymbals, chimes, and tambourines; and especially the

Product Summary

PRODUCT:
RM800 recording mixer
PRICE:
RM800-16: $1,699
RM800-24: $2,399
MANUFACTURER:
Yamaha Corporation
tel. (714) 522-9011
fax (714) 739-2680
e-mail info@yamaha.com
CIRCLE #439 ON READER SERVICE CARD

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ●
EASE OF USE	● ● ● ●
AUDIO QUALITY	● ● ● ◖
VALUE	● ● ● ●

full, warm timbre of vocals and acoustic guitars were a delight. In fact, in an effort to warm up my digital recordings, I recently acquired a tube mic pre, but I've now let three different singers compare the tube preamp with the RM800 and they all preferred the latter. The RM800 is a great match for an MDM, and I'm sure it would sound great with an analog multitrack deck, too.

The EQ is what I would call smooth and modest. That is, it's not "aggressive" like the EQ certain British mixers are known for. Nor is it squeaky-clean

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Can you live without EQ in your monitor mix? I can.

or clinical sounding. Considering the board's price, though, it sounds better than one might expect, and it should prove sufficiently flexible for most home or project studio applications.

The RM800 is neither the quietest budget mixer I've tracked on nor the noisiest. But as long as you set all gain stages properly (and with such a thorough manual, you have no excuse not to), you shouldn't detect board-induced noise on your tracks.

CONCLUSION

Though not exactly revolutionary, the Yamaha RM800 is a groundbreaking product that does its manufacturer proud. As the first 8-bus recording mixer to come in under $2,000 (the 16-channel version, that is), it offers the home-studio market more features per dollar than any other mixer in its class. The unit sounds clean and surprisingly warm, is easy to operate, and appears to be built for the long haul.

Of course, at prices like these, you have to live with a compromise or two. But overall, Yamaha made intelligent decisions regarding which features to include, which to limit, and which to leave out. The result is an inexpensive, pro-quality mixer that's ideally suited for small studios with big dreams. Watch your backs, major labels. Affordable home recording is ready for another bite of the pie.

Musicator Audio 1.0 (Win)

By Allan Metts

A digital audio sequencer that is optimized for notation.

I recently retired my wimpy, 14-inch, VGA monitor in favor of a 17-inch Super VGA model. When I opened a *Musicator Audio* file for the first time, I was glad I had upgraded the monitor. I was greeted with four powerful-looking windows neatly tiled together. These windows included a familiar-looking measure-editing window, a piano-roll view of one sequence track, several staves of notation (some of which contained references to digital audio files), and a graphic controller editor, all on the screen at once. I buckled my seat belt for a wild ride.

Musicator A/S' *Musicator Audio* is yet another new entry in the integrated MIDI/audio/notation software marketplace. Although other sequencer manufacturers have built notation and audio capabilities into their already-powerful MIDI sequencers, Musicator seems to have taken a different tack. *Musicator Audio* handles MIDI and digital audio well, but its real forte is the ability to create professional-looking music scores.

MIDI MADNESS

I've used plenty of sequencers before, so I thought the measure-editing window would be the best place to start. *Musicator Audio* calls this the Overview window (see **Fig. 1**). But unlike many sequencers, there aren't loads of empty tracks waiting for MIDI data.

This sequencer uses the term Part to represent what most people call a track. Parts must be individually created by the user. Each Part includes the MIDI or audio data for one instrument. The sequencer can accommodate up to 32 Parts simultaneously, which is fewer than most sequencers, some of which offer up to 1,000 tracks. However, I rarely need more than 32 Parts.

Each Part is assigned to another *Musicator*-specific construct called a Line, of which there are 32 for MIDI data. Any Part can be assigned to any Line, which is then assigned to a MIDI Out port and channel. (The program supports up to four MIDI Out ports.) You can even assign several Parts to the same Line and several Lines to the same port and channel. This is a flexible but rather complex arrangement that takes some getting used to.

The program can accommodate up to two MIDI In ports. Recording is as simple as pressing the Record button and playing on a MIDI controller. The record resolution is 480 ppqn. By default, all incoming MIDI data is sent to the record-enabled Part no matter what channel it's on. You can also use the Input Map to route incoming MIDI data to any Part or Parts, which allows multichannel recording. During playback, all data in a Part is sent to the port and MIDI channel specified in the Part's Line.

I immediately noticed that *Musicator Audio*'s transport controls are less than adequate. The rewind and fast-forward controls only take you to the start or end of the sequence. You can use the cursor keys to move forward or backward one measure at a time, but only in the Overview window; other windows have different methods of moving around. In addition, you can't set the song position directly by typing in bar and beat numbers. And because the Notation window's Ruler (described later) moves the song position when you move the mouse, it's difficult to keep the position fixed before you start recording or playback.

Musicator Audio alleviates these problems somewhat by providing an unlimited number of markers that let you jump anywhere in the song by pressing a letter key on the computer keyboard. You can name these markers, and the names appear as rehearsal marks in the printed score. You can even jump to a marker during recording, in which case *Musicator Audio* undoes the recording up to that moment, jumps to the marker, and begins recording again. This is great for those who need more than one take to get a part right. Punch-in recording is also available, and recordings can replace or merge with the data already in the Part.

For both audio and MIDI Parts in the Overview window, you can assign a Line and set volume, pan, mute, and solo. I really like having the audio Parts so tightly integrated with the MIDI Parts. I found myself thinking less about what kind of data was in each Part and asking simpler questions, such as "What should be louder, the synth or the guitar?"

In MIDI Parts, you can also specify settings for reverb, chorus, playback-only transposition, and Instrument, which is a combination of Bank Select and Program Change messages that are defined in special Instrument files. Only a few Instrument files come with

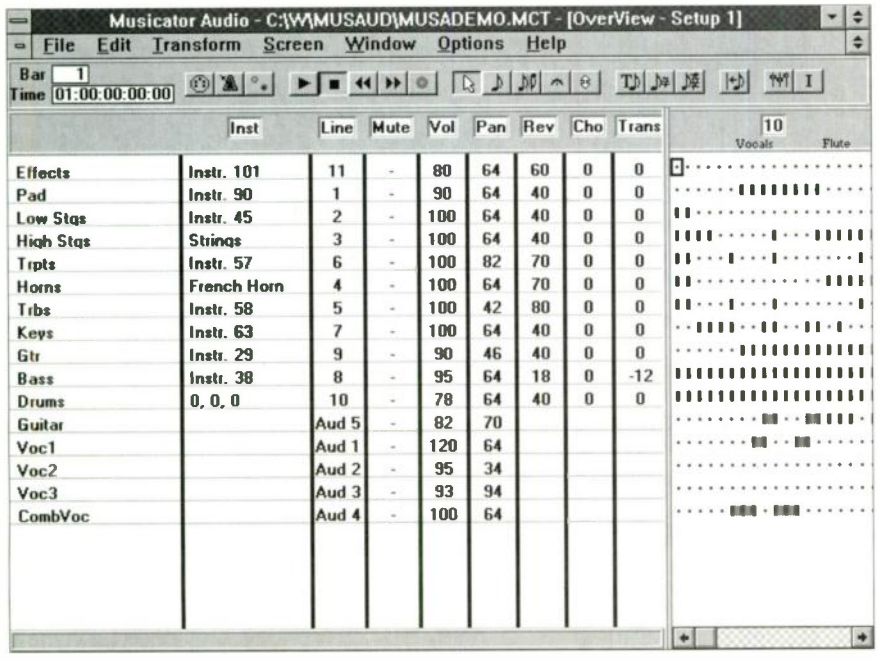

FIG. 1: The Overview window is similar to that of many other sequencers. MIDI and audio Parts can be manipulated together.

Musicator Audio, but you can make your own with a text editor. I made one for my Alesis S4 Plus without much trouble. There are generic Instrument files for General MIDI devices and synths that number their programs from 0 to 127 and 1 to 128.

I was forced to make an Alesis S4 Plus Instrument file because *Musicator Audio* is missing something important. You can't send Bank Select messages from the Overview window. You must build an Instrument file or call up a graphic

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Musicator Audio's real forte is music notation.

controller window to insert a Bank Select message into a Part.

To the right of the Part parameters in the Overview window are the Part's measures, which *Musicator Audio* calls the Bar Display. This display lets you edit the measures using standard cut, copy, paste, and drag-and-drop techniques. Paste operations can replace, merge with, or insert between the existing measures. I found only two missing features in the Bar Display. First, I want to select and edit measures in nonadjacent tracks; second, I want to double-click on a measure and open the Roll View window (described shortly) to the selected measure and Part.

MIDI EDITING

Most editing functions are called Transforms. Among other things, these Transforms let you transpose, time shift, and alter note Velocities. You can also change the key and time signature for a group of measures.

Musicator Audio's MIDI quantization is very unusual in that you must first quantize the Part's notation. Of course, the notation is automatically quantized from a visual standpoint. As a result, you must look at the Part in the Roll View window to see which notes need quantization and how much quantization they need and then move to the Notation window and use the Requantize Notation Transform.

Finally, you invoke the Quantize MIDI Transform, which alters the MIDI data to play as the notation indicates. This Transform lets you specify a percentage of quantization, which corresponds to the Strength parameter in other sequencers, but there is no Sensitivity parameter. You can quantize the Note Off events along with the Note On events, and you can offset eighth and sixteenth notes for a swing feel. Overall, the quantization function is limited and unintuitive; standard MIDI quantization would be much better.

Although the Transforms provide a good selection of editing functions, there are a few obvious omissions. For example, there is no way to remap notes from one pitch to another (e.g., to change a drum sound) and no way to set, offset, or scale note durations. In addition, you can't humanize (randomize) note Velocities or start times. You can offset and scale Velocity, but you can't set it to a specific value.

Like most sequencers, *Musicator Audio* includes a piano-roll view (called the Roll View window), which displays the individual notes in a Part. Compared to other programs, however, the Roll View window is rather limited. You can only move or change one note at a time, and you can't do MIDI-based step entry, as you can in the Notation window. In addition, cut, copy, and paste aren't available.

At first, it appeared that notes could only be dragged as far as the maximum possible Offset value (roughly 700 ticks) from their original location. However, this is true only when the Transcribe checkbox is not checked (which is the default condition). If it's checked, you can drag a note as far as the window's scroll range allows. Unlike most sequencers, this scroll range is not the entire length of the piece, but only a few measures.

Musicator Audio also provides graphic controller windows that let you draw and edit any Control Change, Aftertouch, Program Change, Pitch Bend, and tempo data but not Velocity data. These tools are more than adequate for their intended purpose, but editing individual CC events with the mouse is a bit tricky. Unfortunately, the program has no event list.

The graphic controller windows can also be applied to audio Parts. I like the ability to control audio volume and panning from a graphic controller window that operates just like a MIDI controller window. I also like the graphic controller Transforms, which let you

time shift, offset, compress, and expand controller events. You can use an Interpolate command to add new controller events between existing ones, but there is no Thin Transform to remove excessive controller information.

NOTABLE NOTES

Musicator Audio provides a comprehensive suite of tools that let you view and edit your music using standard music notation (see **Fig. 2**). In fact, the program includes more features for creating professional-looking scores than other Windows sequencers I've seen. Each Part appears on its own staff, and each staff can use a different clef and key signature. (Bass, treble, alto, tenor, and percussion clefs are available.)

Audio parts appear in a single-line staff with a box indicating the position and duration of each audio Region (see **Fig. 2**). Pianists will be happy to know they can display a Part in a grand staff, and percussionists can customize a drum staff with various symbols assigned to different notes and positions in the staff.

You have complete control over the spacing between staves and the number of bars in a line. You can also control the connections between staves in a system using bar lines, brackets, or braces. Staves can be hidden or reordered, but you must do so by manipulating the Parts in the Overview window; it took me a while to figure this out.

Notes can have flat beams, angled beams, or no beams, and their stems can go up or down. Bars can be displayed in a manner that is suitable for a printed score or in Time Proportional mode, which positions notes horizontally based on their length. I like Time Proportional mode because it lets you line up the Roll and Notation windows on the screen.

Most editing in the Notation window is done with the Ruler, which is a floating bar that you place above any measure. The marks on the Ruler indicate the exact position of each beat or subdivision of a beat in that measure.

The Ruler's resolution is specified with the number keys. For quarter notes, you press the 1 key; for eighth notes, press 2; for eighth-note triplets, press 3; and so on. Each note you enter with the mouse has a duration equal to the Ruler's resolution. To create a longer note, simply click on the desired location in the staff, and drag the mouse to set the note's length. You can even begin in one measure and end in another measure; the program automatically inserts all note heads, ties, beams, and rests.

The Ruler makes it easy to enter complicated note patterns with the mouse. You can also enter notes in step time using a MIDI keyboard. For a 9-note

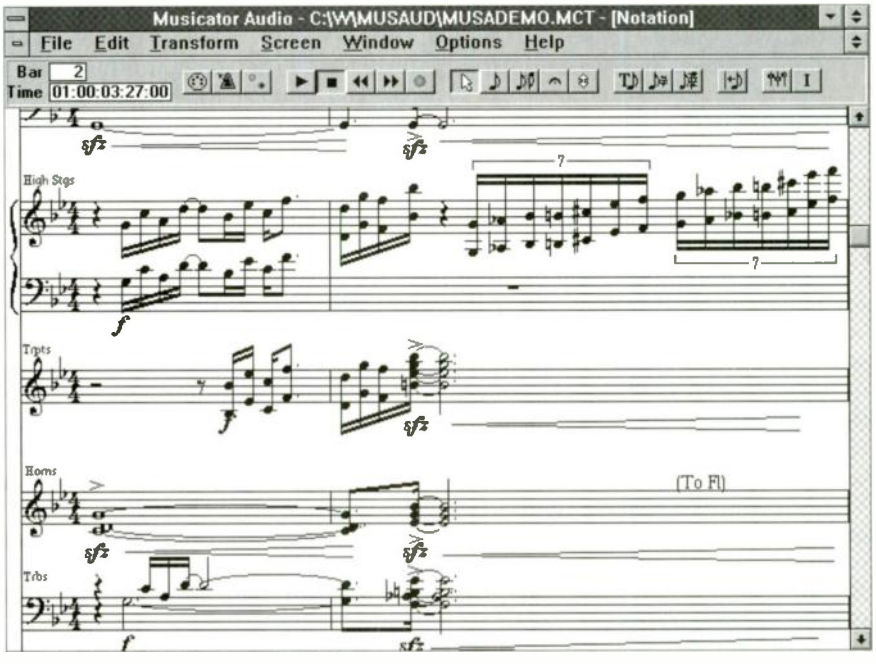


FIG. 2: The Notation window gives you powerful tools for creating professional-looking scores. Most audio Parts appear in a single-line staff, but you also can display them in a grand staff.

tuplet, just press the 9 key and click notes at each mark on the Ruler. This is the easiest notation entry I've seen in a sequencer.

If the preset Ruler resolutions aren't enough, you can create custom resolutions based on any number of subdivisions of the beat or bar. You can divide a measure into as many as 64 ticks and use the Ruler to respace the notes in a measure by dragging the Ruler marks with the mouse.

▼

The program's transport controls are less than adequate.

Notes can be moved by dragging and dropping or cutting and pasting. However, I couldn't change the duration of a note in the Notation window without deleting and replacing it. (This can be done in the Roll View window.) *Musicator* doesn't implement the "infinitely wide" staff that many sequencers use for editing. As a result, you must use some funky keyboard and mouse techniques (e.g., pressing Page Up and Page Down while holding the mouse). Even so, I couldn't reliably select groups of notes that crossed page boundaries using these techniques.

Once the music is in place on the staves, you can add all sorts of embellishments and symbols. I drew in slurs and phrase markings with the mouse, and *Musicator* automatically smoothed my wavy lines into perfect curves. When I printed my score, my markings were thick in the middle and thin on the ends, as they're supposed to be. Crescendo and decrescendo hairpins can be drawn to any length and width.

Musicator supports ottavas, dynamic markings, grace notes, accents, and trills as well as changes in clef, key, and time signature. You can also insert fermatas, breath symbols, pedal markings, articulations, arpeggios, double bar lines, repeat symbols, and multiple endings. You can even insert the phrase markings that appear in jazz scores.

All these symbols are entered using palettes that appear with no more than two mouse clicks. A master palette takes you to several subpalettes so you can quickly find the symbol you want. Symbols affect the display only; they don't change how the music is played. For example, the music doesn't get louder with a crescendo marking, and it doesn't repeat when you insert a repeat sign. The ottava symbol shifts the notes up or down an octave on the staff, but it doesn't affect playback. I really appreciate this feature because it lets me see the sequenced tracks as I played them without lots of ledger lines.

Lyrics and other text can be entered anywhere in the Notation window. Text and lyrics use the Ruler just as notes do, which keeps lyrics beneath the correct notes when you shrink or stretch the measure. You can enter multiple verses cleanly and quickly with the lyric subpalette, and each verse's syllables stay linked to the proper notes. You can also enter chord symbols that automatically transpose if you transpose the notes.

When musical passages include more than one voice on a staff (e.g., quarter notes and eighth notes playing simultaneously), many scoring programs get confused and create ugly notation. *Musicator* handles this situation by providing up to four Voices on each staff. If you don't like *Musicator*'s assignments of notes to Voices, you can open the Voices toolbox to reassign individual notes.

Using the mouse, you can draw lines between notes (or circle them) to change their assignment and stem direction. I used the Voices toolbox to move notes from the treble clef to the bass clef in a piano score. Tools are also available to remove or hide unnecessary rests and to reassign all Voices in a staff to one Voice.

When the notation is ready to go, you open the Page View window to prepare the score for printing. This is where you insert margins, titles, and composer information; position each system on the page; and set the number of bars in each system (which is a separate setting from the one in the Notation window). You have complete control over which staves appear in the printout. If you'd rather send the score to a desktop publishing program, just export the notation to the clipboard in either bitmap or vector-based format.

AUDIO ALCHEMY

Audio Parts behave in much the same way as MIDI Parts when it comes to recording and playback. For example,

audio Parts are connected to any of sixteen audio Lines in the Overview window. However, the program cannot accommodate more than a total of 32 Parts, including MIDI and audio.

You can open a mono or stereo WAV file into a Part, which is automatically assigned to an audio Line. If the mono/stereo or sample-rate parameters of the file and the Line don't match, the program prompts you to convert the file to the Line's specified file type.

Each time you record an audio track, a new WAV file is automatically generated and stored in your default directory. A Region that includes the entire WAV file is also defined. If you move the measures in the Overview window and cause an audio Region to split, multiple Regions are automatically created. In addition, you can record more than one audio Part simultaneously if your hardware supports this capability.

Musicator Audio provides an Audio List window for managing files and Regions. This window lets you determine which Regions are actually used in a song and delete the ones that aren't. You can bring in new WAV files, create Regions, and drag these Regions to the appropriate place in the song.

Two windows let you manipulate the audio data itself. The Wave Edit window (see **Fig. 3**), which is accessed from the Audio List window, includes the tools you need to split a WAV file into multiple Regions. The other window is called the Wave View window, but I would have named it the Region Edit window because it operates on only one Region and includes more editing capabilities than the Wave Edit window.

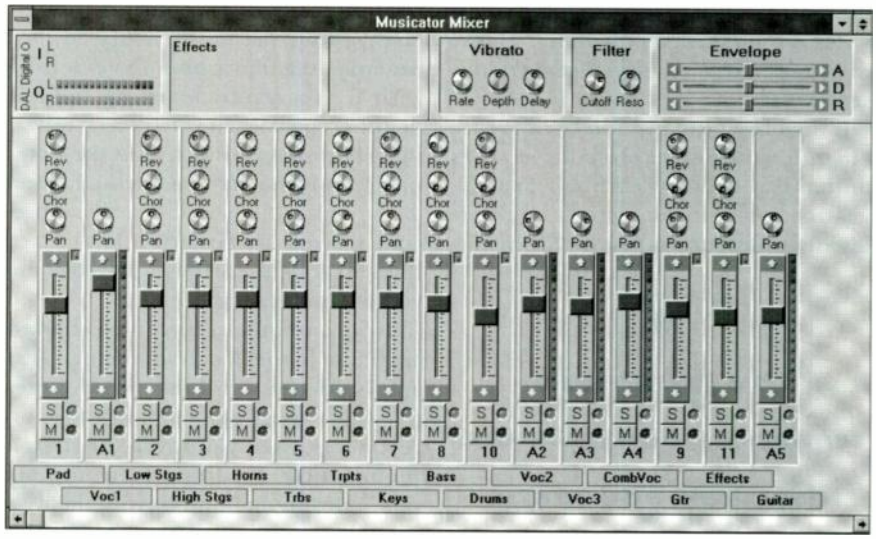


FIG. 4: *Musicator Audio*'s Mixer window lets you control all 32 parts. Audio and MIDI Parts use identical controls in the same window.

The Wave View window, which is accessed from either the Notation or Overview windows, includes the tools needed to move, split, fade, and crossfade Regions. You can also adjust the gain and normalize a Region in this window. Both audio-editing windows have zooming and playback capabilities.

Two Transforms are available for audio files. The Mix Down Transform allows you to select multiple audio Parts in the Overview window and mix them down to one Part. If you drag a beat or measure boundary to the end of a Region in the Wave View window, the Fit Time Transform tells you the tempo needed to make the bar and Region end align, which is way cool.

According to Musicator, the program automatically detects the presence of a full-duplex sound card, which allows simultaneous recording and playback. I tried this with a DAL Digital Only CardD, but playback stopped when I went into Record. In all fairness, I suspect this is the fault of the DAL driver, which has been the subject of many complaints on CompuServe. Apparently, DAL has been slow to provide robust drivers for their products under Windows 95. Musicator claims that the CardD+ can record and play simultaneously when the input and output parameters match (e.g., it can't record in mono and play in stereo at the same time). However, this is a limitation of the hardware, not the driver.

In addition, the program is said to have the ability to record from two different cards and play to as many as four cards at a time. I was unable to test this, but you can assign a different card to each audio Line, which seems to support this assertion.

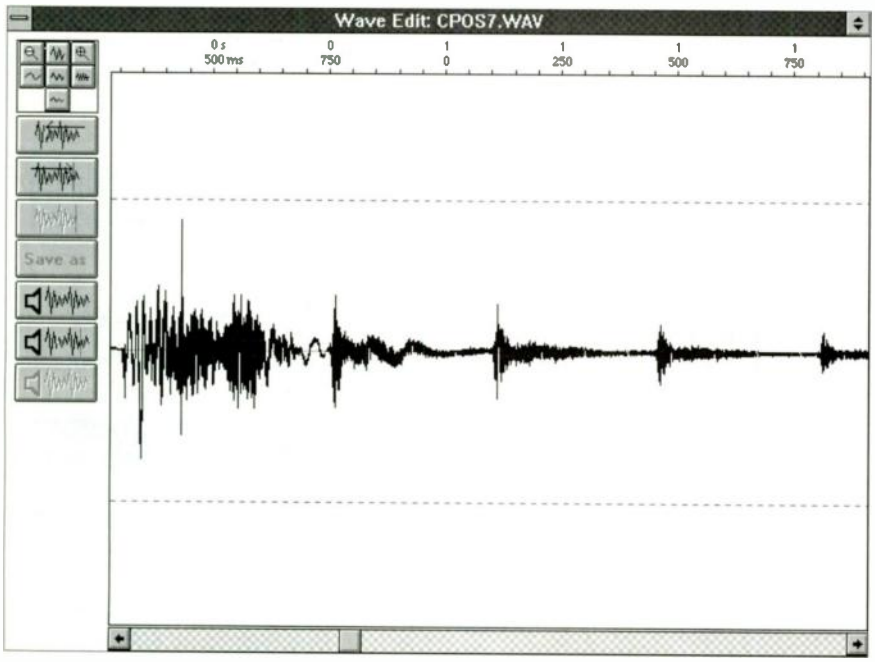


FIG. 3: Audio-editing windows let you split a WAV file into multiple Regions.

BUT WAIT, THERE'S MORE

Rounding out *Musicator Audio*'s bag of goodies are user-definable screen setups, Standard MIDI File importing and

exporting, GS (Roland's superset of General MIDI) parameter editing, and SMPTE/MTC synchronization. I especially like *Musicator Audio*'s Mixer, which includes all 32 Parts (both audio and MIDI) on one mixing surface (see **Fig. 4**).

You can record all fader and knob movements and edit your movements in the graphic controller windows. The faders can be reordered and grouped, allowing you to move multiple faders at once. The Mixer window also includes mute and solo buttons and real-time output metering for each Part.

Musicator Audio is complex, powerful, and sometimes difficult to figure out. Online help is available, but it isn't context sensitive, and it isn't well organized. For example, I couldn't find information on the Roll View window at first because it appears under the Window New menu item. Floating help for the program's many buttons and a tidier user interface would make *Musicator* much easier to use.

Fortunately, the manual is wonderful. It is impeccably organized and contains plenty of illustrations, a table of contents, and a comprehensive index. I kept the manual by my computer because I could find things faster that way than with the online help.

The program seems quite stable. I ran it for several weeks under Windows 95 and only experienced one program crash. I found a few minor bugs, especially when importing and exporting Standard MIDI Files, but nothing I couldn't work around. The manufacturer is checking into the bugs I found.

Meanwhile, the company is also working on the next version (1.1), which is due to be released this summer. The new version is said to address many of the limitations I encountered in version 1.0. For example, the new version will accommodate 256 Parts instead of 32, and it will offer chunk-based editing in the Overview window, as in Steinberg's *Cubase*.

The new version will also include several real-time and non-real-time audio effects, such as EQ, reverb, delay, several modulation effects, and compression/limiting. In addition, it will add an event-list editor, and the Roll View window will be improved with cut/copy/paste capabilities and the ability to select regions of notes for editing length, position, and Velocity. The notation function will include cross-beaming, as well.

OVER AND OUT

Musicator Audio makes a valiant attempt to insulate the user from all the bits and bytes of MIDI and puts the program's emphasis on creating and manipulating standard music notation. For my needs, an attractive printed score is of secondary importance. I need a sequencer that plays my music exactly the way I want it. Give me a powerful piano-roll editor, an event-list editor, and plenty of special functions that will help manipulate my sequence to the nth degree.

For others, *Musicator Audio* may be just what the doctor ordered. Many people prefer to edit their sequences using notes on a staff. If you work with an orchestra or school band and you want to create accurate scores quickly and easily, give this program a serious look. In any case, *Musicator Audio* brings MIDI sequencing, digital audio, and music notation together in a good, solid package.

Allan Metts *is an Atlanta-based musician, consultant, and engineer. No, he doesn't have any extra Olympic tickets.*

Product Summary

PRODUCT:
Musicator Audio 1.0
PRICE:
$399
SYSTEM REQUIREMENTS:
80486/33 or better PC; Windows 3.1 or higher; 6 MB RAM; Windows-compatible, 16-bit sound card
MANUFACTURER:
Musicator USA
tel. (800) 551-4050
or (510) 251-2500
fax (510) 251-0999
e-mail 74431.40@compuserve.com
Web http://ourworld.compuserve.com/homepages/musicator
CIRCLE #440 ON READER SERVICE CARD

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ●
EASE OF USE	● ● ●
DOCUMENTATION	● ● ● ●
VALUE	● ● ●

DigiTech Studio Quad

By Richard Chycki

Get four quality effects processors for a song.

Since the introduction of DigiTech's patented S-DISC technology, it has become a challenge to find a musician's rack or a recording studio that lacks a piece of that company's gear. The TSR-24 and TSR-12 took DigiTech's multi-effects processing line to a whole new level, bringing users powerful, yet affordable, audio processing.

The next generation of S-DISC technology attacks the fiercely competitive bang-for-the-buck market. As economical and versatile as a Swiss Army knife, the Studio Quad offers four independent processing channels with dedicated inputs and outputs for each channel, full audio bandwidth, dynamic parameter control, and a versatile, digital patching matrix and mixer. And all of this power is made easily accessible by a dexterous operating system.

QUADROPHENIA

The 1U rack-mount Studio Quad is surprisingly compact, given its patching and processing power. All four inputs and all four outputs are on balanced, ¼-inch TRS connectors that can be globally switched between -10 dBV and +4 dBu operating levels. Balanced connections are indispensable for ground-loop and noise reduction; big kudos to DigiTech for its forethought here.

The footswitch jack operates with DigiTech's FS-300 footswitch or a standard momentary footswitch. The former offers program increment/decrement and bypass whereas the latter only provides global bypass of all effects.

Power is supplied via a wall-wart adapter. Unfortunately, the Studio Quad has a nasty habit of spitting out the 4-pin DIN power connector. Some kind of connector lock, or at least a power-cable strain relief, would be a welcome addition.

In operation, the rear panel of the unit became extremely hot. Ample ventilation is a necessity, as this unit challenges some smaller tube equipment when it comes to heat emission.

IN CONTROL

It's obvious that attention has been lavished on the Studio Quad's front-panel control interface, which combines a matrix of highly visible, illuminated buttons, a rotary parameter encoder, and an oversized LCD screen. Designed for operation in the most inhospitable of visual conditions, all buttons remain dimly lit except for the current selection, which is fully lit. The LCD display is well illuminated, and the contrast is adjustable. A quartet of onscreen VU meters monitor input level and clipping in all modes (Program, Edit, and Utility). Separate text indicators denote digital and analog clipping.

Input levels for the four channels can be adjusted using the encoder and the In Levels button. (An automatic level-adjustment process is available, too; I'll discuss that later.) A patch map graphically displays how many effects are in use and how they are routed within the unit. A large patch-number indicator rounds out the display.

OPERATING SYSTEM

With any feature-laden effects processor, it is critical that the operating system be well ordered. Fortunately, navigating the Studio Quad's interface is a snap. In Program mode, rotating the encoder scrolls through the 100 factory presets first and then through the 100 user programs. (Pressing the Program button toggles directly between user and factory programs.) Automatic program loading can be disengaged in the Utilities menu so you can preview programs before making your selection.

Loading a program causes the Studio Quad to mute for about a quarter of a second. Unfortunately, the dry signal in the Studio Quad is routed through the DSP and therefore is muted during program changes. This can be inconvenient when the unit is connected in series (e.g., in simple live-performance rigs or when wired to console channel inserts). When the unit is connected in parallel, as with a console effects send/return, this muting is more tolerable because your dry input signal can be heard through the mixer. One effective workaround is to vary the parameters in real time via MIDI instead of changing programs.

Editing is efficient and systematic. Pressing one of the four selector switches places the unit in Edit mode and allows direct access to the selected effects module. Up to four editing parameters can be displayed simultaneously, and pressing the Page buttons scrolls through parameters in groups of four. When you alter a program, a small text indicator appears on the display, and a red Store switch lights up brightly, reminding you that the program has been edited. (It's the only red lamp on the unit, so it's hard to miss.)

The Studio Quad's FX Edit switch accesses the dynamic modifiers, which are onboard sources for real-time parameter changes, and the routing matrix, which routes the signal between effects modules. When you simultaneously press the Program and FX Edit buttons, the Studio Quad toggles between the saved preset and the edited program, allowing you to speedily audition your changes.

In tense "set up and go" situations—hey, you're the opening band, you don't get a sound check—there may not be time to set correct input levels. No problem—Studio Quad's auto input-level function can help you out of the pinch. You just press and hold the In Levels button to get into Auto Level mode and select the inputs whose levels

The Studio Quad delivers four independent effects processors that can be linked in a variety of configurations. Based on DigiTech's proven S-DISC DSP technology, this flexible effects processor is an excellent value.

you want to set. The Studio Quad analyzes the input signals for about eight seconds and sets the levels for optimum gain. If the unit doesn't detect an input signal, it sets the levels to 70 percent.

This feature is a fine emergency tool, but there are a few caveats. All inputs must receive their maximum anticipated level within the analysis period. In addition, stereo programs must receive the same level for each channel, or the stereo image will not be accurately maintained. Also, keep in mind that the Auto Level function only applies to the analog I/O. It is still possible to have internal digital clipping that can only be remedied by manually manipulating the unit's internal mixer. I found the Auto Level function beneficial for ballparking levels, but it was still necessary to tweak them manually.

TOTALLY MODULAR

The Studio Quad offers 51 different effects modules, including the Thru and Mute modules. The Thru module allows only the dry signal to pass, and the Mute module keeps any signal from passing. These modules can be placed anywhere in the effects chain in the same manner as regular effects modules, but unlike the others, they have no user parameters.

All effects modules are classified according to the amount of processing power they require. Logically enough, Fourth modules use a quarter of the processor's power, and Half and Full modules occupy half and all of the processor, respectively. Any combination of up to four of these modules can be assigned to the processor, with the obvious limitation that the sum of their processing demands must remain within the unit's total processing power (i.e., they cannot exceed a Full resource).

Many effects types span the three processor classifications. Those that use more processing power generally offer increased complexity and programmability or expand from a mono or dual effect to a stereo effect (see **Fig. 1**). All modules maintain a very palatable sonic quality even when you use every bit of processing power.

To speed programming, DigiTech provides a list of the presets available within each module. You simply select a preset that is close to the effect you had in mind and tailor it to your situation.

▼

"Octal Detune" turns any input into a swirling, gargantuan mass.

Using the routing matrix, the effects modules can then be interconnected in any of a dozen preset configurations. This routing matrix, along with the panning, level, and wet/dry mix parameters that are available within most modules, produces a tremendously powerful, fully programmable digital mixer.

DigiTech's Studio Quad also lets you assign the modules to the input and output jacks in a dozen different ways. These range from a discrete, 4-channel configuration that uses only Fourth-resource modules to almost every possible assortment of Fourth and Half modules placed on multiple channels in a combination of serial and parallel routings. The I/O routing configuration is saved with each program.

A DYNAMIC PERFORMER

Dynamic, real-time parameter control can breathe life into what might otherwise be a boring effect. The Studio Quad delivers well in this field, allowing dynamic onboard and MIDI control of up to eight parameters per program.

Setup is very straightforward: you just select a parameter and a modifier and set the range within which the modifier can alter the parameter. Parameter changes are shown in real time on the Modifier page but are only indicated on the display for the effects module by a microsized "cc" next to the parameter.

The Studio Quad supports three types of modifiers. You can alter parameters with MIDI Control Changes 0 to 127, Channel Pressure, and Aftertouch. This provides precise, continuous control. You also can modify the parameters via the two onboard LFOs, in which case the parameters modulate between the minimum and maximum setting based on the LFO waveform and speed. Finally, you can use Dynamic Modifiers, which alter the parameter values according to the amplitude envelope of the input signal.

Sadly, I experienced clicking artifacts when many of the parameters were tied to a modifier. Slow and minimal movements helped this situation, but this greatly reduces the usefulness of the Studio Quad's dynamic-control features. This was not a problem when the LFOs were used in programs such as flanging, chorusing, and phasing, however.

BOUNCING OFF WALLS

Thankfully, all the reverb modules have stereo output. (Mono reverb doesn't sound realistic to me unless I have my thumb in my right ear.) Fourth-resource reverbs have only the most basic features, allowing you to select one of ten preset reverb types and to control diffusion, density, and decay. The sound quality doesn't suffer much in modules that use minimal processing power; only the number of parameters (and hence, control) is

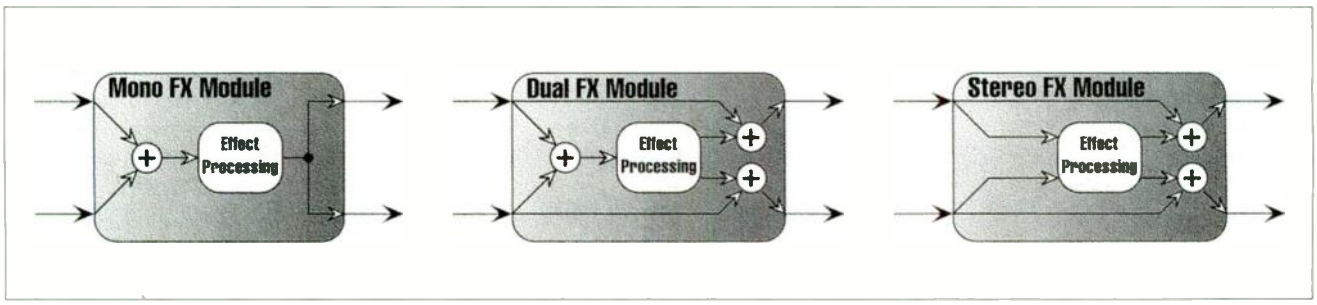


FIG. 1: The Studio Quad can create mono, dual, or stereo effects. Unlike dual processing, stereo processing maintains discrete left and right signal paths for both the direct and processed audio. (Courtesy Harman/DOD)

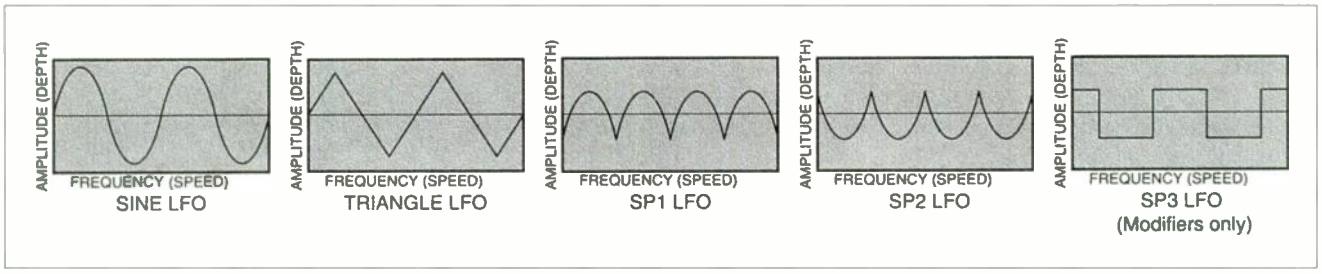


FIG. 2: The two LFOs can generate five waveforms, ranging from the classic triangle wave to the SP2 hypertriangular waveform, which is the secret behind killer flanger and phaser sweeps. (Courtesy Harman/DOD)

restricted. For basic ambiences, Fourth-type reverbs are fine.

The "VocalPlate" preset from the Full-resource category showed healthy density and brightness with fast diffusion. It is a solid plate emulation. "PercPlate" fared well in all but the most difficult small-reverb settings, where the reverb took on some ringy characteristics. On the other hand, the "StudioAmb" preset felt generic and lifeless. Its stereo field was uneventful, although increasing diffusion seemed to breathe some life into the preset.

Many reverbs felt a bit too separated from the original sound source, which I attribute to excessive predelay. Because there is no predelay adjustment *per se*, I resorted to decreasing room sizes and compensating in the density, diffusion, and dispersion parameters.

Gated reverbs are particularly well represented. A selection of twenty presets with ten different decay envelopes are available. All of these presets had good body, with high dispersion and density and a minimum of ringing. The "200msDecay" preset delivers the classic Phil Collins gated-reverb vibe. To give the gate effect more weight, I patched a stereo parametric EQ module after the reverb and kicked up the 80 to 100 Hz band by 2 to 4 dB. Presets such as "Peaking500" demonstrate that the Studio Quad can also pull off credible reverse-reverb simulations.

THE MOD QUAD

Modulation effects add motion and thickness to a static sound source. The Studio Quad has dozens of flangers, choruses, and phasers ranging from simple dual modules to the processor-hungry, superthick "Octal Chorus" patches. Wide sweeps are available in the flanging presets. Negative-phase feedback is available, but the delay phase is not inverted, so negative-phase flanging is weak.

All the choruses are eminently useful for light motion or mondo thickening. The phase-shifter presets within the module seem to be mutations of a 4-stage phase shifter *à la* MXR Phase 90. You get good spatial movement here, but a few 8- and 12-stage phase-shifter presets would have added to the unit's versatility.

Several LFO waveforms are offered for the flanging, chorusing, and phasing modules and as sources for the Dynamic Modifier section. The usual sine and triangle waveforms are provided, along with a pair of exponential, hypertriangular waveforms (see **Fig. 2**). These hyperbolic waveforms are great for creating exaggerated phaser and flanger sweeps that really stand out in a mix. Square wave, sample-and-hold, and random modulators were omitted, however.

Random waveforms are indispensable for creating natural-sounding, noncyclical chorusing and doubling effects. I was able to sufficiently randomize the triangle and sine waves by using the modifier section of the unit to modulate the chorus LFO depth and speed with another LFO and to add input-dependent dynamic elements. This produced a nice performance-tracking touch, but it's a more arduous procedure than most Studio Quad operations.

The Studio Quad does a formidable job of emulating classic, over-the-top tape flanging. (To get a taste of real tape-flanging effects, check out the break in the classic Doobie Brothers' "Listen to the Music" or the Eagles' "Life in the Fast Lane.") Flanging can be made to appear to cross through zero by assigning a stereo flanger (module 206, with the way cool SP2 LFO) to half of the processor, and a stereo delay (module 212) to the other half. Then you set the delay value equal to the top of the flange range (about 0.1 to 5 ms) so there is no delay between the flanged and delayed signals. There should be no feedback on the delay, as this will be our dry signal in this application.

DELAYS DELAYS DELAYS

A single 1.4-second delay line (or two 700 ms delays for true stereo) is available with a Full delay module. This drops to 370 ms for a Fourth module. A variety of mono, dual, and stereo delays are here, accompanied by useful echo, slap, and comb-filter presets. Up to four delay taps with programmable level and pan can be placed within the stereo field.

Studio Quad Specifications

Independent Audio Inputs/Outputs	4/4
Factory Presets/User Presets	100/100
A-D Converters	18-bit, 128x oversampling
D-A Converters	20-bit, 64x oversampling
Sampling Frequency	44.1 kHz
Frequency Response	20 Hz–20 kHz (±3 dB)
THD	>0.03% (@ 1 kHz)
S/N Ratio	>90 dB (max. signal, 22 kHz bandwidth, unweighted)
Operating Levels	-10 dBV, +4 dBu (software switchable)

All delay modules have a TapIt button, which is one of the four selector switches acting as a tempo-sensitive control. In a multitap module, the longest delay locks to the tapped delay time, and the other delays automatically adjust themselves in proportion. It's too bad the footswitch couldn't be assigned to the Delay Tap function; that would have proven useful for live situations, especially when your drummer kicks off a ballad 8 bpm too fast. However, the TapIt function can be assigned to a MIDI controller, so anything that outputs Control Change information can be used for this purpose.

Considering the 20 kHz bandwidth of the Studio Quad, the delays are superclean. There are no filter parameters in the delay modules' output or feedback paths, though, so I had to eat up resources in the unit by patching EQs at the output in order to tame the delay bandwidth. Tying the delay time to a MIDI continuous controller resulted in clicks whenever I changed the delay time. As a result, the Studio Quad isn't suitable for real-time delay glides while the music is playing, although you can use continuous controllers to change delay times between songs or during breaks.

The unit boasts from 2- to 8-voice pitch-shifting and detuning modules. Several of these modules are in stereo. Pitch shifting in the Studio Quad is not diatonic. Although not ideal for processing an entire mix or a hypercritical instrument (a lead vocal or sax, for instance), the pitch shifting is acceptably smooth when added to a direct signal. As with most pitch shifters, the further one deviates from the root pitch, the more dissonance, delay, and warbly artifacts are introduced. Conservative use is the key.

The 8-voice "Octal Detune" turns any input into a swirling, gargantuan mass. Those puny string patches will be monsters when processed through this module! I tried to have an LFO sweep the Spread parameter so that the listening field was swept from mono to wide stereo, but alas, those nasty glitches defeated the idea.

FUN WITH FILTERS

Parametric and graphic equalizers of varying complexity are offered. Again, the complexity depends on how much processor power you assign for EQ. The graphic EQs conform to ISO frequency standards. Frequency ranges overlap in the parametric EQs to create complex frequency curves or to double-boost the selected frequencies.

These EQs are surgically precise, and to my ears they are on the hard side, especially when you're boosting the upper registers. But if aggression is what you seek in an EQ, look no further.

With the EQs, the preset list is an especially welcome relief from the tedium of page scrolling; for example, there are ten pages in the 31-band graphic module. Many common EQ curves are provided, including low-end boost, antihum (60 Hz) cut, and V-curves (which boost the highs and lows and cut the mids). Too bad there was no general boost/cut control that would alter all parameters associated with a preset; I'd like to be able to adjust the Smiley (Studio Quad's name for a V-curve) so I could crank up the low and high frequencies and cut the mids proportionately.

▼ Attention was lavished on the front-panel controls.

Equalization is commonly associated with utilitarian applications. But don't underestimate the power of creative equalization to add flavor to a sound source. Adding dynamic modifiers to EQ can make for some wild effects. When using the parametric EQ module, try applying a deep, narrow cut in a midrange frequency and then assigning the filter frequency to an LFO. You have an instant modulation effect that's somewhat reminiscent of a phaser but really has a sound of its own. Invert the EQ phase for more fun. For even more fun, put the Studio Quad in your console's effects loop, return the EQ'd signal to a channel, and feed some of the effect's output back to its input. When I tried this, I heard some clicking due to the Dynamic Modifier, but it was tolerable in this application.

Boosting a narrow frequency band and then assigning dynamic input to modify the frequency creates an input-dependent wah filter. This is great for slap bass and interesting on staccato vocal performances.

CLOSE THE GATE

The noise-gate module contains the compulsory attack, hold, and release parameters as well as a look-ahead gate trigger. The latter function, which is useful in the processing of percussive program material, delays the direct signal slightly so that the gate has time to open, leaving the initial transient of the source fully intact. Although the maximum delay available here is only ten milliseconds, I recommend judicious use of this feature. Even minuscule delays can markedly change the feel of a performance and alter phase relationships between miked sources, especially drums.

The Studio Quad also offers threshold hysteresis, where the gate-open threshold can be set higher than the gate-close threshold. This feature, which is usually reserved for more expensive noise gates, prevents chattering (quick gate opening and closing) when the source level is sitting very near the noise gate's threshold, and it reduces the truncation of decaying sources as the signal level falls below threshold.

It's strange that a gate with so much inbred versatility was not blessed with any selectable filtering of the trigger signal to remove extraneous frequencies. This would have been useful for difficult gating applications, such as cymbals triggering tom gates on live drums. Also missing are external keying, ducking, and a stereo gate.

Other common dynamic effects, such as tremolo and auto panning, are also provided. These effects are modulated by the same four waveform types that

Product Summary

PRODUCT:
Studio Quad multi-effects processor
PRICE:
$529.95
MANUFACTURER:
DigiTech/DOD
tel. (801) 566-8800
fax (801) 566-7005
Web http://www.digitech.com
CIRCLE #441 ON READER SERVICE CARD

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ◖
EASE OF USE	● ● ● ●
QUALITY OF SOUNDS	● ● ● ● ◖
VALUE	● ● ● ● ◖

are available for the flange, phase, and chorus modules. Surprisingly, there was no compression module in this sonic toolbox. I did manage to fabricate an ersatz compressor by assigning the level of an EQ program (with all bands flat) to a dynamic controller with the parameter range inverted. Its performance was passable, but it was crude, offering absolutely no ballistic control.

I'm a guitarist and would have enjoyed some guitar-oriented modules, such as distortion and speaker emulation. But I had to live without them. It also wouldn't have hurt to add a front-panel, high-Z, instrument-level input.

IN THE END

The Studio Quad packs an arsenal of processing power for less than $550. Dynamic modifiers are one of the keys

▼

Real-time control can breathe life into a boring effect.

to creating unique, customized effects. DigiTech has the right idea here, but it needs to smoothen the Studio Quad's performance to make this feature completely useful.

When it comes to audio performance, the Studio Quad is a clean machine (see the table "Studio Quad Specifications"). All inputs and outputs are analog, but the A/D/A converters are quite good. I'd love to have digital I/O, but that's too much to expect at this price.

A quartet of processor modules under one roof, bonded with an efficacious operating system and decent sound quality, is hard to resist. Clearly, DigiTech's current technology makes the company a potent contender in the effects-processing market. If you want to consolidate your effects units for easy live manipulation or add an almost all-purpose (except compression) processor for your studio, consider the Studio Quad.

Richard Chycki *is a producer/engineer/guitarist in Toronto, Canada. He has recently completed recordings with the Four Horsemen and the Jeff Healey Band.*

Sampleheads NYC Drumworks

By Al Eaton

Hire six awesome drummers via two sample CDs.

Quickly—where can you hear some of the best Cajun, Brazilian, African, and reggae drumming on the planet? What single location hosts some of the most powerful, dynamic, and articulate drummers in the world? As the song says, "New York, New York!" Yes, all of these drumming styles, as well as most any other, can be heard in the city of dreams, played by the industry's finest.

But if you're itching to access all that awesome talent for your musical productions, you don't have to pack up and head to the Big Apple. Just head to your local retailer and pick up *New York City Drumworks*, the new sample CD from Sampleheads. You won't be disappointed.

GIVE THE DRUMMER SOME

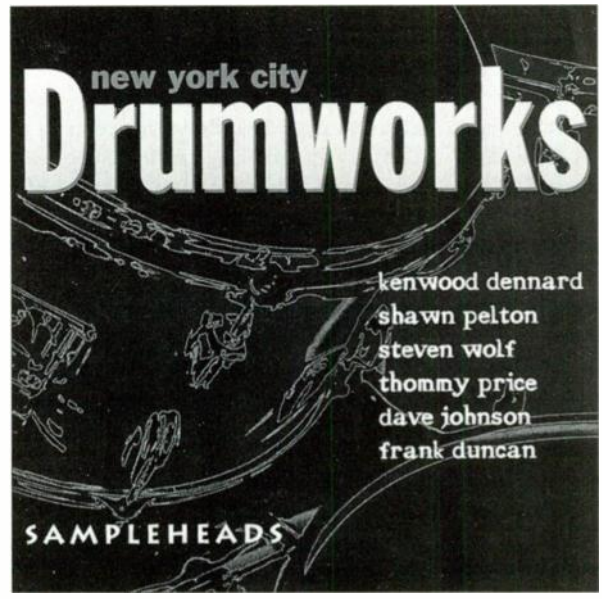
Actually, give the drummer a lot, and not just any drummer, but some of New York's baddest: Kenwood Dennard, Shawn Pelton, Steven Wolf, Thommy Price, Dave Johnson, and Frank Duncan. What, those names don't ring a bell? Well, maybe you'll recognize some of the folks they've worked with: Miles Davis, Sting, Luther Vandross, Chaka Khan, Annie Lennox, Billy Idol, Joan Jett, Psychedelic Furs, Manhattan Transfer, Bobby McFerrin, Grover Washington, the Brecker Brothers, and the Saturday Night Live Band. Are you starting to get the picture?

No matter what flavor of drumming you are looking for, you're likely to find it here. And with this masterful lineup, you can be sure it will groove hard. Styles include funk, rock, hip-hop, Latin, Cajun, R&B, Brazilian, African, reggae, rockabilly, swing, gospel, country, thrash, and lots more.

I auditioned the audio CDs, but *Drumworks* is also available in CD-ROM sets formatted for Akai, Roland, and Sample Cell. Did I mention that *Drumworks* is 100 percent copyright free? That is, of course, if you buy the set yourself.

LOTS O' LOOPS

A brainchild of Frank Duncan, a superior drummer in his own right, the double-CD set contains 735 loops and 517 hits for a total of 1,252 events. Tracks are grouped by drummer, and tempos for each player's loops cover a wide spectrum. Tempos vary by 12 bpm increments, so you get patterns at 72, 84, 96, 108, 120, 132, 144, 156, 168, 180, 192, 204, 216, and 232 bpm. (Hey, what happened to 228?) This system works well and makes it easy to find the right feel and tempo without your having to jump all over the CD. Some maneuvering is necessary, though, because the tempos aren't always in numeric order.



Sampleheads conspired with six monster drummers from the Big Apple to bring you *New York City Drumworks*, a 2-disc sample set available on audio CD and CD-ROM.

Each *Drumworks* disc comprises 61 tracks, with the first having more than 73 minutes of loops and hits and the second coming in at a little more than 70 minutes. Dennard, Pelton, and Wolf appear on the first disc, and disc two features Price, Johnson, and Duncan. The set contains no scratches, vocal bites,

or record cuts—just live drums from live drummers.

Each track contains a main rhythm and quite a few variations on that rhythm. The variations can be used as breaks, bridges, pickups, and so on or as individual patterns. Each drummer also plays a number of drum fills in the same tempos as the main rhythms. These can be cut, copied, and pasted into the arrangement to compose a complete drum score. Furthermore, some of the patterns are given in both whole-kit and hands-only loops. (A hands-only loop is a rhythm pattern without the kick drum.)

Groups of patterns are flagged with start IDs, and start times of individual loops are identified by minutes, seconds, and frames. This system makes it a cinch to find beginnings of patterns within groups.

DISTINCTIVE TRACKS

The great thing about acoustic drum sets is how different each kit sounds from the next. This is due not only to players' distinctive styles, but to the many decisions the drummers make regarding the instrument: brand, number, and sizes of drums and cymbals in the kit; choice of heads and tuning; and even the kind of sticks, Blastix, mallets, or brushes used to strike the drums.

The recordings on *Drumworks* faithfully document these nuances. Thanks to each drummer's signature sound, it's easy to know when you're working with a different player. Of course, that also means it's next to impossible to use two different drummers' patterns to make up a new rhythm track. The sonic contrast simply ruins that real-guy-playing-in-the-studio effect.

As the producer, Duncan chose to record the drums to analog tape "for that warm, rich sound." All tracks are clean, punchy, and very well recorded, usually with a slight hint of room reverb. On the slower rhythms, the reverb is a little bit more pronounced, as it would be in most contemporary ballads. On other selections, effects were added only when the track needed a slight boost to create the right feel for a particular style. For example, some of the reggae loops have a bit of gated reverb on the cross stick. Fortunately, the effects all work well and never get in the way of the music; I never found that I wanted to hear less processing on a track. Of course, if you want more effects, you can always add them yourself as long as you don't mind processing the complete drum mix.

The individual drum-kit mixes are very nice. Only on a few tracks did I wish that the kick was a bit more out front. Fortunately, a little EQ to the low end made up the difference. I also found that, by using the hands-only parts of the loop, I could add the kick on a separate track at whatever volume and syncopation I needed. This approach was time consuming, though, and no matter how carefully I put down the new kick-drum parts, the total feel was never quite as good as the full-kit grooves.

CLICK TRACK, PLEASE!

My main criticism of *Drumworks* is that all the tempos are off by about 1 bpm from the listed tempos. I checked them carefully against several sequencers and metronomes and always got the same results. This was cause for considerable frustration until I figured out what was going on.

Another minor concern is that a few of the loops are a bit *too* human sounding: on some of the loops, the time seems to move around more than I like to hear (or feel). For example, a tempo may pick up enough during a 4-bar section to make for an "interesting effect" when the top of the loop comes back around. Fortunately, this was never too drastic and usually was hardly noticeable.

Nevertheless, I tried to find a solution. One that worked well for certain patterns was to set the tempo of the sequencer to the exact length of the loop. Of course, that caused the tempos to come out at something like 83.235 or 120.5 bpm. Another approach was to speed up or slow down the loop in a sampler so as to match the sequencer's tempo. Both solutions worked at times, but it was all but impossible to find sequencer quantization values that worked for some of the loops. (Another solution would be to use Steinberg's *ReCycle!* software, reviewed in the October 1995 **EM**.) Fortunately, if you're the type who likes to play parts in real time, you'll find it easy to accompany the grooves and come up with tracks that feel great.

CHILL, PEOPLE!

My only other complaint is that some of the tempos were too fast for the songs I wanted to use them for. A bit of time compression solved the problem in most cases, but of course, this technique must be used sparingly. If you take time compression too far, digital-editing artifacts soon raise their ugly heads.

Of course, the preponderance of upbeat tempos can probably be blamed on the city itself. We all know New Yorkers are more fast paced than we are out here on the West Coast. Now, don't get me wrong: there's nothing wrong with crankin' tempos. But if a volume 2 ever comes along, I sure would like to hear more of the laid-back stuff. Hey Sampleheads, how 'bout an L.A. set?

END OF FILL

New York City Drumworks is a winning set of drum samples played by some monster hitters. Each drummer contributes not only his own musical style, but his unique drum sound, as well. Overall, the recording quality is first rate, and you get plenty of loops, hits, and tempos.

Now that the work of these six drummers is permanently burned in plastic, it's possible to play and record with a different world-class drummer every night of the week—well, almost. On the seventh day you may need to rest, at least for a measure or two.

Product Summary

PRODUCT:
New York City Drumworks
sample CD
PRICE:
Audio CD (2 discs): $99.95
CD-ROM (2 discs): $249.95
MANUFACTURER:
Sampleheads
tel. (818) 594-7237
fax (818) 883-3116
e-mail info@
sampleheads.com
Web http://www.
sampleheads.com
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EM METERS	RATING PRODUCTS FROM 1 TO 5
AUDIO QUALITY	● ● ● ●
DOCUMENTATION	● ● ● ●
VALUE	● ● ● ●

Producer, engineer, and musician **Al Eaton** *lives in the San Francisco/Oakland Bay Area, where he produces primarily rap and hip-hop. He is the owner of One Little Indian Music Productions.*

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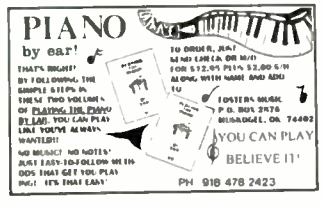

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TECH PAGE

The PAC Man Cometh

AT&T's audio data compression sets a new standard.

By Scott Wilkinson

As I've noted many times before, the music industry has an insatiable appetite for bandwidth and storage capacity. Basically, there are two ways to satisfy this hunger: increase the bandwidth and storage capacity of a system and/or reduce the bandwidth and amount of storage required by the system. The latter usually entails some form of data compression, aka *audio coding*.

Among those working on this approach are scientists at AT&T Bell Labs in Murray Hill, New Jersey. Their current research involves some new audio-compression algorithms called Perceptual Audio Coding (PAC), which are based on the latest studies of human auditory perception. The primary goal is to reduce bandwidth and storage requirements for digital audio while minimizing the audible effects of data compression.

Stereo CD audio requires a bandwidth of about 1.4 Mbps. However, AT&T claims that PAC can compress this signal into 128 Kbps, which represents a compression ratio of 11:1, with no discernible degradation in audio quality for most signals. At 64 Kbps, the PAC compression ratio jumps to 22:1, and the audio quality remains high. According to Jim Snyder, one of the principal researchers on the project, "Most people would be hard pressed to distinguish this from CD quality."

PAC exhibits much finer frequency resolution than other compression techniques, such as MPEG. PAC can resolve up to 1,024 frequency components per channel over the entire audible spectrum; MPEG-1 Layer 3 was the previous leader in frequency resolution with 576 components per channel. The PAC components are determined using one of two types of transforms, depending on the signal content, and are grouped into 49 relatively narrow bands.

Most conventional audio-coding schemes employ fixed frequency bands and time intervals that are uniform across the entire spectrum. However, PAC switches between a set of uniform bands (called a Modified Discrete Cosine Transform, or MDCT) for stable waveforms and a set of variable bands (called a *wavelet transform*) with appropriate frequency and time resolutions for transients. This avoids many of the audible artifacts associated with coding transients using strictly uniform time and frequency slices.

One of the major advances in this research is an improved model of the human auditory process, which is very lossy: there are many components of musical signals that never reach the brain. AT&T calls these components "perceptually irrelevant." For example, any frequency component at a given volume can be masked by a louder nearby frequency. PAC calculates the masking threshold levels in each band and adjusts the quantization noise so it occurs at frequencies that are masked by strong components in the program material; this is called *noise shaping*.

FIG. 1: The AT&T Walken is a prototype music player that uses semiconductor memory and includes no moving parts.

AT&T recently entered into collaborative agreements with two companies to develop practical applications for PAC. Audio Processing Technologies (http://www.aptx.com) supplies equipment to broadcasters, and Netcast distributes music on the Internet (http://www.ncc.net). Obviously, the applications represented by these companies are enhanced by better audio quality at lower bandwidths. In fact, one PAC option is a mono signal at 24 Kbps, which can be accommodated by 28.8 Kbps modems in real time.

Other applications include a solid-state music player that uses semiconductor memory instead of a CD for storage (see **Fig. 1**). Such a player and medium could be much smaller, less expensive, and more robust than CD players because it would require no moving parts. However, although semiconductor memory has been increasing in density and decreasing in cost over the last few years, amounts sufficient for music distribution are still not within reach of the mass market. Nevertheless, PAC offers lower bandwidth and storage requirements with higher audio quality than most data compression schemes, which should benefit all musicians in the near future.

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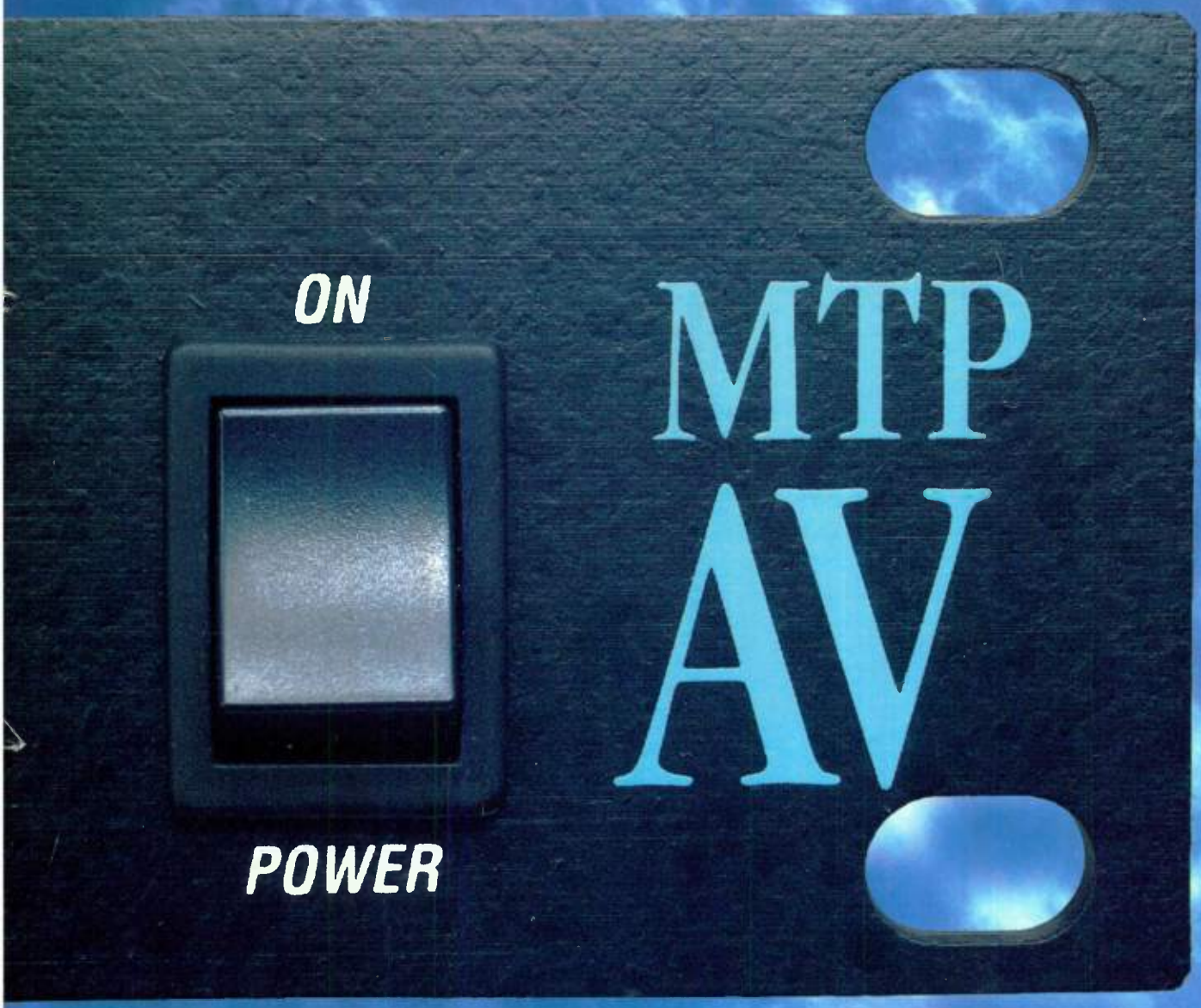

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