Multimedia Windows • MAX Programming • 8 In-Depth Reviews

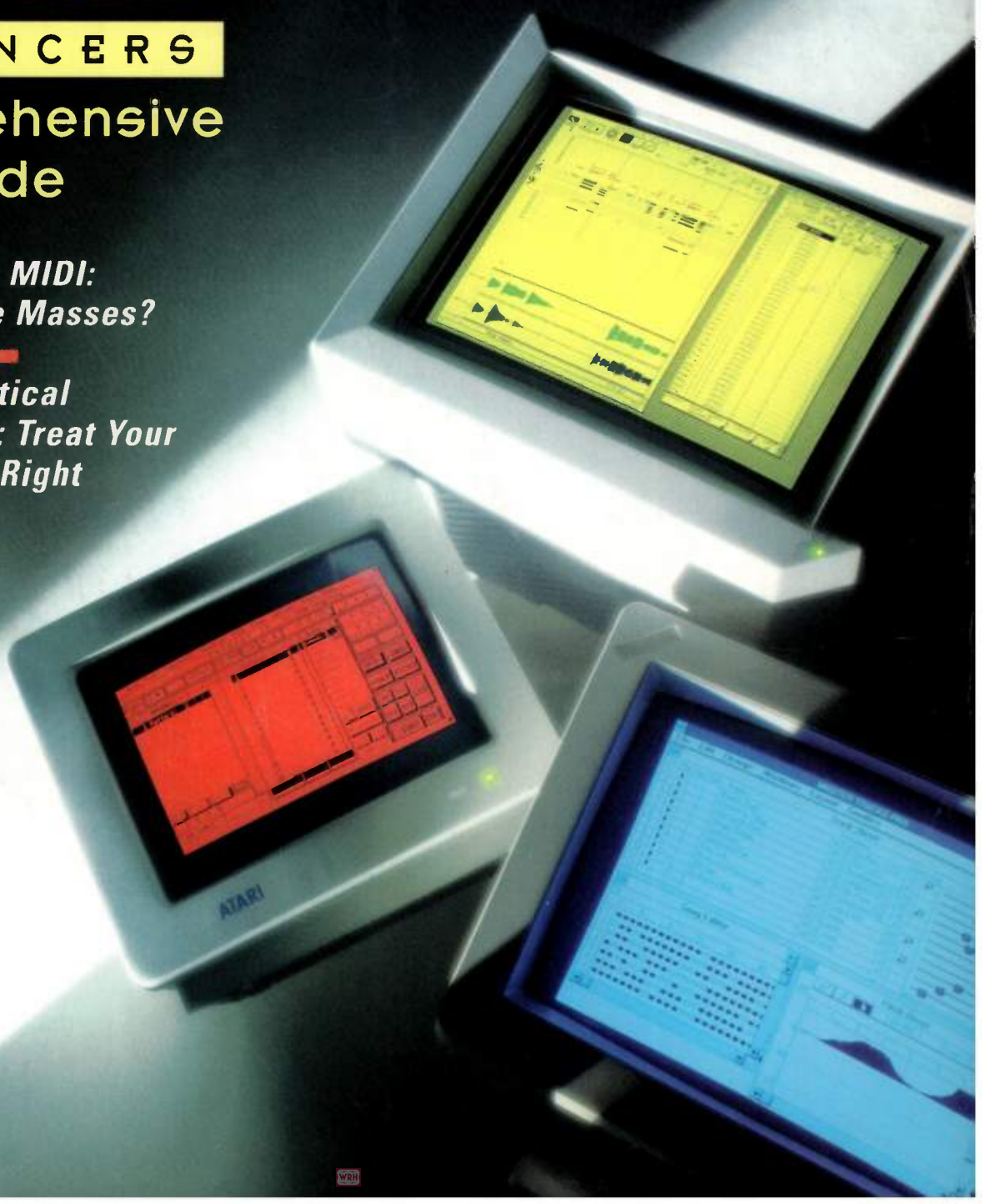
Electronic Musician

U.S. $3.50/Canada $4.50
August 1991

48 SEQUENCERS
A Comprehensive Guide

General MIDI: MIDI for the Masses?

Acoustical Conditioning: Treat Your Studio Right



0 71896 47104 5 08

We asked just about everyone we met exactly what they wanted in a pro keyboard. Pie in the sky, musician's dream, wish list sort of stuff. Everything. We even asked guys in countries we'd never heard of.

Then, with all that tattooed on our brains, we started developing the SY99. We spent two years—days, nights, our weekends (Family? What family?)—making every note, every nuance, every molecule of that keyboard great.

It was an impossible task. Almost. But we did it. The SY99 was done.

But even after all our success in a secluded audio lab with no windows and no air-conditioning on holidays, we still needed to know if it was what a serious musician demands in the real world.

It was time for the ultimate reality check.

So we hand-delivered our final prototype to Chick Corea. Yeah. That Chick Corea. The Mad Hatter. The legend.

After the first day Chick's keyboard engineer, Mick, called to tell us that Chick was up all night playing it. Now someone else was staying up 'til dawn all excited about this keyboard, too. We understood.

Mick called again. "Chick's really into this keyboard. These sounds have really got him thinking."

Another week or two went by. While Chick spent days, nights, and weekends in the studio with it.

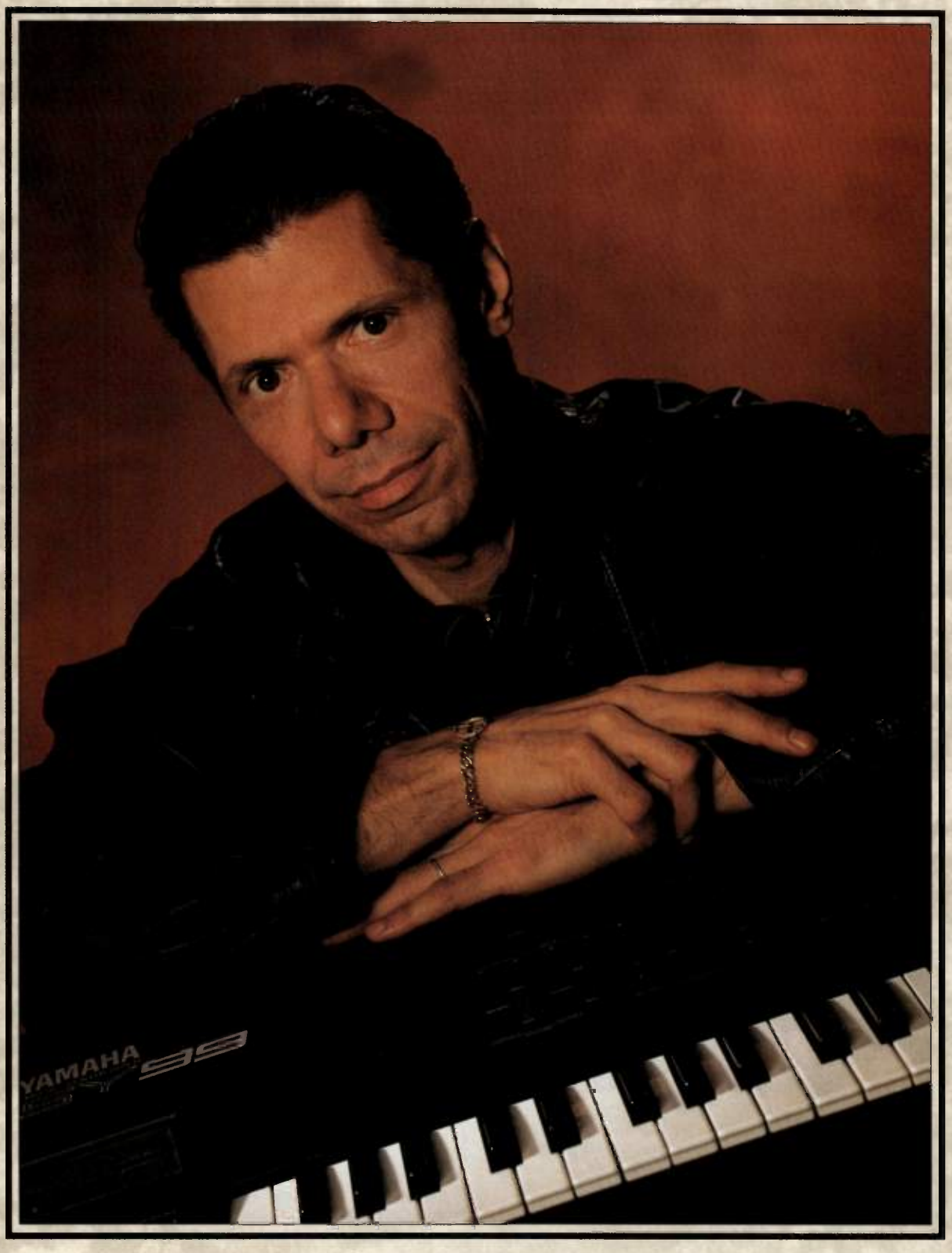
"This thing's incredible," Mick said. "In fact, Chick's using the SY99 as the centerpiece for his new album. He loves it. It's his new voice."

"But you've just got the prototype," we tried to explain. "We need it back. Mick, Chick, wait, that SY99 is the only one in the country, the only one we've got."

"But it's the only one I need," Chick said. "This one's mine, now. Hope you like the new album."

"We will," we said. "We most definitely will."

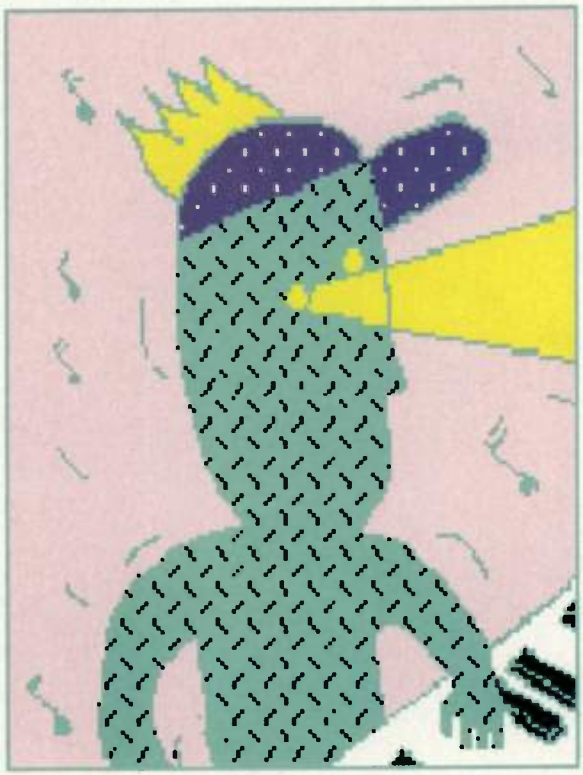
You can hear some great music, and the SY99, on Chick Corea's new album, *Beneath the Mask*, available on compact discs and cassettes on GRP Records.



YAMAHA®
SY99

Opcode's Vision

...new version 1.3



Opcode's new version 1.3 of Vision and Studio Vision® includes significant additions to our award-winning Macintosh music sequencing software.

OMS (the Opcode MIDI System) gives you powerful access to more than 32 MIDI channels for compatibility with multi-port MIDI interfaces using a system of devices rather than ports. OMS has a 'Studio Setup' file where you describe an entire MIDI studio's MIDI connections, devices, channels, controllers, and more. Opcode's software shares the information in the Studio Setup, automatically defining MIDI instruments in Vision and assigning the correct devices to patch banks in Galaxy. In addition, OMS' fast MIDI processing allows you to edit sounds in Galaxy Plus Editors while a sequence plays in Vision!

Opcode's unique publish and subscribe feature allows program and note names in Galaxy to show up in our sequencers so you can choose programs and edit drum notes by name instead of number. And when you change a program name in Galaxy, the name is automatically updated in the sequencer.

Call us or see your local dealer for more information. Current users can upgrade to version 1.3 through Opcode Systems.

- OMS compatible for access to over 200 MIDI channels. Compatibility with Mark of the Unicorn's MIDI Time Piece 128 MIDI channel mode, as well as Opcode's upcoming hardware.
- Compatible with Digidesign's multi-track Pro Tools system.
- System 7.0 compatible. 32-bit clean for using over 8 megs.
- OMS allows Studio Vision and Digidesign's SampleCell to run together on all Macintosh II computers.
- 29.97 non-drop SMPTE format compatibility.
- Punch-in on the fly lets you start in play and go in and out of record instantly without stopping.
- Fast controller chasing starting in the middle of a sequence.
- Substitute command replaces any selected events with the contents of the clipboard. Replace MIDI kick and snare parts with 16-bit samples on hard disk in Studio Vision.
- Paste MIDI files on the clipboard between Vision and CUE.
- Publish and subscribe with Galaxy and Galaxy Plus Editors.

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TEC TECHNICAL EXCELLENCE & CREATIVITY
1991 NOMINEE

Electronic Musician

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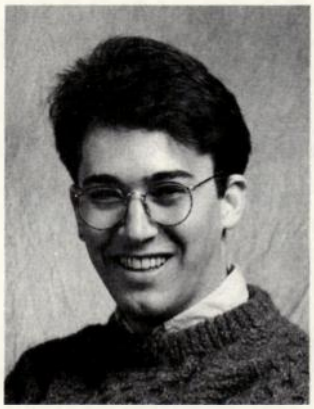
The New Breed



Category-busting new products are redefining the landscape of electronic music equipment.

Innovative products have always played an important role in the electronic music world, advancing the musical possibilities afforded the typical composer. Digital samplers, sequencing software, hard disk recording systems, and the like have strongly influenced the music-making process. These products also serve as guideposts for our understanding. The evolutionary changes they bring often recast our knowledge of the entire field of electronic musical instruments.

The developments shaping the 1990s seem to stem from combinations of existing product categories. Popular thinking holds that eventually everything in a typical music studio will be contained in a single black box. It looks like reality is starting to match that science-fiction scenario. Familiar products are merging their functionalities to form sophisticated "superproducts." Synthesizers and digital samplers are merging into hybrid instruments, for example, and many sequencing and notation software packages have sprouted similar feature sets. As a result, neatly defined product divisions are crumbling as product types begin to crossbreed.

The most obvious development is that dedicated samplers have begun to disappear as sophisticated synths add sample RAM, sample-editing features, and other powerful functions. An example of this melding of two previously distinct worlds is Kurzweil's recently announced K2000 synthesizer. In addition to the standard features of a deep machine, it offers an optional sampling input, with stereo analog and digital connectors.

In a conceptually similar development, several modern sequencing programs (the subject of this month's buyer's guide; see p. 38) sport more notation features, and many notation packages offer sophisticated MIDI sequencing features. The development is by no means universal, and many people would contest it. But the notion of a single "music program" has considerable appeal. Classically trained musicians edit traditional notation intuitively, but the graphic song-arranging, controller-editing, and quantization found in sequencers also has become second nature for some classical musicians.

Despite the desire for an all-in-one package, other software developments may hinder the creation of single "super" programs. System 7 on the Macintosh and Dynamic Data Exchange under *Windows* on the PC encourage the development of smaller, special-interest programs, rather than do-it-all behemoths. We'll see what happens in this arena, but programs such as *The Musicator, Cubase, Performer, Notator, Finale,* and *Encore* point toward sophisticated integrated platforms.

What does this mean for the average electronic musician? Simply that the road map for understanding electronic music products is changing as new products integrate more functions into familiar packages. This may mean greater value for dollars spent, but it also holds potential for even more complex and confusing new products.

In the end, I'm optimistic. The integration of several products into a single, new type should provide musicians the functionality they desire and, until now, have pieced together on their own. The guideposts may change, but I look forward to discovering the paths that open.

Bob O'Donnell

Electronic Musician

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Expand your horizons. Don't limit your creativity by limiting your memory capacity. With the new DPM® SP sample playback synthesizer from Peavey Electronics, the creative possibilities are endless. The Peavey DPM SP can be whatever you want it to be. A nine foot grand piano, an orchestral string section, background vocal harmonies, a brass section, sound effects, or a combination of multiple instruments. The SP has the memory capacity (up to 32 Megabytes) to be anything you need without compromise. 16-bit sample resolution and 44.1 kHz playback rate means the sonic quality of the SP is also uncompromised. Samples can be loaded from the on-board 3.5" high density disk drive, CD ROM, hard disk, or MIDI sample dump standard. With hundreds of Megabytes of professional samples available from Peavey, as well as many independent companies, the capabilities of the SP are limitless. If you want to record your own samples for the SP, just add the DPM® SX Sampling Expander module and you've got an incredibly affordable full blown 16-bit sampling system. Both the DPM SP and the DPM SX are expandable using standard SIMM memory upgrades. Peavey has brought 16-bit sampling to a new level of flexibility. And, at about HALF THE PRICE OF COMPARABLE UNITS by other manufacturers, the SP makes sampling an affordable reality for just about anybody. Check out the DPM SP and DPM SX at an authorized Peavey dealer near you.

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Our readers chide us about environmental issues, debate the practical value of perfect pitch, and introduce us to SEAMUS.

PANDORA'S LONG BOX

I was greatly disappointed to see "Making Your Album" (June 1991) call CD long boxes and blister packs "a must," with no mention of their ecological impact. Such an omission is a disservice to your readership and, most importantly, to our planet.

Electronic musicians are in a tough spot. We do not want to sabotage our slim chances of getting retail distribution by demanding non-standard, environmentally responsible (and expensive) packaging. But a little education would be an important step in the right direction. How about an article discussing these forms of packaging? Suggest an interim compromise, such as insisting the long box be made from recycled paper and safe inks, with the largest hole possible cut in front?

We have been asked to conserve our resources and stop filling landfill with foam and plastic products. Since education was the focus of your article, I certainly hope this omission was merely an oversight.

R. and K. Brower
Glendale, CA

R. and K.—You're right, it's crucial to consider the environmental impact of plastic packaging, and we've repeatedly advocated your position in past articles. The author, George Petersen, was alerting readers to the packaging most retailers require. The retailers, in turn, respond to the demands of music-buyers, as indicated by sales. That means we have to change a lot of people's views, and letters such as yours help greatly.

Incidentally, our sister publication, Mix *magazine, ran an article on the packaging issue in the July 1991 issue. Our sincere thanks. —Steve O.*

POINTLESS PITCH

It's pointless to try to develop "perfect pitch" ("The Perfect Pitch Supercourse," June 1991). David Burge's ads claim that a sense of perfect, or absolute, pitch is an "amazing ability" that "open[s] up unlimited possibilities for any musician." This is utter hogwash. My ear has a good sense of absolute pitch. Although this helps with tasks like arranging and transcribing music from records, it's of little use in performance.

Glenn Gould likened pitch to color. He said a B-flat could be identified in isolation, just as a blue sky can be identified in isolation. To an ear with absolute pitch, this is true. But in ensemble playing, absolute pitch is more of a hindrance than a help; *relative* pitch is what you need.

I can't say whether it's possible to learn absolute pitch. I can say that it's a waste of time; you're better off practicing scales.

John Kafalas
Hudson, MA

MISGUIDED

In many instances, I base my purchases upon **EM**'s articles and reviews. Thus, it was with great anticipation that I waited for your DAT buyer's guide (June 1991). Unfortunately, I was extremely disappointed. The guide amounted to less than two full pages of text, most of which explained terms that a large majority of your readers already know.

I realize your intentions were not to review every DAT machine available, but more space could have been devoted to features such as editing capabilities and external control.

Mark Fayard
New Orleans, LA

ARE YOU SURE?

The May issue contained lots of helpful information. Several of the articles raised some questions and comments. Jenny and Bruce Bartlett ("Production Tips for Your Home Studio") state, "If possible, use a DAT machine for your mixdown deck because it eliminates the noise, distortion, and flutter of the analog tape recorder." Is this accurate? Why wouldn't the DAT faithfully reproduce all of the audio source, including the noise, distortion, and flutter?

In "EM Guide to Multitrack Cassette Ministudios," Jeff Burger states, "Solo, which lets you listen to only the soloed track, is not available in ministudios." I have a ministudio (Sansui WS-X1) that has not only the solo feature but several others that none of the ministudios reviewed have. The price was exceptional in comparison to the prices quoted in the article.

Ed Kosmahl
Gouldsboro, PA

DAVID POVILAITIS

Ed—The Bartletts recommend using DAT for mixdown to eliminate noise, distortion, and flutter that can originate from an analog 2-track mixdown deck, not to deal with the mixdown deck's reproduction of garbage from an analog multitrack recorder. You have to eliminate analog multitrack distortion, wow, and flutter at the source. (Of course, you can reduce the noise with Dolby, dbx, or other NR gear.) As the Bartletts note in the sentence following your quote, the sonic advantages of digital—over analog—recording technology also apply for digital multitrack tape decks or hard disk-based recorders.

Regarding ministudios with a solo function, I, not Jeff Burger, added the remark you quote, based on my research for the ministudio chart. True, the Sansui WS-X1 (reviewed in the August 1989 issue) has a solo function, but the unit has been discontinued, and Sansui apparently has pulled out of the American multitrack-recording market. Our buyer's guides only cover products that, to the best of our knowledge, are currently distributed in the U.S.—Steve O.

ABOUT THE OLD AESTHETIC...

In the May 1991 "Letters," Eugene Rator complained about the lack of information regarding the "old aesthetic of electronic music" in the spirit of Stockhausen or Cage. Mr. Rator also commented on recent MIDI designs that make it more difficult to create "non-conventionally" than with older electronic music equipment. Gary Hall's responses ("When was it ever different?" and "...the old aesthetic of electronic music was never anywhere near mainstream popularity.") did not respond adequately to Rator's concern.

I do not know if there ever was an old aesthetic of electronic music. Many fine musicians work in the medium and exploit it in more interesting ways than most commercial uses of the medium. There are excellent composers who work around limitations of the hardware and software. Most recent developments are oriented towards a mass market, for good economic reasons. Aspiring rock 'n' rollers create an economy that makes sophisticated equipment available at affordable prices to those interested in experimenting or stretching.

There is a real dearth of information regarding electro-acoustic art music. Even your wonderful publication neglects non-commercial music. But there are concerts, radio broadcasts, CDs, and publications for those willing to take the time to search.

SEAMUS (Society for Electro-Acoustic Music in the United States) is an organization dedicated to all styles of electro-acoustic music. Our members keep informed—through the *Newsletter*, the *Journal*, and the *President's Communique*—about technology, books, concerts, and record-

THANKS, AMIGOS

We've literally been overwhelmed by letters from Amigaphiles, continuing the debate over EM's Amiga coverage (May 1991 "Letters"). Lots of you volunteered to review Amiga products, and we'll contact some of you to follow up. Please be patient; there are more would-be Amiga reviewers than products to review.

This leads back to my contention that there are far too few good Amiga music products available for review. We try to keep our ears open, but obviously we miss some products. If you Amigaphiles know of a new Amiga music product—software or hardware—please drop us a note. If you really want to help spread the Amiga faith, ask the manufacturers to contact us. If they send information to my attention, I'll be happy to follow up.—*Steve O.*

What would you do if you lost all your music in the next 30 seconds?

Cry. A lot, probably. But that wouldn't help you remember the subtleties of a great melody. Or bring back the project you're working on under deadline. What a nightmare.

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ings. SEAMUS also sponsors yearly conferences where composers, performers, and software designers share the latest developments in this exciting medium. I encourage Mr. Rator and others to contact SEAMUS.

Rodney Oakes, Editor
Journal SEAMUS
2550 Beverly Blvd.
Los Angeles, CA 90057

DECODING TIME CODE

I offer the following corrections to Paul Lehrman's "Decoding SMPTE" article (April 1991):

1. Since a program exactly an hour long (wall-clock time) has 107,892 frames, it should end at SMPTE 1:59:56:12, not 2:00:03:18.

2. Conversely, a program with 108,000 frames (i.e., running from SMPTE frame 1:00:00:01 to SMPTE frame 2:00:00:00) will be one hour and 3.6 seconds in duration.

As a neophyte in scoring films, I found this article a good introduction, and I hope to see more on the subject in future articles. In the words of the immortal No. 5 from *Short Circuit*, I say, "Need more input!"

M.A.
Northport, NY

Paul Lehrman responds: *I went cross-eyed over this one, but reader M.A. is entirely correct. In a given second, only 29.97 frames of video time code pass a fixed point. By the time 30 complete frames have passed, more than a second has elapsed. Therefore, a "SMPTE second" (i.e., 30 frames) is actually 0.1% longer than a wall-clock second, and a SMPTE hour is 3.6 seconds longer than a real hour. If the SMPTE hour were shorter, we wouldn't need "drop-frame" time code, we'd need "add-frame" code.*

ERROR LOG

June 1991, "Marketing Your Demo," p. 52: The correct phone number for the National Academy of Songwriters (calls made outside the state of California) is (800) 826-7287.

August 1991, Vote For Your Favorite Article, p.82: We accidentally listed articles from the 12/90 issue. If you'd like to see more on video or give us other feedback, please drop us a note.

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Until you *hear* the 16-bit piano sound of the new SQ-2 Personal Music Studio from ENSONIQ, you might find it difficult to believe that piano sounds this good can be heard at a price this low. In fact, we invite you to compare them to the piano sounds available in synths at *three* times the cost!

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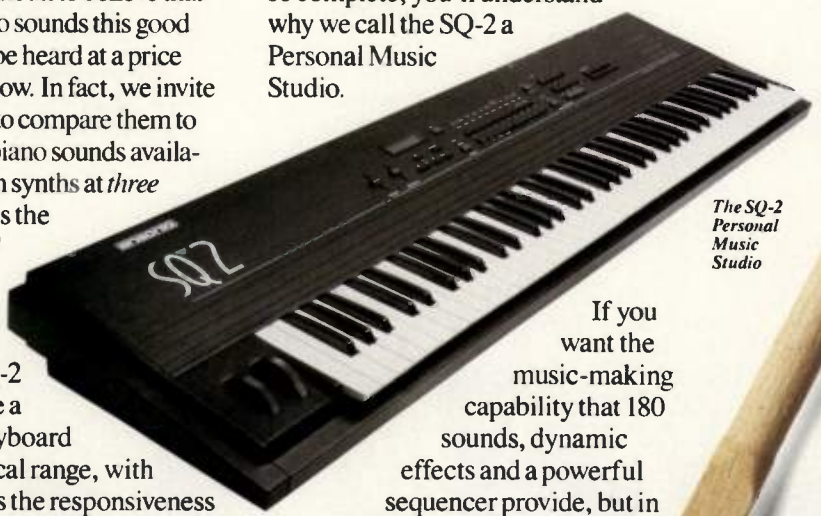
When you want to put those sounds together, the SQ-2's 16-track sequencer offers recording and editing options so complete, you'll understand why we call the SQ-2 a Personal Music Studio.



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The EPS-16 PLUS Digital Sampling Workstation—*16-bit sampling with onboard 24-bit effects, sequencing, and performance features, available as a rack-mount or keyboard. The industry leader in sound and support.*

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The Electronics

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—Optional Voice Editing Module (VEM) for twice normal play speed with normal pitch.

Otari's MX-50. For whenever or wherever you need a *professional* audio machine at an affordable price.

For more information, call your nearest Otari professional audio dealer, or Otari Corporation at (415) 341-5900.

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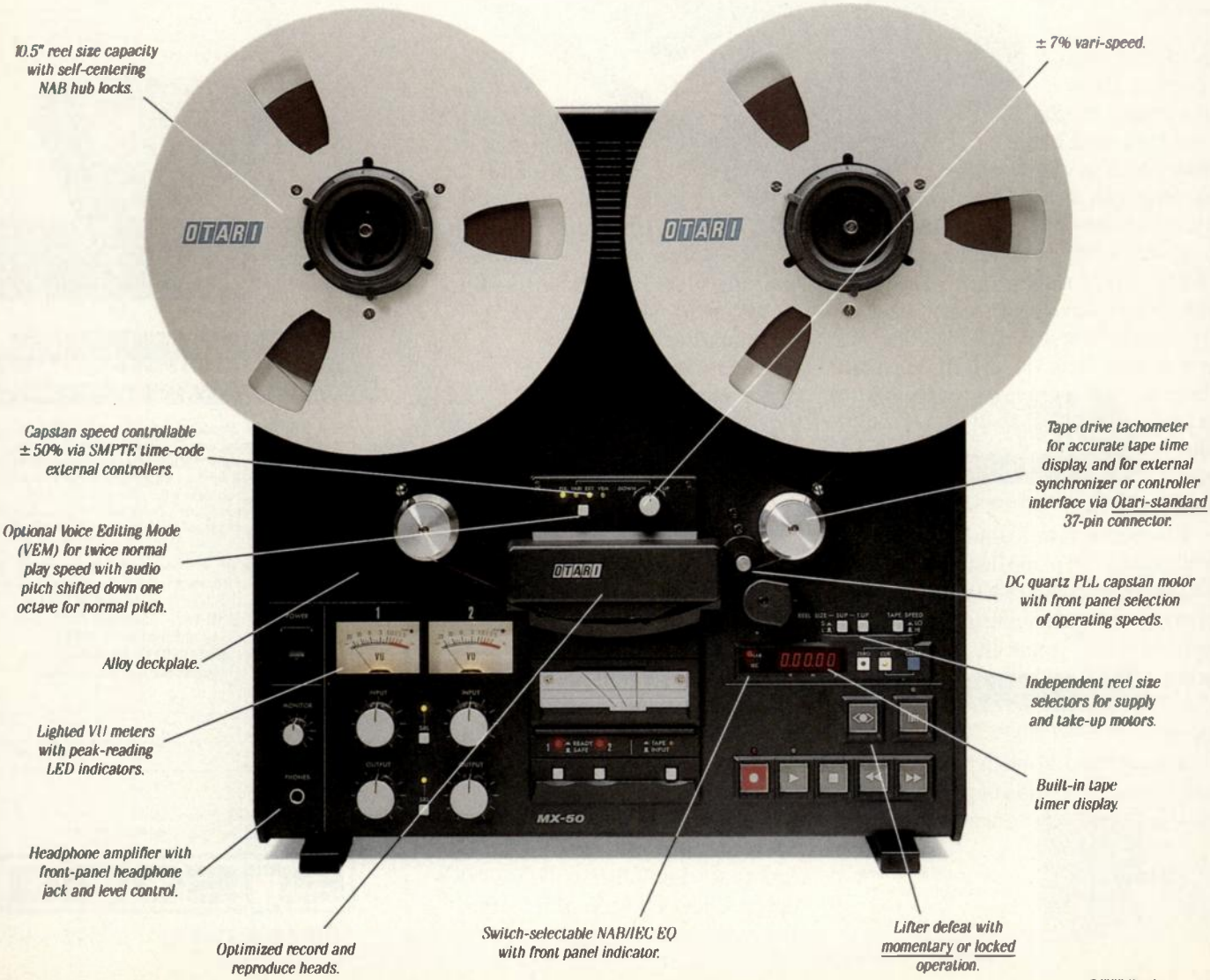


With this august assemblage, we go wireless, take a stand, and get to work on time (code).

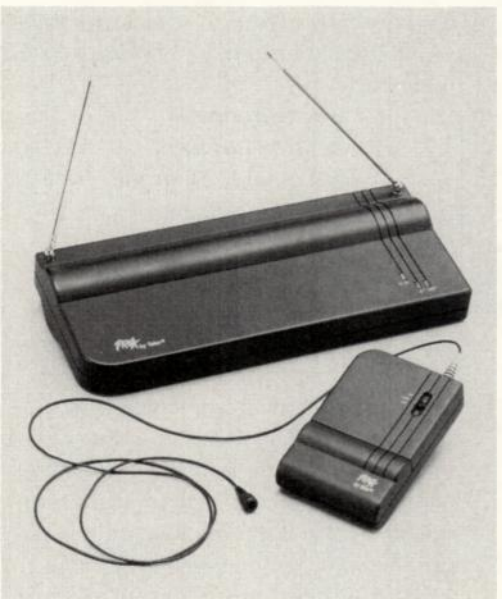
COMPUTER CARDS

SunRize industries is shipping its **AD1016 16-bit digital sampling card** ($2,000) for the Commodore Amiga 2000, 2500, and 3000. The card utilizes a Motorola 56001 DSP chip and provides four 8-times oversampling digital filters (two for input, two for output), selectable sampling rates up to 48 kHz, stereo audio in/out, coaxial and AES/EBU digital I/O, MIDI In/Out, and a SMPTE time-code reader. A 12-bit board, the **AD1012** ($500), uses an AD2105 DSP chip and mono audio I/O, adjustable lowpass filters, and SMPTE reader. The AD1012 supports sample rates up to 90 kHz and is intended for editing video soundtracks. Both boards are bundled with *Studio 16* direct-to-hard-disk recording/editing software. *Studio 16* features cut/copy/paste, real-time delay effects, graphic EQ, and an AREXX interapplications communications port.

SunRize Industries
2959 S. Winchester Blvd.,
Suite 204
Campbell, CA 95008
tel. (408) 374-4962

Turtle Beach Systems announced the **MultiSound** multimedia sound-output card ($995) for the IBM PC. The full-sized card uses a Motorola 56001 DSP chip and supports mono or stereo, 8- or 16-bit recording at 44.1, 22, and 11 kHz. MultiSound also includes MIDI In/Out jacks and an onboard E-mu Proteus/1 sound-generator with 4 MB of ROM-based, 16-bit samples. A CD-ROM mixer lets you mix sound from an internal or external CD-ROM player into MultiSound's main audio output. The analog input and output feature 64-times oversampling. The board comes with a Microsoft *Multimedia Extensions* driver set.

Turtle Beach Systems
PO Box 5074
York, PA 17405
tel. (717) 843-6916



Telex Pro Star Wireless System

WIRELESS

Telex introduced the **Pro Star series** true diversity wireless systems. The **R-10** receiver ($200) includes permanently attached, telescoping antennae, volume control, squelch control, and LED indicator. The **B-10** belt pack ($180 to $270) comes in three mic element options: the Telex WLM-10, the Audio Technica AT-831B, and the Sony ECM-144. The permanently attached mic cord also functions as an antenna. The unit includes power switch, popless mic-mute switch, and mic gain control. Estimated battery life is six to eight hours for alkaline, two hours for NiCd. The **G-10** belt-pack guitar transmitter ($160) includes all features of the B-10 but has a ¼-inch, instrument-level input jack.

Telex Communications, Inc.
9600 Aldrich Ave. South
Minneapolis, MN 55420
tel. (612) 884-4051

SOFTWARE

Wave for Windows ($149) is a sound-editing package for *Windows 3.x* (with *Multimedia Extensions*) that lets you record, edit, and audition sound files. Mono or stereo soundfiles can be recorded with 8- or 16-bit resolution, at up to 44.1 kHz, and up to four soundfiles can be open at once. Maximum soundfile size is 4 gigabytes. Editing features range from copy/cut/paste to level adjustment, EQ, and spectral analysis. *Wave for Windows* uses *Multimedia Extensions* to interface to any MME-compatible sound-generator. The program requires an MME-compatible sound device, VGA monitor, 2 MB of RAM, *Windows 3.x*, and DOS 4.x. It is scheduled for release in October 1991.

Turtle Beach Systems
PO Box 5074
York, PA 17405
tel. (717) 843-6916

STANDS

The newest Quik-Lok Transformer stand, the **QL/690-F4** ($199.95), accommodates heavy keyboards, mixers, and smaller gear with one 11.8 × 13-inch and three 11.8 × 18.5-inch adjustable tiers. Two- and 3-tier versions and a

perforated shelf are also available. The 55.9-inch-tall stand holds up to 150 pounds, weighs 25 pounds, and folds into a compact package for transportation.

Music Industries
99 Tulip Ave.
Floral Park, NY 11001
tel. (800) 431-6699
or (516) 352-4110

TRANSDUCERS

SoundTech's **PM15H powered stage-monitor speaker system** ($569.90) features an STS 15-inch woofer and an all-metal radial horn with a dispersion pattern of 90° × 40°. The MC100 module provides a 100W RMS power amp with a 5-band graphic EQ and level pot. The unit has line-in and line-out jacks and an extension-speaker jack (for an 8-ohm cabinet).

SoundTech
230 Lexington Dr.
Buffalo Grove, IL 60089
tel. (800) 877-6863
or (708) 541-3520

Marschall Acoustics' wedge-shaped, non-ported, **Corner** monitor speaker enclosures ($625 each) are designed to deliver lots of tightly controlled low bass and smooth high-frequency response, reproducing frequencies between 15 Hz and 24 kHz. The close-field monitors handle 150W RMS, 500W peak into 8 ohms. The 28 × 14 × 14-inch cabinets weigh 50 pounds and are available in oak, teak, cherry, or walnut.

Marschall Acoustics
27 Music Square E., Suite 291
Nashville, TN 37203
tel. (615) 649-2380

JBL has replaced its Performance loudspeakers with the **MR-series**. MR systems feature JBL's new M-series low-frequency transducers, with a 16-pound magnet for improved efficiency and heat dissipation and a new voice-coil design that significantly increases power-handling capacity. (MR-series systems handle between 250 and 300W, continuous.) The titanium-diaphragm compression driver is coupled to JBL's new flat-front Bi-radial horn, with a dispersion pattern of 100° × 80°. The horn provides a closer alignment of the acoustic centers of the compression driver and woofer for a more "forward" sound, aiding vocal-range clarity. The enclosure is of a highly resilient, aspen-based composite, the manufacture of which does not produce toxic waste.

SoundTech PM15H
Powered Stage Monitor

JBL Professional
8500 Balboa Blvd.
Northridge, CA 61329
tel. (818) 893-8411

IT'S ABOUT TIME

FutureVideo released the **TCG-2000** ($495), a SMPTE time-code generator particularly suited for use with industrial and consumer camcorders with stereo sound. The TCG-2000 can connect to the remote jack on most camcorders, so time code is generated only during actual shooting. The unit also can lock time code to incoming video. The TCG-2000 can generate drop-frame or non-drop-frame time code and allows the user to program identifying information into the time-code user bits.

FutureVideo Products, Inc.
28 Argonaut
Laguna Hills, CA 92656
tel. (714) 770-4416

Brainstorm Electronics announced the **SR-2 Time Code Refresher** ($295), which adds a 4-digit readout of time code rate to their established **SR-1** ($175). Both units feature high-quality reshaping of time-code signals, with output level control and switchable rise time. The SR-1 and SR-2 recover unreadable time code and eliminate degradation when dubbing code from one tape to another. They also read very low-level time-code signals, making it much easier to control crosstalk into the audio signal path. Both are available with ¼-inch phone jacks or XLR connectors (**SR-1x** and **SR-2x**). SR-1 owners may purchase an upgrade kit for $125.

Brainstorm also introduced the **SR-15 Time Code Distributor+** ($745), a single-rackspace unit that includes a 1 × 5 time-code distributor with reshaping, an 8-digit time-code reader, a 4-digit display of frame rate, indicators for drop/non-drop frame and video lock, and a pilot-tone stripper that outputs a 50/60 Hz sine wave or square wave. The SR-15 has XLR connectors for time code and pilot tone and BNC connec-

JBL MR Series

Model	Type	Components	Freq. Range (-10 dB)	Price
MR802	stage monitors	12", horn	55-20k Hz	$575
MR805	stage monitors	15", horn	50-20k Hz	$650
MR812	instrument	1-12"	60-5.5k Hz	$295
MR815	instrument	1-15"	55-4k Hz	$345
MR818	instrument	1-18"	35-4.5k Hz	$675
MR822	house	12", horn	60-20k Hz	$550
MR825	house	15", horn	60-20k Hz	$595
MR826	house	15", horn	38-20k Hz	$695
MR835	house	15", 10", horn	38-20k Hz	$775
MR838	house	18", 10", horn	38-20k Hz	$895

tors for video input. Reshaping specifications are identical to those of the SR-1 and SR-2.

Brainstorm Electronics, Inc.
1515 Manning Ave., Suite 4
Los Angeles, CA 90024
tel. (213) 475-7570

AUDIO INTERFACES

Horizon Cables is shipping five new audio interfacing devices, including the **Straightline 2 Direct Box** ($49.95), which accepts line- or instrument-level signals, and the **Locking Direct Box** ($41.95), which adds locking, ¼-inch inputs. The DI boxes, the mic-level **1 × 2 Splitter** and **2 × 1 Combiner** ($33.95 each), and the **Speakerline Direct Box** ($39.95), which accepts speaker-level input, are housed in 18-gauge steel enclosures.

Horizon Manufacturing, Inc.
PO Box 1988
230 N. Spring St.
Cape Girardeau, MO 63702
tel. (800) 255-9822
or (314) 651-6500

TEST EQUIPMENT

Forward Innovations is shipping the **PAG-1** ($139), a hand-held, 9V battery-powered, audio generator designed for checking sound systems and testing impedance, inductance, and capacitance. The unit sweeps from 18 Hz to 22.5 kHz, in three overlapping ranges, and the dial is marked in ⅓-octave segments. The generator has variable output up to 1 volt and is DC-coupled for measuring impedance. Claimed THD is less than .03%. The PAG-1 is protected to 50 VDC or 30 VAC.

Forward Innovations
PO Box 9429
Santa Rosa, CA 95405
tel. (800) 866-6264
or (707) 539-3480

PUBLICATIONS

Digital Arts & Sciences is publishing an in-depth quarterly newsletter entitled ***MIDI Guitarist*** ($26/yr. in the U.S., $28 in Canada, and $34 elsewhere), edited by well-known author Warren Sirota. The magazine includes coverage and product reviews of MIDI guitar controllers, synthesizers, effects devices, and sound modules; synth patch exchanges; reviews of recordings featuring MIDI guitar; new product announcements; and free classifieds.

Digital Arts & Sciences
PO Box 21354
Oakland, CA 94620
tel. (415) 652-2867

REV UP

Simmons (tel. [805] 494-5007) announced the **Trixer II** ($1,849; upgrades $250), an upgraded version of its Trixer drum-to-MIDI trigger. In Trixer II, the number of factory preset kits has been doubled to eight, and there are now ten user-programmable kits. Each of the six channels in the user-programmable kits can be programmed to use any of the 48 onboard drum sounds, or sounds on Simmons soundcards. The tuning of each of the six drums in a user kit is program-

Simmons Trixer II

mable. The reverb type is programmable for each factory and user kit. A separate set of MIDI notes and channels can be programmed for factory kits 1 to 8 and for each user kit and soundcard kit. An up/down footswitch socket has been provided for remote switching of kits. An individual channel output modification is available as an additional, optional retrofit... thoughtprocessors (tel. [800] 535-8663 or [718] 857-2860) released version 2.2 of ***The Note Processor*** ($295; upgrades $20), its notation software for IBM-compatibles. Additions include user-designed or preprogrammed graphic score templates; automatic page layout with user-defined titles, headers, footers, etc.; and improved music fonts and new text fonts for multiple-font text input. Other new features include definable staff size, selectable number of lines per staff, and a redesigned text editor for creating and editing DARMS files. Enhanced sequencing functions allow multiple tracks to be assigned to a staff, with variable track-to-staff assignment, and a track may be split to multiple staves. Finally, the graphic page editor has been streamlined with new "accelerator" keys to speed operation...Green Oak Software (tel. [619] 434-0823) is shipping ***Rhapsody 3.0*** ($225; upgrades free), its upgraded Macintosh sequencer. The new version adds user-definable faders (you assign any MIDI controller and channel to a fader); recording of fader movement; MIDI event-monitoring; user-definable scales for inversion, transposition, etc.; an Auto-save feature (saves at a user-specified time interval); an Import Drum Kit command that lets you replace the current kit with one from a saved *Rhapsody* sequence; and more... Turtle Beach Systems (tel. [717] 843-6916) is shipping version 2.0 of its ***SampleVision*** ($349; updates $59.95) sample-editing program for IBM-compatibles. New features include time compression/expansion, pitch-shifting, digital distortion, sample-rate conversion, and support for the Brown-Wagh Sound Blaster MIDI interface/sound card. New drivers support the E-mu Emax II; Ensoniq EPS 16 Plus; Akai S950, S1000, and S1100; Peavey DPM-3; Korg T-series and DSS-1 with expander; and Yamaha TX16W with operating system 2.0. Copy protection has been dropped, the user interface revised, memory requirements lowered, and the EQ algorithm improved. ●

ELECTRIFY YOUR MUSIC

Based on A.R.T.'s revolutionary new VLSI, the Multiverb Alpha is a whole new beginning in digital effects processing.

- 6 simultaneous effects
- 20 kHz bandwidth
- New A.S.I.C. 24 bit integration
- Over 50 effects to choose from
- Better than 90dB S/N ratio
- 200 memory locations
- Multifunction rotary encoder
- Studio sampler - auto, manual and midi triggering
- Over 2 octaves of pitch transposing
- Fully programmable mix, level and parameters
- Stereo inputs and outputs
- DC 9V power output jack for powering foot pedals
- 24 types of reverb
- Over 20 types of delay
- Gated and reverse reverbs
- Programmable equalizer
- Leslies and multi-tap delays
- Stereo chorus and flanging

- Stereo panning and imaging and more!
- Exclusive Midi Data Monitor — see the Midi data stream

The Multiverb Alpha offers a level of sound quality that is stunning. The increased power of the new 24 bit A.S.I.C. system allows for incredible amounts of processing resolution. Reverbs sparkle, chorusing is lush, dense and full.

The X-15 Ultrafoot offers realtime control of all midi products but with the Alpha you may do incredible dive bomb pitch changes, sweep solos side to side in realtime and bend notes with your feet! Control up to eight effects at one time. The creative power is electric!

ART

THE SOUND OF PERFECTION

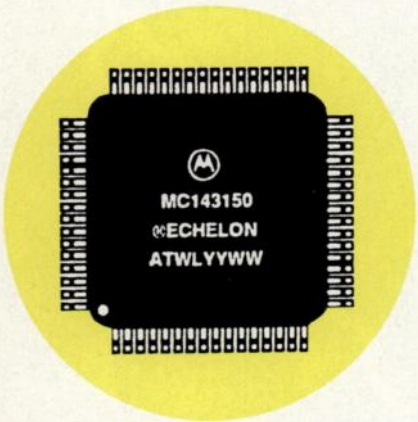
APPLIED RESEARCH & TECHNOLOGY, INC., 215 Tremont Street, Rochester, NY 14608, (716) 436-2720, Telex: 4949793 ARTROC, FAX (716) 436-3942

WRH

The Lay of the LAN

High-performance, low-cost derivatives of Local Area Network technology could take the arts and industry into a new era.

By Gary Hall



Echelon Corporation's Neuron® 3150 chip includes three separate 8-bit CPUs. Two are dedicated to communication and network management, while the third can serve as a general-purpose controller.

It's a technological axiom that changing the scale of something changes its nature. Take computers, for example. In the mid-1970s, engineers reduced the guts of a computer to a piece of silicon. Soon we had them not only on our desktops, but in cars, appliances, and (yes, indeed) musical instruments.

Local Area Networks, or LANs, are accepted as a superior way for computers to communicate. LANs let a group of computers speak to each other over a single cable. A LAN *protocol* defines communications so that any *node* can send information to any other node, and the recipient of the information can respond.

To date, LANs have been expensive, best suited for corporate and industrial environments. Complexity and a lack of standards have kept LAN technology in the hands of specialists. That's about to change. Engineers are designing the hardware and software of a LAN into low-cost ICs. They also are creating new protocols with speed and capabilities not found even in today's high-end networks.

Currently, two companies are prominent in the field. Echelon Corporation (tel. [415] 855-7400) is loudly touting a concept they call LON® (Local Operating Network). Lone Wolf (tel. [213] 379-2036) is hard at work realizing the potential of their MediaLink technology.

THE NATURE OF THE BEAST

Echelon focuses on *control* applications. They believe there is an enormous market for networks of small, intelligent controllers in factories, buildings, and automobiles.

Take the auto: In any car, reams of wiring link various parts of the electrical system. In Echelon's vision, these parts become intelligent units, communicating with each other over a single cable.

Lone Wolf is familiar as the company that brought LAN technology to MIDI. Their MidiTap is an established solution to the problems of large-scale MIDI systems. (See "LANs: MIDI's Next Step," in the November 1989 issue.) Though MediaLink can serve the same purposes as Echelon's LON, Lone Wolf's initial focus is on communication and media.

Lone Wolf is currently developing a MediaLink chip and a digital audio link to their network. According to Lone Wolf, their AudioTap (forthcoming) will handle up to 24 channels of pro-quality digital audio.

TIMING IS EVERYTHING

As said before, changing scale changes something's nature. Current LANs mostly transfer data files. In this application, data rate must be high, but exact timing is not critical.

Control information (such as MIDI commands) consists of small data snippets that must get where they are going at the right time. For music, delays of ten milliseconds (1/100 of a second) can cause problems. Imagine the situation if MIDI were subject to the one-second delays found in computer LANs. Digital media are even more time-critical. A millionth-second error can create unacceptable noise in digital audio or video.

Both Echelon and Lone Wolf recognize the problem. Echelon is taking a MIDI-like approach, in which small messages move quickly through the network. You simply get the data there as fast as you can and expect the target to respond immediately. As musicians have learned, this is a powerful approach, but one that has its limitations.

Lone Wolf, with its media focus, makes more elaborate provisions for timing. MediaLink has two modes, one for bulk and one for real-time data. For digital audio and video, MediaLink can determine a fixed delay for each "channel." The target nodes buffer the data so that every channel pops out at the same moment. This presents a small, but fixed, delay through the system.

THE STANDARD THING

Will one company's protocol squeeze the others out? Probably not. Echelon is pursuing industrial applications, while Lone Wolf's first love clearly is the realm of arts and entertainment. One thing's for sure. Whichever supplier or suppliers rise to the top of the field, we users will be the real winners. ●

Top Ten Reasons For Owning A Wavestation.

1. The main reason is *Sound.*

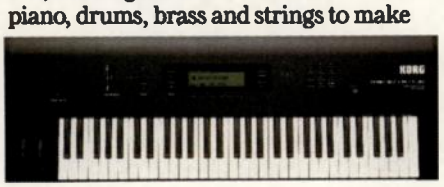
There are over 50 instruments on the market today that make sound one way, and only two that make sound this way: The new Wavestation EX keyboard and new Wavestation A/D rack. You can hear it in their remarkable preset sounds—nothing else can do what the Wavestation does.

2. The Wavestation is now available as a rack.

It's called the Wavestation A/D and it's at your Korg dealer now. The A/D has all the sound-shaping power of the Wavestation keyboard, plus new sounds, increased processing power and more.

3. The Wavestation has now been expanded with twice the PCM memory.

The newly expanded version of the Wavestation keyboard, the Wavestation EX, has 50 great instrument sounds like piano, drums, brass and strings to make



it ideal as your main keyboard. An expansion kit is also available for current owners. Wavestation keyboards can be easily upgraded to EX power at an authorized Korg Service Center.

4. The Wavestation A/D features analog inputs so you can process external sounds through its effects and synthesis sections.

Process voice and instrument sounds with effects like Vocoder and Pitch Shifting. Or through the Wavestation's Vector Synthesis and WaveSequencing sections.

5. WaveSequencing puts the Wavestation in a class by itself.

WaveSequencing produces complex streams of sound that change and evolve continuously over time. It's like the difference between a snapshot and a motion picture. WaveSequencing is a totally new way to create sounds. *To hear it, call 1-800-367-KORG for a special phone demo.*

6. Advanced Vector Synthesis gives you the power to create.

With Advanced Vector Synthesis, you can mix up to 32 of the Wavestation's 484 different waveforms and WaveSequences with programmable envelopes or in real time with a joystick.

7. Both Wavestations feature two independent stereo dynamic digital multi-effects systems with 55 effects.

The Wavestation's Dynamic Modulation feature lets you control these effects in real time from your keyboard or external controller. The A/D rack also stands out as a stand-alone signal processor.

8. The Wavestation EX and A/D offer the most powerful sound architecture available today.

Sounds can be configured as split, layer and multi-layer combinations. Up to 16 channels can be controlled by MIDI for expanded sequencing capability. The Wavestation EX can also transmit on up to eight channels so you can use it as a Master MIDI controller. Both rack and keyboard feature 32-note polyphony.

9. Korg and 3rd party developers offer a growing library of new sound cards for the Wavestation EX and A/D.

These include a broad selection of traditional instrument sounds like the WSC-1S Piano Card and WSC-2S Drum Card, along with radical new non-emulative sounds.

10. When you buy a Korg product, you get full-time product support.

We've created a special team of Product Support Specialists to back you up. Dial 1-516-333-USER and get direct access to our Product Support Center and staff of knowledgeable MIDI experts.

Like we said in the beginning, *sound* is the No.1 reason to find out more about the Wavestation. To hear it, dial 1-800-367-KORG. Or fill out the coupon below for a special Wavestation Video Demo and send it to Wave Demo, Korg USA, 89 Frost St., Westbury, New York 11590.

FREE WAVESTATION VIDEO DEMO!

Yes, send me a Wavestation Video Demo—absolutely free!

Name _____

Street _____

City _____

State _____ Zip _____

Please allow four to six weeks for delivery. Offer good while supplies last. One Video per coupon/respondent.

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WAVESTATION

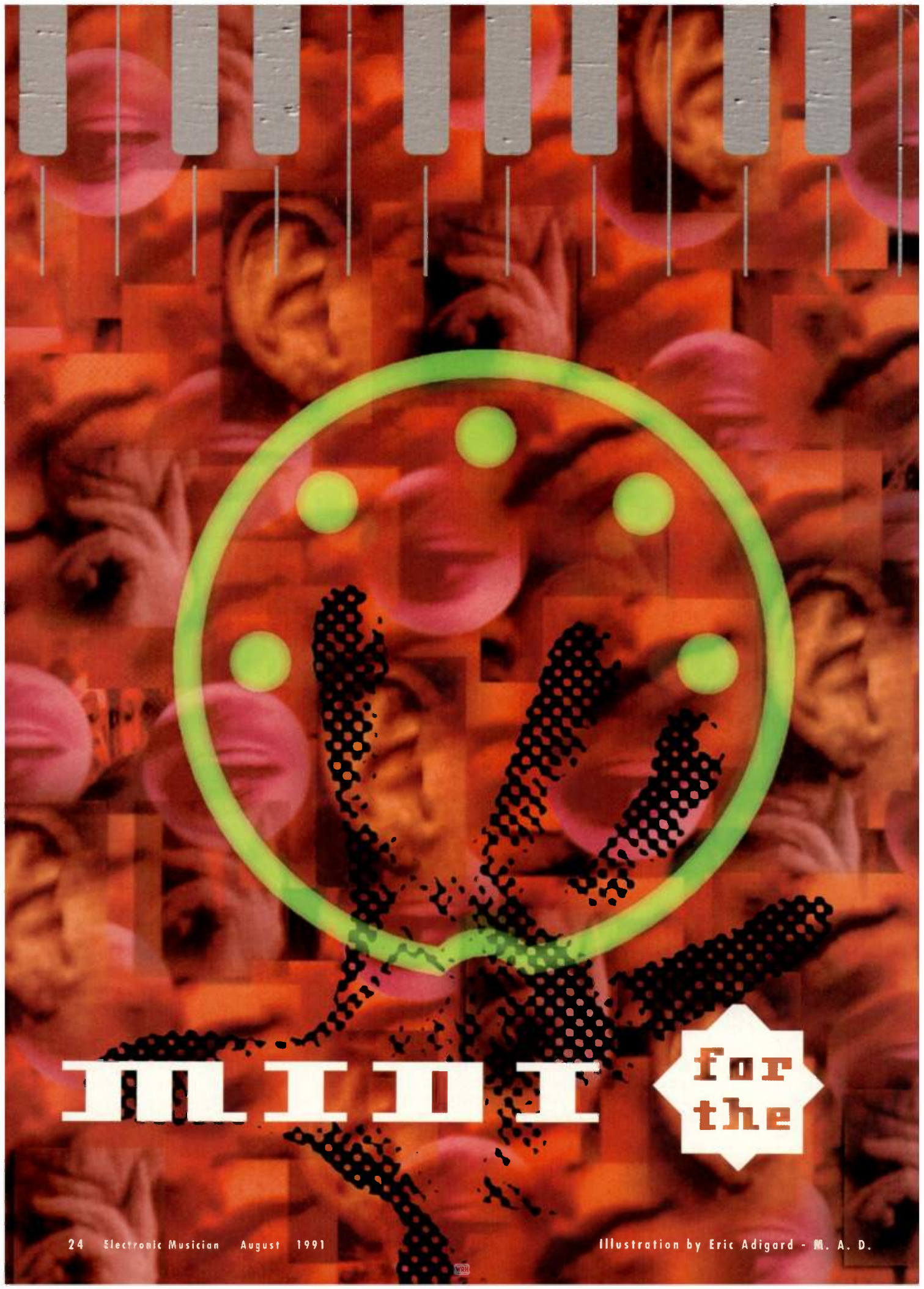

Illustration by Eric Adigard - M. A. D.

General MIDI aims to bring MIDI to the masses.

When MIDI came into being, no one had any idea that it eventually would dominate the music-making process. The goal of Sequential's 1981 proposal for the Universal Synthesizer Interface was sound layering and control from a remote keyboard or sequencer. Crossbreeding with Roland's Digital Control Bus raised the ante to sixteen instruments, with room for growth in control capabilities. At the time, manufacturers were still groping for applications and customers.

Today, MIDI is branching out, poking its head into such areas as mix automation, lighting control, and even tape transports. MIDI also has the opportunity to revolutionize the way consumers experience music.

A few years ago, Warner New Media, a division of Warner Communications, introduced the idea of a standardized subset of the MIDI protocols at a meeting of the MIDI Manufacturers Association (MMA).

MASSES

By Chris Meyer

General MIDI would let a consumer run a MIDI cable from a sequence player to a sound module and have a predictable set of sounds come out the other end.

The original target was CD+M, or CD+MIDI, a variation of CD audio that encodes MIDI data in parallel with sound (see the September 1988 **EM**). The group also had an eye on CD Interactive, a new entertainment system slated for shipment by the end of this year.

At the time, most MMA members, including myself, met the proposal with disinterest. We felt MIDI was only for musicians and couldn't see such "restrictions" placed on our instruments.

Fortunately, the interested parties persisted. Passport Designs, followed by a growing army of companies, finally convinced the MMA to adopt the proposal. General MIDI Level 1 was recently ratified by the JMSC (Japanese MIDI Standards Committee). It's a recommended practice for making a predictable entity of a MIDI sound module. Like MIDI itself, the possible uses for General MIDI (GM) have grown well beyond its initial purpose.

THE PROBLEM

Synthesizers are devices created to make a variety of unique sounds. MIDI, on the other hand, was created so that two connected instruments would perform exactly the same way.

This basic difference plagues every person who uses MIDI with instruments from different manufacturers. You have to translate the capabilities and presets on one synth to another. In the simplest case, you learn which program numbers bring up a particular sound on each instrument. (Let's see: The strings are MIDI program number 8 on Synth A, which it displays as 21 on the front panel, and program number 37 on Synth B, which it displays as 38. No problem.)

More advanced cases include matching pitch bend ratios and other esoterica. Most of us figured out how to do this, but we had to become MIDI engineers in the process. Many people now believe that learning raw hex codes is a requirement for creating music.

Standard MIDI Files (SMF) have only made life more difficult. SMF gave us the illusion that we could exchange sequences and collaborate in new ways. But when we tried this, we found we had to become expert on our collaborator's rig as well as our own. (What's that funky marimba line? I thought Larry said the horns took the lead?)

THE SOLUTION

The heart of GM is the *Instrument Patch Map*, shown in **Table 1**. This is a list of 128 sounds, with corresponding MIDI program numbers. Most of these are imitative sounds, though the list includes synth sounds, ethnic instruments, and a handful of sound effects.

The sounds fall roughly into sixteen families of eight variations each. Grouping sounds makes it easy to reorchestrate a piece using similar sounds. The Instrument Map isn't the final word on musical instruments of the world, but it's pretty complete.

General MIDI also includes a *Percussion Key Map*, shown in **Table 2**. This mapping derives from the Roland/Sequential mapping used on early drum machines. As with the Instrument Map, it doesn't cover every percussive instrument in the world, but it's more than adequate as a basic set.

To avoid concerns with channels, General MIDI restricts percussion to MIDI Channel 10. Theoretically, the lower nine channels are for the instruments, but the GM spec states that a sound module must respond to all sixteen MIDI channels, with dynamic voice allocation and a minimum of 24 voices.

General MIDI doesn't mention sound quality or synthesis methods. Discussions are under way on standardizing sound parameters such as

ROLAND'S GS STANDARD

When Warner New Media first proposed a General MIDI Standard, most MMA members gave it little thought. As discussions proceeded, Roland listened and developed a sound module to meet the proposed specification. At the same NAMM show where the MMA ratified General MIDI Level 1, Roland showed their Sound Brush and Sound Canvas, a Standard MIDI File player and GM-compatible sound module.

Some companies feel that General MIDI doesn't go far enough, so Roland created a superset of General MIDI Level 1, which they call GS Standard. It obeys all the protocols and sound maps of General MIDI and adds many extra controllers and sounds. Some of the controllers use Unregistered Parameter Numbers to give macro control over synth parameters such as envelope attack and decay rates.

The new MIDI Bank Select message provides access to extra sounds (including variations on the stock sounds and a re-creation of the MT-32 factory patches). The programs in each bank align with the original 128 in General MIDI's Instrument Patch Map, with eight banks housing related families. The GS Standard includes a "fall back" system. If the Sound Canvas receives a request for a bank/program number combination that does not exist, it will reassign it to the master instrument in that family. A set of Roland System Exclusive messages allows reconfiguration and customization of the sound module.

This means that a Roland GS Standard sound module will correctly play back any song designed for General MIDI. In addition, if the song's creator wants to incorporate some extra nuance, they can include the GS Standard extensions in their sequence. None of these extensions are so radical as to make the song unplayable on a normal GM sound module. After all, compatibility is what MIDI—and especially General MIDI—is all about.

Music authors interested in the GS Standard should contact Tom White at RolandCorp US, 7200 Dominion Circle, Los Angeles, CA 90040; tel. (213) 685-5141.

TABLE 1

PROG#	INSTRUMENT	PROG #	INSTRUMENT	PROG #	INSTRUMENT	PROG #	INSTRUMENT
1-8	**PIANO**	**33-40**	**BASS**	**65-72**	**REED**	**97-104**	**SYNTH EFFECTS**
1	Acoustic Grand Piano	33	Acoustic Bass	65	Soprano Sax	97	FX 1 (rain)
2	Bright Acoustic Piano	34	Electric Bass (finger)	66	Alto Sax	98	FX 2 (soundtrack)
3	Electric Grand Piano	35	Electric Bass (pick)	67	Teno Sax	99	FX 3 (crystal)
4	Honky-tonk Piano	36	Fretless Bass	68	Baritone Sax	100	FX 4 (atmosphere)
5	Electric Piano 1	37	Slap Bass 1	69	Oboe	101	FX 5 (brightness)
6	Electric Piano 2	38	Slap Bass 2	70	English Horn	102	FX 6 (goblins)
7	Harpsichord	39	Synth Bass 1	71	Bassoon	103	FX 7 (echoes)
8	Clav	40	Synth Bass 2	72	Clarinet	104	FX 8 (sci-fi)
9-16	**CHROM PERCUSSION**	**41-48**	**STRINGS**	**73-80**	**PIPE**	**105-112**	**ETHNIC**
9	Celesta	41	Violin	73	Piccolo	105	Sitar
10	Glockenspiel	42	Viola	74	Flute	106	Banjo
11	Music Box	43	Cello	75	Recorder	107	Shamisen
12	Vibraphone	44	Contrabass	76	Pan Flute	108	Koto
13	Marimba	45	Tremolo Strings	77	Blown Bottle	109	Kalimba
14	Xylophone	46	Pizzicato Strings	78	Shakuhachi	110	Bagpipe
15	Tubular Bells	47	Orchestral Strings	79	Whistle	111	Fiddle
16	Dulcimer	48	Timpani	80	Ocarina	112	Shanai
17-24	**ORGAN**	**49-56**	**ENSEMBLE**	**81-88**	**SYNTH LEAD**	**113-120**	**PERCUSSIVE**
17	Drawbar Organ	49	String Ensemble 1	81	Lead 1 (square)	113	Tinkle Bell
18	Percussive Organ	50	String Ensemble 2	82	Lead 2 (sawtooth)	114	Agogo
19	Rock Organ	51	SynthStrings 1	83	Lead 3 (calliope)	115	Steel Brums
20	Church Organ	52	SynthStrings 2	84	Lead 4 (chiff)	116	Woodblock
21	Reed Organ	53	Choir Aahs	85	Lead 5 (charang)	117	Taiko Drum
22	Accordian	54	Voice Oohs	86	Lead 6 (voice)	118	Melodic Tom
23	Harmonica	55	Synth Voice	87	Lead 7 (fifths)	119	Synth Drum
24	Tango Accordian	56	Orchestra Hit	88	Lead 8 (bass+lead)	120	Reverse Cymbal
25-32	**GUITAR**	**57-64**	**BRASS**	**89-96**	**SYNTH PAD**	**121-128**	**SOUND EFFECTS**
25	Acoustic Guitar (nylon)	57	Trumpet	89	Pad 1 (new age)	121	Guitar Fret Noise
26	Acoustic Guitar (steel)	58	Trombone	90	Pad 2 (warm)	122	Breath Noise
27	Electric Guitar (jazz)	59	Tuba	91	Pad 3 (polysynth)	123	Seashore
28	Electric Guitar (clean)	60	Muted Trumpet	92	Pad 4 (choir)	124	Bird Tweet
29	Electric Guitar (muted)	61	French Horn	93	Pad 5 (bowed)	125	Telephone Ring
30	Overdriven Guitar	62	Brass Section	94	Pad 6 (metallic)	126	Helicopter
31	Distortion Guitar	63	SynthBrass 1	95	Pad 7 (halo)	127	Applause
32	Guitar Harmonics	64	SynthBrass 2	96	Pad 8 (sweep)	128	Gunshot

The General MIDI Instrument Map groups sounds into sixteen families, with eight instruments in each family.

playable range and envelope times. This will ensure that an arrangement that relies on phrasing and balance can play back on a variety of modules.

Other requirements for a GM sound module include response to velocity, mod wheel, aftertouch, sustain and expression pedal, main volume and pan, and the All Notes Off and Reset All Controllers messages. The module also must respond to both Pitch Bend and Pitch Bend Sensitivity (a MIDI registered parameter). The default pitch bend range is ±2 semitones.

Middle C (C3) corresponds to MIDI key 60, and master tuning must be adjustable. Finally, the MMA created a new Universal System Exclusive message to turn General MIDI on and off (for devices that might have "consumer" and "programmable" settings). **Table 3** summarizes these requirements.

General MIDI has room for future expansion, including additional drum and instrument assignments and more required controllers. Also under discussion is an "authoring document" that would standardize things such as channel assignments (e.g., lead on 1, bass on 2, etc.) and setup information in a MIDI file.

APPLICATIONS

General MIDI is a perfect multimedia standard for music, and multimedia is about blurring the lines between different forms of art and entertainment. General MIDI gives musicians a chance to share our talents in new areas.

Home Entertainment. The purpose of CD+MIDI is to put MIDI-encoded re-creations of instrumental parts, or bonus instrumental lines, on an otherwise normal audio CD. Users can try their hand at reorchestration, or explore alternate versions. MIDI is also listed as a future extension for CD-Interactive.

TABLE 2

MIDI Key	Drum Sound	MIDI Key	Drum Sound	MIDI Key	Drum Sound
35	Acoustic Bass Drum	51	Ride Cymbal 1	67	High Agogo
36	Bass Drum 1	52	Chinese Cymbal	68	Low Agogo
37	Side Stick	53	Ride Bell	69	Cabasa
38	Acoustic Snare	54	Tambourine	70	Maracas
39	Hand Clap	55	Splash Cymbal	71	Short Whistle
40	Electric Snare	56	Cowbell	72	Long Whistle
41	Low Floor Tom	57	Crash Cymbal 2	73	Short Guiro
42	Closed Hi Hat	58	Vibraslap	74	Long Guiro
43	High Floor Tom	59	Ride Cymbal 2	75	Claves
44	Pedal Hi-Hat	60	Hi Bongo	76	Hi Wood Block
45	Low Tom	61	Low Bongo	77	Low Wood Block
46	Open Hi-Hat	62	Mute Hi Conga	78	Mute Cuica
47	Low-Mid Tom	63	Open Hi Conga	79	Open Cuica
48	Hi-Mid Tom	64	Low Conga	80	Mute Triangle
49	Crash Cymbal 1	65	High Timbale	81	Open Triangle
50	High Tom	66	Low Timbale		

The GM Percussion Key Map assigns drum sounds to individual note numbers. MIDI Channel 10 is reserved for percussion.

Now that General MIDI finally exists, this medium is ready to take off. Roland's Sound Canvas is the first GM sound module, with more to follow. MIDI File players, such as Roland's Sound Brush, are also available.

Musicians who create most of their music with MIDI should be particularly interested in exploiting CD+MIDI and General MIDI to create "deeper" records that listeners can experience with a greater degree of participation.

Games. Many computer games rely on synthesizer chips or MIDI sound modules to create sound effects and music. The most popular are Yamaha FM sound chips (such as the Sound Blaster card for the IBM PC) and variations of the Roland MT-32 (including the CM-32 module and LAPC-1 IBM PC card).

These two families of targets are incompatible. In addition, until recently there were no standards for sampled sound playback on PCs. Most game companies created their instruments and sound effects by using MIDI System Exclusive codes to reprogram the sound modules. As sound chips evolve, game companies must continually reprogram to support different modules and cards.

Enter the Microsoft MPC (Multimedia PC) standard (see this month's "Computer Musician" column on p. 70). While still offering a compatibility mode with existing cards, it presents a set of sound specs that include support of General MIDI and standardized sample rates and formats. (The Multimedia version of *Windows 3.0* also can play Standard MIDI Files in the background.) This means that game companies can use General MIDI for normal music and background orchestration and use standardized samples for special sound effects and voices.

Music Publishing and Distribution. Music comes either as finished recordings or as a set of marks and codes on paper for humans to play. This doesn't leave much for people who want to explore music, but have neither the time, nor skill to endure several years of learning to play an instrument.

Electronic music pioneer Morton Subotnick has been working on this problem at the Center for Experiments in Art, Information, and Technology at Cal Arts. He has demonstrated a system, using a computer and synthesizer, by which a person can interact with a piece of music in one of several ways:

- conduct tempo and phrasing while the computer plays the actual notes;
- play one of the parts while following the computer;
- play one of the parts and have the computer follow him or her;
- play the entire piece him or herself.

Not only is this great for practicing musicians, it gives non-musicians a way to exercise control over the music.

CD players that can output MIDI already exist (the NEC/Passport MIDIWorld player and Commodore's CDTV). General MIDI inevitably will be the playback standard for MIDI CDs. As a result, interactive music lessons and new forms of music publishing are becoming realistic possibilities.

Professional Collaboration. How does all this concern you, the musician and songwriter? You're not creating games or CD-I applications; you're playing music.

Have you ever tried to exchange Standard MIDI Files with someone using different equipment? How about recalling a song you worked on months ago, trying to remember what sounds were loaded in which synths? With the GM Instrument and Drum Key maps, electronic musicians possess a usable template for exchanging or recalling sequences and hearing them more or less as they were intended.

After the songwriting ends, you can always go back and assign custom sounds for the final mix. Think of General MIDI as the missing link for interchanging Standard MIDI Files. It will make collaboration with others considerably easier, even in real time. Today's computer modems allow you to call someone up and jam. A standardized mapping of sounds makes this hookup and translation much easier.

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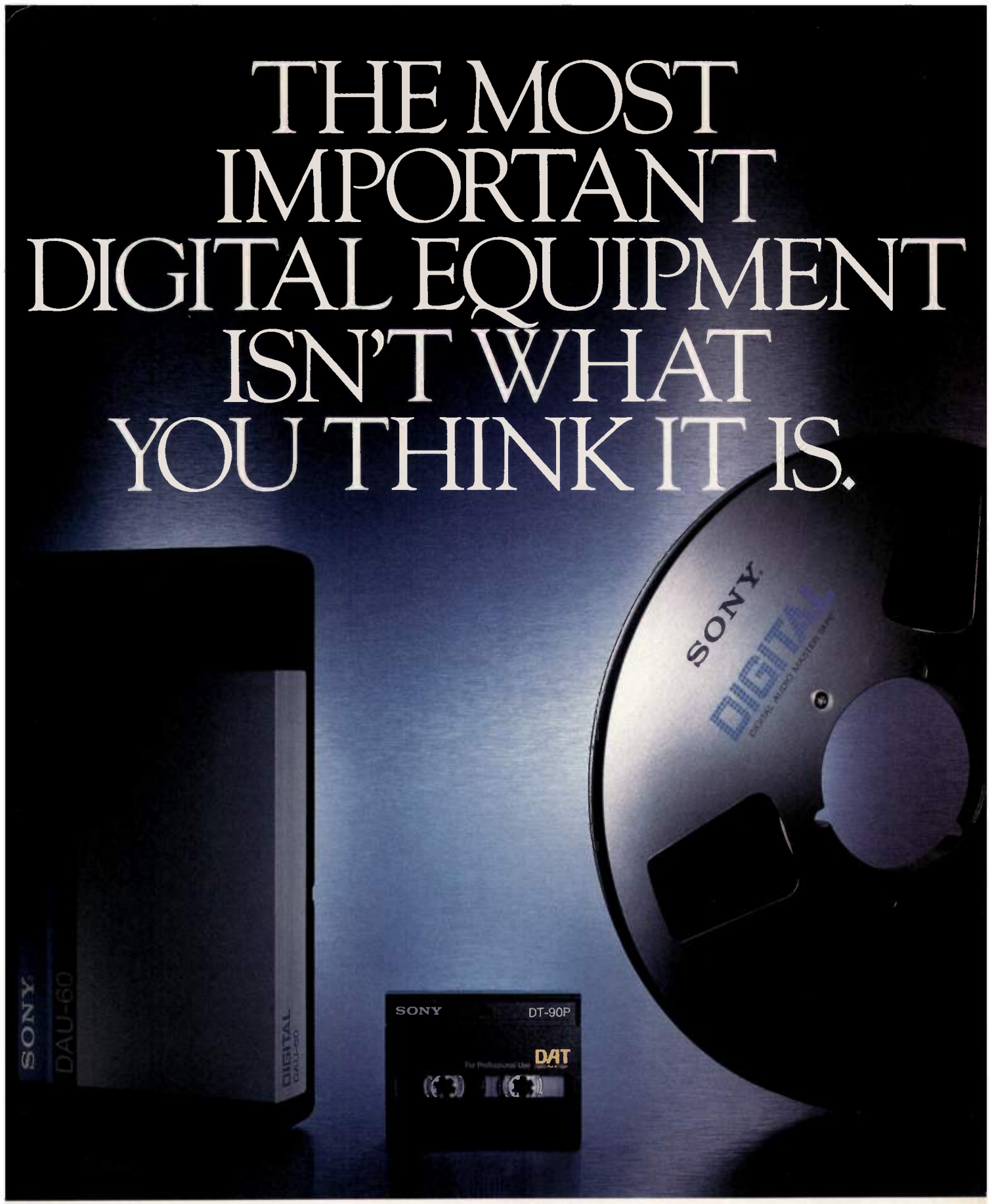

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TABLE 3

Voices:
A minimum of either 24 fully dynamically allocated voices available simultaneously for both melodic and percussive sounds or 16 dynamically allocated voices for melody plus eight for percussion.

Channels:
General MIDI mode supports all sixteen MIDI channels. Each channel can play a variable number of voices (polyphony). Each channel can play a different instrument (timbre). Key-based Percussion is always on channel 10.

Instruments:
A minimum of sixteen different timbres playing various instrument sounds. A minimum of 128 presets for Instruments (MIDI program numbers).

Note on/Note off:
Octave Registration: Middle C = MIDI Key 60. All Voices including percussion respond to velocity.

Controllers:

Controller #	Description
1	Modulation
7	Main Volume
10	Pan
11	Expression
64	Sustain
121	Reset All Controllers
123	All Notes Off

Registered

Parameter #	Description
0	Pitch Bend Sensitivity
1	Fine Tuning
2	Coarse Tuning

Additional Channel Messages:
Channel Pressure (Aftertouch)
Pitch Bend

Power-Up Defaults:
Pitch Bend Amount = 0
Pitch Bend Sensitivity = ± 2 semitones
Volume = 90
All Other Controllers = reset

General MIDI specifies minimum performance of a sound module.

For these reasons, it behooves all of us to look into a GM setup for our own studios, so we finally can work with each other at the drop of a 5-pin DIN cable and 3.5-inch diskette. Look for a burgeoning market in third-party sounds that re-create the GM Instrument Map on a variety of existing instruments.

THE FUTURE

General MIDI could prove as revolutionary as MIDI itself. Any industry needs standards, and General MIDI completes the standard description of a piece of music. Its existence means that anything that uses music can have a common language, other than the final recording, with which to interact.

General MIDI does not mean that every MIDI instrument must follow the GM Instrument and Drum Key Maps. Synths will still be synths and are expected to be different from each other. General MIDI is just a set of rules that ensures that "consumer" modules will react as expected. (Yes, the MMA is discussing a "General MIDI" sticker to make such products easy to identify.)

Of course, you don't have to use General MIDI. Many will resist such a confining, base-case standard. Remember, however, that GM is not just for people who can't set the time on their VCRs.

For more information on General MIDI, you can obtain a copy of the Level 1 Specification document ($5) from the International MIDI Association, 5316 West 57th St., Los Angeles, CA 90056; tel. (213) 649-6434. You also might want to order the first issue of the Journal of the MMA (back issues: $15), which contains an article from Passport Designs and MIDI activist Stanley Jungleib on General MIDI. If you feel particularly motivated, join the MMA (same address as IMA) and participate in further evolving any or all facets of MIDI.

Chris Meyer *is the technical chairman of the MIDI Manufacturers Association. Once a MIDI elitist, he now wants to see MIDI control everything.*

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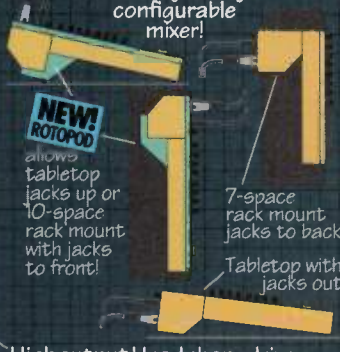

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The TAMING OF THE ROOM

Mischievous acoustics sabotage critical listening.

BY PETER ELSEA

It's a nightmare based on personal experience, and it won't let you go. You drift toward the stereo system at a friend's party to debut your latest composition. As the song fills the room, startled eyes watch you melt with embarrassment.

Your masterwork has transformed into sonic garbage. The bass booms, the highs screech, and the theme from *Gilligan's Island* is audible along with the lead vocal. As you awake in a sweat, the truth is apparent: You're a victim of *bad acoustics.*

It should be no surprise that the shape and furnishings of a room affect the sound within it. Extreme cases such as large reverberant bathrooms and overstuffed restaurants are everywhere. These conditions occur more subtly in your studio and cause inaccuracies in the sound perceived from the monitors. If not treated, these effects prompt adjustments during recording or mixing that sound strange when replayed in other listening environments.

Professional recording studios use expensive instruments to measure and "tune" the quality of sound in a space. Fortunately for the home recordist, the best sound-measuring devices are on the sides of your head.

Simple tests can reveal acoustical problems in your studio. Reference your recording environment to the outside world by comparing sounds on familiar recordings. Listen to one of your mixes and see how it stacks up to a commercial release played on the same system. A good mix in an optimum environment offers clear and balanced bass, highs that shine without harshness, and highly intelligible vocals.

ANDREW SHACHAT

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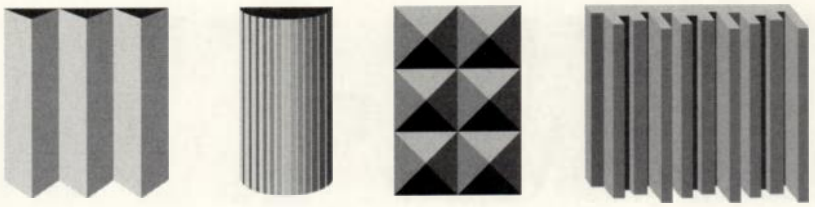

FIG. 1: Diffusers scatter sound with geometric shapes and patterns.

Mono signals should appear in the center of the speakers and not jump around with changes of pitch.

Listen to your studio's relative silence. Can you hear the hum of household appliances? Your neighbors arguing? Street traffic? Clap your hands. Do you perceive a slight broadening of the sound, with minimal reverberation and no pitches or echoes?

If these tests open a Pandora's Box of acoustical demons, don't panic. Controlling a room's sound is not very complicated and usually requires only inexpensive materials. The goal is simple: Move the sound from the speakers to your ears without messing it up.

REFLECTIONS

Three things happen when sound hits a wall: It is reflected, absorbed, or diffused. (Generally, all three occur in different degrees.) If the wall is flat and hard, the sound is mostly reflected. A single strong reflection often is heard as an echo, but most rooms exhibit a multitude of reflections (including reflections of reflections) that combine into reverberation.

Reverberation time is the length of time it takes for a loud, short sound to decay. Desirable reverberation is subjective. Most musicians can't get enough, as it enhances the harmonic qualities of their music. But critical listening demands a spartan approach, and reverb time should be kept to one-half second.

Reverberation time is determined by the volume of the room and the reflectivity of the room surfaces. To reduce a long reverb time, replace reflective wall areas with soft, absorptive sections. Every material possesses absorptive qualities, and these determine its *absorption coefficient.* This is a number between 0 (totally reflective) and 1 (open). For example, the absorption coefficient of brick is approximately 0.04, whereas heavy drapes rate 0.6. To determine the effective absorption of a surface, multiply its absorption coefficient by the area in square feet. You can use these numbers to compare materials and predict treatment results.

STANDING WAVES

Sound bouncing off flat walls often produces an undesirable effect called the *flutter echo,* or *standing wave.* Standing waves occur when parallel reflecting surfaces reinforce a particular set of frequencies. The distance between surfaces determines the frequency of reinforcement. For example, an 8-foot ceiling reinforces 70 Hz. Acoustical engineers refer to this resonant peak as a *room mode.*

To prevent this phenomenon, you should design the room with nonparallel walls. If you're not planning to remodel your studio, you can cure the problem by making one of the parallel walls absorptive or breaking up the flat surfaces with *diffusers* (**Fig. 1**). These objects have rounded or complex surfaces that reflect sound evenly throughout a room. Diffusers not only prevent standing waves, they eliminate "dead spots," places where certain sound components are missing.

Diffusers come in a variety of shapes. All forms of computer-designed surfaces, pyramids, and lattices work well, but avoid concave curves. (They focus sound instead of dispersing it.) The depth of a diffuser determines the lowest frequency it affects. A depth of one foot scatters sound down to 160 Hz.

PHASING OUT

Phase cancellation is a familiar problem to anyone who records with multiple microphones. If a sound arrives at a single point, via two paths, at slightly different times, certain frequencies are reinforced and others weakened. This condition is apparent when you put your ear close to a wall. The overall sound quality changes because reflections from the wall interfere with the direct sound. The effect is most

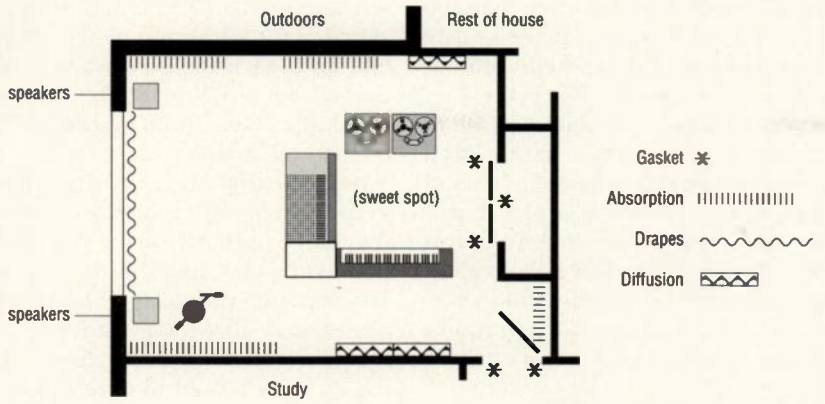

FIG. 2: Proper acoustic treatment transforms an ordinary room into an effective working studio .

intense when the difference between the direct sound path and the reflected sound path is small.

Attack phase cancellation with careful speaker placement. Avoid locating either the speakers or the listening position within short reflective paths, as in a corner. If this is unavoidable, determine where the reflections occur, and make that part of the wall or ceiling absorptive.

COLORATION

Beware of completely deadening the room to solve acoustical problems. A "dead" room is difficult to build and unpleasant to work in. The problem is that all absorptive materials are *frequency selective.* Most material absorbs high-frequency sound more readily than low; as you add absorption, the reverb tone becomes progressively bass-heavy. Employ absorption moderately and use materials that soak up the full range of sound. If you desire a dead room, use devices such as bass traps and Helmholtz resonators to prevent excessive bass coloration.

These materials need not be expensive. For example, ordinary R-19 fiberglass insulation is a good general purpose absorber and costs about 30 cents per square foot. It's also ugly and bad for the lungs, so cover it with lightweight cloth. You can make more attractive absorbers from foam products sold through audio supply houses. These work down to about 100 Hz. Carpet on a thick pad tames floor-to-ceiling waves and absorbs frequencies down to about 250 Hz. When hung in deep pleats, carpeting also works as a wall treatment.

Materials that lose absorbency below 100 Hz are acceptable because normal wall and floor construction is already absorptive in the low end, but reflective above 200 Hz. The reverb in an empty room is almost always bass-shy.

This information suggests a reasonable method for tuning a small studio:

Add absorption until the new material balances the original curve of the room, yielding reverberation with flat frequency response. Place the first absorptive panels near the speakers to eliminate interference paths, then spread the rest throughout the room to crush standing waves. If any hard, parallel surfaces remain, put diffusers on them. This basic method doesn't allow direct control of reverberation time, but this is seldom a problem in rooms smaller than 2,000 cubic feet.

PRINCIPLES IN PRACTICE

As an example, I'll describe the construction of my wife's studio (**Fig. 2**). The room is an 11 × 13-foot rectangle with an 8-foot ceiling. It features a front window overlooking a suburban street and a large closet at the back of the room. The closet enhances isolation by providing a "double wall" between the studio and our living room.

A plush carpet over a thick floor-pad provides the room's sole absorptive material. A clap test in the empty room revealed moderately long, high-frequency reverberation and the characteristic "chirp" of a severe standing wave.

Isolation. Isolation from the rest of the house is adequate, and gaskets on the studio doors solved most of the sound isolation problems. An additional drape across the main doorway offered slight improvement, but proved to be inconvenient. Drapes on the window successfully dampened street noise. (For more information on isolation, see "Sound Sanctuary" in the June 1991 **EM**.)

Equipment. After experimentation, we decided to locate the speakers on either side of the window. Speakers tend to move gypsum as well as air, so outside walls offer the best sound control. We hung the speakers six feet from the floor to allow placement of a writing table.

The speakers wound up eight feet apart, placing the "sweet spot" (optimum referencing area) eight feet from the wall, along the center line of the room. This dictated the location of the mixing board and other equipment (see "Studio Ergonomics" in the May 1990 **EM**).

With the equipment in place, we checked for reflective phase cancellation from the console or cabinet tops. To test this, set a mirror on the console and hold a flashlight at ear level, aimed at the mirror. If the light beam falls on or near the speakers, a potential reflection problem exists. To remedy this problem, prop up the back of the mixing board.

Wall Treatment. At this point, we were down to two problems: the rising frequency response of the reverberation and the standing wave. We attacked both problems with carefully placed absorptive panels of R-19 fiberglass, each measuring 2 × 6 feet. These panels didn't need to extend to the floor because furniture scatters sound at that point. We placed most of the panels on the walls near the speakers to clean up short reflections. To kill the standing wave and provide visual symmetry, we placed panels such that bare wall on one side faces absorption on the other. A large section of absorptive material near the left speaker created a dead corner for vocal recording.

The material of the window curtain is too light to provide broad deadening, but it combines with the low-frequency absorption of the windowpane to provide a reasonably flat response. The carpet and wooden floor interact in a similar way. We added diffusion to side walls at the back of the room with homemade panels and cluttered bookshelves.

Evaluation. This project yielded pleasing results and cost about $30. Gilligan remains trapped in the bedroom TV (no more guest-star spots on vocal tracks), and quiet activity in other rooms does not interfere with close microphone recording. A mono signal fed to both speakers results in a precisely centered image, making any imbalance in a stereo signal obvious. The room has a soft, comfortable ambience and the music produced there sounds fine out in the real world.

Obviously, there is more (a *lot* more) to acoustics, but these budget techniques are quite effective for tuning a small room. If you plan to build a studio from scratch, the *Handbook for Sound Engineers*, edited by Glen Ballou, has some handy articles. Be sure to check Mix Bookshelf (tel. [800] 233-4604 or [415] 653-3307) for additional resource materials.

Peter Elsea, *an electronic music teacher at the University of California, Santa Cruz, promised his wife he'd fix the sound in her studio about two years ago.*

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- *Pitch randomizing.*
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- *No delay time between patch changes.*
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EM GUIDE TO SEQUENCING SOFTWARE

By Dan Phillips
and
Bob O'Donnell

The most powerful tool in your studio is on a floppy disk.

The explosion of MIDI-based music systems in professional and bedroom studios has made sequencers an indispensable tool. Their ability to record, edit, and manipulate MIDI data with tremendous precision has earned the allegiance of composers, arrangers, and musicians who use electronic instruments. For many, the sequencer is the primary tool for conceptualizing and constructing music.

Sequencers come in several formats: stand-alone hardware, keyboard-based integrated "workstations," and software programs. Software sequencers are, by far, the most powerful of the three. Regardless of the computer platform you use—IBM PC and compatibles, Macintosh, Atari ST, or Commodore Amiga—you'll find these programs have developed into sophisticated, feature-rich command centers, giving composers integrated control of every element in an electronic music system. But it wasn't always so easy...

HISTORY REPEATS

The idea of a machine replaying a musical score predates computer sequencers by thousands of years. The earliest documented music box was built in Baghdad during the early 800s. "Sequences" were constructed on a revolving cylinder with pegs arranged to strike bells or chimes. Centuries later, Leonardo da Vinci developed a "workstation" with a cylinder that controlled a spinet and two drums.

In 1846, French craftsman Alexandre Debain broke the convention of an integrated player mechanism and sound source with the *antiphonel*. This device attached to any keyboard instrument and replaced the live musician with "a faultless (mechanical) player who never plays a false note or chord." The response of the musician's union is unknown.

Modern sequencing concepts appeared at the turn of the

PIERRE-YVES GOAVEC / SPECIAL THANKS TO MARK OF THE UNICORN, DR T'S AND TWELVE TONE SYSTEMS


Edit Region
Windows
REMOTE
bpm
Mark
Opt
OK
Load Remote
Load Sliders
Clock
Pointer
Record
Terminal

EM GUIDE TO SEQUENCING SOFTWARE

Product/Version	System Requirements	Interfaces Supported	Copy Protection	Tracks	Total MIDI Channels	MIDI File Types (Import/Export)	Maximum Clock Resolution	Type of Quantization
AMIGA PLATFORM								
Blue Ribbon Soundworks, Ltd. *Bars and Pipes 1.0f*	1 MB	standard	no	no limit	80	0,1/1	192 ppqn	programmable, strict, swing
Blue Ribbon Soundworks, Ltd. *Bars and Pipes Pro 1.1*	1 MB	Phantom, standard	no	no limit	80	0,1/1	192 ppqn	programmable, strict, swing
Dr. T's *KCS II 3.54*	2 MB	Phantom, standard	no	48	16	0,1/0,1	384 ppqn	programmable, strict, swing
Dr. T's *MRS 1.1*	512 KB	standard	yes	8	16	none	384 ppqn	strict
Dr. T's *Tiger Cub 1.08*	1 MB	standard	no	12	16	0,1/1	384 ppqn	strict, swing
MicroIllusions *Music X 1.1*	1 MB	standard	no	250	16	0,1/0,1	192 ppqn	programmable
Steinberg *Pro 24*	1 MB	SMP24	yes	24	80	0,1/1	96 ppqn	programmable
The Disc Company *Harmoni 1.2*	1 MB	standard	no	24	16	0,1/0,1	192 ppqn	strict, swing
ATARI PLATFORM								
C-LAB Software *Creator 3.1*	1 MB	C-LAB	yes	64	96	0,1/0,1	384 ppqn	programmable
Dr. T's *MRS 1.1*	512 KB	n/a	yes	8	16	none	384 ppqn	strict
Dr. T's *Omega 4.0*	2 MB	C-LAB Export, Phantom	no	48	64	0,1/0,1	384 ppqn	programmable, strict, swing
Dr. T's *RealTime 1.22*	512 KB	C-LAB Export, Phantom, standard	no	no limit	64	0,1/0	192 ppqn	programmable, strict
Dr. T's *Tiger Cub 1.0*	1 MB	n/a	yes	12	16	0,1/1	384 ppqn	strict, swing
Hybrid Arts *Edit Track 6.0*	1 MB	n/a	no	60	16	0,1/0,1	192 ppqn	programmable, strict, swing
Hybrid Arts *SMPTE Track Gold 6.0*	1 MB	SMPTE generator/reader (modem port)	no	60	16	0,1/0,1	192 ppqn	programmable, strict, swing
Midisoft *Studio, Advanced Edition 3.03*	512 KB	n/a	no	64	16	0,1/0,1	96 ppqn	programmable
Steinberg *Cubase 2.01*	1 MB	MIDEX +, MTC-1, SMP24, Timelock, Unitor 2	yes	64	80	0,1/1	192 ppqn	programmable, strict, swing
MACINTOSH PLATFORM								
Dr. T's *Beyond 2.09*	1 MB	all	no	99	32	0,1,2/0,1	480 ppqn	programmable, strict, swing
Dr. T's *Upbeat 2.05*	2 MB	all	no	128	32	0,1/0	192 ppqn	strict
Electronic Arts *Deluxe Recorder 1.0*	1 MB	all	no	16	32	1/1	480 ppqn	programmable
Freq Sound *One Step 1.0*	512 KB	all	no	16	16	0/0	96 ppqn	programmable, strict, swing
Green Oak Software *Rhapsody 3.0*	512 KB	all	no	64	32	1/1	192 ppqn	programmable, strict, swing
Mark of the Unicorn *Performer 3.61*	2 MB, hard disk recommended	all	yes	no limit	544	0,1,2/0,1	480 ppqn	programmable, strict, swing
Opcode Systems *EZ Vision 1.0*	1 MB	all	no	16	16	0,1/0,1	480 ppqn	programmable
Opcode Systems *Vision 1.3*	1 MB, hard disk recommended	all	yes	99	238	0,1/0,1	480 ppqn	programmable, strict, swing
Passport Designs *Pro 4 4.52*	1 MB	all	no	64	32	0,1/0,1	240 ppqn	programmable, swing
Passport Designs *Trax 2.2*	1 MB	all	no	64	16	0,1/0,1	240 ppqn	strict
Steinberg *Cubase 1.8*	1 MB (2 MB and hard disk recommended)	all	yes	64	512	0,1/1	192 ppqn	programmable, strict, swing

twentieth century with the *player piano*, a mechanical device capable of reproducing dynamic nuances. The performances of great pianists and composers (Rachmaninoff, Debussy, Mahler, and Gershwin, among others) were recorded and duplicated for playback, and even minor editing was possible. Innovative composers such as Hindemith, Nancarrow, Toch, and Stravinsky explored the player piano's freedom from human limitations. Compositions requiring multiple hands and amazing dexterity were written to exploit the mechanical medium. Stravinsky especially relished the device's ability to create metronomic rhythms and precisely terraced dynamics.

Although the mechanical music machine faded into historical novelty, it must be credited with introducing ideas central to the development of software sequencing: the use of technology to control sound, the recording of music as physical gestures on an instrument, and the unbinding of the composer from human performance.

The first computer-based application of these ideas occurred in the 1950s at Bell Laboratories when electronic music pioneer Max Mathews developed a program called Music I. Unlike previous music-related programs, Music I used the computer to generate audio, handling both synthesis and sequencing. The sequencer portion specified a pitch, a note-on time, a duration, and an amplitude for each note. The composer typed in data and waited as the

ncing thod	Ext							Hard Disk Record (Bits)	
linear	MC, MTC	hybrid notation, piano roll	yes	yes	yes	no	no	no	$199
linear, pattern	MC, SP,MTC	event list, hybrid/std notation, piano roll	yes	yes	yes	yes	yes	no	$379
linear, pattern	MC, SP,SMPTE	event list, piano roll	yes	yes	yes	yes	yes	no	$400
linear	MC	event list	no	no	no	yes	no	no	$49
linear	MC	piano roll	no	yes	yes	no	no	no	$139
linear	MC, SP,MTC	event list, piano roll	no	yes	no	yes	yes	no	$299
pattern	MC, SP,MTC	drum pattern, event list, piano roll, std. notation	yes	yes	yes	yes	no	no	$350
linear, pattern	MC, SP	event list	no	no	yes	no	yes	no	$99
linear, pattern	MC,SP, SMPTE, VITC	drum pattern, event list piano roll	yes	yes	yes	yes	yes	no	$445
linear	MC	event list	no	no	no	yes	no	no	$49
linear, pattern	MC, SP,SMPTE	event list, piano roll	no	yes	yes	yes	yes	no	$450
linear, pattern	MC, SP,MTC, SMPTE	drum pattern, event list, piano roll	no	yes	yes	no	yes	no	$199
linear	MC	piano roll	no	yes	yes	no	no	no	$139
linear, pattern	MTC	event list, piano roll	yes	yes	yes	yes	yes	no	$99
linear, pattern	MC, SP, MTC, SMPTE	event list, piano roll	yes	yes	yes	yes	yes	no	$495
linear	MC, SP,MTC	event list	no	no	yes	yes	yes	no	$99
linear, pattern	MC, SP,MTC	drum pattern, event list, piano roll, std. notation	yes	yes	yes	yes	no	no	$579
linear, pattern	MC, SP,MTC	event list, piano roll	yes	yes	yes	yes	yes	no	$319
linear, pattern	MC, SP,MTC	drum pattern, piano roll	yes	no	yes	no	yes	no	$199
linear, pattern	MC	event list, piano roll	no	yes	no	no	yes	no	$149
linear	MC, SP	limited event list, piano roll	no	yes	yes	yes	no	no	$69
pattern	MC, MTC, SP	drum pattern, event list, piano roll	yes	yes	yes	yes	yes	no	$225
linear, pattern	MC, SP, MTC, DTLe,	event list, piano roll, std. notation	yes	yes	yes	yes	yes	no	$495
linear, pattern	MC	piano roll	yes	yes	no	no	yes	no	$149
linear, pattern	MC, SP,MTC	drum pattern, event list, piano roll	yes	yes	yes	yes	yes	yes *Studio Vision* $995	$495
linear	MC, SP,MTC	event list, piano roll	yes	yes	yes	no	yes	no	$495
linear	MC, SP	piano roll	yes	no	no	no	yes	no	$99
linear, pattern	MC, SP,MTC	drum pattern, event list, piano roll, std. notation	yes	yes	yes	yes	no	no	$495

computer calculated the resulting sound file, taking up to 100 minutes to process each minute of music. Music I was particularly non-real-time, as the data calculated on a computer in New York was taken to Bell Labs in New Jersey for playback.

Music I was refined in various ways—including the addition of more voices, sophisticated compositional control, and significantly expanded synthesis facilities—and finally reached a resting place at Music V. Responding to frustrations with the non-real-time nature of Music V, the GROOVE project, begun by Mathews and associate F.R. Moore in October 1968, attempted to provide real-time, intuitive interaction with the computer music system. Real-time, complex digital sound generation was not yet a reality, so they used a computer to send control voltages to an analog synthesizer, which created the audio. This distribution of tasks and view of the musical score as a series of control signals, as opposed to actual sound data, presaged the modern MIDI studio.

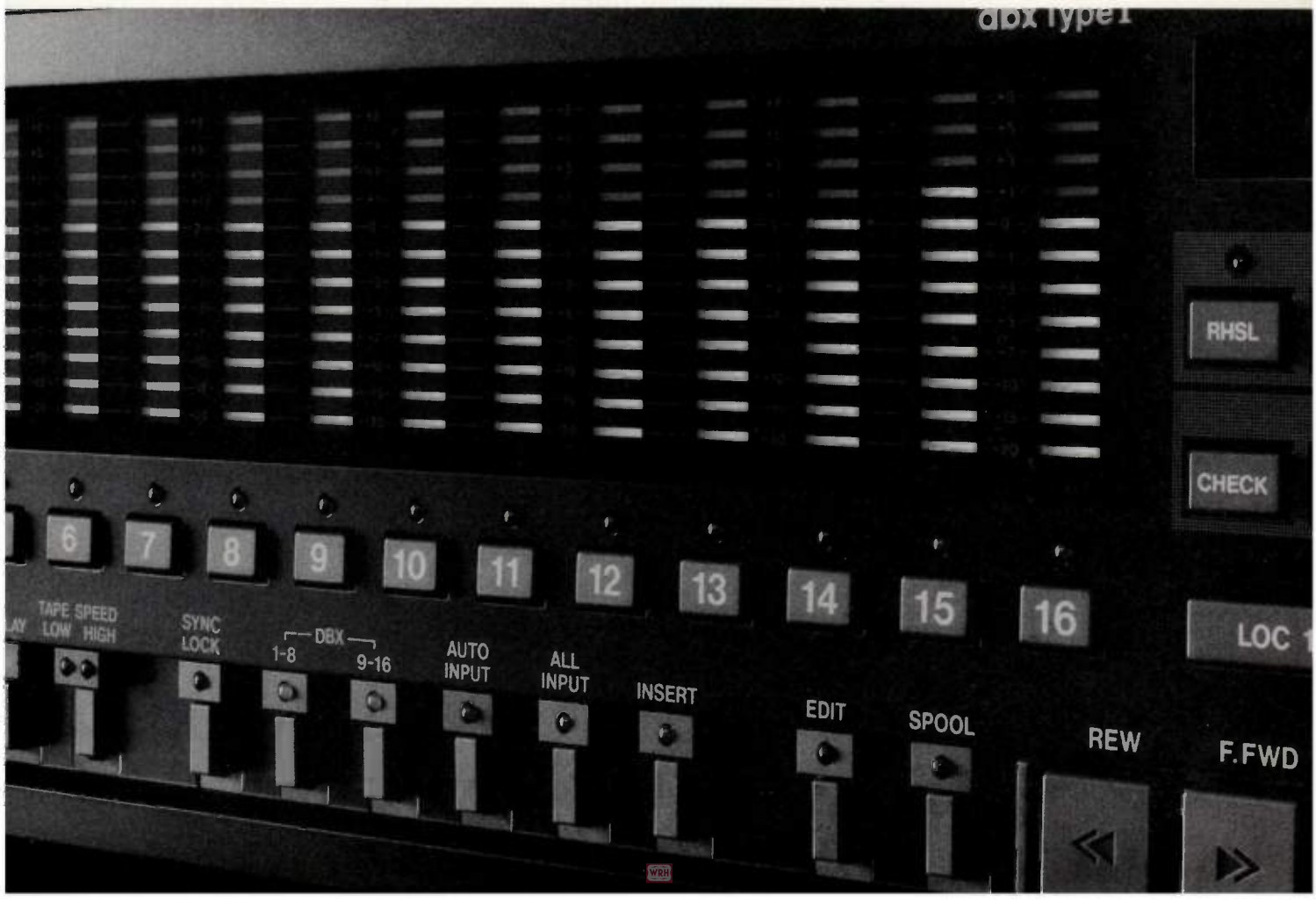
CHARTING PROGRESS

Modern software sequencers expand the concept of the ancient music box towards omnipotence by giving the composer complete control over a myriad of parameters. It is difficult to list *all* these features in a concise format, so we developed a chart reflecting what we felt most musically important. (We also included some history regarding

PC PLATFORM

Product/Version	System Requirements	Interfaces Supported	Copy Protection	Tracks	Total MIDI Channels	MIDI File Types (Import/Export)	Maximum Clock Resolution	Type of Quantization
Big Noise Software *Cadenza 2.4*	512 KB, graphics card	MPU-401, MQX32M	no	64	32	0,1/1	240 ppqn	strict
Circa Industries *Orpheus 2.0*	256 KB, graphics card	MPU-401, MQX32M	no	64	32	0,1/0,1	120 ppqn	programmable
Dr. T's *Prism 1.5*	384 KB, mouse	C1, CMS, MPU-401, Optronics	no	16	128	0,1/0,1	96 ppqn	strict, swing
Dynaware *Ballade 2.5*	640 KB, graphics card, mouse	MPU-401	no	10	16	1/1	48 ppqn	strict
Dynaware *DynaDuet 1.4*	640 KB, graphics card, mouse	MPU-401	no	16	16	1/1	192 ppqn	strict
Eclipse Technologies *PC MusicMaker 3.2*	256 KB, mouse (optional)	HRS-3000, MPU-401, 6850 UART, 8250 UART	no	64	96	0,1/0,1	600 ppqn	strict
Keller Designs *64 Track PC 2.5*	640 KB	MPU-401, MQX16S, MQX32M, Soundmaster	no	64	128	1/1	720 ppqn	programmable, strict
Key Electronics *Keynote 16 1.2*	256 KB	MPU-401, Key MS101, MS103, MS114	no	16	256	1/1	96 ppqn	strict
LTA Productions *Forte II 2.3*	384 KB	C1, IBM, MPU-401, MQX32M	no	32	32	1/1	120 ppqn	programmable
Magnetic Music *Texture 4.0*	384 KB	C1, MPU-401, MQX16S, MQX32M	yes	48	128	0, 1/0, 1	240 ppqn	progammable swing
Midisoft *Studio, Advanced Edition 2.07*	512 KB, mouse (optional)	Midisoft, MPU-401	no	64	16	0,1/0,1	96 ppqn	programmable
Musicator *Musicator 2.5*	640 KB, hard disk	MPU-401	no	32	32	0,1/0,1	192 ppqn	programmable, strict, swing
Passport Designs *Master Tracks Pro 3.93*	1 MB, *Windows 3.0*, hard disk, mouse	MPU-401, MQX32M,	no	64	32	0,1/0,1	240 ppqn	programmable
Passport Designs *Trax 2.13*	1 MB, *Windows 3.0*, hard disk, mouse	MPU-401, MQX32M,	no	64	16	0,1/0,1	240 ppqn	strict
Softelligence *Personal Composer 3.3*	640 KB, hard disk	CMS, IBM, MPU-401, MQX32M, Voyetra	no	32	16	0,1/	120 ppqn	programmable
Twelve Tone Systems *Cakewalk 4.0*	512 KB, mouse (optional)	Kee, MPU-401, PS1, Optronics	no	256	16	0,1/1	120 ppqn	programmable
Twelve Tone Systems *Cakewalk Pro 4.0*	640 KB, hard disk recommended, mouse (optional)	C1, IBM, Kee, MOTU, MPU-401, MQX16S, MQX32M, Optronics	no	256	256	0,1/1	480 ppqn	programmable
Voyetra *Sequencer Plus Classic 4.0*	512 KB, hard disk	IBM, MPU-401, MQX32M, V-22, V-24	no	500	128	0,1,2/0,1	192 ppqn	programmable
Voyetra *Sequencer Plus Gold 4.0*	512 KB, hard disk	IBM, MPU-401, MQX32M, V-22, V-24	no	2000	128	0,1,2/0,1	192 ppqn	programmable, swing
Voyetra *Sequencer Plus Jr. 4.0*	512 KB, hard disk	IBM, MPU-401, MQX32M,	no	64	128	0,1,2/0,1	192 ppqn	strict

linear, limited pattern	MC,SP, MTC	event list, piano roll	yes	yes	yes	no	yes	no	$199
linear	MC, SP	event list, piano roll	no	no	yes	yes	no	no	$180
pattern	MC, SP	event list	no	yes	yes	no	no	no	$99
linear, pattern	MC	drum pattern, std. notation	yes	yes	no	no	no	no	$195
pattern	MC	event list, std. notation	no	yes	yes	yes	no	no	$245
linear	MC, SP	event list, piano roll	no	no	no	no	no	no	$269 (includes HRS-3000, cables, inst. video)
linear, pattern	MC, SP, MTC, SMPTE	drum pattern, event list, piano roll	yes	yes	yes	yes	yes	no	$150 (Pro version $259)
linear	MC	drum pattern, event list	no	no	no	no	yes	no	$99
linear, pattern	MC, SP, MTC, SMPTE	event list, piano roll	no	yes	yes	yes	yes	no	$250
linear, pattern	MC, SP, SMPTE	event list	no	no	yes	no	no	no	$199
linear	MC, SP, MTC	event list	no	no	yes	yes	yes	no	$99
linear	MC, SP, MTC, SMPTE	std. notation	no	yes	yes	no	no	no	$545
linear	MC, SP, MTC	piano roll	yes	yes	no	no	yes	no	$395
linear	MC, SP	piano roll	yes	no	no	no	yes	no	$99
linear	MC	event list, piano roll, std. notation	yes	yes	yes	no	no	no	$395
linear	MC, SP	event list, measure view, piano roll	no	no	yes	yes	yes	no	$150
linear	MC, SP,MTC, SMPTE	event list, measure view, piano roll	no	no	yes	yes	yes	no	$249
linear	MC, SP,MTC, SMPTE	piano roll	no	no	yes	no	yes	no	$169
linear	MC, SP, MTC, SMPTE	piano roll	no	no	yes	yes	yes	no	$299
linear	none	piano roll	no	no	no	no	yes	no	$69



the development of certain features.) The programs are separated by platform to facilitate easy comparison, and multi-platform programs have independent entries for each version. Before finalizing a purchase decision, be sure to acquire a demo disk or contact the manufacturer for more information. Few product categories offer the option to "try before you buy," so take advantage of it.

SYSTEM REQUIREMENTS

Different programs require various types of operating system software and hardware.

INTERFACES SUPPORTED

On the Macintosh and Amiga, standard MIDI interfaces work with all programs. The Atari has a built-in MIDI interface. Multiport MIDI interfaces (discussed in the February 1991 "Computer Musician") require support by the program and are listed separately. For the PC, we list all supported interfaces (for more on the confusing world of PC interfaces, see "MIDI Interfaces for Your PC" in the September 1990 "Computer Musician").

COPY PROTECTION

Some users avoid copy-protected programs because of difficulties caused during normal operation of the computer, such as backing up and/or optimizing hard disks.

TRACKS

The total number of recording tracks available per sequence is confusing if you forget that tracks and channels are not equivalent. In most sequencing programs, each track can have up to sixteen MIDI channels of data, or several tracks can share the same MIDI channel. This last scenario is particularly appropriate for drum parts where each sound is assigned its own track to allow individual quantization, but the drum machine itself is programmed

LIST OF MANUFACTURERS

Big Noise Software
3827 Pizarro Rd.
Jacksonville, FL 32217
tel. (904) 730-0754

C-LAB Software
PO Box 750
Nevada City, CA 95959
tel. (916) 265-6484

Circa Industries
PO Box 3751
Reston, VA 22090
tel. (703) 435-5628

Dr. T's Music Software
100 Crescent Rd., Suite 1B
Needham, MA 02194
tel. (617) 455-1454

Dynaware
950 Tower, #1150
Foster City, CA 94404
tel. (415) 349-5700

Eclipse Technologies, Inc.
1221 West Campbell Rd., Suite 125
Richardson, TX 75080
tel. (800) 456-6434
or (214) 238-9944

Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
tel. (415) 571-7171

Freq Sound
5451 Watercress Place
Columbia, MD 21045
tel. (301) 964-3548

Green Oak Software
4446 Salisbury Dr.
Carlsbad, CA 92008
tel. (619) 434-0823

Hybrid Arts
8522 National Blvd.
Culver City, CA 90232
tel. (213) 841-0340

Keller Designs
2920 Jefferson
Eugene, OR 97405
tel. (503) 485-3481

Key Electronics
7515 Chapel Ave.
Fort Worth, TX 76116
tel. (817) 560-1912

LTA Productions
PO Box 6623
Hamden, CT 06517
tel. (203) 787-9857

Magnetic Music
6 Twin Rocks Rd.
Brookfield, Ct 06804-1910
tel. (203) 775-7832

Mark of the Unicorn
222 Third St.
Cambridge, MA 02142
tel. (617) 576-2760

MicroIllusions
P.O. Box 3475
Granada Hills, CA 91394
tel. (818) 785-7345

Midisoft
PO Box 1000
Bellevue, WA 98004
tel. (206) 881-7176

Musicator
PO Box 410039
San Francisco, CA 94141
tel. (916) 756-9807

Opcode Systems, Inc.
3641A Haven Dr.
Menlo Park, CA 94025-1010
tel. (415) 369-8131

Passport Designs
625 Miramontes St.
Half Moon Bay, CA 94019
tel. (415) 726-0280

Softelligence
3213 West Wheeler St., Suite 140
Seattle, WA 98199
tel. (206) 546-4800

Steinberg/Jones
17700 Raymer, Suite 1001
Northridge, CA 91325
tel. (818) 993-4091

The Blue Ribbon Soundworks, Ltd.
1293 Briardale NE
Atlanta, GA 30305
tel. (404) 377-1514

The Disc Company
PO Box 67713
Los Angeles, CA 90067
tel. (213) 478-6767

Twelve Tone Systems
PO Box 760
Watertown, MA 02272
tel. (800) 234-1171
or (617) 273-4437

Voyetra
333 5th Ave.
Pelham, NY 10803
tel. (914) 738-4500

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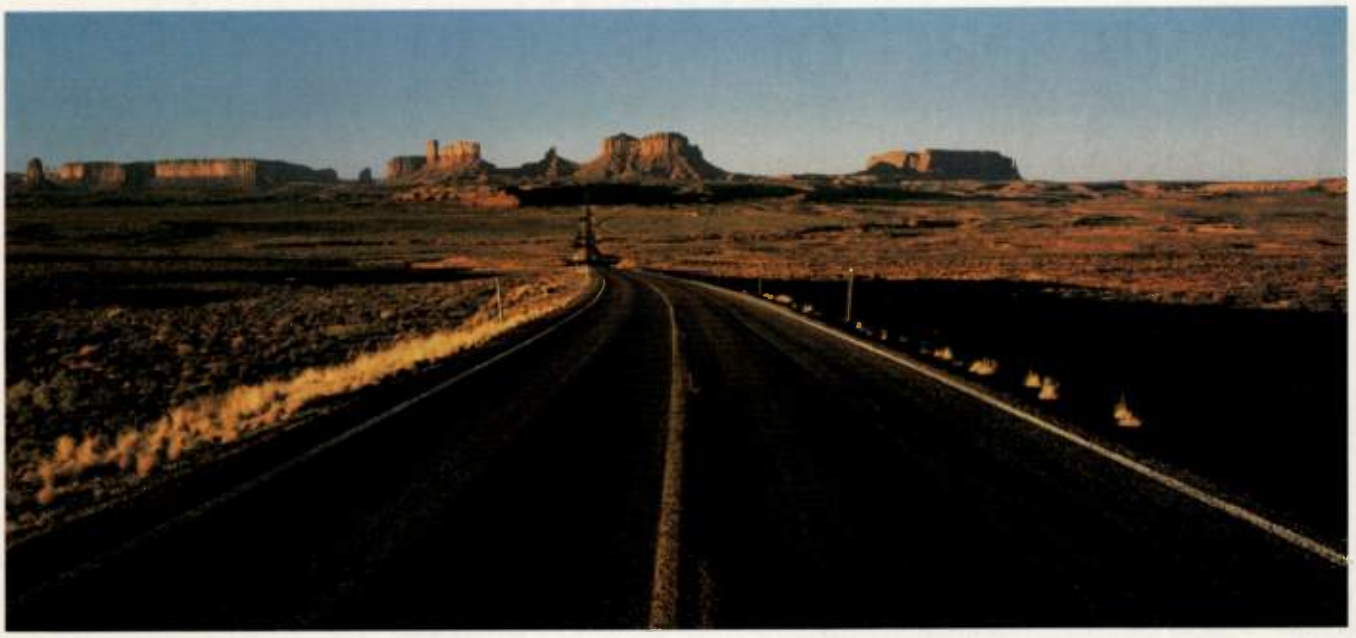

Through long road trips and short tempers, nothing is more dependable than the Yamaha Club Series. So reliable, in fact, they've got one of the best warranties around. So affordable, you'd buy them anyway. If you're putting a band together, use nothing but genuine Yamaha parts.

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to respond to one channel.

TOTAL MIDI CHANNELS

The total number of MIDI channels the program sends data is not limited to sixteen because multiport MIDI interfaces support multiple groupings of the standard sixteen channels. Access to additional channels is important if you independently address several multitimbral sound modules, signal processors, and other MIDI-controlled devices.

MIDI FILE TYPES

Standard MIDI Files are a huge help in allowing musicians to use different programs, or even different computers, to share sequences. Several types of MIDI Files exist, and most programs are selective about the types supported. Type 0 files are the common single track format (all data is combined onto a single multichannel track), Type 1 files contain several simultaneous tracks with identical tempos and time signatures, and Type 2 files consist of independent tracks with different tempos and time signatures.

MAXIMUM CLOCK RESOLUTION

A sequencing program's ability to capture the "feel" of a performance is largely dependent on how fine a resolution is used for its master reference clock. A sequencer must map every event to a particular location in time (even unquantized events). The higher the resolution, the more quantizing locations available per beat, and the less likely moving notes to fit those locations will enforce rhythmic regimentation. However, higher clock rates can tax the computer's central processor, which may cause timing problems. Consequently, some programs allow adjustment of timing resolution to match processing horsepower.

TYPE OF QUANTIZATION

Quantization is both the joy and bane of sequencer users. Proper application "fixes" poor timing in your playing, but overuse produces strict-sounding, unfeeling music. First explored in the drum machine (which combines sequencer and sound module into a single device), quantization was partially a byproduct of design constraints. Because of the high cost of memory at the time, the first Linn LM-1 drum machines featured quantization strictly as a data reduction device (only later was its usefulness realized). If clock resolution was set to eighth-notes, the machine declined to store values for sixteenth- and thirty-second-note positions, thereby keeping memory use to a minimum.

On the chart, the annotation of strict quantization refers to programs quantizing to exactly the level requested by the user. In other words, if you select sixteenth-note quantization, everything falls exactly on a sixteenth of a measure.

Programmable quantization, on the other hand, refers to certain humanizing functions becoming more popular in music programs. For example, some programs allow movement of notes 50 percent of the way towards the selected quantization value. This function nicely tightens up the music, without making everything sound robotic.

Swing is a quick way of injecting feel into quantized rhythms. But even this can sound mechanized, because it applies the same amount of shift to each value. To outstrip this limitation, more sophisticated, programmable swing options are starting to appear.

SEQUENCING METHOD

There are two basic methods for composing with sequencers: Linear formats create a piece from beginning to end, while pattern-based models use repeatable chunks of music to construct a song. Very early sequencers were linear. The drum machine, with its limited memory and orientation towards repetitive pop music stylings, inspired the pattern approach. Many of today's sequencers support both methods, allowing a choice based on the individual composition.

EXTERNAL SYNC OPTIONS

All sequencing programs function as master timing sources for synchronization, but a program's ability to accept control by an external source determines how effectively it works in a larger system. The types of synchronization listed: MIDI Clock (MC), MIDI Clock with Song Position Pointers (SP), and MIDI Time Code (MTC) offer increasing degrees of usefulness and accuracy. MIDI Clock provides only timing information, requiring that a controlling device start from the beginning to maintain synchronization. Song

• SEQUENCING

Position Pointers add location information, allowing a device to start at any point in a piece. MTC offers the absolute accuracy of SMPTE time code. Enhanced Direct Time Lock (DTLe) is a Mark of the Unicorn variation on MTC.

Certain sync options depend on the MIDI interface used, or on other synchronization hardware. For example, MTC support doesn't mean you'll automatically get frame-accurate precision. You also need an external SMPTE-to-MIDI converter or a MIDI interface that supports SMPTE/MTC.

Some programs include support for FSK, Smart FSK, and/or SMPTE time code (with the appropriate hardware). In most cases, a MIDI interface or external sync box converts these sync tones into one of the aforementioned MIDI messages before they are sent to the program. A few programs, however, slave directly to the sync tones.

EDITING STYLE

The type of editing styles and graphics provided by a program make a big difference in how quickly and easily you'll make music. Early sequencers limited editing options to an event list, which typically consisted of a one line text entry for each recorded MIDI event. Though precise, event lists were not very intuitive. To overcome this, several programs added a graphic view of the data in a piano roll format. Notes are illustrated in this format as horizontal bars where vertical placement determines pitch, horizontal placement determines rhythm, and length determines duration.

Piano roll editing is useful for working with note data, and is often more informative than traditional notation because it allows determining, for example, which notes are still sounding on the "and" of a specific beat.

Drum pattern editing is a specialized version of the piano roll method. Here the vertical axis represents available drum sounds, not pitch. Because durations aren't crucial for most drum sounds, this parameter often is not represented. In addition, notes are generally laid out on a very strict grid, with each grid line representing a sixteenth note. Some specialized drum-oriented programs represent levels of velocity with different icons, making dynamics editing visually intuitive. Generally, this method sacrifices some


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of the subtlety of control offered by piano roll editing, in the interest of speed and ease of use.

Finally, some programs incorporate traditional music notation for those who prefer to edit notes in a more familiar representation.

GRAPHIC FADERS

As even modest synthesizer networks grow beyond sixteen MIDI channels, it is necessary that sequencers address the issue of studio networking. Some solutions are hardware-based, such as Lone Wolf's MIDITap and Mark of the Unicorn's MIDI Time Piece. Both devices allow sequencers to address far more than 16 MIDI channels. Other solutions comprise software tools, such as graphic (onscreen) faders introduced in Opcode's *Vision* and quickly copied by virtually every major manufacturer. These allow adjustment of volume and other control parameters on all your synths and modules, without leaving your sequencer. Most programs record the fader movements, giving you a form of automated mixing.

GRAPHIC CONTROLLER EDITING

Controllers often cry out for visual representation to tame huge strings of data that look quite intimidating on event lists. (Credit Passport's *MasterTracks Pro* as the first to offer this now-common feature.) All together, this data describes smooth and orderly curves that edit nicely when viewed onscreen.

CONDITIONAL EDITING

Often times you'll need to edit a group of non-sequential notes or other MIDI data, such as reassigning all snare drum hits to a different MIDI note number. Conditional editing allows this, and other handy things, by accessing any group of events meeting specified criteria. For example, if you want to split simple left hand and right hand parts onto two tracks, a program with conditional editing allows selection of all notes above a certain pitch to be moved to a new track.

SYSEX EDITING

Although not an essential feature, the ability to edit raw sysex data is handy for tweaking real-time synthesis parameters. A program offering this feature typically is very deep and thorough in its editing functions.

INDEPENDENT TRACK LOOPING

When composing music utilizing repetition, it's common to set up a drum groove on one track, a bass line on the next, and so on. Independent track looping lets you turn looping on and off per track, allowing, for example, a repeating four-bar drum pattern and a repeating eight-bar bass line to play with a non-repeating chordal progression.

HARD DISK RECORDING

Currently, the most important trend in sequencing is the integration of MIDI and hard disk digital audio recording. This feature makes an incredible amount of sense if you work with both MIDI and audio tracks, and expect to do any sort of editing (a task in which hard disk systems excel).

Because the cut-and-paste operation on a sequencer often requires the same edit on digital audio tracks, it makes sense to handle them on the same device. The Synclavier held the monopoly on this until late last year, when Opcode's *Studio Vision* brought integrated sequencing and hard disk recording to the Macintosh. Many developers are following suit.

PRICE

Power has its price.

CONCLUSION

Sequencing programs have improved tremendously over the last few years. Current state-of-the-art programs have deep roots in past mechanical innovations, but offer functionality and features beyond anything imaginable even ten years ago.

Use the chart to get a head start looking for programs that meet your budget and feature requirements, but keep in mind you'll need to do some work of your own. It's important to test certain "unchartables," such as ease of use and compatibility with your individual composition skills. A sequencer is an extremely important part of your system, so take your time to find something that works for you. Once you've got the right "partner," your music making will never be the same.

(Thanks to Dr. David Wessel and Roger Linn for their help in preparing this article.)

Dan Phillips, *a self-avowed sequencer jock, works as a product specialist for Korg Research and Development.*

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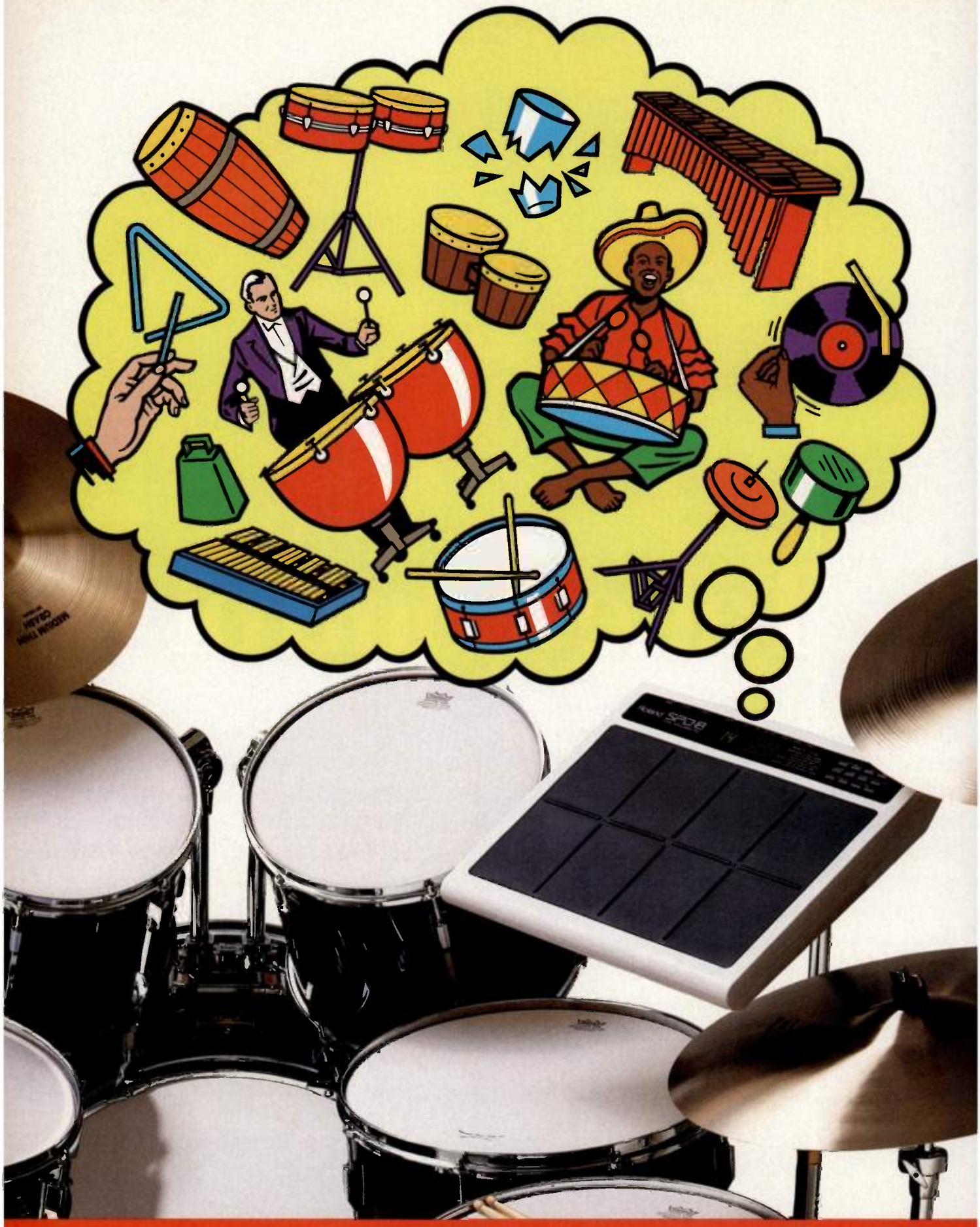

A picture may be worth a thousand words, but in this case we might add six more. Roland. SPD-8. Buy one. Thank you. **Roland**

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MAX

PROGRAMMING WORKSHOP

Opcode brings the excitement of modular synthesis back to electronic music.

In a year of incremental improvements, Opcode's *Max* is a refreshing oasis. Created by Miller Puckette and brought to commercial polish by David Zicarelli, Max (named for electronic music pioneer Max Mathews) is a full-featured, Mac-based, visual programming language for musicians.

Max does almost anything you want and many things you've never considered: custom drum machine-style sequencing (with whatever humanizing you care to build in), elaborate arpeggiation, keyboard remapping, weird interactions between performers—all are possible with Max.

Of course, some jobs are harder than others. My Max programs (called *Patchers*) took from two minutes to a week to create, and more of them were shorter than longer. An evening's work can produce a useful utility or even an entire piece.

Don't mistake Max for a sequencer. Though it records and plays sequences and reads and writes Standard MIDI Files, it lacks the editing facilities of a dedicated sequencer. If you desire carefully crafted pop tunes, Max ($395) may not be the best tool. But if playing with abstract musical ideas as if they're Play-Dough sounds exciting, give Max a try.

Constructing Patchers is easy. You pick *objects*, the basic unit of Max programming, from a

BY WARREN SIROTA

menu at the top of the screen and click where you want to place them. For the most common object—a box with double lines on top and bottom—type in the name or choose one from a list organized by category.

More than a hundred built-in objects cover a wide range of functions, from MIDI-specific to general-purpose programming. There are graphic sliders and dials, and even pop-up menus. The program also features objects that perform many functions needed for patch editors, but the detail necessary for that application requires patience.

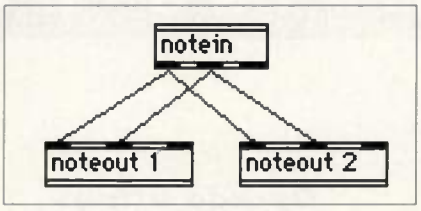


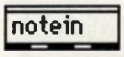
FIG. 1: The Note Doubler receives Note On messages and then retransmits them on two different MIDI channels.

With a language as rich and complex as Max, ease-of-learning is a major factor. In this area, Max shines. Besides an excellent manual, Max has a unique help system: Option-clicking any object brings up an example Patcher that shows the object live and working in a typical context. You can copy the example from the help screen and paste it right into your own Patcher.

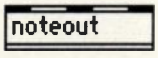
THE NOTE DOUBLER

Max objects have *inlets* and *outlets* through which they transmit and receive *messages*, which consist of either numbers or text. An object's response to incoming messages defines its function.

A Max Patcher consists of some number of objects on the screen with *pipes* running from outlets to inlets. **Fig. 1** shows a simple example.



The **notein** object at the top receives MIDI Note On messages from the outside world that it breaks down into note number, velocity, and MIDI channel. Its outlets are the small black bars along the bottom, one for each type of information in the message. (The object handles Note Off messages as Note Ons with a velocity of zero.)



The **noteout** object gets note number, velocity, and channel (optional) through the inlets along its top. It uses this information to assemble and transmit a valid MIDI Note On. If the label inside the box includes a number—or *argument*—as in this example, the object transmits all messages on that channel. Otherwise, a number received at the right inlet defines the channel. In our Patcher, **noteout 1** sends Note On messages on channel 1, and the **noteout 2** object sends the same on channel 2. The sound you hear is a stack of whatever you have set to receive on those channels.

This example is a bit trivial, but it illustrates the principle of connecting objects to create a Patcher. It also shows you how you can receive and

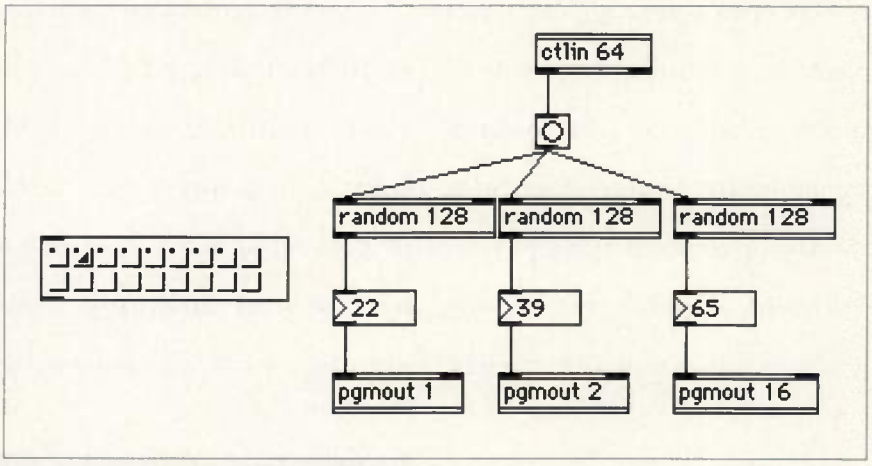


FIG. 2: The Stacking Assistant generates a random set of patch changes every time you hit the sustain pedal. The preset object stores desireable combinations.

transmit MIDI messages in Max.

THE STACKING ASSISTANT

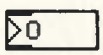
Suppose you have a couple of synths and you want to find sound combinations that work well together. You could either push a lot of buttons and take notes or let Max make things easier. **Fig. 2** shows a Patcher that I use to help program my synth stacks.

The **ctlin** object receives Continuous Controller Messages and decodes them into controller number, value, and MIDI channel. The object's argument makes it respond to just one controller, which in this case is the sustain pedal (CC #64). The object outputs the controller value on the left outlet and the channel number on the right.

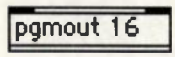
The little square with a circle inside is a **button**. When you click on it with the mouse, it sends a *bang* message down all the pipes connected to its outlet. The bang is Max's way of kicking the next object in the pants and saying, "Do it!"

The **button** object also sends a bang when any Max message hits the inlet at the top. This gives you two ways to trigger the Patcher: You can either click on the **button** object or hit the sustain pedal.

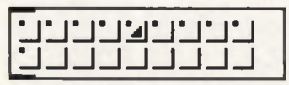
This **random** object is the heart of the Assistant. When the **button** object sends a bang, each of the three **random** objects generates a number between 0 and 127 (inclusive) and sends it out the outlet. The argument determines the range of randomization.



These are **number** objects; they display whatever numbers they've received and pass them on to their outlets. You also can change numbers by clicking on the object with the mouse and dragging up or down.



The **pgmout** object sends MIDI Program Change messages on the channel defined by the object's argument. (The channel number also can come from a message received at the right inlet.) When you click on the **button** or tap the sustain pedal, the Patcher transmits three random patch changes on three different MIDI channels.



The box with the little shaded pseudo-boxes is a **preset** object. When you find a sound combination that moves you, hold the shift key and click in one of the pseudo-boxes. The **preset** object stores the values for every object in the Patcher at that moment. A dot indi-

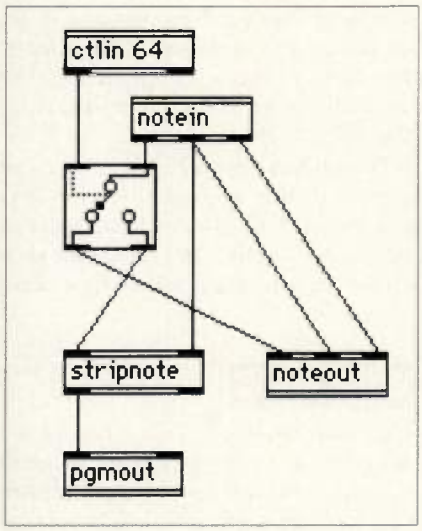


FIG. 3: With this Patcher, you can generate patch change messages directly from your keyboard or other controller.

cates a stored preset. To recall a preset, simply click on a dotted pseudo-box. When you save the Patcher, it saves the preset values as well.

If you want to trigger the random patch generation with another controller—so you can use the sustain pedal for something else—simply change the number in the **ctlin** object's box to match your choice. With a little more effort and Max knowledge, you can assign a key on your controller to trigger patch changes.

FRET/KEYBOARD SHIFT KEY

I don't admit this to everyone, but I play MIDI guitar. Even with MIDI footpedals, it can be a major pain to dance from bank to bank to get the sound I need. With the Max Patcher in **Fig. 3**, I just press the sustain pedal and hit a note. Each pitch selects a different sound. When I release the pedal, everything is normal.

Most objects in this Patcher are now familiar, but there are a few new ones. The heart of the Patcher is the **graphic switch**. This object routes messages at its right inlet to one of two outlets. A message to the left, or *control*, inlet selects the routing of messages. A nonzero number in the control inlet causes the switch to point to the right outlet. When the control inlet receives a value of zero, the switch routes data to the left outlet.

In the "idle" state, note numbers (also velocity and channel number) go to the **noteout** object. In this position, the Patcher transmits Note On messages without change.

When I press my Hold pedal, the **ctlin** object receives a non-zero value and passes it to the **graphic switch**. This in turn toggles the switch so that note numbers from **notein** pass through the right outlet to the **stripnote** and **pgmout** objects.

When you press a key, there is a Note On and a Note Off (or a Note On with velocity zero) message. The function of **stripnote** is to suppress this second message, so that a second program change isn't sent when the note is released. With the pedal down, **stripnote** sends the note numbers to **pgmout**, which sends a MIDI Program Change message corresponding to the note number played. In other words, when I press the Hold pedal, the function of the keyboard (or my MIDI guitar fretboard) shifts from playing notes to playing program changes.

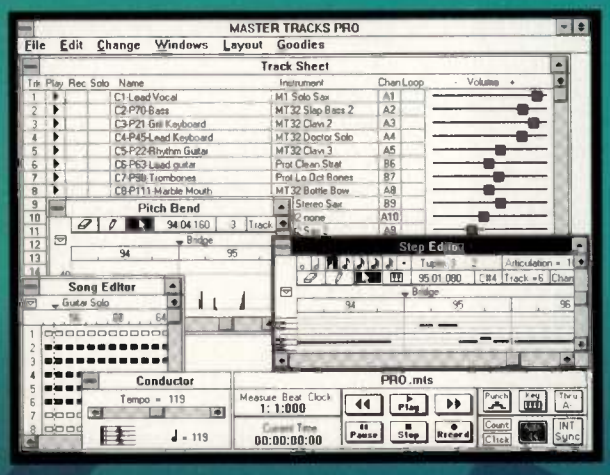
THE DRESHERIZER

Paul Dresher is a composer who made his name working with tape loops. (The best recorded example is *liquid and stellar music* on the Lovely Music label.) With apologies to Mr. Dresher, I have created a looping sequencer controlled by a combination of foot pedals and MIDI notes.

The Dresherizer (**Fig. 4**) consists of a pair of sequencers with associated control logic. The Patcher arms each sequencer in response to a particular MIDI note number. (I used the lowest two notes on my keyboard.) Once armed, the Patcher waits for the first note (other than the trigger note) to start actual recording. The sequence stops recording when it sees the trigger note again. The sequencer then begins to play, looping back to the beginning at the end of the sequence. Loop playback continues until a tap of the sustain pedal brings both sequencers to a stop.

This Patcher is more complex than the ones already examined, so I separated its functional blocks to make it easier to follow.

Rattle Your Windows!



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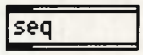
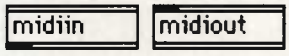
DUAL SEQUENCER



The **seq** object is a simple sequencer controlled by messages such as "record," "start," and "stop." The remainder of the Patcher primarily controls the operation of these two objects.

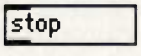


The **midiin** object receives all MIDI input and dumps it into the sequencers. The **midiout** object transmits all MIDI messages fed to it. These objects are different from other MIDI send and receive objects that have been discussed. **Notein, noteout, ctlin,** and **pgmout** objects either break messages down to extract the important information or assemble valid MIDI messages out of raw data. **Midiin** and **midiout** just send and receive, without any kind of filtering, parsing, or separation of data.

This is actually part of the Sequence Stop logic. The **midiflush** object keeps track of hanging notes and shuts them off when it receives a bang message.

SEQUENCE STOP

Now that you know how MIDI moves in and out of the sequencers, look at the upper right portion of the Patcher. The first two objects should look familiar: a ctlin object to receive MIDI sustain pedal messages and a button to turn that into a bang message.



This is a **message** box. Any words or numbers placed in the box will be sent out when the inlet receives a bang message.

To stop the sequencers, press the sustain pedal. The **ctlin** object sends out a number, the **button** converts the number into a bang that triggers the message *stop* to both sequencer objects and to the lower **button**, which bangs **midiflush** to cut off any hanging notes.

The **send** object transmits messages where a normal Max pipe connection

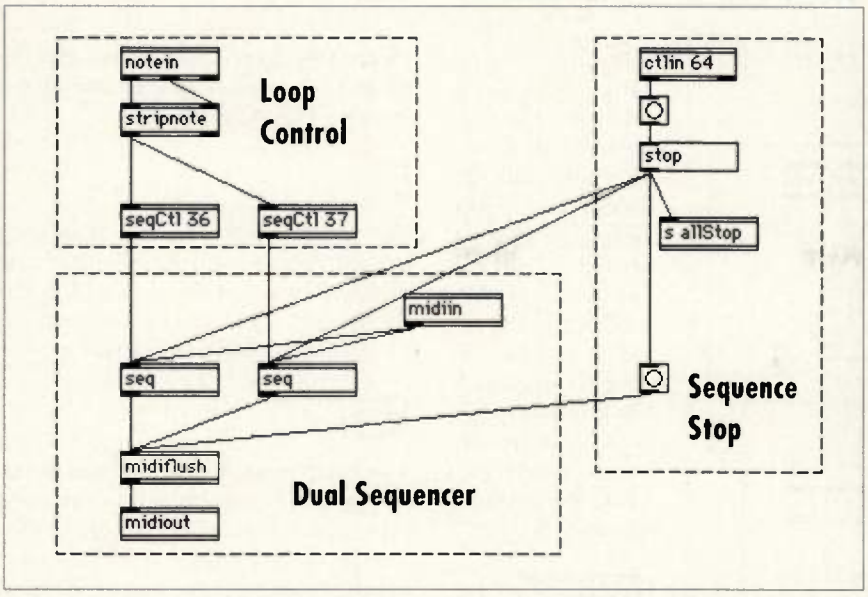
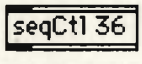


FIG. 4: The Dresherizer is a dual looping sequencer controlled by a combination of footswitches and MIDI note messages.

would be clumsy or impossible. You'll find the destination of this message later.

LOOP CONTROL

This section looks simple, until you realize that **seqCtl** is not a standard Max object. It's a **patcher** object, representing a *subpatch*. Max automatically loads the subpatch with the main program. (The subpatch file must be in the same folder.)



SeqCtl must do several things to make the **seq** objects behave in the desired manner:

- When **seqCtl** receives its trigger note, it outputs a steady stream of *record* messages. These arm the sequencer and keep it reset, waiting for note input.

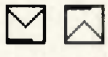
- When the next Note On (other than the trigger note) arrives, the record messages cease, allowing the **seq** object to begin recording.

- Recording continues until another trigger note arrives. At that point, **seqCtl** sends a *start* message to the **seq** object, causing it to play from the beginning of the sequence.

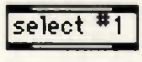
- At the end of the sequence, **SeqCtl** outputs another *start*, which makes the **seq** object reset to the beginning. This process repeats indefinitely.

- When a sustain pedal (Continuous Controller #64) message comes in, the start messages cease, allowing the sequencers to halt.

Look at the **seqCtl** Patcher in **Fig. 5.** It's easier to follow if you break it down to its individual functions.

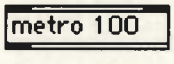


These **inlet** and **outlet** boxes correspond to the inlets and outlets of the **seqCtl** objects in the main program. The inlets of the subpatches receive a stream of note numbers from the main Patcher.



The **select** object compares numbers and sends a bang message when it sees a match. The argument "#1" shows that the number to match comes from the argument of the **patcher** object in the main program. Note in **Fig. 4** that the **seqCtl** objects respond to note numbers 36 and 37 (the lowest two keys on my keyboard).

A bang from the **select** object goes to both inlets of the **graphic switch**, in right-to-left order. The first bang enters the switch's right inlet and passes through to the left outlet. The second bang enters the left (control) inlet, shifting the routing arrow to the right.



This **metro** (metronome) object

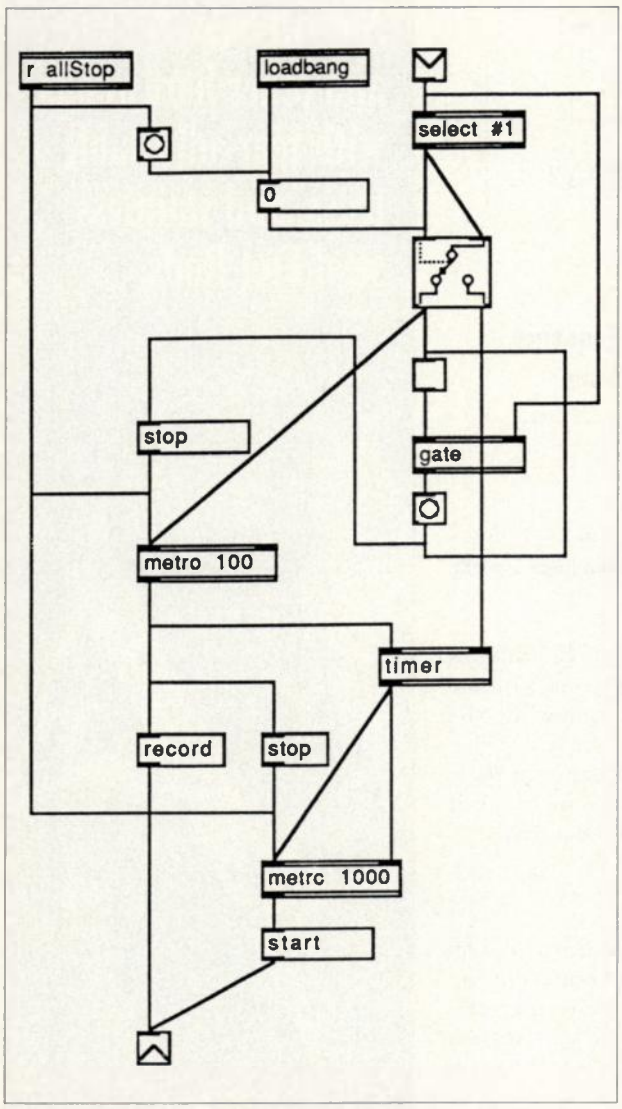


FIG. 5: The seqCtl subpatch provides the control functions needed by the sequencers in the Dresherizer.

responds to the bang message by starting to issue bangs from its outlet every 100 milliseconds. These bangs trigger a record message box connected to **seqCtl**'s outlet, taking care of the first phase of operation. The bangs also trigger a stop message to the second metronome and reset the **timer** object.

timer

The timer object measures the interval between a bang to its left inlet and one to its right. The bangs from metro 100 enter the left inlet, starting the timer but keeping it reset to zero.

The collection of objects dangling from the **graphic switch**'s left outlet controls the second phase of **seqCtl** operation. When a recordable note message comes into the subpatch, **metro 100** stops issuing bangs and the **timer** begins its real job, measuring the length of the loop.

The toggle object changes state each time it receives a bang, transmitting either a one or zero. The first bang sets the toggle, which in turn sends a *one* to the gate object underneath it.

gate

The *one* message to the left inlet opens the **gate** so that messages to the right inlet pass to the object's outlet. This lets the first note hit the **button** underneath, which sends a bang to the **message** object, shutting **metro 100** down with a stop message. It also sends a bang back to the **toggle** object, shutting the **gate** (Rube Goldberg, eat your heart out).

The **seq** object in the main patch now records all incoming MIDI data, while the **timer** clocks the elapsed time. This activity continues until the subpatch receives another note trigger.

This second note trigger sends a pair of bang messages to the **graphic switch**. This time, the bang goes to the right outlet of the switch and from there to the **timer**'s right inlet. The **timer** sends out the loop time, in milliseconds, to both inlets of the **metro 1000** object.

metro 1000

When this object receives the number

MAX 2.1

Opcode has announced a free update for Max, from version 2.0 to 2.1. The release includes additional Max objects, enhancements of existing objects, and new example Patchers.

In addition, Max 2.1 supports OMS (Opcode MIDI System, see "What's New," May 1991). With OMS, the user tells the system which port and MIDI channel connect to each synth or other device. Any Max MIDI object can then address the correct port by using the name of the device as an argument. OMS supports MIDI Manager, opening up communication with other MIDI programs running under MultiFinder or System 7, and NuBus cards such as Digidesign's SampleCell. OMS is also compatible with multi-port MIDI interfaces, including Mark of the Unicorn's MIDI Time Piece.

If you're a Mac user equipped for digital audio, Version 2.1 offers objects to control DSP cards, including those from Digidesign, Studer Editech, Ariel, and PolySonic. These objects, developed at the Center for New Music and Technologies (CNMAT) at the University of California, Berkeley, provide the means to load, run, and modify digital signal processing programs in real time. For DSP developers, front-end control is often the toughest issue, so this is an important development. Max 2.1 offers the most convenient way yet for programmers to give users real-time control of audio processing.—Gary Hall

from the **timer**, it sets its interval to the length of the recorded sequence. The number at the left inlet starts the metronome going. The metronome triggers a start message to the sequencer, which immediately stops recording and starts playing from the beginning. The metronome waits the length of the sequence, then sends out another bang, triggering a bang message that resets the sequencer.

This continues until you stop the whole process with the hold pedal.

Look at **Fig. 4** again. When you hit the Hold pedal, a stop message goes to the inlet of the **send** object, **s allStop**. Whatever enters the inlet of a **send** object goes to a **receive** object of the same name. Here, **r allStop** receives the message, stopping all metronomes and reinitializing the **graphic switch**.

Loadbang is Max's initialization tool. In **seqCtl**, it bangs a **message** box at the time of loading, which sends a zero to the **graphic switch** to ensure that it starts out pointing left.

This accounts for all of **seqCtl**'s functions. Don't worry if you can't follow everything the first time. This Patcher has several interesting, not necessarily obvious, things going on. Fortunately, it isn't necessary to understand all of its details to use it.

Since I started writing this article, I extended the Dresherizer in a number of ways. If you would like a copy of this more elaborate version, you can download it from the **EM** SIG on PAN or the MIDI conference on the Well (tel. [415] 332-7398, 2400 baud). It includes an explanation of the Patcher. (You will need the Max application to use the file.)

TO THE MAX

Max is the most effective music programming environment I've ever used, and I'm very excited about it. If you're the kind of electronic musician who loves to experiment, you'll have a ball.

Warren Sirota *is a Max developer, editor of* MIDI Guitarist *magazine, and author of the* Mitigator Editor *program for the Mac. His latest recording is* Revenge of the Electronic Guitarist.

Effects: The Essential Musical Spice

By Gary Hall

With a little knowledge and a lot of listening, you can make effects processing an integral part of your sound.

AD McCAULEY

In the process of making modern music, the use of signal processors is like cooking with spices. You can record or perform without them, but you will quickly notice their absence. As with good condiments, effects can bring out the particular qualities of a sound, or add their own flavors to the main dish. Similarly, one can use effects with subtlety and knowledge, or dump them indiscriminately into everything. (Do you know musicians who consistently turn on the same effect, no matter what music they play? It makes you wonder if they salt their soup before tasting it.)

The type of meal also affects the way spices are used. French cuisine calls for a subdued but sophisticated blend of condiments, while Indian chefs lavish each dish with a flamboyant mix of exotic, and often fiery, flavors. In the same way, a rhythm and blues tune will employ effects in a different way than will a techno-thrash dance mix. It isn't that one is more tasteful than another, but the style defines the use of effects (and vice-versa).

The most important and commonly used type of effect processing is reverberation, which was discussed in the June 1991 "From The Top" column. This month, I'll look at some of the other effects available to electronic musicians.

TIME DELAY

Time delay could be called the mother of all effects, because so many of the common effects derive from it in one way or another. But let's define our terms. In audio, time delay means that an input signal is repeated, anywhere from less than a thousandth of a second to several seconds after the initial sound. This *delay time* is expressed in *milliseconds*, with one second equal to 1,000 milliseconds.

Delaying a signal doesn't sound too interesting, and if you listen to the delayed sound alone, it isn't. But interesting things happen when you combine delayed signals with the original, undelayed version.

Fig. 1 shows what I'll call "The Universal Delay Patch." With variations, this configuration produces most of the common time delay effects. The difference between one effect and another is *delay time*, the *mix* of delayed and direct (undelayed) signals and the *feedback* of delayed signal back to the input.

Delay Loops. At the longest delay times, an input sound emerges after a few beats or bars of music. At these very long delays, the output provides a rhythmic or melodic counterpoint to the input. By feeding a strong delayed signal back to the input, we create a *loop*, with each note of the input repeating many times. This has a dramatic musical effect and often is used as a musical exploration in itself. "Loop music" is a subculture of its own, with a small but persistent minority of musicians exploring its possibilities.

Echo. Shorter delay times, the length

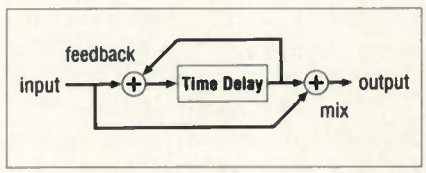


FIG. 1: Most of the common delay effects derive from different settings of the Universal Delay Patch.

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of a musical beat or two (perhaps 150 to 500 milliseconds), produce the much more familiar *echo* effect. This is often used with feedback, so that a single note fades away after a few repeats. Echo can provide a kind of ambient refrain, mixed beneath the main signal to provide a spacey, but still subtle, effect.

In some styles, it's common to use delays to accentuate and develop musical rhythms. These uses require attention to matching delay time with tempo, so that the delayed signal will fall on a musical beat, such as an eighth note or eighth-note triplet.

If you know the tempo of a piece in beats-per-minute, you can calculate the length of a quarter note (in milliseconds) with this formula:

quarter note = 60,000/tempo

From this value, you can derive the length of other note values. If you don't know the tempo, you can tune the delay by ear. To do this, isolate a beat or pulse at the note value you want, mix it with delayed signal, and adjust delay time until the beats match.

Before you go crazy tweaking delay times to even eighth notes, consider that many of the best results come from placing the delay somewhere *between* the beats, and that musical styles such as reggae define their rhythms by the "swing" they place on the eighth note.

Slap. Shorter delays begin to merge with the direct sound, yet still tweak the ear in ways that lend musical interest. A delay of a tenth of second (100 milliseconds) or so is heard as a quick repeat. This can add an element of interest to a rhythm guitar part, or make a snare shot seem to pan from one side to the other on each hit.

In working with delay, remember the three degrees of freedom (delay time, mix, feedback) in the Universal Patch. To these, add stereo pan. Many effects are accentuated when the direct and delayed signals come from different positions.

Lowpass filtering also is common in delay effects, either on the delay output, or in the feedback loop. Rolling off the high end helps a delay effect to fit where it's intended: behind, rather than on top of, the direct sound. Think of an echo in the great outdoors, and you'll understand. The echo is always less bright, and more diffuse, than the original.

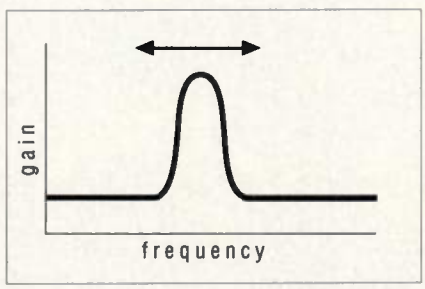

FIG. 2: A wah-wah pedal produces its distinctive effect by changing the center frequency of a filter with a sharp peak in the middle frequency range.

PITCH EFFECTS

Another class of effects devices can transpose a sound up and down in pitch. While less common than time delay, pitch change devices can be powerful sound manipulators. The key here is *taste*. Many pitch-shift effects are so drastic that it's hard to use them more than occasionally. Yes, it's very effective to shift the lead vocal down an octave, but it isn't pleasant for long.

To use pitch transpositions musically takes a lot of attention to control. A few artists, such as guitarist Glenn Phillips, have mastered the use of the pitch shifter as a musical instrument. Intelligent pitch shifters analyze the pitch of the incoming signal and transpose according to a map that (most often) matches a major or minor scale. The result is *diatonic transposition*, with the transposed sound following the input in musical harmony. This is a wonderful concept, but it requires planning to use it well. Also, avoid playing chords into such a unit.

While large pitch shifts can be a problem (though dramatic) in use, small shifts have more mainstream uses. As explained later, a small amount of pitch shift is a very effective way to double a vocal or lead instrument.

TIMBRAL EFFECTS

Consider the searing distortion of a

lead guitar, the "quack" of the classic wah-wah pedal, and the jet-plane whoosh called flanging. These are all examples of effects that alter a sound's tone color. The three basic ways to achieve these timbral effects are waveshaping, standard filtering, and time-based filtering.

Waveshaping. Distortion is a very common example of a waveshaping effect. The distortion unit bends the incoming signal into a new shape, which results in a brighter sound with lots of new harmonics. Many distortion devices let you adjust the amount of distortion and its coloration.

As any guitar player will tell you, there's a huge variety of possible distortion sounds, from subtle warmth to total domination. Distortion effects can be performed with both analog and digital circuits. To date, most players prefer the sound of analog distortion, particularly that produced by vacuum tubes. Some recent multi-effects units have a separate analog (solid-state or tube) section specifically for distortion.

Filtering and Equalization. You also can change a sound by boosting or cutting different frequencies. When using filters to change sound in a static way, the effect is usually called *equalization* (EQ) or *tone control*. An extreme EQ setting (such as one that makes a voice sound like it's coming through an old megaphone) can be used as an effect, but EQ is mostly used to balance tone colors in more subtle ways.

When a filter changes through time, however, it can produce unique changes in sound. The wah-wah pedal is a dynamic filtering effect that's been around since the sixties. The wah-wah circuit is just a filter that has a sharp boost somewhere in the middle frequencies (see **Fig. 2**). When the pedal moves, the center of this peak moves up and down in frequency, producing the distinctive "talking" quality.

Comb Filtering. When very short delays are mixed with the original signal, it affects the quality of sound in a process known as *comb filtering*. In a comb filter, frequencies related to the delay time are either boost or cut. This usually

produces a kind of hollow quality.

As with filters, the real fun begins when the delay time changes in real time. This causes the notches and peaks in the comb filter to sweep up and down, and yields the well-known flanging effect.

Besides changing the frequency content, the shift and delay times also produce slight pitch changes. This gives flanging a sense of motion that a simple filter cannot achieve.

IMAGE EFFECTS

Time delay can produce striking alterations to a sound's stereo image. A very small time delay (0.1 to 10 milliseconds) between signals at each speaker causes the stereo image to spread wide and also to shift away from the delayed speaker and toward the undelayed sound. This effect is especially pronounced over headphones.

Because of this, delay is an important tool in stereo mixing. In a mixdown session, the engineer and producer may spend long periods of time placing each sound element in an appropriate "perspective" for the audience's ear. Listen carefully to a good pop tune and you'll hear the effect.

Chorusing and Doubling. Straight time delay can spread a stereo image, but it's often desirable to create one or more additional images of the same sound. By stretching time delay out to ten or fifteen milliseconds and adding a little modulation to "wiggle" the delay time, you can create the impression of more than one vocalist or guitarist playing the same part. A small amount of pitch shift also is a powerful way to create a separate sound image.

Chorusing often goes beyond distinct sound images to create a kind of swirling blend, suggestive of a whole group performing the same part. Well, it actually doesn't sound that much like a group, but it *is* pleasing in many situations. Chorusing usually involves several delays, all in the range of ten to twenty milliseconds. These delays are modulated against each other to produce a constant shifting of tone and image.

DYNAMIC EFFECTS

Other effects come from controlling signal level. *Dynamics processors* alter sound character by sensing input signal level and changing gain in response. *Compressors*, *limiters*, and *gates* are dynamics units commonly used for general recording. (For a good introduction to dynamics processors and their use, see "Pumping Gain" in the March 1991 **EM**.)

Like equalization, dynamics processing is a general-purpose tool that also can serve as an effect. For example, compression is commonly used to provide sustain for guitar. Dance music producers frequently use gates to *key* one signal with another, imposing the rhythm of a drum machine, for example, onto a sustained chord pad.

CHOOSING EFFECTS

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and even affordable products bristle with an incredible array of features. With so much to choose from, how can the beginner be sure they are making a good choice?

As with other purchase decisions, consider your needs first of all. Many musicians will be happy with a single multi-purpose unit, and there are wonderful products of this type on the market. Others may need a number of devices to serve their musical needs. Singer/songwriters may need just a nice reverb unit with chorusing, while musicians of an experimental bent might seek out products with more drastic and unusual capabilities.

Consider your priorities. For most people, a good reverb should be first on their list. If you only have money for one unit, make sure that it has a good reverb sound, in addition to its other features. Do you expect to do more recording or more live performance work? If you are going on stage, choose effects units with the control features you need.

Built-in versus separate effects. Many instruments today come with digital effects processors built in. For the most part, these processors are quite good and they can cover a lot of effects needs. However, few of these products have any capacity to process external signals. Because most music uses vocals and other non-synth elements, the average person will still want at least one external effects device to augment those in their instruments. Variety of sound is another argument in favor of external effects.

Multi-effects versus dedicated effects. The effects market today is dominated by devices that combine the basic effects, performing several at once. These remarkable products start at around $500 (list) and provide incredible bang for the buck. For many, a good multi-effects unit is the best choice.

There are reasons, however, to look into other product types. Although multi-effects can do more than one effect at a time, most of them only accept a single input. (Many units have two input jacks but combine the signals internally, so that both receive the same processing). If you need more than one effect at a time, but on different instruments, you'll need more than one unit.

Dedicated units sometimes have capabilities that multi-effects lack. For example, most dedicated digital delay units have delay modulation features that the delays in multi-effects do not. Dedicated delays are available with more delay time, as well.

Be aware also that multi-effects programs sometimes have to trade off quality in one effect for the sake of others. Reverberation is the most frequent casualty. Many units have fine reverb programs, but lose smoothness and density when reverb is combined with other effects.

Finally, by assembling separate processing devices, you create a uniquely personal effects system, rather than one with the same sounds that others have. Many recording and performing musicians end up with a combination of built-in effects, multi-effects units, and dedicated devices.

USING EFFECTS

There isn't space here to cover the myriad possibilities in modern effects units, but remember to pay close attention to taste and appropriateness when applying effects to your music. Tailor the effect to the music, and decide how much emphasis to place on processing. Some styles drench the sound in multiple layers of processing, while others call for the most restrained application of sound enhancements.

Use your ears, and use your mind. You are the only one who knows what you want to hear. Spend time listening to different effects in music stores, at gigs and rehearsals, and on record. Experiment with any effects you own or buy, and develop a repertoire of processing that serves your purposes.

Effects are a world of their own, as deep and rich in their way as synths, samplers, and computers. Get involved, and make them a part of your personal music.

EM *technical editor* **Gary Hall** *has been designing and using digital audio effects for more than ten years.*

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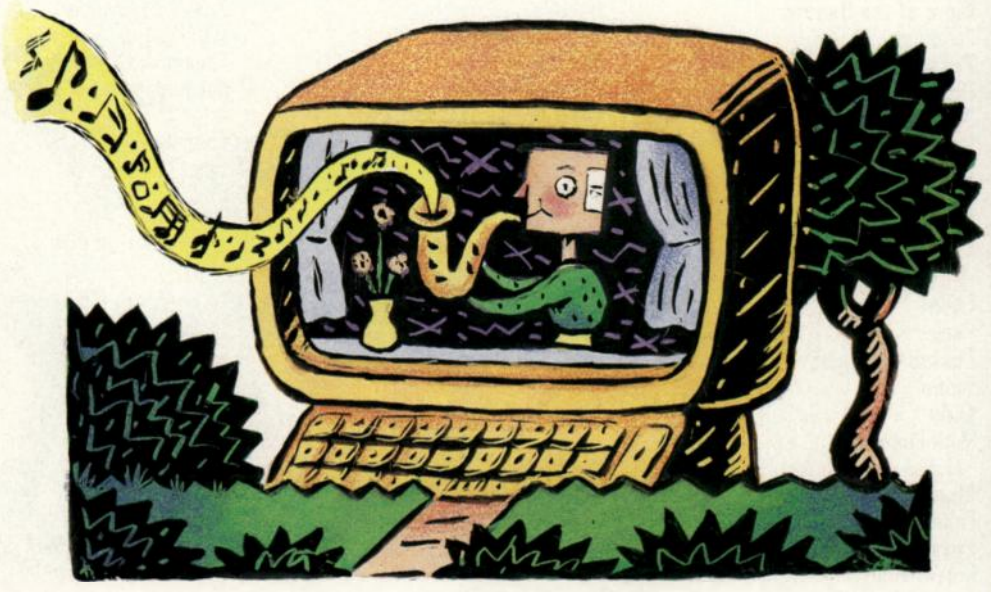
Multimedia Windows

By David (Rudy) Trubitt

Microsoft's multimedia efforts will open new vistas for electronic musicians.



Ever hear the one about five blind men describing an elephant? Each recounted something different, depending where he was standing. That's pretty much the case with "multimedia computing," a catch-all phrase whose definition depends on who you talk to. Most agree that multimedia integrates music, sound, and graphics, but what you do with this capability depends on your perspective. My goal is to describe the part of the elephant with the MIDI plug, looking particularly at Microsoft's Windows environment for IBM PCs and compatibles.

Windows Multimedia Extensions (called MME), among other things, describes standards for using MIDI and digital audio in application programs. Microsoft designed MME for use outside the music arena, but if we're lucky, it will lead to more interesting MIDI and digital audio programs on the PC (and, hopefully, drive down the price of related hardware).

One of Microsoft's priorities is to specify minimum hardware for multimedia programs. A "Level 1"-compatible Multimedia PC (or MPC) must include VGA graphics; 2 MB of RAM; a 3.5-inch, 1.4 MB floppy; 30 MB hard disk; CD-ROM drive with audio outputs; mic input; built-in synthesis; MIDI inputs and outputs, and internal, 8-bit PCM sampling. The processor powering the system must be at least a 10 MHz 286 (practically speaking, I'd recommend a 386 SX or DX).

To help consumers, Microsoft has designed an MPC logo (now the property of the Software Publishers Association) for display on compatible products. Tandy and Compuadd both sell complete MPC systems, and other companies are expected to follow. Microsoft plans to distribute the MME through hardware companies such as these, but, as of press time, had not set an exact timetable for release.

MIDI, MEET MME

Microsoft has fully embraced MIDI and the Standard MIDI File format as part of its strategy. MME includes a simple background sequence player that reads Standard MIDI Files. In addition, MME has the potential to work much like Apple's *MIDI Manager* (see the May 1990 "Computer Musician"), but these capabilities are not yet fully developed.

MME receives MIDI messages from application programs (sequencers, patch editors, etc.), and passes these messages to whatever physical interface is present. The reverse is also true—the software passes incoming messages from the hardware interface to the application(s).

The major benefit is device independence; any MME-compatible interface will work with any MME software. Multitasking is the other potential benefit. MME permits real-time transfer of MIDI data between programs. (See the September 1990 "Computer Musician" column for more on MIDI interfaces and device independence and the March 1991 column for more on MIDI multitasking.)

MME also addresses the issue of patch mapping, something all electronic musicians face when moving sequences from one hardware environment to another. MME's *mapper* program intercepts Program Change

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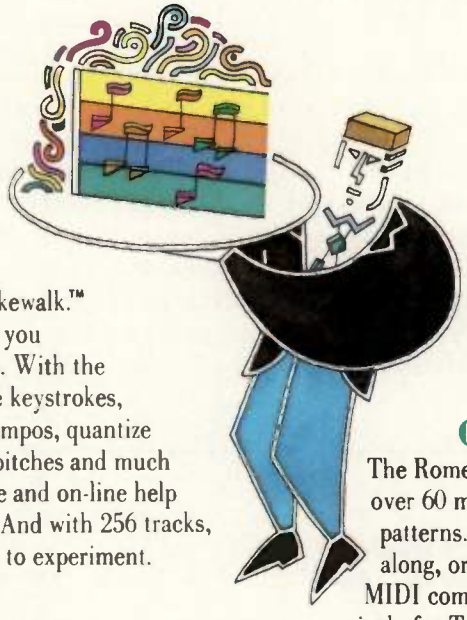

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MULTIMEDIA AUDIO PRODUCTS FOR THE PC

MANUFACTURER	PRODUCT NAME	MAX. SAMPLING RATE	RESOLUTION	SYNTHESIS TYPE	POLYPHONY	CD-ROM CONTROLLER	MIDI INTERFACE	PRICE
Ad Lib, Inc.	Ad Lib Gold AT-2000	44.1 kHz stereo	12-bit	4-op FM	20 stereo voices	yes	yes	$399
Covox	Sound Master II	25 kHz	8-bit	2-op FM	11-voice	no	yes	$229
Creative Labs	Sound Blaster Pro	22 kHz mono, 44.1 kHz stereo	8-bit	2-op FM	22-voice	yes	yes	$299
MediaVision	Pro AudioSpectrum	44.1 kHz stereo	8-bit	2-op FM	22-voice	yes	*	$389
Meridian Data	SoundByte	22 kHz	14-bit	Additive	10-voice	no	no	$250
Turtle Beach	MultiSound	44.1 kHz stereo	16-bit	Sample Playback	32-voice	no	yes	$995

* requires external connector box, $50

messages and changes the program number to select appropriate sounds on the connected synth. (The mapper must be aware of the instrument's program list.) Coincidentally, the MIDI Manufacturers Association has addressed the same issue with "General MIDI," an addition to the MIDI spec discussed in "MIDI For the Masses" on p. 24. The MME's default list for patch assignment will coincide with the one detailed in General MIDI.

DIGITAL AUDIO

The digital audio portion of the MME spec also should be of interest to musicians. The MME "wave" format includes provisions for 16-bit, 44.1 kHz digital audio, though Level 1 compatibility requires only 8-bit equipment. Several companies offer audio recording and playback hardware, and several of these have designed MIDI and sound synthesis into the same plug-in board (see sidebar). This way, customers get everything in one package. Examples include Ad Lib, Inc.'s Ad Lib Gold, Brown-Wagh Publishing's Sound Blaster Pro, and Media Vision's Pro AudioSpectrum. Most of these cards

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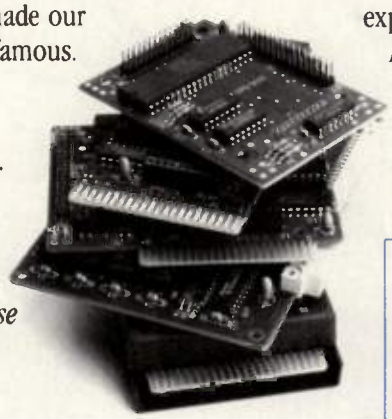

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Specifications subject to change without notice.

At one new sound per second, 24 hours a day, it would take over 300 years to outgrow the new Kurzweil K2000. That's how powerful it is. The K2000 features a totally new approach to creating sound called VAST™ (Variable Architecture Synthesis Technology). It's like having the entire history of synthesis under one control panel — from analog subtractive programming to several types of digital synthesis.

But no programming is necessary to enjoy the K2000's vast stockpile of onboard sounds: 8 megabytes worth of striking new 16-bit soundfiles. Beyond this, the K2000 can accept MIDI sample dump files from other machines. And there's even an option that lets you sample your own sounds. Its sonic potential is infinitely expandable.

There's also an onboard multi-effects processor that can produce up to four simultaneous effects. External signal processors can be patched right into the K2000, too.

Add a 61-note velocity/aftertouch sensitive keyboard with master controller features, a big 240x64 backlit graphic display for programming ease, immediate support from the top names in music software, and you've got all the synthesis power you'll need for a long time to come...the next 300 years, at least. So there's no time to lose. Visit your Kurzweil dealer for a glimpse at the future of synthesis — the K2000.

KURZWEIL

Kurzweil is a product line of Young Chang America, Inc.

include CD-ROM and joystick interfaces (though not the actual devices), providing a single-card upgrade solution for "multimedia-philes."

Meridian Data takes a different approach. Their SoundByte is a small, external black box that connects via a parallel printer port. This device includes a DSP chip and provides monaural digital audio and MIDI-controllable synthesis. Currently, SoundByte timbres are limited to the organ/sine wave variety, but with programming, much more is possible. We'll see what Meridian cooks up.

The most interesting development so far is Turtle Beach's newly announced MultiSound board, which has specs more in line with the requirements of electronic musicians. Its features include 16-bit 44.1 kHz stereo sampling with 64 times oversampled A/D and D/A converters, and a Motorola 56001 DSP. The card includes an E-mu Proteus chip (with its own MIDI I/O) onboard, and also can function as a stand-alone MIDI interface. In addition, the company has announced an audio editing program called *Wave for Windows*, slated to retail for $149. The package includes digital EQ, pitch shift, crossfade, and time expansion/contraction, along with the familiar cut-copy-paste tools for digital audio.

LIST OF MANUFACTURERS

Ad Lib, Inc.
(800) 463-2686; or
(418) 529-9676

Covox
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Creative Labs/Brown-Wagh Publishing
(408) 378-3838

Media Vision
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(408) 438-3100

Turtle Beach
(717) 843-6916

PROS AND CONS

Of course, you don't get something for nothing. While *Windows* and MME offer the advantages of a graphical user interface (pull-down menus, windows, etc.) and the potential for MIDI multitasking, they require considerable effort to get everything running. Problems are harder to sort out when several programs run simultaneously. Also, *Windows* still requires DOS, so you have more to learn overall. Finally, although graphic-oriented software has many advantages, programs using this environment require faster, more expensive computers. Text-only programs such as *Sequencer Plus* or *Cakewalk*, on the other hand, run quickly even on older, slower PCs.

On the plus side, *Windows* seems to be gathering momentum in the PC market, and many PC software manufacturers are quietly working on *Windows* MIDI software. The device independence offered by MME should go a long way to encourage that development.

Also, the release of *Windows* MME may encourage Mac software developers to consider the PC. A case in point? Opcode Systems recently released a PC-version of *The Book Of MIDI*, an educational program that explains MIDI, with brief sound samples of classic and modern synth equipment. Originally written in *HyperCard* for the Mac, the program was ported to the *Windows* equivalent, Asymetrix's *ToolBook*, and uses MME for all of its audio and MIDI functions.

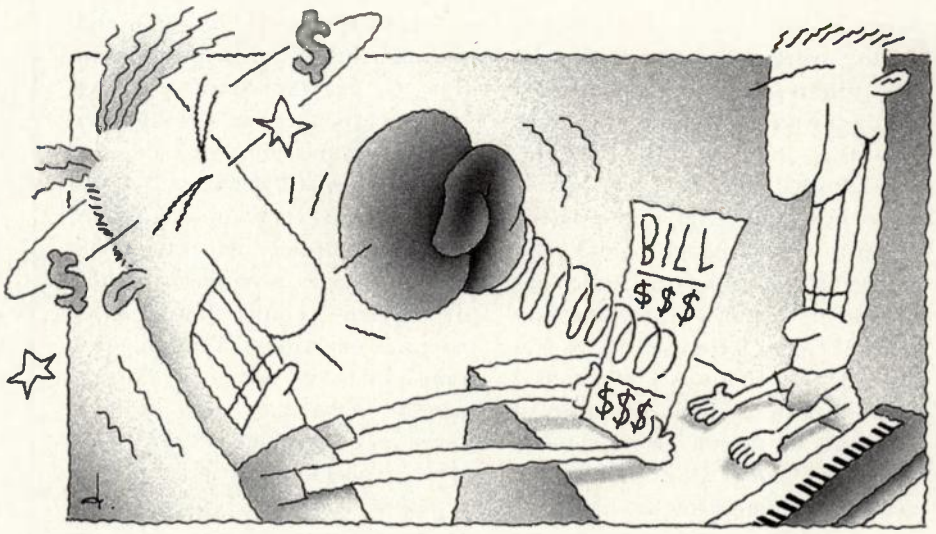
Regardless of your choice, there's one development that's bound to boost the marketplace. As multimedia users learn more about MIDI, the demand for music sequences will rise. This could represent new, paying gigs for computer musicians. As far as I'm concerned, that's the best news of all.

David (Rudy) Trubitt *wrote this column during a sandstorm in Death Valley, California.*

Questions and Answers

By Alan Gary Campbell

This month, a lament over the high wages of repair and practical tips on using rechargeable batteries and volume pedals.



JACK DESROCHER

Q. My service center charged me fifty bucks to repair a broken key on my Korg Wavestation, plus the cost of the key. In addition, I had to wait a week for the part. Isn't this too much and too long?

A. Maybe not. Many instruments use a *pseudo-tension-structure* construction. Circuit boards, keyboard, jack plane, upper and lower case, and various linking supports connect to form a sturdy and cost-effective assembly. Unfortunately, such a design requires near-complete disassembly for service.

On the Wavestation, replacing a broken key requires removal of the bottom panel, CPU board, output board, shields, board supports, and the entire keyboard assembly. This process involves 45 screws (of several different types) and can take more than an hour of a tech's time. With service labor ranging from about $35 to $55 an hour, the service charge does not seem out of line.

It's impossible for a service center to have every required part in stock. However, it is reasonable to expect them to stock keys for common instruments, especially since the keys and keysprings for the Korg M1, T3, and Wavestation, and Yamaha DX7, DX7II, DX7IIFD, SY55, and SY77 (and others) are interchangeable. In any case, the cost of the replacement key should be only two or three dollars.

Attempting to replace a key without complete disassembly often results in serious damage to the key contacts. Given the complexity of disassembly and the number of different screws, you should *not* attempt disassembly without access to a service manual.

Q. The output relay in my Kurzweil K1000 is bad, and the service center says that they can't get the part because Kurzweil is out of business. Is there anywhere else to get a replacement? Can I repair the old one? It has a clear plastic cover that appears to be removable.

A. Kurzweil Music Systems, Inc. is out of business, but Korean piano manufacturer Young Chang purchased a part of Kurzweil's assets and is producing new products under the Kurzweil name. Young Chang is a legally separate entity. While they provide some support for older products, they should not be blamed for problems caused by Kurzweil's demise.

Young Chang's service division stocks the required output relays (American Zettler model AZ820-2C-12DE or Matsushita DS2Y-S-DC12V). Some service centers use a Radio Shack mini DIP relay, catalog number 275-249, as a field replacement. I haven't tested the Radio Shack unit, but it should work, based on the specs.

Contact: Young Chang America, Inc., 13336 Alondra Blvd., Cerritos, CA 90701; tel. (213) 926-3200.

The defective relays are those with clear, removable plastic cases. It is impractical to repair the unit. The usual symptom of a defective relay is "static" in the line outputs, but not in the headphone output. (We discussed K1000 output noise symptoms in the December 1989 "Service Clinic.")

Q. I recently had Version 5 software installed in my K1000, along with the A and B sound blocks. Now I have new sounds, but I have lost most of the old ones, and the new ones are in there three or four times. To get back the old programs, the service center says I have to reinstall the original software and copy down the parameters to enter by hand. Is there a way around this?

A. There is a much simpler way, but it requires access to a computer (Macintosh, Atari ST, or IBM PC-compatible) and the Kurzweil *Object Mover* program. *Object Mover* serves as a K1000 Librarian, and recent disks contain hundreds of alternate sounds gleaned from the K1000 and 1000-series modules. The Mac and Atari versions of the program are available from Young Chang.

Q. Where can I obtain parts and service for my Kurzweil K250?

A. An independent service company is administering K250 parts and service. Contact: Sweetwater Sound Inc., 4821 Bass Rd., Fort Wayne, IN 46808; tel. (219) 432-8176.

Q. Can I use NiCad rechargeable batteries in portable instruments and strap-on controllers? I've read that the voltage is different from that of regular batteries.

A. The terminal voltage of a standard NiCad is lower than that of a carbon-zinc or alkaline cell, and the amp-hour capacity is less. NiCads need more frequent rotation or replacement, but otherwise they are fine in all but the most voltage-sensitive applications.

Caution: *Follow the directions provided with rechargeable batteries. Some NiCads require complete periodic depletion for maximum service life.*

Rechargeable batteries are less destructive to the environment than standard batteries. Solar cells can readily recharge NiCads, a project idea for the environmentally conscious. Also, you can modify most strap-on controllers to receive DC power via the MIDI cable. We discussed this modification in "CZ Mods," in **EM**'s August 1986 issue, and again in the December 1989 "Service Clinic."

Aside: Radio Shack's *Enercell Battery Guidebook* is a concise, inexpensive reference on battery technology.

Q. I have a Roland MKB300 MIDI keyboard controller. I want to use a pedal to control MIDI volume through the jack on the back of the keyboard. Can I rewire a regular volume pedal to work with it?

A. Yes. The MKB300 volume pedal input incorporates a stereo (3-conductor) jack. The sleeve is ground, the ring provides +5 volts, and the tip receives the control-voltage return. To use your pedal with the MKB300, add a (suit-

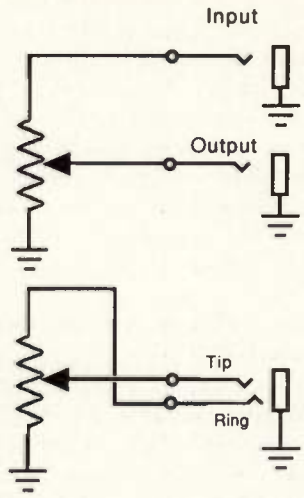


FIG. 1: To use a volume pedal as a CV pedal, wire the ring of a tip-ring-sleeve (stereo) phone jack to one side of the pot. Connect the tip to the pot's wiper.

ably wired) stereo jack and connect the pedal with a shielded stereo cable (see Fig. 1).

A 25K or 50K audio-taper pot works best here. Viewing the pedal pot from the front, the jack terminals (or cable leads) connect as follows:

For pots with clockwise rotation as the pedal is depressed,

- ground (sleeve) connects to the left pot terminal;
- control-voltage return (tip) connects to the center pot terminal;
- +5 volts (ring) connects to the right pot terminal.

(For pots with counter-clockwise rotation, reverse the ground and +5 volt connections.)

On many pedals, the range of travel is insufficient to turn the pot through its complete rotation. This results in a volume control that does not go fully off or fully on. It is probably best to adjust the *pedal offset* so that the volume is fully off at the minimum position and compensate for the reduced level elsewhere.

To adjust pedal offset, loosen the set screw that holds the tensioner for the vertical pedal-gear and disconnect the vertical gear from the rotary gear on the pot shaft. Move the pedal assembly to its minimum position and turn the pot to its minimum position. Then reengage the gears, reposition the tensioner, and tighten the set screw.

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 Procussion Percussion Module

By David Crigger

Proteus architecture meets MIDI percussion.

It's been awhile since E-mu introduced a strictly electronic percussion product, and as a former Drumulator and SP-12 owner, I looked forward to this unit with great anticipation. The Procussion percussion module is based on E-mu's highly successful Proteus G-chip hardware engine, known for its cost-effective, high-quality sound. As with the Proteus, the new unit offers 32-voice polyphony, 16-part multitimbral operation, 4 MB of 16-bit Emulator III samples (expandable to 8 MB), six audio outputs, four buttons, two knobs, and a 32-character, backlit display.

JULIAN OKWU

Emu's Procussion combines ROM-based samples with extensive programming capabilities.

There are a few bass sounds and a slew of various waveforms, but the main order of business is percussion. The unit's memory is filled almost entirely with 135 percussion sounds, including twelve bass drums, from TR-808 to orchestral; 26 snares, from wet to brushes; ten hi-hats, with two sets of five degrees each, from open to closed (including foot hats); seven cymbals; six toms; and over 40 Latin sounds, including timbales, congas, shaker, shakere, bells, and blocks.

Add to this around twenty rap/dance noise bursts, laser blasts, scratches, and a few other odds and ends, and you have quite a collection of percussion choices.

STACKS AND MODULATION

Just playing back straight percussion samples is not what the Procussion is about, though. Stacks are where the Procussion really comes into its own. A Stack is made up of one to four raw samples, coupled with an excellent selection of synth-type editing parameters. You can layer more than one sample to create big, composite sounds, and one or more aspects of your performance can control which layers are heard.

The volume, pan, and tuning of each sample in a Stack can be modified individually. The sounds can be reversed and/or delayed, and you can adjust the sample start time. The latter feature lets you pull off such Stack constructions as combining the attack of one drum (where the envelope closes at some point after the initial transient) with the body of another drum (whose start time is set to play the sample beginning at some point after the transient). There is a pitch bend (up or down) envelope and a 3-stage amplitude envelope. Though three stages (attack, hold, and decay) may seem skimpy for an envelope generator, it should be plenty for most percussion applications. The processor has a triangle/sine/saw/square wave LFO that can be applied to the pitch or volume of a layer or a whole Stack.

Like the Proteus, the Procussion is loaded with MIDI modulation features. There are four modulation "patches" available per Stack, each coupling a modulation source to a destination. Sources include velocity, key number, random values, four global MIDI continuous controllers selected in the Master menu, channel pressure (aftertouch), and pitch wheel. Trigger Tempo, one of many innovative features in this unit, is a modulation source whose value is based on the speed at which notes are played. Playing more notes per second increases the modulation, and playing fewer notes decreases it. A Tempo is selected

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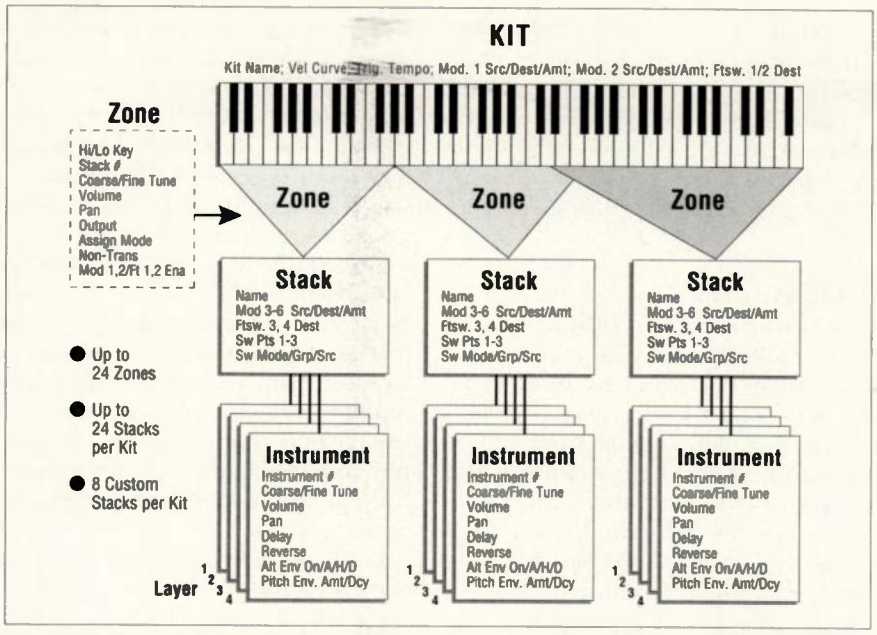

FIG. 1: A Procussion Kit, contains up to 24 sounds, or Stacks. The user can assign these to overlapping MIDI-note Zones.

for each kit to determine the note-triggering speed (threshold) at which modulation kicks in.

Virtually every sample-editing parameter mentioned (pitch, volume, pan, attack/hold/decay, pitch envelope amount/decay, sample start, LFO rate/amount) can be modulated by a source. Additional editing parameters include Accent, which adds gain to the existing volume setting, and Tone, which applies simple lowpass filtering to the sound. Most modulation destinations control the whole Stack or a single layer, and all modulation patches have a sensitivity control that can be set for either a positive or a negative response.

Either of two MIDI footswitch controllers can be routed to a Stack to control sustain, reverse envelopes (for layers or Stacks), or for turning on the alternate envelope setting. Again, each of these can affect the whole Stack or a single layer.

BEYOND STATIC LAYERING

Super-switch modes allow a modulation source to determine when the various layers are audible. Crossfade and Threshold are the most straight-ahead choices. For example, velocity can be used to switch from one layer to another (either through crossfading or direct switching) as you play from loud to soft. The levels at which the crossfades or switches occur are fully adjustable, but velocity is not the only choice; any modulator can be used.

Other modes include Alternating, Random, and Hi-Hat. A new twist in the Alternating and Random modes is the ability to play just a single layer until an adjustable threshold is crossed, then alternation or random modulation kicks in. This allows some subtle programming. For example, three or four snare drum sounds can be made to switch at random when played softly, yet a specific sound can consistently play on loud accents.

Hi-Hat mode allows a control pedal to switch between three layers, while playing a fourth whenever the pedal's travel approaches maximum. This works well and, as the switch points are adjustable, can accommodate different pedals and players.

KITS AND ZONES

Like the Proteus, the Procussion is 16-part multitimbral. The module holds 64 factory Kits, which can't be modified, and 64 user-programmable kits. Each Kit is divided into 24 overlapping Zones (ranges of MIDI note-number assignments that allow splits and layers to be created). One Stack is assigned to each Zone (see **Fig. 1**), so there can be only 24 different sounds in a Kit, but you can use multiple Kits assigned to different MIDI channels.

Creating a Zone in a Kit amounts to selecting a key range, choosing a Stack, and adjusting the Stack's overall pitch and volume. You can use the pan setting preprogrammed into the Stack, or impose a new one. As with many samplers, the Stack can be set to transpose across the key range, or not. There are two modulation and two footswitch patches that apply to the entire Kit, and these can be enabled individually for each zone.

To get the ball rolling, E-mu preprogrammed 548 Stacks. Dozens of snares, kicks, hats, toms, etc., are burned into memory, just waiting to be assembled into Kits. On top of this, there are eight user Stacks available per kit. Though I found a great many of the factory stacks useful, I often desired to do a little tweaking to get things just right, or start from scratch and program my own Stack. It's too bad E-mu didn't allow more than eight user-programmable stacks in a Kit, but at least you can use another MIDI channel to multitimbrally finish a custom Kit. A full set of copy utilities allow the copying of Kits, Zones, and Stacks (factory or custom) to any other Kit.

INTELLIGENT FEATURES

The Procussion has some of the most well-thought-out, percussion-oriented features of any percussion module/drum machine I've come across. The polyphony-assignment modes—all seven of them—provide a good example. Not limited to Mono and Poly modes, the Procussion has an Exclusive mode and three different Poly modes: Poly 32, Poly 8, and Poly 4. Exclusive mode is a virtual channel that can be programmed so all Zones assigned to it cut each other off. The best-known example is a closed hi-hat on one key that cuts off the open hat on another. The number in the different Poly modes refers to the number of layers a Stack can use before it starts cutting off its own decay. For instance, if you take a layered cymbal sound set to Poly 32, and do a roll, you'll wipe out any other voices that are trying to play. If you change the mode to Poly 4, this problem is eliminated but the number of repeatable voices is reduced.

There also are three Mono modes: Mono, Layer Mono 1, and Layer Mono 2. While Mono mode works conventionally, the other two determine how one layer affects other layers of the same Stack. Layer Mono 2, for example, allows an open hi-hat to overlap itself polyphonically, while a closed hi-hat in the same Stack will cut it off.

There are eight exclusive assignment channels, allowing different zones to cut each other off.

Another excellent feature is the output submixer. Each Zone is assigned to one of sixteen submix categories (Kick, Snare, Hat, Tom 1, Tom 2, etc.), while in the Master menu, each submix category can be assigned to one of eight output categories (Main, Sub 1, Sub 2, Sub 1 left, Sub 1 right, Sub 2 left, Sub 2 right, and Layer). What a wonderful, time-saving feature! Say you need the bass drum to go out its own output. Go to the Master menu, select Kick to Sub 2 right, and not only is the kick currently in use routed to that output, so is every other kick in the machine.

E-mu also supplied a Zone Mapping feature that allows all the kits in the machine to be remapped to match the MIDI output assignments of several popular controllers, including the Roland Octapad, KAT drumKAT, and Alesis drum machines. There are two user-definable maps for those who need to roll their own.

Remote Edit allows the Procussion to be programmed from an external MIDI controller. The sticks-in-hands approach is one of the more popular aspects of the drumKat MIDI controller, and this feature allows the same concept to carry over into sound-editing.

SOUNDS

An instrument with no disk drive, card slot, or RAM for loading additional sounds lives or dies by its internal sounds, and I have a few misgivings here. Now, don't get me wrong, there are a lot of excellent sounds in this unit—virtually all of the Latin material is superb—and there is room for 4 MB of additional ROM-based sounds. But some sounds aren't as strong as I would like. The Brush Tom, in particular, might be useful for unusual timbres in a Stack, but it doesn't sound like a real brush tom; it has a lot of out-of-tune drum tone and too little brush attack.

E-mu gives you samples of several tom-toms but puts them in separate kits. In each kit, one tom-tom sample is stretched across a 2-octave range to create multiple toms. If you want real-sounding 12- and 16-inch tom-toms in the same kit, you have to copy the 16-inch tom from one kit and the 12-inch tom from another to create a custom kit. The stretched samples are free of digital artifacts, and if you like the "stretched" sound, you can have it, but to my ears, a transposed 12-inch tom doesn't sound like a 16-inch tom. In fairness, E-mu sees the Procussion as a sound-designing toolkit and has given you the opportunity to choose the samples you need, but I wish the company had put samples of different-sized toms in the same kit.

The hi-hats and cymbals are quite good, with the exception of one of the two crash cymbals, which has a tremendously loud, low overtone. It's an excellent sample of a mediocre cymbal. This sort of thing showed up in a number of places. Although there are lots of good raw samples, I would have preferred meatier kick drums, snare drums that cracked a little more, and just a little

more sizzle and life overall. Obviously, when you start stacking up layers, things sound a lot better, but I think the Procussion Stacks would be truly outstanding with stronger raw material. (*The manufacturer's sound-development team tested the unit with "bigger" samples but preferred the sound of smaller samples when combined in Stacks.—SO*)

THE BOTTOM LINE

Conceptually, this instrument just floors me. The potential for sonic exploration and performance expression is staggering, unparalleled by any other piece of electronic percussion gear. I also like E-mu's implementation of sampling kick and snare "reverb returns," yielding effects without an effects processor.

So, would I buy this unit? It depends. If I wanted big, punchy, "acoustic" drum sounds, e.g., for classic rock 'n' roll, the Procussion would not be my first choice. On the other hand, if I wanted rap, house, modern pop, and/or dance music, it would do a fine job. A great many of the sounds lean in that direction, and the editing capabilities make it easy to come up with cool, off-the-wall stuff, or get into exotic percussion sound design. If you want to create your own sounds and need an extensive amount of programming power, the Procussion is a good choice. If you like the way it sounds, you'll love what you can do with it.

Product Summary

PRODUCT:
E-mu Procussion
Percussion Module

PRICE:
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MANUFACTURER:
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David Crigger *has played drums for Burt Bacharach, Dionne Warwick, Don Ellis, Passport, and Drum Drops. He currently teaches electronic and studio drumming at the Grove School of Music.*

Kurzweil K1200 Pro 76 Synthesizer

By Edward Tywoniak

Given a new lease on life, Kurzweil offers top-notch samples and in-depth programming.

At the last Anaheim NAMM show, one of the hot topics among veteran floor walkers was the recent acquisition of Kurzweil Music Systems by Korean piano-maker Young Chang. Kurzweil representatives promised the original Kurzweil R&D department would remain completely intact and would be luxuriating in a new influx of funding to begin the design and development of the next generation of Kurzweil products. The K1200 series (which includes the 88-key K1200 Professional, the Pro 76, and the Pro 1 rack-mount unit), while not necessarily a new product of next-generation design, represents the flagship of Kurzweil's current offering of

The Kurzweil K1200 Pro 76 offers a weighted keyboard, quality samples, and solid programming functions.

electronic instruments.

The K1200 Pro 76 is virtually identical to the K1200 Professional, released last year, except for the number of keys (76 versus 88). The Pro 1 is also identical to both instruments in its voice architecture. The Pro 76 offers the modern keyboardist an expressive, weighted-action keyboard for stage or studio use, while the full-featured MIDI implementation and voice-allocation architecture allows the orchestrator plenty of multitimbral options. Its 24-voice, 16-part multitimbral, sample-playback section offers the crisp, realistic sounds we've come to know and love from Kurzweil's earliest days, coupled with a nicely designed digital-processing section that allows emulation of modular synthesis designs. The result is a sound generator and master controller that is flexible, clean, and impressive in scope.

THE BASICS

The K1200 Pro 76 is housed in the sleek, injection-molded, flat black casing that is typical of the current line of Kurzweil products. A spring-loaded, center-detent pitch bend wheel and a non-spring-loaded, bidirectional (center is zero, while up and down send different controllers) modulation wheel are located on the left side of the 76-note keyboard. The headphone jack is on the front panel.

The top-mounted control panel is spartan in appearance, with two horizontal slider controls (one for volume and the other for data), a 32-character LCD display, and 23 momentary switches used for accessing and altering system data. One small gripe is that the switches are somewhat small and configured closely together and have no LED status indicators. It's not a problem in the home studio but could be an inconvenience in a live situation involving low ambient light levels.

The back panel is equally austere. The two pedal jacks can be programmed for any MIDI switch function. You can use a pedal of either polarity—Japanese pedals often are wired with the opposite polarity of American pedals—because when powered up, the K1200 checks the pedal polarity and functions accordingly. Unfortunately, the K1200 offers only stereo outputs rather than more-expensive, multiple, independent audio outputs.

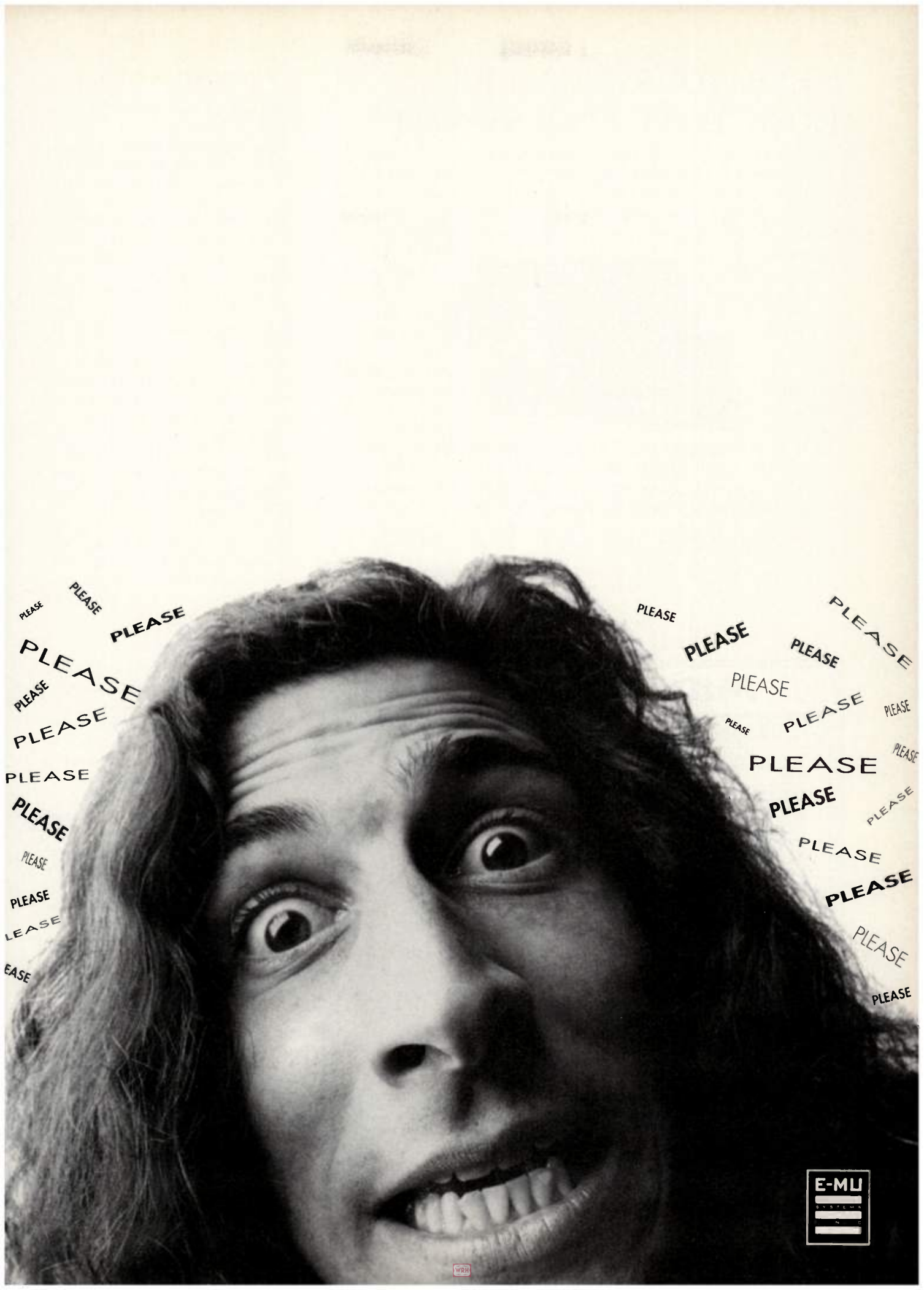
The dominant visual feature of the K1200 is its piano-style keyboard, and indeed, playing notes is one of the things the Pro 76 does best. The unit offers an expressive, weighted-action keyboard featuring plastic keys that help keep the unit's weight down to a respectable 55 pounds, without sacrificing too much playability. Although the K1200 sound generator can receive polyphonic aftertouch commands, the keyboard offers only monophonic aftertouch.

SOUNDS TO KILL FOR

Kurzweil has consistently developed products that give the performer a variety of interesting, non-traditional playing techniques, offering real-time control of a variety of parameter changes. As good as these controllers were, the sound of Kurzweil instruments was the company's signature. True to this tradition, the K1200 is a superb-sounding instrument that offers a tremendous depth and breadth of sonic possibilities.

Based upon sample-based synthesis technology developed for the Kurzweil K250, the K1200 offers 162 preset Programs and 93 RAM locations for user-defined Programs, providing a broad sonic palette of traditional and non-traditional instrument sounds.

The signature Kurzweil piano sound is featured prominently, as are lots of other modified grand piano sounds. Brass, percussion, string sections, guitars,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and harps are among the traditional instruments offered.

Other types of sounds offered in the K1200 include complete drum kits, ethnic percussion, and a broad selection of synthesizer sounds. The synth varieties range from fat, analog pads to digital, bell-like timbres, including a fair amount of sci-fi special effects for your next B-grade movie score.

For aficionados of alternate tunings, the K1200 comes standard with seventeen tuning tables, including Werkmeister, Tibetan, Carlos Alpha, and Pythagorean with diminished 5th. You also can develop your own tuning tables by specifying the tuning, in cents (hundredths of a semitone), of each interval of the scale.

I spent a great deal of time hunting for sampling flaws such as obvious loop points, graininess, distortion, and poor keyboard mapping. For all of my efforts, I couldn't find a dog in the bunch. Sound after sound came forth with crystalline clarity and a naturally ambient depth of field. It's obvious the folks at Kurzweil have good ears and good technology.

VOICE ARCHITECTURE

The K1200 would be a fine instrument if all it did was play those wonderful Kurzweil samples. But that's only half of the picture. When you investigate the Edit menus, you immediately realize there is a lot of sound-shaping power underneath the hood.

The K1200 divides the available modules into two separate classes: signal generators and signal modifiers. The signal-generation section contains over 150 basic digital waveforms, or Soundfiles, including many sampled acoustic instruments and several square, sine, sawtooth, and pulse waves. All sounds are extensively processed (on a mainframe computer) samples.

Once a Soundfile has been selected, it is routed to the signal-modifier (Modular Effects) section for processing. Up to four processed Soundfile layers can be combined to create a Program, each with its own set of parameters. Once defined, multi-layer Programs can be mapped across the keyboard range in up to three zones.

The Modular Effects section is the most advanced Program-editing level. When you select Modular Effects, you gain access to what is in effect a digital emulation of a traditional modular

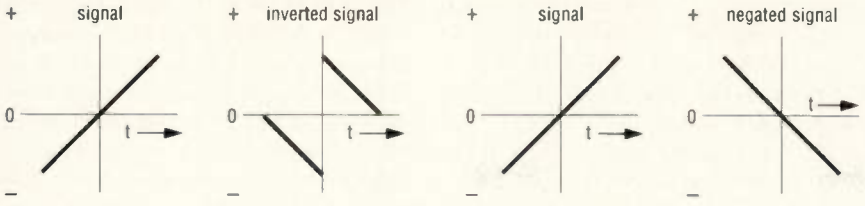


FIG. 1: An invertor reverses the amplitude of a control signal, while a Negator reverses the sign of an input waveshape.

synthesizer, sans filters. These processing algorithms are used for a variety of functions, including LFO modulation and envelope generation, and each Soundfile layer can be assigned its own Modular Effect.

You create each desired group of modulator by patching together modules from a list of five basic types: LFO, ASR envelope generator, Mixer, Local Inverter/Negator, and Amplitude Envelope Generator. Two of each basic modifier type are available per layer. Inverters are used for unipolar control-signal processing, while Negators are applied to bipolar control signals (see **Fig. 1**). The Amplitude Envelope Generator provides an ADR (Attack, Decay, and Release) envelope, and you can loop the Attack and Release stages independently. Sustain functions are included in the ADR envelope but are programmed as part of the Attack parameter controls. Looping functions come in two flavors, forward and bidirectional. The Modular Effects section also includes Envelope Control modules, which provide real-time MIDI control over user-selected parameters of the amplitude envelopes.

Kurzweil has simplified the programming process by providing a Compiled Effects section, which consists of Modular Effects macros. If you elect to process the Soundfile with Compiled Effects, you can choose among twelve macros (Vibrato, Delay Vibrato, Tremolo, Delay Tremolo, Leslie, Chorus 2, Tremolo 2, Vibrato/Chorus 2, Phasor 2, Leslie 2, Chorus 3, and Echo 3) that combine multiple Modular Effects algorithms. Each Compiled Effects macro gives you control over several parameters, and the type of parameter control is dependent on the Compiled Effect selected. For instance, Vibrato gives you control over such parameters as maximum depth, maximum rate, and shape of the LFO modulator. (Twenty-two LFO waveshapes are provided, including sine, cosine, rising sawtooth, falling sawtooth, square, triangle, circular, and white noise.) Available parameters in other Compiled Effects include transposition, detuning, and panning.

One of the best ways to learn about K1200 signal modulation is to choose a Compiled Effect, then, using the Layer menu, switch to Modular Effects. This lets you see all the modules and parameters that comprise the Compiled Effect, and you can continue editing from there. (You can't switch from Modular to Compiled Effects, though, as the Compiled macro would overwrite your Modular Effects settings.) An especially nice programming feature lets

you compare altered Soundfiles with their original timbres, store the changed Soundfile in a RAM location, and name the stored sound without leaving Edit mode.

By applying these processing modules to selected sound sources, a variety of rich variations can be quickly and easily achieved. When you layer processed Soundfiles, then superimpose yet another level of processing at the Program level, you get lots of interesting possibilities, even without filters.

Kurzweil also has provided just the librarian tool you need. *ObjectMover* is a software application (available for Macintosh, IBM PC, and Atari ST) that allows you to move synth programs back and forth and store up to 8,000 MIDI events in the K1200's 64K Demo RAM buffer. (The RAM buffer is shared between sequence and patch data.)

The Macintosh version of the *Object Mover* disk also contains *MIDI File Converter*, which converts Type 0 Standard MIDI Files to the K1200 format. That doesn't make the K1200 the world's most sophisticated sequencer, but it may be what you need to store a few parts for this weekend's casual gig at the Loungelizard Bar. Clearly, even the less-important functions in this unit are useful.

TONIGHT'S FEATURE

The Pro 76 delivers plenty of special features sure to please the demanding keyboardist. For instance, Kurzweil has provided a impressive Bin Banks feature that is especially useful for live performance. Each of the three Bin Banks (labeled A, B, and C) contains memory locations (Bins) for ten preset Programs, with a dedicated button for each Program, giving the performer instant access to 30 sounds. Each group of 30 sounds can be stored as a Bin Map, and you can name and save multiple Bin Maps. This is extremely helpful given the enormous number of sounds you can store in the K1200 and the amount of time it takes to scroll through them. Other forms of data also can be stored in Bin locations, including Performance Setups and alternative tuning information.

Performance Setups let you split the keyboard into three non-overlapping zones, each of which can be set for local control, MIDI control, or both. You can set the MIDI channel and control parameters (pedals, mod wheel, etc.) independently for each zone. Up to 255 Performance Setups can be stored. (The number of setups you can store is limited by available memory.)

Some keyboards give you a choice of preset amplitude curves, but Kurzweil apparently thinks that approach doesn't provide enough flexibility. Instead, the Pro 76 has Keyboard Tilt, a programmable amplitude curve that enables you to assign a progressive change in volume from the lowest note to the highest note in any selected region. The Pro 76 also provides a great deal of control of velocity adjustments, with one velocity curve (which Kurzweil calls a "map") that can be applied globally across the keyboard. Velocity crossfading is possible between stacked layers and between overlapping regions. Eleven different velocity maps are included for emulation of different keyboard architectures when triggering the K1200 from other controllers, and you can create your own custom maps. In addition, you can create custom pressure (aftertouch) maps.

Other useful features include group transposition, selectable in regions (you too can play in the key of A-flat without practicing your scales) and onboard diagnostics, including a MIDI data monitor. The manual is well-written, which is critical because although you don't need an advanced engineering degree to operate it, the K1200 is a sophisticated instrument that doesn't have a lot of onboard prompts to assist your programming efforts.

The MIDI implementation is comprehensive, and anything that can be

Product Summary

PRODUCT:
K1200 Pro 76 keyboard synthesizer

PRICE:
$2,595

MANUFACTURER:
Kurzweil Music Systems
Young Chang America
13336 Alondra Blvd.
Cerritos, CA 90701-2205
tel. (213) 926-3200

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ●
EASE OF USE	● ● ●
AUDIO QUALITY	● ● ● ● ●
VALUE	● ● ●

named and saved can be exported via Sysex dump commands. The MIDI data analyzer, Midiscope, allows you to view transmitted or received MIDI events. Information displayed in Midiscope mode includes time in milliseconds between events, type of event, MIDI channel number, key velocity, and key number.

WHAT'S THE VERDICT

At $2,595, the Pro 76 represents a significant investment in an age where money doesn't do what it used to. But if you need a good controller that sounds absolutely dynamite, this instrument is a must-see (and hear).

Ed Tywoniak *holds an MFA in electronic music and has been on the faculty at St. Mary's College of California since 1978. He has composed many works for a variety of media and his writings have appeared in several magazines.*

Yamaha FX900 Simul-Effects Processor

By Larry "the O" Oppenheimer

Multiple processors and signal routing algorithms add sparkle to this multi-effects gem.

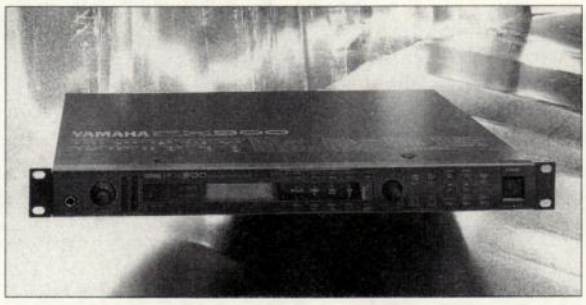
The Yamaha FX900 is a potent and versatile signal processor that strides heavily into the multi-effects arena and breaks a bit of new ground. It can produce up to four effects simultaneously, and some of the effects are themselves two- or three-effect combinations, such as compression/distortion/EQ.

The FX900 user can select one of thirteen serial and parallel signal routing options and place each effect anywhere in the chosen signal chain. Add some well-thought-out effects programs and real-time MIDI control, and you have convincing arguments to find out more about this bird.

THE LOWDOWN

The FX900 is a 1U rack-mount unit with a sleek front panel featuring dual input-level pots and two 8-LED meters

• YAMAHA FX900



The Yamaha FX900's variety of presets, patching options, and audio quality make it a versatile unit.

for input level. A 2-character LED displays the program number, and a 16-character × 2-line LCD with backlighting shows program name and parameter values.

The effects-patching algorithms fall into four groups; a graphic representation of each structure and an accompanying LED identify the one currently selected. Above this display are four buttons for switching individual effects in and out of the signal path, while below it are four effect Edit Select buttons. Pressing an Edit Select button takes you to the parameters for that effect; multiple presses step through the pages of parameters. This is a quick and intuitive layout that aids the process of developing sounds.

To the right of these is a rotary pot. The user selects parameters for editing, using right and left arrow buttons. The unit also has Bypass and Utility buttons and a big, square Power button.

The rear panel includes two unbalanced, ¼-inch inputs and outputs. There are separate input and output level switches (marked "+4 dB/-20 dB" with no indication of the dB reference), and an input-impedance switch (10K/1M) for use with guitars or other instruments with high-impedance pickups.

The FX900 has MIDI In, Out/Thru (with a switch to select the Out or Thru function), and a connector for the optional FC900 foot controller. Rear panel jacks accept two footpedals and two footswitches (for bypass and memory increment/decrement), and the FC900 can accept two more footpedals. Obviously, control options are not a problem. Finally, there is a non-detachable, 3-wire AC cable.

EFFECTS GROUPS

The FX900 can run four or more effects simultaneously. The effects fall into four groups, and you construct a preset by selecting one effect from each group.

The DYN effects group has various combinations of compression, distortion, wah, EQ, and an exciter program. Some programs are mono, some dual (i.e., discrete stereo), and some true stereo (but not discrete). Dual 3-band parametric EQ (with additional lowpass and highpass filters); dual compressor; compressor/distortion/equalizer; and multiband distortion are just a few of the choices.

The REV1 group has mono and stereo pitch change programs; reverb programs with hall, room, chamber (which Yamaha labels "Vocal"), and plate simulations; an early-reflections program; and a variety of delay programs. Mono and stereo delays have features such as low or highpass filters and stereo cross-coupling in the feedback loops. Multitap delay offers six taps of up to 1.3 seconds delay, and the modulated-delay program allows a speed offset between left and right channel sweeps, as well as phase-inversion of the modulator. The REV2 group is mostly the same as the REV1 program, but includes a combined reverb and delay program not found in REV1.

Finally, the MOD group has chorusing, flanging, Yamaha's mysterious Symphonic program (which seems to be a light chorusing effect), tremolo, and a circular-panning program.

CONTROLLERS

The FX900 can use up to four controllers to modulate parameters in real time. The available control sources are the two rear panel footpedal jacks, the two footpedals accepted by the FC900, and MIDI. The FX900 accepts MIDI controllers 1 through 31 and 64 through 95, but not the rest. The FX900 also can accept Last Note, Last Velocity, or Channel Pressure as control sources. The patching for controllers is global; the preset memories do not store the settings as part of the program.

The user has the option of scaling controllers, but the system of scaling seems convoluted: Min and Max

parameters set the range by specifying the end points as a *percentage* of the total available range. Inverting the scaling is easy, though; just make Min greater than Max.

RENDER UNTO GUITARISTS

I first attempted to use the FX900 on a synthesizer, but I couldn't find a lot to snag my interest among the first twenty or thirty presets. At that point, I realized that Yamaha has aimed the device more at guitarists than studios: a single, front panel, ¼-inch jack; lots of distortion options; input impedance switch; and so on. I plugged in a guitar and got a whole new take on things. Suddenly, the presets made more sense and the FX900 started sounding more useful.

The FX900 is not a guitar preamp, however. The undistorted sound lacked character, and the distortion sounded like most solid-state distortion devices I have heard: somewhat cold and brittle. The multiband distortion was new for me, though, and I became quite enamored of the sound. With some tweaking of this program, I was able to get a more rich, less harsh distortion. For some tasks, the FX900's distortion sounds fine, but I recommend a good tube preamp in front of the FX900, or perhaps putting it through a guitar amp and miking it.

The compression, EQ, delay, and reverb portions of the guitar-oriented presets sounded great, both over speakers and in headphones. I really enjoyed the delay programs, especially fooling with cross-coupled feedback with the circular panning program in front of the stereo delay. The spatiality of the FX900 effects program is one of its strongest points.

PROGRAM ENHANCEMENT

After exploring the unit as an effects device and guitar processor, I investigated its usefulness as a utility tool. Mounting a direct-to-DAT recording, I checked out the FX900 as a program-enhancer.

I like Yamaha reverbs for many uses, but to my ears they aren't the warmest and most natural, especially when simulating large spaces. The FX900 is no exception: Its reverb and early reflections simulations are neither as dense nor as uncolored as some other reverb units. For this recording, I was looking to make an intimate, yet rich and full

room sound, sort of like a recital hall the size of a 7-11 store. The FX900's reverb and early reflections programs worked excellently, adding a fine sense of space. The ability to tweak the early reflections and reverb individually let me tune the ambience very finely.

The dual compressor and dual parametric EQ sounded smoother than I had expected. I wish there were also stereo versions of these programs. For instance, I'd like a stereo compressor that links left and right channels, using the higher of the two channels' instantaneous levels to trigger compression.

Lack of an indication of when the signal is over the threshold, or of gain reduction, complicates setting the compressor threshold. There is, however, an indicator that shows when the FX900 is receiving MIDI messages.

Sonically, the FX900 is definitely not up to the digital compressors and equalizers that mastering houses use, but it is quite good for program-shaping in a small studio environment. I'd love to see more of those types of programs in a box like this.

THE UPSHOT

My first take on the FX900 was not unfettered ecstasy, but the more I sank into it, the more I liked it. The user interface is straightforward: Although there are multiple layers, things are consistent and don't take too many keystrokes.

The FX900's outstanding versatility stems from a combination of program variety, patching options, and decent sound. The FX900 is not going to kill the market for more expensive units, such as the Eventide H3000 or Lexicon 300, but it sounds better than Yamaha's older reverbs, probably due in part to the sigma-delta (1-bit, oversampled) A/D.

The FX900 responds well to dynamic control, but some parameters work better than others. For example, the steps are quite audible when changing the low-frequency boost in the dual parametric EQ. Interestingly, changing some effect parameters from the front panel resulted in interruptions in the audio, even if that effect was not in the signal path at the time.

I'm really struck by the FX900. It offers a large selection of both functional and rad effects, tremendous flexibility in building a sound, and sonic quality acceptable for all but critical

applications. All this comes at a most reasonable price, making the FX900 a potent addition to any sorcerer's bag of tricks.

Larry the O *thinks that sound is the most beautiful thing he's ever heard.*

Product Summary

PRODUCT:
Yamaha FX900
Simul-effect Processor
PRICE:
$995
MANUFACTURER:
Yamaha Corp.
6600 Orangethorpe Ave.
Buena Park, CA 90620
tel. (714) 522-9583

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

Softelligence Personal Composer 3.3

By Jim Conger

A long-established composition and notation package continues to evolve.

My first exposure to MIDI came about six years ago at Orange Coast College in L.A. My dad took me to a class that had an IBM PC, running Jim Miller's *Personal Composer,* hooked up to a Yamaha DX7 synth and a drum machine. I was astonished to see that what I played on the keyboard transformed instantly into standard notation and recorded to disk. It was love at first sight, and I've been MIDI-ing ever since.

Miller, who recently renamed his company "Softelligence," is now up to version 3.3 of *Personal Composer.* (*The new company name heralds an expanding product line that includes a Sonata-compatible font for use with PostScript interpreters, a set of sequences, and a library of functions for Microsoft* Windows *that allow arcade-style control of VGA cards directly from* Windows.—*SO*) The package has grown and now addresses several markets: sequencing, music publication, and music programming. The latter is due to Miller's incorporation of the LISP computer language into the program. This opens the door to all sorts of wild possibilities, which I'll cover shortly.

OVERVIEW

You need an IBM PC XT- or AT-compatible, with a hard disk and an MPU-401-compatible MIDI interface board (or IBM PC Music Feature card) to run *Personal Composer.* The screen graphics work with Hercules, EGA, and VGA systems, but not CGA. I installed the program on both a 4.77 MHz PC clone (with Hercules graphics and a Music Quest MIDI interface), and a 20 MHz, 80386-based machine running VGA graphics with a Roland MPU-401 interface. The program ran well on both sets of hardware, although you end up waiting a lot longer for compiling scores and running programs with the older PC. Installation is easy: The *Install* program figures everything out for you.

When you first start the program, you are given a blank editing screen, ready to create music in notation form. There is an online hypertext help system, along with the two bound manuals to get you started. I didn't find the online help very useful, but the tutorials in the manuals are well-written. The index for the reference book is also complete enough to answer most questions.

The program responds to two-letter commands, typed on the keyboard, and to pull-down menu selections. If you have a mouse, you can select menu and edit items by pointing and clicking. In either case, the menus allow you to scoot quickly around the different parts of the program. These are:

• A Score Editor that creates standard musical notation, ready for publication-quality graphics. You can "play" the score instantly, at any point, using your MIDI equipment. All normal notational elements are built-in, and you can create custom graphics with a special MIDI Graphics Editor (described shortly). Printer drivers for Epson, HP LaserJet and DeskJet, and PostScript printers are provided.

• A 32-track MIDI Recorder with all normal functions for record and playback. Recorded data can be translated to standard notation almost instantly. Synchronization is either internal, external MIDI, or external tape, matching the limitations of the Roland MPU-401 interface.

• The Event Editor, a piano-roll edit screen. Both MIDI notes and controller data are displayed. Any portion of the sequence can be selected for cut, paste, scale, etc. Although this is a graphics screen, the functions remain largely command-driven. For example, you can scale the note velocity values for any region by a given percentage. However, you can't edit velocity or controller curves directly by sweeping your mouse over the graphic data.

• The MIDI Graphics Editor, which allows you to create custom graphics for your scores. This means there is no limit to what you can include in your printed music. You also have the option of hooking MIDI data to the graphics. For example, you can make a graphics symbol that also sends a program change message to your synth during the course of a piece.

• A fairly complete implementation of the LISP computer language is included in the LISP Interpreter. A number of MIDI-specific functions are built-in, along with functions that use LISP to add features or modify how *Personal Composer* operates.

• A simple Text Editor is built in to make creation and editing of LISP programs and keyboard macros available within the program.

• The Universal Librarian supports synths that have a bulk dump and receive function. DX7 and TX816 editors (written in LISP) are included as demonstrations.

• Keystroke Macros allow you to save any sequence of commands for instant playback. This is similar in concept to macros in *Lotus 1-2-3*, and is just as useful.

TRYING IT OUT

My first experiments were in entering music notation directly on the screen. After about a half-hour of work, I had most of the commands figured out. You can create notation *quickly* with this system, especially if you have a mouse. The program "remembers" the last item you picked, so you can plop in a string of eighth notes in a few seconds. It is also a simple matter to move notes, connect them with ties, and join bars. Your work can get quite complex, including multiple staffs, alto and tenor clefs, fermatas, piano and forte markings, grace notes, and Baroque mordents.

The nice part about working with the notation system is that anytime you type the letters "pl" on the keyboard, the score is translated into MIDI events and sent out to your MIDI equipment. This amounts to almost instant gratification. Your multi-part electric ensemble plays exactly what you have written. There is just no excuse for using staff paper once you have this package.

I should mention that the raw MIDI output from converted scores tends to sound sterile, as every note is sent exactly on time with the same key velocity. You can fool with the timing and dynamics later to improve the sound, but an alternative is available: Play on the synth's keyboard and let *Personal Composer* convert what you played back into notation.

To convert from playing a synth to recorded notation, you first enter the 32-track recorder and set it to record. You can set what track to record to, what range of data to accept (aftertouch, pitch bend, etc.), the tempo, and so on. Once you finish playing, just click the Score button, and the MIDI data is converted to notation.

If you play accurately, the results look good, and it is a simple matter to clean up the score to get it into standard form.

One of the unnerving things about converting what you play into notation is finding out what you really play. I tend to rush notes and hold my left

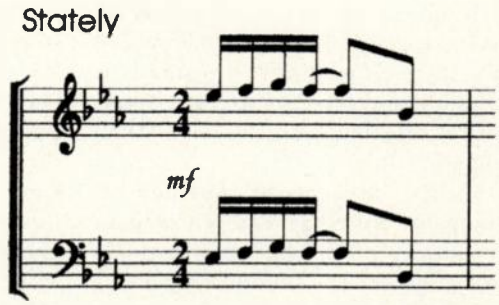


FIG. 1: This is an example of output on a Hewlett Packard LaserJet IIP printer.

hand down too long. Guess what: *Personal Composer* shows it just like I played it. This can be more than just a problem of sloppy playing. Jazz styles and French Baroque (to name two) are played far from the literal notation, so the conversion to notation is less successful. This is not a fault of *Personal Composer* but just highlights the limitations of the notation conventions we use.

The program has input quantization, and during conversion to notation, you choose relatively coarse or fine levels of quantization. But if you over-quantize, you lose the details of your playing (for instance, triplets).

The printed output from the program is excellent. I didn't try the PostScript driver, but the dot matrix and HP LaserJet drivers work well. The example shown in **Fig. 1** was printed on an HP LaserJet IIP printer. The driver allows sizing of the finished score.

The Event Editor (see **Fig. 2**) is where you do quantization, cut-and-paste operations, and look at controller data. Although you can do a lot of things from this screen, it is probably the weakest part of the program. Other sequencers that emphasize graphic editing over notation as the basis for MIDI editing have more powerful graphic editing features.

For example, there is no good way to graphically adjust a pitch bend or controller curve on the screen. This is not too important for classical compositions but is more so for jazz and rock styles.

I could go on about the multitude of other built-in features in *Personal Composer*, but let's move on to the most unique part of this package: the built-in programming language.

THE LISP INTERPRETER

Unless you are a computer jock, you probably have never heard of the LISP language. It is more popular in the UK than the USA and tends to be used more for artificial intelligence work than commercial programming. Don't let that scare you; LISP is not a difficult language to learn or use.

LISP stands for List Processing, and it contains built-in language elements for handling lists of data. It turns out that a lot of musical ideas can be expressed simply as lists. For example,

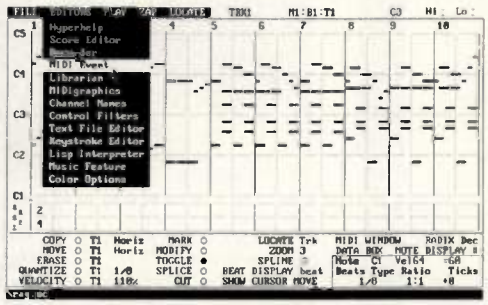


FIG. 2: The Event Editor provides editing and manipulation in a graphic environment.

the number of semitones between the notes of a major scale is the list:

Major Scale:

2 2 1 2 2 2 1

To write this list in the LISP language is simply:

(list 2 2 1 2 2 2 1).

You can quickly think up other common lists, such as the list of notes in chords, the list of keys in the circle of fifths, and the list of durations in a drum pattern.

In addition to normal LISP operators, *Personal Composer's* version includes functions for creating song files and scores. Below is a short example that creates a C major scale. The words preceded by semicolons are comments, included to make the program more readable.

Space does not allow me to explain every line, but you can see that there is not too much code needed to get started. Once this program is loaded, you can immediately play it or convert it to notation. Think of how much programming it would take to accomplish all that starting from scratch with BASIC or C. (I know; I've done it.) This program easily can be modified to write songs that randomly select notes, but only from the given scale. Adding to it, you can think of chord functions, rhythmic additions, etc.

You also can use LISP to create custom applications such as utility programs, compositional aids, patch librarians, you name it.

One limitation is that LISP is not particularly fast. LISP is an interpreted language, meaning that the program is not converted to machine language until you load it. This is great when learning the language, as you can type lines in one at a time and see what happens. However, program speed is a problem on older machines. I would not recommend serious programming on anything less than an AT-class machine, although you can learn the language on an XT.

FINAL COMMENTS

Basically, I like this program. The few bugs I ran into are minor, such as the cursor showing up on the wrong screen area and obscure parts of the program not following the manual exactly. The raw power of the scoring program and LISP interpreter more than compensate for these items.

No program is perfect. My suggestions to keep improving *Personal Composer* mostly have to do with the user interface. The mouse driver looks like an add-on (like those weird mouse menus you can tack on to *Lotus 1-2-3*). In addition, the menu selection operations with the mouse do not follow the industry standards (e.g., Macintosh and Microsoft *Win-*

```
; scale.lsp create a major scale of quarter notes
; Jim Conger 1990

(setq major-scale (list 2 2 1 2 2 2 1))          ; list of half steps for notes
(setq note-value 48)                             ; variable to hold MIDI note

; write necessary first event data to start track
(set-event-time 1 1 1)                           ; start at beginning of song
(make-event '((:time-sig 4 4)))                  ; 4/4 time sig
(first event)
(make-event '((:tempo 80)))                      ; set tempo at 80 bpm

; create scale notes
(setq i 0)                                       ; i is just a counter
(while (<= (incf i) (length major-scale))        ; for every note in scale
    (make-event '((:note note-value 64 30)))     ; make a new note
    (incr-event-time 60)                         ;time + 60 ticks
                                                 ; add right # half steps
    (setq note-value (+ note-value (nth i major-scale)))
)
(redraw)                                         ; refresh screen
```

dows applications). (*The manufacturer says the menuing system is not an add-on, but was designed on the Xerox PARC document Mockingbird. It allows the user to place the cursor immediately for icon selection without moving the mouse to a menu.—SO*) Additional mouse-based graphic editing functions would be welcome. Also, *Personal Composer* needs to have other synchronization options to allow sync with video images.

I would recommend this program to quite a few people. The strong emphasis on notation makes this an ideal sequencer for anyone working with live musicians. Struggle at home on the score with your synths, then print out the parts for the ensemble to work over. The printout quality is good enough to justify the package purely as an editor for sheet music. Finally, having LISP in the package makes this the sequencer for anyone with a programming bent, or for university settings.

Product Summary

PRODUCT:
Personal Composer System/2 3.3 notation and composition software
REQUIREMENTS:
IBM PC XT- or AT-compatible; hard disk; MPU-401-compatible MIDI interface board or IBM PC Music Feature card; Hercules, EGA, or VGA graphics systems (but not CGA)
PRICE:
$395; $75 upgrade from version 2.0 and later
MANUFACTURER:
Softelligence
3213 West Wheeler St., Suite 140
Seattle, WA 98199
tel. (800) 446-8088
or (206) 236-0105

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

Jim Conger *is the author of* C Programming For MIDI *and* MIDI Sequencing In C, *not to mention the occasional article for* EM.

Hybrid Arts GenEdit 1.1 for the Atari

By Jim Pierson-Perry

Is this universal editor/librarian a good choice for the long haul or an overhaul?

In early 1990, universal patch editors and librarians emerged as new tools for taming a MIDI system. Using software handlers (or drivers) for the gory details of communication, universal editor/librarians provide a cost-effective alternative to separate editors.

Hybrid Arts' *GenEdit* was an early entry to the field. Version 1.1 was released last summer and I reviewed this most recent upgrade on an Atari Mega 4 system. A somewhat different version is scheduled for release on the Macintosh.

GETTING STARTED

GenEdit runs on any Atari ST or Mega with at least a megabyte of memory. *GenEdit* is best suited to run from a hard drive, though it can be adapted to floppy systems. With sufficient memory, you can run *GenEdit* under the *SoftLink* or *HybriSwitch* multiprogram environments (M-ROS is not compatible).

The copy protection scheme is particularly stupid: If it doesn't find its master disk in drive A, it crashes the system without warning or explanation. (It's great fun in the middle of a recording session.) You at least should get a dialog box.

GenEdit installs easily; just drag the appropriate handler files from the program disks into folders on your working disks. Many devices are supported through multiple handlers. (The Kawai K4, for example, is broken down into four handlers: Singles, Multis, effects, and drums.) You only need take the ones you will use. The manual is well-done and contains a detailed appendix on the supported devices.

Some universal ed/libs require a configuration profile of the devices in your setup. This profile is used to save and load complete "snapshots" of the system's state. *GenEdit* uses a minimalist

approach: The program swaps editing templates in and out of memory, as needed. This simplifies installation and conserves memory, but it precludes fully automated system management.

GenEdit has provision for loading manually assembled multiblock files, but even then it prompts you for the MIDI channels and unit ID numbers each time you load the block. Worse, *GenEdit* lacks support for automated MIDI patch bays. You must manually work the patch bay from the front panel, or control it using ST keystroke macros.

LEVELS OF INTELLIGENCE

GenEdit device handlers are made up of two parts: configurations and templates. Configurations—written in *GenEdit's* CNX language—handle the necessary Sysex manipulation and provide librarian functions. Templates provide the editing features, with a variety of graphical screen controls representing individual patch parameters (see **Fig. 1**). Each device has its own configuration, but templates can be shared between compatible devices.

GenEdit supports three configuration types. Filing configurations allow basic bulk data transmission and storage. Organizing configurations are a bit smarter and can separate individual patches within a bulk transmission for librarian operations.

Editing configurations require a matching template for actual patch editing. *GenEdit* uses the configuration to translate the user's actions into corresponding parameter changes. Controlling templates let you send standard MIDI messages, such as patch or volume changes, without need of a configuration file.

THE LIBRARIAN

The main screen (**Fig. 2**) is deceptively simple. Patch banks can be saved as raw Sysex files, or they can be bundled with the device configuration. A desk accessory can be used to send these patch files from within another program.

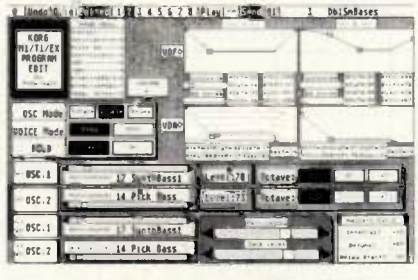


FIG. 1: GenEdit's Korg M1/T1/EX device template, with graphical screen controls representing individual parameters.

FIG. 2: Raw patch files are bundled with configurations, templates, and MIDI channel assignments in a data window on the main screen. The configurations handle Sysex data manipulation and provide librarian functions.

Raw patch files must go through a data window using the appropriate configuration. If an organizing or editing configuration is used, the patch names show up in the window, and you can perform basic librarian operations, such as patch-naming and copying of patches or patch groups.

The copy routines let you send patches between windows for patch-compatible devices. For example, one window can hold DX7 patches while another holds TX802 voices. Passing DX7 patches into the TX802 window transfers all pertinent parameters; those specific to the 802 are set to initialized values.

GenEdit provides tools to import files across several formats on different platforms. Hybrid's own *CZ-* and *DX-Android* files are not directly compatible, but there is a translation function for *GenPatch* (Hybrid's earlier universal librarian) files.

GenEdit treats libraries as large banks. The maximum library size depends on the device, from 512 voices for the Proteus up to 1,024 for the M1. You can make multiple library files, but I'd prefer a single large library for each device. *GenEdit* lacks the search and sort features found in many competitive programs.

THE EDITOR'S DESK

The editing templates provided with the program are attractive and easy to use, with logically related patch parameters arranged on one to eight screens. One screen might handle operator envelopes, while another holds modulation routings, and so on. Theses tem-

plates have been designed by various authors, and they vary greatly in style, functional utility, and parameter layout.

GenEdit templates are created using an editing program that works like a drawing program. There are seven different graphical tools that can be used to display and alter various patch parameters:

- sliders,
- knobs,
- text fields,
- numeric fields,
- buttons,
- joysticks, and
- envelope graphs.

Controls may be linked to one another to show parameter changes both numerically and graphically. Most of the templates incorporate the names of multiple-choice parameters such as PCM waveforms, or modulation sources, and this greatly simplifies editing.

Patch parameters initialize to their minimum values unless you select a specific patch. You can create an "initial" patch to load as a starting point, but it would have been nice to have a set of default initial values associated with the template itself.

Other small annoyances: You cannot enter numeric values directly, but must always use the mouse (the screen controls respond readily, but twisting and sliding quickly gets old); the Undo command works at the global level, restoring all settings to the values they had when you opened the template (you cannot undo just the last edit); and *GenEdit* will not print patch parameters, so you have to dump each template page to the printer separately. High-order editing facilities also are surprisingly absent. You cannot, for instance, copy parameters or groups of parameters, either within a patch or from one patch to another.

GenEdit provides parameter distortion, randomizing, and averaging algorithms for automated patch-creation, but these are all generic schemes and do not utilize any device-specific information. Users can selectively mask parameters from these functions by altering the device's editing template.

GenEdit is unable to coordinate between different editing modules, even when these affect a single device. The program recognizes one template at a time, and the templates are mutually ignorant of each other. When you move from a voice template to its corresponding performance template, for example, *GenEdit* loses all knowledge of the internal patches. This leaves you building performances based on generic bank locations and patch numbers.

OTHER TOOLS

GenEdit provides two ways to audition patches. MIDI controller input can be passed through to the target device. Using a built-in, 1-track sequencer, you can listen to patches in a musical context but you cannot import or export sequences. To hear patches in a recorded sequence, you must run *GenEdit* under a multitasking setup, or record the sequence *de novo,* in a single pass.

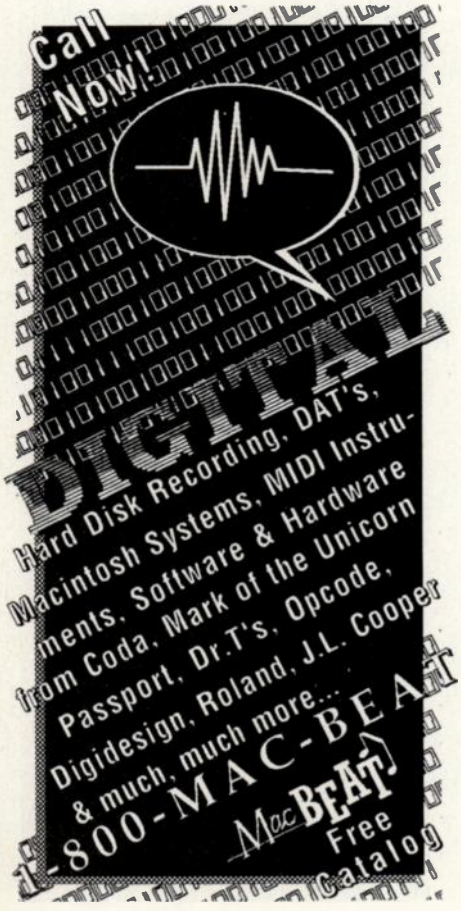
Because of the sequencer limitations, it is quite possible to create patches that you cannot audition properly, such as controller effects that your keyboard cannot send, but that you plan to step-enter with your sequencer. It would be helpful if *GenEdit* could at least import Format 0 Standard MIDI Files, and it wouldn't hurt to use the mouse as an assignable controller either.

There are two functions of interest to MIDI hackers. The MIDI monitor screen lets you watch incoming MIDI data, with optional English translations. Macros let you send predefined strings of MIDI commands to your system with a single keystroke. Most users probably won't need these features, but they are handy for general system control, MIDI education, and debugging *GenEdit* configuration files.

SUPPORT

The true test of a universal editor comes down to the number of devices it services and how well it covers each. *GenEdit* provides editing support for roughly 25 devices and their lookalikes, with librarian support for about fifteen others. None of these devices are more recent than late 1989.

Several templates are incomplete. The Roland D-110 template omits rhythm setups and timbre tables. The Yamaha TX81Z template lacks effects-editing and microtuning, also absent from the TX802 template. Some templates are excessively generic: PCM waveform names were dropped from the D-110 template for MT-32 compatibility. I don't want to look these up or memorize them; that's why I buy patch editors.



• GENEDIT

Other templates are needlessly restrictive. The D-110 template only recognizes unit number 17; what if you have more than one unit? The Matrix-1000 voice template does not recognize the edit buffer, part of last year's ROM revision. The list goes on.

No templates show a revision number or date. Configuration files contain dates buried in their code, but there are different versions of the same configurations that have the same date. Identifying current configurations and templates could be a big problem.

Hybrid Arts has provided no support for new devices since version 1.1 was released last summer. A bug-fix update for some configurations was released to computer BBSs in October 1990, but there was no customer notification. Since that time, nothing. A Hybrid Arts representative commented that the company has nothing in the pipeline and anticipates that third-party developers will provide new support. So far, three developers have done so:

- Tom Bajoras (5650 Sumner Way #310, Culver City, CA 90230) offers fourteen new templates for $25, including support for the Niche ACM, Akai S1000, Peavey DPM-3, Roland D-70, and Eventide H3000.
- Galanter Productions (tel. [312] 871-1343) provides editing templates for the Oberheim Matrix-12 and Xpander and the E-mu Proteus/2.
- Andy Pederson (tel. [612] 541-1015) has developed templates for the Multi-Verb II, ART SGE, GR-50, and GP-8.

GenEdit provides the tools for crafting your own configurations and editing templates, but I suspect few will do so. It takes the patience of a saint and strong programming skills to create good configurations and editing templates. The CNX language and template editor are very good and well-implemented, but this is the reality of patch editor design.

CONCLUSIONS

GenEdit is a bit of a disappointment. It comes close on many counts but ultimately trips up from underlying design limitations and poor support. If this were a brand new product, these faults might be palatable. But *GenEdit* has been out for about 18 months and it appears that it has been abandoned by the manufacturer. There has been no new editing support in a year, and none is planned. In addition, it fares poorly against its competition in performance, features, and number of devices supported.

Could it be a contender? Yes, but only with a significant overhaul and renewed support. Those interested only in voice programming may find the program adequate, if their devices are supported. A demo version is available from Hybrid Arts' BBS (tel. [213] 841-0347) and several national bulletin boards.

A Macintosh version of *GenEdit* should be available by the time you read this. It requires at least a Mac Plus and is compatible with Apple's *MIDI Manager*. There are several changes from the Atari version, including support for MIDI patch bays and system setup files. The Mac program includes both configuration and editing template in a single file, and Macintosh drivers are compatible with their Atari counterparts. Hopefully, the Mac version will be better integrated and have a more up-to-date list of supported devices.

As it stands, *GenEdit* is a good programming tool for third-party developers but crippled for musician's purposes. For my part, I'd look elsewhere for a viable universal editor.

Product Summary

PRODUCT:
GenEdit 1.1 universal editor/librarian
REQUIREMENTS:
Atari ST or Mega ST computer; minimum 1 MB RAM
PRICE:
$250
MANUFACTURER:
Hybrid Arts, Inc.
8522 National Blvd.
Culver City, CA 90232
tel. (213) 841-0340

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

Jim Pierson-Perry *is a research clinical chemist by day and musician/author by night. In between times, he just soaks up entropy.*

East-West Prosamples CD Library

By Geary Yelton

A top producer drums up some high-quality percussion and bass samples.

I constantly look for new and better drum sounds to sample. Excellent, versatile snares are usually the hardest to find. Now, thanks to the talents and resources of record producer/engineer Bob Clearmountain (Rolling Stones, The Who, Bruce Springsteen, and others), I've never had such a wide selection of outstanding snare drum samples in my life.

With a CD player and Clearmountain's two-hour-long volumes of East-West Communications' Prosamples, plus the requisite patience and skill (or at least a willingness to learn) to sample them, you can load your sampler with wonderful snare drums, as well as other percussion instruments and bass guitars. Both volumes also are available on CD-ROM for the Akai S1000 sampler and Digidesign's SampleCell sample-playback card for the Macintosh.

Track numbers and index numbers are listed in the accompanying booklets, but there are no indications of length. Because some tracks have more than twenty performances, using a CD player without indexing can be tedious. Otherwise the documentation is impressive. The first volume lists the mics used for each track, along with comments on either panning, mic position, or effects processing. The second volume lists each track by location, instrument name, stereo position, and description.

DRUM SAMPLES

Prosamples Volume 1 (Drum Samples) contains at least a dozen digitally recorded snares, two bass drums, a dozen tom toms, eight assorted cymbals, and a pair of 14-inch, Zildjian New Beat hi-hats. All sounds are from a standard drum kit.

Clearmountain sampled most drum hits four times with close-miking (dry) and several times with room-miking at increasing distances (ambient). If you can spare the RAM, record all the versions and alternate them so your drum tracks don't sound repetitive. Dry drums are recorded in mono, but the majority of tracks are in stereo. The first two of three banks of toms are recorded dry on one side and ambient on the other, so you can mix and match.

You should get a lot of mileage from the drums and cymbals on this disc. Loud and soft hits would have been nice, though. Even though the only hi-hat is beautiful, and it's played seven different ways, a choice of hi-hats would have been welcome, too.

Finally, a few drums played with brushes would probably make this collection more complete. Nonetheless, Prosamples 1 is a tough act to follow.

PERCUSSION AND BASS

Prosamples Volume 2 (Percussion and Bass) compares favorably with similar outings from competing manufacturers, but in contrast with the first volume, it almost seems like an afterthought. All the percussion sounds that were left out the first time are here, with electric bass thrown in for good measure.

Volume 2 features most of the popular Latin percussion instruments, plus eight tambourines, four shakers, sleigh bells, tabla, Japanese rattle, Malaysian drums, Kenyan bongos, bell tree, talking drums, repeque, gato, darbuka, daf, tamboras, whirly tube, wind chimes, and several others. All are recorded in stereo. All percussion sounds are played a second time, processed with a 3-D placement effect called "QSound." Of course, a stereo sampler is necessary to make use of QSound recordings.

Almost half of the hour-long Prosamples 2 disc features two basses—a fine-sounding Fender Precision and a 5-string Musicman Stingray—played with fingers and with a pick. A Trace Elliot amplifier is miked on one side of the stereo tracks, with the direct bass signal on the other.

Each set includes samples of every "natural" note (C-D-E-F-G-A-B) within at least a 3-octave range. There's a nonstandard way of referring to octave, though, with E3 a whole step above D2. All notes are sustained as long as possible. There's enough dynamic

unevenness from one note to another to (at best) give almost every note in any key its own timbre, or to (at worst) make a few notes stick out obtrusively in a mix.

As a bass player, I wish there had been more levels of inflection and dynamics, but I suppose vibrato, thumping, popping, and harmonics would take up at least a complete disc. I'm sure many musicians will make good use of these excellent bass samples.

In the last five years, the quality of sampler libraries on compact disc has steadily improved, and these two discs are perfect examples. If sampled drum sets assembled from these sounds are the only ones you ever use for rock, jazz, pop, or R&B, you'll probably be at least as happy as you would with any drum machine, and probably happier.

To sweeten the deal, East-West just cut the price of Prosamples in half: Buy Volume 1 for $129, and you get Volume 2 free. That sounds like a bargain to me. A great-sounding sampler doesn't have much value without great sounds to play on it. Fortunately, Prosamples sounds like a million bucks.

Product Summary

PRODUCT:
Prosamples CD sample library
PRICE:
$129 both volumes
MANUFACTURER:
East-West Communications
302 Ocean View
Del Mar, CA 92014
tel. (800) 833-8339
or (213) 659-2928

EM METERS	RATING PRODUCTS FROM 1 TO 5
AUDIO QUALITY	● ● ● ● ●
SOUND SELECTION	● ● ● ● ◖
DOCUMENTATION	● ● ● ● ◖
VALUE	● ● ● ● ◖

Geary Yelton *lives in midtown Atlanta with his musical instruments, computer gear, and very little furniture. He is author of the books* Music and the Macintosh *and* The Rock Synthesizer Manual.

Audio-Technica Artist Series Headset Mics

By George Petersen

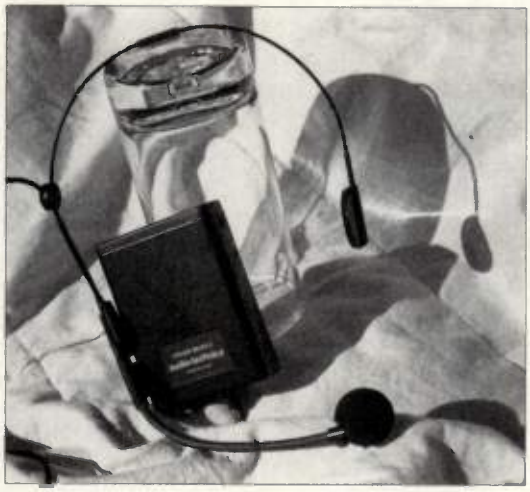
If you're fed up with stand-mounted mics, try using your head.

If you're a gigging multi-keyboardist or drummer who sings, you know the difficulties of working with stand-mounted microphones. While suitable for guitarists and bass players, the mic stand is a poor choice for active players. Placing a boom arm or gooseneck on the mic stand helps, but the results usually are less than wonderful.

Enter the headset mic. Although they resemble a switchboard-operator microphone, the audio performance of modern miniature microphones rivals, and even surpasses, many handheld models. Recently, Audio-Technica unveiled two cardioid, head-worn microphones from its Artist Series mic line, the PRO 8 ($154) and ATM71 ($190), that offer respectable audio performance at an affordable price.

One of the most important aspects of a headworn mic is how the unit fits and balances on the performer's head. In this regard, both A-T models rate highly. The ATM71 and PRO 8 use a similar support system consisting of an adjustable wire frame (which easily tucks under a performer's hair), with cushioned pads that rest over the ears for a snug, secure fit. The mic element is mounted on a highly flexible gooseneck, which makes optimizing mic placement simple. Bearded singers will appreciate the protective tubing covering the gooseneck, which prevents it from catching on facial hair.

The ATM71 is equipped with a condenser mic capsule and terminates in a small power module with an XLR output jack; a 3-way switch for battery on/off, bass roll-off, and "flat" frequency-response selection; and a compartment for an internal 1.5-volt AA battery. (The unit also can be powered by any 5- to 52-volt phantom power source.) The PRO 8 uses a dynamic (moving coil) mic element and includes a 15-foot cord that terminates in a male XLR plug. Since the PRO 8 is a dynam-



The Audio Technica Pro 8 offers a dynamic mic element. The ATM71 (not shown) is a condenser version.

ic mic, no battery or external power is required. This makes it perfect for use with wireless transmitters.

Both microphones performed well under a variety of conditions. The headset and mounting system is extremely stable and keeps the mic locked in place, even under the most arduous stage movements. Where the two mics really differ, however, is in the basic sound of the two capsules.

The frequency response of the PRO 8's dynamic capsule rises sharply, with a strong midrange boost (about 10 dB), peaking at 3,500 Hz. While this is a far cry from the ruler-flat laboratory ideal, I liked the effect on my voice. In contrast, the ATM71's condenser design provides a smooth, flat, uncolored response that is particularly nice on female vocals.

Both mics employ a cardioid design, which requires some sort of air vents located in the mic body behind the capsule. When sounds emanating from the rear or side of the mic enter these vents, a bit of wave cancellation occurs, creating the unidirectional cardioid

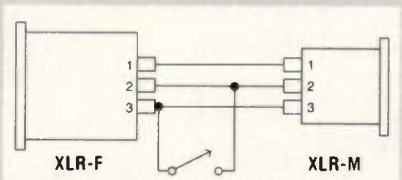
BUILD A MIC SWITCH

An external mic switch can be a real godsend, especially when you're using a headset mic onstage and don't want the entire concert hall to hear you scream to the backstage tech crew. This simple mic switch project costs only a couple bucks and takes about an hour. In fact, as one of the simplest circuits ever devised, it's an ideal project for novice do-it-yourselfers.

The circuit disables the mic output when switch S1 shorts pin 2 to pin 3 (see schematic). You construct the entire mic switch in a compact 4 x 2 x 1.5-inch, metal project box, which features a female XLR panel jack at the top of the box, a male jack at the bottom, and an SPST toggle switch in between. As an alternative, you can substitute a momentary button switch for the toggle switch, making the unit act as a "cough" switch that only mutes the mic output as long as the button is held down.

Construction is a snap. The most difficult part is cutting holes for the switch and XLR jacks. If you lack the proper chassis punches for the XLR holes, start with a 1/2- or 3/8-inch drilled hole and use a nibbler to enlarge the hole to size. As an option, add a belt clip (taken from a money clip) on the back of the box, or just attach the box to one of your keyboard stands with duct tape.

Wiring is easy and requires less than five minutes once you have the components mounted on the box. Just keep your solder connections clean and make sure that pin 1 of the top jack connects to pin 1 of the bottom jack, pin 2 to pin 2, etc. Close the box, plug it in, and go.—*George Petersen*



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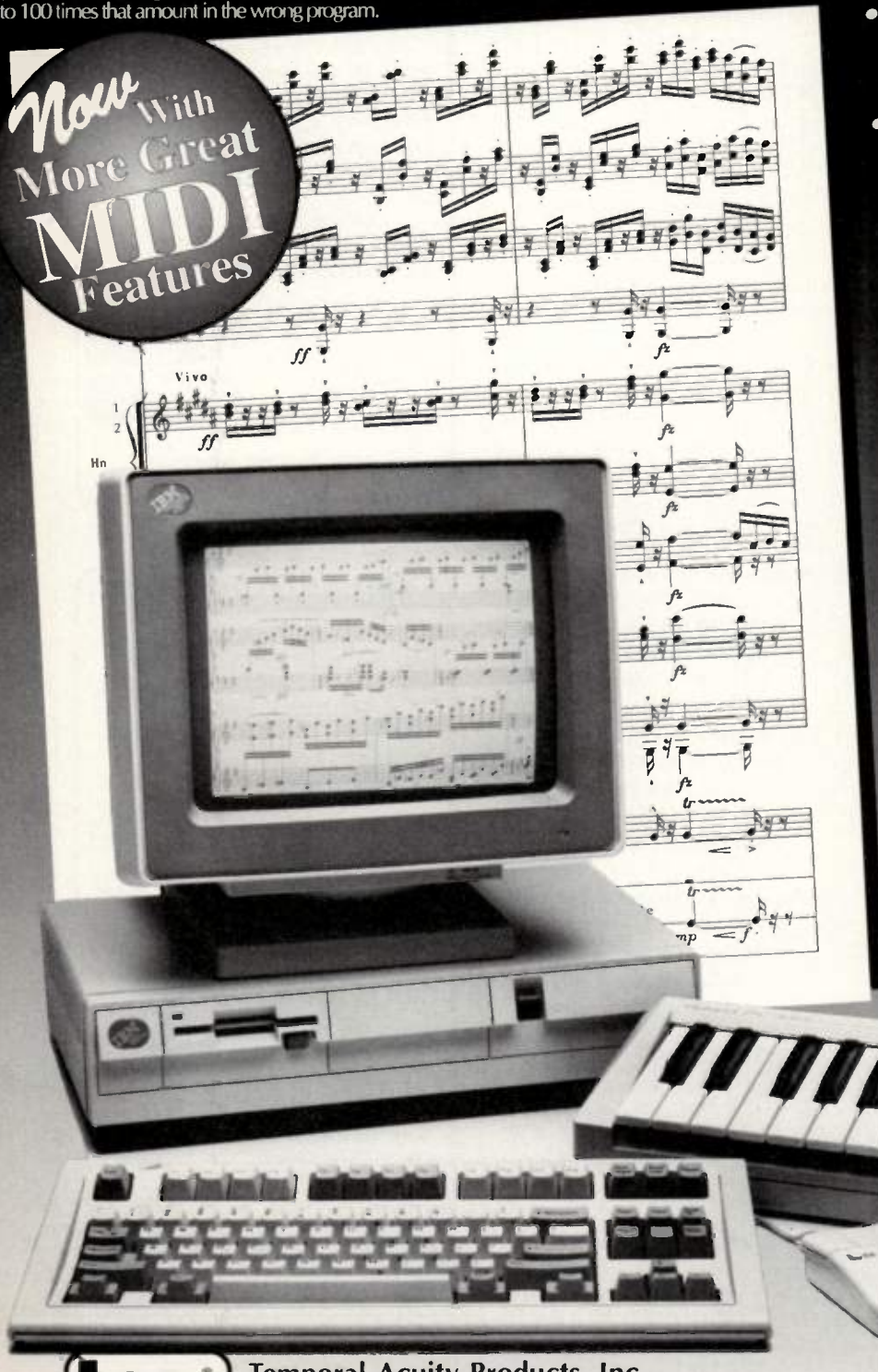

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pattern. Since the sound vents on these A-T headset mics are shaped like long narrow slits, both models are susceptible to low-frequency rumble caused by nasal exhaling. While this was more evident on my voice than with several other people who tried the mics (maybe I just have a big nose), it presented a noticeable problem. In addition, the ATM71's bass roll-off filter wasn't steep enough to handle the noise. With this in mind, Audio-Technica offers two optional windscreens, priced at $7.95 each. However, both of these are fairly sizable. The AT8117 windscreen is about the size of a small lemon, but the AT8117S is effective and, at about half that size, a more reasonable solution.

Be careful with the ATM71's on/off switch, which disconnects the internal battery to conserve life (estimated at 1,000 hours of intermittent use). You should never use as an audio on/off switch, since disconnecting the power from any condenser capsule causes a distinctly audible and quite loud popping noise. The accompanying sidebar shows how to construct a simple on/off switch that works with any XLR, balanced mic.

Overall, Audio-Technica's ATM71 and PRO 8 are solid, comfortable headset microphones, with quality capsules and an affordable price tag. If you're tired of old-tech mic stands, these mics may solve your problems.

George Petersen *operates a Third World-class recording facility in the San Francisco Bay Area.*

Product Summary

PRODUCT:
Audio Technica Artist Series Headset Microphones
PRICE:
PRO 8 $154
ATM71 $190
MANUFACTURER
Audio-Technica U.S.
1221 Commerce Dr.
Stow, OH 44224
tel. (216) 686-2600

EM METERS	RATING PRODUCTS FROM 1 TO 5
DURABILITY	● ● ●
MOUNTING SYSTEM	● ● ● ● ◖
AUDIO QUALITY	● ● ● ●
VALUE	● ● ● ●

Tech 21 SansAmp

By George Petersen

Finally, a big tube-amp sound in a little box.

Getting a great guitar sound in the studio is no easy thing. Besides a great guitar, it requires just the right speaker cabinet, speaker component(s), amp head, microphone, and mic placement to achieve that killer sound. Unfortunately, all of this experimenting requires a lot of equipment and a lot of time, and when you're in the studio, time is money. One possible solution to this dilemma is the SansAmp from Tech 21.

SansAmp re-creates the warm sound of tube amplification in a compact box that allows connection of your electric guitar or bass directly to a console, guitar amp, or power amplifier. It is *not* a distortion pedal or fuzzbox, but a precision device that yields an extremely wide range of tonal control, with thousands of possible permutations.

Operationally, SansAmp is simple. Insert a 9-volt battery, or attach the AC adapter (included with the unit), plug your guitar into SansAmp, and connect the unit's 1/4-inch output to an amp or console input. Push the footswitch, and a red LED indicates that SansAmp is active. A 3-position input switch selects between three preamp sounds: Lead (Marshall sound), Normal (Mesa Boogie sound), and Bass (a Fender-style sound suitable for rhythm or bass guitar). The heart of SansAmp's tone-shaping ability comes from eight Character DIP switches, which can be used in any combination. In addition, four potentiometers control amplifier drive, presence drive, high-EQ compensation, and output level. Incidentally, the latter can be as high as +4 dBm, hot enough to feed pro-level gear or drive a pair of headphones at a respectable level for silent practicing.

One of the best things about SansAmp is that a credible amp sound can be achieved in a matter of minutes, rather than the tedious hours spent in the studio swapping amp heads, cabinets, and mics. From this starting point, SansAmp easily can be fine-tuned by selecting different combinations of the Character switches, adding different auxiliary devices (EQ, reverb, delay, pitch shifter, etc.) as needed. However, effects such as distortion or compression should be placed in line *before* adjusting the SansAmp. While the tiny Character switches are somewhat difficult to move (due to their miniscule size), they usually can be regarded as "set and forget" once you've found the sound that works for your style. The SansAmp manual also includes a variety of recommended starting points, along with blank charts for storing favorite user patches.

One caveat is that SansAmp is designed to be played through guitar amps or *full-range* P.A. speakers or studio monitors. When I tried driving a 2 × 12 guitar cabinet with SansAmp and a power amplifier, the results were unspectacular. To remedy this situation, Tech 21 is designing an inexpensive accessory, which should be available soon.

I particularly liked using SansAmp at line level to drive different guitar multi-effects boxes. The combination seemed unbeatable, offering all the fun of digital signal processing, with SansAmp providing just the right amount of warmth in the analog department. Can SansAmp really re-create the sound of well-known tube amplifiers? Yes, it scores well in this regard, and accomplishes the feat without losing the guitar's original harmonics and tone. At $295, SansAmp sounds great, saves time, and and lets you concentrate on making music rather than chasing sounds. It's well worth listening to.

Product Summary

PRODUCT:
SansAmp Guitar Amplifier Simulator
PRICE:
$295
MANUFACTURER:
Tech 21, Inc.
1600 Broadway
New York, NY 10019
(212) 315-1116

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

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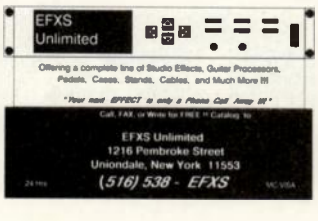

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Let's Develop a Common Language for Synth Programming

The time has come to establish synthesizer standards that go beyond MIDI.

By David Wessel

These pages have seen considerable discussion of the programming (and non-programming) of synthesizers. The sad truth is, many musicians never go beyond the factory presets. But there are many synth programmers who strive for new sounds with more expressive control.

These programmers must struggle with various idiosyncratic and awkward front-panel programming systems. Patch editors help, but the whole enterprise lacks coherency, consistency, and expressive power.

The time has come for a common programming language to describe the behavior of our synths. What might such a language allow us to do? At least two things: First, the language should allow us to describe the way MIDI events such as note and controller data influence synthesis or processing. Second, we should be able to describe the flow of sampled data and thus characterize the audio signal processing patch. This language should allow us to insert arithmetic operations of a general nature into the data-flow description. By way of example, we might want to scale the depth of modulation by a particular controller with another controller, such as the value of the Mod Wheel. Such interrelationships are at the heart of expressive control.

The computer music community has seen the development of several sound synthesis languages such as MUSIC 4, MUSIC V, and CSOUND. A close look at these languages might be suggestive, but they were not designed with real-time performance in mind. They lack a real-time scheduling mechanism to manage the temporal behavior of the program. The language concept I propose relies heavily on a well-behaved scheduling mechanism.

This proposition might seem far-fetched given the current state of synth technology. I'd argue that we are not far from affordable architectures that make this notion of a common synthesis and control language possible.

If we look inside the current generation of synths and samplers, we see "real" computers, such as those of the Motorola 68000 family, used as embedded controllers. These computers operate in tandem with the audio processing hardware. The controller chips handle MIDI input and output, front-panel display, mapping of controllers to synthesis parameters, voice allocation, and a host of other synth behaviors.

There are real computer processors in our synths and the trend is toward the use of ever more powerful processor chips. Why then do we not have a common language for programming them as we have for personal computers? A little thought suggests that such control computers can run a real-time operating system, including real-time scheduling and a high-level language designed to simplify programming the synth's behavior.

What about programming at the level of the audio samples? Synths will continue to use specialized DSP processors that are not easy to program. Some are exploring the use of general-purpose DSP chips, but the algorithms must be hand-programmed in machine code for reasons of efficiency.

Is there hope for a high-level programming language at the audio-signal level? I think so. Most processing algorithms can be described in terms of modules such as filters, oscillators, reverb units, and so forth. The language would describe the flow of audio samples between these modules. Different synths and effects processors would have different signal processing modules, but we could hope for a common language for patching them together.

There is a model for this sort of thing in the desktop publishing world. Adobe developed the PostScript language, and a number of different manufacturers have made it run on the embedded controllers in their printers.

This standardization has had important consequences. Of these, the most notable is that diverse hardware platforms (from Linotronics to Brand X laser printers) respond to PostScript programs in a consistent manner.

The music industry's next standardization effort should not stop at a communications protocol such as the proposed extensions to MIDI. Rather, we should seek a common language for music control and synthesis.

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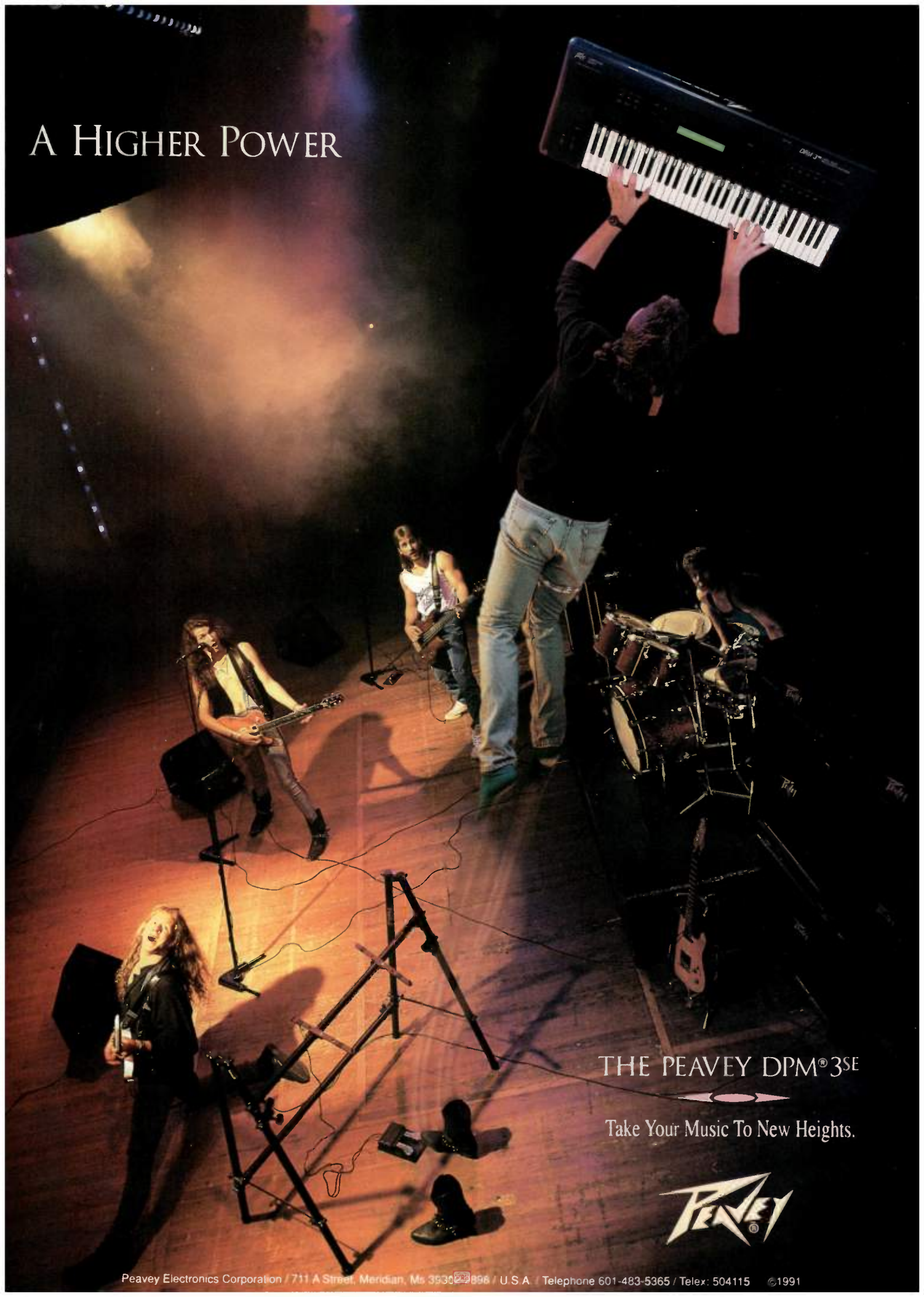
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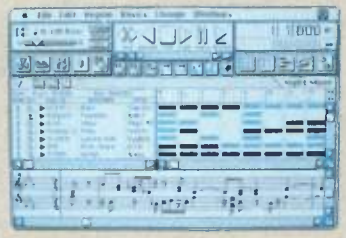

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