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Electronic Musician

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April 1992

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Making Money Making Music

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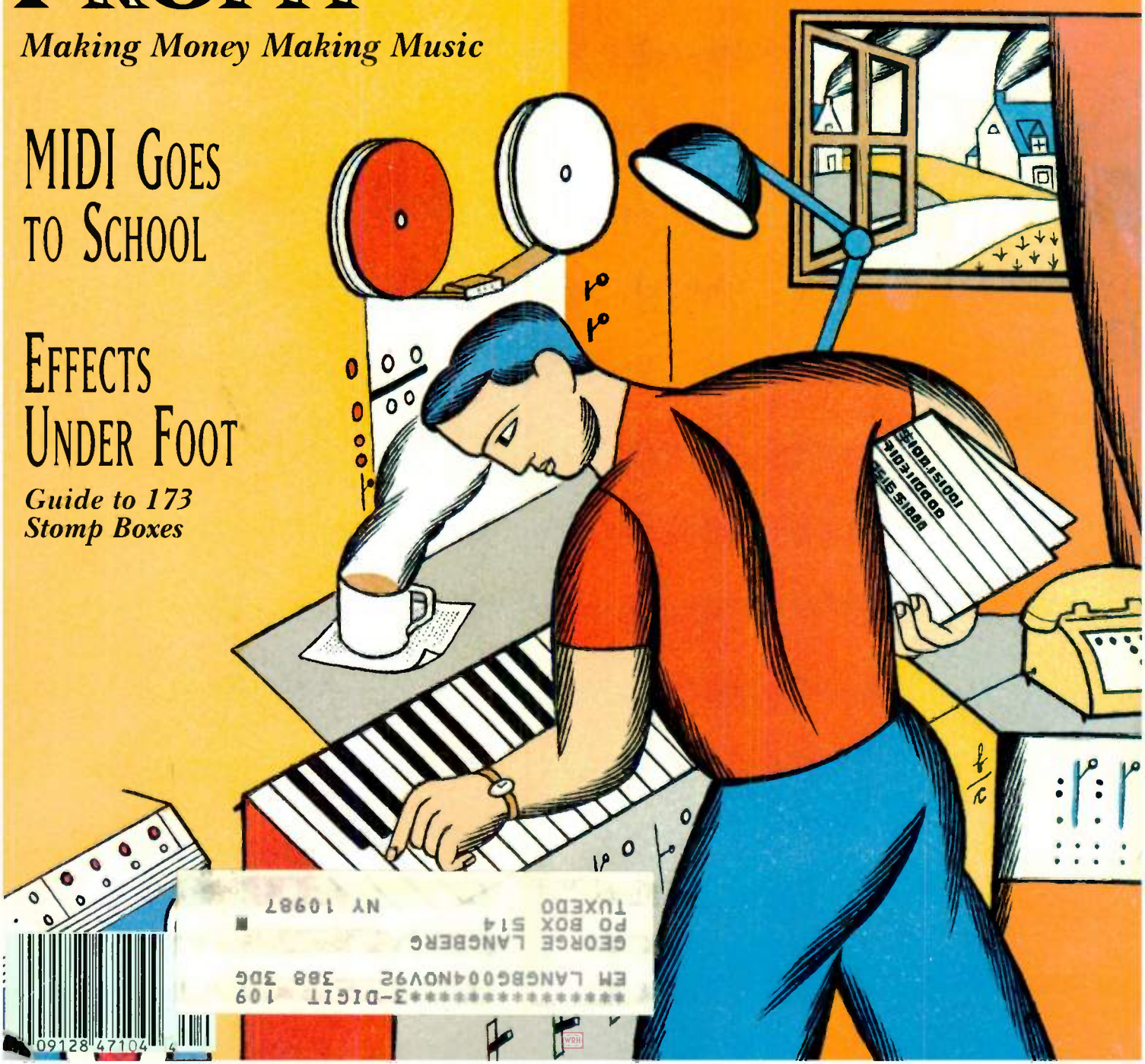

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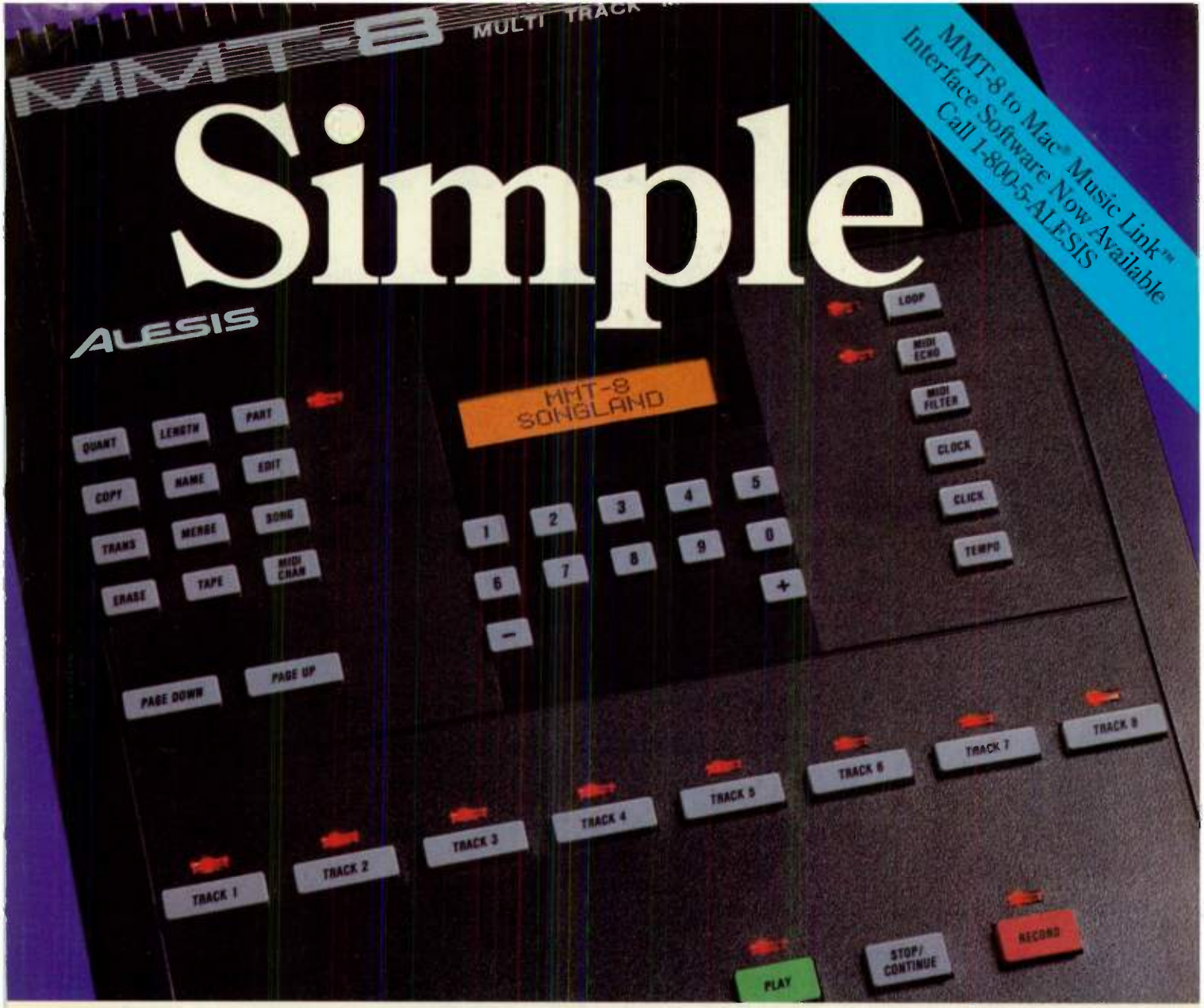

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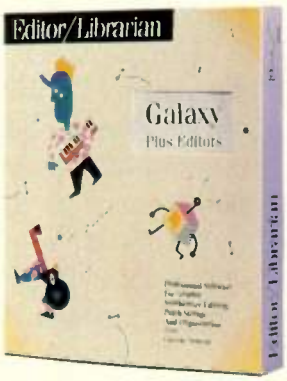

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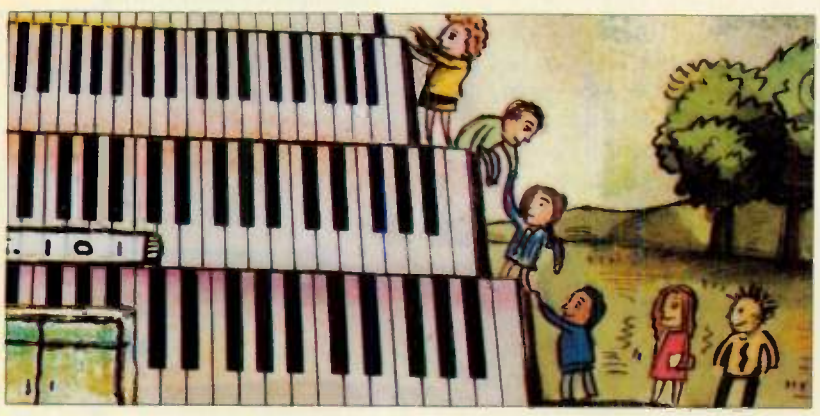

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Cover: Illustration by Brian Cronin.

The State of the Union

The 1992 NAMM show highlighted trends of the coming year.

ANNE HAMERSKY

Once a year, in the spandex and hair weave-adorned aisles of the Anaheim Convention Center, the musical instrument industry charts its course for the new year. Known as the NAMM (National Association of Music Merchants) Convention, this ritual provides an opportunity for music companies to introduce new products, marketing plans, employees, endorsees, and anything else they believe will interest the show's 33,000 attendees and large press corps.

The new product announcements provide the most interesting fodder, of course, and though this year's show failed to produce any amazing innovations, there were several pleasant surprises (see "What's New" on p. 18 for more details). Twelve Tone Systems' new *Cakewalk Professional for Windows* brings an impressive-looking, state-of-the-art graphic sequencer to the PC; Passport's *Producer* media integration/authoring software will offer a new twist on multimedia production and MIDI and digital audio synchronization for the Mac and *Windows*-equipped PCs; Mark of the Unicorn's Digital Waveboard NuBus card for the Mac signals the company's headfirst dive into digital audio; Mackie Designs' line of 8-bus mixers helped it out-pace its many imitators; and Alesis continued to surprise by announcing a keyboard.

Even more interesting than individual product announcements, however, are the larger trends that surface at these gatherings. This year's show offered continued evidence of the MIDI industry's efforts to look outside itself and its now-confining walls for new opportunities. Foremost among these efforts is the movement to further integrate MIDI gear and recording equipment through MIDI Machine Control and related developments. Atari Computer held a press conference along with Fostex to highlight the sophisticated control available between Atari-based sequencers and Fostex tape recorders, but similar developments with other computers, other recorders, and other media were happening all over the show. Controlling tape recorders and other studio devices from a computer-based sequencer just makes sense, and the centralized control it offers is an obvious benefit, so expect to hear more about this.

In a related development, interest in recording products and accessories, particularly lower-cost mixers, was high. As home MIDI systems expand into multiple instrument configurations, a mixer becomes a necessity, and numerous manufacturers responded by introducing appropriately targeted new products.

Windows-based music software also came into its own at this year's show. After years of homely but functional, character-based DOS programs, PC users can look forward to an onslaught of attractive, user-friendly programs that promise to give the other platforms a serious challenge.

Multitrack hard disk-recording systems for mainstream computers hit with a vengeance in Anaheim. New products for the Mac, ST, and PC made it clear that this technology soon will challenge analog tape recorders for your buying dollars. Along similar lines, several companies displayed CD recorders at this year's show. Though still rather pricey, the very presence of these devices points to the inevitable, and not-too-distant birth of the all-digital home studio.

In all, the show offered a fairly positive outlook for the year, though it remains to be seen how the current economic conditions will affect the high-tech music and recording industries. With movements toward integration and efforts to expand beyond the limited boundaries that previously have defined these industries, however, things are moving in the right direction.

Bob O'Donnell

Electronic Musician

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Over the past year, as the CR-1604 16-Channel Mic/Line Mixer's reputation has grown, we've been noticing more and more warranty cards returned by notable studio and performing musicians, composers, producers and engineers. This month we thought we'd diverge from our usual mondo-tech ad and take a minute to thank some of these individuals — as well as everyone else who has helped put us on the map (albeit up in the Northwest corner of the map, a few miles north of Seattle). Being more interested in spending money on improving our products than on pricey photographers, we just sent some of our notable users each a cheap Polaroid* camera and told them to fire away at their Mackie CR-1604 installation. The results were mixed. But then, we're a mixer company.

1ST ANNUAL THANKS TO THOSE WHO HAVE BOUGHT OUR PRODUCTS & HELPED PUT US ON THE MAP.

FRANK HELLER • Engineer, Producer, Programmer & Keyboardist • **RECENT PROJECTS:** Used his Mackie CR-1604 to record & mix Brian Slawson's "*Bach Beat*" for Sony Classical Records; mixed "*Mama Said Knock You Out*" LL Cool J for Def Jam; mixed "*All I Need is You*" for BMG/Zoo; producing Movement EX, an LA-based rap group for Columbia Records • **PAST ACCOMPLISHMENTS:** zillions of 7", 12", EP & album mixes & production for groups including Madonna, New Kids O/T Block, OMD, The Spinners, , Earth Wind & Fire, Jimmy Cliff, , Force MD's, Was Not Was, Pointer Sisters, New Order, Fat Boys, Heaven 17, Steve Winwood, Quincy Jones (filmtrack), Debbie Harry, 808 State, New Edition & many more.

PAT MASTELOTTO • Drummer, Percussionist, Programmer • **RECENT PROJECTS:** Rembrandts, Jude Cole, Peter Kingsbery, Richard Page, Keedy, percussion on upcoming Sugercubes and work on Voice of the Beehive and Big Car singles • **PAST ACCOMPLISHMENTS:** Drummer for Mr. Mister; session discography includes XTC ("*Oranges & Lemons*"), Too Much Joy ("*Cereal Killers*"), The Truth ("*Weapons of Love*"), Vanity ("*Skin on Skin*"), Danny Wilde ("*The Boyfriend*"), Jack Wagner ("All I Need"), Patti Labelle ("*Winner in You*"), Pointer Sisters ("*Contact*"), Hall & Oates ("*Change of Season*"), Eddie Money ("*Take Me Home*"), Shandi ("*Shandi*"), Al Jarreau ("High Crime"), Cock Robbin, Knight & Des Barres, Danny O'Keefe, Robyn Hitchcock & the Egyptians, Martika and Nick Gilder.

MICHAEL WATTS • Synthesist • **ON-GOING PROJECTS:** *The Young Riders* for MGM/ABC TV, *Harry & the Hendersons for Fox Television*, • **RECENT PROJECTS:** Soundtrack for upcoming Disney Productions television movie "*Still Not Quite Human*,", re-recording of all music for Tomorrowland section of Disneyland, "*The Seduction of Travis County*" (CBS TV Movie of the Week), *The Vidiots* (NBC pilot), "*The Usual Suspects*" (an audiophile album for Sheffield Labs), "*Karaoki Music*" for Pioneer LaserDisc/Weberworks • **PAST ACCOMPLISHMENTS:** Session work on "*The Rookie*" for Clint Eastwood/Warner Bros., "*The Two Jakes*" for Paramount Pictures, "*The Jetson's Movie*" for Hanna Barbera/MCA/Universal, *The New Lassie* for Fox TV, "*Major Dad*" for MCA/Universal, "*The Fisherman's Wife*" album with Jodie Foster for Windham Hill, Van Dyke Park's new Warner Bros. Records album "*Tokyo Rose*," *The Tonite Show* with k.d. Lang.

A photo provided by Mark after we ran out of of cameras.

MARK PORTMANN • Composer, Keyboardist, Producer • **RECENT PROJECTS:** Releases from GRP acts including The Rippingtons' "*Curves Ahead*" album & tour, Nelson Rangell ("*In Every Moment*"), Carl Anderson ("*Fantasy Hotel*") and co-producer for new dance/pop artist Miralles; currently running 24-track recording studio as producer and songwriter • **PAST ACCOMPLISHMENTS:** Performing with the Rippington's "*Killimanjara*," "*Tour in Paradise*," and "*Welcome to the St. James Club*" tours, GRP Christmas Collection II, Coors TV commercial, recorded and performed with David Benoit, Phil Perry, Syreeta Wright, Gary Herbig, Paquito D'Riviera; traveled and performed in over 20 countries.

STEVE McELYEA • Keyboardist, Producer, Arranger • **ON-GOING:** 24-tk. recording studio in Atlanta, IL, uses CR-1604 on various album and demo projects as well as audio for video productions. Runs two CR-1604's on the road as his house desk • **PAST ACCOMPLISHMENTS:** Toured with Ronnie Milsap (5 yrs), the Imperials (5 yrs), performed with Amy Grant, Reba McIntire, Merle Haggard, Ricky Skaggs, The Judds, the late Stevie Ray Vaughn and on *Austin City Limits*, *Phil Donahue*, The Nashville Network, *Mike Douglas* and the 1986 Grammy Award Show.

Definitely not a Polaroid*: Bob provided this photo of himself, wife Lola and son Kenny.

BOB BLANK • Studio Owner, Engineer, Producer • **RECENT PROJECTS:** SBK recording artist Phoebe Snow, produced by Phil Ramone, national TV campaigns for Yugo, Tyco Toys, ESPN, produced soundtrack for Miramax Pictures' "*Eversmile*" with Daniel Day Lewis • **PAST ACCOMPLISHMENTS:** Twenty Platinum and Gold Records for engineering, three Grammy nominations for engineering, three #1 chart records as producer, engineered over 500 chart records & over 100 Top-40 records including "*Push, Push in the Bush*" & "*I Got My Mind Made Up*." Formerly owned Blank Tapes, NYC for 14 years; opened Blank Tapes, CT in 1987.

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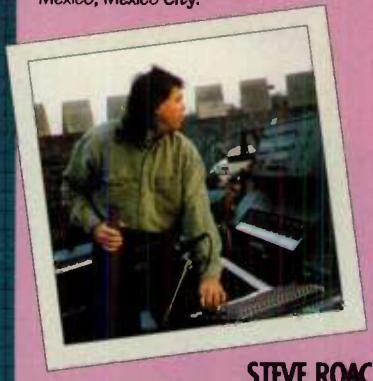
CHARLIE BISHARAT

• Electric, MIDI and acoustic Violinist • **RECENT PROJECTS:** Albums: "*The Best of Shadowfax*" for Windham Hill, Chuck Greenberg's "*From a Blue Plant*" for Gold Castle Records. Soundtracks: "*Midnight Rider*" for Universal Studios, "*Hi Honey, I'm Dead*" for Fox Television. Commercial work for Intel, Hertz, Buick, Universal Studios. Yanni 1991 U.S. Tour • **PAST ACCOMPLISHMENTS:** Violinist for Shadowfax from 1985 to 1990. Kitaro 1990 World Tour. Awarded Grammy for Best New Age Performance for "*Folksongs For A Nuclear Village.*" Contributions to albums by Tracy Chapman, Jane's Addiction, Stunz & Farah, Kitaro, Scott Cossu. Soundtrack work includes "*Godfather III*", "*Kindergarten Cop*", "*Air America*", "*Russia House*", "*Joe Vs. The Volcano*", "*War of the Roses*", "*Ghostbusters*", "*Beaches*", *Murder She Wrote* for CBS Television, *B.L. Stryker* for ABC Television. Commerical work for Mercedes, LaBatt's, Oldsmobile, Anheuser Busch/Budweiser, AT&T.

CORY LERIOS & JOHN D'ANDREA

• Composers for movie and television scores • **RECENT PROJECTS:** Musical scores for Universal Picture's "*Child's Play III*", ABC Movie of the Week "*The Entertainer*" with Bob Newhart and Linda Gray, twenty-two new episodes of *Baywatch* • **PAST ACCOMPLISHMENTS: John D'Andrea**: Scored and written songs for eight features films and numerous television projects including composition of four songs for "*Dirty Dancing*" and arrangement of its Academy Award-winning "*I've Had The Time Of My Life.*" Has been associated as composer/producer with twenty-five gold and platinum albums by artists ranging from Belinda Carlisle to Air Supply. **Cory Lerios**: As founding member and principal songwriter for Pablo Cruise, wrote numerous hit songs including "*Love Will Find A Way*" and "*Whatcha Gonna Do.*" More recently has worked on albums with Whitney Houston and Kenny G., and written songs for artists such as The Neville Bros., George Benson, Melba Moore and Santana. Scored and wrote the themes for ABC Television's *Max Headroom* and *O'hara.*

Steve & CR-1604 in a volcanic crater on the campus of the University of Mexico, Mexico City.



STEVE ROACH

• Composer, Synthesist, Producer • **RECENT PROJECTS:** Double compact disc "*World's Edge*" just released on Fortuna Records; recording collaboration with artists in Germany, Spain, Mexico and U.S. in progress; upcoming European concert tour in 1992 • **PAST ACCOMPLISHMENTS:** Ten solo releases since 1981, including the groundbreaking "*Dreamtime Return*"; numerous collaborations including "*The Leaving Time*" with Michael Shrieve, and "*Strata*" with synthesist Robert Rich which hit the Top 10 on *Billboard*'s Adult Alternative chart in 1991; one of the few electronic artists performing live consistently for over ten years, Roach's engagements in the past year alone have taken him from concert halls in the U.S., Canada and Europe to lava caves in the Canary Islands and volcanic craters in Mexico.

TOM MGRDICHIAN

• Keyboardist/Programmer, Composer, Producer • **RECENT PROJECTS:** *Into the Night with Rick Dees* (Par 3 Productions), *Into the Night* (ABC TV Productions), *Studio 59* (ABC TV Productions) • **PAST ACCOMPLISHMENTS:** Used Mackie CR-1604 while playing with Air Supply, Andy Summers, 5 Star, Seals & Crofts, Richie Havens, Debbie Gibson, Ronnie Milsap, Englebert Humperdink, Maxi Priest, Marilyn McCoo, Riff, Mickey Gilley, The Osmond Boys, Thelma Houston and many others. Composed, produced and arranged musical cues as well as served as session keyboardist/programmer for: "*Die Hard 2/Die Harder*" (20th Century Fox), "*Millenium*" (20th Century Fox), *Totally Hidden Videos* (Fox Television), *Night Court* (Warner Bros./NBC), *Life Goes On* (Warner Bros.), "*Friday the 13th Part 8*" (Paramount), "*The Cellar*" (Cannon), "*The Fisher King*" (Tri Star), *Rick Dees Weekly Top 40 Show* (KIIS FM) plus commercial work for Nissan, Standard Brands, Dupont and others.

MICHAEL BEARDEN

• Keyboardist, Producer, Composer • **RECENT PROJECTS:** Keyboards for Whitney Houston "*I'm Your Baby Tonight*" World Tour; writing and producing for After 7, Vertical Hold and Jocelyn Brown • **PAST ACCOMPLISHMENTS:** Performed and/or recorded with Whitney Houston, Chaka Kahn, Patti Austin, Jonathan Butler, James Ingraham, Yoko Ono, Will Downing, Phylicia Rashad. Member of Grammy-nominated jazz-fusion group Special EFX for 4 years. Scored several PBS programs, produced acts for GRP Records including Nelson Rangell and Omar Hakim (Grammy nomination). Musical director for *Jazz Explosion* tour house band which included Freddie Hubbard, Noel Pointer, Stanley Turrentine and Angela Bofill.

A promo photo provided by Michael. (We temporarily ran out of Polaroid® cameras.)

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Whatever your musical style, or the way you work, or the computer you use, we invite you to savor the many flavors of Cubase...Whatever your taste.

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NO MYSTERY

I was intrigued with Paul Lehrman's article "The MIDI Trap" (February 1992). While he isolated the symptoms and solutions to bad MIDI music, he did not get to the cause of the problem. It's not a mystery. Music is going through the same thing the publishing world experienced when desktop publishing was introduced.

MIDI and desktop publishing are tools, nothing more, nothing less. Just as newcomers to MIDI tend to overuse the variety of sounds available on their machines, amateur desktop publishers overuse the various typesetting tools at their disposal.

Unfortunately, MIDI setups and desktop publishing outfits do not come equipped with taste, experience, or artistry. Taste can be acquired, experience can be accumulated, but artistry is an entirely different matter.

The bulk of people with MIDI-equipped instruments are not professional musicians. All of us started as beginners. The solution is training.

MIDI helps proliferate a solitary type of music; there is no feedback from one band member to another as to how well or how badly the performer is playing. Ensemble work is the solution. Many small music stores use the principals established by the old-style music studios to teach new users to play and give them ensemble experience.

The next few months will see a new set of variables thrown into the equation: the worlds of desktop video and multimedia. High-tech tools plus no taste and training are going to validate Lazarus Long's famous statement, "Ninety-five percent of everything is crap."

Bill Palmer
League of PC Users
MIDI SIG
Houston, TX

EXPENSIVE MISTAKE

Oops! Rudy Trubitt's column on Standard MIDI Files (February 1992 "Computer Musician") was most informative, but contained an expensive-sounding error.

For two years, I have been transferring MS-DOS files, both text and MIDI, to my Amiga for the princely sum of two dollars. A public-domain program, *PcPatchII*, allows a standard Amiga disk drive to read 3.5-inch 720 KB disks from IBM-compatibles and Ataris. There also are at least two commercial products (probably with slicker user interfaces) that provide the same capability.

Granted, if I needed to execute MS-DOS programs, I would have to spring for a bridge board. But for simple file transfers, there are some very inexpensive options.

Ruth H. Kaczmarek
Woodridge, IL

Richard Viard, Dr. T's Music Software director of technical support, responds: *Ruth Kaczmarek is correct, the Amiga will read, write, and format both Atari and IBM-PC (MS-DOS) formats without a bridge board. We have used* DOS-2-DOS *(New Horizons; tel. [415] 382-4400) for the past several years here. This program involves using CLI commands to copy, format, etc., from one drive type to another.*

We recently started using Cross Dos *from Consultron, which simply turns your Amiga drives into PC or Atari drives. They can be accessed from the file selector of any application, or simply dragged like any Amiga file, which makes the process totally transparent. The drives still can be used as Amiga drives.*

I also have heard about the PD programs but never used them. Considering the price of both commercial programs, they are well worth having.

The article also says the Atari only supports 720 KB disks. This is what the specs say, but I have been formatting my disks with 82 tracks and ten sectors giving 840K of space on regular DS-DD disks, using various PD and commercial products like New-Desk *from Gribnif Software (tel. [413] 584-7887). This has been very reliable.*

GUITARS VS. KEYBOARDS

I was very disappointed in "Guitars vs. Keyboards" (February 1992). Why did your article focus only on guitars? In the first half, you wrote about all the lovely tricks guitarists use that keyboard players have a hard time imitating. The second half tells keyboardists techniques to imitate those tricks explained in the first half. Other than as an exercise (i.e., Jan Hammer), what self-respecting, talented keyboardist only wants to imitate guitarists?

I am content in my digital (but not sterile), mechanical (but never boring) world of heavy industrial keyboard sounds, which are far beyond the range of most guitarists (exceptions include Adrian Belew, David Gilmour, and Robert Fripp). And what about keyboard bass?

Keith Russell
Garland, TX

Keith—We thought the guitar-emulation piece was a fun point/counterpoint partner for Mike Molenda's "The Guitar Unbound" signal-processing article. It wasn't meant to give you a specific guitar sound or limit your timbral palette, but to suggest some ideas to explore when you seek a guitar-like sound. By the way, I suspect Jan Hammer, like many synthesists, emulates guitarists because it's fun and sounds right for the music, not as an exercise.—Steve O.

STORE STORIES

I agree we dastardly musicians should not try out a synth at the local music store and then sneak off and order the same item from an 800-

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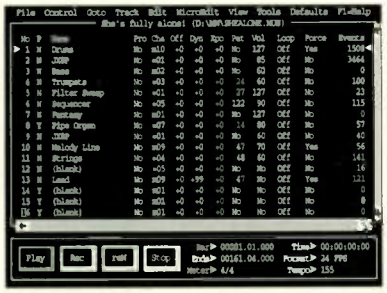


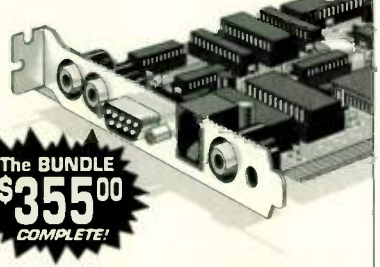
YOU BE THE JUDGE

SEQUENCER	EZ MIDI Pro	Cakewalk Pro
All Standard Sequencing Functions	YES	YES
Extended Memory/XMS	YES	NO
EMS (expanded memory)	YES	NO
Configure MIDI Interface and Screens from Within Program	YES	NO
Multiple Tempo Maps	YES	NO
Multiple Meter Maps	YES	NO
VU Meters on Screen	YES	NO
8 MIDI Ports Standard	YES	NO
Graphic MIDI Control Edit Screen	YES	NO
Tap Your Tempo In	YES	NO
"Live" Included	YES	NO
Load a Song with a Patch Change	YES	NO
Bring Up Lyrics on Screen When Song Starts	YES	NO
Windows SAA Standard Convention	YES	NO
4 MIDI Faders Assignable to Controllers	YES	NO
Best Price and More Features	$149	$249
INTERFACE	**CMS-444C**	**MQX-32**
Roland™ Compatible	YES	YES
4 Ports In and Out	YES	NO
Optional Programmable Timer	YES	NO
Lifetime Warranty on Parts	YES	NO
Price	$299	$349

Bundled Price Sequencer and Interface	CMS-444C/ EZ MIDI PRO $355	MQX-32/ Cakewalk PRO $549

(All Prices and Features from Manufacturer's Literature as of 11-1-1991)

MORE FOR YOUR MONEY



The CMS-444 is manufactured in the USA and has the highest quality control and a lifetime warranty on all parts.

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RFP

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line discounter ("Working Through the Maze," January 1992). I mean, twenty minutes in a music store is surely worth a twenty-percent extra markup. On a $1,500 unit, that's $300. I swear, I'm willing to pay it to be honored by my salesman's unfailingly professional, considerate, and musical presence.

Of course, I'm omitting the guy who had never heard of synching to an IBM PC; the guy who bumped the price on my D-50 by $150 by the time I arrived at the store ("Prices went up at the factory"); the store that upgraded my D-50 ROM chip in less than six months; and the store that sent my 360 Systems Midibass off for repair, got it back, sold it as a new unit, got it back at my request, and finally sent it to me, all in under three months. They were pleased to drop one of the shipping charges.

The local guys have been great at answering my questions on panning from a sequencer, creating new voices, and synching from an HR-16. Real geniuses, all.

Thanks for the ethical shot in the arm.

Jay Taylor
Richmond, VA

I read "Working Through the Maze" with great interest. As a professional musician, hence consumer, for over twenty years and a music retailer for the last six years, I have an inside view into the buying and selling process the author may not have. Much of the article offers sound advice, but Mr. Peha draws conclusions that should not be accepted as gospel.

For example, on the subject of seasonal buying, the article advises not making a purchase in December, but then encourages buying discounted items. With the major NAMM convention in January, many items go on sale in December. Waiting until the convention is over may cost you time and opportunity. On the subject of layaways, the reader is advised not to put down a deposit, as if the idea of a layaway was a scheme to somehow defraud the consumer. On the contrary, a layaway is a convenience for the buyer, allowing them to take advantage of an opportunity, while the retailer incurs the extra expense of having valuable inventory dollars tied up for that period of time. A number of retailers offer some form of price protection that ensures a buying decision today won't cost you down the road.

The article really gets off base on the subject of used equipment. "The latest and the greatest" is only that for a short period of time, and the values you can find in used gear today are amazing.

Finally, much of the article deals with driving down the dealer's asking price through shopping your purchase mail order. The old saying "you get what you pay for" is true. Mr. Peha shrugs off the possibility of your local dealer ceasing to exist, but it's happening all over the country. Mr. Peha states he will gladly pay five to ten percent more than mail-order price to get local service and support, but many dealers' costs more than offset that extra money. If mail-order businesses are the only ones that make money, they'll be the only ones left in business, and we, the consumers, will be the losers.

Michael Abbott
Daddy's Junky Music Stores
Boston, MA

Author Steve Peha responds: *One need only look at the decline in the number of music stores across the country to know that music retailers have been hit hard over the last fifteen years. I would hate to think my article might make matters worse. There is certainly much more to the dealer-customer relationship than I was able to present.*

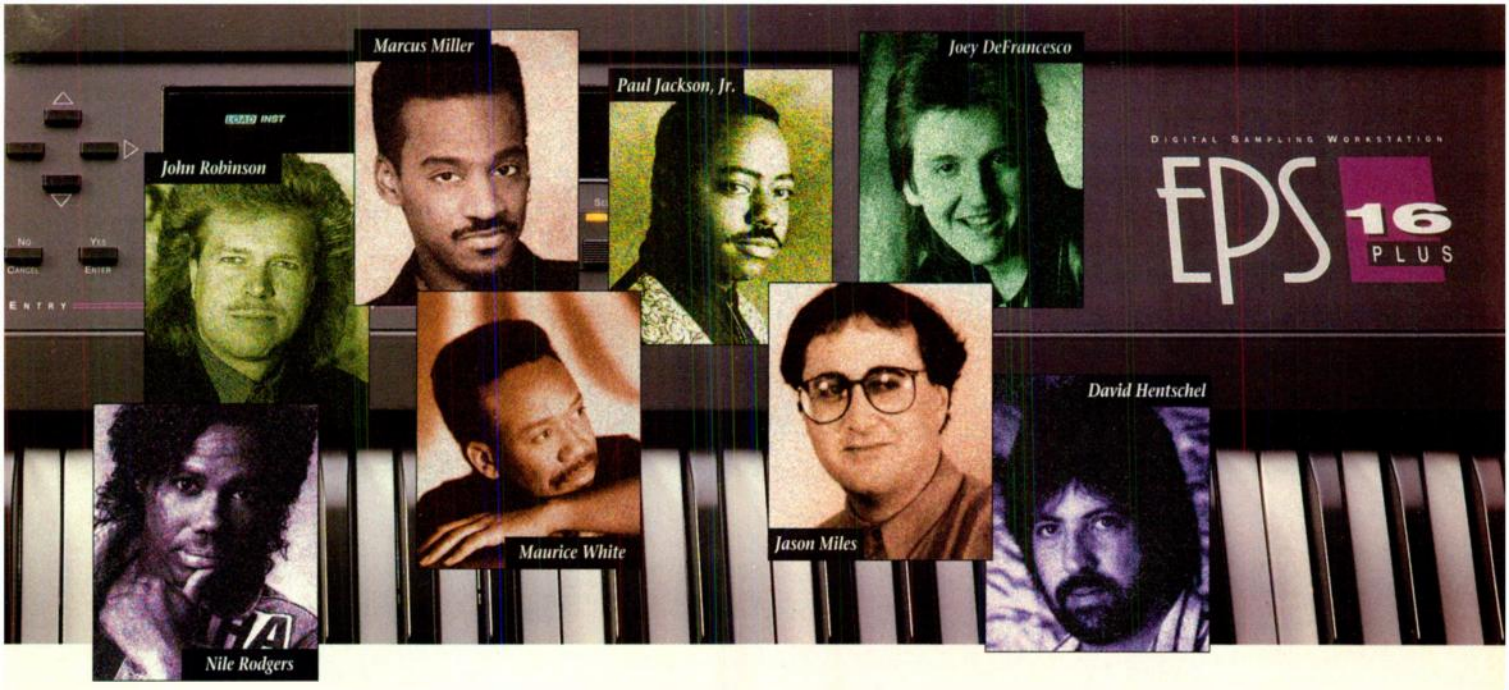
I know dealers need to make more than ten percent above mail-order prices, so perhaps I was wrong when I implied that's all a dealer's efforts are worth. Some buyers need a lot of support, others don't. But I have spoken to a lot of consumers about this, and ten percent is where most draw the line.

As to the music retailer going the way of the dinosaur, the reality of mail-order purchasing in the music industry is that virtually all mail-order sources are actual retail stores. Just look at the retailer ads in this magazine. Mail-order purchasing is getting simpler, cheaper, and more popular all the time, and I felt my article needed to reflect this. However, I did not intend to do that at the expense of retailers.

DON'T CUT 'EM OFF

When was the last time you read an interview with Bob Moog or John Cage in *Rolling Stone* ("Letters," January 1992)? We should remember that electronic music does not begin and end with MIDI. Personally, I'm at least as interested in new computational

continued on p. 17



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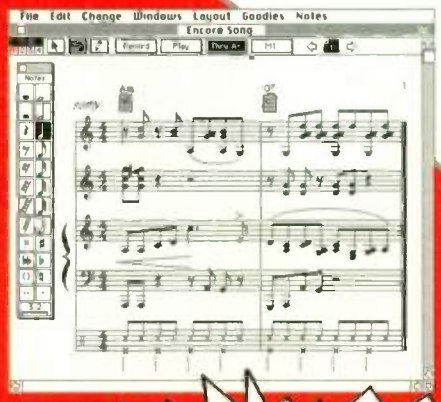
- ***Sonata® Font*** and Adobe® Type Manager (ATM) utility now included with Encore!



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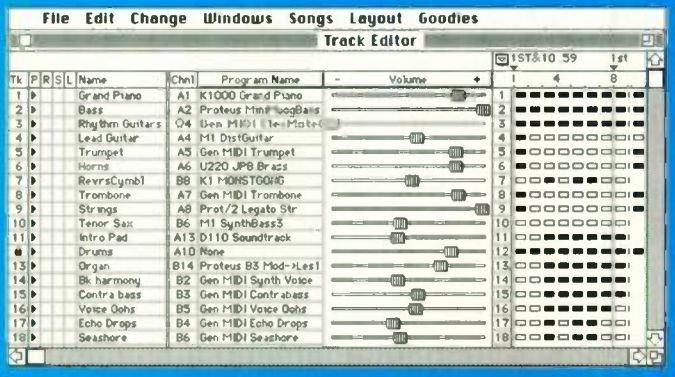

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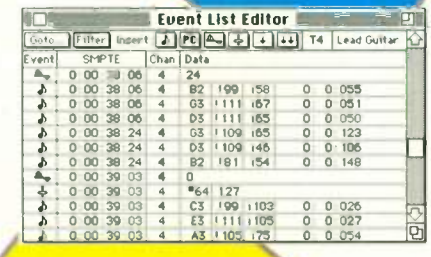

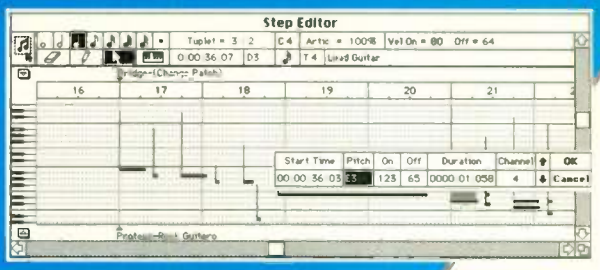

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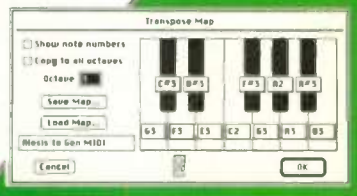

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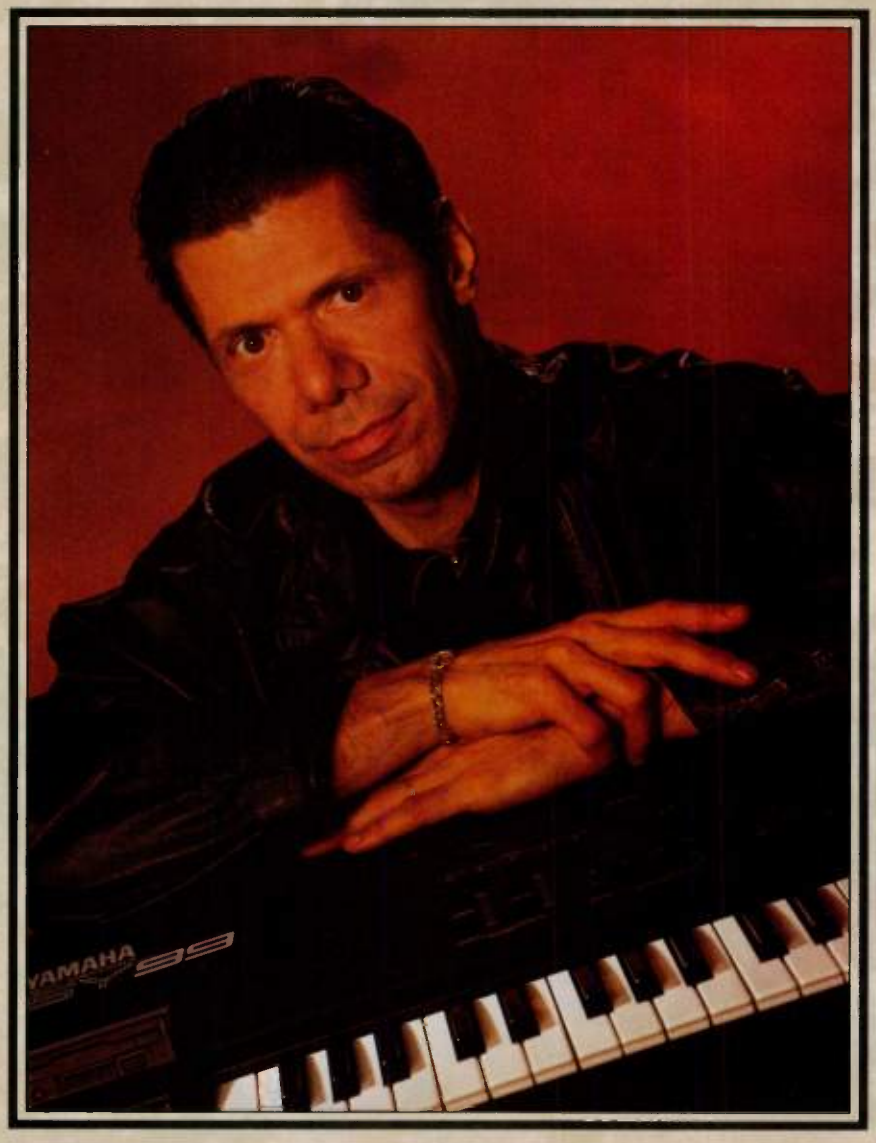

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approaches to sound generation as I am in the presets on Roland's latest offering.

Electronic music is a large subject. Interviews with pioneers and visionaries in the field help cast light on corners we sometimes forget about and can help us to look at our old equipment in new ways. I'm not saying there shouldn't be product reviews. EM will always have lots of them. I simply feel we shouldn't neglect topics just because they are not involved with the New Expensive Plastic. Interviews are one of our primary links to these other topics. Please don't cut them off.

Glenn Hughes
Lincoln, MA

DIGITAL AUDIO FOR PCS

I am seeking a list of available software packages that will perform direct-to-disk audio recording on the IBM-PC or PC-compatibles. The only hardware interface I am aware of for this type of function is the Sound Blaster expansion board by Creative Labs. I would also like to know if there are any other available hardware interfaces that will perform the required interfacing function for direct-to-disk audio recording.

Nuland Wong
Sacramento, CA

Nuland—For a discussion of digital audio and synth cards and related software for the PC and other computers, see "The Computer as a Musical Instrument" in our March 1991 issue. A sidebar gives the manufacturers' addresses and phone numbers. We have reviewed a number of 16-bit hard-disk recording systems for the PC (send a self-addressed, stamped envelope for a free list of back issues) and will review new ones as they appear.—Steve O.

ERROR LOG

February 1992, "Working Musician," p. 91: The correct forms hotline number for the Copyright Office, Library of Congress, is (202) 707-9100.

February 1992, "Dr. T's KCS 3.5," p. 123: Dr. T's Music Software's current address is 124 Crescent Rd., Suite 3, Needham, MA, 02194; tel. (617) 455-1454.

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1992 Winter NAMM Report, Part 1

The first installation of our show report covers synths, hard-disk recorders, and software.

By the EM Staff

Roland JW-50

Despite the hard economic times, the mood of this year's Winter National Association of Music Merchants (NAMM) show was decidedly upbeat. The association even announced a possible revival of the somnolent summer show, albeit in a less-ambitious form.

A record-breaking 706 companies filled the Anaheim Convention Center and nearby Marriott hotel, but the booths were not crammed with mind-bending technological breakthroughs. Rather, we noticed that advances of the last few years are coalescing into more-refined products. Some of the show's important themes, such as the rapid acceptance of MIDI Machine Control (discussed in "The Front Page," on p. 6), flowed like an undercurrent beneath the surface. But so much was happening that we'll need a two-part report to cover a fraction of what we saw, and we'll discuss many more products introduced at NAMM in later issues.

As with all "What's New" columns, all prices in the report are U.S. recommended list as of press time and are subject to change. Some of the products described are not yet finished, or at least not shipping; for these, in particular, virtually anything could change.

SYNTHS & SOUND MODULES

In the world of electronic musical instruments, the two apparent trends at the show were low cost and General MIDI (GM). There were no less than eight new products that conform to the General MIDI spec, which defines a standard program map and other responses to MIDI messages. GM is intended to make it easy for consumers to hook up a simple MIDI system and hear music played on the expected instruments with little or no configuration on their part. Considering the state of the economy, it should come as no surprise that most manufacturers were introducing new professional and consumer products below the $2,000 level.

The Roland (tel. [213] 685-5141) room was awash with new products. No less than three new keyboard synths, two new sound modules, and a new guitar synth were introduced, all with list prices under $2,000. The **JV-80** ($1,895) includes 4 MB of ROM samples, which can be upgraded to a whopping 14 MB with the addition of a user-installable 8 MB expansion board ($350) and a 2 MB ROM card (price not announced). The JV-80 provides up to 28-note polyphony, 8-part multitimbral operation, and an onboard multi-effects processor. In addition, it's the first Roland keyboard to offer a Patch Remain feature, which allows a sustaining sound to continue after a patch change. The 61-note keyboard can be divided into eight zones, each with its own MIDI channel, and eight programmable sliders provide real-time control of internal parameters or external MIDI modules. The **JV-30** ($1,195) incorporates the SC-55 Sound Canvas engine into a 61-note velocity-sensitive keyboard. With 24-note polyphony and 16-part multitimbral operation, the JV-30 offers 317 preset Tones in the GS format (Roland's version of General MIDI). Three programmable sliders are used for internal sound-editing and MIDI control. Also included are reverb and chorus generators. Although it wasn't operational at the show, the **JW-50 Music Workstation** ($1,995) promises to combine the JV-30's multitimbral GS-compatible sound source with a 61-note, velocity- and aftertouch-sensitive keyboard; 16-track sequencer with 25,000-note capacity; and 3.5-inch floppy-disk drive. Eight programmable sliders allow you to automate the mix, and a Backing Function creates rhythm parts based on user-defined parameters such as musical style and chord progression.

Roland also introduced the **GR-1 Guitar Synthesizer** ($1,295). This floor unit, which is designed for easy operation, connects to a GK-2 pickup that mounts on any electric guitar. The 6-part multitimbral synthesizer includes 200 sounds that have been tailored to guitar playing styles, and 200 additional sounds can be added with a user-installable 4 MB expansion board. Also included are a 4-track sequencer with a capacity of 2,000 notes, a digital effects processor, and a tuner. A MIDI Out jack allows guitarists to control external MIDI devices.

Jumping on the General MIDI bandwagon, Yamaha (tel. [714] 522-9011) introduced the **TG100** ($449), a half-rack sound module based on the sound

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Literally thousands of hours have gone into the development of this library, as well as the talents of dozens of the finest musicians in the world. The result is *the* definitive, world-class library of acoustic and electric samples including stunning new programs that take the K2000 to the next level of sonic excellence.

From lyrical woodwinds, sweet solo strings and beautiful concert grand pianos to red-hot electric guitars, earth shaking basses and powerful percussion, the Stratus Sounds library has rewritten the standards by which all other samples will be judged for years to come.

Sweetwater Sound has just acquired the exclusive rights to this incredible sample collection and, once you hear these sounds, you will agree they are the finest, most musically useful samples available at any price, for any instrument. The library is available on floppy disks, Syquest cartridges, CD ROM and specially-formatted hard disks.

But not only do you get these truly superb sounds, you also get a good feeling knowing that fully one-half of all Stratus Sounds' profits go to a number of worthwhile environmental and animal rights groups including the Nature Conservancy and the Humane Society.

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What could be better than owning the hot, new Kurzweil K2000 with all its sonic potential? How about a hot, new K2000, ***PLUS*** the entire SampleCell™, Soundesigner™ and K250 sample libraries only a mouse click away!

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Peavey DPM Spectrum Synth

engine of the QY10. Featuring 28-note polyphony, 16-part multitimbral operation, and internal signal processing, the TG100 is distinguished by the presence of a serial port in addition to MIDI In, Out, and Thru. The serial port lets you connect the unit directly to a Macintosh or PC-compatible computer with no need for a separate MIDI interface. In fact, the TG100 will serve as a MIDI interface in addition to providing its own music. A stereo audio input lets you mix other sound sources with the unit's internal sounds.

E-mu (tel. [408] 438-1921) introduced the latest addition to the Proteus line, the **Proteus/3 World** sound module (**$995**) and **Proteus/3 XR** ($1,295). Similar in appearance and operation to its predecessors, the Proteus/3 features 4 MB (expandable to 8 MB) of 16-bit samples with 128 factory presets and 64 user presets (256 user presets in the XR). The Proteus/3 provides instrumental sounds from around the world, including the Australian didjeridoo, Indonesian gamelan, Indian tabla and sitar, Japanese shakuhachi, African udu drum, Scottish bagpipe, and American 5-string banjo. E-mu also announced plans to provide Proteus-based circuit boards to multimedia developers. Initial products will include the **SoundEngine** daughter board for Video Seven's Media FX card and the integration of sound chips into Turtle Beach Systems' MultiSound card. Both products are designed for Multimedia PC (MPC) applications and conform to the MPC and General MIDI specifications.

As usual, Peavey (tel. [601] 483-5365) presented a plethora of new products. The **DPM-2si** (price not announced) synth features a 76-note keyboard and 8 MB of ROM samples. This instrument is 32-note polyphonic, 16-part multitimbral, and includes a dual effects processor as well as a 16-track sequencer with a capacity of 80,000 notes. Two new single-rackspace modules also were announced: the **DPM Spectrum Bass** ($299) and **DPM Spectrum Synth** ($399). The Spectrum Bass includes 1 MB of 16-bit acoustic, electric, and synth bass samples in 100 presets and offers 8-note polyphony and 4-part multitimbral operation. The Spectrum Synth provides 1 MB of synth waveforms in 999 presets, with 12-note polyphony and 12-part multitimbral operation. In addition to 24 oscillators, the Spectrum Synth includes sixteen dynamically resonant modulated filters and LFOs as well as hard sync and pulse-width modulation.

Oberheim (tel. [818] 503-0631) introduced the long-promised **OB-Mx analog synthesizer** (estimated $2,000 for two voices to $5,000 for twelve voices). The synth module occupies eight rack spaces and sports no less than 35 knobs and 62 switches. The unit can be equipped with voice cards to provide up to 12-voice polyphony and 12-part multitimbral operation. Each stereo voice includes two oscillators with an external signal input, four ADSR envelopes, three LFOs, vintage Minimoog and Oberheim SEM filters, and separate stereo outputs. Matrix modulation also is included.

In a surprise move toward even-number pricing, Korg (tel. [516] 333-9100) introduced the **01/Wpro** ($3,600) and **01/WproX** ($5,000). These new keyboards offer the same sound-generation, sequencing capabilities, and floppy-disk drive as the original 01/WFD, with expanded keyboards (76 and 88 keys, respectively). In addition to all the sounds found in the 01/W, the new instruments include a new acoustic piano and new drum and percussion sounds. Korg also unveiled two rack-mount modules. The **01R/W** ($2,300) is a 2U rack-mount version of the 01/W that includes a 7,000-note sequencer and the waveshaping synthesis found in the original instrument. The **03R/W** ($1,300) is a single-rackspace module based on the 01/W sound engine, but without waveshaping. It conforms to the General MIDI spec, making it compatible with a growing number of consumer products and multimedia applications.

Alesis (tel. [213] 467-8000) announced it is developing a keyboard synth and a sound module. The **S4 QuadraSynth Sound Module** (projected list $995) is a single-rackspace MIDI sound module with 64-note polyphony and 16-part multitimbral operation. Its Composite Synthesis architecture combines additive and subtractive techniques with matrix modulation. Up to seven simultaneous effects can be independently assigned to any of four effects buses, which allows different sounds to be processed individually in multitimbral mode. The **S5 QuadraSynth Master Keyboard** (projected list $1,495) includes the S4 sound engine and features a 76-note keyboard with velocity, release velocity, and aftertouch. Multiple keyboard zones can have their own program, MIDI channel, and velocity curve. In addition to four analog audio outputs, the S4 and S5 will include optical digital outputs, allowing the audio signals and effect buses to be sent to Alesis' ADAT digital multitrack recorder without leaving the digital domain. Both synths are expected to be available in the latter half of 1992.

DIGITAL AUDIO

On the Macintosh, the big surprise of the show was Mark of the Unicorn's (tel. [617] 576-2760) **Digital Waveboard** ($1,495), a Motorola 56001-

Korg 01R/W

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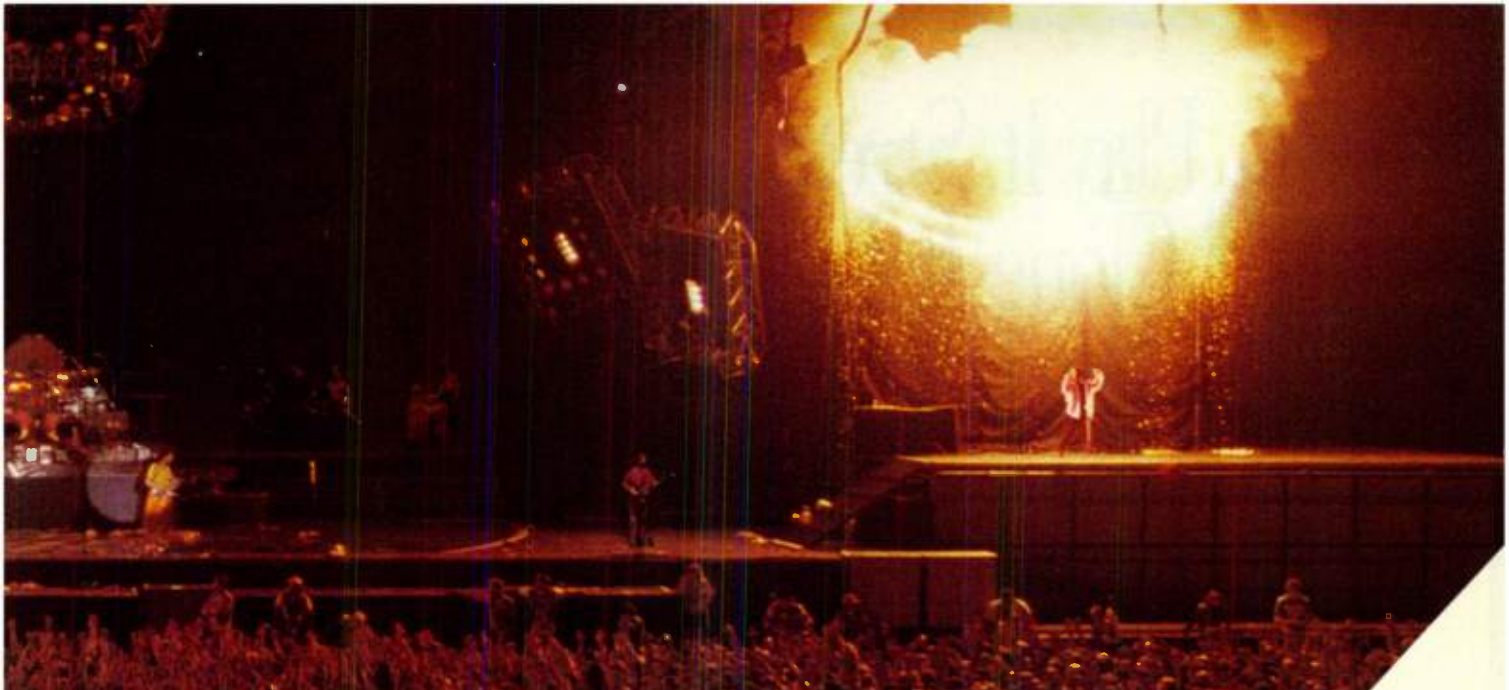

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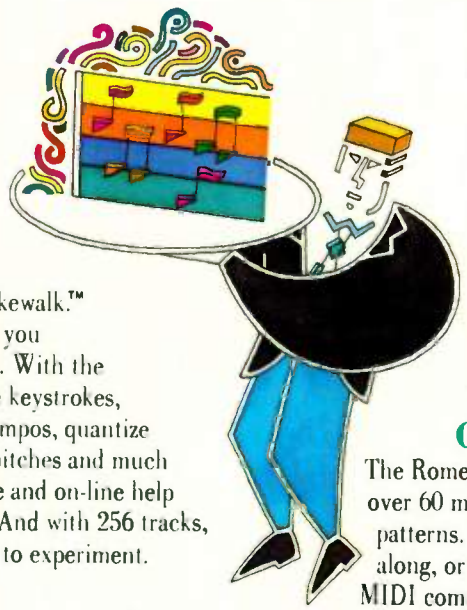

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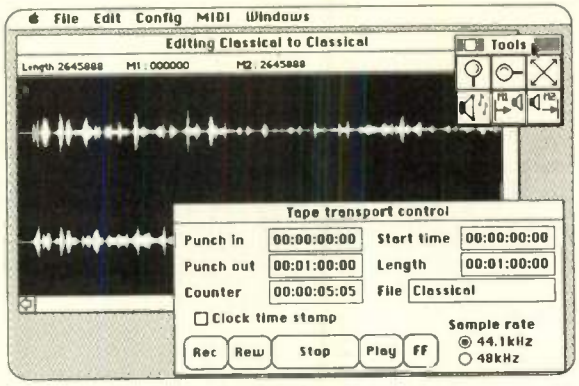
equipped NuBus card that currently supports two tracks of hard-disk recording. The unit features AES/EBU and S/PDIF digital I/O, which requires you to use your own converters, such as a DAT machine, for analog audio. Version 1.1 (a planned free update) will support four independent channels and the card's own SCSI connector, allowing you to dedicate a hard drive to the Waveboard and not tie up the Mac's internal processor. The only software that currently supports the card is MOTU's *Digital Performer* MIDI/digital audio sequencer, which still wasn't shipping at press time, but Passport Designs has announced that *Producer* and future versions of *Alchemy* will support the Waveboard.



Plasmec ADAS-MC for Macintosh

At the Atari booth, U.S. distributor Digital I/O (tel. [310] 398-3993) showed UK-developed Plasmec's **ADAS digital recording system** ($1,495). ADAS, which consists of both hardware and software, was shown on both an Atari Mega ST and a new Atari 80386-based PC-compatible running *Windows 3.0*. Each of the two systems, which look and function almost identically, offer 2-track, 16-bit, hard-disk recording and editing with analog and optional S/PDIF and AES/EBU digital I/O ($495). The new rack-mount Atari version can run via a desk accessory from within both Steinberg/Jones' *Cubase* or C-Lab's *Creator/Notator*, allowing you to incorporate digital audio within those sequencers. The ISA plug-in board version for PCs offers similar capabilities, but no sequencer currently supports it. The company also offers a SCSI-based Macintosh version that runs on anything from a Classic or Plus on up. All three computer versions can be locked directly to SMPTE and come with free DAT backup software that allows you to store your audio and event lists on normal audio DAT. The company also announced the **ADAS-SA** (price not announced), a stand-alone, 2-rackspace version that incorporates a large, backlit LCD; transport controls; a scrub wheel; analog and digital I/O; MIDI; SMPTE support; and a 200 MB hard disk. The unit, which is designed for those who would rather not work with a separate computer, offers connections for a keyboard, a mouse, and a monitor.

Hybrid Arts (tel. [310] 841-0340) demonstrated **Digital Master EX** ($2,999; $999 for 2-channel analog module) for the Atari ST. The EX hardware is a single-rackspace unit containing two DSP chips, four channels of AES/EBU digital I/O, and a SMPTE time-code reader. The box also offers connection for up to four A/D converters, or you can use a DAT machine to provide two channels of conversion. Hybrid Arts also showed the 16-bit **Sample Playback Module** ($1,399), a 24-voice, 1U rack-mount box with twelve independent audio outputs. The instrument, which reads Digidesign *Sound Designer*-format files, loads sounds through SCSI. It offers room for 1 to 16 MB of RAM, using standard SIMMs. The included voice-editing and mapping software runs on the ST.

In a private room, **Tascam** (tel. [213] 726-0303) unveiled a 3U rack-mount, 8-track digital recorder that looks similar to the company's 238 cassette recorder but uses 8mm videotape. Recording time is 60 minutes per tape. No list price was announced for the unit, which is rumoured to be released toward the end of the year, but the price is said to be "competitive."

SOFTWARE

Probably the most intriguing new software product of the show was Passport Designs' *Producer* (no price yet; tel. [415] 726-0280) for the Macintosh and *Windows*. *Producer* is a media-integration program that allows you to combine MIDI sequences, digital audio, QuickTime movies (on the Mac only), animations, and more into a coherent

continued on p. 122

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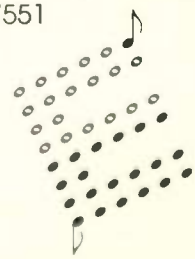

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The March to Programmable Logic

The history of electronics is captured in the transition from "hard" design to "soft" programmability.

By Gary Hall

In the beginning, electronic circuits were manufactured by wiring individual components with binding posts and insulated wire, cut to length. I'm sure many readers have taken apart an old TV, or built one of the old-style electronic kits. The construction of these devices was sometimes a work of art, but in terms of manufacturing, it was labor-intensive and subject to error.

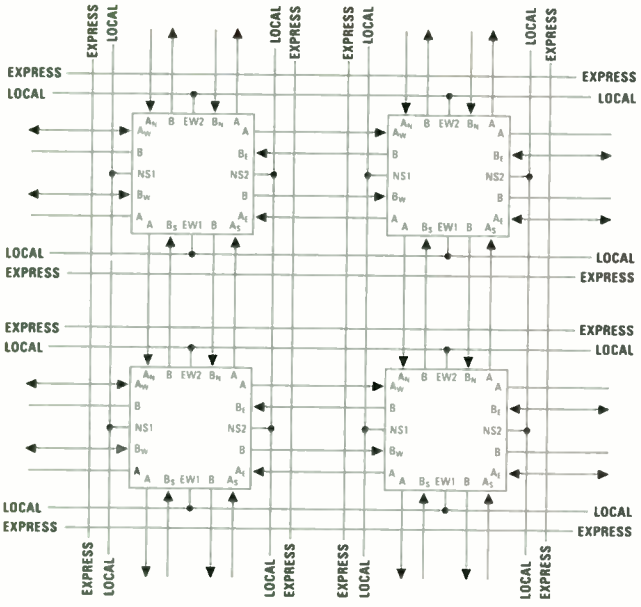


FIG. 1: The newly-announced Cli6000 from Concurrent Logic provides 3,136 individual general-purpose logic cells connected by local and express buses.

The first step in automating electronics manufacturing came with the printed circuit board. By etching interconnections in copper foil, the PC board changed a circuit's wiring from "hardware," a matter of individual handcrafting, into "software," a specification for a manufactured item that could be stamped out by the thousands.

The integrated circuit took things to the next level. Instead of interconnecting discrete components, IC designers etched the circuits themselves into tiny blocks of pure silicon. Commonly used circuits could be manufactured by the millions, packaged in plastic and ceramic DIPs (Dual Inline Packages).

But electronic circuits still were fixed items. Once manufactured, a given circuit board only could perform the function for which it was designed. Any change of function required a completely new design.

The first step toward true programmable logic came with the microprocessor, and what a step it was. By replacing hardwired circuits with a tiny, general-purpose computer, the microprocessor ushered in the modern age of electronics, including electronic music. Polyphony, sequencers, personal computers, and MIDI are direct results of the microprocessor.

The function of a microprocessor is defined by its program. Synthesizers, drum machines, and other devices driven by microprocessors generally use Programmable Read Only Memory (PROM), the original programmable-logic chip, to carry this program. PROM chips are programmed once, so the designer must be certain that every aspect of the program's design is complete before commiting to PROM. Erasable PROM (EPROM) met the needs for field-programmability and reusability and became popular for electronic music devices.

The Gate Array brought the next major revolution in integration and programmability. Conventional integrated circuits are custom-designed and must be manufactured in huge quantities to pay off the costs of design and tooling. Gate Arrays provide what the name implies, an array of thousands of gates (individual logic blocks) that the designer can use as desired. The connection of the gates, and hence, the circuit's function, is defined by a final "interconnect" layer. Gate Arrays enable many companies to reduce their designs into ICs, but tooling a Gate Array is costly. Unless a company can count on selling several thousand units, they cannot justify the cost.

A recent development in programmable logic, the Field Programmable

Gate Array (FPGA), is changing all that. Unlike mask-programmed Gate Arrays, FPGAs are standard parts, programmed by the product-designers. Most can be programmed once, but some can be reprogrammed multiple times. FPGAs make it possible to design even low-volume products using "custom chip" ideas. An added advantage is shorter turnaround between design and production, as there is no need to wait for the chips to return from the "foundry."

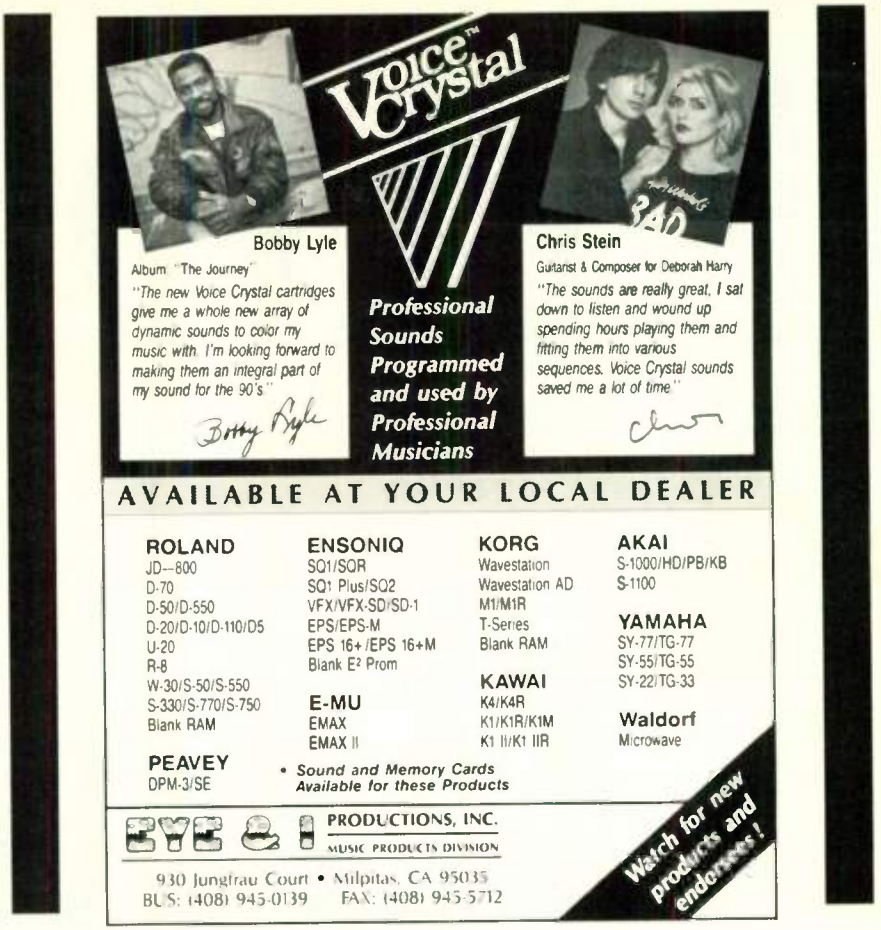
With FPGAs, the bulk of the cost is in the design. FPGAs streamline manufacturing, but do not reduce the difficulties of connecting thousands of individual logic blocks. Besides the digital logic, the FPGA designer must be attentive to "analog" effects, such as fan-out (which concerns the limited number of inputs that can be fed by a particular gate's outputs) and line length (the distance a signal must travel across the chip to reach its next connection), if the finished design is to work reliably.

The demands of FPGA design are met with special software-design packages. These programs have become quite sophisticated, allowing the designer to transfer a schematic into a software simulation of the completed array. The simulator takes into account all the effects of interconnection and accurately represents the behavior of the finished circuit. Most design packages have facilities to optimize the design automatically and "back-annotate" the schematic to record the changes.

But this is not the end for programmable logic. The most recent technology announcement comes from start-up Aptix of San Jose, California. Their Field Programmable Interconnect Component (FPIC) makes interconnections on a circuit board as programmable as a Gate Array. Their first product is a 1,024-pin chip that can be programmed to connect any pin to any other pin internally. The idea is that all circuit lines on a board are routed to this one monster part, like a programmable patch bay on a chip.

What comes next? FPGA technology will continue to grow, with higher gate counts and more sophisticated design tools. Perhaps one day we'll see a true general-purpose digital device that changes itself to fit the demands of the moment.

Gary Hall *is product support manager for Sonic Solutions.*



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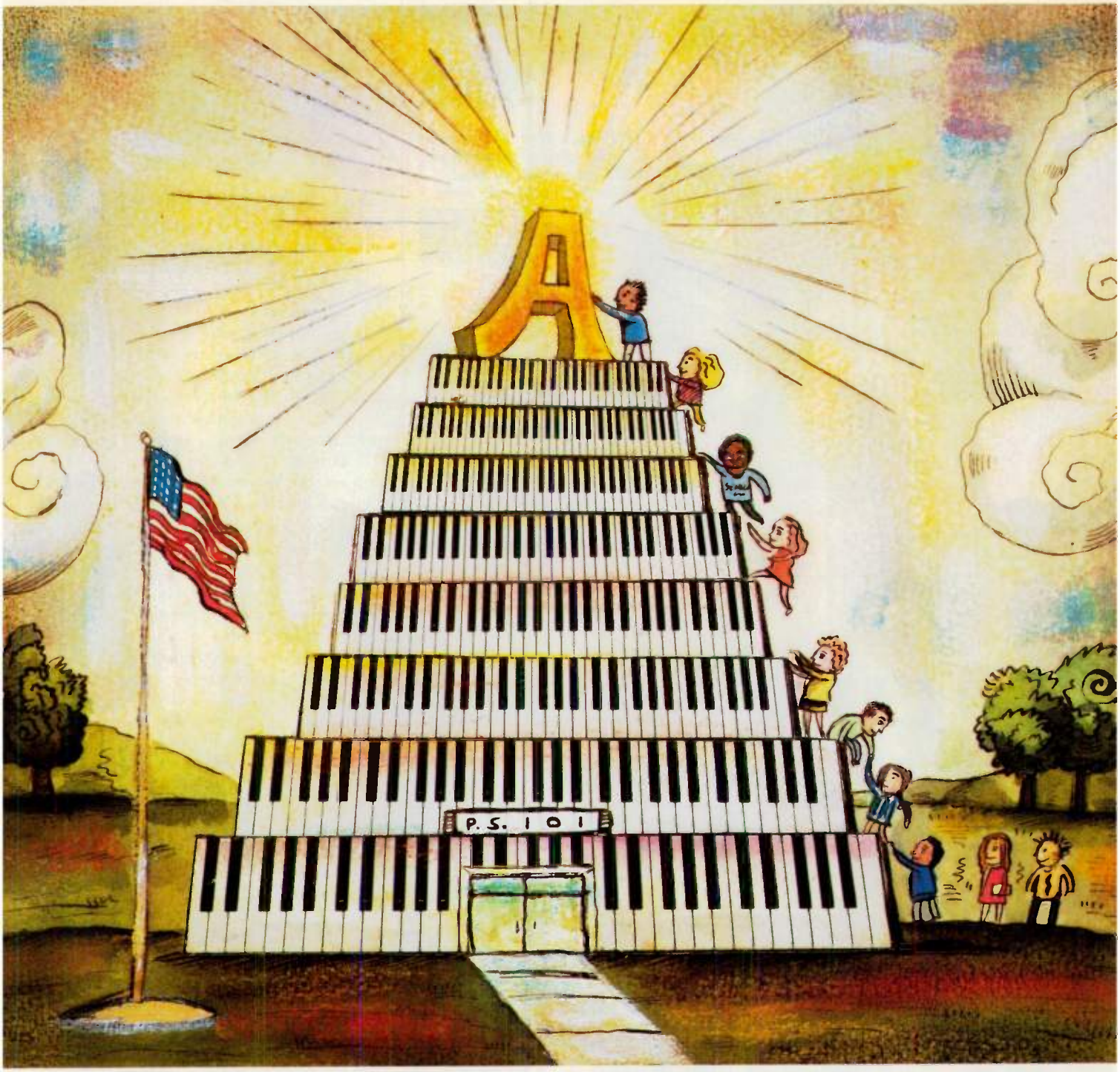
MIDI Enters the Classroom

Educators are discovering new ways to use computers in music curricula.

By Edward Tywoniak

A seven-year-old child sits with his father in their Oakland, California, home, playing a Nintendo game that allows him to shoot ducks off a treble clef, interact with aliens in a game of musical tag, and compose a child's nursery rhyme. Students in a Mississippi elementary school find their academic test scores improve dramatically after taking only two semesters of electronic keyboard classes. In a San Diego, California, middle school, students compose atmospheric mood music while watching videos of a rainforest. And college students attending a small technical institute in Cupertino, California, take a series of courses with titles like MIDI Fundamentals, Sound Analysis and Design, and Digital Signal Processing.

While we all lament the recent decimation of instrumental music programs in schools, several related changes offer hope for the future. Fantastic advances in musical technology, a gradual acceptance of computers as educational tools by



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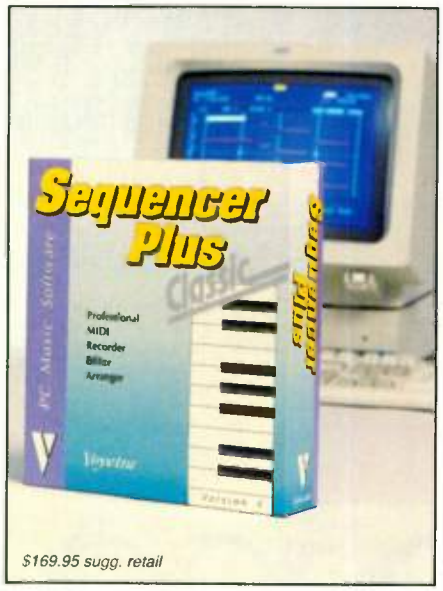

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WHY MUSIC EDUCATION?

In these harsh economic times, it's unfortunate that the very existence of music education programs must be justified. Here's a sampling of the current arguments. First, music education cultivates the imagination necessary for innovative thinking and nurtures the creativity fundamental to problem solving. The analysis of abstract constructs is critical for cognitive development, and the process of reading and performing music provides an unmatched experience for developing these skills. Studies also show that as students tap into their innate creative forces, self esteem rises along with overall grades. Test scores benefit, and children with discipline problems show marked improvement in their personal, social, and academic lives.

There also are indications that keyboard lessons can dramatically improve concentration and the basic learning skills of young children. A recent study of 115 socially disadvantaged second grade students at Davis Elementary School in Greenwood, Mississippi, demonstrated that after two semesters of keyboard instruction, the children in the study displayed an average increase of seven percent on their achievement test scores, compared to no increase in the control group of 127 students who received no keyboard instruction.

C.L. Stevenson, Superintendent of Greenwood Public School District, indicated that learning the keyboard aided students in many areas, especially in the pre-reading skills of listening concentration, pattern recognition, and sequence cognition. According to Stevenson, "In studying piano lessons, children use two eyes, two ears, both arms, all ten fingers, both legs, and both feet, with the brain giving each of these a different task to perform. That's a powerful exercise in concentration for the brain."

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tem. Yet statistics show we are in jeopardy of losing the fight. At the elementary and junior high school levels, only about three percent of the instructional time (about one hour per week) is spent on all of the arts combined. Similar statistics hold true for the nation's high schools. In addition, the performing arts have been reduced to second-class status among the shapers of higher education curricula. So the question is, "Where do we go from here?" Enter the computer.

MIDI IN THE CLASSROOM

Within the last half decade, computers have made major inroads at all levels of academia. However, there are still many pundits who bemoan the "intrusion" of new technologies into the sacrosanct halls of scholastica. Regardless of their concerns, today's students not only are comfortable with it, they expect a minimal level of technology in their school and private lives. TVs, VCRs, computer game systems, boom boxes, even telephone beepers are as much a part of children's lives as baseballs and bubble gum.

Although private ownership of personal computers still is limited to the higher socioeconomic segments of the population, they have become almost as prevalent as blackboards in most schools. Many music educators have begun to incorporate these machines into music curricula. At the same time, rapid technological and manufacturing developments in electronic musical instruments have made the installation of a computer music laboratory almost as cost-effective as a fully outfitted band room. And, like it or not, the sounds that emanate from these new laboratories are the sounds that kids hear on the streets. This is no bold new territory for them, but old, familiar turf.

Examples of MIDI technology in music instruction are cropping up everywhere. The seven-year-old child in Oakland utilizes a wonderful new system developed by The Software Toolworks. Dubbed the Miracle Piano Teaching System, it includes a 4-octave, velocity-sensitive keyboard synthesizer and software for the Nintendo video game system as well as IBM-compatible, Macintosh, or Amiga personal computers. The Miracle keyboard also supports MIDI, includes a built-in stereo speaker system, and features 16-note polyphony. The educational software supplied with the system, which can accommodate both adult and child learners, is remarkable. Its variety of interactive modules allow you to develop sight reading, composition, and accompaniment skills, all in an easy-to-use and inviting graphical environment. (For more information on the Miracle system, see the review on p. 114.)

Students at Hardy Elementary School in San Diego use a unique instructional program developed by music teacher Gary Stokes. The program is based around two electronic music laboratories supplied by Roland Corporation, which has provided an entire line of products specifically geared for the education marketplace for many years.

Each workstation in the laboratories includes a keyboard synthesizer, Macintosh computer, powered speakers, and headphones. Wind synthesizers, drum pad triggers, and other MIDI musical devices also are available to the students. An array of music-oriented software allows students the opportunity to explore music fundamentals as well as tap into their own individual creativity.

"What's important," Stokes points out, "is that the effect of this one music program has crossed over into the entire curriculum. We've seen a tremendous advancement in problem students; those whose test scores were very low have jumped two or three grade levels in a year. It's proof that by using technology, we can educate students through the arts. We've proved that we can cross over into the curriculum—and they love it!"

MIDI also has become a major force at Cogswell College, in Cupertino, California. Students enrolled in their unique four-year Music Engineering Technology program receive comprehensive training in current music technologies, including hands-on experience in their well-equipped labs. By utilizing state-of-the-art equipment from manufacturers like E-mu Systems, Opcode, Digidesign, Korg, and Yamaha, students explore all aspects of music from fundamental concepts through orchestration for video and film. They also take a variety of electronic engineering courses designed to provide an in-depth understanding of the architectures that lie beneath

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STARTING A MIDI-BASED MUSIC PROGRAM

If you're interested in setting up or acting as a consultant for a MIDI-based music education program, there are several important steps you should follow. Here is a checklist of prioritized procedures that can act as a guideline for putting together an instruction-based music system.

Curriculum Assessment. It is imperative that a school's faculty and administration assess the demographic breakdown of the student body, its current needs for musical instruction, cross-curricular applications and benefits of a Computer-Aided Instruction (CAI) lab, growth projections for student and faculty populations, availability of fiscal resources and future opportunities, and possibilities for growth and development of the institution's makeup and academic mission.

Budget Assessment. Once the decision has been made to proceed with a CAI music lab, the bottom line for future decisions probably will be just that—the bottom line. Give careful consideration to costs involved in starting such a program, as well as hidden or overlooked costs of maintaining it. Fortunately, the cost/performance ratio of electronic instruments has drastically reduced the amount of money needed to start and maintain such a program. Keep in mind that you don't need the best, nor do you need everything all at once. Start with the basics and grow from there.

Space Allocation. Aside from fiscal resources, the next most desired resource in any institution is real estate. Potential locations should be carefully assessed for lighting, power, security, ventilation, storage, number of student workstations, and layout of faculty work area. Don't forget to consider how existing furniture may affect your plans. For example, dust from a standard chalkboard can wreak havoc on electronic equipment. Consequently, you'll probably need dry-pen "white" boards on wall surfaces.

General System Design. Your particular environment obviously will be the primary influence on your system design, but most situations require a few basics. First, you need general purpose computers, such as the Atari ST, Apple Macintosh, Commodore Amiga, or IBM PC and compatibles (see "Music Boxes" in the March 1992 **EM**). Second, you need instruments. All types of MIDI controllers are useful in one way or another. Keyboards are the most popular and probably the most educationally useful in the K-12 area, but there also are MIDI guitars, wind controllers, percussion pads, and more.

You'll also need a simple sound system. Small self-powered speakers are quite useful in these applications, and headphones often are a necessity to reduce sonic interference between workstations. Other types of equipment might include additional MIDI sound modules, mixers, signal processors, recording devices, and MIDI or audio signal routers. Don't forget to include such things as power strips, cables, adapters, computer printers, and other seemingly mundane peripheral support devices in your budget projections.

Finally, you must select the appropriate

software. Important criteria to consider include function (ear training, keyboard exercises, music fundamentals, music notation, musical games, acoustic analysis, song playback, compositional instruction, sequencing, etc.), level of complexity, and quality of graphical interface.

System Procurement and Installation. Catalog mail-order services typically offer excellent prices and sometimes eliminate sales taxes. Local discount houses also offer bargains on equipment. Sometimes, manufacturers offer factory-direct sales for music educators, especially if you buy in quantity. However, a full-service dealer ultimately might be the best deal, when you consider such important intangibles as presale consultation, after-sale support, and peripheral item freebies. In any case, it's important to establish a relationship with a dealer who has experience with educational systems.

System installation also is a critical issue. Having a teaching staff install the system is a wonderful learning process for those who will be teaching on the equipment. However, their lack of experience may prove costly in both time and money. Hired installers charge higher up-front costs, but this may be the most cost-effective solution in the long run. Either way, it's crucial to have a knowledgeable expert directing the installation to avoid mistakes, confusion, and frustration that could stop the program before it starts.

Curriculum Development. Once the system is up and running, you need to develop a well-planned course curriculum. Don't forget to include items like wall charts, operational manuals, reference guides, and student-directed tutorial modules. It also helps to assign better students to the roll of lab assistant. This allows for a distribution of work loads, rewards better students for their efforts, and helps establish an environment for peer learning.

SUPPORT

Despite the isolation that one often feels when embarking on such an ambitious undertaking, remember you are not alone in the MIDI jungle. The most important rule in this regard is: There is no such thing as a dumb question. You will find that free assistance is just a phone call away.

A good place to start is reading trade magazines like **EM**. Also of interest is a new book entitled *Fundamentals of Music Technology: A Course of Study for Secondary Schools*, by Dennis Mauricio and Dr. Steven Adams. This book includes units on the history of electronic music, physics of sound, synthesis, sampling, computers, multitrack recording, signal processing, MIDI, drum machines, and sequencing. Each unit includes teacher lecture notes, classroom activities, student notes, quizzes, vocabulary lists, and additional resources. The book is available from Consultant Help (tel. [818] 991-0110).

Your local music dealer who specializes in computer music equipment can be an invaluable resource. But be wary of sales hype, especially if you are a novice. Never approach a dealer with a wad of cash in your pocket. Take the time to assess their sales staff, and try to build a rapport with someone knowledgeable in the type of system you are putting together.

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For information and application, contact: Naro Khandjian, Berklee College of Music, 1140 Boylston Street, Boston, MA 02215. (617) 266-1400, ext. 317.

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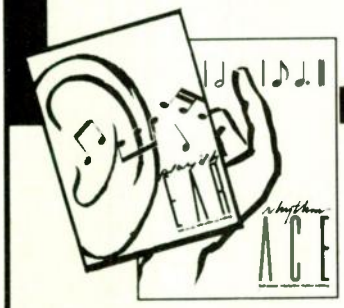

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manufacturers often offer telephone support services. For example, Mix Bookshelf (tel. [800] 233-9604) is a marvelous source for literature and information about all aspects of the music industry. If you are already a computer user, national music-oriented bulletin boards such as PAN (tel. [215] 584-0300) can be of significant assistance. The National Association of Music Merchants (NAMM; tel. [800] 767-6266) also supplies helpful information. Roland Corporation offers a hotline to the Roland Education Staff (tel. [213] 685-5141). Perhaps most important, seek out advice and information from similar institutions in your area that have set up a program, or are planning a laboratory similar to the one you envision.

Several institutions offer seminars and workshops for educators interested in becoming involved in music technology. For example, the University of Northern Colorado in Greeley (tel. [800] 548-8178) presents the Rocky Mountain Music Technology Workshop for music educators every summer. (This year's seminar will be held July 9 through 12.)

TOWARD THE FUTURE

The technology of electronic music offers a great deal of promise for music education programs, but it cannot and will not replace existing instructional methods. As Professor Dennis Miller, director of the Music Industry Program at Northeastern University in Boston, aptly points out, "Despite the incredible saturation of technology in the real music marketplace, there is still a wide gap between technology and students. Students must be exposed to the aesthetic and the literature of electronic music. And while it is an important pedagogical tool for ear training and other areas, it is still no substitute for a solid foundation in composition."

This is the trap that music educators of the future must avoid at all costs. Just as electronic instruments never will replace acoustic instruments, computers never will replace the two most important musical tools we already own—our minds and our ears. But computers sure do make it fun!

Edward Tywoniak, *an educator, author, composer, and performer, has been a member of the faculty at Saint Mary's College of California since 1977.*

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But great specs are only part of the answer. The bottom line on the continued success of the K4 and KIII is something thousands of musicians already know: THEY PERFORM — consistently, professionally and reliably. And while they don't try to be the flavor of the moment, they do provide an unbelievably rich arsenal of sounds to complement setups from the most miniscule to the most fully blown. Get some lasting power out of your keyboards — add a K4 or a KIII to your set up. Better yet, a K4 *and* a KIII.

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The quest for alternative music markets can yield financial rewards.

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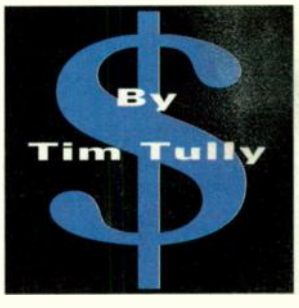
We usually buy MIDI gear for simple reasons: We love music; we play for fun or, occasionally, money; and there's always the dream of becoming a star.

Certainly, for those who get there, the star scenario is the biggest, most obvious payoff for years of practice, lousy road food, and equipment that costs more than rent. But what about the 95 percent of us who never land the Big Recording Contract? Are we forever doomed to toss cash down the MIDI pit, or are there other ways to get financial payback for our expensive hardware and software?

There are. But like most things in life, they are not free and hardly ever easy. In addition to instrumental and compositional skills, marketing music requires a batch of other skills (as well as time, dedication, legwork, discipline, and luck). Also, cultivating new markets for your electronic music inevitably cuts into the time you spend sharpening musical chops. If stardom seems just a few breaks away, it may be best to leave the marketplace to an agent and focus on developing your schtick. However, if you believe success lies in



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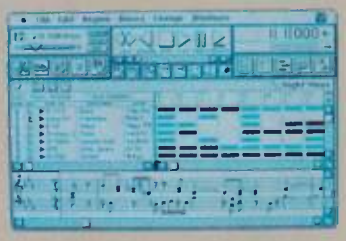

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exploring other avenues, there are alternatives.

THE PRODUCTION STUDIO

The most common way to turn MIDI into money is to establish a production studio. At one point or another, every performer, band, and composer needs to record a demo tape. Traditionally, this means booking time in a conventional recording studio, setting up the band and microphones, getting sounds, multitracking performances, and mixing. In addition, composers and solo artists might need to hire professional musicians and provide them with written parts (or pay for pre-production rehearsals). All of this costs money.

A well-equipped MIDI studio can duplicate many functions of the full-sized recording studio less expensively and, in some ways, provide potential clients a greater opportunity to maximize the quality of their music. You can create a production studio in one of two ways: Either you hustle up jobs and hire out your skills as composer/arranger/recording engineer, or you turn a portion of your home into a part-time (or full-time) business. In the first instance, you'll generate the final product in the privacy of your home and deliver it to your clients. The second requires that you open up your studio (and thus, your home) to clients. Though potentially more lucrative (because you can rent time), this second tack opens up a Pandora's box of concerns, including privacy, sonic isolation, and your local zoning laws. In most cases, you're better off renting your services, not your space.

The now-classic function of the home MIDI studio in the recording process is pre-production. Defined loosely, pre-production is any preparation that shortens the time and money spent in a standard recording studio. In its most basic form, pre-production consists of creating a MIDI sequence, dumping it to floppy disk, and taking it to the fully equipped recording studio. There, the sequence is played back through a professional mixing console using top-of-the-line MIDI instruments and signal processors. The sequence can be synchronized to, or actually recorded onto, multitrack tape. Vocals and acoustic instruments are added, and the entire production is mixed to stereo.

The archetypal client for MIDI pre-production is the singer/songwriter who knows nothing about instrumentation, arranging, or recording technology. The relatively low overhead of a small MIDI system allows you to charge much less for killer instrumental tracks than the big recording studio. The flexibility of MIDI sequences also gives clients the luxury of making arrangement changes inexpensively. Rearrangement sessions in a big studio are quite costly because musicians must be recalled and paid to redo their parts.

If someone just wants a MIDI sequence, you'll need a sequencer, keyboard, and enough sound modules to play all the parts. Sound quality matters relatively little in this situation (unless your client lacks imagination), because you are writing "parts" that can be replayed through any chosen sound module. If you become accomplished at this, try selling your sequences to local performers to use as backup tracks, or to companies that sell prerecorded MIDI sequences. (Ads for such companies regularly appear in EM's classifieds section.)

The working band lies at the other end of the client spectrum. While most bands are self-contained and have no interest in sequenced MIDI tracks, you may be able to sweeten their demos with MIDI percussion, horns, or strings. Also, if you own the appropriate computer and software, you can produce lead sheets. This involves translating the live band arrangement into a MIDI sequence, then enlisting notation software to turn the sequence into a musical score. Many casual or show bands log consistent personnel changes, and your charts can ease the introduction of new members.

Achieving any success requires spreading the word about your services. Because recording studios frequently serve as way stations for bands, have some professional business cards printed and post a few on the studio bulletin board. You never know when a desperate band leader may give you a call. It also helps to supply the studio manager with a few samples of your work (transcriptions or demo tapes), as he or she often is the first person a client turns to when a recording session breaks down. If you make a good impression, you may find yourself benefitting from frequent (and profitable)

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referrals. Don't overlook local music contractors (many advertise in the telephone Yellow Pages) who book club acts into hotels and large parties. Their databases usually encompass the whole of a city's professional music makers.

UPWARD MOBILITY

Between the extremes of bands and MIDI-innocent songwriters, you'll find clients who push services toward higher levels. For example, instead of routing your sequence through a pro studio's mixer and sound modules (a process that still eats "on the clock" time), a client may wish to save even more money by having you assemble a master mix of the sequenced tracks and print it to tape or hard disk. In this instance, the backing tracks are premixed in your studio, so the client incurs big studio charges only with the addition of vocals (or other acoustic instruments) and the brief time it takes to mix these overdubs with the previously assembled rhythm tracks.

Doing this type of work makes your studio's equipment requirements grow significantly. It requires plenty of good-sounding instruments and signal processors, a flexible mixing board, and a quality 2-track recorder. If the budget allows, add a traditional multitrack deck or hard-disk system compatible with professional studios in your area.

If your MIDI studio has these features, as well as the space to accommodate extra people, you can increase your service base with live recording capabilities. This essentially involves buying quality microphones, additional headphones and cables, and possibly building an isolation booth.

At this point, you've practically become a big studio yourself. Research the market to see if your potential clients are best served by a combination MIDI/live studio before committing to such a drastic step. (Don't forget basics such as bathroom facilities, food, and places to sit.)

AUDIO FOR VIDEO

Fortunately, enlarging the physical scope of your studio is not the only way to entice clients. A tiny, well-equipped MIDI studio is perfect for exploiting the growing market of audio-for-video.

At the top of this particular heap, depending on how you look at it, is film or television scoring. While both activities pay quite well, film scoring generally carries more popular recognition and prestige. However, scoring for television commercials can be extremely lucrative and is at least equally demanding an art. While a film composer develops themes and motifs in relatively traditional ways, ad music must integrate with visual images, narration, and sound effects and elicit a specific, powerful reaction in no more than 60 seconds.

Unfortunately, both industries are intensely competitive. Smaller markets are only slightly less cut-throat than national centers such as New York, Los Angeles, and Chicago. Clients for ad music are demanding, and the musicians, composers, and studios who succeed in this business are among the best anywhere. However, similar markets that are more accessible to someone starting out are available.

Many video studios make a solid income producing industrial videos that need soundtracks every bit as much as Hollywood films. When a company introduces a new product, explains a revised employee benefits package, or describes its product line at a trade show, a video presentation often does the talking.

Scoring for video (or film) differs from conventional composition and/or songwriting (see the sidebar "Video Lingo"). The most obvious difference is you are not employed to communicate your heartfelt passions, but to support a specific set of visuals within rigidly defined time limits. In addition, video producers often consider music of secondary importance and budget productions accordingly. Still, scoring industrial videos can be a rewarding and challenging job, and the top musician/composers in this field are well-paid and highly respected.

To prepare your studio for an assault on the industrial video world, it must

SYSTEM SHAKE DOWN

What you sell depends on what you produce, which depends on the kind of equipment in your MIDI studio. These lists include the basics. And while more is almost always better, practiced skill and technique are vital, and restrictions often enhance creativity.

The basic studio does a good job turning out MIDI files (sequences other people can use in production or on stage):

- MIDI keyboard (or alternate controller) to perform the original sequences.
- MIDI sequencer, either hardware unit or computer-based. The latter also requires a computer, software, and MIDI interface.
- Sound modules to generate the sound. One keyboard with onboard percussion that can play at least eight multitimbral parts simultaneously can get you through some jobs. Usually though, you'll need at least one other multitimbral, multiple-output unit for melodic instruments and another for percussion.

The elementary **production studio** cranks out completely produced tapes. In addition to the above, it requires:

- At least four to six synthesizers with complementary sound architectures (analog, L/A, FM digital, sample playback, wavetable, etc.). Acquire a 16-bit sampler for custom percussion and sound effects.
- A high-quality mixing console with at least four effects sends and EQ.
- Three or more delay and reverb units.
- Good studio monitors.
- A mixdown deck (15- or 30-ips analog half-track, DAT, or Sony PCM F1).
- A cassette deck is necessary to make demos and rough mixes. A 3-head deck that allows monitoring off the play head while recording saves time and frustration.

The **audio-for-video** studio adds the ability to compose music and sound effects that are synched to picture. In addition to the above, it has:

- A SMPTE time-code reader and writer that also converts SMPTE to MIDI Time Code.
- A video monitor.
- A video cassette player. This can be a consumer unit, but it should have a sturdy transport mechanism. (A jog and shuttle wheel also helps.)

Everything About Our New Digital Audio Equipment Is Designed To Sound Better Than Ever.

SONY

TCD-D10 Pro II
Portable DAT Recorder

The TCD-D10 Pro II is the smallest professional DAT recorder from Sony. Yet, while it weighs only 4 lbs. 7 oz., the TCD-D10 Pro II is no lightweight when it comes to performance.

Built to withstand the rigorous demands of field work, the TCD-D10 Pro II allows you to stay in the digital domain from acquisition to studio. It also features absolute time (A-time) recording/playback which places a continuous time code on tape, allowing you to locate recorded segments faster and more easily.

Plus, A-time is compatible with SMPTE time code DAT recorders like our PCM-7000 Series. There's even an improved digital I/O and LCD multi-display with a combination of safety/warning indicators to help insure fail-safe operation. And when combined with one of Sony's high quality microphones, you're fully equipped to meet the most demanding challenges in the field.

KEY SPECIFICATIONS

DYNAMIC RANGE: MORE THAN 85 dB

FREQUENCY RESPONSE: 20 Hz-22 kHz

THD: 0.06%

I/O: ANALOG—MIC/LINE BAL, DIGITAL—AES/EBU

ACCESSORIES: BATTERY (X2), CHARGER, REMOTE, AC SUPPLY, CASE

▼ SHOWN WITH OPTIONAL SONY ECM-MS5 STEREO MICROPHONE.

PCM-2700
Studio DAT Recorder

Taking advantage of Sony's latest innovations in digital technology, the PCM-2700 is the first affordable professional 4-head DAT recorder.

Featuring Sony's advanced HDLC (High Density Linear Converter™) System, the PCM-2700 delivers superior sound quality. The PCM-2700 also employs a 4-motor direct drive transport to insure tape stability, accuracy and reliability. Its 4-head design provides off-tape monitoring to verify your recordings.

There's even a duration adjustable digital auto fader for fade-in and fade-out times as well as an A-time search function for rapid access to any recorded A-time location—all giving you the utmost in professional performance.

KEY SPECIFICATIONS

SIGNAL TO NOISE RATIO: MORE THAN 90 dB

FREQUENCY RESPONSE: 20 Hz-22 kHz

THD: <0.045%

ANALOG I/O: +4 dBs (+24 dBs MAX.) ADJUSTABLE

PARALLEL REMOTE: TTL COMPATIBLE, D-SUB 37

Including The Price.

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If you've been looking to expand your capabilities with a new professional DAT recorder, CD player or signal processor, Sony quality is now within your reach.

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PRO/STANDARD DIGITAL AUDIO SERIES

DPS-R7

Digital Reverb

If you want to add even more power and versatility to your audio system, Sony's DPS-R7 is right on the money.

Offering two discreet channels of advanced digital reverb effects, the DPS-R7 is an invaluable tool for the audio professional. As with the DPS-D7, the DPS-R7 employs HDLC D/A converters for superior sound reproduction as well as high-speed 32-bit digital signal processing, which deliver sophisticated, multiple reverb effects.

It also includes 100 factory presets as well as 256 memory locations for your own presets. In addition, the DPS-R7 features an ingenious "data wheel" and large graphic display for easy operation.

KEY SPECIFICATIONS

DYNAMIC RANGE: MORE THAN 90 dB

FREQUENCY RESPONSE: 10 Hz-18 kHz

THD: <0.004%

ANALOG I/O: BALANCED +4 dBs (+24 dBs MAX.), UNBALANCED –10 dBs (+10 dBs MAX).

MAXIMUM SIMULTANEOUS EFFECTS (TEN): 4 PRE EFFECTS (2 PER CHANNEL), 2 REVERB (1 PER CHANNEL), 4 POST EFFECTS (2 PER CHANNEL)

CDP-2700

Compact Disc Player

The CDP-2700 compact disc player delivers a multitude of professional features for a very compact price.

Like all Pro Standard equipment, the CDP-2700 is rugged and reliable while delivering superb sound quality. Ideal for on-air applications in radio broadcasting and sound sweetening in video post, the CDP-2700 includes important features such as variable speed playback, fader stop/start control from a mixing console and an auto cue function for instant start.

And because its digital output conforms to both the AES/EBU and IEC-958 formats, the CDP-2700 directly interfaces with other professional equipment for flexible system expandability.

KEY SPECIFICATIONS

DYNAMIC RANGE: MORE THAN 110 dB

CROSSTALK: 100 dB

THD: 0.04%

VARI-SPEED RANGE: ± 12.7% (0.1% STEPS)

D/A CONVERSION: DUAL 18-BIT 8X OVERSAMPLING

DPS-D7

Digital Hyper Delay

If you want to take your creativity in exciting new directions, Sony's DPS-D7 Digital Hyper Delay is the way to go.

Featuring seven sophisticated algorithms, there's virtually no limit to the number of unique and complex digital delay effects you can create. The DPS-D7 incorporates an 18-bit over-sampling A/D and 1-bit HDLC D/A converter system with digital filters for excellent linearity, ultra low noise and wide dynamic range.

Second generation LSI's allow for high-speed 32-bit digital signal processing. And with its large graphic display and help button for assistance on any function, the DPS-D7 is always simple to use.

KEY SPECIFICATIONS

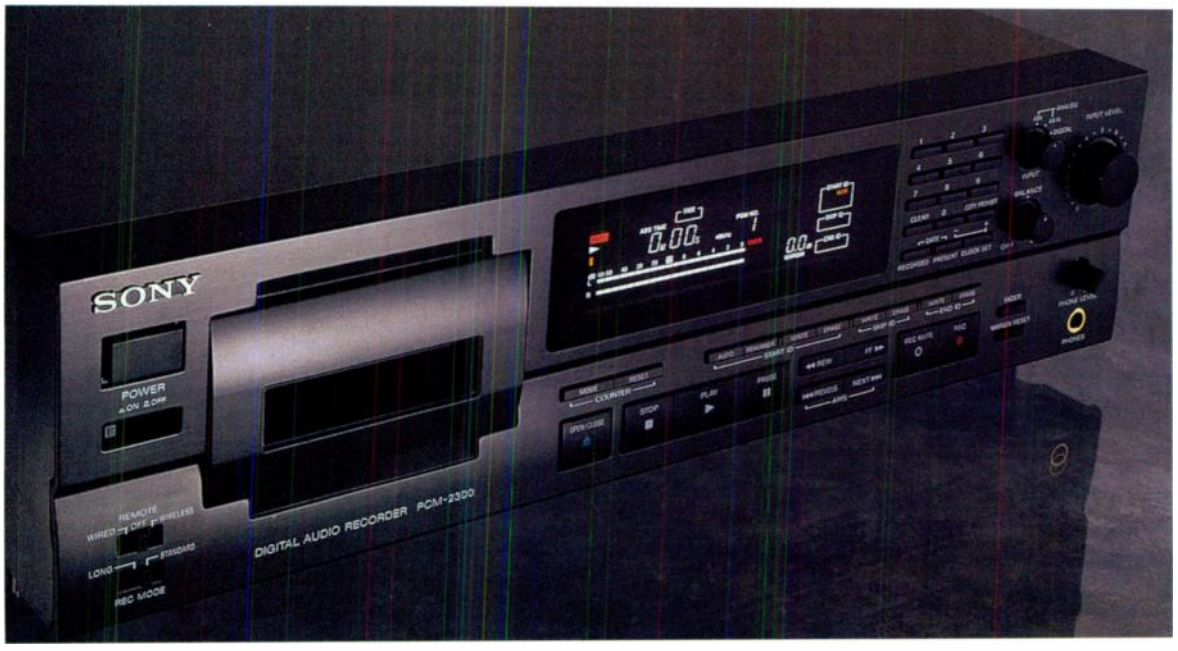
DYNAMIC RANGE: MORE THAN 94 dB

FREQUENCY RESPONSE: 10 Hz-22 kHz

THD: <0.0035%

ANALOG I/O: BALANCED +4 dBs (+24 dBs MAX.), UNBALANCED –10 dBs (+10 dBs MAX.)

MEMORY CAPACITY: 100 FACTORY PRESETS, 256 USER LOCATIONS



PCM-2300

Studio DAT Recorder

As Sony's most affordable professional DAT recorder, the PCM-2300 is ideally suited for a wide variety of applications where high quality recording and playback are necessary.

Like the PCM-2700, the PCM-2300 incorporates the latest conversion devices—1-bit delta Σ A/D converter and HDLC 1-bit D/A converter—for outstanding sound quality. The PCM-2300 also incorporates a sophisticated 3-motor transport design for solid reliability. And in 32kHz long-play mode, it delivers twice the normal recording and playback time—a full four hours.

Plus, its analog and digital I/O's provide a wide range of flexible interfacing possiblities.

KEY SPECIFICATIONS

SIGNAL TO NOISE RATIO: MORE THAN 86 dB

FREQUENCY RESPONSE: 20 Hz-20 kHz

THD: <0.05%

ANALOG I/O: +4 dBs (+24 dBs MAX.) ADJUSTABLE

SUPPLIED ACCESSORIES: WIRED/WIRELESS REMOTE, 19" RACK MOUNT, POWER AND REMOTE CABLES

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Representing a breakthrough in high-performance D/A conversion, Sony's new High Density Linear Converter™ (HDLC) System defines a new level of performance in sound quality.

More specifically, HDLC, a single-bit technology, recreates an analog wave form from digital data by representing it as a rapid series of pulses, overcoming differential non-linear distortion and glitch-induced distortion as well as zero-cross distortion inherent in previous technologies.

The HDLC system also employs Sony's proven 45-bit noise-shaping digital filter, circumventing base band dynamic range deterioration and assuring a high degree of oversampling accuracy. All of which translates into the purest, most accurate sound reproduction. All from Sony.

To experience the power of HDLC, along with the other advanced technologies behind our new digital audio products, call 1-800-635-SONY, ext. 914, for the Pro Standard dealer nearest you.

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SONY

be equipped to function as a complete production facility. A professional sequencer is a necessity. Most people now use computer-based sequencers, although I know a highly successful composer who still uses one of the first hardware sequencers—a Linn 9000—and claims it does everything software sequencers do. This also requires several of the best-sounding synthesizers and samplers you can afford, some high-quality signal processors, a mixing board with sixteen inputs or more, and a good analog (¼-inch, half-track, 15- or 30-ips) or digital (DAT or F1) mixdown deck. Remember, the entire production begins and ends in your studio, so equipment quality and flexibility is paramount.

In addition, you must integrate MIDI functions with the world of video. For this, you need a video recorder and monitor, as well as a device that reads SMPTE time code from video tape and converts it to MIDI Time Code, so you can synchronize your music to the client's video.

Typically, a client provides a finished video, with time code recorded on an audio track and a readout of the code in a window that appears on the video screen. Sophisticated (expensive) productions utilize numerous "hits," where a given sound or musical event must be synched to a visual event. Matching cues requires a lot of the start-stop-rewind-stop-and-start-again routine, so a video deck with a shuttle wheel saves time and headaches.

Want to jump in? A tour of your local telephone directory should yield names of local video production studios, but do not pitch your audio services without a demo tape. Unfortunately, compiling the demo tape that garners future commissions requires some degree of uncompensated work. If you're just starting out, film students are prime candidates to provide your scoring chops. Amateur and independent film makers offer other possibilities. You should check the film or media departments of local colleges or trade schools, and seek out independent film societies. With perseverance, you'll find someone who will let you work for free, and the road to glamour, riches, and 65-hour work weeks will open before you.

MULTIMEDIA

A similar market to industrial videos is the emerging field of multimedia. The typical multimedia production uses sound effects and music to underscore computer-generated presentations and corporate logos. Although it's questionable whether multimedia will justify its hype as the next big thing, many companies already have been established to service the industry. In short, it took little time for job competition to get brutal.

As with all these markets, research is a vital weapon. Don't assume "an underscore is an underscore." The audio demands of interactive multimedia productions often are more complex than the requirements of linear narrative industrial videos or film vignettes. Seek out trade magazines, multimedia conventions, and software demonstrations to acquaint yourself with the language of the field (also see "Making Multimedia" in the November 1991 **EM**). Remember that these productions often are run through the audio system of a desktop computer, so get ready to reacquaint yourself with sonic minimalism. Audition your mixes on small radio speakers to envision how much sound effectively translates to mini-transducers.

VIDEO GAMES

Blasting 30-foot mush monsters, dodging Terminators, and taking the checkered flag require proper mood music. If you've got the chops to excite the Nintendo crowd, try scoring video games. Like multimedia, video games are not known for sophisticated audio. You'll probably end up using one-tenth of your MIDI studio. I scored so many video-game projects where a Roland MT-32 provided the end sounds that I broke down and bought one. Today's newer games are written for Roland's Sound Canvas, which offers an MT-32 compatibility mode.

Breaking into this field is difficult, but you can start by sending a query letter to manufacturers of popular games. Ask about their submission policy and whether they accept unsolicited demo tapes.

THEATER AND DANCE

There's no such thing as a rich theater company or dance troupe, so getting a fine arts commission often is a mixed blessing. On the plus side, your work is promoted and exposed to a sophisticated audience that still holds composers in high regard. It's also wonderful to see your music translated into choreography, or enlivened by the passions of actors and actresses.

The down side is you'll probably lose money on the gig. Even if a commission seems reasonable at first, by the time you've witnessed myriad rehearsals, sat in on hundreds of production meetings, taken countless 3 a.m. panic calls from the director or choreographer, and filleted your work during endless restagings, you might net 50 cents an hour.

However, a demo reel appears considerably more attractive with an actual theatrical production as a credit. Just about every city has a call board

VIDEO LINGO

If you want to conquer the audio-for-video market, you'd better know the language. Here are a few terms you'll hear tossed around during a typical underscore or jingle session.

Bed: The instrumental component of a jingle.

Donut: A jingle format in which vocals are placed at the beginning and end, with an instrumental section in the middle that often includes the ad's narrated "sell" lines.

Needle Drop: The act of using prerecorded music (or samples), rather than new music specifically composed for a piece. The term comes from the early days of broadcasting, when engineers "dropped the needle" onto a record to hit music cues.

Opens: These are musical introductions that cue the beginning of a video production and/or specific sections. Some producers want short opens and long opens so they can mix them up throughout the production.

Outro: A musical finale. It can be a bombastic big finish, or a quiet fade. The length can vary, but the composition should evoke a feeling of completion.

Sting: A brief vocal or instrumental passage that often serves as a slogan or identifible musical motif. Good stings are ruthlessly memorable.

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- The Gear You Need
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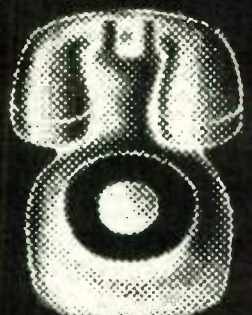

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newsletter that announces auditions. Discover the main producers of your local theater community and start pitching. Choreographers always need material. Check out local dance classes and notable instructors. Many theatrical producers rate music and sound design as the last priority, so a show already in rehearsal may still need music.

Also, you'll have an easier time getting theatrical gigs if you can produce a finished master. Usually by the time the music is dealt with, the director/choreographer is so frazzled they'll run to the first composer who offers full service. Many theaters use cassette or ¼-inch reel-to-reel (2-track, 15-ips). Some productions still utilize ¼-track reel-to-reel running at 7½-ips.

AEROBICS CLASSES

Aerobics instructors constantly search for music to pump up their classes. Top instructors spend hours seeking appropriate songs (or instrumentals), choreographing musical segues, and even changing the speed of a track to match a routine's tempo.

Several companies offer "custom" tapes of music with selections timed to specific beats per minute (similar to dance records). There's no reason why you can't offer the same service. Check out local aerobics classes to familiarize yourself with the role of exercise music, and get to know a few instructors. If you create a buzz within the instruction community, you may be able to advertise and sell sequences or tapes nationally.

None of this comes easy. Subscribe to trade magazines, study the presentation of existing production music services, and maybe even take a few classes. You'll need to learn where the average instructor likes to "punch up" a routine so you can score musical crescendos to suit. It also helps to imbibe the personality of a class to determine the appropriate emotional level of your tracks (i.e., linear dance beats, frequent hits or crescendos, lyrical content, etc.).

SOUND DESIGN

If you are a synth programming whiz, or if you've polished your sampling and sample-editing skills to a high gloss, you also may be able to market yourself as a sound designer. Find musicians who are working so much they can't spare enough time to create and edit new sounds, and you'll find musicians willing to pay you to update their sonic palettes.

Again, local recording studios are good places to find potential clients. Ask the studio manager if you can meet a few staff engineers, and invite yourself to an overdub session. If your demo tape shows off some amazing patches

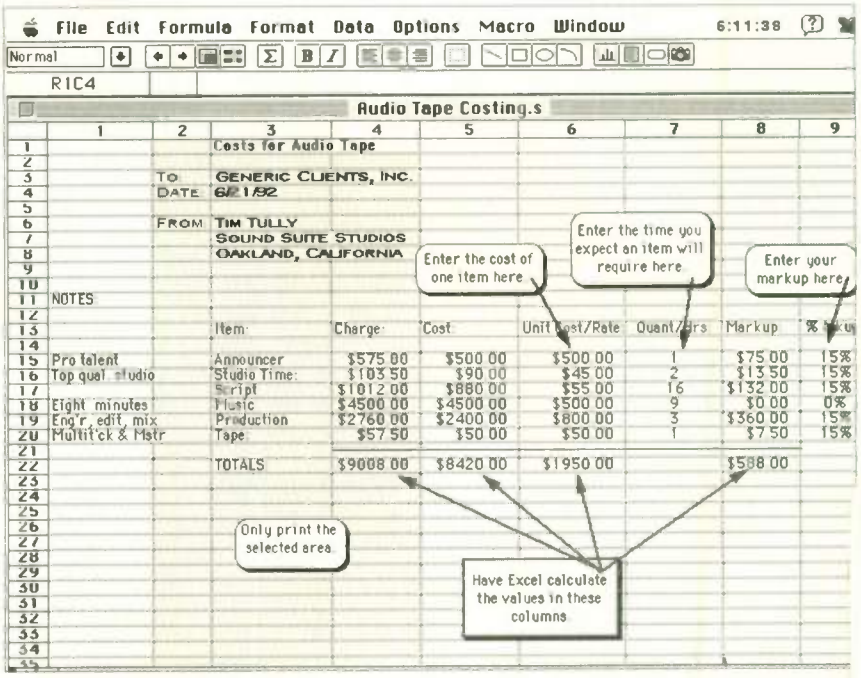

Fig. 1: A spreadsheet helps track time, expenses, and profits for each project.

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(and you hit it off on a personal level), an engineer may introduce you to clients whose sweetening sessions have been less than sweet. Don't forget to include record producers in your marketing focus, as they also are on the prowl for bizarre sounds.

MARKETING TIPS

Hopefully, anyone smart enough to program a synthesizer knows to seek out those who use and purchase music. The trick is convincing these users to buy your stuff.

Most important, present yourself as a reliable person. Especially if you're an unknown, you must look, sound, act, and feel like you'll deliver the goods on time. You don't have to wear a 3-piece suit, or pretend you're someone you're not, but you'll only get work from people who trust you. And you only have a few seconds to create that trust.

Get professionally printed labels for your demo cassettes. If you have a computer, use your word processor or desktop publishing program to create a concise brochure telling people who you are, what you do, and for whom you've done it. When you invest time and thought into your business, people tend to take you more seriously.

Learn to use a spreadsheet program. I use Microsoft *Excel* for a number of chores. I can break complex jobs into a list of small items, estimate the time each will take, and have *Excel* calculate how much to charge, including time, material costs, and markup (see **Fig. 1**). This allows me to present low-budget and expensive versions of a project to a client. When the project is completed, the spreadsheet can generate an invoice.

Also, remember that your expertise with equipment is more important than the gear itself. Learn to use your musical tools with speed, imagination, and assurance, and you'll develop a good reputation (and return business).

In all of these markets, you face competition from established audio-for-video studios and composers and prerecorded production music libraries, which most video producers consider less expensive than original music. Your best weapons against both are the quality of your music and your pricing.

THE MONEY MINDSET

You may feel your music is fated to be an important, vital, artistic force in the world and will get there only if you follow your every instinct to the exclusion of all other considerations. This path is often the way of greatness. If it's your way, more power to you, and best of luck.

However, if selling your music on a more mundane level interests you, consider your music as a craft at which you excel. Success in the areas we've discussed often is based on how well you accept, interpret, and realize the input of your client. If you take pride in your collaborative skills and your ability to evoke moods on cue, it becomes easy to do good work on someone else's project. Despite aggressive competition, new projects always open up. If you have the chops and can deliver them on spec and on time, you'll soon see a return on your MIDI investments.

Tim Tully *knows what he's talking about here, since he hasn't had a real job for years. He alternates between doing this kind of stuff and writing for various music and computer magazines from his comfortable, San Francisco Bay Area studio.*

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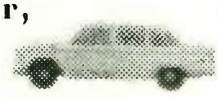

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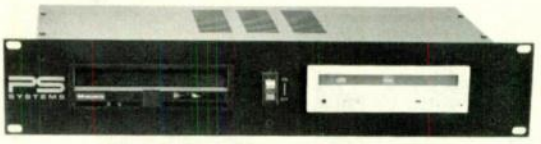
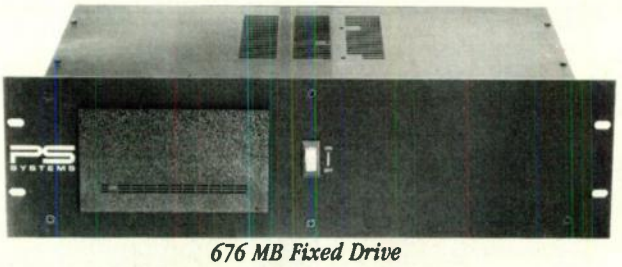


44 MB Removable / CD-ROM combo



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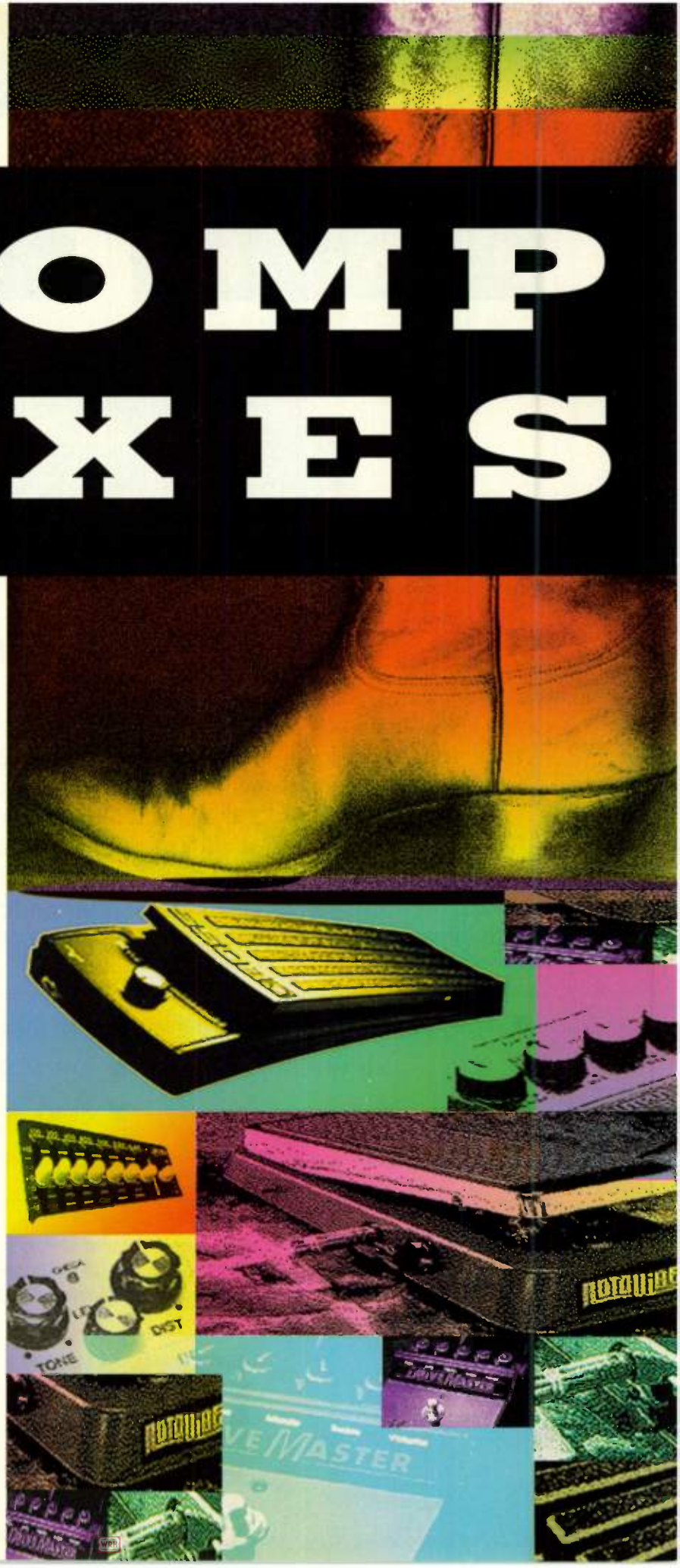
EM Guide to Floor Pedal Effects

STOMP BOXES

Floor effects pedals don't exactly bulldoze across the cutting edge of technology. In fact, they are the grunts of the audio chain. They're tossed into gig bags, taped to stage floors, trod upon, and tripped over. It takes a certain elan to withstand such abuse, and stomp boxes are hell-bent-for-leather. Most utilize totally retro analog circuitry, eat 9-volt batteries as if they were bon-bons, and reduce programming options to "discreet" and "obnoxious."

And even though the stomp box is a child of the past, modern devices such as rackmount digital processors and guitar preamps haven't dumped floor pedals onto the endangered species list. Far from it. There are 173 products on our buyer's guide chart, and few are holdouts from a manufacturer's back catalog. For example, Boss and Ibanez introduced new pedals at the Winter NAMM show, and manufacturers such as Korg and DigiTech

by Michael Molenda



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"It sounds Superb! - B.H. Edmond, OK
"It's really quite wonderful isn't it? - P.M. Alameda, CA

a The PCD-401 16-bit Sound Module / MIDI Interface is a Multi-timbral PCM/FM synthesizer and MPU-401 compatible MIDI interface on one card. It just slips into your PC and turns it into a Music Work Station.
$389.00

"It's the easiest of them all!"
- T.M. software evaluator for Sys Tech, Los Alamitos, CA
"...I can see that it's more powerful!" - K.J.M., Hollywood, FL

b The Final Cut Professional 16 track MIDI Sequencer program for the PC. The Final Cut is a comprehensive tool for conceptualizing and constructing music. Using animated "Tape Reels" and standard tape recorder controls, lets you record and play your songs with the ease of a home tape recorder. Graphic editing and a full view of an 88 key Piano Roll Screen makes fast, powerful editing simple.
$99.95

"Hey, these sound good!"
- I.M., London, England at NAMM '92

c MLI Multi-Media Speaker Systems are stereo self-powered monitors designed for clear, clean reproduction of digital sounds and to prevent damage to your computer system. Strong magnetic fields cause distortion and possible long term damage, so both the PP-6MS and PP-12MS are Magnetically Shielded.
$69.95/pair and $99.95/pair

d Keyboard Controller, PP-49K with Velocity Sensitivity. Velocity controls the volume of each note and adds dynamics to your music. Full size keys. Space saving design.

e MIDI-Studio workstation from Invisible Products, Newtonville, MA. Invisible makes great stands, ranging from the new single keyboard stand to composer stations.

MIDI Land also makes standard MIDI Interfaces, Game Sound Cards, Voice-Speech I/O Cards, and utility software for its products. See and Hear them at your local MIDI Land Dealer!

Applied Melody for the PC

MIDI Land, Inc.

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● *PCD-401 is a trademark of MIDI Land, Inc. All others belong to their respective companies.*

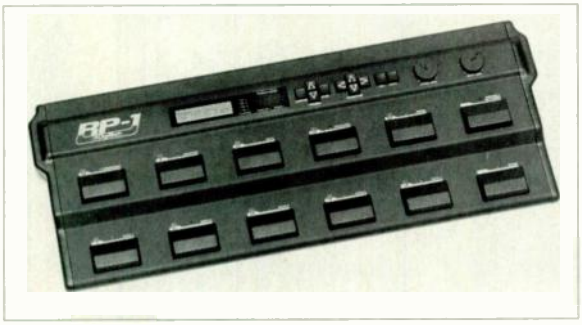
seem committed to refining and enlarging technical parameters.

SWITCHING ON

Few electronic music products are as user-friendly as stomp boxes. Neophytes can purchase a single floor pedal and learn about basic signal processing without being intimidated by the myriad options of rack effects. My first pedal was an ancient Roland phase shifter with speed and depth controls. It was nothing fancy, but it opened my mind to the sonic possibilities of modulation effects. If it weren't for that pedal, my first mixdown session in a professional recording studio would have been a lot tenser.

The main market for floor pedals is still guitarists (and to a lesser extent, bassists). However, these pedals also are perfect for the club musician or home recordist who just wants one simple, inexpensive tone enhancer.

The main appeal of stomp boxes is their sound. The resurgence of big guitars in rock, dance, and rap music kicked signal processing backwards a few steps. (U2's recent album *Achtung Baby*, which is a virtual banquet of distortion, was produced by Daniel Lanois and Brian Eno, who typically produce elegant, crystalline sonics.) Many producers now view a guitar's "dirt" as the driving force in a record's impact. For these applications, digital multi-effects processors often have less punch than an analog floor pedal.



DigiTech's RP-1 combines the sophistication of a studio rack effects processor with the accessibility of a simple floor pedal.

The CE-5 Chorus Ensemble by Boss is a classic effects-pedal design.

This is not a slap at digital technology, but an example of matching technology to the medium. Certain stylistic genres depend on putting music into the listener's face, and analog sounds often provide the needed aggressive edge. And as far as effects

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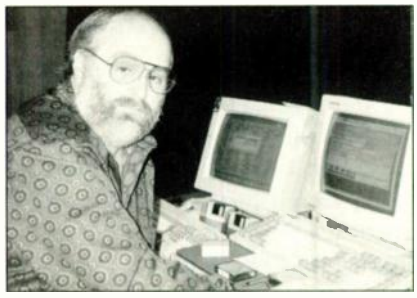
Hey Glenn, what do you do with your 56K?

Glenn Meadows is the president of Masterfonics Inc. in Nashville, Tennessee. His mastering credits, 350 of which have achieved Gold/Platinum status, include: Alabama, Hank Williams Jr., Dan Fogelberg, and Reba McEntire. Recent 56K projects include: Steely Dan Gold Extended/MCA, Reba McEntire/MCA, and Sawyer Brown Curb/Capitol. He has been mastering since 1973.



"The 56K has made my life much easier. In an effort to find a digital mastering system suitable to my needs, I evaluated several other systems on different platforms. The 56K proved significantly easier to use and faster to learn, as well as very quick to do the type of edits I normally did with analog tape.

The playlist in SoundStage is the most intuitive I have seen. I use it daily for quickly changing the song order on compact discs, as well as reassembling songs for different required mixes. What used to be done in a day with tape can now be done in minutes with the 56K.

I've seen the competition... used it..., and in my opinion, there is no better 2 track mastering solution on the market today."

56K digital recording system

A Professional System.
A Reasonable Pricetag.
Still $1995.00.

turtle beach systems

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EM Guide to Stomp Boxes

COMPRESSOR/LIMITER PEDALS

Manufacturer/Model	Effect	Control Knobs	Internal Processing	Output	Notes	Price
Boss CS-3 Compression Sustainer	compressor	level, tone, attack, sustain	analog	mono		$110
Boss EH-2 Enhancer	dynamics enhancer	mix, freq, tone	analog	mono		$120
Boss LM-2 Limiter	limiter	level, tone, threshold, release	analog	mono		$110
Boss LM-2B Bass Limiter	limiter	enhance, level, threshold	analog	mono		$120
DOD FX80B Compressor Sustainer	compressor	level, attack, compression	analog	mono		$80
DOD FX82 Bass Compressor	compressor	level, attack, compression	analog	mono		$80
Ibanez Power Series BP10 Bass Compressor	compressor	attack, sustain, level	analog	mono		$120
Ibanez Power Series CP10 Compressor Sustainer	compressor	attack, sustain, level	analog	mono		$120
Ibanez Sound Tank CP5 Compressor	compressor	level, attack, sustain	analog	mono		$70
MXR M-102 Dyna Comp	compressor	output, sensitivity	analog	mono		$120
Peavey CSR-2 Compressor/Sustainer	compressor	sustain, threshold, level	analog	mono		$83
Vestax CMP Compressor	compressor	sense, output, attack, treble, bass	analog	mono		$109

DELAY PEDALS

Manufacturer/Model	Effect	Control Knobs	Internal Processing	Output	Maximum Delay Time	Price
Boss DD-3 Digital Delay	delay	effect level, feedback, delay time, mode	digital	effect, direct	800 ms	$240
DOD DFX9 Digital Delay	delay	level, repeat, delay, range/mode	digital	mono	1000 ms	$150
DOD FX90 Delay	delay	delay, mix, repeat	analog	mono	400 ms	$150
Ibanez Power Series DL10 Digital Delay	delay	delay level, repeat, delay time	digital	effect, dry	400 ms	$130
Ibanez Power Series DPL10 Pan Delay	delay with panning	pan delay time, repeat, delay level	digital	stereo	800 ms	$170
Ibanez Sound Tank DL5 Digital Delay	delay	delay level, repeat, delay time	digital	mono	400 ms	$100
Peavey DDL-3 Digital Delay	delay	delay adjust, feedback level, effect level, delay range	digital	mix, dry	2.2 seconds	$220
St. Louis Music S1000 Stereo Digital Delay	delay	delay time, feedback, delay level	digital	stereo		$140
Vestax DDX Digital Delay	delay	range, feedback, multi, mix	digital	mono	1,024 ms	$191
Vestax MDX Digital Delay	delay with modulation	range, depth, feedback, multi, rate, mix	digital	stereo	1,024 ms	$216

DISTORTION/OVERDRIVE PEDALS

Manufacturer/Model	Effect	Control Knobs	Internal Processing	Output	Notes	Price
Boss DF-2 Super Feedbacker & Distortion	distortion	level, tone, drive, overtone	analog	mono		$140
Boss DS-1 Distortion	distortion	tone, level, distortion	analog	mono		$90
Boss DS-2 Turbo Distortion	distortion	level, tone, drive, turbo	analog	mono		$120
Boss HM-2 Heavy Metal	distortion	level, color mix, distortion	analog	mono		$100
Boss MZ-2 Digital Metalizer	distortion	level, tone, drive, doubling mode, chorus mode	analog/digital	stereo		$240
Boss OD-2 Turbo Overdrive	overdrive	level, tone, drive, turbo	analog	mono		$110
Boss OS-2 Overdrive/Distortion	overdrive/distortion	level, tone, drive, color	analog	mono		$110
Boss SD-1 Super Overdrive	overdrive	level, tone, drive	analog	mono		$90
DOD FX50B Overdrive Plus	overdrive	level, tone, drive	analog	mono		$60
DOD FX52 Classic Fuzz	distortion	volume, tone, fuzz	analog	mono		$56
DOD FX53 Classic Tube	overdrive	volume, tone, drive	analog	mono		$65
DOD FX54 Attacker	distortion with compression	level, tone, compression, distortion	analog	mono		$100
DOD FX55B Supra Distortion	distortion	level, tone, distortion	analog	mono		$60
DOD FX56B Super American Metal	distortion	level, bass, presence, distortion	analog	mono		$90
DOD FX57 Hard Rock Distortion	distortion	level, presence, distortion, delay	analog	mono		$100
DOD FX58 Metal Maniac	distortion	level, presence, distortion	analog	mono		$80
DOD FX59 Thrash Master	distortion	level, presence, distortion	analog	mono		$90
Dunlop JH-2 Jimi Hendrix Fuzz	distortion	volume, fuzz	analog	mono	classic saucer shape; also available as conventional pedal (JH-2S, $120)	$120
Dunlop JH-3S Jimi Hendrix Octave Fuzz	octave distortion	volume, tone	analog	mono		$120
Ibanez Power Series MS10 Metal Charger	distortion	distortion, level, attack, punch, edge	analog	mono		$110
Ibanez Power Series MT10 Mastertone	distortion/overdrive	distortion, level, bass, middle, treble	analog	mono	MOSFET-driven distortion	$100
Ibanez Power Series TS10 Tube Screamer	overdrive	drive, tone, level	analog	mono		$90
Ibanez Sound Tank CM5 Classic Metal	distortion	level, tone, distortion	analog	mono		$60
Ibanez Sound Tank PL5 Power Lead	distortion	level, tone, distortion	analog	mono		$60
Ibanez Sound Tank TM5 Thrash Metal	distortion	level, tone, distortion	analog	mono		$50
Ibanez Sound Tank TS5 Tube Screamer	overdrive	level, tone, distortion	analog	mono		$50
Kamen Applause AP100	distortion/overdrive	level, wave, distortion	analog	mono		$60
Marshall Blues Breaker MFP04	distortion	gain, volume, tone	analog	mono		$130
Marshall Drive Master MFP02	distortion	gain, volume, treble, mid, bass	analog	mono		$130
Marshall Shred Master MFP03	distortion	gain, volume, treble, contour, bass	analog	mono		$130
MXR M-104 Distortion	distortion	output, distortion	analog	mono		$110
Peavey ADD-2 Accelerator Overdrive	overdrive	sensitivity, drive, level	analog	mono		$83
Peavey HFD-2 Hotfoot	distortion	level, presence, distortion	analog	mono		$75
Pro Co Sound Rat 2	distortion	distortion, filter, volume	analog	mono	luminescent control graphics	$111
Pro Co Sound Turbo Rat	distortion	distortion, filter, volume	analog	mono	luminescent control graphics	$131

EM Guide to Stomp Boxes

DISTORTION/OVERDRIVE PEDALS (continued)

Manufacturer/Model	Effect	Control Knobs	Internal Processing	Output	Notes	Price
Pro Co Sound Vintage Rat	distortion	distortion, filter, volume	analog	mono	original design reissue	$180
St. Louis Music S10BD Bass Distortion	distortion	level, distortion, high EQ, low EQ	analog	mono		$60
St. Louis Music S10D Distortion	distortion	level, tone, distortion	analog	mono		$65
St. Louis Music S10TD Overdrive	overdrive	level, low EQ, high EQ, distortion	analog	mono		$60
St. Louis Music S10UM Ultra Metal	distortion	level, low EQ, high EQ, distortion	analog	mono		$80
Tube Works Model 901 Real Tube	vacuum tube overdrive	drive, output, hi, mid, low	analog	mono	digital switching, hard wired 110 VAC	$150
Tube Works Model 903 Blue Tube Enhancer	vacuum tube overdrive	drive, output, hi, mid, low	analog	mono	digital switching, hard wired 110 VAC	$165
Tube Works Model 910 Tube Driver	vacuum tube overdrive	drive, tone, output	analog	mono		$100
Vestax DST Distortion	distortion	low EQ, mid EQ, hi EQ, distortion, output	analog	mono		$110
Vestax DSX Multi Distortion	distortion	mode, tone, distortion, depth, rate, output	analog	mono		$100
Vestax OVD Overdrive	overdrive	low EQ, mid EQ, hi EQ, drive output	analog	mono		$70
Vestax V-1X Tube Drive	overdrive	master, drive, contour, headphone level	analog	mono		$300

MODULATION EFFECT PEDALS

Manufacturer/Model	Effect	Control Knobs	Internal Processing	Output	Notes	Price
Boss BF-2 Flanger	flange	manual, depth, rate, resonance	analog	mono		$140
Boss BF-2B Bass Flanger	flange	manual, depth, rate, resonance	analog	mono	flanger harmonic content only	$140
Boss CE-2 Chorus	chorus	rate, depth	analog	mono		$125
Boss CE-2B Bass Chorus	chorus	rate, effect level, depth	analog	mono	flanger harmonic content only	$130
Boss CE-5 Chorus Ensemble	chorus	effect level, rate, depth, filter	analog	stereo	low- and high-cut filters	$140
Boss CH-1 Super Chorus	chorus	effect level, EQ, rate, depth	analog	stereo		$110
Boss DC-3 Digital Dimension	chorus	effect level, EQ, rate, depth	digital	stereo		$270
Boss HF-2 Hi Band Flanger	flange	manual, depth, rate, resonance	analog	mono	flanges one octave higher	$150
Boss PH-2 Super Phaser	phase shift	rate, depth, resonance, mode	analog	mono	12-stage filter	$170
Boss PN-2 Tremolo/Pan	tremolo with pan	rate, depth, mode	analog	stereo		$130
DOD FX28B Stereo Phaser	phase shift	speed, depth, regeneration	analog	stereo		$90
DOD FX62 Bass Stereo Chorus	chorus	speed, delay time, depth	analog	stereo		$100
DOD FX65 Stereo Chorus	chorus	speed, delay time, depth	analog	stereo		$100
DOD FX68 Super Stereo Chorus	chorus	level, speed, delay time, depth	analog	stereo		$110
DOD FX72 Bass Stereo Flanger	flange	delay, speed, width, regeneration	analog	stereo		$110
DOD FX75B Stereo Flanger	flange	delay, speed, width, regeneration	analog	stereo		$100
Ibanez Power Series BC10 Stereo Bass Chorus	chorus	speed, width, delay time	analog	stereo		$160
Ibanez Power Series DSC10 Digital Chorus	chorus	speed, width, delay time, color	digital	stereo		$140
Ibanez Power Series PH10 Bi-Mode Phaser	phase shift	speed, width, feedback, mode	analog	mono		$170
Ibanez Power Series SC10 Super Stereo Chorus	chorus	speed, width, delay time	analog	stereo		$110
Ibanez Power Series SF10 Swell Flanger	flange	speed, width, regeneration, delay time	analog	mono		$170
Ibanez Sound Tank CS5 Super Chorus	chorus	speed, width, delay time	analog	mono		$80
Ibanez Sound Tank FL5 Flanger	flange	speed, depth, regeneration	analog	mono		$90
Ibanez Sound Tank PH5 Phaser	phase shift	speed, depth, feedback	analog	mono		$90
Kahler Applause AP200	chorus	rate, width, sensitivity	analog	mix, invert		$90
MXR M-101 Phase 90	phase shift	speed	analog	mono		$130
Peavey BAC-2 Bionic Bass Chorus	chorus	speed, depth	analog	high, low		$165
Peavey CMC-1 Companded Chorus	chorus	speed, depth	analog	mono		$120
Peavey DSC-4 Dual Clock Stereo Chorus	chorus	speed 1, depth 1, speed 2, depth 2	analog	stereo		$160
St. Louis Music S10BF Bass Flanger	flange	rate, depth, manual, feedback	analog	mono		$75
St. Louis Music S10C Stereo Chorus	chorus	rate, depth, intensity	analog	stereo		$75
St. Louis Music S10F Stereo Flanger	flange	rate, depth, manual, feedback	analog	stereo		$85
St. Louis Music S10PH Phaser	phase shift	depth, feedback, rate	analog	mono		$65
T.C. Electronic Stereo Chorus-Flanger	chorus, flange, pulse-width modulation	speed, width, intensity, input gain	analog	stereo	external bypass, power supply included	$374
Vestax FLCH Digital Chorus/Flanger	chorus, flange	time, feedback, depth, rate, effect mix	digital	mono		$180
Vestax SCH Stereo Chorus	chorus	rate, mode, mix, depth, filter	analog	stereo		$150
Vestax SFL Stereo Flanger	flange	rate, feedback, mode, depth, time	analog	stereo		$100

MULTI-EFFECT PEDALS

Manufacturer/Model	Effects	Control Knobs	Internal Processing	Output	Notes	Price
Boss BE-5 Guitar Multiple Effects	chorus, noise suppressor, digital delay, overdrive/distortion, compressor	rate, depth (chorus); effect level, feedback, fine, range (delay); level, tone, drive, color (distortion); level, tone, attack, sustain (compressor)	analog/digital	stereo	effects loop, tuner out, power supply included	$395
Boss BE-5B Bass Multiple Effects	delay/chorus/flange, 10-band EQ, enhancer/overdrive, limiter	feedback, fine, range, effect level, rate, depth (delay/chorus); 31.5 Hz to 16 kHz with 15 dB boost/cut (EQ); enhancer, drive, level, balance (enhancer/overdrive); threshold, level (limiter)	analog/digital	stereo	effects loop, tuner out, power supply included	$395

MULTI-EFFECT PEDALS (continued)

Manufacturer/Model	Effect	Control Knobs	Internal Processing	Output	Notes	Price
Boss DSD-3 Digital Sampler/Delay	delay, sampler	effect level, feedback, delay time, sampling mode	digital	mono	trigger input	$295
Boss ME-6 Guitar Multiple Effects	compressor, distortion, overdrive, EQ, noise suppressor, delay, chorus, flange, reverb	attack, sustain, level (compressor); mode, drive, tone, level (distortion); high level, mid freq, mid level, low level, total level (EQ); threshold (noise gate); time, feedback, effect level (delay); mode,) pre-delay, rate, depth, effect level (chorus/flanger); mode, time, tone, effect level (reverb	analog/digital	stereo	6 simultaneous effects, 25 user memory locations, power supply included	$400
Boss ME-10 Guitar Multiple Effects	compressor, distortion, overdrive, noise suppressor, EQ, phase shift, flange, pitch shift, delay, chorus, reverb, amp simulator	sustain, attack, tone, level (compressor); mode, drive, tone, level (distortion); threshold (noise gate); high level, mid freq, mid level, low level, total level (EQ); manual, rate, depth, resonance, effect level (phase shift/flanger); pre-delay, pitch, fine, feedback, mix (pitch shift); delay time, feedback, high cut, low cut, effect level (delay); pre-delay, rate, depth, tone, effect level (chorus); mode, pre-delay, decay, tone, effect level (reverb)	analog/digital	stereo	9 simultaneous effects, 128 user memory locations, built-in tuner, power supply included	$870
Boss PS-2 Digital Pitch Shifter/Delay	delay, pitch shift	balance, feedback, fine tune, mode	digital	mono	tuner output	$230
DigiTech RP1 Guitars Effects Processor/Controller/Preamp	compressor, overdrive, distortion, delay, chorus, reverb, flange, noise gate, EQ, speaker simulator	effect parameter, program select, compare, store, title, utility, output level, input level	analog/digital	stereo	150 programs (75 presets/75 user definable), 9 simultaneous effects, MIDI ports, power supply included	$580
DOD DFX91 Digital Delay/Sampler	delay, sampling	level, repeat, delay, range/mode	digital	mono		$160
DOD FX17 Wah/Volume Controller	volume, wah	n/a	analog	mono		$130
Dunlop EW-95V Mister Crybaby	volume, wah	n/a	analog	mono	volume range 4.5 dB to -19 dB	$150
Dunlop GCB-95FW Crybaby Fuzz Wah	distortion, wah	volume, fuzz/distortion control	analog	mono	kick button places distortion before or after fuzz, effect status LED	$206
Dunlop GCB-950 Crybaby Octave Wah	octave distortion, wah	level, tone (distortion)	analog	mono		$206
Dunlop JH-1FW Jimi Hendrix Fuzz Wah	asymmetrical distortion, wah	volume, fuzz/distortion control	analog	mono	kick button places distortion before or after fuzz, effect status LED	$206
Ernie Ball 6159 Stereo Pan	stereo volume, pan, A-B switching	volume mode, minimum volume, pan mode, on/off, left/right	analog	2 input/2 output	no battery required	$150
Ibanez Power Trio PT3 Guitar	overdrive/distortion, digital delay, chorus	drive, level, mode, tone (overdrive); delay time, repeat, range, delay level; speed, width (chorus)	analog/digital	mono	power supply included	$200
Ibanez Power Trio PT3B Bass	compressor, 7-band EQ, chorus	attack, level, sustain (compressor); 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2.2 kHz, 5 kHz with 15 dB boost/cut (EQ); speed, width (chorus)	analog	mono	power supply included	$200
Ibanez PUE5 Guitar Multi-Effect	compressor, distortion, digital delay, chorus	attack time, sustain, level (compressor); drive, tone, level (distortion); delay time, repeat, delay level, range (delay); speed, width (chorus)	analog/digital	stereo	power supply included	$300
Ibanez PUE5 Tube	distortion, overdrive, digital delay, chorus	drive, level, tone (tube screamer); drive, level, bass, middle, treble (tube drive); delay time, repeat, delay level, range (delay); speed, width (chorus)	analog/digital	stereo	power supply included	$400
Ibanez PUE5B Bass Multi-Effect	compressor, EQ, digital delay, flange/chorus	attack time, level, sustain (compressor); 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2.2 kHz, 5 kHz with 15 dB boost/cut (EQ); delay time, repeat, delay level, range (delay); delay time, speed, width, feedback (chorus/flange)	analog/digital	stereo	power supply included	$330
Korg A5 Bass	compressor, 5-band EQ, exciter, chorus/flange, reverb/delay	6 sliders, 24 selectable parameters	digital	stereo	programmable, 5 simultaneous effects, power supply included	$350
Korg A5 Guitar	compressor, distortion/overdrive, 3-band EQ, chorus/flange, reverb/delay	5 knobs, 24 selectable parameters	digital	stereo	programmable, 5 simultaneous effects, power supply included	$350
Korg A5 Multi-FX	compressor, 3-band EQ, exciter, chorus/flange, reverb/delay	5 knobs, 22 selectable parameters	digital	stereo	programmable, 5 simultaneous effects, power supply included	$350
Morley PDW	distortion, wah	drive, tone, level	analog	mono	electro-optical circuitry	$144
Morley PWV	volume, wah	level	analog	mono	electro-optical circuitry	$107
Peavey DEP-16 Stereo Effects Processor	chorus, delay, flange	depth/speed, effect level, regeneration, program select	digital	stereo	12-bit A/D/A	$210

EM Guide to Stomp Boxes

VOLUME PEDALS

Manufacturer/Model	Effect	Control Knobs	Internal Processing	Output	Notes	Price
Boss FV-50H/50L	volume control	n/a	analog	stereo	no battery required	$100
Boss FV-100	volume control	minimum volume	analog	stereo	configured for guitar FV-200 is keyboard model	$150
Boss FV-300L/300H	volume control with expression	minimum volume, expression	analog	stereo expression	300L functions as volume and/or expression	$140
Dunlop GCB-80	volume control	n/a	analog	mono	no battery required	$98
Dunlop GCB-81	volume control with preamp	n/a	analog	mono	0 dB to 15 dB boost	$124
Dunlop SL-50 Lead Master	balanced line volume control	minimum volume, maximum volume	analog	mono	no battery required balanced XLR connectors	$140
Ernie Ball 6180	volume control	on/off	analog	mono	no battery required	$99
Ibanez Power Series VL10	volume control with panning	minimum volume	analog	stereo		$120
Morley PSV	volume control	minimum volume	analog	stereo	electro-optical circuitry	$97
Morley PVO	volume control	minimum volume	analog	mono	electro-optical circuitry	$75
Morley SSV	volume control	n/a	analog	stereo	slide pot	$97
Morley SVO	volume control	n/a	analog	mono	slide pot, no battery required	$75
St. Louis Music VP200	volume control	n/a	analog	stereo	no battery required	$56

OTHER PEDAL TYPES

Manufacturer/Model	Effect	Control Knobs	Internal Processing	Output	Notes	Price
Boss AW-2 Auto Wah	auto wah	rate, depth, manual, sens	analog	mono		$140
Boss FT-2 Dynamic Filter	auto wah	sens, cutoff frequency, dynamic filter, mode	analog	mono	accepts input from EV-5 Expression pedal for wah wah	$145
Boss GE-7 Equalizer	7-band graphic EQ	100 Hz, 200 Hz, 400 Hz, 800 Hz, 1.6 kHz, 3.2 kHz, 6.4 kHz (15 dB boost/cut)	analog	mono		$140
Boss GE-7B Bass Equalizer	7-band graphic EQ	62 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz (15 dB boost/cut)	analog	mono		$140
Boss NS-2 Noise Suppressor	noise gate	threshold, decay, mode	analog	mono	built-in send/return loop	$140
Boss OC-2 Octave	octave divider	octave 1, direct level, octave 2	analog	mono		$130
DOD FX10 Bi-FET Preamp	acoustic preamp	tone, level	analog	mono	17 dB gain	$65
DOD FX25 Envelope Filter	level dependent wah	range, sensitivity	analog	mono		$75
DOD FX30B Noise Gate/Loop	noise gate with effects loop	release, gate, sensitivity	analog	mono		$70
DOD FX35 Octoplus	creates note one octave below note played	octave level, tone, direct level	analog	mono		$100
DOD FX40B Equalizer	7-band EQ	100 Hz, 200 Hz, 400 Hz, 800 Hz, 1.6 kHz, 3.2 kHz, 6.4 kHz (18dB boost/cut)	analog	mono		$100
DOD FX42B Bass EQ	7-band EQ	50 Hz, 100 Hz, 200 Hz, 400 Hz, 800 Hz, 1.6 kHz, 3.2 kHz (18 dB boost/cut)	analog	mono		$100
Dunlop GCB-95 Crybaby	wah	n/a	analog	mono		$134
Dunlop GCB-100 Bass Crybaby	wah	n/a	analog	mono		$134
Dunlop JH-1 Jimi Hendrix Wah Wah	wah	n/a	analog	mono		$140
Dunlop JH-1S Jimi Hendrix Wah Wah Special	wah	n/a	analog	mono	470 kilohm taper potentiometer for easier sweep control	$145
Dunlop JH-4S Rotovibe	rotating speaker simulator	vibrato mode, chorus mode, modulation depth (pedal controls speed)	analog	mono		$216
Ibanez Power Series BE10 Bass EQ	7-band graphic EQ	63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2.5 kHz, 5 kHz (15 dB boost/cut)	analog	mono		$150
Ibanez Power Series GE10 Graphic EQ	7-band graphic EQ	100 Hz, 200 Hz, 400 Hz, 800 Hz, 1.6 kHz, 3.2 kHz, 6.4 kHz (15 dB boost/cut)	analog	mono		$150
Ibanez WH10	wah	depth	analog	mono	mode switch for bass or guitar	$160
Morley PWA	wah	level	analog	mono	electro-optical circuitry	$95
MXR M-109 6-Band Graphic EQ	6-band graphic EQ	100 Hz, 200 Hz, 400 Hz, 800 Hz, 1.6 kHz, 3.2 kHz (18 dB boost/cut)	analog	mono		$120
MXR M-133 Micro Amp	pre amp	gain	analog	mono		$110
St. Louis Music S10PEQ Parametric EQ	parametric equalizer	level, freq, width, gain	analog	mono		$90
St. Louis Music WP100 Omniflex Wah-Wah	wah	n/a	analog	mono		$68
Tech 21 SansAmp	tube amplifier emulator	presence drive, amp drive, output, high	analog	mono	8 "character" switches offer amp simulations from very clean to full tilt distortion, power supply included	$295
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are concerned, if you're talking analog, you're talking stomp boxes. They're simple, dependable, and joyously rude.

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It's hard to improve on the sublime simplicity of floor pedal effects, but few manufacturers subscribe to the "If it ain't broke, don't fix it" axiom. Thankfully, relentless product development has yielded some interesting turns on the basic box.

The Boss BE/ME processors and the Ibanez Power Trio and PUE5 series solved the problem of messy pedal chains by incorporating selected effects into single units. These devices are virtually individual pedals molded together in the same chassis and offer parameter controls identical to the solitary units. Korg's A5 series enlarged on this concept by adding user-programmable memory patches. Perhaps the ultimate foot pedal is DigiTech's RP-1, which offers the power and programmability of a rack multi-effects processor in a floor unit. And now, even Marshall stacks can be stashed underfoot via the SansAmp guitar-amp emulator manufactured by Tech 21.

However, sometimes the quest for

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The SansAmp, a guitar amplifier emulator, can put a Fender Twin or a Marshall stack right under your feet.

interesting sounds depends more on history than technology. Wah pedals are back with a vengeance, and Dunlop Manufacturing has revitalized the original Crybaby, as well as Jimi Hendrix's flying saucer fuzz, the Rotovibe, and MXR's old rectangular wonder boxes. Pro Co's Rat and Morley's fuzz/wah pedals are powering the new guitar generation, and Boss, Ibanez, DOD, and others keep the flame by continuing to manufacture basic, single-effect floor pedals.

ON THE CHARTS

There are so many stomp boxes currently available (see chart, pp. 51-54) that we opted to separate them by effect category to simplify comparisons. All models require 9-volt batteries unless noted otherwise. If you commit exclusively to 9-volt power, do yourself a favor and purchase stock in a battery company. The average floor pedal has an insatiable appetite. Fortunately, most models accept (optional) external power supplies.

We've listed the **control knobs** included on each model to provide some insight on effect parameters. Obviously, the majority of these controls are not as sophisticated as those on digital rack processors. However, true to the rough-and-ready credo of the basic stomp box, they get the job done. Most parameters are optimized for guitar or bass tonalities. So, rather than offering minute frequency adjustments, the EQ control on a distortion pedal might add only more "bite" or "warmth."

The **internal processing** on the majority of pedals is analog, but enough use digital or analog/digital circuitry to warrant a category listing. Throwbacks like myself still use these pedals *because* they're analog. I can't imagine a world without the sensual undulations of an analog chorus, or the brutal cacophony of analog distortion. However, some heretics prefer digital. Also, a digital pedal is better suited for home recordists, who want a simple but clean effect to spice up their mixes. Some of the multi-effects boxes offer digital delays, but keep distortion, compression, and modulation effects in the analog domain.

As far as **outputs** are concerned, most pedals follow the Phil Spector philosophy that mono is beautiful. However, stereo is nice if you use two amplifiers onstage or employ an effect for home demo mixes. Some models (usually delays) offer wet and dry outputs.

Floor pedals are strong, silent types. There's not a lot to say about them. You choose an effect, twist a few knobs, then stomp and go. However, some models offer additional features and we've listed these in our **notes** column.

SWITCHING OFF

For guitarists, the stomp box evokes memories of 6-string glory days. Now the ghosts materialize on video, where Hendrix and Clapton (and others) hypnotize past audiences with explosive talent, massive amplification, and strange little boxes that make bizarre sounds. There's just something unspeakably wonderful about feeling the tight click of an effects pedal unleash a cascading flange, a wash of repeating notes, or the fury of maximum overdrive.

Beyond the nostalgia rush, stomp boxes offer reasonable sound for reasonable money and are practically indestructible. (You don't see many Lexicon PCM70s tossed across the length of a stage into a road case.) And they're fun. Except for some of the multi-effects pedals, stomp boxes aren't about programming or grand tonal designs. It's one effect for one foot. You set it up, step on it, and have a party. Isn't simplicity beautiful?

EM *associate editor* **Michael Molenda** *is co-owner of Sound & Vision studios in San Francisco.*

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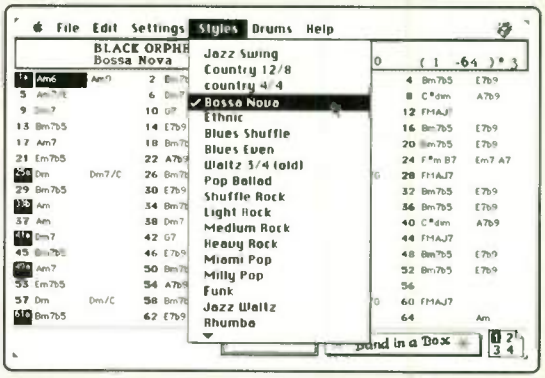

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PROGRAMMING THE CASIO CZ-101

Who says you can't teach an old synth new sounds?

By Peter Freeman

The Casio CZ-101 first appeared in 1985, sporting a new method of sound creation called Phase Distortion synthesis. Although greeted with some skepticism by professional musicians, it quickly proved to be a great-sounding, surprisingly powerful synth that offered a wide range of sonic possibilities at an affordable price. Used by everyone from amateur home recordists to top pros like Nile Rodgers and Erasure, the CZ has been further supported by computer-based editor/librarian programs, freeing synthesists from the confines of its rather cramped front panel. Despite the CZ's enormous popularity, programming the instrument has remained a seldom-explored subject. Here are some ways to get the most out of your CZ-101.

Illustration by Joel Nakamura

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BASIC PARAMETERS

When considering the CZ from a programming point of view, it's wise to start with its selection of eight digitally generated waveforms (see **Fig. 1**). A complete description of each waveform is not possible here (the basic properties of these waveforms are outlined briefly in the CZ's manual). The only way to become truly familiar with these waveforms is to play them yourself and experiment.

The first five waveforms generally are the most useful for pads, strings, brass, as well as many other traditional timbres. Waveforms 6 through 8 are resonant, making them more appropriate for bells, percussion, and more obviously electronic sounds. However, there are no hard and fast rules here; many interesting sounds can be created by experimenting with various combinations of waveforms using the CZ's two independent "lines" (more on this in a moment).

Bass sounds are one of the CZ's strongest suits, and they can be created quite easily.

One characteristic unique to the CZ is the way its filters (the Digitally Controlled Waveforms, or DCWs) affect the sound of the waveforms. On most synths, lowering the filter cutoff to zero or near-zero simply makes the waveform sound muted and dark. On the CZ, lowering the cutoff (setting low values for the DCW Envelope Levels) sometimes can change the perceived octave of the sound, depending on the waveform. This illustrates the importance of becoming familiar with the waveforms and the ways in which they are modified with the DCWs.

An often-overlooked aspect of the CZ's architecture is the flexibility of its "2-Line" discrete oscillator/filter/amplitude envelope design (see **Fig. 2**). Some of the most unusual timbres are created by considering each of these two synthesis Lines as distinct, independent entities. Each Line can be used to create different components of a composite sound. For example, you can use Line 1 to create a short, percussive, high-pitched tone, while Line 2 produces a darker, sustaining tone with slow attack and release times (achieved by lower End Rate settings in the Digitally Controlled Amplifiers, or DCAs). The two Lines then can be detuned to the desired interval using the Detune page.

BASS SOUNDS

Bass sounds are one of the CZ's strongest suits, and they can be created quite easily. For best results, include at least one of the first three waveforms in your patch—these waveforms provide the fundamental content of the sound. Remember that the CZ allows up to four waveforms simultaneously (two per Line). One technique is to combine two non-resonant waveforms (1 to 4) in one line with two resonant waveforms (5 to 8) in the other. This approach provides the best of both programming worlds. Other useful combinations include waveforms 1+4 for both Lines, 1+3 for both Lines, or 1+4 for Line 1 and 2 alone for Line 2.

To add emphasis to the attack of the sound, set both DCWs with high Rate and Level settings for Step 1 and a high Rate setting (for a fast decay time) but a much lower Level setting for Step 2. This technique creates a fast filter-sweep effect, which is perceived as a click in the attack of the sound. Use Level 1 to control the amount of click, and Rate 2 to vary its "width." For more obvious analog-style filter sweeps, use lower values for Rate 2 to lengthen the sweep time. If you want a pronounced sweep (similar to that of a resonant filter on an analog synth), use the resonant waves (6 to 8) in your patch.

Small amounts of detuning (values of around 8 or less for the Fine parameter of the Detune page) also can help liven up bass and many other sounds. Use this sparingly, though: too much detuning will spread out the pitch center, causing unwanted beating of the oscillators and detracting from the sound's "solidity."

PERCUSSION SOUNDS

The CZ is capable of producing many interesting percussive sounds as well. For these types of sounds, the ring modulator and noise features of the

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synth are extremely useful. Try combining two of the resonant waveforms (5 to 8) using the 1+2 Line configuration, with quickly-decaying DCA envelopes for each Line. Tune the two oscillators anywhere from two to three octaves apart, then add ring or noise modulation. You may want to experiment with the Detune interval until you find a pleasing result. The DCW section will help determine the overall tone of the sound. You may want to try different DCW settings for each Line, depending on which waveforms you choose.

Once you've created a sound you like, try shifting the whole timbre up or down, using the Octave parameter. This produces drastically different results. Note the significant effect of ring modulation. This often helps lend an unusual quality to these sounds.

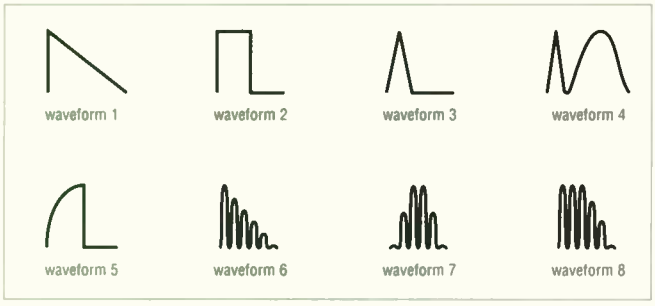

FIG. 1: The eight waveforms of the CZ-101.

PADS AND PITCH TRICKS

The CZ has a characteristic lower-midrange "warmth" that makes it quite good for pads and other sustained sounds. In general, use the non-resonant waveforms, slightly detuned, with low to medium DCW Sustain Level settings. To avoid overly static sounds, it is effective to program complex, changing DCW envelopes. Skillful, sparing use of the Vibrato parameter (here and generally) can create a subtle sense of motion, which is particularly important with this type of sound.

The Digitally Controlled Oscillators (DCOs) include pitch envelope generators that can give CZ timbres more subtlety and life with a little judicious tweaking. For sustained sounds, try subtly varying the pitch of one of the DCOs by using all eight steps of the DCO Envelope with different Rate settings and small Level changes (within three or four increments of zero). If the oscillators are tuned to the same pitch, this creates an irregular chorusing/detuning effect, which is quite helpful because the CZ lacks independent LFOs for each Line. If your sound uses ring modulation, varying the DCO pitch can produce wild, unpredictable results (more on this in a moment).

The design of the digitally controlled ocillators is rather limited in that only positive (above nominal) pitch sweeps are possible. However, it is possible to sweep up to the nominal pitch if you really need to. First, create a DCO envelope for one or both Lines that sweeps from zero up to the Sus Step of the envelope at the desired Rate. Set the Sus Level so that the pitch of the sound sustains a whole step higher than where you want it to end up. This is tricky: The DCO Level values don't bear any relationship to musical intervals such as half steps or cents, so this will probably take a bit of trial-and-error tweaking

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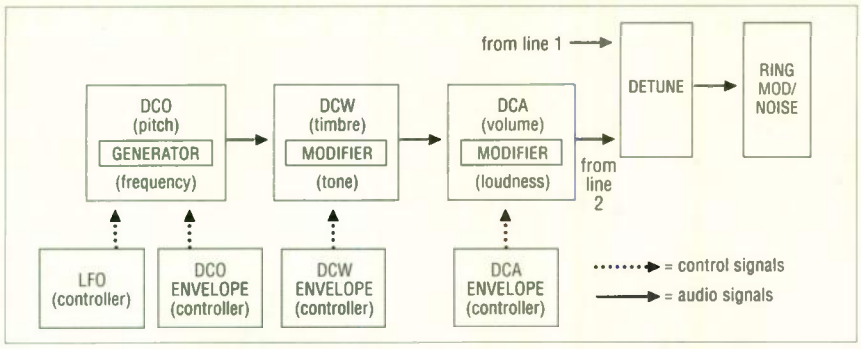

FIG. 2: The "2-Line" architecture of the CZ-101 provides two independent oscillator/filter/amplifier signal paths.

before the correct DCO Sus Level is found. Once you've found it, you can bring the pitch of the entire patch down to its nominal level by using the Key Transpose function to globally lower the CZ's pitch by a whole step. But remember, the Key Transpose function affects all CZ patches globally, so transpose back up to normal before using other patches.

RING MODULATION AND ENVELOPES

The CZ's ring modulation section is capable of subtle, unusual, and unpredictable effects. To become familiar with its behavior, apply it to your preexisting CZ patches. Note that the ring mod section can affect the way in which the oscillators "track" the keyboard, depending on the Detune interval and Octave settings. Experiment with extreme detunings and ring modulation in the lowest and highest Octave ranges. Also, try different waveforms and waveform combinations. It is possible to create patches in which the oscillators only work on certain keys of the keyboard, and the pitches produced by the keys are not in the equal-tempered scale. Many strange effects are possible using ring mod if you dig deeply.

The CZ's envelope generators (DCOs, DCWs, and DCAs) are surprisingly powerful and flexible. They provide a wide range of attack and release times, allowing you to create unusual, subtle "sound sculpture" effects. To try this, create a patch using the 1+2 Line configuration. Use all eight envelope steps with mostly slow envelope times, but set the DCAs and DCWs of Lines 1 and 2 to move in contrasting ways. For example, set slow rise times for DCW1/DCA1 and fast times for DCW2/DCA2, and specify different Sustain levels and End Rates. Also, use contrasting sets of waveforms for each Line, and place the Sustain points at Step 1 in both lines.

Your patch should fade in slowly while the tone color changes continuously and then slowly fade out while the timbre continues to "evolve." This type of patch can provide a backdrop for a portion of a song or even form the basis for an entire composition.

CRASH PATCHES

If the CZ-101's batteries become severely depleted, the program memory can become corrupted or altered. This is a truly horrible thought, particularly if you don't have your programs backed up on a RAM cartridge, in a computer, or written on patch sheets. If you haven't done this yet, you should do it now.

Assuming you have your intended patches backed up, low batteries can precipitate an interesting phenomenon. Under these conditions, the CZ randomly generates its own very strange patches. If you turn on your CZ one day and find its memory filled with bizarre patches bearing little or no resemblance to those you spent hours programming, don't immediately erase them. See if there's anything you find interesting. Inspect the various parameters, and try modifying them. You may come up with something you like! Fortunately, it often is possible to store the results in the CZ's RAM cartridges as usual.

I hope these tips prove helpful in your quest for new and useful sounds. As always, the best method is experimentation, so keep on tweaking.

Peter Freeman *is a freelance bassist and synthesist living in New York City.*

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Sequencing Made Easy, Part 2

By Scott Wilkinson

It's time to roll up your sleeves and get your hands dirty as we show you how to sequence.

SUSAN GROSS

If you read last month's "From The Top," you should have a basic understanding of the concepts and devices required to perform MIDI sequencing. (If you don't have such an understanding, it might be a good idea to check out last month's column before reading on.) This month, I'm going to present some additional concepts as well as step-by-step procedures for most of the basic sequencing tasks.

I also use the MIDI system depicted in last month's column (see **Fig. 1**) as a basis for the procedures. Your system probably differs from this one, particularly if you are using a workstation in which a keyboard, sequencer, and multitimbral sound module are integrated into a single unit. However, the concepts apply regardless of the type of system you are using. (Don't be concerned with the multitrack tape deck and sync converter in the diagram; I'll explain these new items later.)

RECORDING & PLAYBACK

The two basic types of sequence recording are real time and step time. Real-time sequencing resembles audio tape recording: after some preliminary setup, simply press Record and play.

All sequencers provide some sort of *metronome* for real-time sequencing. The metronome establishes the tempo and provides a reference for your performance. The sound of the metronome might be generated within the sequencer itself as a sort of click, or it might be sent at regular intervals from the sequencer as a MIDI Note On message on one of the MIDI channels. This message is meant to be played by an external sound module, typically a drum machine set to something like a rim-shot sound. Most devices and programs let you specify a *count-in*, which plays the metronome for a number of bars before the sequencer starts recording. This lets you get a sense of the tempo before you start playing.

If the song you want to sequence is too difficult for you to play at its intended tempo, you can slow down the metronome until you can play it easily. If you tried to do this with a tape recorder, the performance would sound much higher in pitch when you played it back at the right speed. However, a sequencer can change the speed of playback without changing the pitch because it's recording a sequence of MIDI messages, rather than actual sounds. The messages specify the pitch of the notes while the sequencer controls how quickly they are sent to the instrument that's playing them.

Once you've recorded one part, you can record additional parts in a process called *overdubbing*. The sequencer will play the part you previously recorded while recording the new part. If your sequencer has many tracks, it is a good idea to record the different drum and percussion parts (kick, snare, hi-hat, etc.) on separate tracks so that you easily can edit them separately.

Referring to **Fig. 1**, let's say that the keyboard's internal sound module is set to play a piano sound on MIDI channel 1. Remember to turn the keyboard's Local function off and the sequencer's Thru function on. (This may not apply if you're using a workstation.) The multitimbral sound module should be set to play a bass sound on channel 2, a rhythm-guitar sound on channel 3, a lead-synth sound on channel 4, a punchy horn sound on channel 5, and an additional bass

sound on channel 6. The drum machine will play the drum part on channel 10. For now, the drum machine acts like a passive sound module producing drum sounds without using its internal drum programming capabilities. Its part will be recorded into the sequencer along with all the other parts.

Procedure: Real-Time Recording

1. On the sequencer, select real-time recording and set a tempo at which you wish to record your song. Remember that, if necessary, you can set a slower tempo than the song requires.

2. Set the count-in so that you know when to start. A typical count-in is two bars long.

3. Decide which part you want to record first. Many people record the drum part first so that they have a sense of the "groove" when recording the other parts. Others prefer to record the piano part first to get a sense of the whole song. You might want to record a condensed piano version of the whole song even if such a part won't be in the final recording. You can play subsequent parts to this piano reference and delete it later.

4. On the keyboard, set the MIDI transmit channel to match the instrument you've selected. If it's the piano part, set the controller to transmit on MIDI channel 1; if it's the drum part, set it to channel 10.

5. Play a few notes on the keyboard to ensure the MIDI messages are getting to the right sound module.

6. On the sequencer, select the track on which you wish to record the part, enable its Record function, and press Record.

7. After the count-in, play the selected instrument's part.

8. After recording, press Stop.

9. Press Rewind and disable the track's Record function.

10. Press Play to hear the new part.

11. To overdub the next part, press Stop and Rewind. Select the next part to record and repeat steps 4 through 9 until all parts are recorded.

Step-time sequencing differs from real-time sequencing in that each note or chord of each part is recorded one at a time without playing to a metronome. This allows you to record parts that are impossible to play otherwise. However, it also results in a very machine-like recording.

Procedure: Step-Time Recording

1. Select the part you wish to record and set the keyboard's transmit channel accordingly.

2. On the sequencer, select step-time recording, select the track on which you wish to record, enable its Record function, and press Record.

3. On the sequencer, select the duration value (whole note, eighth note triplet, etc.) for the first note or chord.

4. On the keyboard, play the first note or chord. You needn't play any particular rhythm or duration. The sequencer simply records the note or chord you play and assigns the specified duration to it.

5. On the sequencer, select the duration value for the next note or chord and play it on the keyboard.

6. Repeat step 5 until the entire part is recorded.

7. On the sequencer, press Rewind and disable the track's Record function.

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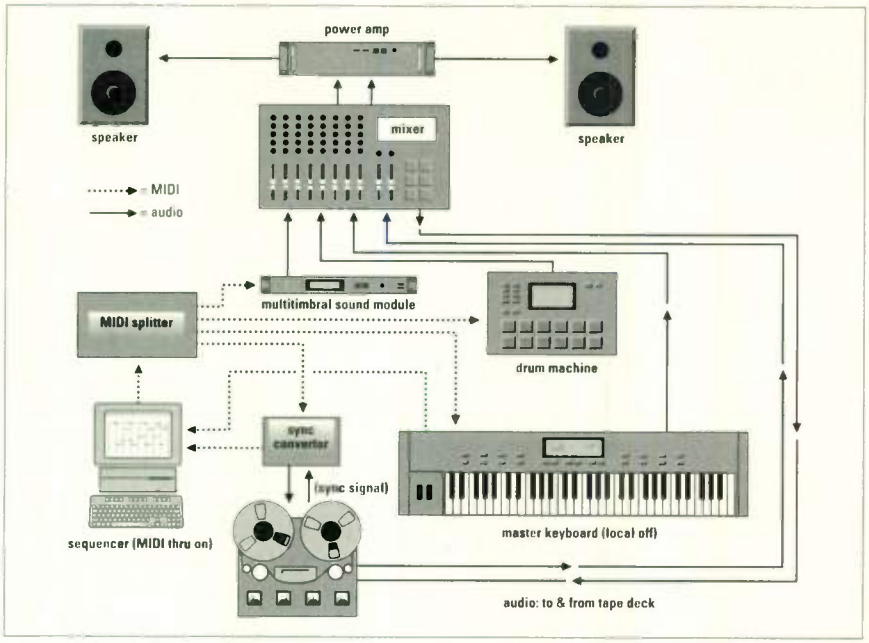

FIG. 1: A simple sequencing and tape-sync system. The sync converter accepts MIDI Clocks from the sequencer and sends a sync signal to be recorded on the tape deck. The sync signal is then converted back into MIDI Clocks and sent to the sequencer, which synchronizes to the tape as it plays. You must switch the connection on the sync converter's MIDI In from the sequencer's MIDI Out to the keyboard's MIDI Out in order to sequence additional parts while synched to tape.

8. Press Play if you want to hear the part you just recorded. You might have to exit step-time mode and adjust the tempo setting.

9. Select the next part to record and follow steps 1 through 8. Repeat these steps until all parts are recorded.

As you can see, step-time sequencing is a tedious job. But it provides a means to record musical ideas that are too difficult to play in real time.

EDITING

One of the main advantages of sequencing over tape recording is editing. If you make a few mistakes, many types of editing functions available on most sequencers allow you to fix them. These functions can be applied to an entire song, sections of a song (such as the chorus), individual tracks, sections of tracks (such as bars 9 to 16), MIDI channels, specific note ranges (such as C4 to B4), types of events (such as MIDI Volume messages), and even single events (such as a single note). Typically, you simply select the event, section, or type of message you want to edit and apply the desired editing function.

For example, you can transpose the notes in any specified range up or down by semitones. The events in the specified range can be *channelized* to a different MIDI channel and shifted forward or backward in small increments of time, which changes the feel of the part. The specified range of events also can be merged with other events, which is useful for combining tracks in a manner similar to "bouncing" tape tracks. Unlike bouncing, however, merging results in no degradation of signal quality. This also means that messages on different MIDI channels can coexist in a single track.

One important editing function is called *quantization*. This function allows you to clean up sloppy rhythms in a variety of ways. Basically, quantization shifts each selected event to coincide with a user-specified rhythmic position. It's usually applied to notes, but it can be applied to other MIDI messages in some sequencers.

For example, let's say you apply quarter-note quantization to all the notes in a particular track. If a note starts right on a quarter-note position (beat 1, 2, 3, etc.), it is left alone. However, if the note starts slightly ahead of a quarter-note position, it is shifted back to coincide with that position. Similarly, a note that starts a bit late is shifted forward. This helps clean up slightly sloppy playing, but notes that are far off the mark might get shifted to an unintended position (see **Fig. 2**).

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If it's used at all, quantization almost always is applied to Note On events. It also can be applied to Note Off events, although this sometimes changes the duration of the notes, and the result sounds like it was entered in step time. Most sequencers offer the option to preserve the performed duration of quantized notes by shifting Note Off events by the same amount as the Note On events.

In general, you should use a quantization value equal to the shortest note in the section to be quantized. If you have alternating triplet and duplet figures, you should quantize each figure separately. This is a real drag, but quantizing eighth-note triplets into straight eighth notes destroys the triplets.

It's important to recognize when and where quantization should and shouldn't be applied. If you quantize everything, your music will sound mechanical and uninteresting (unless you're a rapper; then it will sound mechanical and interesting). My preference is to quantize as little as possible, but there are situations in which it helps the overall sound. For example, the kick drum and bass parts should be dead-on together, especially on the downbeats, so it might be a good idea to quantize these parts. On the other hand, a lead solo should not be quantized: The juxtaposition of a quantized rhythm section and fluid solo can be quite exciting.

Another important editing function is *cut-and-paste*. As its name implies, most sequencers let you cut or copy a section of the song or a track and paste it elsewhere in the song. For example, you can record a repeating background part only once and then copy and paste it throughout the song. This is not unlike the cut-and-paste function found in most word processors.

The events in a sequence can be displayed in a variety of ways, providing a visual representation of the music and allowing you to select the events you wish to edit. Because of their small displays, hardware sequencers only offer an *event list* that presents the events in a list of numbers. This allows you to change a single note or other event such as a Program Change quite easily, but it's cumbersome if you're trying to change a stream of controller messages. Most hardware sequencers also offer the ability to select a specific type of event in a specific section of a song or track (or on a specific MIDI channel) for more global editing such as transposition or quantization.

Software sequencers often include event list editing, but they usually offer graphic editing as well. Thanks to a large computer screen, many events can be displayed at once. This display usually takes the form of a strip chart much like a piano roll (see Fig. 2), although some programs also have standard musical notation. A graphic editor also allows you to draw continuous Control Change messages, such as Mod Wheel, on the screen with a mouse or other pointing device. In the case of programs that offer several different editing modes, it's important to remember that you're always working with the same musical information. The different modes simply provide different ways of looking at and working with the musical data.

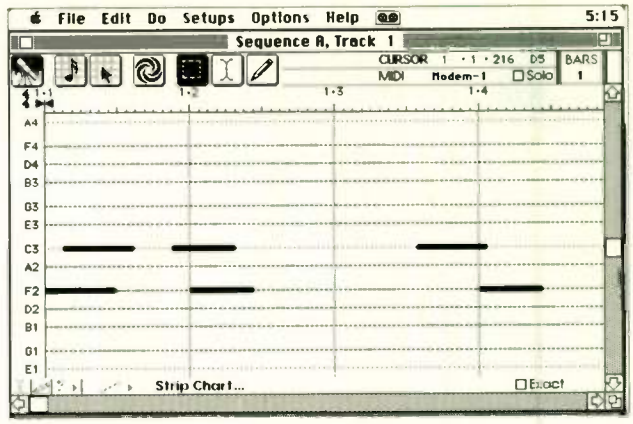

FIG. 2: The graphic editing window from Opcode's *Vision* for the Macintosh. In this example, the C3 eighth notes are not quantized, while the F2 eighth notes were played with the same rhythm and quantized to quarter-note resolution. In both cases, all notes are supposed to start on consecutive beats. Notice that the first note was played a bit late and the second note was played a bit early, but both were shifted to their correct positions. The third note was played so late that it was shifted to beat four instead of beat three.

In the following procedure, several basic editing functions are illustrated with specific examples. It assumes that several parts already have been recorded on several tracks. Although this procedure probably will not apply directly to your needs, it should give you an idea of how to edit your songs.

Procedure: Editing

1. To transpose the horn part up an octave, select the track on which the part was recorded (or select MIDI channel 5; remember the settings I specified earlier) and apply an upward transposition of twelve semitones.

2. To layer the bass part with the other bass sound on channel 6 in the multitimbral sound module, select the bass track, copy it, and paste it to an empty track. Now select the new track and channelize it to channel 6.

3. To shift the snare-drum part slightly behind the beat, select the snare track and shift backward by several clock pulses. Listen to the result and adjust it until it sounds right.

4. To quantize the kick-drum and bass parts (assuming that the parts have no triplets and notes no shorter than sixteenths), select the appropriate tracks and apply sixteenth-note quantization. You might have to adjust some notes individually if they are too far from their intended positions.

5. Once the drum tracks are edited to your satisfaction, you can merge them together. Select one track as the final merged drum track and merge the other drum tracks into it. You might have to do this one track at a time.

6. Your solo lead line is perfect except for one wrong note. Select the note and change its pitch to correct the error.

SYNCHRONIZATION

Previously, the drum machine has been used as a passive sound module and its parts have been recorded into the sequencer along with everything else. But what if you've already programmed some great patterns or songs into the drum machine and you want to use them as is? Is there any way to synchronize its performance with the sequencer so that the drum patterns play in time with the sequencer?

Actually, it's relatively easy. In a process called *MIDI synchronization*, special MIDI messages are sent from the sequencer to coordinate the drum machine's performance. This saves memory that could be used to record the drum parts, which is important in

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small-capacity hardware sequencers. It also allows you to use the drum machine as a "groove" metronome, which is more inspiring than a click.

The special MIDI messages are called *real-time* messages. They include Start (which tells the drum machine to start playing from the beginning of the selected pattern or song), Clock (which is sent 24 times per quarter note and therefore defines the tempo), Stop (which tells the drum machine to stop playing), and Continue (which tells the drum machine to start playing from the point at which it was stopped). Another real-time message is Song Position Pointer, which tells the drum machine where to start playing if you jump to another part of the song. Unfortunately, not all drum machines respond to Song Position Pointer.

Procedure: MIDI Synchronization

1. On the sequencer, set the sync mode to Master or Internal.
2. On the drum machine, set the sync mode to Slave, MIDI, or External.
3. On the drum machine, select the pattern or song you wish to play with the sequencer. You can automate this on some machines by sending a Program Change message from the sequencer. You insert this event at the beginning of the sequence.
4. Press Play on the drum machine. It won't start playing; instead, it's put into a mode that waits for a Start message from the sequencer.
5. Press Play or Record on the sequencer. The drum machine will start playing in sync with the sequencer.
6. Press Stop on the sequencer. The drum machine will stop with the sequencer. Pressing Continue on the sequencer would start the two again from the stopping point.

While sequencing is invaluable for recording electronic instrumental parts, it can't handle vocals or acoustic instruments (although there are several sequencers that incorporate direct-to-disk digital recording for acoustic parts, but that's a subject for another article: see "When Worlds Collide" in the December 1991 **EM**). In order to synchronize acoustic parts recorded on a multitrack tape deck with the "virtual" tracks on a sequencer, a process called *tape synchronization* is used.

In this process, a *sync signal* typically is recorded on the last track of the multitrack tape (e.g., track 4, 8, or 16). One type of sync signal is called *FSK* (Frequency Shift Keying). This signal consists of two alternating frequencies recorded onto the tape from the sequencer. The rate at which they alternate is determined by the tempo of the sequence.

As shown in **Fig. 1**, this usually is accomplished with an extra device called a *sync converter*, which takes the MIDI Clocks from the sequencer and converts them into an FSK signal. This signal is recorded (or *striped*) onto the tape by playing the entire song in the sequencer, which means that the length of the composition must be decided, and at least some of the parts must be sequenced before the sync signal is recorded. The recorded FSK signal is then played back and converted into MIDI Clocks for the sequencer, which is placed in External sync mode like the drum machine in the previous procedure. Some sequencers provide a direct FSK input and output, eliminating the need for a separate sync converter.

The advantage of FSK is that it's inexpensive. The drawback is that there is no way to start the tape in the middle of a song and have the sequencer "chase" to that location. With regular FSK, the sequencer simply starts at the beginning, no matter where you are on tape. An enhanced FSK signal called *Smart FSK* includes positional information that allows the use of Song Position Pointer for this purpose.

Procedure: Tape Synchronization

1. Make the appropriate audio and MIDI connections between the sequencer, sync converter, and tape recorder, as shown in **Fig. 1**. In particular, connect the MIDI Out of the sequencer to the MIDI In of the sync box.
2. Place the sequencer in Master or Internal sync mode.
3. On the tape deck, enable the Record function on the sync track.
4. Press Play on the sequencer.
5. On the tape deck, adjust the input level for the sync track to read between 0 and +3.
6. Press Stop on the sequencer and then Rewind.
7. On the tape deck, press Record.
8. On the sequencer, press Play.
9. When the song is finished, wait a few extra seconds and press Stop on the tape deck.
10. Press Rewind on the sequencer and the tape deck.
11. Disconnect the sequencer's MIDI Out from the sync converter's MIDI In and connect the keyboard's MIDI Out to the sync converter's MIDI In. This allows you to sequence additional parts while the sequencer is synched to tape.
12. Place the sequencer in External or MIDI sync mode and press Play or Record.
13. On the tape deck, disable the Record function on the sync track and press Play. The sequencer will start playing.
14. You can now record any acoustic parts on the other tape tracks along with the sequenced parts. You also can record new parts into the sequencer.

Most professionals use *SMPTE time code*. Developed by the Society of Motion Picture and Television Engineers, this sync signal represents the passage of time in hours, minutes, seconds, and frames. It allows sequencers to start playing at any point in the song based on the tape's position. Although this format reflects its intended use with film and video, more strictly music studios are using SMPTE time code because of its reliability and standardization throughout the industry.

Typically, a sync converter is required to use SMPTE with sequencers. However, the procedure is slightly different. It often is more convenient to stripe SMPTE time code for the entire length of the tape and specify different SMPTE time values for each song. This can be done before any parts are sequenced because the time code represents absolute time rather than relative time. Otherwise, the procedure for using SMPTE is much the same as it is for FSK.

STOP

Now that you have a basic understanding of the fundamentals of sequencing, try it for yourself. There's no substitute for the teacher of experience. And remember: The tools of electronic music exist to help us develop our ideas, not to intimidate us into creative stagnation. So go ahead, show them who's the boss around your studio!

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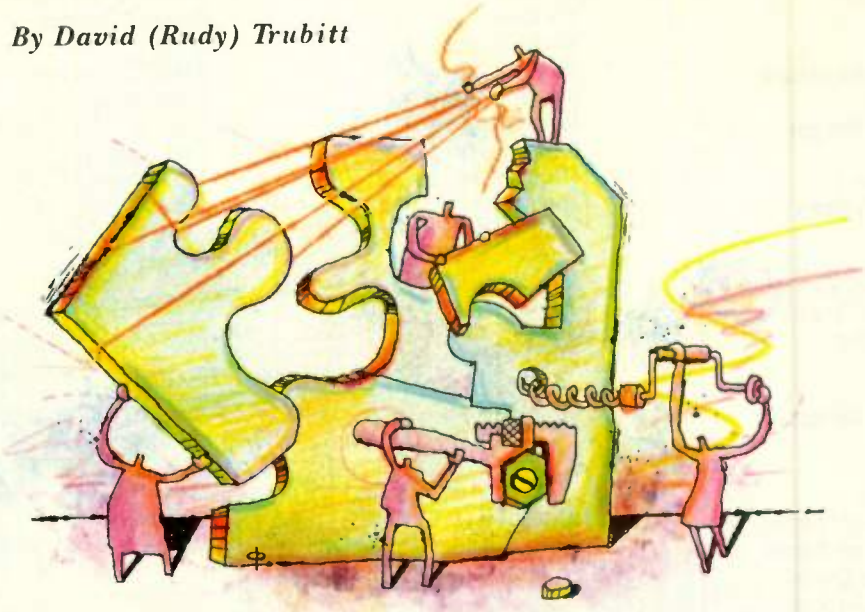
The Software Design Process

By David (Rudy) Trubitt

Designing music software is rarely a job for a lone programmer anymore.



DAVID POVILAITIS

Have you ever wondered how software is created, or how developers decide which features will be added to the next revision of your sequencer? If so, it's time to take a peek at what goes on behind those closed development doors.

DESIGNING PROGRAMMERS

"It's very important to keep in mind who you're designing for," says Denis Labrecque, vice president of products at Passport Designs. "It costs a lot to develop a program. It's not just a programmer sitting in a basement coming up with an idea anymore. In general, it's two years from idea to product release."

At Passport, program development starts with a document that describes the product in broad terms. "That document is circulated throughout the development and marketing teams to see if it's a commercially viable product," Labrecque explains. "By this time, a programmer and designer—who may or may not be the same person—have been picked and a functional spec is worked up. From there, we go to mocking up the main screens."

As smooth as this sounds, the design is sure to change along the way. "It would be wonderful to know what the product will be when you start," says Jack Jarrett, co-author of Temporal Acuity Products' *MusicPrinter Plus*. "But I think you get a more interesting product if you grow with it as it develops. The field is changing so rapidly that I don't think you can design any large program without changing your notion as you go along."

Sometimes the program helps design itself. "You don't know what you want until you design something and it tells you its inadequacies," says David Zicarelli, author of *M* and *Jam Factory*, and a primary developer of Opcode's *Max*. "It's almost impossible to create something from scratch without making a model," Zicarelli continues. "It's like writing music: There are always intermediate stages. People think you should be able to design a computer program from scratch, but I don't really think it can be done."

Once the concept has taken root, decisions about programming languages, internal data structures, and the user interface must be made. (Every software program represents the data with which it works in a *data structure*, which specifies exactly how the bits and bytes of data are stored and manipulated within the computer. Although this structure isn't directly apparent to the user, its design is critical for smooth and efficient operation.) "Some people design the data structure first," explains Zicarelli, "or you can start with a picture of the screen and model the data structure on that."

In either case, decisions about the program's underlying framework will resonate throughout the development process. "Your basic data structure is the most important single choice you make," says Jarrett. "You have to live with that." Interestingly, the design of *MusicPrinter Plus* was significantly altered after its data structure was established. "When we started out," reveals Jarrett, "it was going to be a music printing program. But fairly early on, we were persuaded to add MIDI playback. Fortunately, the database supported it very well, but it was a major change."

Just as often, the program's initial structure must be supplemented to meet the design goals. Bob Melvin, author of countless patch editors, explains, "In designing *X-oR* for Dr. T's, I tried to build a general structure

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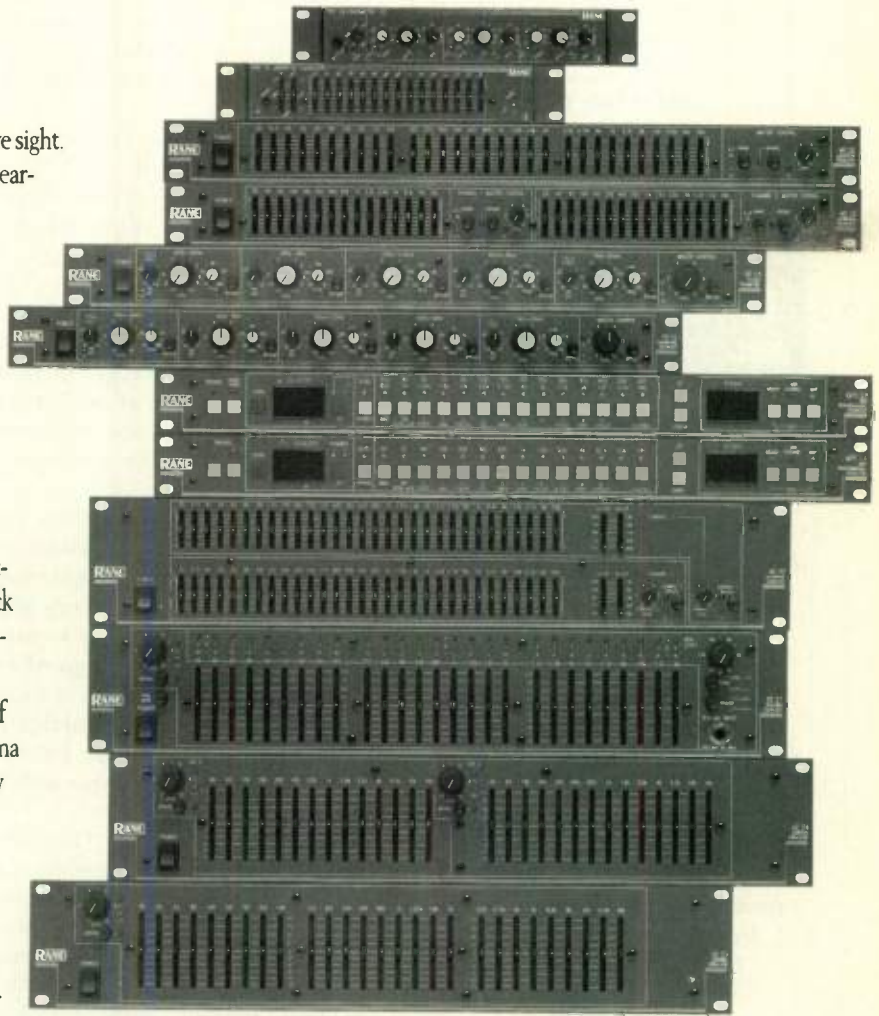

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that would allow the creation of an editing program for a new synthesizer by simply filling in the blanks in a chart." But by the time that was functional, he realized that a user-programmable language also would be required to handle the enormous range of devices supported by *X-oR*.

Development decisions often force compromises. "We had to make tradeoffs between sheer power and a unified, consistent interface," says Jarrett. "We found that it wasn't good enough to add a capability unless it could be incorporated into an intuitive interface, as well. Otherwise, the program becomes obscure and difficult to work with."

In many cases, the best choice may be no choice at all. According to Zicarelli, "Whenever you have an either/or situation, you've already lost, because one thing isn't going to happen, and someone's going to be disappointed. At some point, you might have to ask something like, 'Should we have four of this and six of that, or eight of that and two of this?' Any time you're dealing with specific amounts of stuff, there will be someone who wants twice as many."

As in many creative pursuits, collaboration can produce a whole that's greater than its parts. Zicarelli explains: "I work very closely with Tony Widoff. He doesn't program, but I consider him essential to the design of everything I've worked on. He's quick to understand the concept and figure out if it's appropriate or not. I think it's important to have someone with a different perspective."

Melvin agrees, saying, "There are different ways of designing software. What I've done in the past was motivated by my own needs. Now, making improvements to my programs has become a collaborative process. My job has evolved into being an editor of ideas, rather than coming up with all the ideas myself."

SOFTWARE TESTING

As the program draws nearer to completion, an extensive testing process begins. Testing is essential because many programming errors can be found only under actual-use conditions. This requires people who can recognize and (most importantly) *replicate* the problems they find. A tester who can "make" the problem happen every time is far more valuable than someone who doesn't remember what led up to a crash. "I only had three or four testers out of twenty who really did the job well," says Melvin, recalling a recent project.

Testing generally is divided into two phases: alpha and beta. "During alpha testing," says Labrecque, "we test the interface and the features: how it feels, what it looks like, and what people like and don't like about the program." At this stage, it usually is possible to change or add features, but every modification includes the risk of creating new bugs.

Next comes beta testing. The beta version of the program, which is sometimes called "pre-release software," usually has all the functionality of the final release. At this point, it's generally too late to do anything but fix bugs, but plenty of people still are interested in becoming beta testers. "There are a lot of misconceptions about beta testing," says Labrecque. "It's not reviewing software, it's not making a wish list, it's supposed to be crash-testing the program. In the beta-testing phase, people work." In other words, what the testers get (a copy of the final program) isn't free; they've earned it.

In order to test a program properly, the testers must learn how to use it, and that means documentation. Nearly all programmers participate in that process to some degree. For example, Melvin writes all the manuals for his programs. "It's quite good to write them, because if I have trouble describing how something works, maybe it's a little too complicated."

Zicarelli agrees. "It's not essential to write it yourself, but you often hear a programmer say, 'I changed the program when I had to document the way it worked, because I realized it was too ridiculous.'" Often the software publisher provides additional help. "Temporal Acuity Products has a staff writer who prepares the first draft," says Jarrett. "Then Gary Barber, the co-author, and I go over them until we think they're right. We always sweat blood over the manual."

Sooner or later (often much later), the program must be declared finished. But how do you recognize the end when it arrives? "It's like music," says Labrecque. "I don't know of anyone who is one hundred percent satisfied with the final mix. But if you don't

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"The 'end' usually takes about half of the total development time," bemoans Zicarelli. "Sometimes the more you work, the further from your goal you seem to get. At the beginning of one day, you might plan to finish the documentation. At the end of that day, you're wondering why your computer doesn't work. Each day progresses from hope to despair."

DO YOU TAKE REQUESTS?

At last, the program ships. Advertising heralds its arrival, eager musicians line up for their copy, and the reviewers rave. Then the requests start trickling in. "Any request that involves large-scale restructuring of the program is never going to be easy," explains Jarrett. "And if it's too large, it simply can't be done without destroying the integrity of everything else."

Melvin agrees. "Some things are so incredibly difficult you have to put them off indefinitely." But you can't avoid the tougher enhancements forever. "If you just accumulate those easy, attractive ideas and never work on more general things," adds Zicarelli, "the program will suffer."

Prioritizing requests is a delicate balancing act. Each potential feature falls into one of several categories. For example, many users might ask for the same thing, which moves it up the list. On the other hand, many users might be calling tech support with the same question. This suggests that an existing feature should be changed to reduce user confusion and save money by reducing support calls.

Perhaps the development team has a new feature they consider important, even if users aren't asking for it (yet). Also, competition between programs plays a role in determining which feature makes it to the top of the priority list. If an algorithmic phrase generator based on whale songs is added to one company's sequencer, someone else will probably implement a version derived from bird calls, with or without a flock of user requests. All the while, someone must keep an eye on the program's evolution, making sure it doesn't stray too far from its original intent and alienate its faithful users.

AND IN THE END...

That's the process, but what yardstick can be used to measure the success of software design? "For me, it's a program that works on an intuitive level," says Melvin. "That's an overused expression, but I think there really is a way to design a program so a person doesn't get distracted by it." Labrecque agrees. "If you have to start thinking about the fact that you're using a computer, you're not making music anymore. We're primarily interested in the musician's creative process and try to stay out of the way."

"In my opinion," offers Zicarelli, "the best designs give users an open space in which they confront their own restrictions, rather than those imposed by the designer. Also, you could say that a successful program is one that makes an innovative contribution to the field, one that changes what people think software can do."

David (Rudy) Trubitt *worked for a small software company until he experienced all the hope and despair he could stand. Now he savors those emotions by writing magazine articles.*

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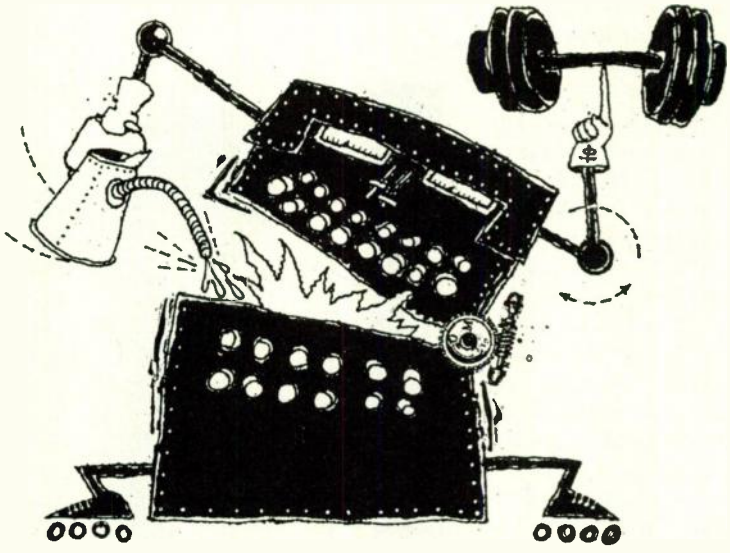
Maximizing Your Mixer

By Larry "the O" Oppenheimer

Unleashing a mixer's peak performance requires getting into the belly of the beast.



DAVID POVILAITIS

Nobody bought me a 72-input Neve VR-series mixing console for my birthday, so I'll have to make do with the lesser model currently residing in my studio. Similarly, I'm sure many of you drive affordable, sensible Escorts, rather than luxurious BMWs. But employing a modest console in no way dooms my studio to turn out harsh-sounding, noisy masters. After all, a good driver in an Escort is a safe chauffeur, while a bad driver in a Beamer is a menace, albeit a comfortable one.

In the typical home studio, the choice of mixer often is dictated by price. Fiscal compromises usually rule the model with just enough features (i.e., no frills) the winner. For example, many **EM** readers probably emphasize quantity of mixer inputs over features such as parametric EQ.

In high-ticket consoles, money tends to go towards highly refined circuitry for critical functions such as microphone preamps and equalizers, as well as quality connectors and pots. Modern technology allows manufacturers to expand features and save money by compromising on circuit sophistication and component quality. Sometimes, the most inexpensive console sounds good if pushed to its peak performance. The bottom line is to identify weak spots and find ways to avoid them.

PRIME POSITION

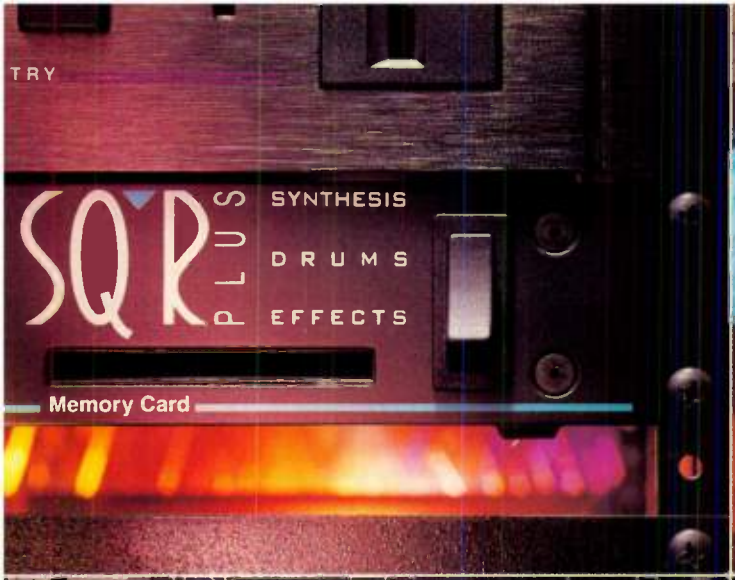
The best place to start is the placement and connection of your mixer. Avoid putting the mixer near any source that radiates magnetic or radio-frequency waves, such as power amplifiers, speakers, computers, digital signal processors, and video monitors. The most sensitive area of the mixer is near the top of the channel strip where the input preamps are located, as they provide the highest gain.

Be sure your mixer has a solid ground and clean AC power, or you may end up with noise and distortion that can't be eliminated. Neatness counts: Careful wiring and quality cable make a drastic difference in the number of hums, buzzes, and assorted nasty noises the system picks up. Using balanced inputs whenever possible helps avoid these problems and minimizes ground loops, too. Direct boxes provide the easiest method of balancing signals.

GAIN STRUCTURING AND NOISE

Once the mixer is situated and hooked up, the most critical aspect of sonic performance in virtually any audio chain is gain structuring. Careful gain structuring minimizes the noise and distortion that identifies an amateur tape. A signal passing through a typical mixer traverses at least three gain stages: the preamp, the summing buses, and the output section. Typically, each of these stages offers a level control: a preamp trim (usually found at the top of the channel strip), a channel fader, and a master fader.

The preamp section of the mixer has the most gain, and its behavior largely dictates the gain structure. Some preamps are noisy when turned up near maximum, while others are noisiest when set low. This may be due to a combination of component quality, shielding, grounding, and topology. (Some preamp trims are attenuators



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that act on the signal before, or even after, a fixed-gain op-amp stage, while others are in the feedback loop of the op-amp, varying the circuit's gain.) The objective is to familiarize yourself with the noise and distortion characteristics of the different stages and find optimal settings.

To get a feel for your system's quiescent noise (noise level with no signal), turn the mixer preamp trim all the way down, leave the EQ flat, and set the channel and master faders at about 70%. Listen closely to the noise level as you slowly raise the preamp trim to see if there is a particular spot where noise takes a jump (often in the last 10% of the pot's rotation). Since this test requires high monitor levels to reveal subtle noise differences, exercise extreme caution. One tiny pop can destroy your speakers (as well as your ears).

CLIPPING

The most common preventable source of distortion in inexpensive mixers is clipping. This occurs when the circuit runs out of available headroom, so it is important to know the dynamic limits of your mixer's gain stages. Put a signal from a test oscillator, or a simple, steady tone from a synthesizer (a sine wave is ideal), calibrated to the mixer's specified nominal input level, into a channel and perform the same exercise used to check quiescent noise levels. As you increase the gain, be careful to lower channel or master fader levels as necessary to avoid overloading any stage other than the one being tested. Listen closely for the first hint of distortion. While listening for distortion, watch any level indicators (channel overload LEDs and channel or master meters) to get an idea of the correlation between their readings and the aural onset of distortion.

A single tone isn't a comprehensive test, as practical use often requires multiple sources to be routed through the mixer simultaneously. While this operation has no effect on the individual preamps, the summing buses are impacted, as each individual signal contributes noise and reduces headroom. Channel faders and, occasionally, even preamp trims may need to be adjusted to keep from overloading summing buses and master output stages.

When tracking, less often is more. If your mixer has direct channel outputs, feeding your tape deck from those eliminates several stages of electronics and their accompanying noise and distortion.

EQUALIZATION

Moving beyond the primary issues of noise and headroom, the next most pressing concern about mixers is the sound of the equalization. Circuit design and component quality are the determinants here. Most inexpensive mixers offer simple EQ, such as fixed, 2-band shelving (treble and bass); fixed, 3-band (treble, bass shelving, midrange peaking), or 3-band with switchable (or sweepable) midrange. If you are lucky (or paid more), you may get switchable/sweepable high and/or low frequencies, or more bands.

As with gain structuring, you need to learn the characteristics of the EQ to optimize its use. Identify the center frequencies, check the amount of boost and cut available, and find the slope of the shelving and the bandwidth of the peaking filters. One often-overlooked concern is that boosting the EQ increases the signal level, which can cause clipping. In most cases, cutting undesired frequencies is preferable to boosting desired ones. Having said that, it is important to note that the equalization of some mixers sounds thin or wimpy when set flat and sounds much better when some boost is applied.

THE IN CROWD

For many of us, getting the most out of a mixer is affected by how much we can get into it. Studying a mixer's block diagram reveals all sorts of sneaky ways to gain additional inputs.

While analyzing the block diagram for the Ramsa 8118, I discovered selecting Monitor on the switchable, stereo, post-fader, monitor/effects send connected the channel line inputs to this send, even when the microphone input was selected by the mic/line switch. Taking the outputs of this send bus and connecting them to the master sub-inputs, I was able to use the eighteen line inputs simultaneously with the mic inputs, albeit with no channel facilities such as EQ.

Since many synthesizers include onboard signal processing and panning, effects returns are useful for more than just effects. I commandeered the effects returns and other sub-inputs to bring more line signals into the board and was able to get more than 40 inputs for mixdown on Ramsa's ostensibly 18-input mixer. And if effects-return knobs seem more difficult to mix with than faders, remember that you can use your sequencer to automate levels of MIDI synths, samplers, and effects.

AUDIO SUPPLEMENTS

Another way to get the most out of your mixer is by selectively supplementing it. Many inexpensive mixers sound pretty good except for their mic preamps, which usually are terrible. Purchasing an inexpensive outboard mic preamp, such as the stereo model made by Symetrix, allows for much better-sounding vocal or acoustic instrument tracks at an investment of only a few hundred dollars. Similarly, buying one or two of the inexpensive half-rack, parametric EQs made by Alesis, Symetrix, and other manufacturers will let you treat critical signals better than the limited EQ your mixer may have.

Not enough effects sends? Some effects processors, such as those from Alesis, have stereo inputs that are summed to mono before processing. I've taken advantage of this by using direct outs from two channels and letting the Alesis box do the mixing. This saves effects sends for more critical applications. Don't have direct outs? If your mixer has insert points, a Y-adapter (with one end going back into the insert and the other to wherever you wish) effectively turns an insert into a direct out.

If you plan to get into this creative patching, you may find it useful (if somewhat costly) to have a patch bay for your mixer's ins and outs. Although it can be a pain to wire, a patch bay saves wear and tear on the mixer's connectors and eliminates the need to crawl around the back of the mixer on a regular basis. If you're going to do this, be sure to construct a patch bay that services *all* your mixer's inputs and outputs, even if it ends up being a lot of jacks. Halfway measures work fine, but if you worship at the altar of "kludge patching," you'll eventually want access to even the most obscure patch points.

MASTER FADE

There is much that can be done to expand the functionality of seemingly limited mixing consoles. The main trick is to know your mixer inside and out. This takes a lot of time, research, and frustration. It won't be fun, and many musician/engineers recoil at the mere thought of crawling into schematics, but all your efforts will be repaid when you save a brutal mix with some inspired patching. In many ways, getting optimum performance from a mixer is no different than dragging an incendiary solo from a laconic guitarist—you need to pull a few tricks from your sleeve. The rewards of learning all these tricks go far beyond the tapes you make now, because the same approach and tricks are used by every engineer on every level of console, right up to the Neve I'll see on my *next* birthday.

Larry the O *has driven everything from Fostex Volkswagens to SSL big rigs around the studio. He is waiting for you to call with delivery details on his Neve.*

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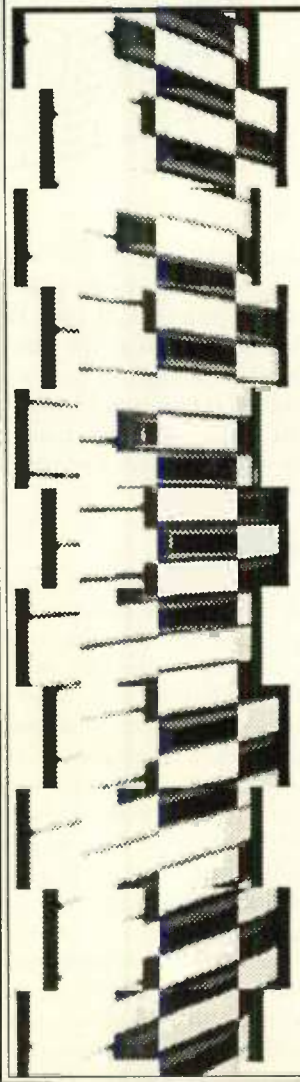

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Booking a Commercial Studio

By Michael Molenda

When should the home recordist seek professional help?

SUSAN GROSS

Batman's utility belt stashed countless secret weapons, but if the gizmos failed, it was Robin who plucked the caped crusader from the frying pan. A professional recording studio is like a trusty sidekick. Although much of a project's grueling creative work can be planned or even recorded at home, producing a commercial master tape often is a job for professionals. The trick is when to cry "help."

First, decide where the project is going. If you have no direction, you have no market, so put some time into serious goal evaluation. A simple demo to get your band booked into local clubs can be recorded in a basic home studio with a cassette multitrack and a few microphones. There is no need to waste money in a commercial facility. A more advanced, sequencer-based home studio can produce final masters for theatrical sound design, industrial video and advertising underscores, and even some multimedia productions.

However, the ante increases when you strive to impress major record-label executives, promote an independent record to distributors, or audition a song for unimaginative music publishers. In these instances, if your tape doesn't sound as good as the Mariah Carey disc the executive's paramour has on endless rotation in the car CD player, you're lost. (Game, set, match; pack it up.) This is where a pro studio can save the day.

PRO BENEFITS

There are always exceptions, but for the most part, pros are pros for a reason. The successful recording studio survives a brutally competitive field by producing work that is beyond reproach. Shoddy engineering seldom is rewarded by repeat business or referrals. This is why it's imperative to ask for references before booking a studio.

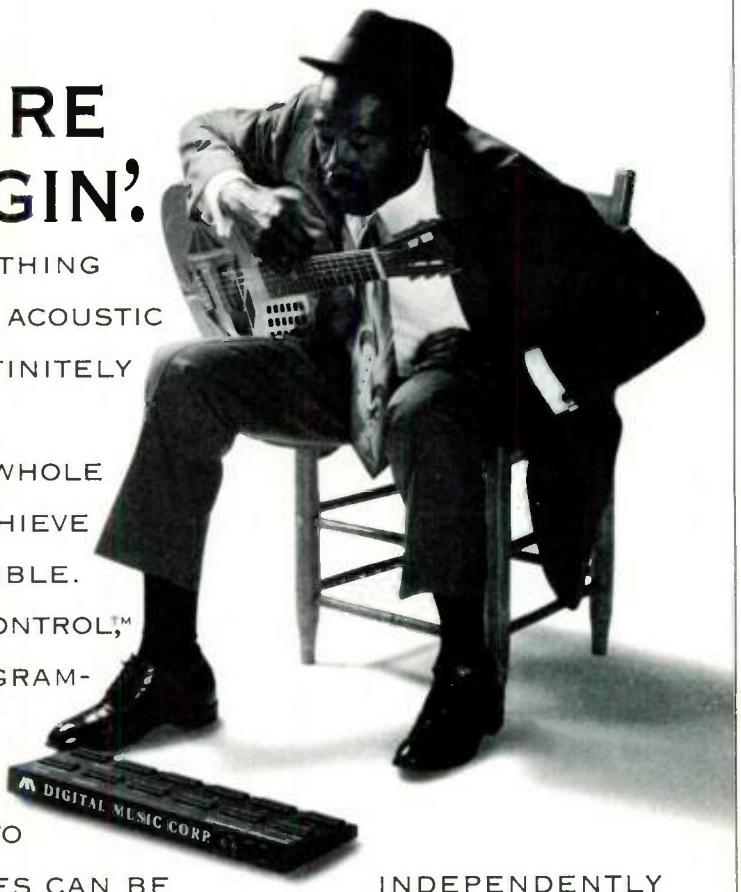
In addition, a "hot" studio is immersed in the business of making commercial products. The studio may specialize in album projects for independent and/or major labels, soundtracks for industrial films, jingles, or publishing demos. The bottom line is, they know what a marketable tape sounds like because they churn them out daily. Access to this knowledge alone can transform a home demo into a marketable commodity. But there are other ways a professional studio can come to your musical rescue.

REMASTERING

If you really want to shoot yourself in the foot, submit a demo tape overrun with audible hiss. It doesn't take much to annoy most industry powermongers. I've seen A&R executives pop tapes out of their cassette decks in less than five seconds. And hiss isn't the only audio problem that rushes their fingers toward the cassette eject button. Boomy or muddy bass, shearing midrange, pogo-ing dynamics, distortion, and dull sound are other career-killers. Of course, your talent may rise above the maelstrom of a noisy track, but why risk it? Professional remastering can improve many sonic sins.

Noise Toys. If you're happy with mixes completed in your home studio, but find the masters compromised by excessive hiss, single-ended noise reduction (such as Rocktron's Hush or the dbx 563x) may be your savior. The

THE TIMES SURE ARE A-CHANGIN'.



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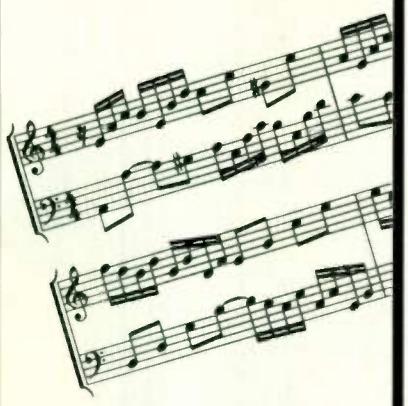

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studio engineer can route your master tape through one of these devices and diminish hiss to almost imperceptible levels. As with any quick fix, care must be taken to prevent overcompensation that could result in clipped or dull signals. A pro's ears helps. They are used to minute adjustments of these devices.

Power EQ. Let's face it, the tone controls on most cassette ministudios are laughable. Their mediocre quality makes it difficult to record great sounds and fix tonal problems during mixdown. Even if you employ a sequencer and sound modules for your demo work, sloppy synthesizer programming and timbre-stacking can produce sonically crippled masters. Luckily, professional studios have master-quality graphic and/or parametric equalizers that can revitalize dull frequencies and tame obtrusive ones.

Once again, your master tape is routed through the studio's gear. The engineer may reference your tape to current records of a similar style to audition optimum frequency ranges. Obviously, tonal modifications are restricted somewhat by the condition of your original master, but you should be pleasantly surprised at what can be improved. Boomy bass frequencies can be cut, highs boosted, and ragged midrange tones smoothed out.

Dynamics. Does your vocal scream miles above the backing track? Is the kick drum louder than the world? Are soft passages inaudible? Well, your mixing chops need work (and we'll discuss this later), but your tape still may be salvageable. Wide dynamics often can be controlled with studio-quality compressors and limiters. A good engineer knows how much to crush the track before the "breath" of the compression is audible. In most cases, the sonic spectrum can be adjusted so instruments sit in the track better and have more punch.

Cost Factor. Since you are providing the professional studio a finished master, remastering is relatively inexpensive. West Coast studios suitable for remastering work charge between $30 to $75 per hour. Most engineers can get you out the door within an hour or two, although this depends on the scope of your project (three-song demo, album, etc.) and the depth of required processing. Remastering requires another master tape, so put tape costs into the budget. I recommend making a DAT safety master, in addition to whatever format is required for your cassette duplication.

MIXING

If you don't feel your home studio has the capability to produce a good master, bring your tracks to the pros. This is a more expensive proposition than remastering, but if you've carefully recorded (or sequenced) your tracks at home, a pro studio's sophisticated console and extended menu of outboard signal processing can make the difference between a demo that sounds like a demo and a demo that sounds like a "record."

Besides the added cost, be prepared to put your back into the project. It's doubtful a pro studio will have the same type of recorder as you, so you'll have to cart your deck to the mix session. If you're a sequencer jock, the studio may be able to run your software, but it might not have the sound modules you need. (Be sure to have the studio manager send you an equipment list.)

But even if the studio has classier modules than your MIDI studio (and you're loathe to trash your setup and carry four keyboards and six modules across town), think twice before walking into a mix session with just a floppy disk. You will be charged for the time you spend auditioning sounds and/or reprogramming synths. I've watched clients eat three hours of billed time looking for one "transcendent" string sound. If you refuse to deconstruct your MIDI studio, prepare to either compromise on sound choices, or spend big bucks tailoring the pro studio to the sonic vision you developed at home.

Once your tape deck is routed into the pro console (or your software is running through their MIDI system), your processing options expand far beyond the capabilities of the conventional home studio. Vocal tracks can be compressed, re-equalized, de-essed (to diminish sibilance), electronically doubled, pitch-shifted, and washed in glorious reverbs. Instrumental tracks can be brought to life, noisy tracks gated out or muted, and ordinary sounds can be made extraordinary.

Unfortunately, countless options can be intoxicating. Don't lose sight of your goals. The reason you're spending additional funds is to make your tape

sound clean, mean, and professional. I've witnessed countless sessions where clients have destroyed a good track by drowning it in inappropriate effects. Remember, you're not just paying for studio time, you're hiring an engineer. Play the engineer examples of records you like and ask his or her opinion on mix strategies. You don't have to take their suggestions as gospel, but more times than not a competent engineer can save you from making poor mix decisions.

Cost factors for mixing sessions are difficult to gauge. Much depends on knowing what you want to hear and not getting sidetracked by minute details. I've mixed well-planned cassette ministudio projects within one hour per song. Sequencer sessions usually require more setup and tweaking and can run up to four hours per song.

OTHER OPTIONS

Sometimes it doesn't pay to put your money-maker through the thin audio line of cassette ministudio mixers. If your voice is the main thrust of your act's marketability, why toss it through your banged-up SM58, sans compression, into the 2-band EQ signal path of a ministudio? The same holds true if you're doing an instrumental demo featuring your solo instrument (guitar, flute, harp, etc.). Your project may warrant recording the featured track in a professional studio.

Again, you end up lugging your deck (or sequencer file) to the big studio. Once there, your prerecorded backing tracks can be transferred to multitrack tape, or the tape can be striped with time code to fire virtual tracks. From that moment on, you'll be paying pro rates to complete your project. Sonic quality increases the more you involve professionals, but the budget inflates accordingly.

If a powermonger is *seriously* considering your work, and quality is paramount, you may decide to record your project entirely in a pro studio. Obviously, this option is the Godzilla of budget busters. Three- to five-song major-label demos can cost from $1,500 to $5,000 (and I know some bands that paid up to $10,000). Be sure you're ready, both financially and emotionally, to take this step. Also, if a label is interested in your work, try to get them to pay for the demo sessions. Musicians should train A&R executives to put their money down when their mouths start making promises.

FADE OUT

May I vent a pet peeve? (Thank you.) If you've had a bad experience with a recording engineer, don't let it poison your opinion of the entire industry. Every field has good apples and rotten ones. Remember to get references. Also, try to keep your ego in check. Nearly every musician who owns a cassette ministudio walks into my studio thinking he or she knows more about making records than I do. Don't be stupid. Smart musicians study hard and learn from experience. I don't mind if you steal my licks, just don't break my chops. I'm on your side, and so are the majority of pros you'll meet throughout your career. You want your work to sound great, and our livelihoods depend on making *sure* you sound great. Collaboration seldom gets better than that. ●

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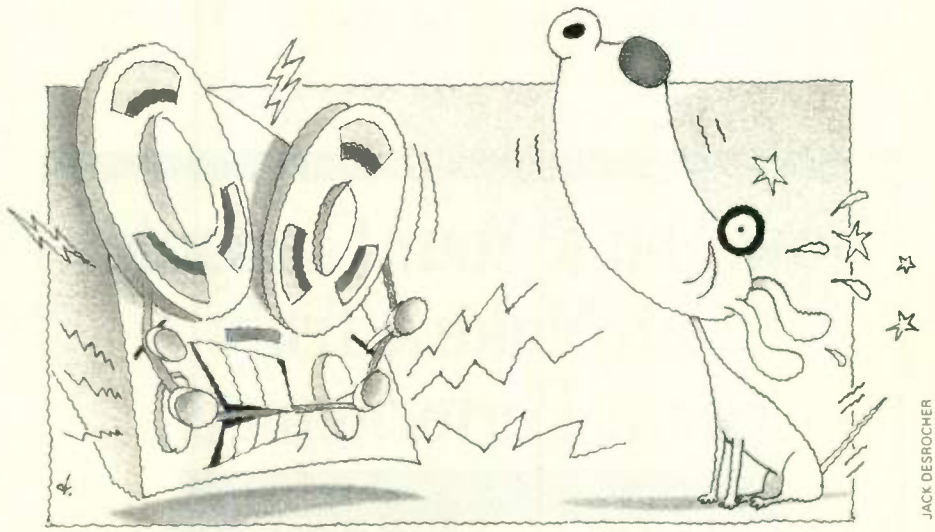
Questions and Answers

By Alan Gary Campbell

Footswitch identity crisis, silencing noisy tapes, and mo' better MIDI cables.



JACK DESROCHER

Q. Is there a simple, affordable way to reduce the noise on analog master tapes? I have some old rhythm tracks that kick, but were recorded without noise reduction. I'd like to transfer these to multitrack, but the noise sticks out compared to more recent, quieter tracks.

A. Improving the signal-to-noise ratio of older tapes (and other sources) that were recorded without the benefit of noise reduction is a complex and somewhat controversial matter, especially with regard to remastering analog sources to CD and DAT. In general, at the current level of technology, it is difficult to remove the offending noise from the source without audibly affecting the signal. Nonetheless, the benefits frequently far outweigh the drawbacks in cases such as yours, and the procedure can revitalize otherwise unlistenable tapes.

The simplest method is to apply a single-ended noise reduction unit, such as the Dolby 563X, in conjunction with careful equalization. (Two units can be used in tandem for stereo operation.) Adjust the noise-reduction threshold to the minimum useful setting. Equalization should be used sparingly; a slight high-frequency rolloff may be all that is required. EQ can be applied pre- or post-noise reduction. The best results are obtained with fairly active tracks; more audible artifacts may occur with sparse passages (e.g., solo acoustic guitar interspersed with silence).

Q. Is there any type of footswitch that can be used with both the Korg/Ensoniq type of equipment and Yamaha gear? The Yamaha footswitches are reverse polarity.

A. Yamaha and Roland footswitches incorporate normally-closed switch mechanisms, whereas most other brands incorporate normally-open switch mechanisms. This simply is a matter of whether the switch opens or closes when the footswitch is engaged, and is not, technically speaking, a matter of polarity. Reversing the footswitch leads does not affect the "sense" of the switch, though it can, infrequently, create ground-loop problems if the footswitch case is metal and is in electrical contact with a system ground.

Some instruments (e.g., Kurzweil K1000, Ensoniq VFX, and Korg T3) allow the user to program the footswitch "sense" to work with either type. A few footswitches can be set to work in either a normally-open or a normally-closed configuration; this usually is achieved via a bottom-panel switch but sometimes requires disassembly of the footswitch. Some devices detect, on power-up, whether a footswitch is normally-open or normally-closed and adapt themselves accordingly.

The circuit shown in **Fig. 1** allows a single switch to function in either normally-open or normally-closed configuration. A stereo jack provides phantom switching functions for an SPDT momentary-contact push switch. When a plug is inserted fully in the jack, the footswitch provides a normally-open response; when a plug is inserted just far enough to "catch" the tip connection, the footswitch provides a normally-closed response. If the cable fails, it can be unplugged and replaced.

Note that this circuit functions properly only when used with a connecting cable that terminates, at the footswitch end, in a standard, 1/4-inch mono phone plug. Any suitable enclosure may be used to house the dual-sense

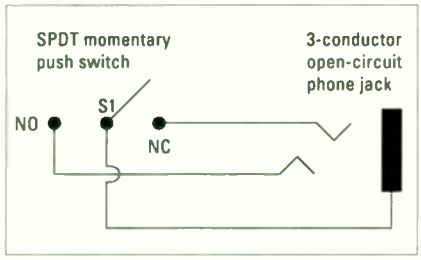


FIG. 1: With this circuit, when a 2-conductor, 1/4-inch cable is fully inserted into the jack, the Single-Pole, Double-Throw momentary switch (S1) is normally-open. Inserting the plug halfway gives normally-closed operation.

footswitch. S1 can be any rugged, SPDT push switch (e.g., an Arrow-Hart switch or equivalent). A push-on/push-off type can be substituted for the momentary type, if desired. If necessary, bend the jack's tip and ring contacts slightly inward (don't overdo it) to provide a firm grip on the plug.

Aside: The Yamaha FC-8 footswitch employs a potentiometer, not a switch, to allow partial-pedal effects when used with instruments, such as the Pf-70/80 Electronic Piano, that can detect intermediate pedal positions.

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Q. Can you wire a single MIDI cable to both send and receive data? There seem to be enough wires in some cables, such as the Conquest Sound brand, which has four leads and a shield. Could you modify the jacks to work accordingly?

A. That's an interesting question. The MIDI specification calls for a twisted, shielded pair *per cable.* The extra leads are employed by Conquest, et. al., for use in secondary applications or with phantom power, or simply because the raw cable comes that way.

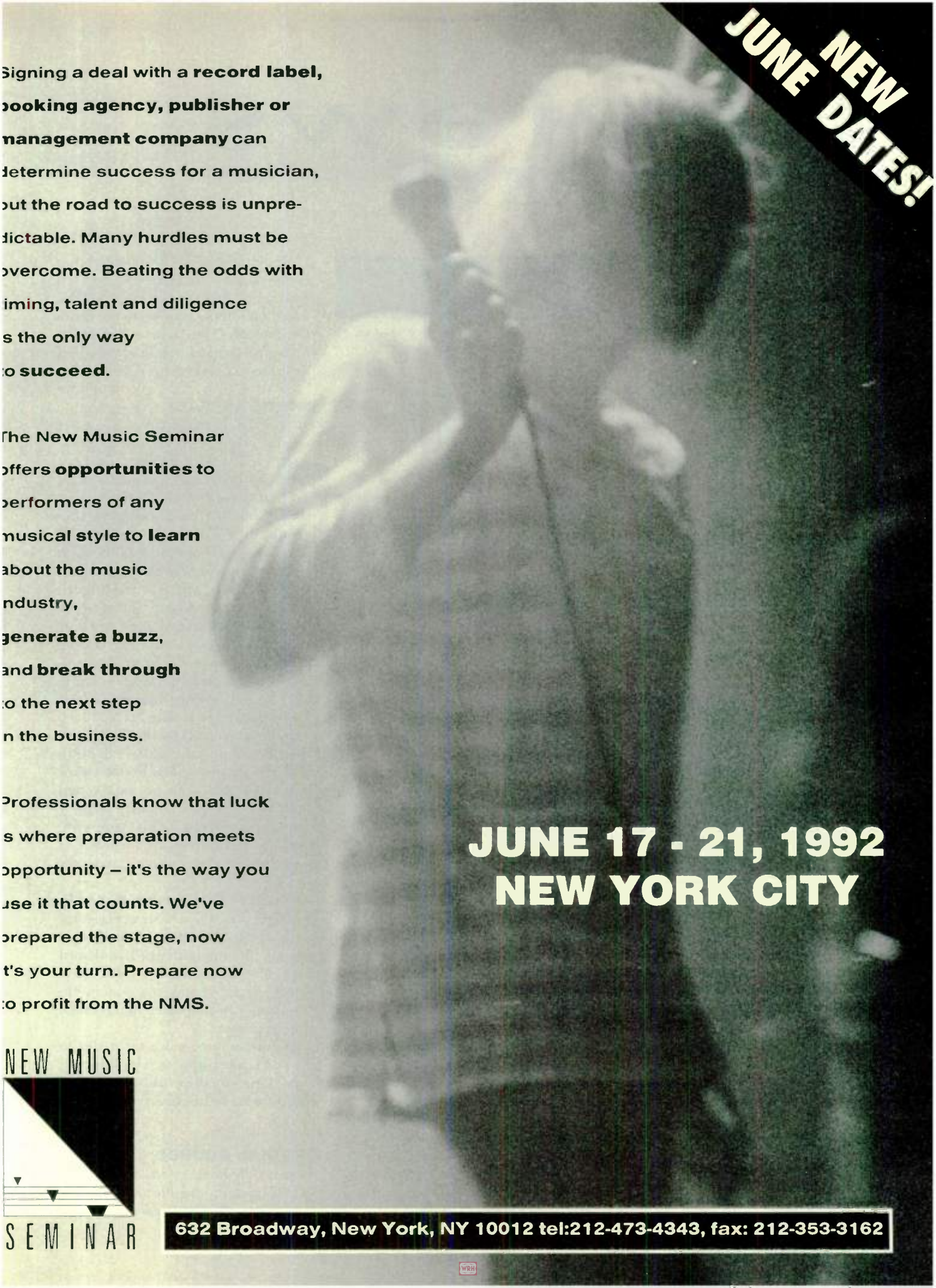
The shield protects the twisted pair from electromagnetic interference from transmitters, amps, motors, lights, etc. It also protects outside devices from MIDI interference. Though the MIDI bit rate is ultrasonic, the word rate is not and is audible if leaked to audio gear through transmissive interference.

Using both pairs within a single shield to provide single-cable transmit/receive capability does not significantly increase the susceptibility of either pair to interference from other devices, but it does significantly increase their susceptibility to interference from one another, which could, in some cases, cause data errors. (Although this is not a problem with equipment that does not simultaneously transmit and receive data, some devices transmit Active Sensing data even in standby mode.) Further, this wiring scheme approximately doubles the average transmissive interference from the cable when both the transmit and receive pairs are active.

The jacks could be rewired by jumper-cabling the MIDI Out lines to the unused pins of the MIDI In on one instrument and connecting the MIDI In lines to the unused pins of the MIDI Out of the second instrument. This meets the requirement that the shield must terminate at one end only, but it could cause crosstalk at the jack pins that might also be a source of data errors.

This scheme is perhaps instructive to experiment with, but because of its limitations, it cannot be recommended for professional use or serious applications outside the home studio.

EM *contributing editor* **Alan Gary Campbell** *is owner of Musitech, a consulting firm specializing in electronic music product design, service, and modification.*



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Reviews

E-mu Proteus MPS

By Charles R. Fischer

A popular sound module grows beyond the rack race.

One of the big music-technology success stories of 1989 was the E-mu Proteus/1, a sample-based, rack-mount, multitimbral sound module. The Proteus became an overnight monster thanks to a good selection of quality sounds (using samples created with E-mu's Emulator III), a $995 list price, and surprising programming capabilities for a sample player. E-mu followed up by releasing the Proteus/2, which features an 8 MB library of orchestral sounds, and producing a 4 MB ROM of samples and patches from the Proteus/2 for the Proteus/1. Ads already have appeared for the Proteus/3, which will feature ethnic sounds from around the world.

E-mu's Proteus Master Performance System integrates a modified Proteus/1 sound module with a pair of stereo signal processors; a 5-octave, velocity- and pressure-sensitive keyboard; and an assortment of live performance-oriented control features.

While E-mu occasionally hinted about a Proteus keyboard, it seemed forgotten. Now the long-awaited keyboard has become a reality: the Proteus Master Performance System (MPS). The MPS combines a slightly modified Proteus/1; a pair of stereo digital signal processors; a 5-octave, unweighted, velocity- and channel aftertouch-sensitive keyboard; and some powerful controller capabilities, housed in an unusual plastic and steel case. The list price is $1,495.

I'm going to focus on features that are specific to the MPS. For detailed analyses of Proteus sound modules, read the Proteus/1 review in the October 1989 **EM**, "The Art and Craft of Using E-mu's Proteus" (March 1990), and the Proteus/2 review (December 1990).

ON THE SURFACE

On the back panel are an on/off switch; a connector for the external power supply; MIDI In, Out, and Thru ports; footpedal and footswitch jacks; and four audio outputs. I was surprised to find the MPS has fewer audio outputs than the Proteus/1, which has six. The diminished number of outputs is balanced somewhat by the addition of onboard effects. Also, like the original Proteus, one pair of outputs uses stereo (TRS) jacks and can be used as a pair of insert points or a stereo effects loop. This makes it possible to process certain sounds with outboard gear while other sounds use the internal effects or remain unprocessed.

The front panel is user-friendly, with a number of buttons that are dedicated to specific tasks. The buttons were designed to be visible on a darkened stage, and as they're not metallic, they won't reflect spotlights into your eyes. Pitch and mod wheels are included, as are a volume slider and a data-entry wheel.

The MPS' 16 × 2-segment, liquid-crystal display is one of its weakest features. It's too small to be read comfortably and is mounted at an awkward angle that makes viewing difficult. A slightly larger display, placed at a different angle, would make things much more pleasant.

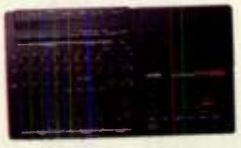
The owners manual is far easier to read than most, although people with Type A personalities should be prepared for its rather breezy and casual style.

PROTEAN SOUNDS

As you may have guessed, the MPS sounds similar to the Proteus/1, whose fine samples live on almost unchanged.

PETER DIGGS

My feet just, like, took over.
It was eerie. But you know, good eerie.



The new Fostex X-28 four-track. Rehearse with your feet. Play with your hands. Listen with whatever's left over.

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WRH

The effects processors don't disguise the sonic clarity associated with the Proteus, and although there are some changes, there are no unpleasant surprises in the patches.

The most important change is to the acoustic piano samples, which were disliked by a number of Proteus/1 owners. E-mu has replaced these with a monophonic version of a Proformance/1 piano sample. (The Proformance piano module was reviewed in the November 1990 EM.) To my ears, the new piano sounds a good deal more realistic than the old Proteus piano, but it has some unpleasant grunge on notes in the upper register, which was not audible in the Proformance module.

Most of the factory patches are greatest hits from the Proteus/1, including such favorites as Thunder Bass and Acoustic Guitar. The piano multisamples are the only new waveforms, but E-mu added several new patches in RAM. In addition, many of the familiar patches take on new life thanks to the onboard effects. While I find some of the new RAM-based sounds musically dubious (the Cowbell/String patch, for instance), there are plenty of mainstream sounds.

The MPS offers 200 patch memory locations, 100 in battery-backed RAM and 100 in ROM. An optional RAM card can be used for another 100 RAM patches. As of this writing, InVision Interactive's Protologic ROM-based sound-expansion board for the Proteus/1 (reviewed in the September 1991 EM) is not available for the MPS.

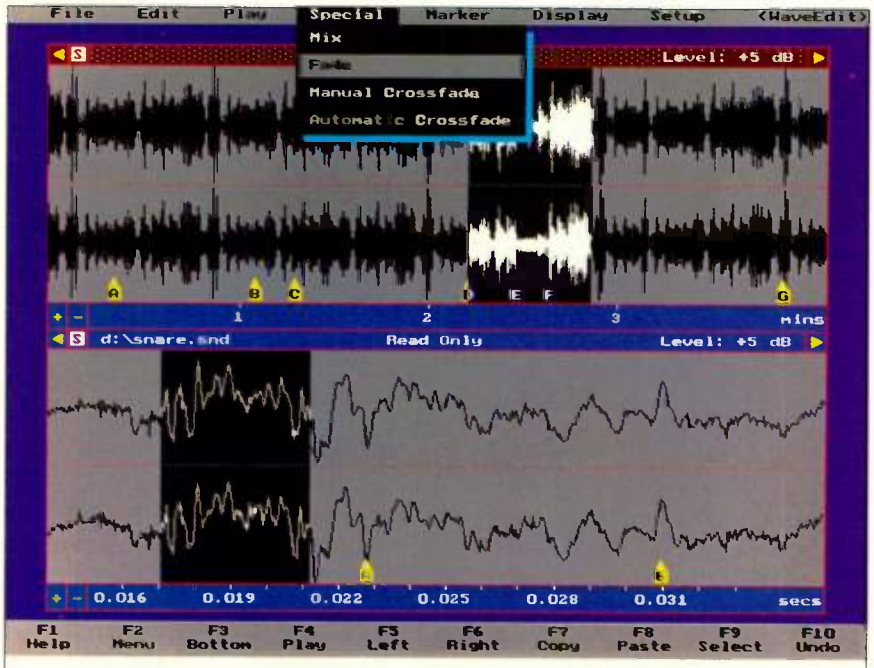
With two exceptions, the parameters of the MPS are the same as in the Proteus/1. The keyboard version offers variable detuning (different degrees of detuning between doubled, identical instruments), a nice touch that was introduced in the Proteus/2. But the more important new parameters control the effects processing.

EFFECTS

One of the most common complaints about the original Proteus was its lack of onboard effects. Apparently E-mu listened: The MPS is fitted with a pair of stereo effects processors (as with many "stereo" signal processors, the inputs are summed to mono), referred to as "A" and "B," which can be configured in parallel or series. In multitimbral mode, the two effects processors are treated as independent effects buses. Each of the sixteen MIDI channels are assigned to either processor A; processor B; neither bus, with the dry signal routed to the main outputs; or neither bus, with the dry signal routed to the aux outs for external processing. Thus, the effects routing for a given patch in a multitimbral setup depends on which MIDI channel it's on. The onboard effects are good, but as with many onboard synth signal processors, they're limited in terms of the number of effects available at a time (two).

Each processor is designed to produce specific types of effects, and a few effects can be done by both units. Processor A is tailored for reverb and ambience effects, while processor B covers utility effects, including delay, parametric EQ, fuzz, flanging, chorusing, and even a ring modulator for the more adventurous.

There are sixteen reverb variations, including the mandatory halls, plates, and rooms, along with something new: a Rain algorithm that provides "a first-order simulation of rain falling on a metal roof, in a redwood grove on a



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foggy afternoon." The reverbs add a considerable amount of spaciousness to the Proteus, and the designers did a good job of tailoring the reverb algorithms to work well with the instruments' excellent sound quality.

While most of the effects range from decent to very good, the two fuzz effects are disappointing. The first fuzz is too intense, producing excessive noise and grunge in almost all situations. While the Lite version is tamed down to eliminate the side effects, it's just too mild for my tastes. A tube-overdrive algorithm might be more useful.

All parameters for both effects processors can be controlled in real-time, with each parameter pre-mapped to a particular controller number (usually somewhere in the 80s or the 110s). This is okay if your controllers can be remapped to match; if not, you're out of luck. This limitation is common to many contemporary instruments, but the Proteus has an especially versatile setup for modulating the voice parameters, and I'm glad E-mu carried this over to the effects. As with many effects processors, making real-time changes to certain time-based parameters, such as reverb time and reverb decay, can produce nasty glitching.

MASTER PERFORMANCE SYSTEM

Although grafting a signal processor and keyboard onto a Proteus/1 doesn't assure success, a number of touches make the MPS more than the sum of its individual parts. It's easy to dismiss "Master Performance System" as a pretentious sales ploy, but indeed the whole instrument is designed from the ground up to make it especially useful in live performance.

The Master Performance System aspects are perhaps the most interesting portion of the instrument. You can split the keyboard into four overlapping zones, with user-selectable top and bottom notes. Local On/Off is set for each zone, rather than each patch, so you can play up to four onboard instruments and slave modules on four MIDI channels. It's also possible to reconfigure a wide variety of parameters for both the onboard patches and MIDI setup at the touch of a button.

The performance capabilities are considerable, so you'll probably spend some time figuring out how to use them. You can have up to five Performance Maps, which can be doubled by using an optional RAM card. Each map contains a number of parameters, including the volume, pan, preset, effects parameters, and program changes for up to sixteen parts, using the internal voices. Performance Maps also include a group of MIDI messages, such as Program Change, Song Select, and Start/Stop, that can be used to control outboard equipment.

Each map contains a user-programmed MIDI message up to 320 bytes long, defined in hexadecimal numbers. The messages can be loaded in from any MIDI source, or the truly hardcore can enter them manually, using the data wheel. You can use this feature to send SysEx messages to other instruments, but the 320-byte limit prevents you from storing sample data or sequencer files. Its main function is to store outboard Proteus patches for use in live performance.

On the other hand, musicians who perform live will use the Quick Key feature. Each of ten conveniently located, numbered buttons can be mapped to one of the 300 onboard presets. In Quick Key mode, pushing one of the numbered buttons defines up to four keyboard zones, each with its own internal preset and controller map. Each zone sends on its own MIDI channel. Pressing the Quick Key also sends MIDI Program Change, Volume, and Pan messages for each zone.

If you're a gigging musician, these features make the MPS invaluable. With a little preparation, you have a powerful way of managing a whole rack of gear from one instrument.

Product Summary

PRODUCT:
Proteus Master Performance System (MPS)
PRICE:
$1,495
MANUFACTURER:
E-mu Systems, Inc.
1600 Green Hills Rd.
Scotts Valley, CA 95066
tel. (408) 438-1921

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THE KEYS

The MPS' 5-octave, unweighted keyboard felt a little mushy at first, but I soon adjusted to it. Global settings for velocity curves, adjusting the overall channel aftertouch amount, and recalibrating the aftertouch response are all found under the Master menu.

Although aftertouch "recalibration" sounds scary, it's simple. The MPS measures your finger pressure for the minimum and maximum points, which lets you decide when the aftertouch comes in and bottoms out. If you ever felt handicapped by keyboard controllers that force you to change your playing style to keep the aftertouch from coming in where it isn't wanted, you'll have no problem enduring the process.

CONCLUSION

The MPS is a good, solid instrument. It's a Proteus, which means it has a proven, winning sound. For the price, the MPS offers plenty of usable patches and features. If you pair it with a computer sequencer of your choice and another effects processor or two, you'll have a capable setup for songwriting or performing.

(Thanks to Al Eaton, Lloyd Ferris, Mark Okimoto, and Chris Tabor.)

Charles R. Fischer *works as a studio musician and synth programmer, designs custom audio and MIDI equipment, and writes for several magazines.*

Digidesign Pro Tools (Mac)

By Paul D. Lehrman

Sound Tools' 4-track sibling offers a host of new features.

When Digidesign released Sound Tools, its phenomenally successful stereo, hard disk-based, digital audio recording and editing package, it was hailed as a major advance. But predictably, people started asking when a multitrack version of the system would be available. The answer is now, and the product is called Pro Tools.

Pro Tools is more than just a multitrack recorder, however. It combines the features found in its predecessor with the audio editing, MIDI sequencing, real-time processing, and mix automation found in *Studio Vision* and *Deck*. For now, it handles up to four simultaneous audio tracks on a single hard disk, although future versions will support eight, twelve, and sixteen tracks on multiple hard disks.

THE BASICS

The Pro Tools system includes two hardware components and two software programs. A NuBus card is installed into any Mac II (the IIsi requires a NuBus adapter), which then is connected to the Audio Interface box. This box includes four balanced (XLR) analog inputs and outputs and one set each of AES/EBU (XLR) and S/PDIF (RCA) digital audio connectors. You can record and play up to four tracks of analog audio at a time, but only two tracks of digital. The active set of digital connectors is selected in software (as is the sample rate, 44.1 or 48 kHz). The interface box also includes various indicator lights and screwdriver trim pots for calibrating analog levels.

▼ The system is far more than a multitrack recorder.

The two software programs are called *ProDeck* and *ProEdit*. They are designed to work together under MultiFinder, manipulating the same files simultaneously. A descendant of *Deck*, *ProDeck* generally is used to begin and end a project because the recording and mixing functions are available there. *ProEdit* presents a graphic interface for placing and editing audio and MIDI tracks. It is most useful in the middle of a project, when the various elements are assembled. The files created by the programs, which collectively are known as a "session," consist of audio, MIDI, and automation data. The software automatically arranges them in folders when you start a new project.

This two-pronged approach to software may not be the most intuitive way of doing things, and it can get confusing to sort out which features are found in which program, but you'll adjust.

Although they work well together, each application is not dependent on the other, and there are situations in which using just one is sufficient. This allows you to use Pro Tools effectively without needing to know everything about it. For example, some post-production engineers almost never use *ProDeck*, but do all their assembly in *ProEdit* and mix down through an external board, or dump to multitrack without ever leaving the program.

The software provides up to 32 "virtual" audio tracks, although only four of them actually can play simultaneously. Each audible track is assigned to one of four voices. A track with a unique voice assignment plays as expected, but if two tracks have the same voice assignment, the one with the lower number takes priority. Should that first track stop, the second track immediately breaks in.

Despite the patchwork nature of this approach, the system should be considered far more than a 4-track recorder. Each of the 32 tracks maintains its own identity and includes its own fader, processing, and EQ, and all the settings can be automated. It's cool to have such a large number of tracks available for things like alternate takes. If you really need more than four tracks to sound simultaneously, two or more can be bounced and mixed entirely in the digital domain.

The four voices do not necessarily correspond to the four physical audio outputs. Regardless of its voice assignment, any track can be assigned to any output pair and pan position within that pair. For example, all four voices can play from a single audio output.

RECORDING

A typical session usually starts in *ProDeck* (see **Fig. 1**). Each track in the Audio Mixer window includes a fader, Solo/Mute/Record buttons, pan and output-pair assignment controls, and a voice selector. Each track also includes two effects-send level controls and an independent two-part signal-processing module that acts on the signal in real time during playback. Each half of a

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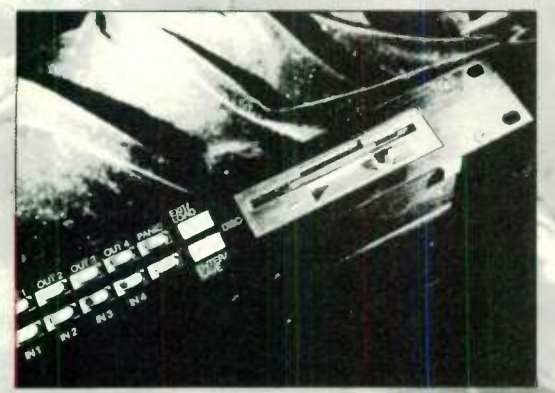

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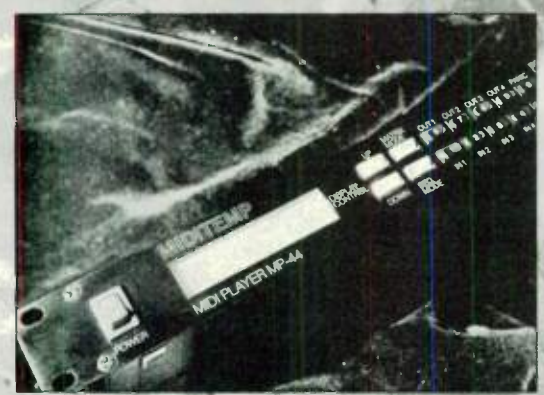

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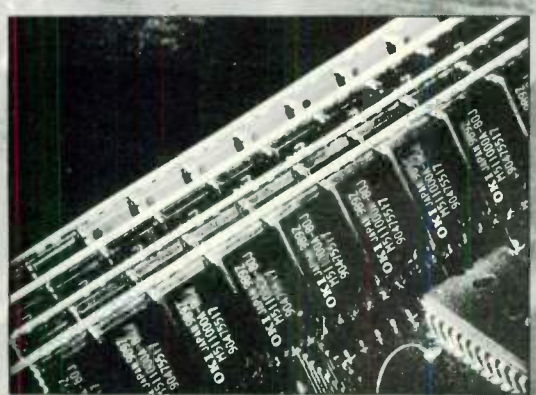

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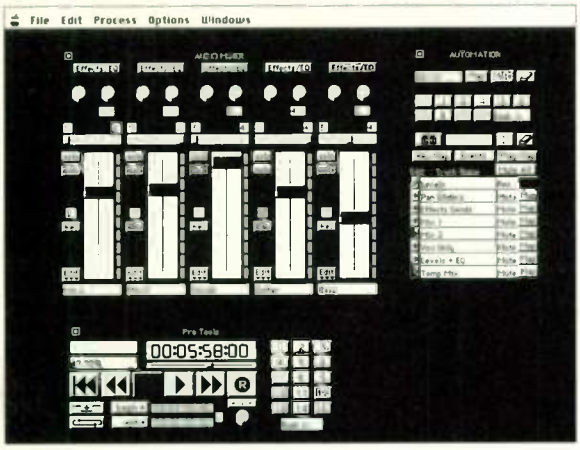

FIG. 1: *ProDeck* s main screen provides access to the transport, track, and effect-send level controls.

processing module can be a single-band equalizer with selectable mode and frequency range, a digital delay with a maximum delay time of about 300 ms, a chorus generator, or a delay-based stereo simulator. Any of the processing parameters (but not the modes) can be changed in real time. You also can use any two of the physical outputs as external sends during recording or mixing, and any of the inputs can serve as returns.

Analog audio signals are recorded on up to four tracks at a time, although slower Macs may be able to handle no more than two. The mouse can be used to operate a standard set of Transport controls, which also have user-programmable equivalents on the Macintosh numeric keypad. The program allows you to scrub the file, set up a loop with programmable pre/post-roll, slow down the playback time by as much as 98 percent, and set punch-in/out points. Punches are non-destructive, so the data underneath a punched section can be recovered at any time. If you need to conserve disk space, a destructive Erase Record option is available.

An individual audio track consists of one continuous file, or it can be divided into an unlimited number of segments or *regions*. The start time and duration of each region are independently adjustable. Once a region is recorded, it doesn't have to remain in its original track but can be moved to any of them. Files also can be imported from other applications such as *Sound Designer*, *Deck*, *Studio Vision*, or Passport Designs' *Alchemy*, but all files must share the same sample rate.

Regions are edited in the Audio Playlist window, and edits are non-destructive. As with Sound Tools, regions are automatically butt-spliced to each other when they are first assembled, so that one begins where the previous one ends. However, this can be changed by altering the start time of any region. The system creates crossfades between adjacent regions of up to several seconds in length depending on available RAM. Once calculated in RAM, Pro Tools stores its crossfades to disk (unlike Sound Tools, which stores them in RAM), so you can create as many as you need. Seven different crossfade curves are available, and using dissimilar curves on either side of the fade is a nice touch.

EDITING

Once your audio is recorded, it's time to move over to *ProEdit* (see **Fig. 2**). A highly intuitive graphic front-end manipulates audio and MIDI files. As in *ProDeck*, nearly all the editing functions are non-destructive and merely move pointers around. (For destructive edits, you need the new Pro Tools-compatible version of *Sound Designer II*, which is optional.) The major operations include moving a region (horizontally in time, or vertically from track to track), scrubbing the audio (one track at a time, or all together), trimming a region, and selecting a region for editing.

The display is similar to the highly successful audio editing interface of *Studio Vision*. Tracks are displayed as waveforms horizontally across the screen, and MIDI tracks are displayed in a simple piano-roll display (notes only). Across the top is a time scale, calibrated in SMPTE hours/minutes/seconds/decimals, film feet and frames, or bars and beats. At the left are controls for adjusting each track's volume, pan position, voice assignment, and mute/solo status.

ProEdit has two modes for assembling audio: Shuffle and Slip. In Shuffle

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mode, regions always butt up against each other to form a continuous track. If you move one region, they all move with it. Placing one region in front of another causes the second region to "shuffle" to the right to make room for the first. In Slip mode, individual regions can be moved or trimmed without any constraint, with space between them, if desired. If a region is moved so it overlaps another, the stationary one will be trimmed automatically to accommodate the one being moved.

Aside from multitrack capability, this might be Pro Tools' single most important improvement over Sound Tools. While Sound Tools requires the creation of a carefully timed silence region if you want to separate sounds, Pro Tools lets you simply put the sounds where you want them. Moving sounds freely to match a visual time scale or MIDI tempo map (which we'll get to in a minute) with as much precision as possible should make the system popular with broadcast and post-production people. One missing feature, however, is the ability to grab several discontinuous regions and slide them all together, which is a must for editing audio for video.

Crossfades are established by dragging the selection icon across the two regions you want to fade and selecting fade-out/in curves. There's also a Strip Silence feature that automatically chops up a long file into shorter ones. The start and stop points of these short files are determined by pauses in the audio signal that exceed a user-specified time. Unlike *Studio Vision*, Pro Tools' level threshold is not user-adjustable (although Digidesign claims that it will be in version 1.1, which should be shipping by the time you read this).

AUTOMATION AND MIXING

Once you've placed the audio regions where you want them, you typically go back to *ProDeck* for automation and mixdown. Like its predecessor, *ProDeck* offers several automation modes, which is a bit bewildering at first. Up to eight real-time automation tracks are recorded in which all fader and processor movements are stored just like events in a MIDI sequencer. You can play back

Product Summary

PRODUCT:
Pro Tools 1.03 4-track digital audio and MIDI recording and editing system

SYSTEM REQUIREMENTS:
Macintosh II series, IIci or better recommended; System 6.0.7 (version 1.1 requires System 7.0); 5 MB RAM, 8 MB recommended; hard disk with 18 ms or less access time; SMPTE-to-MIDI Time Code converter recommended

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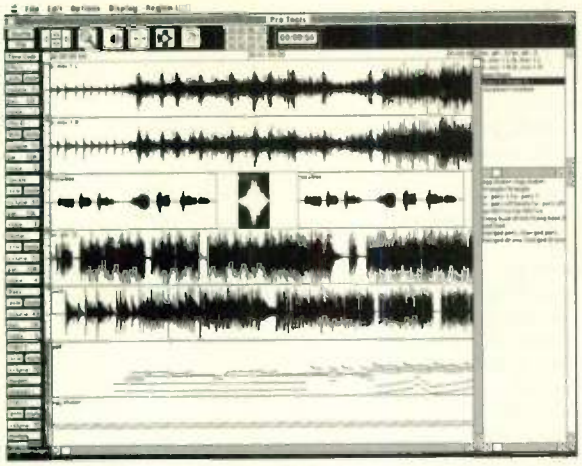

FIG. 2: *ProEdit*'s main screen displays the audio waveforms and allows you to select the major editing operations.

any or all of these tracks simultaneously and filter data so that certain tracks only affect certain controls.

All of the program's controls can be manipulated with the Macintosh mouse. This is okay when preparing tracks for recording or playback, but it's pretty unwieldy when performing a live mix. As in *Deck*, the solution is MIDI mapping. Simply turn on the mapping function, click on any onscreen control, and move a controller (mod wheel, footpedal, etc.) on an external MIDI device. The onscreen control now is operated with the designated MIDI controller.

A single MIDI controller can be assigned to any number of onscreen controls, and you can store an unlimited number of maps in one session. JLCooper Electronics has produced an external control box, the CS-10, to exploit this feature fully. It has eight faders, several knobs and buttons (including transport controls), and a jog wheel. Although it is a generic serial device, it automatically configures itself to work with Pro Tools when you hook it up and boot the software.

Snapshot automation is supported as well. In this mode, the program memorizes the settings of all controls at any moment, loads several of these snapshots into a list, and plays them back to become part of an automation track. For more precise control, record the current settings into one of 40 "mixer state" locations. These mixer states are incorporated into an automation track and moved around or duplicated in a playlist editor similar to the one used for audio events. You also can instruct the program to move smoothly from one state to another.

Prior to final mixing, tracks can be bounced, or more accurately, premixed. One or more tracks or regions can be combined into a new file, complete with panning, effects, EQ, and mix automation, and saved to disk. The playback can be slowed down as part of the operation. Everything is done in the digital domain, so there's no signal degradation regardless of how many bounces you perform.

Mixing is performed live to analog or digital tape, or directly to disk, creating a mono or stereo file. Once the master files are on disk, use Digidesign's *Master List* software (provided with the system) to create a contents file for use by a CD-mastering facility.

MIDI

ProDeck includes a MIDI Sequencer window (see Fig. 3) that lets you record and play multi-channel MIDI tracks with the same looping and punching facilities found in the audio section. A MIDI Playlist window lets you assemble MIDI tracks. In *ProEdit*, MIDI tracks

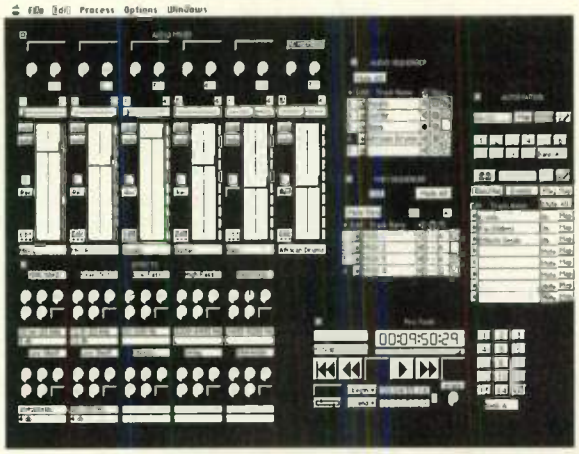

FIG. 3: *ProDeck* includes both MIDI and audio sequencers.

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APRIL 1992

We want to know what you think of the articles in *Electronic Musician*! Now you can use your reader service card to give us feedback about *EM*'s editorial coverage. We have assigned a rating number to each of the main articles in this issue. Please select a rating for each article and circle the appropriate number on your reader service card:

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e. "Recording Musician: Maximizing Your Mixer," p. 76	717	718	719	720
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can be moved around in Shuffle or Slip mode, broken into regions, duplicated, channelized, quantized, and transposed. Type 0 (single) or Type 1 (multitrack) Standard MIDI Files also can be imported. Each track can be soloed, muted, and overdubbed with more data.

The current version recognizes two MIDI output ports—printer and modem—enabling you to address up to 32 channels. Future versions will support Mark of the Unicorn's MIDI Time Piece and Opcode's Studio 5 for many more channels.

If you're combining audio and MIDI tracks, and you record the MIDI data first using *ProDeck* or another sequencer, you can generate a MIDI-note click based on the sequence's tempo map. When you go over to *ProEdit*, the tempo map will show up in the time ruler when you choose the Bar/Beat display. If there is a tempo change, the distance between the beat markers gets shorter or longer. This makes it easy to adjust audio events so they fall on MIDI beats. A Snap-to-Beat function provides a clever way to quantize the beginnings of audio or MIDI regions. When this function is engaged and you move a region, the cursor is constrained to move only in specified rhythmic intervals, which range from quarter-notes down to 64th-note triplets.

The tempo map is edited by marking the beat at which you want the tempo to change and moving that beat forward or backward with respect to the recorded track. Any beats between the one you're moving and an earlier, marked beat will shrink or stretch like a rubber band, and the click track changes accordingly. However, the playback of the MIDI File itself remains unaltered. A nice option would be to stretch or shrink the MIDI File along with the tempo map. I'd also like the ability to view the time code and bar/beat scales simultaneously. This would allow you to move beats to specific frames and fit MIDI Files into designated time slots.

The most serious problems I encountered in Pro Tools have to do with MIDI. For example, Type 1 MIDI Files are handled very poorly. Each sequence track is imported to its own MIDI track within the system. If you import a MIDI File with 32 tracks, you've used up all available MIDI

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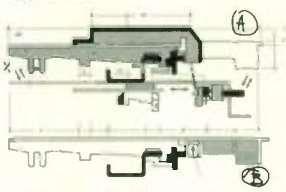

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tracks. Any MIDI data you record or import afterward must be placed on the same tracks, which isn't particularly convenient. When the planned drivers for the MIDI Time Piece and Studio 5 are put in place (providing over 100 MIDI channels), it's going to be a nightmare. Also, the MIDI tracks should take up less screen space; it takes forever to scroll through them.

You could scrunch your sequence down to a Type 0 SMF in your sequencer (there's no provision for this within Pro Tools), but then you are limited to sixteen channels per sequence because MIDI Files have no way to identify different output ports or cables. Also, there is no way to solo or mute individual tracks, nor can you view or edit them individually. For example, if the drum track is combined with everything else, it's impossible to visually line up a drum hit with a sound effect, or vice versa.

It is possible to import a MIDI File with or without its tempo map. If you import it without the tempo map, playback tempos are not entirely accurate. But if you load a file *with* a tempo map and then try to load a second one into the same session, Pro Tools crashes. (*Digidesign claims they were unable to duplicate this crash.—SW*) Also, stuck notes occur with distressing regularity. The MIDI Mute function doesn't turn the selected track off; it merely stops sending data to it. If a note is sounding (or stuck) when the track is muted, it will play forever.

A critical omission is the absence of Program Change and Control Change chasing during playback. If you start in the middle of a MIDI region, there's a good chance your patches and volume settings won't be what they're supposed to be. This is a feature that *must* be included before any serious MIDI-head can work effectively with Pro Tools.

When the program boots up, it sends an inquiry message from the serial ports to see if a CS-10 and/or any MIDI interfaces are connected. This presents two serious problems. First, this message regularly fries the RAM of my DX7 with E! and occasionally takes out my MIDI Time Piece and Proteus/2. Second, if you want to change your serial port setup in the middle of a session, there's no way to tell Pro Tools about it short of quitting both programs and rebooting.

SYNCHRONIZATION

Pro Tools can lock to MIDI Time Code while recording and playing. Audio and MIDI are synchronized and chased, so starting playback in the middle of a file is no problem (except for Program Changes and Control Change settings, as noted earlier).

The system offers two modes for synchronizing audio on playback: Trigger and Continuous Resync. In Trigger mode, the audio plays at its designated time and follows a clock in the Audio Interface box. The playback always will be stable in terms of pitch, but if the time-code source (audio or video tape) is off in any way, the digital audio and the tape signal drift apart. In Continuous Resync mode, tape and audio stay locked together, but if there is a speed problem with the tape, the sample rate will change and pitch changes may be audible. (Resync mode is not available when recording.)

Digidesign recommends Trigger mode for short audio regions and Resync mode for longer ones, but this is not a hard-and-fast rule. In a professional environment with good time-code sources, Trigger mode usually should work. In my studio, working with two minutes of audio locked to a

WHAT DO YOU NEED?

So you think you can just plunk down six grand and turn your Mac into a multitrack digital workstation? Not so fast; you'll probably need to spend a lot more money before you're ready to take on the next Dolph Lundgren film. Even so, Pro Tools will seem darn cheap next to most of the competition.

First, you need one heck of a hard disk. Four tracks of audio gobble up about 20 MB per minute at 44.1 kHz, and that's without any alternate takes or non-destructive punches. In addition, when you import an audio file from another program, Pro Tools often makes a copy in its native format first, which doubles the space requirement. I consider 300 MB to be the minimum for any serious work; others say 650.

And they've got to be fast megabytes. SyQuest removable-cartridge drives work fine with *Deck*, but they won't accommodate four channels in Pro Tools. This also is true for many other drives that used to be good enough for audio. The requirements for a hard disk to be used with Pro Tools include an access time of 18 ms or less and a continuous throughput speed of 800 KB/sec or more.

Another issue is computer speed, at least until the System Accelerator board (a 25 MHz, 68020-based, hard-disk processor under development by Digidesign) is available. I had little trouble using Pro Tools on a IIcx, but if I had wanted to use *MIDI Manager*, I would have been up the proverbial creek without additional horsepower. Digidesign includes its own SampleCell driver in the Pro Tools software so that owners of slower machines who want to use SampleCell aren't forced to use *MIDI Manager*. The system is not yet compatible with Opcode's *OMS* software.

But if you have a Mac II, IIx, or IIcx, don't throw it in the garbage quite yet. Daystar makes several reasonably priced accelerators that can improve the performance of older machines significantly. Digidesign recommends the 40 MHz model. They even got me one to check out, and it helped.

Needless to say, you need lots of RAM. Five megabytes is an absolute minimum, but there's no reason (especially at today's prices) not to go with eight. Even more than that would be useful, but then you have to get involved with System 7. Although Pro Tools reportedly works fine with System 7, Digidesign still does not "officially" support it. On the other hand, System 7 will be required for version 1.1, according to the company.

If you plan to do a lot of mixing, you'll want to invest in a dedicated external controller. Almost any MIDI fader or slider box will do, but if you also want transport controls, you'll need the JLCooper CS-10. (If you just want transport controls, the CS-1 will do.) As of this writing, however, the CS-10 is not compatible with the MIDI Time Piece.

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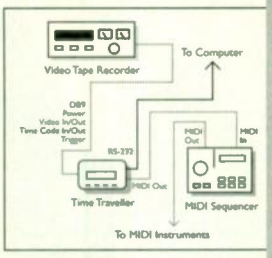

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VHS tape, I heard no difference between the two modes.

When you record audio while locked to incoming time code, the system is *very* finicky about the quality of the code. Unlike a sequencer, which will happily fly over a few bad frames, *ProDeck* demands time code that is absolutely perfect in all respects during recording. In practical terms, this means you can only record "off-line" unless the tape deck you are using as a SMPTE source is locked to a highly stable "house sync" generator. Fortunately, the system is much more forgiving of flaky time code on playback.

For many applications, off-line recording is perfectly acceptable. But if you want to record a piece of audio with its time-code number—for instance, if you're stripping dialog off a videotape—you must record while locked to code. If you can't, you are forced to insert the SMPTE numbers by hand, which is inefficient and an invitation to inaccuracy.

On a positive note, *ProDeck* and *ProEdit* include a useful "spotting" feature that lets you capture a video frame number and assign it to any hit point you choose in an audio or MIDI region.

WISH LIST

While Pro Tools provides many wonderful features, there are a few things I wish for. Post-production engineers need a way to import an edit decision list (EDL) directly from a video-editing system, the way *Q-Sheet* can. Also, it has no "fade to silence" or "fade up from silence" commands (although they are intended for version 1.1). I'm sure many users (especially those who work primarily with *ProEdit*) would welcome a way to change the volume of individual regions within a track without having to automate the entire session in *ProDeck*.

Another missing feature is time compression for MIDI or audio. You can export an audio file into *Sound Designer II* and use that program's time-compression feature, but it never sounded all that good. (Fortunately, Digidesign says they're about to release a much-improved algorithm.) Besides, this is a clunky and time-consuming procedure. You can do the same thing with MIDI Files—export to a sequencer, edit, and import again—with all the attendant dangers.

I found *Deck*'s approach to automation too fussy and indirect. While *ProDeck*'s real-time automation recording feature is a big improvement, it still looks like the older program with an extra level of complication on top of it, and it still turns me off. There is an Automation Editor window, but it's a display of meaningless numbers in the current version. A better solution would be a graphic representation of mix moves like the MIDI controller-editing windows in many sequencers.

When you move a control in *ProDeck*, a readout of its position is presented in percentage of full value, rather than any meaningful units like EQ frequency or delay time. This is an unfortunate leftover from *Deck* that is due to be upgraded in version 1.1.

Switching between the two programs must be done with a special command, not by clicking on the MultiFinder icon or in one of the other program's windows. Failure to follow this procedure means any changes made in one program will not be carried over to the other and may never get saved. Mac users have been doing application-switching in the normal ways for years, and it's a hard habit to break. If you happen to be using any other application at the same time, you must remember which of the two programs you were in when you left Pro Tools, and be sure to go back to that program when you return.

Even when you do it correctly, the system occasionally crashes when switching between the programs. Fortunately, no crash I experienced ever ate a file, so while they were a bit dismaying, they weren't devastating.

CONCLUSIONS

Digidesign originally promised that Pro Tools would be shipping by September of 1991, and they delivered the first units in November. In the world of major music technology development, that's considered on time. But promptness has its price, so it shouldn't shock you to hear that the system has bugs and remains unfinished in a few key ways. Fortunately, Digidesign has a solid record of making good on their promises, at least when it comes to major products. The prognosis, therefore, is excellent that most of the problems will be resolved and the missing features included before long.

That's good, because I think the ideas behind Pro Tools are great and their implementation deserves to be better than this initial version. Far more than just a "digital Portastudio"—*Deck* with an Audiomedia card does a good job of that at one-quarter the price—it is a serious multitrack recording and post-production system, with professional, high-end features and a price still comfortably below that of the "big boys."

Its visual metaphor for arranging audio events is superb. For straightforward music recording or post-production work, it's fast and a joy to use, and it sounds excellent. When it comes to integrating MIDI and audio, however, it is not so successful. If you are strongly oriented toward the MIDI side of things, *Studio Vision* is still a much better (and potentially cheaper) bet. But I foresee Pro Tools becoming an extremely popular system in many parts of the audio and music industry. I look forward to working with it and watching it evolve.

(The author would like to thank Steve Olenick, Dan Caccavo, and Mark Parsons for their help on this review.)

Paul D. Lehrman *has so many noisy computer peripherals in his studio that he can barely hear his music. He is thinking of starting over again on the Tonette, but that would probably mean giving up his seat on the executive board of the MIDI Manufacturers Association.*

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produce a single harmony in response to an input signal. In addition, top-quality models cost top dollar, with prices nearing $10,000. Practical harmonizing was far from a tool for the musical masses.

The situation began to change with the appearance of the Eventide H3000 in 1987. Harmonizing became less expensive and more sophisticated, offering multiple harmony notes and "musically intelligent" (key-sensitive) harmonization. Even with these advancements, producing natural-sounding harmonies for the human voice remained difficult.

The task is simpler and cheaper now. DigiTech has collaborated with IVL Technologies, Ltd. (makers of the Pitchrider pitch-to-MIDI converter) to produce a quality harmonizer for $849: the VHM-5, a.k.a. the Vocalist.

OVERVIEW

The Vocalist is a harmony-producing device capable of generating up to four harmony notes from a monophonic input. As its name suggests, it is primarily intended for the human voice. Housed in a black, tabletop package, the unit communicates with the user through an easy-to-read, yellow/green, backlit LCD display and 3-digit LED program-number indicator.

The device is programmed via a pair of up/down Program select buttons, a 4-way Parameter select/edit switch, and a small keyboard arrangement of twelve keys (one each for the notes C through B), each with its own on/off LED. Four Variation keys (explained later) reside under the main display. There are additional buttons that control Utility

Product Summary

PRODUCT:
The Vocalist (VHM-5) vocal harmonizer
PRICE:
$849
MANUFACTURER:
DigiTech/DOD
5639 South Riley Lane
Salt Lake City, UT 84107
tel. (801) 268-8400

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ●
EASE OF USE	● ● ● ●
DOCUMENTATION	● ● ● ●
VALUE	● ● ● ◖

DigiTech's VHM-5 is a harmonizing device designed for vocal applications. Better known as the Vocalist, it creates four user-defined harmony notes from a monophonic audio input.

mode, Program Store, and Bypass.

The inputs accept either standard 3-pin XLR or 1/4-inch, unbalanced plugs. Front-panel sliders control input signal, Vocal (dry signal) output, and Effect (harmonized signal) levels. A +4 dBm/-10 dBV input-level selector switch accommodates a variety of level-matching situations.

Rear-panel outputs include unbalanced, 1/4-inch left and right mains, a Line Out that sends the summed dry input signals, a footswitch jack, and a headphone jack. Next to these are MIDI In, Out, and Thru jacks.

It would have been nice if DigiTech had provided four separate harmony outputs, allowing each harmony to be externally processed individually. A set of balanced outputs would have eliminated the need for DI boxes in live situations. (Apparently, there wasn't enough room in the chassis to accomodate additional outputs.)

Access to the Vocalist's various functions is provided through a mercifully small set of parameters and submenus. Although the Vocalist is a sophisticated device, its designers went to great lengths to make it simple to learn and operate, and they succeeded.

The Vocalist operates in four basic modes: Chordal, Scalic, Vocoder, and Pitch Correct. The various modes can be combined within a single program, using the four Variation keys under the LCD. The Variation keys, as the name suggests, allow you to set four different sets of parameters and switch between them with a button-press or MIDI message. Essentially, Variations are complete, independent subprograms. For example, Variation 1 could be set to minor harmony in Scalic mode, with two custom-edited harmonies above the input note and one below; Variation 2 could be Vocoder mode; Variation 3 could be close-voiced major harmony in Chordal mode, with two harmonies above the input and none below; and Variation 4 could be Pitch Correction, all within a single program and all switchable via MIDI.

The unit contains 256 program memories, of which 128 are user memories, and 128 are editable (but not erasable) factory presets.

CHORDAL MODE

In Chordal mode, The Vocalist produces harmony notes that are chord tones of a preprogrammed chord type. For example, let's assume you want to harmonize your part with various C chords. You select the chord's root, C, using the Vocalist's keyboard, an optional footswitch (see Special Features), or incoming MIDI notes. Each of the four Variation keys can be programmed to provide a different chord type, which can be a major triad, minor triad, major seventh, minor seventh, dominant seventh, minor seven flat five, diminished triad, or augmented triad. In our example, the selected root is C, so you could program the four Variation keys to produce C, Cm, C7,

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and Cdim chords.

Next, you elect to use either open or closed chord-voicing and decide how many harmonies you want above and below the input note. The Vocalist can provide up to three harmonies above and one below, or three below and one above the input note. To return to our example, if the current program calls for a Cm7, and you select closed voicing with two harmonies above and two below the input and sing an Eb (the third of the Cm7 chord), the Vocalist will provide the Bb and C below and the G and Bb above.

If the Vocalist receives a pitch at its input that is not in the currently selected chord, the unit can respond in one of three programmable ways. If you use the No-Change (n/c) feature, the Vocalist produces the harmonies from the last chord tone you sang. In our example, the last note sung was an Eb, so if you sing an F# over the Cm7 chord, the Vocalist produces the same Bb-C-G-Bb voicing it used for the Eb. Alternately, if you choose the Slur feature, the machine smoothly bends the F# up to the nearest chord tone (G).

For more sophisticated custom harmonization, you can go to the Harmony Edit page and define, note by note, the specific chord (unrelated to key) that will occur every time you sing each of the twelve notes from C to B. You can choose which of the twelve notes to work on by singing the pitch into the device, or by using the parameter up and down keys. Each harmony can be one octave above, one octave below, or two octaves below the sung pitch. This makes it possible to set up harmonies that would be impossible using the normal chord types supported by the Vocalist.

SCALIC MODE

Scalic mode, as the name implies, yields harmony notes within the chosen scale (you can't input non-scale tones), which can be major, minor, chromatic, blues, whole-tone, or diminished. Each Variation can represent a different scale type, which allows up to four different scales to be accessible instantly without changing the Vocalist programs.

You can designate which chord tone you're singing, e.g., the third or fifth of the chord the Vocalist builds. The Variation keys also can be useful here. For instance, you could assign Variation 1 to build seventh chords in closed harmony, using the notes in a Cm scale, with two harmonies above and one below (the fourth harmony would be turned off) and the sung input note as the third. Singing a G would produce a root-position Eb maj7 chord, with the Vocalist creating an Eb below the input note and Bb and D above. In Variation 2, the sung note could be the fifth of an open voicing, with a completely different set of parameters. Alternatively, as with Chordal mode, you can use the Harmony Edit page to edit the harmonies in detail, defining note-by-note the specific chord (within the selected scale) that will occur for each input note.

The No-Change and Slur features mentioned earlier also are available in Scalic mode. If the Vocalist receives a pitch at its input that is not in the currently selected scale, No-Change allows the non-diatonic note to retain the harmony of the previous scale tone. If Slur is used, the unit smoothly bends the pitch of the input signal up to the nearest scale note.

VOCODER MODE

In Vocoder mode, the Vocalist samples the input note, pitch-shifts it to a note determined by incoming MIDI Note On messages, and adds harmonies. There are three submodes: Mono, Doubled, and Normal. In Mono mode, a single harmony note is generated, the pitch of which is determined by a note played on a MIDI keyboard. All four harmony outputs produce the same note, but Vibrato and Detuning can be added separately to each output. In Doubled mode, two keyboard notes produce two doubled harmony notes. Normal mode allows four keyboard notes to produce four harmony notes.

The harmonies can be transposed by plus or minus three octaves, relative to middle C. If no transposition is selected, the Vocalist's Auto function chooses the octave closest to the voice input. A MIDI keyboard split option allows a range of MIDI note numbers above or below a specified key to be ignored, leaving those keys on the MIDI controller available for other tasks.

The use of the term vocoder is misleading here. It pitch-shifts but does not perform real vocoding.

PITCH CORRECTION MODE

Pitch Correction mode does not produce harmonies, but simply shifts the pitch of the incoming vocal. In one submode (which is unnamed, but could be thought of as Pitch Redirection), the input note is shifted to the pitch of a note being played on a MIDI controller or the Vocalist's keyboard. In Auto Pitch Correction, the sung note is shifted to the nearest scale tone, without MIDI input.

Portamento Attack and Release parameters control how fast the Vocalist shifts the sung note to the pitch being played on the keyboard and how fast it returns to its actual pitch after the MIDI note is released. The keyboard split functions exactly as it does in Vocoder mode.

SPECIAL FEATURES

The Vocalist offers several special features that add to its accuracy and usefulness. For more sonic depth, it supplies variable amounts of Vibrato, Portamento, and Detuning (±25 cents) to its harmonies. However, these can be dangerous if the vocal being processed is not consistently in tune, since they tend to exaggerate slight fluctuations in a singer's pitch.

A keyboard and tone generator provide a pitch reference for the singer. This makes sense, especially since the Vocalist is extremely precise with regard to pitch-tracking, making it important to provide an accurate input pitch. The feature is accessed in Utility mode, which also contains the MIDI parameters, master tuning control (adjustable in cents), harmony gate threshold (for adjusting input sensitivity), and a parameter called "Ess Sensitivity." The latter parameter finetunes the Vocalist's sensitivity to sibilant sounds, acting as a de-esser, since harmonizing sibilants can sound horrible.

For live performances, the Vocalist provides a Song mode, in which a specific chain of up to 32 harmony programs can be arranged in a chain for recall from an optional footswitch. In this way, the correct harmonies for each song in a set could be worked out in advance and recalled easily onstage. One song list can be stored with each program.

MIDI IMPLEMENTATION

The Vocalist has a fairly good MIDI

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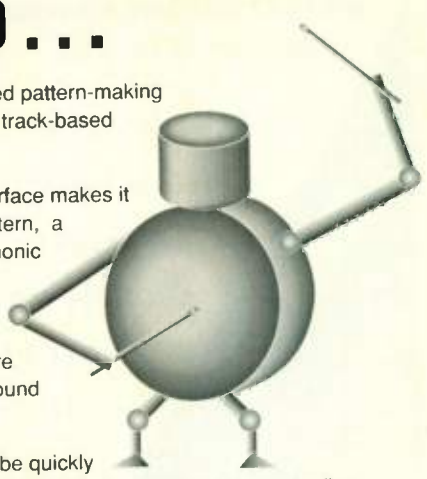

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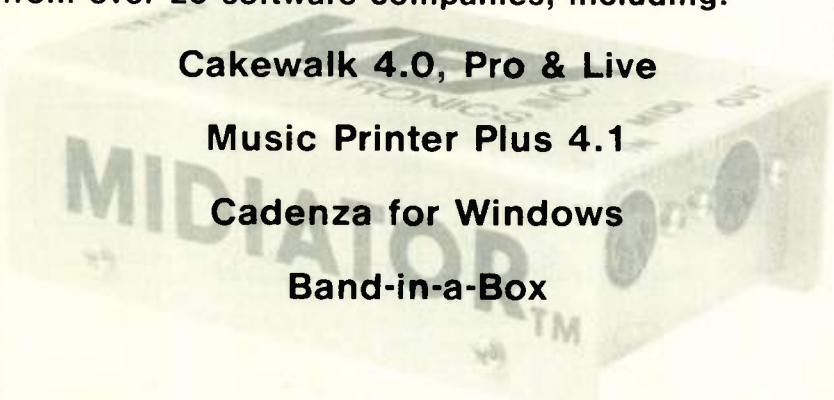

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implementation. Incoming Program Changes can select programs directly, or be remapped through a program map in the MIDI Parameters menu. A second program map simultaneously remaps incoming Program Changes while it transmits the new Program Changes to other devices down the MIDI chain.

The Variation and Key of a VHM-5 program also can be switched via Program Changes, or in response to MIDI Note On messages. The latter option can be extremely useful for making the unit "follow" a piece of music in live performance and opens up many self-accompaniment possibilities for singers. Because the VHM-5 responds to incoming MIDI data "on the fly," a singer can control the backup vocals from a MIDI controller, allowing spontaneity in a performance (or studio) context.

Continuous Controller messages provide real-time adjustment of parameters such as detuning for each harmony note; vibrato speed, delay, and depth; harmony volume levels; portamento parameters; and Pitch Randomization. Finally, System Exclusive program dump commands allow VHM-5 programs to be archived on a computer, sequencer, or MIDI data filer.

SWEET HARMONY

One of the more eyebrow-raising claims made by DigiTech in the VHM-5's advertising and owner's manual is that it produces "vocal harmonies that sound completely natural, even when shifting through large intervals up to an octave." As it turns out, the Vocalist does not disappoint.

I tested the unit with four different singers whose voices varied from high and breathy to low and strong. Surprisingly, the VHM-5 responded unflinchingly, harmonizing each singer smoothly. However, the real surprise was the sound of the harmonies themselves. Although I'd be hard-pressed to say that the Vocalist sounds exactly like four singers singing right along with you, the quality of its harmonies is unquestionably cleaner and more natural-sounding on the human voice than any other harmonizer I've heard. Only in the extreme upper and lower ranges did the Vocalist's harmonies sound noticeably unnatural.

Another remarkable thing about this box is its tracking speed: There was no noticeable tracking delay on the VHM-

5's harmonies. This is a characteristic found only on expensive devices such as the Fairlight Voicetracker and IVL Pitchrider. There is something uncanny about the way the Vocalist follows a singer; it always seems to be "right there." Be warned, however: Since this unit tracks pitch accurately, it can make even small tuning errors noticeable if you don't use its pitch-adjustment/ compensation features. Of course, this is not a problem with the unit; it simply forces the singer to be extremely pitch-conscious.

The VHM-5's sound quality is quite good. Although the unit generates some audible background hiss, it didn't prove objectionable and was no worse than other signal processors in this price range. In recording situations, it would be easy to gate the outputs if necessary (recording engineers often do this even with high-end processors).

CONCLUSION

Between its MIDI control capabilities and built-in harmonization options, the Vocalist packs a lot of power into a small package. It breaks new ground with the high quality of its pitch-change circuitry and does so for a relatively low price, considering its sophistication. At $849, it probably is not a box every musician can afford to rush out and buy, but its flexibility and ease of use make it a must-hear. You may find yourself inventing reasons why you can't live without one.

Doepfer LMK3 MIDI-Masterkeyboard

By Steve Oppenheimer

When is a two-handed keyboard player like a famous milkman?

Occasionally, a product has me debating like Tevye, the milkman from *Fiddler on the Roof*: "On one hand...but on the other hand...." For example, German keyboard manufacturer Doepfer implements a pleasing array of features in its LMK3 MIDI keyboard controller, but then

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PETER DIGGS

The highlights of the Doepfer LMK3 MIDI controller include a good 88-key weighted action and an affordable price. On the other hand, the manufacturer has made a host of unfortunate design decisions.

diminishes their value with incomprehensible design decisions.

A CASE IN POINT

At 61 × 10 × 3.5 inches, this is one of the longest, narrowest, thinnest 88-key, weighted controllers I've seen. It had to be shoehorned into its niche in the studio. Doepfer appears to have gone to extremes to reduce width and depth, but I would much prefer a shorter, wider unit with the display and buttons conveniently located front and center.

On one hand, the LMK3 is built into a road case. Unlike most similarly encased music equipment, only the top quarter-panel comes off, exposing the keyboard and controls (see photo). There is an aluminum rim where the panel attaches above the keys, but I doubt it will bite your fingers unless you get awfully rowdy.

On the other hand, all the MIDI, footswitch, and power jacks are exposed on the rear panel. If you're unloading the equipment truck and put the unit down by its handle, its unrecessed, uncovered jacks hit the ground, encountering asphalt, dust, mud, water, snow, or other unfriendly substances.

The U.S. distributor, Cedos Corp., says the next Doepfer keyboard will have covered jacks, which should be a big improvement. There's one other case-design choice that was a first for me: Two thumbscrews hold the keyboard in place for transporting by truck, train, etc., and must be removed (and securely stashed) before playing. You probably could move the LMK3 to a local gig without the screws, but then the keyboard rattles around in the case, and I wouldn't take the chance. This so-called road/flight case easily wins the EM Boo-of-the-Month award.

The LMK3's rear panel provides a jack for an optional, normally-closed (Yamaha-type), double footswitch. An upcoming software revision will let the keyboard sense and accept either normally-open or normally-closed footswitches. Also on the rear are MIDI Out and In jacks (the latter for SysEx loads only), an optional CV pedal, a barrel connector for the "wall wart" power supply, and a 3-pin XLR power connector. The external supply was chosen so the product could ship worldwide regardless of differing local voltage and plug standards. According to the manual, a power supply and XLR plug are included, but they weren't with the review unit. A Cedos representative later sent along a standard Radio Shack supply, which worked fine. There is no power switch.

According to the manual, connecting footswitches and pedals with the power on could deep-six the presets, but your intrepid reporter tried it and encountered no problems.

USER INTERFACE

The tactile interface—the keyboard

action—has a good, firm feel, with a shallow keybed and fast action, rather than the deep key-travel favored in many 88-key, weighted controllers. Although I prefer a bit deeper action, once I got used to the LMK3's touch, it worked fine for piano samples and synth sounds alike.

The programming controls are on a single panel to the extreme left of the keyboard, which explains the unit's over-extended length and compact width. Three rows of eight 3/8 × 1/4-inch, rectangular buttons, marked Menu, Bank, and Number, provide access to the 64 program locations (eight banks of eight programs) and various parameters. A row of status LEDs shows which menu is selected.

The control panel holds two programmable sliders at the far left, a rotary data-entry pot, and two programmable wheels. The spring-loaded pitch bend wheel is to the right of the mod wheel, which is counter to tradition but closer to the action. The wheel's spring is rather stiff, making it difficult to achieve smooth, even pitch bends.

On one hand, most LMK3 parameters are easily accessed with its relatively simple menu and page layout. (One menu is a grab bag of leftover features.) On the other hand, programming the LMK3 literally can be a pain in the neck. Because the green LCD display is located at the far end of the keyboard, instead of the center, it is unreadable (despite the contrast and brightness set-screws) unless you crane your neck well to the left or move far out of playing position.

Worse, the miniscule parameter buttons are inconvenient when you have plenty of time and all but unusable in a

Product Summary

PRODUCT:
Doepfer LMK3 MIDI-Masterkeyboard
PRICE:
$1,595
DISTRIBUTOR:
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DOCUMENTATION	● ● ● ● ◖
VALUE	● ●

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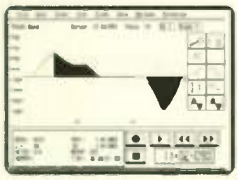

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fast-paced environment such as the stage. You'll miss as many button-pushes as you make. Even if relocated, the buttons should be enlarged.

The documentation is reasonably clear and quite thorough. The System Exclusive implementation is documented in detail, and Doepfer thoughtfully provides a quick-reference table of parameters. There is no index, but the way the book is organized, an index seems unnecessary.

Around the time this issue went to press, Doepfer released editing software for the LMK3 and Atari ST. The company is developing a version for PC-compatibles but has not announced LMK3 editors for the Mac or Amiga.

PRESET PARAMETERS

On one hand, you can control a lot of MIDI events with the LMK3. The keyboard can be split into eight floating, overlapping zones with independently programmable top and bottom notes. Each of eight MIDI controllers—an optional CV pedal, two wheels, two sliders, a data-entry wheel, channel aftertouch, and velocity—can be programmed to send either Pitch Bend, Aftertouch, Mod Wheel, Breath Controller, Portamento, Data Entry, Volume, Pan, or a user-defined controller message. You can define up to eight custom controller messages, one for each controller. Of course, when a preset is called up, each zone can send Program Change and Volume commands on its MIDI channel.

On the other hand, although you can turn each controller on or off in each zone, you can't map a controller to perform different functions in each zone of a preset; as goes zone 1, so go the rest. In the studio, you can get around this design by remapping controllers, but it's a pain when playing live.

For instance, say you're layering two sounds from different sources into a fat pad and want to make simultaneous, but distinct, changes in the two instruments. Perhaps you need to bring in different sample layers in an Ensoniq EPS or VFX sound, using Patch Select messages (user-defined controller 70), while opening a filter on a layered analog synth using Mod Wheel (Controller 1) messages. The easiest way would be to define a single controller, such as a slider, to send different messages in each zone. But you can't do that with the LMK3 because, according to the Doepfer manual, "It certainly wouldn't make sense if the same controller simultaneously had two different functions in two different keyboard zones of the same preset." Well, it makes sense to me.

Either pedal in the optional double-footswitch can send Sustain, Portamento On/Off, Soft Pedal, and Sostenuto, or can step through a user-programmed chain of linked LMK3 presets. The displayed preset numbers are from 01 to 64, but you select them by hitting Bank keys 1 through 8 and Number keys 1 through 8; thus, you type "88" when you want preset 64. If practicing multiplication when setting up presets turns you on, you'll love this feature. Alternatively, you can dial the preset number with the Data Entry wheel.

Each zone is assigned one of eight aftertouch curves and one of 32 velocity curves, a sufficient selection for most purposes. A Velocity Split (velocity-switching) function, selectable for each zone, lets you set a Velocity threshold above which the MIDI channel of a zone is bumped up by one. For instance, when the Velocity exceeds the threshold, data in a zone assigned to MIDI channel 2 is sent on channel 3 instead.

GLOBAL PARAMETERS

Several global functions located in the Parameters menu add an extra edge of control. An Aftertouch-to-Pitch parameter, operative only when aftertouch is mapped to Pitch Bend, determines whether pressure yields positive or negative bend in all presets. An unusual and surprisingly useful Scale Black parameter lets you reduce the velocity sensitivity of the black keys, scaling them relative to the white keys. The Parameters menu also contains the preset dump and load commands that permit transfer of individual, or all, presets via MIDI System Exclusive. The LMK3 doesn't store SysEx for external equipment, though.

In the Real-Time menu, you can send Start, Stop, Continue, and MIDI Clock (50 to 254 bpm) messages from the control panel, if you're able to grab the little buttons. Fortunately, you can step through linked program changes with a footswitch and can save any Real-Time menu command with the preset. Program changes can be accomplished from the front panel only when you are in the Preset menu, which limits the live use of the Real-Time menu.

On one hand, a Panic button is a welcome feature; on the other hand, the

Doepfer designers are victims of fuzzy thinking in its implementation. Hitting the Panic Button sends Controller Reset and global All Notes Off commands on the global MIDI channel and sets up the eight Bank buttons and eight Number buttons as pseudo-panic buttons. These sixteen buttons send 128 Note Off commands on MIDI channels 1 through 16.

The manufacturer says that to use a single button to send all 2,048 Note Off commands along with the global All Notes Off and controller resets would cause MIDI overflow in most MIDI instruments. If the button sent all the messages at the same instant, of course, this would be true. But if the Panic button did what it *ought* to do, sending the global messages and channel Note Off messages sequentially, rather than all at once, no such problem would occur. As it is, you have to guess which channel the stuck note is on and nail its little button, or slide your finger across all sixteen buttons to ensure getting the right one. When stuck synths are howling, this could make you crazy enough to smash things.

NO OTHER HAND

I wanted to like this instrument unconditionally, but I encountered a design philosophy I couldn't fathom any more than Tevye could fathom the ways of God. Considering the price range, isn't it worthwhile to charge a few dollars more and provide a road case that protects the whole instrument, or spend a few extra hours designing a proper Panic button?

On one hand, if you only use the LMK3 in a well-equipped studio environment, some of my gripes, such as controller assignments that are the same across all zones and dumb case design, cease to be major issues. On the other hand, the location of the LCD and the tiny buttons are a drag for all applications. Besides, if the LMK3 wasn't meant for live performance, why was it built into a road case to begin with?

If the keyboard *was* designed for live work, somebody at Doepfer needs to do a lot of rethinking about the performer's needs. On one hand, it's relatively portable and has a nice touch and some good features. On the other hand, the manufacturer made some poor design decisions, and the product is unnecessarily flawed.

On one hand, with a few significant improvements, the LMK3 could do the

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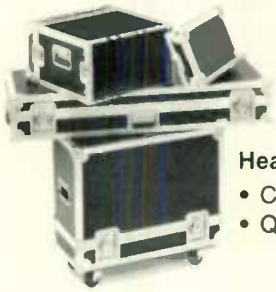

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job. Hopefully, the LMK4, if and when it appears, will address many of my complaints. But as for the current version, as Tevye sadly concluded, sometimes there is no other hand.

Steve 0 *is in search of the ideal 88-key, weighted master controller. On the other hand, he'll probably go the traditional* **EM** *route and modify a likely candidate.*

Piano Proficiency Software (PC)

By Sheila Waxman and Dennis Miller

Three piano-instruction programs employ contrasting methods.

Self-help music-education software has been around for some time, but the new breed of computer-assisted learning tools offers much greater power and flexibility. Three new IBM-based releases, *Miracle Piano Teaching System* from The Software Toolworks, *PianoWorks* from Temporal Acuity Products, and *Fast Fingers MIDI Keyboard Lessons* from Fast Fingers Music Software provide interactive piano instruction for the home or school user. Using dissimilar approaches, each can keep you busy for a long while.

The three programs work under a basic assumption: If a stimulating visual work environment is provided, much of the chore of acquiring piano proficiency can be eliminated. All three set clear, reasonable goals that should be manageable for the disciplined user. Two of the programs, *Miracle Piano Teaching System* and *PianoWorks*, provide you with enough material to acquire Level 1 piano proficiency, which includes pitch-recognition in treble and bass clefs, simple rhythm reading, performance of major scales, and playing basic triads. These two (especially *PianoWorks*) also include enough music theory exercises to help you learn intervals and many standard music symbols.

Fast Fingers has less ambitious goals—it won't teach you much about theory or rhythm—but allows you to acquire

excellent keyboard facility for both classical and jazz playing.

To use any of the programs, you'll need an IBM or compatible with at least 640 KB RAM, a graphics adapter (color for *PianoWorks* and *Fast Fingers*), and a hard disk for *Miracle* and *PianoWorks*. You also need your own MIDI keyboard to use *PianoWorks* and *Fast Fingers*. *Miracle* offers mouse support, but since it uses the computer's serial port, if you only have one serial port, you'll probably have to unplug your mouse. *Fast Fingers* currently requires an MPU-401 or compatible MIDI interface (a future upgrade will support the Brown-Waugh SoundBlaster Pro), while *PianoWorks* supports Voyetra's VAPI MIDI drivers, the SoundBlaster Pro, Covox's Soundmaster 2, MPU-compatible interfaces, and the Covox PC MIDI card, which can be ordered with the system.

IT'S A MIRACLE

First up is the *Miracle Piano Teaching System*, from The Software Toolworks. At $479.95 for the IBM-based version (there's a less expensive version for the Nintendo system), it's the most expensive of the group, but because that price includes a multitimbral MIDI keyboard, its price is not out of line.

The 4-octave, velocity-sensitive keyboard has MIDI In and Out ports (but no MIDI Thru); can be split into two zones, divided at middle C; and can be used as a stand-alone controller. The *Miracle* software does not communicate with the keyboard via MIDI, however, but through a separate cable that connects to the PC's serial port. The stereo outs are RCA jacks, indicating that the system is designed for use with a home stereo system, although speakers are built into the keyboard and an 1/8-inch mini jack is provided for headphones. The footswitch jack connects to a funky little plastic sustain pedal. Unfortunately, the keyboard does not have a display.

The keyboard's 16-voice polyphonic, 8-part multitimbral sound source plays back 8-bit stereo, PCM-sampled sounds, sampled at various rates. The patches cannot be edited. Some patches use two sounds, reducing polyphony to eight notes, and samples of acoustic instruments that are not velocity-sensitive (e.g., pipe organ and harpsichord) do not respond to velocity data. The acoustic instrument emulations sound pretty weak (especially the piano and strings), but for basic instructional purposes, they get the job done. The non-acoustic synth sounds are more respectable.

Patches are accessed in two ways, both of which require the use of a plastic overlay that changes the labels under the front-panel buttons. The first method, which allows access to 45 of the 128 patches, arranges the patches into stylistic categories such as classical, jazz, rock, and blues. Each category comprises five banks—Melody 1, Melody 2, Accompany, Bass, and Percussion—with nine tones available in

FIG. 1: The *Miracle Piano Teaching System* presents concepts using text and musical examples.

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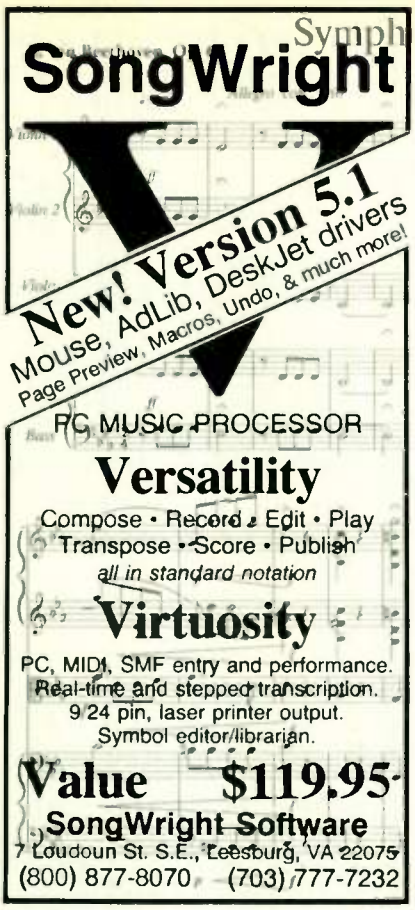

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each bank, which are selected with various button combinations indicated on the plastic overlay. The category assignments appear somewhat arbitrary, and I don't see a great advantage to this arrangement.

The second option is to enter Library mode by pressing the Select and Scroll Up buttons, then directly select any of the 128 sounds. Without an LED display, it's easy to get hopelessly lost in this mode, but hitting the Select key again brings you back to patch 0. All 128 sounds also can be accessed via MIDI Program Change commands.

MIRACULOUS PROCEDURES

After a simple setup routine, you move directly to the program's main screen, which contains six windows representing the central areas of the program: Classroom, Arcade, Studio, Administration, Performance Hall, and Practice Room. Each of these, with the exception of Administration and Studio, provides different types of interactive exercises, and during the course of a lesson you'll move seamlessly from one to the next.

First-time users can select Classroom for a brief tour of the *Miracle* and an explanation of how the course proceeds. Then you're ready for the first lesson of Chapter 1, which covers navigating around the keyboard and identifying a few pitches.

The interactive process is simple: Miracle presents you with information by displaying text and/or music and prompts you to respond using the keyboard controller. If you play correctly, you automatically move on to the next exercise. If you err, either the program won't advance, or it will suggest ways to improve your performance. When you are given multiple screens of text to read, you advance using either the computer keyboard, or the sustain pedal, a handy option that keeps you from constantly moving between the two keyboards.

Once the first group of exercises are completed, the program advances to the Arcade, which offers games that reinforce what you've learned. The best of these is the Shooting Gallery, where you knock moving ducks off the staff lines by playing the correct notes. As with other areas of the program, the graphics are excellent. The Shooting Gallery soon became a favorite part of the program, and we looked forward to returning to it with each new chapter.

When you're done in the Arcade, it's back to the Classroom to start work on the actual piece associated with this chapter. Herein lies one of the best things about the *Miracle Piano Teaching System*: You're always working toward a musical goal. The program teaches you to play real music, not just arbitrary exercises, and there are dozens of pieces from which to choose. It keeps your interest level high, and since you stay motivated, you're more than likely to reach the program's goals.

After finishing the next exercises in the Classroom, it's on to the Practice Room. Like a good teacher, *Miracle* now separates the rhythmic aspects of the piece from the notes and allows you to practice each independently. The error checking seems more rigorous here (there's a "weighted error" system in place that sets the tolerance threshold), and the program proffers an exact count of how many mistakes you've made. If necessary, you're given several more opportunities to improve your performance before moving to the Performance Hall to rehearse and, finally, perform your piece with a multipart accompaniment.

You don't have to follow the path *Miracle* chooses and can move to any area of the program simply by choosing it from the main screen. If you stick with the plan, though, you move gradually through single-note melodies, to two-hand playing in different keys, and beyond, while learning important musical concepts, with lots of reinforcement

Product Summary

PRODUCT:
Miracle Piano Teaching System
PRICE:
$479.95
MANUFACTURER:
The Software Toolworks
60 Leveroni Court
Novato, CA 94949
tel. (800) 234-3088
or (415) 883-30000

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ●
EASE OF USE	● ● ● ● ◖
DOCUMENTATION	● ● ● ◖
VALUE	● ● ● ● ◖

and occasional quizzes along the way. According to the manufacturer, the entire course will take from six months to a year to complete. That seems about right by our estimation.

Miracle's two other modules are Administration and Studio. Administration provides lots of basic housekeeping options such as adding (up to the maximum disk space you have available) and deleting users, setting default metronome and accompaniment volumes, and viewing or printing progress reports. It's all well-organized and provides every type of information you need. The Studio is a basic 8-track MIDI sequencer used to record your performances from the Miracle keyboard and play them back. You can load and save songs to and from disk as Standard MIDI Files, mute or erase tracks, adjust volume and tempo, and assign instruments and select patch numbers for each track, but there are no other editing capabilities.

Miracle has excellent record-keeping and always knows where you left off, even if you quit a lesson in mid-stream. Online help is always available, and its manual is well-organized, though lacking in detail about the objectives of each lesson. The program is full of visual and aural cues to keep you moving in the right direction, and it constantly changes teaching styles to keep you from getting bored.

As good as the *Miracle Piano Teaching System* is, we have several minor complaints. First, the musical selections are short, usually no longer than a minute. While that's good for beginners, it would be nice to have a few longer pieces, or at least some sort of repeat function when performing. Along similar lines, we'd like to have some printed music for additional practice of the selections. Finally, adult users could get bored with the nursery songs that appear in the lessons; the second chapter in the adult sequence, for example, is "Mary Had a Little Lamb." Though a wide range of pieces are included with the system, we think more appropriate selections could be chosen for the lessons.

PIANOWORKS

Temporal Acuity Products (TAP), publisher of the popular notation program *MusicPrinter Plus*, is well-known for its music-education software. Its current offering, *PianoWorks*, is a well-organ-

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ized, interactive system for acquiring piano proficiency, with a good dose of basic theory and ear-training skills thrown in. It's aimed at students of all ages and could work well both as an adjunct to a piano class or private studio instruction, or for the self-directed home user. The system is closely integrated with Book 1 of the *Alfred Basic Piano Library*, a popular pedagogy method that is included with the package. *PianoWorks* is offered in two versions: an Independent Study version that will track up to five users, and a customizable School/Studio version able to handle 100 users. The single-user package sells for $129 ($195 with a MIDI interface), while the School version lists for $295.

PianoWorks installs quickly and easily. The program is organized like a traditional classroom lesson plan and contains eight Units, each of which consists of several dozen lessons each. Each lesson supplies exercises that reinforce basic concepts of piano playing and music theory. The exercises take various forms, including multiple-choice questions, flash cards (see **Fig. 2**), and rhythmic pattern-matching. As with the *Miracle Piano Teaching System*, the exercises are seamlessly connected, and you move through them by answering correctly. With the TAP system, however, although you can repeat lessons or exercises at will, you must complete the lessons in order. As with the *Miracle*, you don't have to use the computer keyboard to give replies but can answer all questions and advance directly from the MIDI keyboard.

Work begins by assigning a starting

Product Summary

PRODUCT:
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PRICE:
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$195 (with Covox PC MIDI card)
$295 (School version)
MANUFACTURER:
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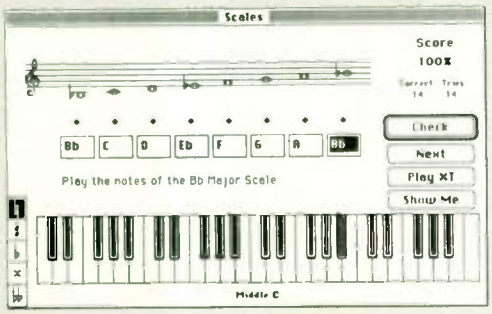

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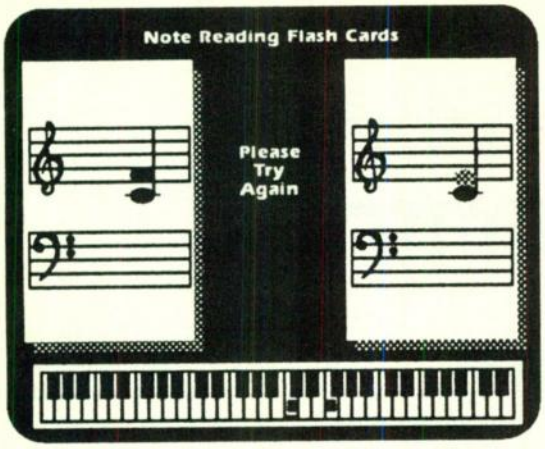

FIG. 2: In *PianoWorks'* flash card note-reading exercises, the program gives feedback by showing the correct notes on a grand staff and onscreen keyboard.

Unit to a new user in the Manager Options screen. The program proceeds to the first few exercises, which cover note names, finger positions, and keyboard navigation. At every stage, the program tests you to ensure that you're clear on the concepts, and it continuously reinforces basic ideas by presenting you with the same material in different formats. While working, it's a good idea to keep the Alfred book around, as *PianoWorks* frequently refers to supplemental musical examples in the book.

As each lesson progresses, *PianoWorks* presents concepts, waits for a reply, and gives appropriate feedback. When you're asked to play some notes, for example, it shows what you played and indicates the errors. In other cases, such as the multiple-choice questions, the answers are either right or wrong, so the program simply asks you to do the incorrect part over again.

The only area where more feedback would be useful is in matching rhythmic patterns, a type of exercise in which the student plays a pattern shown on the screen while the computer draws a bar across the screen representing the performance. The student can see each note's attack and duration and decides whether the performance was good enough. But a "perfect" attack (i.e., precisely on the beat) usually isn't desirable in a performance unless you want a mechanical, quantized feel. It would be nice if the program guided the student by delineating a range of acceptable variation from perfection.

PianoWorks' interface is a bit more austere than the *Miracle Piano Teaching System*; no flying ducks here, just the general business of piano playing. That's not a bad thing, but it demands a more disciplined student. The program has excellent record-keeping and can print or display progress reports in various formats, allowing the user to check overall progress at any point. There's no online help, but the manual is clear and well-organized and gives a good idea of the goals for each unit and the best way to reach them. The manual also contains a good overview of MIDI, enough to handle the most common problems that might occur while setting up the system.

FAST FINGERS

Fast Fingers represents a far more basic approach to the process of learning at home. Its goal is to increase finger dexterity through scale, chord, and arpeggio drills in every key. It provides feedback in the form of visual cues that display the notes being played, and a Correct Note report tells you how accurately the performance tests were played (see **Fig. 3**). Though the program's graphics look dated, the single screen display is uncluttered and contains everything required.

The *Fast Fingers* system consists of individual modules, each with a different collection of exercises. Volume I, for example, covers major scales, arpeggios, and triads; Volume II covers traditional and jazz minor scales, triads, and arpeggios; and Volumes III and IV are devoted entirely to jazz modes and chords, respectively. Each module sells for $49.95. Unlike the other systems, there's no fixed time frame to finish, as each module is continually revisited.

To start a session, load a module and choose an exercise. The program immediately displays the pattern you're going to work on, in the key of C. Key changes are accomplished by hitting the "K" key (not a bad way to learn key signatures), and all other commands use similar one-keystroke mnemonics. Unfortunately, you only can initiate commands or advance the exercises by using the computer keyboard; if your computer keyboard and MIDI con-

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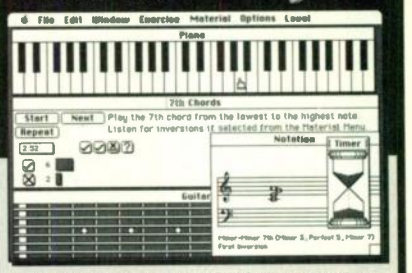
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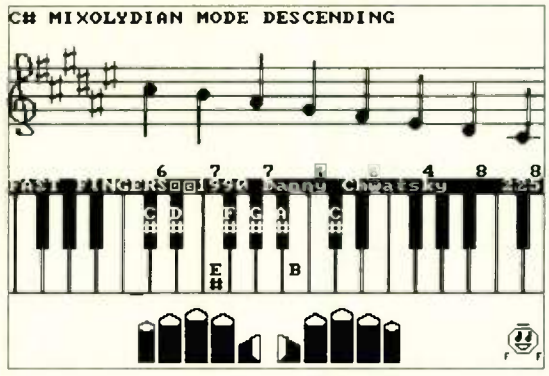

FIG. 3: *Fast Fingers'* single screen, showing a descending C# mixolydian scale from Volume III (Jazz modes). The numbers above the keyboard indicate how many times the user played each note correctly in eight attempts.

troller aren't adjacent, this means a lot of jumping around.

Once an exercise is chosen, pressing the "G" key initiates playback of the pattern via MIDI, at a user-defined tempo. The student plays the part simultaneously with the program. It's distracting to hear the computer playing while you're supposed to play the same part on the same synth; we'd rather be able to toggle computer playback off and on. That's not possible, but you can accomplish the goal indirectly by going into the Options menu and selecting an unused MIDI channel for computer playback.

Fast Fingers doesn't use the standard numbering scheme to designate fingerings, but displays a graphic image of two hands on the screen. As an exercise plays, the proper finger for each note lights up, and in some cases, you can choose an alternate fingering. While this display is clear, we found it a little hard to watch the fingers light up and follow the notes on the staff at the same time. The program also displays all chordal examples using a single stem on a single staff, even if the particular chord only can be played using two hands. That's not exactly sound pedagogy! Another minor nuisance is that chords are not always evenly spaced across the screen, even though the duration of each chord is meant to be the same (a quarter note).

Fast Fingers doesn't have any record-keeping; it doesn't know who's using it, or (other than the Correct Note report) how well the performer is playing. There's no online help, but the commands are intuitive. Despite its shortcomings, the benefits of playing through so many finger exercises is clear. Teachers who love drills should find this simple and direct approach a

Product Summary

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or (516) 536-0298

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FEATURES	● ●
EASE OF USE	● ● ● ●
DOCUMENTATION	● ● ●
VALUE	● ● ● ◖

good adjunct to the studio lesson. The weekend warrior who wants to become fluent in scales, modes, and chords should find *Fast Fingers* ideal. Most technique books, of course, include lots of different exercises, not just scales and arpeggios, and it would be nice to see more variety in the program's examples.

CONCLUSION

Learning piano, especially for an adult beginner, can be intimidating. By enlivening the atmosphere and providing immediate and positive reinforcement, these three programs make the challenge less daunting and the process less tedious. *Miracle* and *PianoWorks*, in particular, with their emphasis on playing musical pieces, offer the sort of training you'd get in a beginning class, while *Fast Fingers* provides enough material to build a solid technique.

All three programs have notable limits. Unless you have an excellent, weighted-action controller, you won't get the finger strengthening benefits a real piano provides. The programs can't evaluate quality tone-production, either. As a result, your ear does not become sensitive to the evenness of playing or tone-matching necessary to good playing.

If the programs gave detailed feedback in response to MIDI Velocity, these concepts could be better addressed. (The *Miracle* program tells you to stop banging on the keys but doesn't comment further regarding tone production.) On the other hand, music theory and ear-training, components often omitted from beginning lessons are well-presented by *PianoWorks* and *Miracle*, and to some extent *Fast Fingers*. That represents a real bonus to the student.

The benefits of interactive software and the growing sound capabilities of multimedia systems offer tremendous potential for educational music software. These three programs have a jump on the pack and can get you started in the right direction. If you've got the discipline to do it yourself, give one of them a try.

Dr. Sheila Waxman *is educational marketing director and digital piano specialist for E.U. Wurlitzer in Boston.* **Dennis Miller** *is on the music faculty of Northeastern University.*

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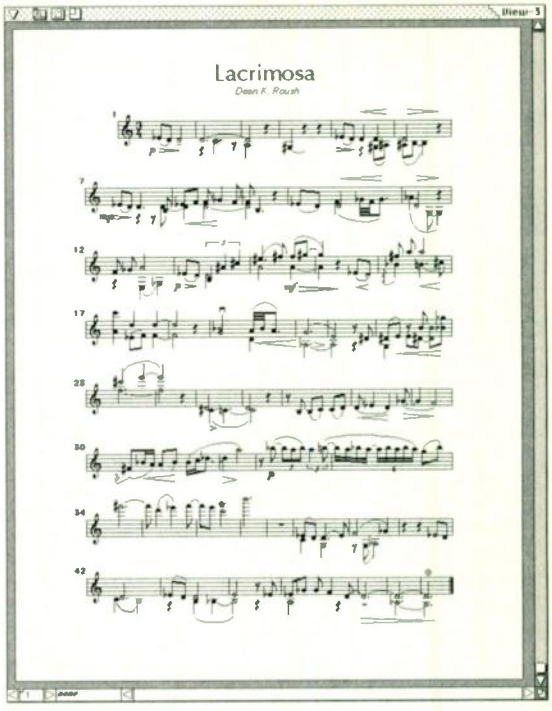
 (continued from p. 25)

presentation. Unlike other authoring tools, however, *Producer* allows you to accurately integrate MIDI sequences with 16-bit digital audio files, using SMPTE as a time base. While capable of functioning on its own, the program seems better-suited to working with imported data created by other MIDI sequencers and hard-disk recording systems. *Producer* is structured around a Visual Cue Sheet that you use to place the various data types along a timeline. It then functions as a scheduler, ensuring that MIDI Files or single MIDI events, multiple digital audio files, and more happen in a synchronized fashion. The program also controls attached CD-ROM drives and video equipment via Sony's VISCA media-control language.



Mark of the Unicorn *Composer's Mosaic*

In other Passport news, ***TurboTrax*** ($129) is an enhanced version of the company's introductory sequencer program for the Mac and PC. *TurboTrax* adds a MIDI Mixer screen, an animated MIDI Jukebox, and a selection of QuikTunes Standard MIDI Files. Passport also announced ***MusicTime*** ($249), a simplified notation program based on *Encore* that provides standard music notation on the Macintosh or PC-compatible computers running *Windows*. Music can be recorded in real time or step time, entered with the mouse, or imported as a *Master Tracks Pro*, *Trax*, or Standard MIDI File. The program handles up to six staves and provides comprehensive editing and playback capabilities. In addition, the PC version supports the Microsoft *Multimedia Extensions* and all compatible interfaces and sound cards.

The big news in Mac notation software came from Mark of the Unicorn. The company's new ***Composer's Mosaic*** ($595) offers an intuitive interface for creating anything from lead sheets to complex orchestral scores with individual parts. *Mosaic* uses a "click-and-drag" philosophy for adjusting individual music symbols and overall page-design elements so scores can be edited easily. The program's current version supports import and export of Standard MIDI Files (with "smart" quantization), but an upcoming version is expected to have MIDI playback of *Mosaic* scores.

Oktal (tel. [514] 738-3000) showcased ***Multitude*** ($395), a 256-track, icon-oriented sequencer for Macintosh, Atari ST/STe/TT, and *Windows*-equipped PCs (80286 or better, with VGA display). The program, which syncs to SMPTE via MIDI Time Code, offers up to sixteen "ghost" tracks (non-editable copies) per regular track, each with its own mute, volume, instrument, cycle, and delay settings, as well as MIDI port and channel assignments. *Multitude* records with 768 ppqn resolution and addresses up to 96 MIDI channels. The program can control the Fostex 280, R8, G16, and G24 tape recorders directly. Other features include real-time MIDI-controller remapping, a MIDI data analyzer, a MIDI SysEx librarian, and on-line help. The Mac version requires a Classic or better, with System 6.0.7 or higher, and is System 7.0- and *MIDI Manager*-compatible.

For multimedia programmers, Voyetra (tel. [914] 738-4500) introduced ***Sound Factory*** ($295), a PC sound-developer's toolkit. This software provides the equivalent of Microsoft's *Multimedia Extensions* for the DOS environment, allowing programmers to control MIDI,

sound cards, digital audio, and CD players from their DOS applications.

Voyetra also introduced *Sound Central* ($199) audio-control software for Multimedia PCs under *Windows* with *MME*. This program provides an ensemble of utilities for controlling every aspect of MPC sound, including digital audio editing, MIDI song-file editing, MIDI mapping, FM editing, CD-player control, and audio mixing of all MPC sound sources.

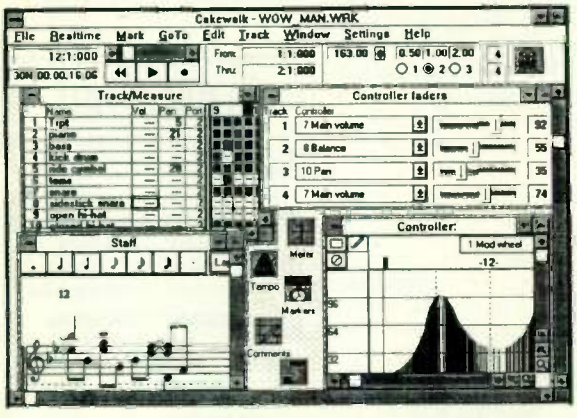
New from Dr. T's (tel. [617] 455-1454) is ***QuickScore Deluxe*** ($149), an entry-level notation program for the PC that allows you to enter notes with a mouse or record them in real time or step time from a MIDI keyboard. This menu- and icon-driven program also can import and export Standard MIDI Files. It handles up to sixteen staves, each of which corresponds to a sequence track, and the display scrolls during playback. The transcription algorithms were derived from the company's *The Copyist* (with some improvements), and a full range of editing functions are provided. Hardware support includes all XT, AT, 80386, and 80486 machines with VGA, CGA, EGA, or Hercules monitors and the Sound Blaster, AdLib, Thunder Board, or Media Vision sound cards, as well as the Key MIDIATOR and MPU-401-compatible MIDI interfaces.

Twelve Tone Systems (tel. [800] 234-1171, or [617] 273-4437) announced ***Cakewalk Professional for Windows*** (price not announced). Aside from offering 256 tracks and all other features of *Cakewalk Professional* for MS-DOS, the new version takes full advantage of the *Windows* environment, with comprehensive editing in standard notation, piano-roll, and event-list formats. The program offers graphic display and editing of MIDI controllers and use of extended memory for large songs and SysEx files. It also implements the Multimedia Command Interface (MCI), allowing you to control other multimedia devices such as digital sound cards and CD-ROM drives. In addition, the program supports any MIDI interface that is compatible with the Microsoft *Multimedia Extensions*, including MPU-401-compatibles and Music Quest MQX interfaces.

Soundtrek (tel. [404] 623-0879) demonstrated ***The Jammer*** ($175) for PC-compatibles with any type of monitor. (No graphic monitors are required, although they are supported.) The program provides a 256-track sequencer, but that's only the beginning. Three different "session musicians" (drummer, bass player, rhythm player) provide an entire arrangement automatically. You can apply any of these virtual "musicians" to any track and modify their performance with many style settings. In addition, a Progression Writer creates a chord progression in any style selected. You can override any of the "musicians" at any time to insert your own musical ideas.

MACWORLD EXPO

A week before NAMM, Macintosh users were treated to the annual San Francisco **MacWorld Expo**. Few new music software products debuted, but in line with the growing interest in multimedia, Opcode (tel. [415] 369-8131) introduced ***Audioshop*** ($89), a combination CD-ROM controller and 8-bit sound-editing program for the Mac. *Audiophile* allows you to create a playlist of CD and disk-based audio selections and offers cut-and-paste editing and simple signal-processing of 8-bit digital audio files. Opcode also introduced ***SOUNDtraK*** (no price yet), a *HyperCard*-based application that allows you to organize and preview clip music in 8-bit audio or MIDI formats. *SOUNDtraK* comes with a CD-ROM containing over 150 songs in each format. The program also allows you to adjust parameters of the MIDI Files via its built-in MIDI mixer and can sync to SMPTE via MIDI Time Code.



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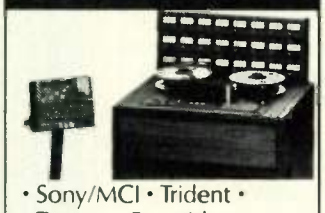

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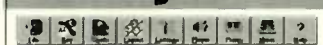

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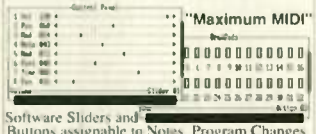

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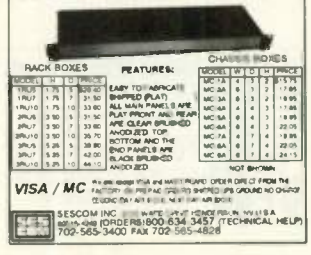

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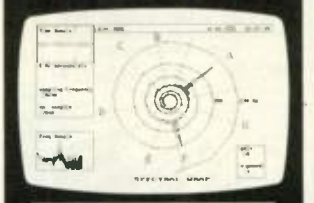

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Music Education as a MIDI Marketplace

Music educators represent a vast market for electronic music equipment, once the right products become available.

By Jack Jarrett

A few years ago, I attended a music educators conference at which a representative of a large music corporation gave a MIDI demonstration. Using a sequencer, he first created a drum track, then added bass and harmony parts, and finally laid down a solo track, thus producing a typical commercial rock composition. After playing the piece, he concluded his presentation with "Ladies and gentlemen, this is the future, and you will have to come to grips with it." Although he was referring to the potential of the technology rather than the music itself, many in the audience came away with the impression that the new technology meant rock and roll music.

Classically trained musicians often feel out of place in rock-oriented music stores where MIDI equipment is sold. Manufacturers of MIDI equipment, in turn, often seem unaware of the existence of classically trained musicians. The truth is, with the possible exception of music notation software, most MIDI products have been designed and sold primarily for the production of commercial pop music, not for the special needs of classically trained musicians and music educators.

Music education and the professional classical music world together represent an enormous potential market for MIDI products, although not necessarily for the kind of products currently being sold. If the MIDI industry wants to tap into this vast market, it needs to begin a meaningful dialog with these professions to determine their needs and what kinds of MIDI products best serve them.

For example, high on my personal wish list is an affordable dedicated orchestral synthesizer that can reproduce the entire range and subtlety of orchestral sounds, all within a unified, balanced, acoustical ambience that satisfies the most discriminating taste of a classical composer or conductor. With such an instrument, educators could provide realistic accompaniments for solo, chorus, and musical theater and could cover missing parts for instrumental ensembles.

Such a device could provide the means for composers to create realistic performances of new works and could be an effective tool for studying musical interpretation and style through actual manipulation of performance. It could provide fledgling conductors and home-hobbyist music lovers with the means to edit and perform their own interpretations of musical masterworks.

Currently, the E-mu Proteus/2 comes closest to being a true orchestral synthesizer, with its excellent battery of percussion sounds and beautiful solo wind and brass patches. It's a fine instrument for its intended market, but its choppy strings and the absence of such sounds as straight-muted brass, muted strings, *sul ponticello*, and *col legno* prevent it from handling most modern orchestral scores.

In general, more focus is needed on accurately reproducing the *sounds*, as opposed to simply the *instruments*, of the orchestra. This includes the ability to produce a sustained legato from note to note following an initial phrase. Nevertheless, the Proteus/2's existence proves that an affordable orchestral synthesizer can be built with current technology.

By establishing a MIDI orchestral specification similar to the current General MIDI spec, such an instrument could be marketed in a variety of quality and price ranges.

With so many obvious applications, why hasn't a true orchestral synthesizer already appeared? To begin with, I think the major synth manufacturers are not yet aware of the potential market for such an instrument. In addition, their orientation is so deeply rooted in pop-music applications that they have not yet formed a vision of the alternative possibilities.

Only a small part of the music-education industry needs sequencers and drum machines. There is great need, however, for MIDI-based, computer-assisted instruction tools to develop basic musical skills, guide and facilitate vocal and instrumental practice, assist performance, provide meaningful exposure to music literature and history, and enhance the traditional, notation-based composition process.

Although the promise of MIDI technology for music education is vast, its realization will depend to a great extent on the ability of MIDI manufacturers to seek out and understand the special needs of music educators and classical musicians. This understanding may, in fact, be the most important piece of music education to take place over the next few years.

Jack Jarrett *is chairman of the composition department at Boston's Berklee College of Music and co-author of Temporal Acuity Products'* MusicPrinter Plus *notation program. He has received Fulbright, Ford Foundation, and Aspen Music Festival fellowships and has been conductor of the Richmond, Virginia, symphony orchestra and opera.*

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