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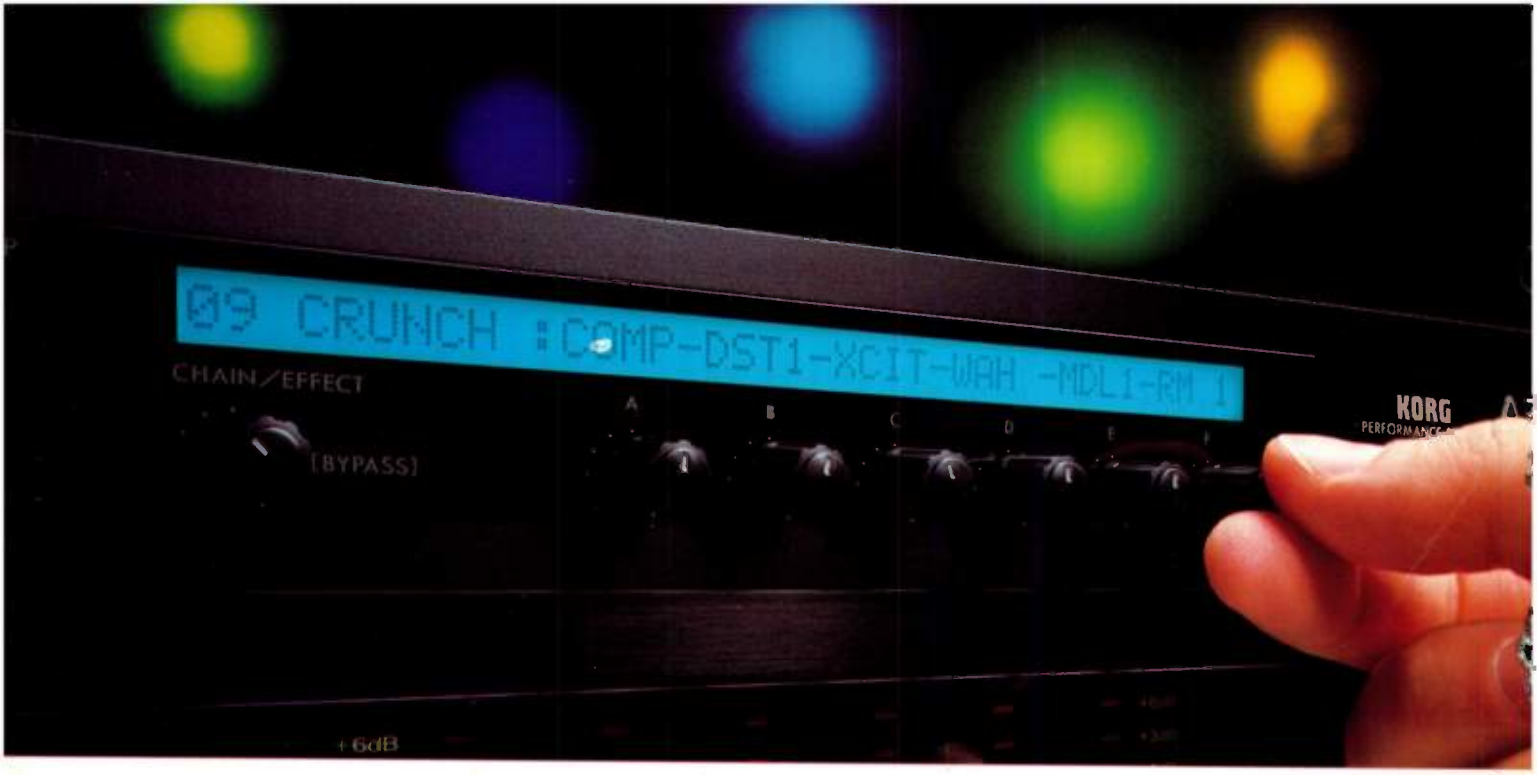

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Electronic Musician

AN ACT III PUBLICATION
JUNE 1989 VOL. 5, NO. 6

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WHAT'S NEW THIS MONTH

This is the first issue of **Electronic Musician** produced entirely on desktop computers, including all word processing, typesetting, page layout, and some illustrations. That's not all that's new: Steve Oppenheimer, detail-oriented maniac and keyboard wizard, has become assistant editor. Sattie Clark, guitarist and ace organizer, is now editorial administrator and will be handling traffic flow and coordinating action with the outside world. Maybe now Craig will take a vacation.

ABOUT EM (*Electronic Musician*):

Since its inception in 1975 under the name *Polyphony*, **EM** has been a communications medium for sharing ideas, circuits, tips, and other information and is dedicated to improving the state of the musical art.

SUBSCRIPTION SERVICES:

All subscriber services are handled by a different office from the main **EM** business offices. For subscription inquiries, address changes, renewals, and new subscriptions, contact: **Electronic Musician**, PO Box 3747, Escondido, CA 92025; tel.(800)334-8152 (outside CA) or (800) 255-3302 (CA). Do not send any other requests or items to this address. One year (12 issues) is $22; outside the U.S. and Canada, $37—all amounts in U.S.dollars. Visa and MasterCard accepted (only Visa, MasterCard, or international money orders on foreign payments). Allow 6 to 8 weeks for new subscriptions to begin or to renew current subscriptions. Postmaster: Send address changes to **ElectronicMusician**, PO Box 3747, Escondido, CA 92025-3747.

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This mail-order distribution service (a.k.a. Mix Bookshelf) offers products (books, instructional tapes, music and video software, etc.) oriented toward our readership. For a free catalog, contact: EM Bookshelf, 6400 Hollis St. #12, Emeryville, CA 94608; tel. (415) 653-3307 or (800) 233-9604.

BACK ISSUES:

Single back issue price is $3.50. For a listing of published articles, send a SASE (self-addressed, stamped envelope) to our Emeryville, CA, address and request a "Back Issue Listing."

ERROR LOG:

Occasional errors are unavoidable. We list known errors in "Letters." We compile published corrections annually for those who order back issues; to receive a copy, send a SASE to "Error Log Listing" at our Emeryville, CA, address.

CALENDAR ITEMS:

To have events (seminars, concerts, contests, etc.) listed, send dates and times *three months* prior to the event deadline to "EM Calendar Listing" at our Emeryville, CA, address.

EM NEW PRODUCTS AND REVIEW POLICY:

Manufacturers: Send press releases to our Emeryville, CA, address, attention: What's New. A release must be received three months prior to the cover date to be included in that issue. Regarding reviews, there are more products than pages available to review them. We welcome unsolicited software, books, etc., for review on a space-available basis; contact the editorial staff regarding hardware reviews.

Readers: Unless otherwise noted, **EM** reviews production versions of hardware/software (there are no "reviews" written from press releases). We encourage readers to scan "What's New" for new product announcements and contact the manufacturer for more information. Note: Manufacturers constantly update products, and prices and specifications stated in **EM** are subject to change. **EM** does not make product recommendations. Reviews represent only the opinion of the author.

LETTERS:

We welcome opposing viewpoints, compliments, and constructive criticism and will consider these for publication unless requested otherwise (we reserve the right to edit them for space or clarity). All letters become the property of **EM**. Neither the staff nor authors have the time to respond to *all* letters, but all are read. If you are having problems with your gear, please call the manufacturer, *not us*.

PROBLEMS WITH ADVERTISED PRODUCTS:

Information in ads is the responsibility of the advertiser. **EM** does not have the resources to check the integrity of every advertiser. However, we try to monitor ads and ensure that our readers get fair and honest treatment. If you encounter problems with an advertiser, let us know by writing to our Emeryville, CA, address. Tell us the problem and what steps you have taken to resolve it.

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DO-IT-YOURSELF (DIY) PROJECTS:

If you do not know basic electronic construction techniques, get a good book on the subject from your local electronics supply store (or try *Electronic Projects for Musicians*, available from EM Bookshelf). **EM** specifies parts values following international protocol, thus minimizing the use of decimal points and zeroes. A nanofarad (nF) = 1,000 pF or 0.001 µF. Suffixes replace decimal points. Examples: 2.2kΩ (U.S. nomenclature) = 2k2 (Intl. nomenclature). 4.7µF (U.S.) = 4µ7 (Intl.) 0.0056 µF (U.S.) = 5n6 (Intl).

If you detect an error in a schematic or listing, *let us know*. If a project doesn't work for you, contact us to see if anyone has reported any errors (wait at least a month for **EM** to be in circulation).

HELP US HELP YOU:

Please reference **EM** when asking manufacturers for product information, returning warranty cards, etc. Advertising provides our financial base, and ad purchases are based on your feedback to manufacturers about which magazines you like.

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This is probably going to sound like one of those advertisements encouraging people to discover their true potential. In a sense, it is.

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You can choose from four different chorus modes with a feedback control for creating flanging effects, as well as panning delay with up to 999 milliseconds of delay.

You can also choose from eight different distortion modes, including Special 1 and Special 2 settings. And even better, you can tailor those distortion modes simply by using its programmable pre drive and post drive controls, as well as its three-bank EQ with mid-range frequency.

Of course, while digital processing gives you a far greater range of sounds, it also gives you far greater flexibility and control. When you want sounds that are big and broad and seem to sustain themselves forever, that's exactly what you'll get. And when you want sounds that are more subtle, the Roland GS-6 will deliver them without degrading sound quality.

Speaking of which, the sound quality in a GS-6 is nothing short of remarkable. Among other things, we've equipped it with both digital noise suppression as well as hum cancellation. That way, you have the ability to create ear-splitting distortion sounds while still maintaining studio-quality noise specifications.

Which brings us to our final point. Hopefully, you've noticed that we call the GS-6 a "Sound System." Unlike modular set-ups, ours is fully integrated with all of the processing contained in one rack-mounted unit.

And because it's programmable, you can store up to 64 patches in the memory and then call up those patches simply by pushing a button. All of which makes the new Roland GS-6 ideal for both studio and live applications.

As we see it, in order to create truly amazing guitar sounds you really need two things: the equipment and the imagination. The first one we've provided. The second one is up to you.

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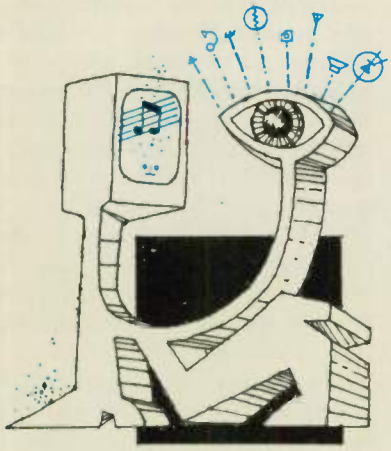
This month's eclectic assortment of letters touches on how to get started with MIDI and whether creativity has a place in today's music.



ST ALGORITHMS ON COMPUSERVE AND GENIE

In the March 1989 EM I noticed an article about algorithmic composition on the Atari ST. A year ago, I wrote a program for the Atari ST called *AMI* (Algorithmic Musical Instrument), which was inspired by John Simonton's *Pink Tunes* for the old PAiA computer/synth combo (by the way, whatever happened to PAiA?). It is completely GEM-based, and although it was written with the CZ-101 in mind, it can be used with most MIDI synths. If any readers have access to CompuServe or GEnie, they can easily download a copy of it. The file is called AMI.ARC. The archive includes the program, resource file, docs, and several sample data files. On CompuServe, it is available in the Atari 16-bit Forum (go atari16), in Library #5 (Music/MIDI). On GEnie it is available in the Atari ST Roundtable Library 11 (Music), as file #6662. The file is about 21K. Anyone downloading it will need a program (such as ARC.TTP) to unarchive the files.

Mike Yocum
Illinois

Mike—Thanks for the tip. For those readers who are not aware of it, EM *began in 1975 as a users' newsletter for PAiA Electronics, a manufacturer of do-it-yourself kits for the electronic musician. After a period of relative dormancy, PAiA is back in the kit business. For more information, contact PAiA at 3200 Teakwood Lane, Edmond, OK 73013; tel. (405) 340-6300.*

KUDOS TO KEYFRETS

So R. Paul Bergsman thinks that "no one in their right mind would try to type in that list of garbage" (March '89 Letters), referring to the *KeyFrets* software listing. Well, I typed it in and found not garbage, but gold. The program is a unique guitar-styling program for MIDI keyboards. You won't find anything like it commercially. James Chandler is right about his program multiplying; I have given several copies to friends, who have all been impressed with what the program can do.

Eric Bean
Indiana

Eric—We think it's a hot program, too. A Mac version is now available for $35 from the author; call (615) 877-6835 for more details or write to James Chandler at 204 California Ave., Chattanooga, TN 37415.

MAYBE CREATIVITY IS ITS OWN REWARD...

I couldn't agree more with your January 1989 editorial "Why Don't Musicians Sample?" How many times have you heard that same old factory-sampled slap bass work its way into countless songs? As a musician, I find it increasingly offensive that musicians are using some of the most powerful tools available to date, yet they insist on regurgitating sounds or relying heavily on factory sounds.

Why is there no reward for creativity? According to some record companies, creativity doesn't line their pockets (as everyone knows). That line of thinking offends me. I derive pleasure out of working to be creative, so it angers me when other musicians make a comfortable living by using the same old sounds. Has the music industry really sunk to a level of apathy consistent with just making a buck? Am I out of line for trying to be different? It hurts to think that all the time I've spent trying to be more creative will not receive any recognition because someone assumes it would not be marketable.

Wil Ferguson
California

Wil—Interestingly enough, it often takes someone creative to truly capture the public fancy, but you can be sure that person received a lot of rejection slips along the way. The goal of any mature corporation (which many record companies are) is to make money, and if they thought they could make a fortune by being innovative, they'd be innovative. Paradoxically, the major success stories of the past few years—companies like Windham Hill, Enigma, Ryko, Narada, The Nature Company, and many others—have come out of nowhere, done things differently, and taken off. I think the climate is changing; people want something new. Those artists and companies who know how to take successful chances will be best prepared for the transition.

FINE POINTS ABOUT SONG STRUCTURE

Regarding Craig Anderton and Steve Oppenheimer's comments about "Yesterday" (January 1989), the song has no "chorus." Like many Lennon/McCartney songs, the structural model is the "show" song (i.e., music

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hall and Broadway), which usually features a bridge, not a chorus. The title usually appears at the beginning or the end of the A section, in the "hook" position. The bridge appears to provide contrast.

A chorus has a different function: it usually contains the title and the strongest hook, it is the most important part of a song, and it is always repeated. Also note that "Yesterday" has a seven-bar A section. The songwriters among your readers may wish to ponder how this structural anomaly works. How is the A section subdivided? What bar is "missing"? Where is the elision? (There is more than one answer.)

Note, also, the way the first two bars of the bridge reuse the harmonies heard in measures 2 and 3 of the A section, and the way this harmonic/rhythmic displacement moves the song forward. I disagree that this is a "simple" song!

Jeff Olmsted
New York

YET ANOTHER COPY-PROTECTION LETTER

I was trying to stay out of this, but Donald Labriola's letter (March '89 issue) dredges up an unreasonable line of reasoning that I have now heard exactly once too often. People who oppose copy protection often compare music software to compiler and word processor programs. These people argue that if cheap and unprotected software of any type can be sold for a profit, the same should be true for music software. But the problem publishers face is that they have to sell the software to somebody. Market sizes can be radically different (and in Labriola's example, they are). Also, the way products are used can be radically different. Any reasonable theory must take both of these facts into account.

For each product, a publisher must estimate the size of the potential market and search for a profitable combination of price and market penetration. Large demand allows lower prices, while a small market size requires higher prices and greater market penetration. Pricing is crucial to copy protection, because if (as Labriola states) manuals, updates, and support have "at least as much value as the software itself," users of the software will gladly pay for their copies. When the price is much higher than the perceived value of the software, copying occurs more often, which leads to lost sales, which leads to higher prices, and so on. When the price is close enough to the perceived value of a software package, the product is "economically copy-protected."

The usual way to increase the value of software is to offer a hefty manual, slick packaging, friendly support, and periodic updates. However, products have different personalities, and some are simply too self-sufficient. For example, a well-written patch editor/librarian needs little in the way of support, updates, or even a manual. A pro-level sequencing and scoring package, however, is often quite the opposite. Complicated software is relatively easy to sell without protection, while solid, simple, intuitive software is, unfortunately, the most vulnerable.

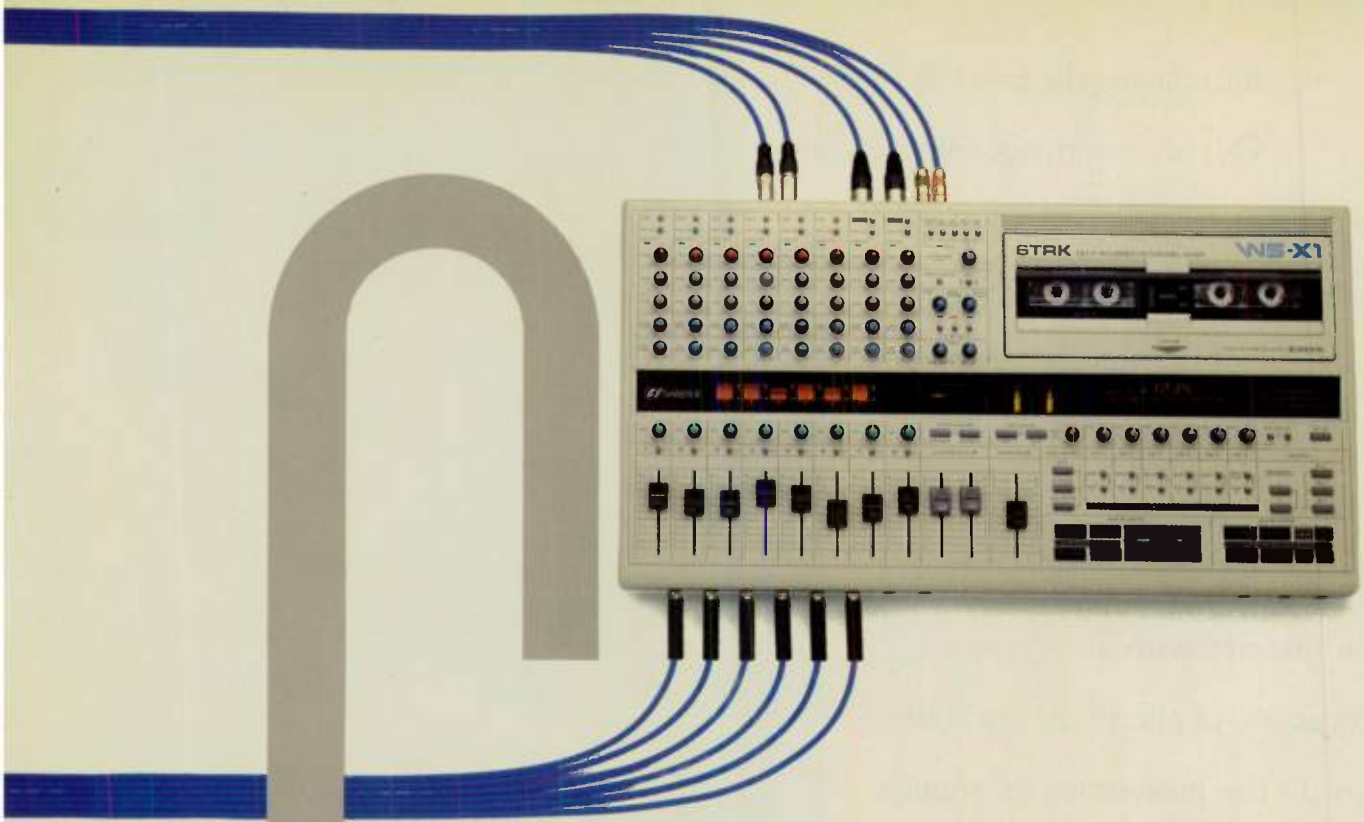
The decision to copy protect is an economic one. I'm not disregarding the fact that copy protection may be obtrusive, or that copying can be an effective form of advertisement; it's just that these facts have little weight in our current situation. In today's music software market, high prices are necessary, and a publisher either copy protects, or suffers financially. But things change, and perhaps it's only a matter of time until all MIDI software is either sophisticated or popular enough to be unprotected. I really don't think bickering about copy protection in the pages of EM will make that day come any sooner, but it may increase our chances of appearing on "Geraldo."

Bob Melvin
Massachusetts

Bob—Publishing these letters on copy protection hasn't inspired Geraldo to give us a call yet, but hopefully they will present points of view that people may not have considered. Incidentally, for the information of our readers, Bob Melvin is the author of the Caged Artist series of patch editor/librarians.

HELP! HOW DO I GET STARTED WITH MIDI?

I've just started searching for MIDI equipment. Although your magazine has been helpful in this process, I don't understand the relationship between computer MIDI boards, sequenc-



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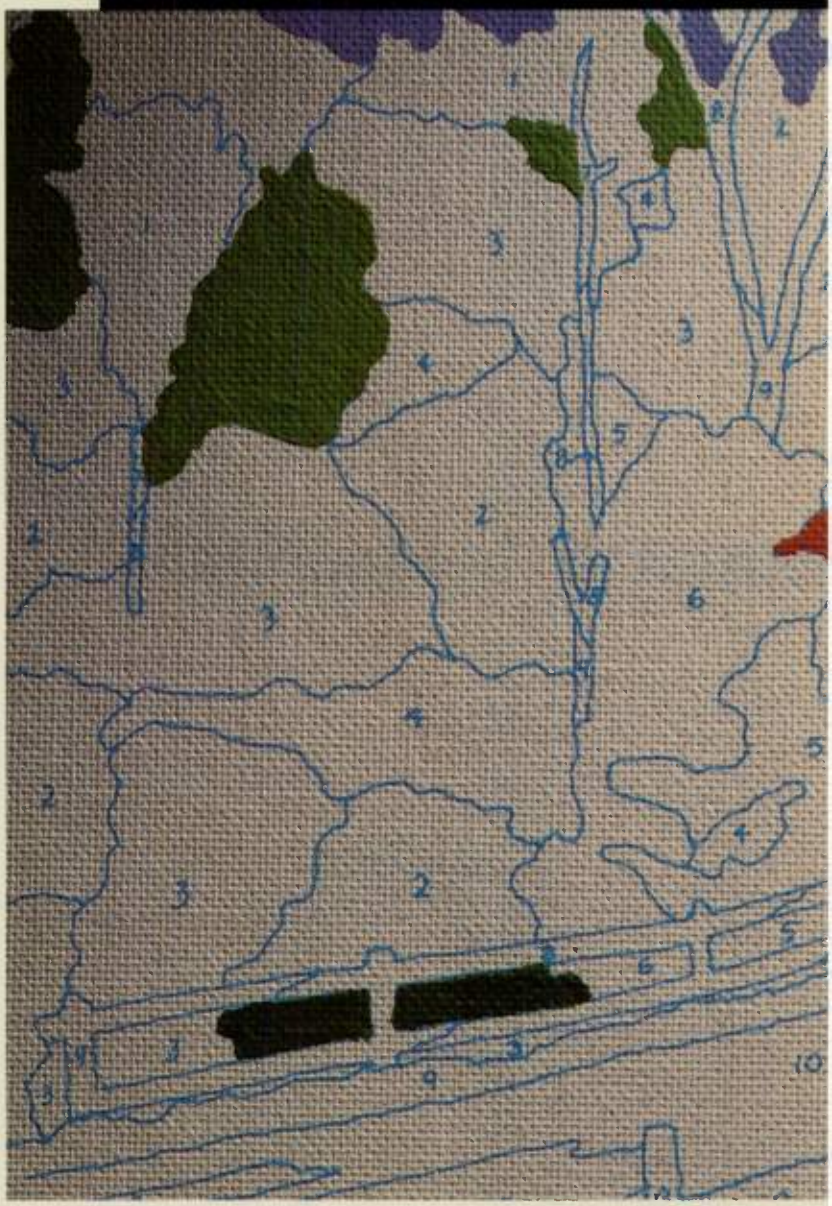

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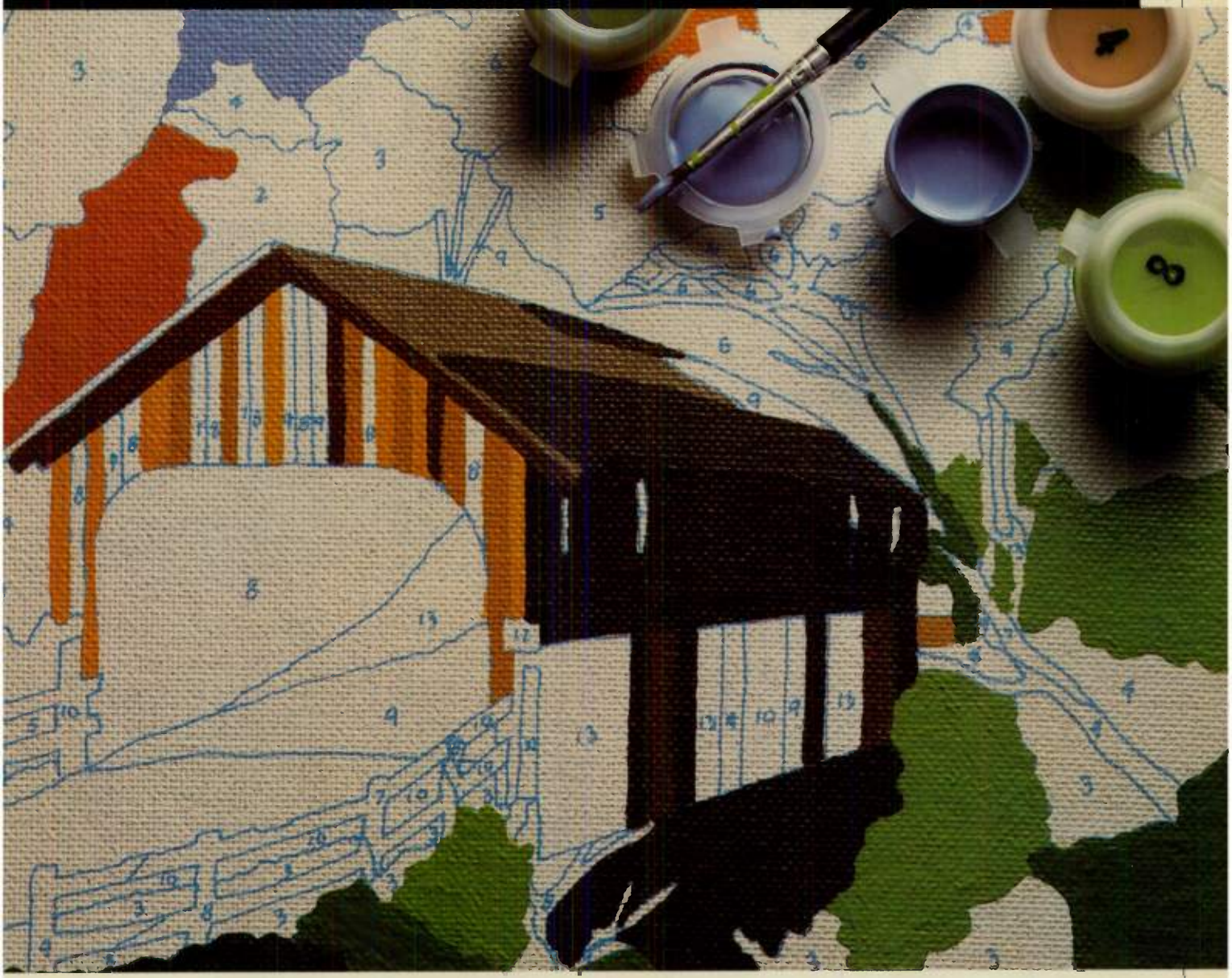

into a single wave. The VFX's Patch Select buttons let you combine up to six timbres in four different ways. And you can stack sounds simply by double-clicking a button.

If music is your art, get the instrument that lets you put more of yourself into your art. For more information and the name of your nearest Ensoniq dealer, call 1-800-553-5151.

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Forget everything you ever knew about the DSP-128. Just remember to ask for a demo of the DSP-128 Plus at your DigiTech dealer. For a full-color product sheet, write DigiTech, 5639 South Riley Lane, Salt Lake City, Utah 84107. Or call (801) 268-8400.

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ing programs, and synthesizer/sound modules. For example, which brands work with which? Is there an easy way to figure this out before I start shopping?

Ron Schneider
Illinois

Ron—Unless a computer comes already equipped with a MIDI port (a 5-pin jack similar in concept to the printer port where you connect a printer to the computer), you will need a "computer MIDI board," also called a MIDI interface. The MIDI interface translates computer data into musically oriented MIDI data. Continuing the analogy think of MIDI as carrying the type of information you would send to a printer, except that instead of describing letters to be printed, MIDI describes notes and timing events that relate to music. Instead of a printer to print letters, a musical instrument plays what the MIDI data instructs it to play. MIDI data can flow from a controller (such as a MIDI synth, guitar, sax, etc.) to the computer for processing or storage, or from the computer to a sound-generating instrument (usually a synth/keyboard device or rack-mount synth) for playback.

A sequencer is a software program, comparable to a word processor, that runs on your computer. With a word processor, you manipulate text; the screen displays what you type, and you can edit text, move blocks of text, print text, and so on. Similarly, a sequencer manipulates music information. For example, as you play notes on a MIDI keyboard, the MIDI interface translates this into data the computer can understand, and the screen displays what you played in some form (music notation, list of MIDI events, "piano roll" graphics, etc.). You can then edit your work and send this data out through the MIDI interface to "play" your instrument. In this case, the computer acts like a high-tech player piano with extensive editing capabilities.

Generally, MIDI interfaces are computer brand-specific; what works with an IBM usually will not work with a Macintosh. Also, the Atari ST series of computers and the Yamaha C1 include a built-in MIDI interface, which obviates the need for an add-on board. Programs are also brand-specific, although companies frequently offer versions of the same program for different computers in order to expand their potential market.

MIDI instruments, thanks to standardization, are compatible with all MIDI equipment. In other words, once your computer has a MIDI output, you're sending out standard signals that can be understood by any piece of MIDI gear (although some instruments' MIDI capabilities are limited in that they don't utilize all the information they receive). A MIDI input accepts signals from any type of MIDI gear.

For more information, start with the two-part article "Making Your Micro Musical" in the August and September 1986 **EM**. *I also recommend Michael Boom's excellent book,* Music Through MIDI, *published by Microsoft Press, which, in an accurate, non-threatening manner, covers MIDI, synthesis, and recording. If you want to focus in on MIDI specifically, check out my book,* MIDI For Musicians. *Both books are available from* **EM** *Bookshelf, as are* Using MIDI, *by Helen Casabona and David Frederick;* MIDI—The Ins, Outs, and Thrus, *by Jeff Rona; and several other titles that you may find useful. Good luck, and have fun.*

IN REMEMBRANCE

Mike Rasfeld, owner of Acme Audio and Recording Corp. in Chicago, passed away in March. He was active in fund raising for deafness and will be missed by many of us. Those who want to honor his memory may make a contribution to the Center on Deafness, 10100 Dee Rd., Des Plaines, IL 60016, attn: Anne Downer.

ERROR LOG

In the Microtonality Chart on page 50 in the March 1989 issue, the heading "MIDI" should have appeared over Key, and "Tuning" over Units.

Orders for the Digisound System reviewed in the April '89 issue should now be made directly to the manufacturer: Tim Highm, 16 Lauriston Rd., London SW19 4TQ, England.

In the April 1989 "Service Clinic," the Korg M1 keyboard is incorrectly described as incorporating a rewireable, dual-primary, 110/220-volt transformer. The M1 uses a switching power supply and requires an external, step-down transformer for 220-volt operation. The DW-8000, however, does incorporate a rewireable, dual-primary transformer.

"DX/TX Librarian," April '88 **EM**, p.80, the first sentence should begin, "Line 100," not "Line 10." In the listing on p.81, Line 4040 should not contain "+" before "CHR$ (170)." ■

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School's out! Here are some hot new releases geared toward cool electronic musicians.

Coda Perceive

ACCESSORIES

Ultimate Support Systems' *The Studio Organizer* ($199.95) provides space-saving, customized studio setups. Tabletop height is adjustable from 27 to 32 inches, and all tiers and surfaces can be tilted to suit the user. Options include a mic boom, rack-mount hardware, and keyboard extensions. USS has also reintroduced its Deltex Column double-tier keyboard stand (in black-anodized aluminum) at a retail price of $99.99.

Ultimate Support Systems
2506 Zurich Drive
Ft. Collins, CO 80524
tel. (303) 493-4488

Music Industries' *Quik-Lok QL-624 Workstation* ($189.95) is designed to support one keyboard instrument and up to eight 1U rack-mount spaces. Available in black or silver finishes, the unit's height is adjustable, and it accommodates keyboards ranging from 49 to 88 keys.

Music Industries Corp.
99 Tulip Avenue
Floral Park, NY 11001
tel. (516) 352-4110

The *Pedal Organizer* from Sound Logic ($19.95 and $29.95, incl. shipping) is available in 15- and 22-inch lengths. The system uses Velcro strips for securing effects pedals to a black-anodized, nonskid, aluminum base plate, so pedals can be rearranged in different orders to suit the performer's needs.

Sound Logic
1125 Eleventh Street
Ramona, CA 92065
tel. (619) 789-6558

COMPUTERS

Based on the Amiga 2000, Commodore's *Amiga 2500* ($4,699) is configured with a Motorola 68020 processor, 2 MB of 32-bit RAM (expandable to 4 MB), and a 68881 math co-processor. Other standard features include a built-in, 3.5-inch floppy drive; internal, 40 MB hard disk; sound, animation, and graphics chips; and two audio outputs. The 2500's open architecture allows expansion with multiprocessor, multi-DOS options, such as a bridgeboard for running MS-DOS-compatible software under Amiga control. Commodore has also introduced the *Amiga 2000HD* ($2,999), a version of the Amiga 2000 that comes with an internal, 40 MB hard disk.

Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
tel. (215) 431-9100

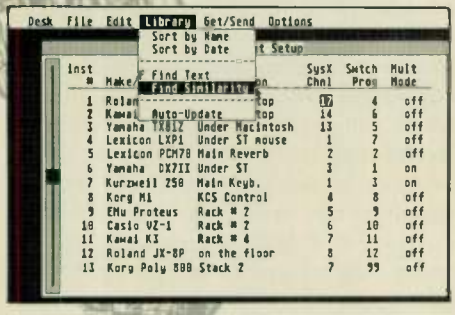
EDUCATIONAL SOFTWARE

Perceive ($99) is a set of six interactive, ear-training programs for the Macintosh. The course guides beginners through music fundamentals, including reading/writing skills, pitch, time/key signatures, scales, and both standard and alternate tunings. Lessons can play the Mac's internal, four-voice

X-or™

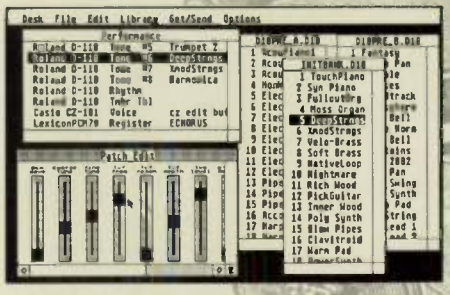
Your system exclusive orchestrator

X-or treats your entire MIDI setup as if it were just one big instrument. Our 5 years of knowledge and experience in the field of patch editor librarians made it possible for us to create a highly integrated system for patch editing, storage and retrieval. X-or's advanced Performance commands can get, send, load, or save patches from every instrument in your setup with a single click of the mouse. And with its Setup Editor,



you can customize X-or for your MIDI equipment setup. Whether you have 16 identical Instruments, or 100 different Instruments, **X-or can handle it.**

Designed for the future, X-or takes full advantage of its multi-window environment, with movable, resizable windows for greater flexibility. It is a modular system, using "Instrument Profiles"—files containing everything it needs to know about a specific Instrument. With our optional X-or Profile Editor, you can even create



an X-or Instrument Profile for virtually any Instrument that converses in *"System Exclusive."* These Instrument Profiles may be freely copied, traded, or even downloaded from bulletin boards. As long as MIDI exists, X-or will never become obsolete.

X-or is a bona fide Patch Editor for any MIDI Instrument. Parameters may be directly edited by sliders, buttons, and graphic envelope displays. With X-or's Transplant feature, sections of a patch (for example, a DX operator or a D-110 partial) may be copied between patches. Also, X-or has four types of Randomization—Blending, Mingling, Transplanting and Randomize with Mask—each of which use existing patches to generate banks of new patches with a few clicks of the mouse.

Once you've edited a patch and stored it, you won't have any trouble finding it. X-or's extensive search and sort features give you the convenience of a database for organizing your patches.

Other features include:
Patches and banks for all instruments kept in memory for instant access;
Number of banks in memory is limited only by memory size;
Click and Drag method for Copying, Moving or Swapping patches between banks;
Four bank windows open on screen simultaneously;
Comments for all Patch, Bank, and Performance files;
Intelligent MIDI Switcher control for HANDS-OFF operation;
Smart multi-timbral instrument handling;
Mouse-Play feature; play any note, velocity or controller with the mouse;
Bank files are compatible with our existing Editor Librarians;
Atari ST version has MPE compatibility, contains Desk Accessory version;
Amiga version is fully multi-tasking;
Mac version is Multifinder compatible.

Partial List of Instruments Supported:
ART: Multiverb
Casio: CZ-101, 1, 1000–5000, VZ-1
Digital Music: MX-8
Digitech: DSP-128
Ensoniq: ESQ-1, ESQ-M, SQ-80
J.L. Cooper: MSB+
Kawai: K1, K3, K5
Korg: M1, DS-8, 707, DSS-1, DSM-1, Poly 800
Lexicon: LXP-1, PCM-70
Oberheim: Matrix-6 1000, Matrix 12, Xpander
Roland: D10, D20, D110, D50, D550, MT32, JX-8P, GM70
Yamaha: DX1, DX5, DX7, DX9, DX11, DX7II, DX7S, DX21, DX27, DX27S, DX100, TF1, TX7, TX802, TX216, TX816, TX81Z, FB-01, RX5, RX7, RX11, SPX90, REV7, DMP7.
. . . and many more.

Other Dr. T's products include:
Level II, KCS, and MIDI Recording Studio sequencers; Copyist Apprentice, Professional, and DTP scoring and transcription programs; Caged Artist and Lilley Freelance instrument specific editor librarians; Samplemaker sample editor and creation program; Tunesmith and Fingers computer-aided composition tools; Phantom SMPTE synchronization device; TIGER graphic music editor; Guitaristics guitar training program; and many more.

Dr. T's
MUSIC SOFTWARE
220 Boylston Street
Chestnut Hill, MA 02167
U.S.A.

(617) 244-6954
FAX (617) 244-5243

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"It's priced like an entry level product but offers features that are associated with top of the line sequencers." Electronic Musician

"It's really amazing that so many features are available in such a well organized package, at such a low price." PC Magazine

The CMS Enhanced Cakewalk™ is a sequencer software and hardware package that has the high-powered tools to help you work faster and more efficiently. The CMS Enhanced System™ includes the CMS Enhanced Cakewalk sequencing software and the new CMS-105S™ Midi switcher. A user friendly program puts you, the musician, in total control of every note and lets your creativity fly unhindered by complicated commands. See what experts in the computer field have said about this exciting new product from CMS....

PC MAGAZINE EDITORS CHOICE

"Cakewalk beats higher priced sequencers in many functions and is a great package for the money."

Make sure the program you're buying is the actual program that recieved PC Magazine's Editor's Choice.

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In California call (714) 594-5051
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sounds, or will send MIDI information. The package includes a 120-page textbook and 55-page, self-study workbook.

Coda Music Software
1401 East 79th Street
Bloomington, MN 55425
tel. (612) 854-1288
or (800) 843-1337

INSTRUMENTS

Casio's CPS-700 ($799) is a 76-key, 16-note polyphonic, touch-sensitive MIDI keyboard designed to produce realistic piano sounds from internal, 12-bit PCM digital samples. Other sounds include harpsichord, vibraphone, electric piano, and pipe organ. An optional damper pedal (SP-10 or SP-1) allows multistage control of sustain by changing the sound source envelope according to the degree of pedal depression. The unit is powered by six D batteries or with optional AC and 12 VDC adapters.

Casio, Inc.
570 Mt. Pleasant Avenue
Dover, NJ 07801
tel. (201) 361-5400

MIDI

PAiA's MCVI ($119.95 kit; $139.95 assembled) converts MIDI information to control-voltage/trigger signals and vice versa. The MCVI enables classic analog synths and signal processing to operate under MIDI control, and the compact 4.5 x 7.5-inch board can be mounted inside most equipment. In addition to performing MIDI/CV functions, the device includes an RS-232 interface and a 44-pin, card-edge bus for adding memory and interfaces to the MCVI's onboard CPU. A free catalog featuring this and other electronic kits is available on request.

PAiA Electronics, Inc.
3200 Teakwood Lane
Edmond, OK 73013
tel. (405) 340-6300

Distributed by IMC, *MIDIBoost* ($199.95) allows MIDI signals to be transmitted up to 4,000 feet over audio cables, such as snakes and studio wiring, without losing data integrity. MIDIBoost is sold in pairs, and the user simply connects MIDI in and out at each end of the line to the MIDIBoost units, which are linked via standard, low-impedance audio cables equipped with XLR connectors.

Ultimate Support Systems Studio Organizer

International Music Corp.
PO Box 2344
Ft. Worth, TX 76113
tel. (817) 336-5114

MIDI Accelerator ($269) is a compact processor said to relieve MIDI data clogging by converting MIDI data to a more efficient code. Some of the conversion takes place continuously, while other processing (aftertouch, modulation wheel, breath control, foot control) is user-controllable via front panel settings. According to the manufacturer, the MIDI Accelerator conserves music memory storage up to a factor of twenty, and processing time is stated as one microsecond.

Audiomatrix
1517 20th Street
Santa Monica, CA 90404
tel. (213) 453-7947

MidiVU ($39.95), a multitasking, desktop recorder for the Commodore Amiga, records one track in real time from any MIDI instrument. Since MidiVU takes up less than 3% of a standard Amiga disk, copies can be kept with nearly any other program (word processor, animation, notation, paint box, etc.). A file utility saves tracks to disk for later recall, and MidiVU's small 2 x 6-inch window (with record, play, stop, and loop "buttons") is managed easily. Because it records sys ex data, MidiVu

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Telefax 011-31 3402-34815

ORIGINAL FORMULA.

Since its release, the Kawai K1 has brought thousands of musicians fast relief from the pain of paying high prices for great sounds. Now there are two ways to enjoy the sound formula that has the critics raving—the original Kawai K1 and the new enhanced-version Kawai K1II.

Either one gives you the multi-timbral power of 64 internal Single sounds or 32 Multi combinations of Kawai's Sampled Digital Waveform technology —256 digital waveforms, combined to produce rich and soothing analog-sounding tone colors blended with bright and powerful digital textures.

To this incredible sonic formula, the K1II provides the extra-strength ingredients of a full function digital reverb with fully adjustable

EXTRA STRENGTH.

parameters. Plus, the K1II also strengthens your tracks by adding a separate drum section that is active independently of the other voices—to play 8 multi-timbral instruments plus drums. Of course, the K1II costs a little bit more than the K1, but a lot less than the cost of an outboard reverb or drum machine.

Avoid the pain of paying high prices for great sounds. Whether your set-up calls for the original K1, or if you need the extra strength of the K1II, you can count on Kawai to provide fast relief to your whole system.

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INGENIOUS!

Kawai Digital Products Group, 2055 E. University Dr., P.O. Box 9045, Compton, CA 90224 (213) 631-1771. Kawai Canada Music Ltd., 6400 Shawson Dr., Unit #1, Mississauga, Ontario, Canada L5T1L8.

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TEAMING TALENT AND TECHNOLOGY

Hybrid Arts, the leader in innovative and affordable software, is pleased to introduce the Total Control music computer software system. Each module is a state of the art music computer software package...like a music compositional aid, sequencer, music notation, or editor/librarian. By combining

modules, the system provides the MIDI musician the equivalent of a multitrack recording studio...and more. Because these programs are integrated, you can instantly switch and share data between them, via HybriSwitch. This capability saves valuable time...especially when you're in a creative mode.

Originally developed for the Atari ST and Mega computers, this system provides the tools you need to increase and support your creativity. The individual modules within the system have been designed to allow you, as the musician, the flexibility to develop and enhance your musical ideas...at your own pace...regardless of your technical playing abilities. Total Control is easy enough for the novice and fully capable for the professional. When you compare the price to performance ratio for this system, it stacks as a valuable investment with great returns.

Here is an example of how Total Control works:

LUDWIG

Let's start with Ludwig, the music compositional aid program. It has been designed to radically develop the germ of a song idea by suggesting and implementing rhythmic and pitch variations to complement the idea played on a MIDI instrument. For example, a simple say five note melody could be developed in Ludwig into a full blown score—with multi parts and harmony.

EditTrack - or - SMPTE Track

The original song developed in Ludwig can then be manipulated in either EditTrack or SMPTE Track...full feature sequencer programs. In either of these, your new composition can be quantized, transposed, rearranged and even radically altered. The editing functions of these sequencers are far more versatile and accurate than many other MIDI programs.

EZ-Score Plus

Now lets transfer your sequence to EZ Score Plus. With excellent music notation capabilities, EZ Score Plus will automatically translate your composition to music notation and allow you to print a professional copy of your song score for other musicians, publishers and members of the band.

Now, what about control of MIDI synthesizers and signal processors used throughout the song's arrangement?

Enter GenPatch...the universal patch librarian which will allow you to transfer "banks" of sounds or individual patches (programs) to and from all of your MIDI devices. The first advantage this offers is that you can build and access a library consisting of thousands of different sounds and load them into your instruments quickly. This saves you having to learn how to program each of your MIDI instruments.

Let's go a step farther:

Enter GenEdit...the universal patch librarian/editor. It gives you the capability to use your own original sounds rather than presets. The bigger the MIDI studio, the more essential GenEdit is for you. It replaces the need for individual patch editors for each synthesizer. You can design your own edit window which will control all of your MIDI devices in the same way rather than trying to control each device individually. GenEdit saves valuable time by storing, organizing and editing program/patch data for any MIDI device presently available...*or likely to be made available.*

Additional modules for the Total Control package are being developed.

Exclusively distributed in the U.S. by:
IMAGINE MARKETING CO
PO Box 1400 • 3000 Birch St., #200
Brea, CA 92622 • (714) 528-2122

THE MODULAR MUSIC SOFTWARE SYSTEM

LUDWIG™ Compositional Program
SMPTE Track™ Sequencer Program
GenEdit™ Universal Patch Librarian/Editor
EZ Score Plus™ Music Notation Program

Get TOTAL CONTROL. Each module is a state-of-the-art music computer software package. They function independently or in unison as part of the system...like a music compositional aid, sequencer, music notation, or editor/librarian. By combining modules, TOTAL CONTROL provides the MIDI musician the equivalent of a digital multi-track recording studio...and more. HybriSwitch is the key. It allows you to quickly access any module without 'quitting.' This saves valuable time and increases your capabilities.

Exclusively distributed in the U.S. by:
IMAGINE MARKETING CO
PO Box 1400 ▼ 3000 Birch St., #200 ▼ Brea, CA 92622 ▼ (714) 528-2122

Hybrid Arts, Inc.
11920 W. Olympic Blvd. ▼ Los Angeles, CA 90064 ▼ Main Office: (213) 826-3777

can be used as a generic patch librarian.

Diemer Development
12814 Lansdale Street
Studio City, CA 91604
tel. (818) 762-0804

PATCH EDITORS

FX Pac 1 ($129) from Dr. T's is a set of Atari ST-based editor/librarians for the DigiTech DSP 128, Yamaha SPX90/SPX90II, Lexicon LXP-1, and ART Multiverb. Each program provides editing of effects banks and parameters, as well as patch and controller mapping. With the timing calculator, delay times can be entered in terms of tempo and note length, for synching rhythmic events to the beat. FX Pac 1 also includes MIDI merging and mouse modes to test effects with several voices. These programs can all utilize Dr. T's *Multi Program Environment* for instant access while using its *Keyboard Controlled Sequencer.*

Dr. T's Music Software
220 Boylston Street
Suite 206
Chestnut Hills, MA 02167
tel. (617) 244-6954

PERCUSSION

Drum Huggers ($599), from Simmons Electronics, are compact MIDI pads that attach to acoustic drums without interfering with the sound or playability of the acoustic instrument. The system includes a master controller pad and four slave pads, each with a high-bounce rubber surface. The master pad (also sold separately for $199) includes a two-digit LED patch/edit display and has a memory capacity of 20 patch setups, with programmable recall of MIDI notes and channels.

Simmons Electronics USA
2630 Townsgate Road
Suite H
Westlake Village, CA 91361
tel. (805) 494-5007

PUBLICATIONS

MIDI Programming for the Macintosh ($22.95 book; $37.95 book and disk) is for those with varying levels of programming experience who want to write music software. Authors Steve De Furia and Joe Scacciaferro cover: MIDI devices, the Mac user interface, program design, Mac programming languages and tools, MIDI code resources, and a programmer's reference with summaries for every message and data format defined by the MIDI specification. There are also guidelines for creating software, with samples in BASIC and Pascal. Published by M&T Books and available at technical bookstores or the EM Bookshelf (see FYI page in the front of the magazine).

M&T Books
501 Galveston Drive
Redwood City, CA 94063
tel. (415) 366-3600

Simmons Drum Huggers

The *Milli-Chart* ($15.95, postage-paid) is a plastic-coated, 10 x 17-inch wall or tabletop chart that shows the relationship between digital delay time settings and musical tempos. It can also be used to compute tempos and the number of beats within a fixed time frame, such as a 30-second commercial. The Milli-Chart gives delay times in milliseconds for tempos ranging from 60 to 250 beats per minute, for quarter, eighth, and sixteenth notes, quarter- and eighth-note triplets, and beats per second.

J.S. Lo Bianco Enterprises
36 Park Avenue
Oyster Bay, NY 11771
tel. (516) 922-3958

RADIO

Future Radio is a one-hour, syndicated, weekly radio program presenting music tapes and song demos

from new and established artists who have recorded original compositions in small studios or on home recording systems. All styles of music are considered, as long as the material is copyrighted and not available in a major commercial release. Send an SASE for more information and tape submission forms.

Future Radio
Box 34005
Louisville, KY 40232-4005
tel. (502) 968-9062

SEQUENCERS

The *Q-80 Digital MIDI Sequencer* ($849) incorporates a disk drive, 26,000 notes of internal memory, and up to 32-track recording, including sixteen tracks recorded simultaneously.

Kawai Q-80

The unit's static RAM design allows sequences to be retained in memory when powered down, and features include internal storage of up to ten songs (which also can be stored on disk) and a tempo track for adjusting tempo during the song. Tracks can record any type of MIDI data, such as velocity, pressure, wheels, and system exclusive. Among the Q-80's editing functions are track splitting/merging, transposition, velocity modification, quantizing, and word processor-style search-and-replace functions for individual events.

Kawai America Corporation
2055 East University Drive
Compton, CA 90224
tel. (213) 631-1771

The *QX5FD* ($1,095) is an enhanced version of Yamaha's QX5 MIDI sequence recorder, featuring an internal 3.5-inch, 720K disk drive capable of storing more than 100,000 notes per disk. Other features include: 8-track sequencing with 32 floating "macro" tracks; automated punch-in/out; Quantize Duration for controlling actual note lengths; Expand, which automatically recalculates individual note lengths to fit a specified overall playing time; and a Reverse function that reverses any type of MIDI data, including notes, pitch bend, and controller data.

Yamaha Corporation
of America
Digital Musical
Instrument Division
Box 6600
Buena Park, CA 90622
tel. (714) 522-9011

SIGNAL PROCESSING

The *Rockman Smart Gate* ($99) uses frequency-dependent, noise-gating circuitry that automatically adjusts attenuation and release times so the ends of notes are not cut off. The half-rack Rockmodule is AC-powered and accepts both instrument and line-level inputs for use with guitar, bass, keyboards, vocals, and wind instruments.

Scholz Research &
Development
1560 Trapelo Road
Waltham, MA 02154
tel. (617) 890-5211

Industrial Strength Industries' *R-16* (sold direct at $995) is a single rack-space unit providing both programmable digital effects and sampling capability. This 16-bit processor features: a 32-bit numeric co-processor; full MIDI control of effects parameters and changes; 99 programmable sounds (30 factory presets); and -10 dB and line-level input/outputs. Help screens are built into the display, which shows all relevant data simultaneously, and the R-16 now includes software packages (spectrum analysis, FFT, and 3-D waveform plotting) for the Atari ST and IBM-compatible computers.

Industrial Strength Industries
13042 Moore Street
Cerritos, CA 90701
tel. (213) 921-2341

UPGRADES

Mark of the Unicorn has released *Performer 2.41* ($395), a new version of its Mac sequencer. New features include audible playback directly from the event list, Standard MIDI File compatibility, recording and editing of sys ex data, a conductor track for manipulating tempo and meter changes, MIDI channel activity monitoring, and a "change key" command. Free upgrades to Version 2.41 are being shipped to all registered users.

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

Steinberg's *Pro-24 III Update* ($75), previously offered only to registered owners, is now available to all Pro-24 users. The update expands the features of this 24-track sequencer for the Atari ST, and it includes a new operating disk and a completely rewritten, comprehensive owner's manual.

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

CALENDAR OF EVENTS

Introduction to Electronic Music: Sound Synthesis & MIDI ($350), part of the UCLA Extension Summer Programs for Secondary School Students, is a hands-on lecture course for students entering grades nine through twelve this fall. Taught by noted author Scott Wilkinson, the course will meet Tuesdays and Thursdays from June 27 through August 3. Topics will include acoustics, synthesis, sampling, sequencing, MIDI, computer basics, and application to music production and performance. On-campus housing is available for an additional fee.

UCLA Extension
Box 24901
Los Angeles, CA 90024-0901
tel. (213) 825-4191

All prices are suggested retail as supplied by the manufacturers. All prices and specifications are subject to change without notice. Inclusion of product information and manufacturers in this magazine does not necessarily constitute a recommendation by Electronic Musician *magazine or its staff; we suggest all mail order purchases be COD or credit card. Contact the manufacturers or local music dealers for further information.* ■

4 Bits Ahead !

20 bit digital/analog conversion

ADS & ADS-K

16/20 bit Keyboard Sampler

Conventional 16 bit samplers with 16 bit A/D conversion lose up to 24 dB of dynamic range when all 16 voices are played simultaneously. Leaving only 72 dB of the 96 dB possible from a 16 bit converter. This is equivalent to a 12 bit sampler.

The ADS and ADS-K sampler are equipped with 20 bit D/A converters with a dynamic range of 120 dB. You always have a full 16 bit resolution, with a constant 96 dB range, even when all 16 voices are played.

And that's only the beginning. An integrated 8 x 8 mixer with programmable effects paths, sound fusion digital resampling, loop smoothing and tuning, capacity for 2 MB ram (expandable to 8 MB), built in SCSI interface for hard disks and editing via computers, 8 polyphonic outputs, double oversampling, are only some of the features of these outstanding instruments.

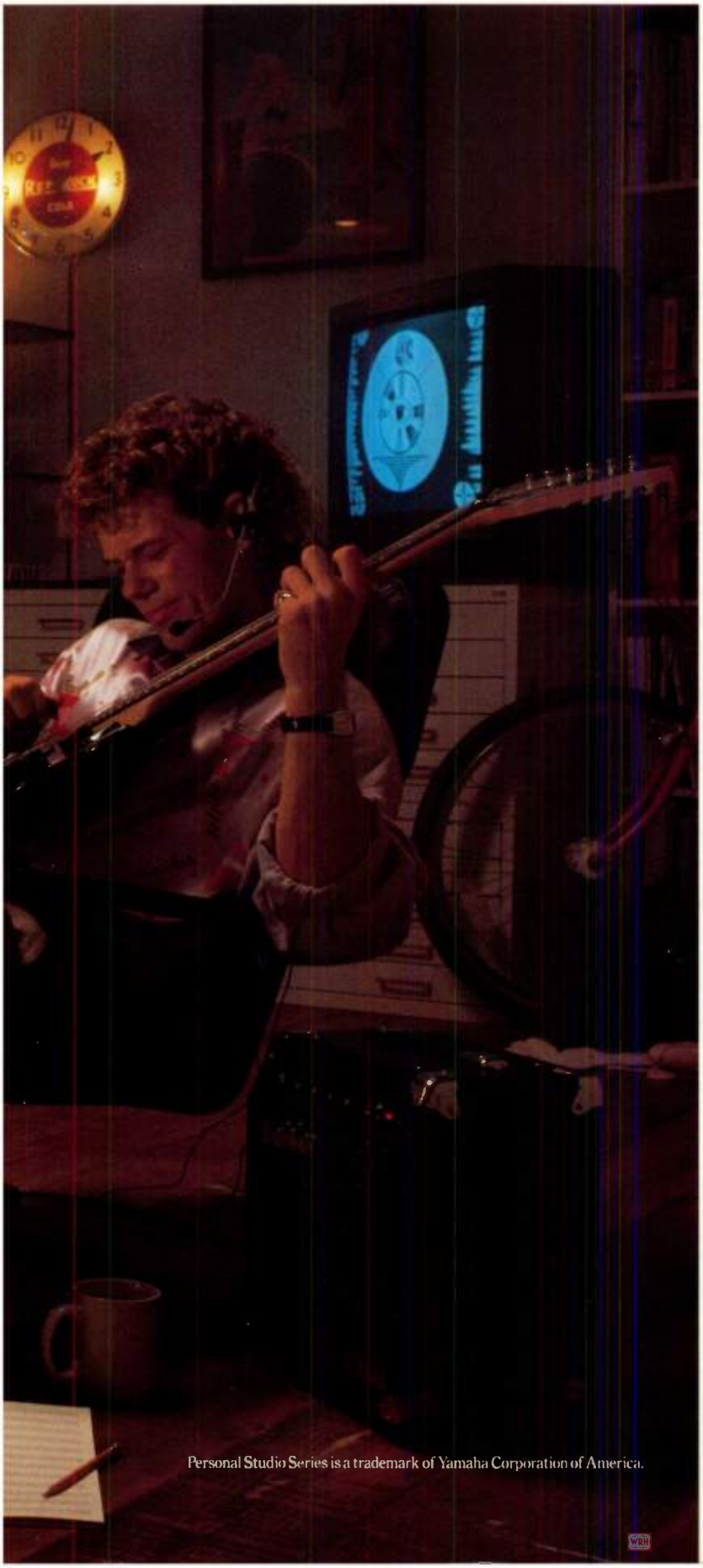
For sounds you can access the gigantic DYNACORD library or use MIDI sample dump. Sample data can also be read directly from S-900 disks.

The ADS-K sampling keyboard has a great feel with programmable dynamic sensitivity, aftertouch, and weighted keys.

DYNACORD®

Drum Workshop Inc. • 2697 Lavery Ct. • Unit 16 • Newbury Park 91320 • California

The cure for the one-track mind.



Personal Studio Series is a trademark of Yamaha Corporation of America.

Earlier tonight in the restaurant, someone at the next table laughed. No one heard it quite the way you did.

By the time dinner was over, you almost had the entire tune done in your head. You apologized to your date for not being much of a conversationalist.

MT100 Multitrack Recorder

And once you got home, the creation took real form.

Flip on the amp. Set the EQ. Grab your guitar. Hit record/play.

That primal urge is precisely why Yamaha created the Personal Studio Series.™ A line of products designed especially for the home recordist.

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The Yamaha Personal Studio Series. Get cured at the Yamaha Professional Audio dealer near you. Yamaha Corporation of America, Professional Audio Division, P.O. Box 6600, Buena Park, CA. In Canada, Yamaha Canada Music Ltd., 135 Milner Avenue, Scarborough, Ontario M1S 3R1.

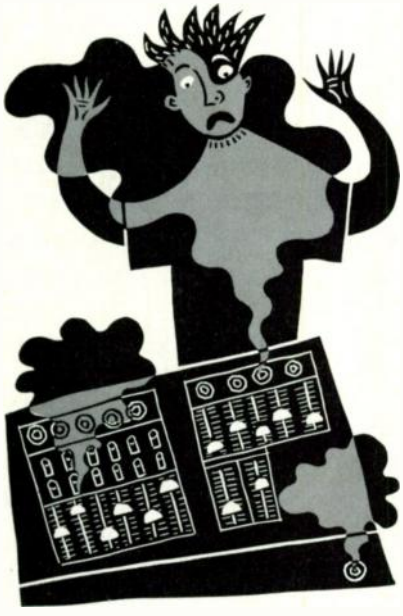
Personal Studio Series™

YAMAHA

Engineering Imagination™

READERS HELPING READERS

EM readers search for schematics, librarians, parts, sounds, MIDI retrofits, Theremins, and advice.



DEBBIE DRECHSLER

Operation Help *is dedicated to helping musicians help each other. If you need technical assistance, a schematic for an old piece of gear, or just want to connect with people having similar interests, send your name, address, phone number (optional), and the nature of your request to: Operation Help,* Electronic Musician, *6400 Hollis St. #12, Emeryville, CA 94608. If we print your letter, we'll include your name and address so that our helpful readers can contact you. There is no charge for this service, but we cannot guarantee that all requests will be published.*

ARP Odyssey: I have an ARP Odyssey whose oscillator seems to be stuck "on." I could use an owner's manual, schematics, and any advice on how to correct this. Steve Hayes, 504 East 143rd St., Cleveland, OH 44110; tel. (216) 681-6115.

Binson Echorec/Final Phase A/DA: I've tried everywhere but have not yet found an operating manual for the Binson Echorec PE-603-T-6 or Analog/Digital Associates Final Phase. Please help. Nicholas Oshana Jr., 187 Morningside Dr. East, Bristol, CT 06010; tel. (203) 589-6223.

Casio CZ-101: I'm thirteen years old and won a CZ-101 from the clinic I attend for kidney treatments. Unfortunately, the treatments make family money scarce. Is anyone willing to donate some patches? Chris Goggans, 5888 Bearcreek Dr. #418, Bedford Heights, OH 44146.

Crumar Bit One: I need schematics and service info for the Bit One synthesizer, originally manufactured by Crumar and later distributed by Digital Keyboards Inc. (New York), Unique Musical Products (Kansas), and others. Bob Desiderio, 415 Rosarita Dr., Fullerton, CA 92635; tel. (714) 879-3374.

I would like to swap or buy Bit One synth patches and/or technical information. Jack Hammer, 121 N. Newport, Kennewick, WA 99336.

Fender Chroma Polaris: I need the Polaris's MIDI system exclusive format so I can write a patch librarian/editor for my IBM PC (or does such software already exist?). Schematics and other technical information would also be helpful. Michael Dunn, 68 Rectory St., London, Ontario, N5Z 1Z8 Canada.

Found sound: I use found sound (much like Cabaret Voltaire) and would appreciate tapes for copying. I'm not looking for easily accessible material (nature sounds, famous personalities and events, etc.) but rather unusual and unique tapes (local radio broadcasts, home conversations, etc.). I can copy reel-to-reel and microcassettes. All tapes will be returned. Vladimir Kazhin, PO Box 9794, Tarson, MD 21284-9794.

MXR pedals: My MXR Distortion+, Dyna Comp, and Phase 90 did not come with LED status indicator lights or DC power jacks. I have installed the LED modification and purchased the original MXR power jacks, but unfortunately do not have a diagram on exactly how to go about wiring them. Any suggestions? Bob Stack, PO Box 304, Sayville, NY 11782; tel. (516) 567-7579.

Octave-Plateau Catstick/Korg MS-20: I need a service manual and/or schematic for the Catstick controller, as well as a Korg MS-20 owner's manual. David Wyatt, 1325 McCutcheon Rd., Apt. C, St. Louis, MO 63144.

Reticon SAD4096: Does anyone have, or know where I can get, an SAD4096 Analog Delay IC in working condition at a reasonable price? Brian Morris, 4685 Belmore Ave., Montreal, Quebec, H4B 2C1 Canada.

Steinberg MasterScore: I'd like to correspond with anyone using *MasterScore* by Steinberg Research or other scoring programs for the ST. Good, hands-on demos are hard to find, and I need the input before I shell out the bucks. Steve, c/o Reel Productions, 2705 Flicker Lane, Rolling Meadows, IL 60008.

Technics Digital Ensemble: I use a Panasonic Technics SX-PR 60 Digital Ensemble with its SY-PD5 disk drive in conjunction with *Master Tracks Pro* on an Atari 520 ST. The system works well but has its quirks (such as "all notes off" signals from the Technics, in defiance of the MIDI spec). Would anyone with a similar combination care to trade advice? Mark E. Ingram, PO Box 16, Rte. 2, Purdy, MO 65734; tel. (417) 442-7231.

Theremins: The Theremin Users Network is in touch with Theremin players across the USA. We're still looking for new designs (preferably digital) for a modern instrument that can be built at an affordable cost. If you have a design, or are an interested player or builder, contact: Eric Ross, 259 Oak St., Binghamton, NY 13905; tel. (607) 722-1457.

Please also contact *Electronic Musician* if you have a design. ■

Feature Shock!

Otari's new MX-50. Built around the premise that you can have everything you ever wanted in a two-track tape machine, and still stay within your budget. For example:

The Transport

—DC quartz PLL capstan motor with front panel selection of operating speeds (from either a 15/7.5 or 7.5/3.75 ips speed pair).

—Capstan speed variable by ± 7% from the front panel, and by ± 50% from SMPTE time-code external controllers via an Otari-standard 37-pin connector.

—Optional remote control.

The Electronics

—Lighted VU meters with peak-reading LED indicators.

—Transformerless active balanced inputs with XL-type connectors.

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

A built-in tape timer displays current tape position in hours, minutes, and seconds, and includes a search-to-cue locator with cue point and zero location memories.

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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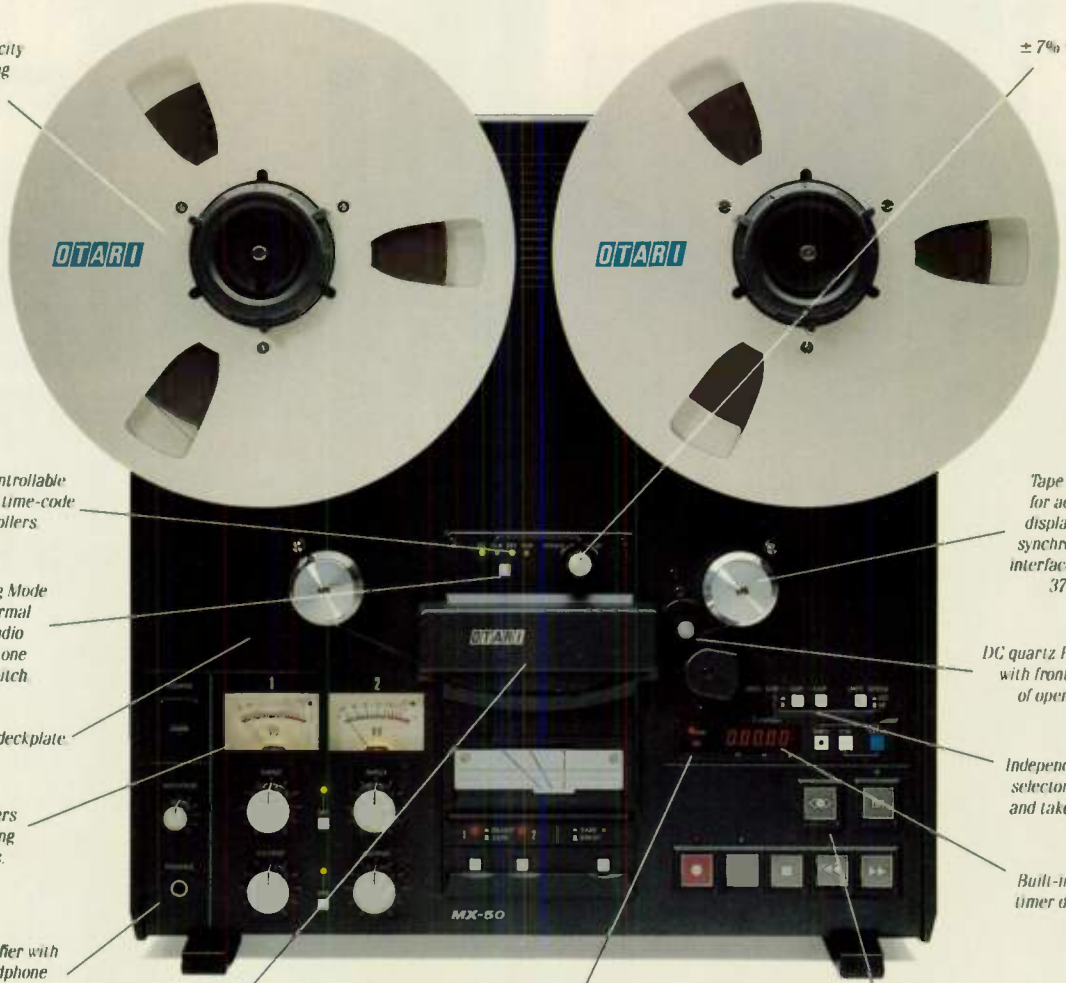

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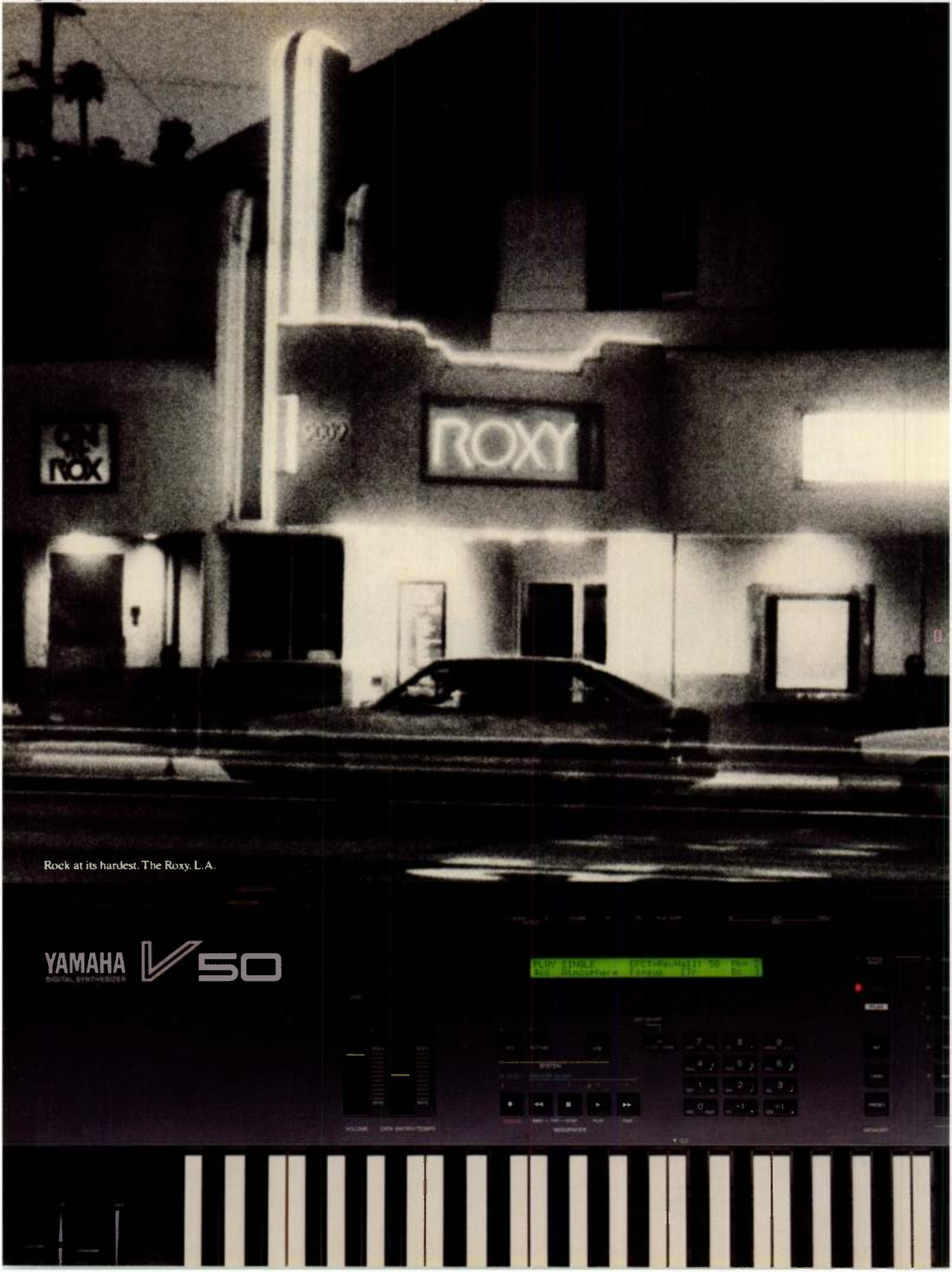
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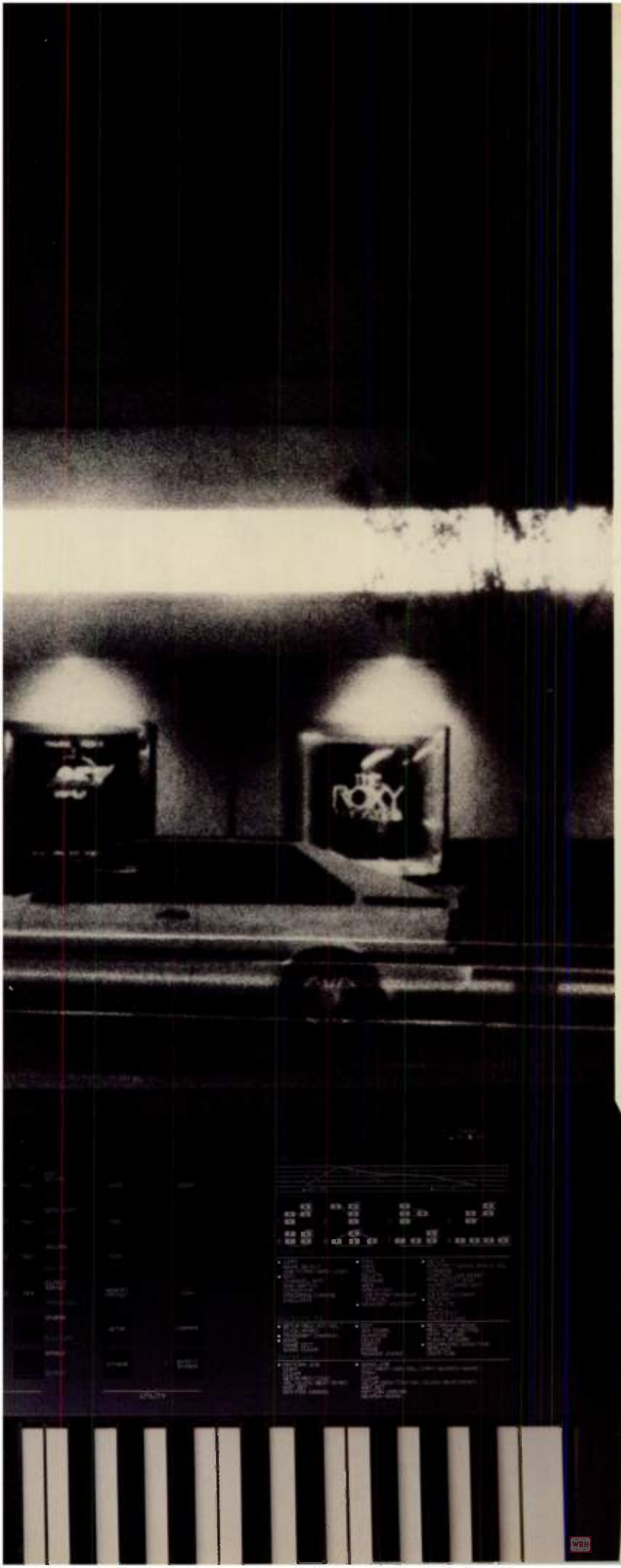
Rock at its hardest. The Roxy, L.A.
YAMAHA
DIGITAL SYNTHESIZER
V50



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DREAM MACHINES:

Exploring High-End Audio Workstations

New digital audio dream machines put crystal-clear recording, flawless editing, and powerful processing into one desktop package.

Life in the studio is changing *very* rapidly. Just a few short years ago, basic tracks were recorded on a master multitrack, analog tape deck or several analog decks slaved together. Then came remixing, where trial stereo/surround-sound balances were made on a computer-controlled, analog console until everyone was happy with the mix (or the budget ran out, whichever came first). Segue to the pressing plant, where dollops of vinyl would be stamped into familiar black "frizzbies." ■ Today, analog recording is rapidly moving toward obscurity. The digital world of MIDI, sampling keyboards, computerized mixers, and recorders has democratized the process of composing, playing, and producing music. The distinction between professional studios and even the most modestly equipped home facility is blurring; we make music wherever and whenever the muse descends. In fundamental terms, the means of producing music is changing from "centralized" to "distributed." ■ Concurrent with all the above, we're seeing a fundamental change in the technology used for music production. Compact disc and digital audio tape (DAT) media deliver 96 dB dynamic range, DC to 20 kHz frequency response, unmeasurable wow and flutter, and minimal distortion, even at high recording levels. Yet today, digital technology is not just being used

By MEL LAMBERT

BACKGROUND PHOTO BY DAVID BISHOP

for high-quality stereo systems, but through all the steps of the recording process. Of course, the dramatically improved sound quality offered by digital recording, processing, and editing systems is very attractive, but of perhaps greater importance for those plying their art in the studio are the enhanced operational features all-digital systems offer. These include high-speed access to digitized audio stored in memory (RAM, hard disk, or optical drives mean no more tape rewinding), freedom to remap "control surfaces"—the devices with which we interact with the system—as necessary by software commands, ability to repeat settings and mixes, and much more. For all music creators, digital means extended power in the studio; the latest generation of digital audio workstations are veritable dream machines that have the power to change the way music is made.

Previous page, clockwise from the top: The Muse from Audio Animation; Lexicon Opus; NED Synclavier 9600; AKG Acoustics DSE-7000.

ANALOG VS. DIGITAL

In an analog mixer, for example, are familiar circuit components comprising EQ, effects sends, output bus amps, etc., sending signal voltages to one another via standard copper wires. Each component in an analog recording chain—from mics, to console, to recorders and effects rack—is based on the same general technology, so interfacing these components presents few problems.

Digital audio devices are just dressed-up computers designed to convert analog input into numbers representing signal amplitudes. Distinctions between "mixing console" or "multitrack recorder" or "mastering recorder" exist principally in software that tells the computer which function to perform. The digital hardware only receives, processes, and stores a signal, so a digital disk-based recorder can be configured to handle single or multitrack information and store it on hard disk or optical drive in virtually any format.

Whether a workstation is based on a low-cost personal computer or a high-end mainframe, the basic principle (although not necessarily the *speed*) of operation is the same: once analog information is digitized, microprocessors add, multiply, divide, or subtract the data (producing level, EQ, dynamic, or other changes) and shuffle it off to RAM or disk for storage. Digital audio devices are just computers that perform mathematical gymnastics on digitized audio and produce an output mixed and processed to our liking.

INTEGRATION, CONNECTIVITY, AND CONTROL SURFACES

Digital technology is radically different from analog in three main aspects: *integration, connectivity,* and *control surfaces.*

Integration implies that all the recording and production tasks previously performed by different subunits of a recording studio are now software tasks assigned to a master audio computer. It makes little sense to redigitize an analog signal each time it needs to be processed; once converted to digital data, it should be mixed, processed, and edited in the digital domain.

Connectivity means that standardized

The Computer for the Eyes.

Capture color or black and white images with New Tek's **Digi-View.**

Paint in up to 4096 colors with MicroIllusion's **Photon Paint.**

Dive into the world of desktop video with Amiga animation software.

Create spectacular video effects with A-Squared's **Amiga Live!**

With the Commodore® Amiga personal computer, you can create music videos right along with your MIDI music tracks. The Amiga® is being used by major recording artists and network television producers to create professional-quality video graphics, special effects, and animation in 4096 simultaneous colors. And you can get that same professional production power at a price that will fit right in with your home studio.

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analog-to-digital conversion techniques allow digital processors—recorder, mixer, or reverb—to exchange data freely. The pro audio community has developed several interconnect standards that allow this: the AES/EBU 2-channel and MADI 56-channel IN/OUT; SPDIF (found on several CD players, DAT decks, signal processors, and digital mixers); and Sony's proprietary SDIF-2 single-channel interfaces, used on its PCM processors.

Connectivity also requires standardized internal data bus architectures, so dedicated digital signal processing (DSP) cards can be added to a master computer. Such formalized bus schemes allow such things as math co-processors/accelerators, high-resolution D/A converters, and specialist processing boards to be plugged into the computer, or enable multiple SCSI (Small Computer System Interface) hard and optical disk drives to be connected in a daisy-chain configuration.

The final biggie, control surfaces, involves a fundamental reevaluation of the ways in which we manipulate audio material. Since signals in an analog device must flow physically through elements such as faders and switches, controls for these functions are usually located on easily accessible front panels, or an equally accessible remote. Digital hardware need not be limited by this "one function/one control" restriction, since controls in a digital system do not themselves alter the data, but instead tell the computer what alterations you want. Form is no longer restricted to following function: each control of an all-digital system can be assigned a specific role, with little concern about its construction. The front panel can be any size or shape you desire, and functions can be assigned to any device. A digital audio workstation might look like a conventional mixing console and recorder remote control, or like nothing we've ever seen before.

We can soon expect more functionality in every species of workstation.

This concept has already been a great boost for digital musical instrument design (though sometimes to the detriment of accessibility). Further, because each control function works in the digital domain, the instructions for operations can be stored in memory, referenced against some form of time code, and recalled later for comprehensive studio automation. Synthesizers can change sounds in the instant between verse and chorus with a simple computer command—imagine the same kind of freedom throughout sound production, from digitized vocals to signal processing to mixing, and you start to appreciate the power of keeping everything in the digital domain.

THE ERGONOMIC QUESTION

Inherent in digital technology's exceptional flexibility is the critical concern for ergonomics: the design of the hu-

The Computer for the Ears.

The Commodore Amiga personal computer lets you run a MIDI sequencer at the same time you edit your patches, scores, samples—even your production notes. It's a process called multi-tasking, and it's an Amiga first. There's a large and growing library of top-quality music software to choose from, including packages from Dr. T's, SoundQuest, New Wave, Intelligent Music, Blank Software, Mimetics, and more.

So take in the sights and sounds of the Commodore Amiga family of personal computers. Call 1-800-627-9595, ext. 200, for more information and the name of your nearest authorized dealer.

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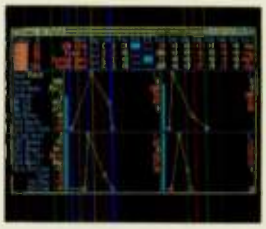
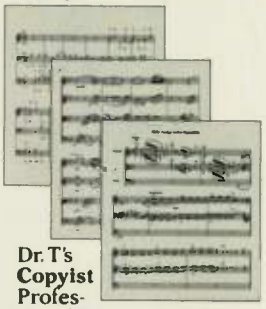
Intelligent Music's **M** Interactive Composition Program.



Kawai K1 Patch Editor from Sound Quest.



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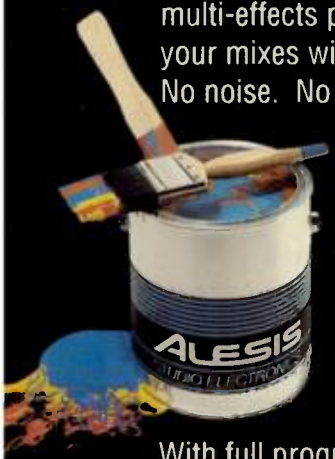
If Michelangelo had a QUADRAVERB, he might have mixed music instead of paint.

It's true. Music and painting are very similar. A stroke of red, a touch of chorus. A splash of blue, a wash of reverb. Either way, it's art. And every artform has its masterpieces. And its tools.

Introducing the Alesis QUADRAVERB. An all-new 16 bit digital, simultaneous multi-effects processor and dead-serious musical tool. With QUADRAVERB, your mixes will be mirror images of the sound in your head. No letdowns. No noise. No nonsense. No boundaries between art and creation.



Inside, QUADRAVERB is alive with colors. Chorus, flange, phase shift, pitch detune and delay... all in stereo, to give your music depth and space. For absolute tonal control there are 5 bands of parametric and 11 bands of graphic e.q. And, of course, there's the unmistakable clarity and drama of the award-winning Alesis digital reverb programs.

With full programmability, 100 memory slots, and 90 factory programs created by the best ears in the business, QUADRAVERB gives you total artistic freedom. Plus, in QuadMode™, four of these flawless 20kHz bandwidth effects occur simultaneously. Like crunching thousands of dollars worth of studio gear into one rack space.

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man interface. It's of little use to develop a do-all system if one has poor access to all the available functions. Every manufacturer of digital audio workstations has to address two basic questions:

1. How should the information be presented to the user so it mimics (if appropriate—you don't want to mimic tape rewind time) familiar functions?

2. How should the required recording and production tasks be controlled from the user interface?

Since computer-based audio workstations can *centralize* all the required tasks, we should be able to enable record mode; select a "track" to which the data will be sent; control levels and, on some systems, set up EQ, dynamics, and reverb parameters; locate and store edit in/out locations; and, during playback, control stop and start points of the recorded data according to our predetermined edit sequences. The ease with which these tasks can be performed is an important measure of a workstation's effectiveness, since speed is often the crucial factor when deadlines loom.

WORKSTATION DESIGN OPTIONS

Currently, there are three primary design approaches for digital audio workstations:

The modular PC design: With this approach, the major digital elements are controlled from an Atari ST, IBM AT/PS-2, or Apple Macintosh computer. The total system includes a rack of digital input, output, and DSP cards, connected via a high-speed serial link so the computer can interrogate and instruct the recording and editing systems to perform various functions. Custom-developed software for the PC workstation provides a "user-friendly," window-style environment in which the user selects tasks, and the computer issues commands to the outboard subsystems. Most software writers find it more cost-effec-

DIGITAL AUDIO BUZZ WORDS

At the front end of all digital systems is an analog-to-digital (A/D) converter that converts incoming analog signals or voltage levels into a sequence of digital bits, using a process known as *Linear Pulse Code Modulation*. (Although other encoding techniques are also available to the digital designer, LPCM is favored by a majority of system developers.)

The number of times per second a signal is buffered into the A/D converter (producing a binary number) is defined as the *sampling frequency*. The higher the sampling frequency, the greater the bandwidth of the recorded signal. As explained below, the range of frequencies that can be recorded at a sampling frequency of n kHz is approximately 0 Hz to n/2 kHz; in this case, the digital system is said to feature a bandwidth of n/2 kHz.

In the real world, a digital audio workstation with a sampling frequency of 48 kHz will handle frequencies from around 5 Hz to just under 24 kHz. By comparison, conventional, 15 ips production studio analog decks can record and play signals from around 20 Hz to 19 kHz (or occasionally higher). These figures are only available at low to medium recording levels, however. At high levels, the performance of an analog recorder rolls off at the top end of the audio spectrum. Digital technology, on the other hand, offers ruler-flat bandwidth at all record levels.

The sampling frequency used in CD players, certain sampling keyboards, most PCM processors that utilize companion video decks, digital DASH-format and PD-format reel-to-reel recorders, and prerecorded DAT cassettes is 44.1 kHz. Many decks record at 48 kHz to provide extended bandwidth; frequency converters are necessary to feed these signals into workstations configured to operate at different sampling rates.

A digital system's *resolution* is determined by its *quantization rate*, expressed in bits. During the A/D conversion process, the digital word can be set to virtually any byte size, although current ICs usually limit this to 14, 16, 18, or 20 bits. A 16-bit binary number provides a maximum of 65,536 discrete levels, so a 16-bit digital recording system will accommodate over 65,000 unique values between loud and soft sounds; a 14-bit device, on the other hand, is capable of producing only a quarter as many sound levels.

Dynamic range is the difference in level between the softest and loudest sounds that a system can handle. A 16-bit system will produce a recording with a dynamic range of just over 96 dB, while a 14-bit system offers a dynamic range of around 84 dB. The dynamic range of analog recorders, in contrast, is limited to between approximately 55 dB and 80 dB, though newer forms of noise reduction can improve these figures.

The *bandwidth* of a workstation system with a sampling frequency of 44.1 kHz will be just over 22 kHz. This 2:1 relationship results from the Nyquist Sampling Theorem, which states that to represent an audio waveform in digital form, accurately and unambiguously, the sampling rate must be at least twice the frequency of the highest frequency sampled.

To prevent unwanted frequencies from interfering with the digital sampling process, lowpass *anti-aliasing filters* are inserted ahead of the system's A/D and D/A converters. Digital filters offer many advantages over analog designs, mainly because they can be fabricated to tighter tolerances and are more linear in operation.

Oversampling is a technique used to address phasing and distortion problems caused by filtering digital audio at playback. Oversampling uses playback sample rates of two, four, or eight times the original sampling frequency and allows the digital designer to use analog or digital filters with gentler, less abrupt roll-off curves. To most golden ears, these sound far less abrasive than filters used in non-oversampling systems. —*ML*

tive to use the already available screen-driven interfaces for the computers, rather than develop their own.

Examples of this type of design approach include the Digidesign Sound Tools, Hybrid Arts ADAP II, Integrated Media Systems Dyaxis, Post Logic Systems Digital Audio Computer System, Sonic Solutions Sonic System, Spectral Synthesis SynthEngine, Steinberg Digital Audio Topaz, and Symetrix DPR-100 Digital Processing Recorder.

The stand-alone format: In this case, a flexible, reassignable control surface connects to a rack system that houses the converters, disk drives, and processing cards. The control surface is typically a combination of screen-based menus and keyboard commands with a reasonably simple hardware interface featuring dedicated switches, scrub wheels (for edit location and other functions), and similar tactile controller elements. Examples of this second design approach include the AKG Acoustics DSE-7000, Advanced Music Systems AudioFile, Digital Audio Research SoundStation II, Fairlight Instruments Series III/MFX, New England Digital Synclavier 3200/9600 and PostPro, Solid State Logic ScreenSound/HarrySound, and WaveFrame AudioFrame.

The full-function mixing console, recorder, and editor: This consists of a control surface that looks and behaves pretty much like a conventional analog console, but with enhanced, assignable control functions such as EQ, compression/limiting, and dedicated displays. (This design only functions to get engineers up to speed more quickly, though, since very few feel instantly at ease controlling a multichannel production console or random-access editing system from a video display terminal, using a keyboard and mouse.)

Examples of this third design philosophy include the AMS Logic 1/Edit 1, Analog Digital Synergy One, Audio Animation The Muse, Lexicon Opus, Real World Research Audio Tablet, and Solid State Logic 01 Digital Production Center.

WHAT IS A DIGITAL WORKSTATION?

While there are many possible definitions, this one captures the essentials of the modern workstation:

A digital audio workstation is a computer-controlled system or networked collection of devices that allows all of the major digital recording, processing, editing, and replay functions to be controlled from a central location. It also enables companion audio production tasks and functions—including, for example, the integration of MIDI information or time code/sync data from an editing or synchronization system—to be coordinated from the same control surface.

Although first-generation workstations were configured around single or networked minicomputers, nowadays, due in no small part to the sophisticated microprocessor and support chip sets currently available to digital designers, it makes more sense for desktop audio/video production systems to be configured as outboard digital processing boxes whose specialist functions are controlled and coordinated by a central workstation running customized, multitasking software. In this way, the central workstation controller can be optimized for graphics display of the various recording, mixing, and editing functions, while a series of high-speed "subengines" can perform the real-time audio processing, manipulation, and time code synchronization functions required for today's complex sound and audio-for-multimedia productions. —*ML*

TOWARD THE FUTURE

We can soon expect more functionality in every species of workstation. An increasing number of studios now accept the inevitability of digital technology for both its high audio quality and the extended creativity it offers engineers and producers. Plenty of entry-level systems based on personal computers now offer a phenomenal amount of digital bang for the buck, and, in the near future, we can expect software controllers and high-speed DSP cards allowing desktop four-, eight-, and even 16-track recording, editing and real-time EQ, dynamics control, and reverb/ambience generation. Already, prices are beginning to drop as this technology becomes more commonplace.

Digital technology is radically different from analog in three main aspects: *integration, connectivity,* and *control surfaces.*

Bear in mind that digital technology is young, and workstations will continue to evolve. The digital path seems to have unlimited potential, and the results of musicians tapping that potential will be exciting indeed.

BACK TO THE PRESENT

While the future is promising, the array of digital audio workstations that's already available is nothing to sneeze at. An amazing amount of capability is here now, as indicated by the following annotated list of currently available digital audio workstations, all-digital consoles, and editing systems, arranged alphabetically, according to manufacturer.

The Digital Products Division of AKG Acoustics has developed a RAM-based workstation, the DSE-7000 **Digital Sound Editor**, with an 8-track, random-access recorder, editing control surface, and 10-channel mixer; the stand-alone unit is controlled from a menu-driven video display. Front panel control elements include conventional-looking channel faders, an edit/scrub wheel, Play/Stop/Record/FF/Rewind "recorder" controls, and software-definable keys for track routing and assignment. Available sampling frequencies are: 32, 44.1, and 48 kHz. Each plug-in RAM card holds a total of 264 seconds of mono audio, with input from either analog or AES/EBU-format digital inputs; a total of four memory cards can be added to provide a storage capacity of 17.5 minutes. Future systems will offer up to 70 minutes of digital capacity. AKG Acoustics, 125 Walnut St., Watertown, MA 02172: tel. (617)924-7694.

The Advanced Music System's **AudioFile** system consists of a stand-alone workstation control panel and CRT display, connected to a rack of processing units and hard drives. AudioFile can simulta-

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Forgive us if we sound a little pompous. It's just we find ourselves in a curious position. Over the past several years, everyone and their brother has introduced a so-called "work station." When, to our way of thinking, they really aren't work stations at all.

To us, a work station should have the most sophisticated sequencer available. And in fact, our new W-30 does. It features 16 tracks, microscope editing, full compatibility with both Roland MicroComposers and Directors "S" Sequencing software, to say nothing of the friendliest user interface there is.

Because the W-30 uses the same disks as the S-50 and S-550, you won't need to build a sound library. It already exists.

To us, a work station should also be designed around a sampler rather than a synthesizer. What this does, more than anything else, is make the system remarkably versatile. It's a whole lot easier to make a sampler sound like a synthesizer than the reverse. And speaking of sounds, those from the W-30 can be processed through either eight polyphonic outputs or a mix output.

To us, a work station should possess an excellent memory. Which is why we've equipped the W-30 with a one mega-

n the market, the first.

byte, user-accessible memory (ROM). And because it comes with the most frequently-used sounds, you won't need to load in a sound disk to begin working.

The sampler section's 512k (RAM) memory is no less impressive. It's actually equal to that of a Roland S-330, and can be used for creating new sounds, or for playback, or for manipulating any of the S-Series disks. As a result, you'll not only be in a position to work with the sounds that are currently hot, you'll be in just as good a position to capture the sounds that will become hot.

Nor does its versatility end here, because the Roland W-30 not only puts

If you squint you can probably make out the fact that the new Roland W-30 has eight polyphonic individual outputs which allow any sound to be routed individually to a mixer.

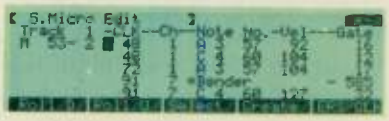
a 3.5" floppy disk drive at your disposal, it also gives you the ability to access additional data by using either a CD-ROM or a hard disk connected to an optional SCSI interface.

Of course, a work station should be able to express itself too. Which is why we've made our 61-note keyboard sensitive to both velocity and after-touch.

And it should be easy to use. Hence, the W-30 uses a large, state-of-the-art 240 x 60 dot LCD display that's capable of providing more useful information at one time than ever before.

But before we go, let us take this moment to pose a hypothetical question. Let's just say that all of the other so-called work stations found a way to include these very same features. They'd be better, of course, but still not comparable to the remarkable new W-30. Because they'd still be missing the most persuasive and motivating feature of all.

Our state-of-the-art 240 x 60 dot LCD display lets you view all the parameters while editing.



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The LXP-1 has Lexicon *Dynamic MIDI*® for real-time control of the front panel Decay and Delay parameters with any MIDI controller. And its System Exclusive gives you access to six more "hidden" parameters using the Lexicon MRC MIDI Remote Controller. The MRC controls all eight parameters in real time and stores your setups. It turns the outwardly simple LXP-1 into an amazingly powerful and versatile multi-effects processor.

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Lexicon Inc., 100 Beaver Street, Waltham, MA 02154 (617) 891-6790—Fax (617) 891-0340—Telex 923468

neously handle a total of eight independently editable, digital "tracks." A graphic display of each digital track on the CRT enables edit sequences to be constructed as the material flows from the right-hand side of the screen to the left; a "Now Line" in the center of the screen establishes the real-time position of audio being replayed from the hard drives. In addition to analog ins/outs, the system offers digital SDIF-2 (Sony PCM-1630 format) and AES/EBU-format digital interfaces. For editing of mono or stereo audio, access to eight digital channels allows sound elements to be checkerboarded and crossfades or hard edits made between shortened or lengthened material. Recent enhancements include new software that provides automated control of record in/out timings and the stacking of as many as 30 different takes, plus control of external tape machines. AMS also is developing a pair of all-digital consoles, Logic 1 and Edit 1, scheduled to begin shipping soon. Logic 1 comprises an 8-input stereo mixer with a 4-band EQ section, stereo phase reverse, panning, linear-motorized fader per channel, aux send buses, a full-feature dynamics section, plus storage and recall of all switch and knob settings; the system architecture has been designed to handle up to 256 stereo channels. AMS/Calrec, AMS Industries Inc., 3827 Stone Way North, Seattle, WA 98103; tel. (206) 633-1956.

Digidesign's Sound Tools system includes a Sound Accelerator card and Sound Designer II software.

The Analog Digital Synergy **Synergy One** is an in-line, all-digital console, available with between four and 64 channels. A dedicated control surface offers conventional aux send, PFL, AFL, pan, 4-band parametric EQ, lowpass and highpass filters, bus assignment, and channel fader. A separate rack houses A/D and D/A modules that accommodate analog and AES/EBU, SDIF-2, and SPDIF digital inputs and outputs, at sampling frequencies between 32 and 50 kHz. Analog Digital Synergy, 120 SW 21st Terrace #C-104, Ft. Lauderdale, FL 33312; tel. (305) 791-1501.

Audio Animation's **The Muse** is a fully automated, 2-channel digital console with 5-band parametric EQ and dynamics control, settings for which can be made via conventional front panel rotary controls or a color CRT display. Settings for EQ bandwidth, center frequency, cut/boost, compression ratio, threshold, and attack/decay times can be stored and recalled at a rate of 100 per second; up to 80 minutes of real-time EQ, compression, and level changes can be stored in onboard memory. The Muse features analog, as well as AES/EBU and SDIF-2 digital inputs and outputs, at sampling frequencies between 30 kHz and 100 kHz. Audio Animation, 210 W. Magnolia Ave., Knoxville, TN 37917; tel. (615) 544-0458.

Digidesign's **Sound Tools** for the Apple Macintosh SE/II comprises the AD IN high-quality analog-to-digital conversion system, a Sound Accelerator plug-in,

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digital-to-analog converter card, and Sound Designer II recording, waveform editing, and time compression/expansion software. The system allows two channels of 16-bit audio to be recorded directly to and replayed from the Mac's hard disk; storage capacity is solely dependent upon how many SCSI-equipped drives are attached to the SE or II. Digidesign, 1360 Willow Rd., Suite 101, Menlo Park, CA 94025; tel. (415) 327-8811.

The Digital Audio Research **SoundStation II** stand-alone system features a very stylish-looking control surface that connects to a processor and digital storage unit. The control surface features dedicated editing and transport controls along with a touch-sensitive, electroluminescent screen that relabels various control sections according to the recording, editing, and/or playback assignment. The system handles up to eight channels of analog plus SDIF-2 AES/EBU digital ins/outs, and features 32, 44.1, or 48 kHz sampling frequencies. Record time is upwards of 60 track-minutes at 44.1 kHz; a maximum of 32 channels of simultaneous record and replay is available with a single controller. Now available is a 600-megabyte WORM (Write Once, Read Many) optical drive system holding up to 60 minutes of stereo audio. Digital Audio Research, 6363 Sunset Blvd., Suite 802, Hollywood, CA 90028; tel. (213) 466-9151.

Although the company is no longer in business, Fairlight Instruments' **CMI Series III**—like the New England Digital Synclavier and WaveFrame Corporation AudioFrame—represents a good example of a MIDI-based, digital sampling synthesizer that can also function as a powerful digital audio workstation. Prior to going under, Fairlight developed a custom-designed control surface for audio post. The Series III MFX (Music and Effects) hardware/software package for film and video post-production featured dedicated transport controls, programmable function keys, and time code-based sequencing/controlling software. Series III standard features include four track-hours of stereo, 16-bit sampling to hard disk at a 50 kHz sampling frequency (100 kHz for mono samples), as well as analog and digital AES/EBU ins/outs.

Hybrid Arts **ADAP II** is a direct-to-hard-disk recorder/editor controlled by an Atari ST-series PC. It will store over 50 minutes of stereo, 16-bit audio at a sampling frequency of 44.1 kHz, using a 760 MB hard drive. Its close cousin, the ADAP I, is a RAM-based version that holds up to approximately 34.8 seconds of mono samples, at 44.1 kHz, on an Atari Mega 4 ST. Both systems follow MIDI commands plus SMPTE time code and feature optional AES/EBU digital ins and outs. Hybrid Arts, Inc., 11920 West Olympic Blvd., Los Angeles, CA 90064; tel. (213) 826-3777.

The Synclavier 3200 is New England Digital's "entry-level" system.

Integrated Media Systems' Dyaxis is controlled from a Macintosh or IBM computer.

Integrated Media Systems' **Dyaxis** is a high-speed, digital record/replay system that is designed to be controlled from an Apple Macintosh Plus/SE/II or IBM AT/PS-2 workstation and connects to a custom-designed audio processor rack and mass storage system. Sound sampling can be set to 44.1 or 48 kHz rates or any of 200 other user-selectable frequencies, with 16-bit resolution. Audio inputs/outputs are via analog or digital AES/EBU, SDIF-2, SPDIF, and Sony PCM-601-format ports. Systems are available with up to 1.6 gigabytes of random-access, hard disk storage, capable of holding 2.5 hours of 2-channel audio; eight simultaneous digital and/or analog outputs are planned for midyear. In addition to the company's MacMix II controller software—which now offers faster digital mixing capabilities, scrub editing, custom keyboard macros for dialog editing, and new upgrades for radio production—Dyaxis can also be controlled from other sound editing and processing software, including Blank Software's *Alchemy*, Soundsmiths' *SoundBase*, and Digidesign's *Sound Designer II* and *Q-Sheet A/V*. Integrated Media Systems, 1370 Willow Rd., Suite 201, Menlo Park, CA 94025; tel. (415) 326-7030.

The Lexicon **Opus** has a console-style control surface with twelve channels of

digital mixing and eight channels of simultaneous record/replay to hard disk at a sampling frequency of 44.1 kHz or 48 kHz; 480 track-minutes of recording are available at a sampling rate of 44.1 kHz. Input/output can be from both analog and SDIF-2 (PCM-1610/30) digital sources. Recent enhancements include an equalization/filter option that provides twelve channels of real-time digital EQ, plug-in processing modules, an EQ control strip for the work surface, and controlling software enabling four independent equalization bands to be assigned across the 20 Hz to 20 kHz range. Individual mode keys assign a parametric, notch, high-shelf, low-shelf, highpass, or lowpass filter characteristic to each section. Lexicon Inc., 100 Beaver St., Waltham, MA 02154; tel. (617) 891-6790.

New England Digital, considered by many as the "godfather" of workstation developers, has many years of experience under its corporate belt and recently repackaged the **Synclavier** system to function with an Apple Macintosh II keyboard and graphics-driven software as the primary controller. The Synclavier 3200 represents NED's "entry-level" system and provides up to 32 megabytes of RAM storage, 32 mono voices, 720 MB of hard disk storage, and full MIDI control. The Synclavier 9600 offers 96 MB of RAM storage, 96 stereo polyphonic voices, 3 gigabytes of storage, additive FM synthesis, and resynthesis and is compatible with multiple-user interfaces, including the Mac II. It has a 76-note, velocity- and pressure-sensitive keyboard, digital guitar option, and the Direct-to-Disk™ recording/editing system. The PostPro disk-based, digital multitrack offers onboard time compression, direct digital transfer, and full time code synchronization. NED is also working with Lucasfilm's Sprocket System Division to develop a "new generation of film and video sound-editing products." New England Digital, 49

The WaveFrame Corp. AudioFrame is a networked system of modules.

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Hybrid Arts' ADAP II is controlled by an Atari ST-series computer.

North Main St., White River Junction, VT 05001; tel. (802) 295-5800.

Post Logic Systems has developed the **Digital Audio Computer System**, an expandable processor rack with SCSI hard disk drives, which, under either stand-alone or external control from an Apple Mac or PC, can function as a digital multitrack recorder or be networked in a multi-user editing environment. A companion Digital Audio Control Console incorporates input/output assignment, transport control, and digital editing in a desktop format. The systems will accommodate both analog and digital inputs/outputs, full control of external digital transports, and time code synchronization. Post Logic Systems, 14-140 Finchdene Sq., Scarborough, Ont., M1X 1B1 Canada; tel. (416) 297-0193.

Developed in the UK for use initially by the BBC, Real World Research's **Audio Tablet** is a 2-channel, disk-based, digital recording and editing system that operates at 32, 44.1, or 48 kHz sampling frequencies, with a standard capacity of 60 minutes of stereo, expandable to six hours. An input/output and hard disk rack accepts analog, AES/EBU and SDIF-2 digital formats and connects to a remarkable control surface featuring touch-sensitive, remappable screen displays. Various graphic elements displayed on the control surface are relabeled according to the task for which Audio Tablet has been set up—software is currently available for 2-channel music and speech editing, with other functions under development—while a dedicated scrub wheel provides online "rock-and-roll" (i.e., moving the scrub wheel moves the audio, much like rocking the reels on an analog tape deck) edit-point location. A unique combination of pressure sensitivity, a "confirm" button, an "undo" function, and an audible "click" ensures that each transport, editing, and system command is unambiguous and mimics the kind of system response provided by conventional analog-based recorders and editors. Real World Research, c/o Syco, 20 Conduit Pl., London SW6 2BX, UK; tel. (01) 724-2451.

Solid State Logic's **1 Digital Production Center** is a stand-alone, all-digital mixer/editor/recorder that features eight input channels, assignable EQ, and dynamics control, plus "transport" controls for three stereo digital recorders (two designated for playback and the third to "record" the processed or edited material), time code reader/generator, and sync generator. Full cut-and-splice editing is provided; in addition, individual "tracks" recorded to hard disk can be slipped and offset against each other, or with reference to external time code.

Solid State Logic's **HarrySound** is designed to function as an adjunct to the Quantel Harry digital video effects/recorder. The audio system is configured for external control from the Harry user interface, to provide enhanced audio-follow-video editing control and synchronization. Up to eight reels/tracks of edited sound files can be manipulated against picture, replayed, and mixed simultaneously. In addition, any audio track can be time-offset or slipped relative to any other. **ScreenSound** is a lower-cost, less sophisticated version of HarrySound designed to function with laser disc recorders and companion video editing systems. Solid State Logic, 6255 Sunset Blvd., Los Angeles, CA 90028; tel. (213) 463-4444.

The Sonic Solutions **Sonic System** includes an Apple Macintosh II, hard disk drives, controller software, and plug-in cards for the Mac that handle analog, AES/EBU and SDIF-2 digital ins/outs at 44.1 and 48 kHz sampling frequencies. The company's first software release provides digital editing, mixing, EQ, and dynamics control, plus NoNOISE processing for removing unwanted

continued on page 72

THE $64,000 (OR MAYBE $164,000) QUESTION

Today's high-end workstations have an equally high-end price. Few people can afford simply to write out a check for a hundred grand, but there are ways around the problem.

The simplest solution for those on a budget is to prepare as much of a project as possible in a home studio, then rent time at a workstation-equipped studio to do the final mixing and tracking of parts you can't do at home (e.g., digitized acoustic instrument parts, which require huge amounts of RAM). Rates for good workstation-oriented studios are competitive with conventional studios and may even offer amenities you wouldn't find in a tape-based studio (such as more extensive audio-for-video options).

Some companies also offer leasing programs; for example, New England Digital works with Terminal Marketing on a variety of leasing arrangements. A typical lease runs for five years (with interest currently in the 13% to 15% range), after which the owner usually elects to buy the machine for a token sum. This arrangement is technically considered a financing lease, since the equipment is still owned by the lessor during the term, but the lessee retains any tax benefits. There are several advantages to leasing, including the ability to finance without making a substantial down payment, conservation of working capital, the facts that a fixed payment rate makes it easier to predict cash flow, and that it's not necessary to tie up existing lines of bank credit. Perhaps most important, you can start making money from the equipment starting at day one of ownership, which can help finance your payments. There are tax advantages as well, since payments are often deductible as operating expenses.

Of course, the above are just generalities and there are many variations on this particular theme. The bottom line, though, is that for many studios, spending a couple thousand dollars a month on a lease is often the most cost-effective way, and sometimes the only way, to upgrade to higher technology. *—Craig Anderton*

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Chart shows results of blind, subjective listening tests conducted by *Keyboard* (© 1989). Ratings do not reflect scientific test results, price/performance ratio, or evaluation of instruments' features.

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Your couch is a bass drum, your pop bottle a pan-pipe—Emax, like other samplers, can do a lot more than most people realize.

Sample Your HOUSE

And Other Fun Emax Tricks

Sampling can stretch your creativity and extend the boundaries of your music, and it can be a lot of fun. E-mu's Emax is a great sampling keyboard, providing five sampling frequencies, dual mode (which lets you layer two or more notes while only using up one note's worth of memory), stereo sound placement, auto-looping and crossfade-looping functions that really work, and 100 presets. So what's the problem? According to E-mu, perhaps 90% of all Emax owners—like owners of other samplers—do *not* sample their own sounds.

Why, with all the tools current samplers offer for making music from the sounds around us, do thousands of people use their samplers only to play the sounds others have sampled? Perhaps they were interested in sampling when they bought the machines but discovered, through painful experience, that sampling great sounds isn't necessarily easy, and using factory or third-party sounds is the path of least resistance. While there's nothing wrong with using premade sounds, you may prefer unique, individual sounds that will add an original flavor to your music. If that sounds like a good idea, let's start with some tips on sampling in general, then focus on how to take maximum advantage of what Emax has to offer.

By Mike Tucker

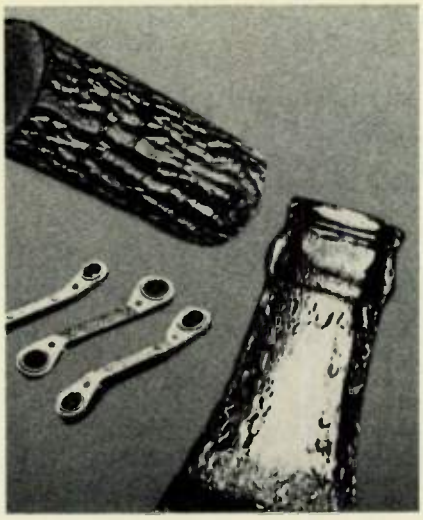
Illustrations by Marcia Stieger

COMMON HOUSEHOLD SOUNDS

Instead of trying to sample some oboe, guitar, or zither (who has all those instruments around, anyhow?), try sampling the musically useful sounds you can make right in your own house. The trick in finding musical sounds is to listen for a *pitch* in a sound. Strike, rub, or blow into an object—whatever's necessary to get it vibrating and producing a sound. If you can discern a pitch in the resultant sound, sample it, truncate the attack portion, and loop it to create a continuous musical note. If the sound doesn't have a definite pitch, try using it as a percussion sample.

Go to your medicine cabinet and find the hardest plastic pill bottle you have. Half-fill the bottle with M&Ms, shake it vigorously, and sample it. You have just sampled one of the best-sounding, useful cabasas you'll hear.

Find five various-sized, empty jars with metal lids. Set the lids on the jars as if you were going to screw them on and give each lid a quick spin so it tightens itself. Figure out the approximate pitch each lid makes as it tightens down and



sample the sound. Place these samples appropriately across the keyboard and loop them. You can use these sounds by themselves, but I prefer to layer or merge them with normal string or other sustaining "pad" sounds to add a new flavor to an old sound.

Grab a wide, flat, wooden board and smack it hard against one of your couch cushions (make sure the flying dust doesn't get in your disk drive). Sample it. Wow, a kick drum! Transposition can deepen the sound, if that's what you're after.

Need an alternative to the breathy flute sound that's so popular this month? Get a 16-ounce glass bottle of your favorite beverage and drink it. Next, blow across the top of the bottle until you get a good, solid tone and start sampling. Add water to the bottle to raise the pitch of the sound and sample as many of these notes as you'll need to fill up the range of your keyboard (five or six should do it). Layer these breathy notes with your favorite tinkly notes, add some reverb, and you've got your own custom version of the "breathy flute" sound.

Find your grandmother's wind chimes and hit each one to determine its pitch. Sample each chime to appropriate keys on your Emax and truncate the attack portion of each sample. Loop and crossfade the voices to create a smooth, continuous, ringing tone, which you can combine with your

"breathy" sample to make a completely original timbre.

I'm sure these suggestions will encourage you to experiment with taking samples of other household sounds. It's a nice feeling knowing the sounds you're using are yours; even better, your original tune is made a little more original by playing it with your own samples.

THE WAY OF THE SAMPLER

Understanding how Emax samples, and some of the ways it lets you manipulate those samples, also helps in using this instrument to its potential.

When sampling almost any percussion sound, I've found that for some reason I can add from 4 to 6 dB more gain than the input meter says I should and get a much hotter sample with no distortion. The more you can boost the gain (short of distortion), the louder the sample and the lower the noise. When you sample percussion sounds, always use the Force Sampling feature and set Emax's sample time to be longer than the sound you're sampling. Using Force Sample for a percussive sound ensures you won't miss the sound's attack. If you use Arm Sampling, the sound may not turn the sampler on fast enough, even if the threshold is set to minimum. Try it both ways; you'll hear the difference.

Since Emax's preamp is noisier than most mixer preamps, set the VU Mode/Gain meter as low as possible—0 dB if you can—and boost the gain at the source or use an external, high-quality preamp (see "Build a Hot Mic Preamp" in the May 1987 EM). This can give your sample's signal-to-noise ratio a significant boost.

SAMPLE MANAGEMENT

Once your sounds are in Emax, it's important to manage them. When developing sounds, I suggest you save each sample as its own preset (i.e., a one-voice preset). If you follow the normal procedure of taking a number of samples, placing them across the keyboard, saving the entire collection of samples as a preset, and looping individual samples, and you mess up a loop, you'll need to reload the entire preset to get back to where you were. This can take up to 40 seconds, which is a long time when you're on the track of a good loop; saving and loading individual samples takes much less time. Further, since Emax cannot load individual voices, only presets, if each voice is saved as a preset, and

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you want to load just one or two voices, you can.

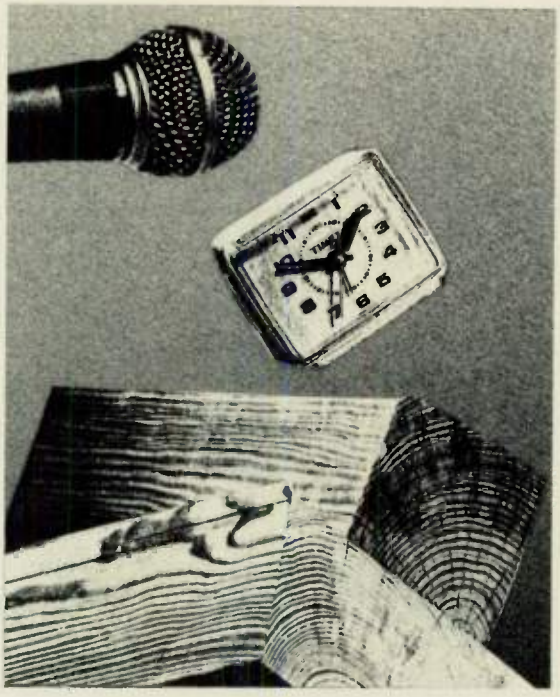
As an example, suppose you want to make a preset with five electric piano samples on Emax's default keys, G1, G2, G3, G4, and G5. Go into the Preset Management module and hit #3, Create Preset. Create five presets and name them EP-G1, EP-G2, EP-G3, EP-G4, and EP-G5. Exit the Preset Management module and call up preset EP-G1. Call up the sample module and hit #2, Place Sample. Assign your sample from C1 to B1 and sample the note. Exit the sample module and call up preset EP-G2. Reenter the sample module, assign the next sample to the range C2 to B2, and sample the next note. Repeat this procedure until all five samples are placed across the keyboard and save the presets. Now, if you make a mistake looping voice EP-G3, for example, you can reload the original sample into Emax's memory much more quickly than you could a five-voice preset.

After all voices are looped and processed to your liking, create a sixth preset and, using Preset Definition #1, copy, at the appropriate locations, all five electric piano voices to the new, complete preset.

In addition to simplifying the looping process, this will save you time and headaches when you assemble sounds from different disks to make a new sound disk, especially with drum sounds. If you put each drum sound in its own preset, assembling new drum kits from these various presets is a lot quicker, because there are no other sounds on an existing "drum kit" disk to erase. Emax gives you 100 presets, and I always run out of sample memory before I run out of presets, so why not use them?

APPLIED LOOPOLOGY

Looping sounds can be problematic, so here are a few tips that may help. Place the loop start point at about the midpoint of the sound. For example, if a sample is 005000 bytes long (press Digital Processing #2 to see the total sample length in Emax's display), move your slider so 002500 is the loop start point and 002500 the loop length. Hit autoloop repeatedly until you find an acceptable loop and write down the loop points. (Should you keep looking for a better loop and not find one, you can punch the loop points back in manually.) Now, move the loop start point as close to the beginning of the sound as you can (the numbers should decrease) while still maintaining a reasonably good loop. Don't change the loop length, only the start point.



While you move the start point of the loop, be sure to avoid loops that have a vibrato; this modulation is particularly obvious and unpleasant higher up the keyboard or with a very short loop and makes it difficult for notes to blend properly, especially when you're playing chords. When you find the stable loop with the earliest (smallest) loop start point, you've got it made. By finding the earliest acceptable start point, you'll be using the smallest sample possible while keeping the loop pitch constant. Don't worry about those pops and clicks in the sample; they'll disappear when you crossfade the loop, which comes next.

When you use autoloop, never truncate the sample, as Emax prompts you to do, because the sampler needs a little sample time on either end of the loop to do crossfade looping. Push Digital Processing #8, Crossfade, select Equal Power, and press Enter. Emax will ask if you want to truncate the sound. This time, push "yes," and you'll get a nice, smooth loop. I've found Equal Power crossfade looping seems to work the best in most situations. Linear looping has only given me better crossfades on samples of instruments like pipe organs, which have multiple, but simple, waveforms.

ANALOG PROCESSING

Emax has an amazing analog processing section that you can use to change radically the timbre of your samples. Press the Analog Processing button, and you'll be asked to "Select Lo Voice." Instead of selecting a low voice and then a high voice, press Enter twice to process the whole keyboard. By using Analog Processing #13 and #12, you can create many different presets from one sample. I like to slow the attack of a brass preset to hide the initial attack characteristic, close the filter to smooth out the high end, increase the hold and sustain of both the filter and amplitude envelopes, then turn on the chorusing. This produces a string sound that will rival a real string sample.

Try to use analog processing to create new presets from existing samples. You'll save Emax memory for new samples and be able to pack more sounds onto one disk.

Speaking of disks, even if you take all precautions, every Emax owner I have spoken with has occasionally loaded in a disk, hit the load button, and had the dreaded "CRC Error" come up on the display window. If that happens, try loading the disk again; if that doesn't work, you can save most or all of the data on the disk by pressing Preset Management #1. Emax will load the disk directory, whereupon you can scroll through the presets using the data slider and load many of the presets individually. Save this bank of sounds to a new disk. Reformat the disk that had the CRC Error on it and use it to store expendable data.

I hope my Emax experiences help you with your sampling. Remember, enjoyment can come from the process of creating a sample as well as from the end result. Put some time into your samples, and you'll get that much closer to your music.

Mike Tucker *is the owner and operator of Rock Warehouse in Fort Meyers, Florida.*

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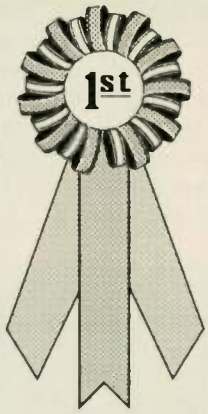

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In general, this is a reasonably solid program. It offers more patch-generating functions than Dr. T, and clearer editing than Opcode. For auditioning, it offers sequence recording and playback plus a Keyboard window similar to Opcode's, with the addition of sending several types of controller data along with the triggered notes. The program's most innovative feature is called PatchSheet™, which shows all patch settings in a list that can be scrolled through for editing.

Excerpt of a review by Freff for **MacUser Magazine** February 1989

The Valhala D-50 Editor/Librarian is a full-featured voice editing and storage program for the Apple Macintosh. I have to say that the Valhala Editor Librarian is a very well constructed program. The manual is clear and the program is easy to learn. It does the job of editing and managing D-50 files very well and it is an outstanding value for only $129.00!

Excerpt of review by Steve Quinzi for **Music & Sound Output** September 1988

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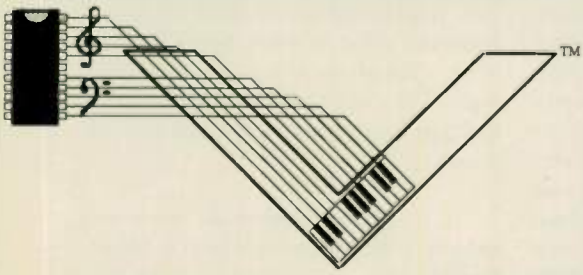

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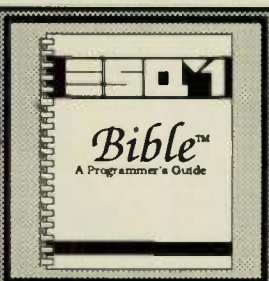

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This useful project (to build or buy) is the missing link between analog, trigger-based, electronic music devices and MIDI—and opens a new world of applications.

The MIDI-to-Trigger Converter

ILLUSTRATION BY RICHARD SALA

I'm still excited! In the last installment (May 1989 EM), I waxed enthusiastic over the possibilities for useful MIDI projects using the 68705 microcomputer on a chip. Now we're going to see how to actually build something with this silicon marvel: a MIDI-to-Trigger Converter (MIDI Trigger for short).

The MIDI Trigger accepts standard MIDI note messages from any MIDI note-generating device (keyboard, sequencer, MIDI guitar, computer, or MIDI drum programmer) and converts these notes to standard trigger outputs suitable for firing analog drums, ADSRs in an analog synthesizer, sample-and-hold modules, relays for lighting control, and much more (see sidebar, "MIDI-to-Trigger Converter Applications"). Since many non-MIDI synths and drum machines are relatively inexpensive these days, this is a great way to expand your capabilities. The MIDI Trigger is polyphonic and can control up to eight devices simultaneously in poly mode (each instrument responds to an individual MIDI channel) or omni mode (instruments respond to information on all MIDI channels). A sophisticated MIDI filter discards everything but the desired note on bytes.

HOW THE CIRCUIT WORKS

Referring to Fig. 1, the 68705 microcomputer forms the heart of this project. The rest of the circuitry provides some buffering and interfaces the chip to the outside world.

The MIDI input signal couples to the device via jack J9, a standard, 5-pin, 180°, female DIN connector. This signal then goes to optocoupler IC1, which isolates the rest of the circuitry from the driving device. The optocoupler's digital output (pin 4) goes directly to pin 27 of the 68705. Pin 27, configured as an input, is PA7 of Port A. When the bits making up the serial byte start to flow in, the microprocessor will read them at this port, at a rate of one bit every 32 microseconds. The bits are assembled into MIDI bytes, which are further analyzed and processed by the 68705 microprocessor before being converted to triggers.

The biggest problem is identifying when the MIDI bytes occur. MIDI is an asynchronous protocol, meaning that

By THOMAS HENRY

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the start bits framing the byte can occur almost any time. To make sure we don't miss any data, we tap off the signal from IC1, pin 4, and after routing it through some NAND gates, send it to interrupt pin 2 of the 68705. The high-to-low transition on the MIDI line indicates a start bit, and this, in turn, fires an interrupt in the processor. The processor halts what it is doing and turns its attention to reading the eight bits comprising the MIDI byte; these appear at PA7 (mentioned above). The processor then exits the interrupt condition and returns to its normal activity until detecting another start bit.

We need the NAND gates because if the interrupt flag is set, interrupts are ignored but *latched for further processing.* Read that again, because this characteristic caused me a week of grief until I figured it out. In human terms, this means that when we are in an interrupt state, if another interrupt occurs, it will be latched; as soon as we exit the interrupt routine, the processor detects the latched flag and we're pulled right back into the interrupt routine again. Clearly, we need to disable external interrupts when in the middle of reading a MIDI byte. You'll notice the first NAND gate is configured as an inverter. The output of this inverter feeds the second NAND gate, pin 1 of IC3. Pin 2 of IC3 is controlled by PA1 (pin 21 of the 68705), and this is an output line of Port A. Here's what we'll do. Normally, we'll leave PA1 in a high state to allow the interrupt signal to pass through to the processor unchanged. But the minute (or microsecond, actually) we jump to the interrupt routine, we'll pull PA1 low, thus effectively sealing off the optocoupler from the interrupt pin. A truth table will convince you of this.

We now have a MIDI byte in the 68705. After checking channel numbers, ignoring pitch bend and other unneeded data, we will end up with a byte that says "trigger output n," where n is an integer from 1 to 8. Let's move on

SOME MIDI-TO-TRIGGER CONVERTER APPLICATIONS

Using analog electronics, you can build useful circuits inexpensively and simply, but interfacing with digital electronics is complicated. Digital circuits are more costly and complex, but provide a great degree of control and predictability. Marrying the two gives you the best of both worlds, and this project lets you do that. So, dust off your analog data books and check out some of the following applications. If any of these really pique your interest, let us know, and we'll see about providing schematics for the more popular options.

Driving analog drum sounds: Older analog drum units respond to trigger pulses, as provided by the MIDI Trigger. This lets you drive analog drums from MIDI notes.

MIDI tape recorder control: Trigger a small relay or FET switch, hooked up in parallel with your recorder's record button. Place a note in a sequence where you want the recorder to go into record.

Pedalboard control: Use various outputs from the MIDI Trigger to drive switches hooked up in parallel with the bypass switches on your effects, and switch effects in and out via MIDI. You may need to condition the trigger pulse with a flip-flop, so the first trigger turns the effect on, and a second trigger turns it off.

Automated 8-channel console muting: Connect eight FET switches in series with the audio line and drive these from the trigger outputs. You'll need to use a flip-flop so the first trigger turns the audio off, and a second trigger turns the audio back on again. Place notes in a sequence where you want to control the audio.

Lighting controller: For this application, you will probably need to either stretch the output pulses or condition them with flip-flops. Simply place notes in a sequence where you want lights to turn on and use the MIDI Trigger outputs to drive optocoupled triacs for lighting control.

Synchronized panning: Feed a trigger output into a flip-flop. Split the flip-flop output in two, invert one, and send each signal to the control voltage of a VCA so when one VCA is on, the other is off. Then, split an audio signal and feed each one to a VCA input; route the VCA outputs to the left and right channels. When you hit the flip-flop with a trigger, the pan position of the signal going through the VCA changes.

Crossfading: This is similar to the above, but feed each flip-flop output through a diode/resistor/capacitor combination to form a simple envelope generator. This provides a gentle sweep rather than hard switching.

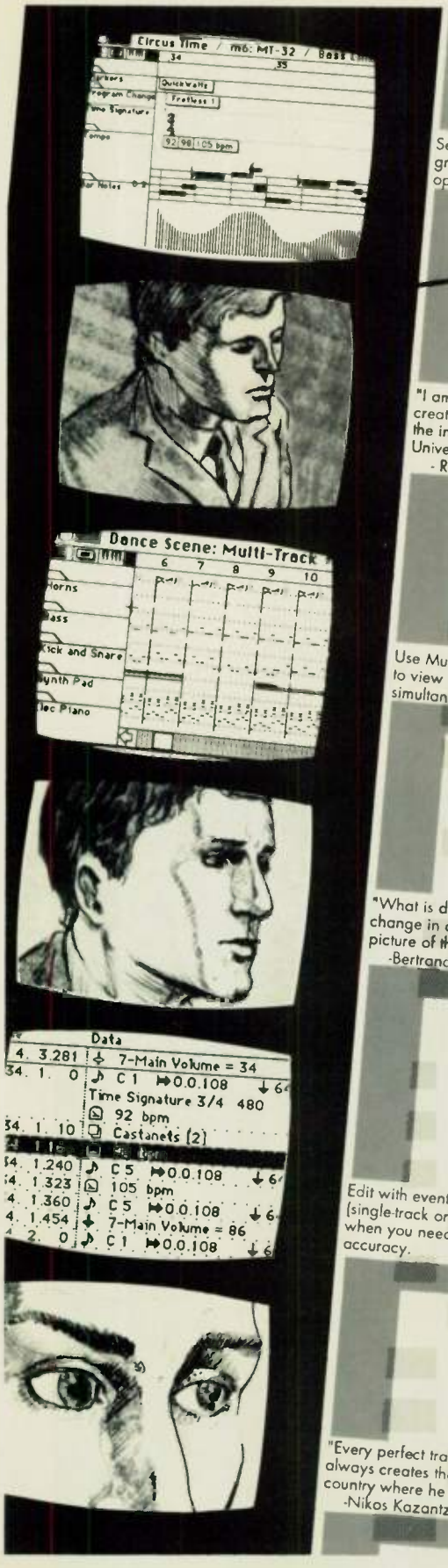
Synchronized LFOs: Synchronizing low-frequency oscillator speed to the tempo of music produces a great effect, but one that is difficult to do with most digital synths. In older analog gear, the LFO speed is usually set by a resistor-capacitor combination. Shorting the capacitor resets the LFO and "hard syncs" the LFO period to the pulse rate of the triggers resetting the LFO. To do this, connect a FET switch, in series with a low-value (e.g., 100Ω) resistor, across the capacitor terminals. Hit the switch with a trigger from the MIDI Trigger to reset the LFO.

Security system: Use a MIDI sequencer to drive the MIDI Trigger, the outputs of which can drive relays, opto-isolators, etc., to turn lights and other appliances on and off.

Other options: A 555 timer chip can be triggered via the MIDI Trigger outputs to do a variety of tricks. For example, the 555 makes a dandy one-chip envelope generator, pulse stretcher, or timer.

The above is just the tip of the iceberg. Just think: anything you can trigger, you can now control via MIDI. And because analog trigger-oriented circuitry is easy to build, these are mostly simple, one-afternoon projects that don't involve burning EPROMs or writing software.

—Craig Anderton



Select from multiple graphic staves with optional numeric views.

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to the output and see what happens there.

To keep things simple in the diagram, only one output (the one for PB0, pin 12) is shown in detail. The other seven outputs use the same circuit design but connect to pins 13 through 19. Recall that the Port B lines are directly LED compatible, which simplifies the circuit. PB0 connects to an LED D2 and limiting resistor R3. When PB0 goes low, the LED lights to indicate that a trigger has occurred. (The software keeps the LED lit long enough for our eyes to see it.) As this line goes low, capacitor C3 (in combination with resistor R32) differentiates the relatively slow transition, creating a more pulse-like signal. Transistor Q1 squares up, buffers, and inverts (to create the proper polarity) the signal. Thus, when the LED lights, there is a 10-millisecond trigger pulse that swings from 0 to +5 volts at output jack J1. This is just what we need to fire drums, ADSR envelope generators, and a bunch of other circuitry.

Switch S1, with its associated pull-up resistor, allows us to choose omni on or off. Note that this switch feeds Port A line PA0 at pin 20, so we'll need to configure PA0 as an input when creating the software. (Note that the switch is reversed from what you would expect. When the switch is closed, omni is off; when open, omni is on.)

Switches S2 through S5 select the

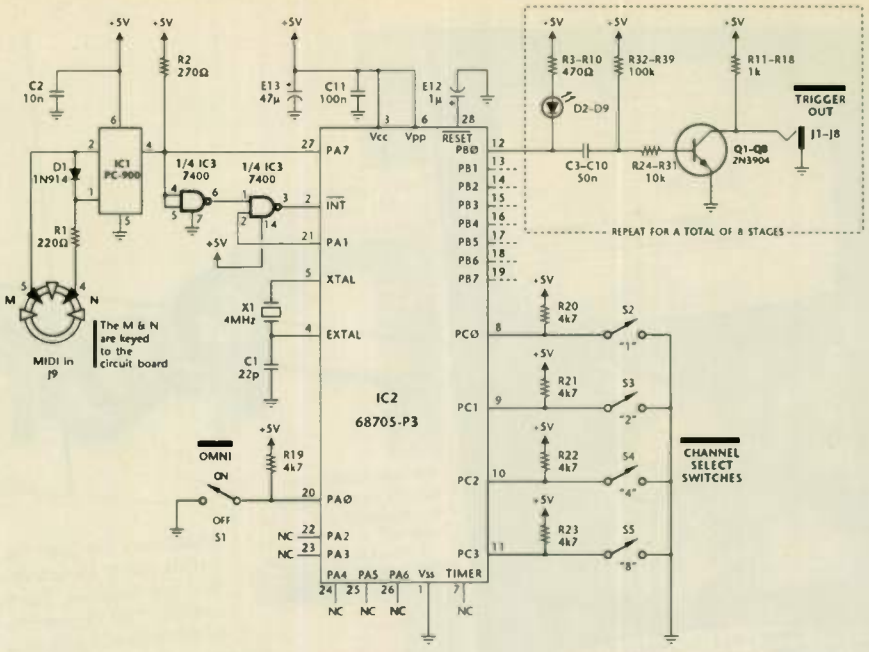

FIG. 1: MIDI-to-Trigger Converter schematic.

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Software Listing for the MIDI Trigger

```
LINE# LOC  CODE      SOURCE                          COMMENT

01020 0000 :
01030 0000 :**********************************
01040 0000 :*                                *
01050 0000 :*   MIDI-TO-DRUMBOX CONVERTER    *
01060 0000 :*                                *
01070 0000 :*         THOMAS HENRY           *
01080 0000 :*       OCTOBER 8, 1988          *
01090 0000 :*    REVISED OCTOBER 19, 1988    *
01100 0000 :*      OCTOBER 29, 1988          *
01110 0000 :*       APRIL 10, 1989           *
01120 0000 :*                                *
01130 0000 :**********************************
01140 0000 :
01150 0000                     .REL  $4000
01160 0000                     .OPT  N,P4
01170 0000 :
01180 0000 :
01190 0000 :*** ASSEMBLER CONSTANTS ***
01200 0000 :
01210 0000           PRETRIG   =    75              :TRIGGER PRESCALE CONSTANT.
01220 0000           TRIGTIME  =    20              :TRIGGER ON-TIME CONSTANT.
01230 0000           QSIZE     =    64              :MAXIMUM QUEUE SIZE.
01240 0000           LOWEST    =    36              :MIDI DATA:
01250 0000           HIGHEST   =    43              :MIDI DATA:
01260 0000 :
01270 0000 :
01280 0000 :*** 68705 MEMORY MAP AND VARIABLES ***
01290 0000 :
01300 0000           START     =    $000            :START OF 68705 MAP.
01310 0000           PORTA     =    START           :I/O PORT A.
01320 0000           PORTB     =    $001            :I/O PORT B.
01330 0000           PORTC     =    $002            :I/O PORT C.
01340 0000           DDRA      =    $004            :DATA DIRECTION A.
01350 0000           DDRB      =    $005            :DATA DIRECTION B.
01360 0000           DDRC      =    $006            :DATA DIRECTION C.
01370 0000           RAMSTART  =    $010            :START OF USER RAM.
01380 0000           INBYTE    =    RAMSTART        :INPUT BYTE BUILT UP HERE.
01390 0000           TRIG1     =    INBYTE+1        :TRIGGER 1 COUNTDOWN.
01400 0000           TRIG2     =    TRIG1+1         :TRIGGER 2 COUNTDOWN.
01410 0000           TRIG3     =    TRIG2+1         :TRIGGER 3 COUNTDOWN.
01420 0000           TRIG4     =    TRIG3+1         :TRIGGER 4 COUNTDOWN.
01430 0000           TRIG5     =    TRIG4+1         :TRIGGER 5 COUNTDOWN.
01440 0000           TRIG6     =    TRIG5+1         :TRIGGER 6 COUNTDOWN.
01450 0000           TRIG7     =    TRIG6+1         :TRIGGER 7 COUNTDOWN.
01460 0000           TRIG8     =    TRIG7+1         :TRIGGER 8 COUNTDOWN.
01470 0000           RUNSTAT   =    TRIG8+1         :RUNNING STATUS FLAG.
01480 0000           QUEUE     =    RUNSTAT+1       :START OF DATA QUEUE.
01490 0000           QNUM      =    QUEUE+QSIZE     :# OF ITEMS IN QUEUE.
01500 0000           QFRONT    =    QNUM+1          :POINTER TO QUEUE FRONT.
01510 0000           QREAR     =    QFRONT+1        :POINTER TO QUEUE REAR.
01520 0000           DIVIDER   =    QREAR+1         :TRIGGER TIME PRESCALER.
01530 0000           KEYFLAG   =    DIVIDER+1       :"SEEN A KEY # YET?
01540 0000           TEMP      =    KEYFLAG+1       :TEMPORARY LOCATION.
01550 0000           STACK     =    $07F            :TOP OF STACK.
01560 0000           ZEPROM    =    $080            :PAGE 0 EPROM.
01570 0000           AEPROM    =    $100            :ABSOLUTE EPROM.
01580 0000           MOR       =    $784            :MASK OPTIONS REGISTER.
01590 0000           BOOTSTRP  =    $785            :PROGRAMMING BOOTSTRAP.
01600 0000           EXTVEC    =    $7FA            :EXTERNAL IRQ VECTOR.
01610 0000           RSTVEC    =    $7FE            :RESET VECTOR.
01620 0000 :
01630 0000 :
01640 0000                     *    =START
01650 0000                     *    =AEPROM         :SKIP OVER EARLIER JUNK.
01660 0100 :
01670 0100 :(BOOTSTRAP WILL IGNORE ALL NON-EPROM ADDRESSES)
01680 0100 :
01690 0100 :
01700 0100 :*** THE RESET VECTOR JUMPS HERE ***
01710 0100 :
01720 0100 :
01730 0100 A6 7E     RESET     LDA   #%01111110      :A7 & A0 ARE INPUTS.
01740 0102 B7 04               STA   DDRA
01750 0104 A6 FF               LDA   #%11111111      :ALL OF B IS OUTPUT.
01760 0106 B7 05               STA   DDRB
01770 0108 A6 00               LDA   #%00000000      :ALL OF C IS INPUT.
01780 010A B7 06               STA   DDRC
01790 010C A6 FF               LDA   #%11111111
01800 010E B7 01               STA   PORTB           :CLEAR ALL OUTPUTS.
01810 0110 3F 19               CLR   RUNSTAT         :NO RUNNING STATUS YET.
01820 0112 3F 5E               CLR   KEYFLAG         :NO KEY # SEEN YET.
01830 0114 3F 5A               CLR   QNUM            :INITIALIZE THE QUEUE.
01840 0116 3F 5B               CLR   QFRONT
01850 0118 A6 3F               LDA   #QSIZE-1
01860 011A B7 5C               STA   QREAR
01870 011C 12 00               BSET  1,PORTA         :ENABLE EXTERNAL IRQ'S.
01880 011E :
01890 011E AE 07               LDX   #7
01900 0120 6F 11     RESET1    CLR   TRIG1,X1        :CLEAR ALL TRIGGERS.
01910 0122 5A                  DEC   X
01920 0123 2A FB               BPL   RESET1
01930 0125 9A                  CLI
01940 0126 :
01950 0126 :
01960 0126 :*** MAIN LOOP - HANDLE ALL MIDI MESSAGES ***
01970 0126 :
01980 0126 :
01990 0126 3D 5A     MAIN      TST   QNUM            :"ANYTHING IN QUEUE?
02000 0128 27 5B               BEQ   MAIN7           :NO. SKIP AHEAD.
02010 012A :
02020 012A BE 5B               LDX   QFRONT
02030 012C E6 1A               LDA   QUEUE,X1        ;GET BYTE TO PROCESS.
02040 012E 97                  TAX                   :SAVE TEMPORARILY.
02050 012F 3A 5A               DEC   QNUM            :ONE LESS ITEM IN QUEUE.
02060 0131 B6 5B               LDA   QFRONT          ;GET FRONT POINTER.
02070 0133 4C                  INC   A               :POINT TO NEXT ITEM.
02080 0134 A4 3F               AND   #QSIZE-1        :MODULO THE QUEUE SIZE.
```

FIG. 2: Listing

continued on page 64

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CMS

LISTING, from page 63

```
LINE# LOC  CODE      SOURCE                          COMMENT

02090 0136 B7 5B            STA   QFRONT
02100 0138 9F               TXA                     ;RESTORE DATA BYTE.
02110 0139 4D               TST   A
02120 013A 2B 12            BMI   MAIN1             ;BRANCH IF STATUS BYTE.
02130 013C ;
02140 013C 0E 19 27         BRSET 7,RUNSTAT,MAIN5   ;BRANCH IF RUNNING STATUS.
02150 013F 3D 5A            TST   QNUM              ;"VELOCITY BYTE LEFT?
02160 0141 27 42            BEQ   MAIN7             ;NO. SKIP AHEAD.
02170 0143 ;
02180 0143 3A 5A            DEC   QNUM              ;DISCARD VELOCITY BYTE.
02190 0145 B6 5B            LDA   QFRONT            ;GET FRONT POINTER.
02200 0147 4C               INC   A                 ;POINT TO NEXT ITEM.
02210 0148 A4 3F            AND   #QSIZE-1          ;MODULO THE QUEUE SIZE.
02220 014A B7 5B            STA   QFRONT
02230 014C 20 37            BRA   MAIN7             ;THEN SKIP AHEAD.
02240 014E ;
02250 014E A4 F0    MAIN1   AND   #%11110000        ;STRIP OFF CHANNEL.
02260 0150 A1 90            CMP   #%10010000        ;"NOTE-ON?
02270 0152 27 04            BEQ   MAIN3             ;BRANCH IF YES.
02280 0154 ;
02290 0154 1F 19    MAIN2   BCLR  7,RUNSTAT         ;TURN OFF RUNNING STATUS.
02300 0156 20 2D            BRA   MAIN7             ;DISCARD STATUS AND PROCEED.
02310 0158 ;
02320 0158 00 00 07 MAIN3   BRSET 0,PORTA,MAIN4     ;BRANCH IF OMNI ON.
02330 015B 9F               TXA                     ;REGET STATUS BYTE.
02340 015C B8 02            EOR   PORTC             ;COMPARE WITH CHANNEL.
02350 015E A4 0F            AND   #%00001111        ;STRIP GARBAGE OFF.
02360 0160 26 F2            BNE   MAIN2             ;WRONG CHANNEL.
02370 0162 ;
02380 0162 1E 19    MAIN4   BSET  7,RUNSTAT         ;ELSE SET RUNNING STATUS.
02390 0164 20 1F            BRA   MAIN7
02400 0166 ;
02410 0166 ;
02420 0166 ;*** HANDLE NOTE DATA ***
02430 0166 ;
02440 0166 ;
02450 0166 0E 5E 06 MAIN5   BRSET 7,KEYFLAG,MAIN6  ;BRANCH IF VELOCITY BYTE.
02460 0169 B7 5F            STA   TEMP              ;SAVE KEY # UNTIL VELOCITY.
02470 016B 1E 5E            BSET  7,KEYFLAG         ;FLAG:
02480 016D 20 16            BRA   MAIN7
02490 016F ;
02500 016F 1F 5E    MAIN6   BCLR  7,KEYFLAG         ;TOGGLE FLAG BACK.
02510 0171 4D               TST   A                 ;"IS VELOCITY 0? (NOTE OFF?)
02520 0172 27 11            BEQ   MAIN7
02530 0174 ;
02540 0174 ;
02550 0174 ;*** HANDLE DRUM DATA BYTES ***
02560 0174 ;
02570 0174 ;
02580 0174 B6 5F            LDA   TEMP              ;GET MIDI NOTE DATA.
02590 0176 A1 24            CMP   #LOWEST           ;SEE IF IN RANGE.
02600 0178 25 0B            BLO   MAIN7             ;BELOW ACCEPTABLE KEY #.
02610 017A A1 2B            CMP   #HIGHEST
02620 017C 22 07            BHI   MAIN7             ;ABOVE ACCEPTABLE KEY #.
02630 017E ;
02640 017E A0 24            SUB   #LOWEST           ;MAKE OFFSET FROM KEY#.
02650 0180 97               TAX                     ;PUT IN INDEX REGISTER.
02660 0181 A6 14            LDA   #TRIGTIME         ;TRIGGER TIME CONSTANT.
02670 0183 E7 11            STA   TRIG1,X1          ;PUT IN RIGHT DRUM.
02680 0185 ;
02690 0185 ;
02700 0185 ;*** UPDATE TRIGGER OUTPUTS ***
02710 0185 ;
02720 0185 ;
02730 0185 3A 5D    MAIN7   DEC   DIVIDER           ;DEC TRIGGER PRESCALER.
02740 0187 26 1F            BNE   MAIN12            ;DON'T DEC TRIGGERS YET.
02750 0189 A6 4B            LDA   #PRETRIG          ;RESET TRIGGER PRESCALER.
02760 018B B7 5D            STA   DIVIDER
02770 018D ;
02780 018D AE 07            LDX   #7
02790 018F 6D 11    MAIN8   TST   TRIG1,X1          ;"ALREADY AT ZERO?
02800 0191 27 02            BEQ   MAIN9             ;YES, DON'T DEC ANYMORE.
02810 0193 6A 11            DEC   TRIG1,X1          ;DEC TRIGGER ON-TIME.
02820 0195 5A       MAIN9   DEC   X
02830 0196 2A F7            BPL   MAIN8
02840 0198 ;
02850 0198 4F               CLR   A                 ;CLEAR TRIGGER BITS.
02860 0199 AE 07            LDX   #7
02870 019B 6D 11    MAIN10  TST   TRIG1,X1          ;"DOWN TO ZERO YET?
02880 019D 99               SEC                     ;ASSUME NOT ZERO.
02890 019E 26 01            BNE   MAIN11
02900 01A0 98               CLC                     ;UPDATE THE ASSUMPTION.
02910 01A1 49       MAIN11  ROL   A                 ;ROLL IN TRIGGER BIT.
02920 01A2 5A               DEC   X
02930 01A3 2A F6            BPL   MAIN10
02940 01A5 ;
02950 01A5 43               COM   A                 ;TURN OFF THE TRIGGERS
02960 01A6 B7 01            STA   PORTB             ;WHICH ARE DONE NOW.
02970 01A8 CC 01 26 MAIN12  JMP   MAIN              ;START MAIN LOOP AGAIN.
02980 01AB ;
02990 01AB ;
03000 01AB ;*** INTERRUPT ROUTINE - READ SERIAL BYTE ***
03010 01AB ;
03020 01AB ;
03030 01AB 13 00    IRQ     BCLR  1,PORTA           ;DISABLE FURTHER IRQS.
03040 01AD 3F 10            CLR   INBYTE            ;BYTE BUILT UP HERE.
03050 01AF BE 5A            LDX   QNUM              ;"ENOUGH ROOM IN QUEUE?
```


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```
LINE# LOC  CODE      SOURCE                    COMMENT

03060 01B1 A3 3E          CPX   #QSIZE-2
03070 01B3 22 71          BHI   IRQ1          ;BRANCH IF NOT.
03080 01B5 3C 5A          INC   QNUM          ;BUMP QUEUE COUNTER.
03090 01B7 B6 5C          LDA   QREAR         ;GET REAR POINTER.
03100 01B9 ;
03110 01B9 BE 00          LDX   PORTA         ;READ BIT 0.
03120 01BB 59             ROL   X
03130 01BC 36 10          ROR   INBYTE
03140 01BE 4C             INC   A             ;BUMP REAR POINTER.
03150 01BF A4 3F          AND   #QSIZE-1      ;MODULO THE QUEUE SIZE.
03160 01C1 C7 00 5C       STA   !QREAR
03170 01C4 9D             NOP:
03170 01C5 9D             NOP:
03170 01C6 9D             NOP                 ;KILL SOME TIME.
03180 01C7 ;
03190 01C7 B6 00          LDA   PORTA
03200 01C9 49             ROL   A             ;READ BIT 1.
03210 01CA 36 10          ROR   INBYTE
03220 01CC 9D             NOP:
03220 01CD 9D             NOP:
03220 01CE 9D             NOP:
03220 01CF 9D             NOP:
03220 01D0 9D             NOP
03230 01D1 9D             NOP:
03230 01D2 9D             NOP:
03230 01D3 9D             NOP:
03230 01D4 9D             NOP
03240 01D5 ;
03250 01D5 B6 00          LDA   PORTA
03260 01D7 49             ROL   A             ;READ BIT 2.
03270 01D8 36 10          ROR   INBYTE
03280 01DA 9D             NOP:
03280 01DB 9D             NOP:
03280 01DC 9D             NOP:
03280 01DD 9D             NOP:
03280 01DE 9D             NOP
03290 01DF 9D             NOP:
03290 01E0 9D             NOP:
03290 01E1 9D             NOP:
03290 01E2 9D             NOP
03300 01E3 ;
03310 01E3 B6 00          LDA   PORTA
03320 01E5 49             ROL   A             ;READ BIT 3.
03330 01E6 36 10          ROR   INBYTE
03340 01E8 9D             NOP:
03340 01E9 9D             NOP:
03340 01EA 9D             NOP:
03340 01EB 9D             NOP:
03340 01EC 9D             NOP
03350 01ED 9D             NOP:
03350 01EE 9D             NOP:
03350 01EF 9D             NOP:
03350 01F0 9D             NOP
03360 01F1 ;
03370 01F1 B6 00          LDA   PORTA
03380 01F3 49             ROL   A             ;READ BIT 4.
03390 01F4 36 10          ROR   INBYTE
03400 01F6 9D             NOP:
03400 01F7 9D             NOP:
03400 01F8 9D             NOP:
03400 01F9 9D             NOP:
03400 01FA 9D             NOP
03410 01FB 9D             NOP:
03410 01FC 9D             NOP:
03410 01FD 9D             NOP:
03410 01FE 9D             NOP
03420 01FF ;
03430 01FF B6 00          LDA   PORTA         ;READ BIT 5.
03440 0201 49             ROL   A
03450 0202 36 10          ROR   INBYTE
03460 0204 9D             NOP:
03460 0205 9D             NOP:
03460 0206 9D             NOP:
03460 0207 9D             NOP:
03460 0208 9D             NOP
03470 0209 9D             NOP:
03470 020A 9D             NOP:
03470 020B 9D             NOP:
03470 020C 9D             NOP
03480 020D ;
03490 020D B6 00          LDA   PORTA         ;READ BIT 6.
03500 020F 49             ROL   A
03510 0210 36 10          ROR   INBYTE
03520 0212 B6 5C          LDA   QREAR         ;FORM QUEUE ADDRESS.
03530 0214 AB 1A          ADD   #QUEUE
03540 0216 97             TAX
03550 0217 9D             NOP:
03550 0218 9D             NOP:
03550 0219 9D             NOP:
03550 021A 9D             NOP
03560 021B ;
03570 021B B6 00          LDA   PORTA         ;READ BIT 7.
03580 021D 49             ROL   A
03590 021E 36 10          ROR   INBYTE
03600 0220 ;
03610 0220 B6 10          LDA   INBYTE
```

continued on page 66

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CMS

MIDI channel number. Like the omni switch mentioned above, there are pull-up resistors to ensure proper operation. These switches feed all four bits of Port C (pins 8 through 11), so all of Port C will be configured as inputs. Again, the sense of the switches is reversed: a closed switch represents 0, while an open switch represents 1. Think of these switches arranged side-by-side and representing a binary number; the switches may be toggled in various combinations to represent binary numbers 0000 through 1111 (0 through 15 in decimal), which correspond to MIDI channels 1 through 16. To help you keep things straight, the switches have been labeled 1, 2, 4, and 8, which represent their various binary "weights."

To read MIDI bytes successfully, the 68705 needs a reliable time base, as provided by the 4 MHz crystal (X1). Four MHz is pretty fast, but we need this speed to do more than just read in bytes.

It is imperative that the 68705 start in a known condition at power-up, so capacitor E12 (found at the reset input, pin 28) provides a time constant during which the microprocessor stabilizes and gets ready to work its tail off for us.

Finally, regarding power supply connections, pin 1 connects to ground and pin 3 connects to +5 volts DC. Pin 6, the programming voltage input, is also tied high once the chip has been programmed. Pins 7 and 22 through 26 are not used and may be left floating.

AND HERE COMES THE SOFTWARE...

But what about the software (or firm-

LISTING, from page 65

```
LINE# LOC  CODE      SOURCE                          COMMENT

03620 0222 F7                  STA   (X)             ;PUT BYTE IN QUEUE.
03630 0223 12 00               BSET  1,PORTA         ;RE-ENABLE IRQS.
03640 0225 80                  RTI
03650 0226 ;
03660 0226 AE 15     IRQ1      LDX   #21             ;KILL SOME TIME.
03670 0228 5A        IRQ2      DEC   X
03680 0229 9D                  NOP
03690 022A 9D                  NOP
03700 022B 26 FB               BNE   IRQ2
03710 022D 12 00               BSET  1,PORTA         ;RE-ENABLE IRQS.
03720 022F 80                  RTI
03730 0230 ;
03740 0230                     *     =MOR
03750 0784 20                  .BYTE %00100000       ;SEE COMMENT BELOW:
03760 0785 ;
03770 0785 ;THIS IS THE MASK OPTIONS REGISTER:
03780 0785 ;BIT 7 = SELECT CRYSTAL CONTROLLED CLOCK.
03790 0785 ;BIT 6 = SELECT SOFTWARE CONTROLLED COUNTER.
03800 0785 ;BIT 5 = INITIALIZE TO CLOCK OFF.
03810 0785 ;BIT 4 = SELECT PHI2 AS CLOCK SOURCE.
03820 0785 ;BIT 3 = NOT USED.
03830 0785 ;BITS 2,1,0 = PRESCALER.
03840 0785 ;
03850 0785                     *     =EXTVEC
03860 07FA 01 AB               .WORD IRQ             ;EXTERNAL IRQ ROUTINE.
03870 07FC                     *     =RSTVEC
03880 07FE 01 00               .WORD RESET           ;STARTUP ROUTINE.
03890 0800 ;
03900 0800 ;
```


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ware, to be more accurate)? There isn't space to go into all of the details, but **Fig. 2** shows the complete source code for the MIDI Trigger. This is a real lesson in itself and demonstrates principles used in many commercial MIDI circuits. Furthermore, you will find lots of sections (like the serial input routine) to be directly usable in a host of other MIDI projects. Now a bit of warning: I had to break just about every rule of structured design in writing this code to keep the speed up. So if the program seems ugly, you're right, it is. In spite of this, there's a lot to learn here, so dig in.

FINDING THE PARTS

Let's put the theory behind us and start building. First, collect all of the needed parts. The PC-900 is easy to find now, thanks to the **EM** Bookshelf, which sells them for a mere $3 each (see the FYI page for more information). I got the panel-mount, 5-pin, DIN jack from Jameco Electronics (1355 Shoreway Road, Belmont, CA 94002), which also happens to stock the 68705. I have sometimes seen this chip sold as surplus for less than the usual price, so shop around. You can follow my suggestions in the last installment to "burn" (program) the 68705 yourself. If you would rather not mess with this, I am providing a 68705-burning service to **EM** readers. Send one blank MC68705P3; one self-addressed, stamped (75 cents postage), padded envelope; and a check or money order for $4 to Thomas Henry, 805 South Avenue, N. Mankato, MN 56001. All the other parts are easy to find and may be obtained from almost any mail-order parts house.

If you'd prefer to purchase a complete kit, Hobby Electronic (PO Box 1339, Claremont, NH 03743; tel. (603) 542-6291) sells a complete MIDI-to-Trigger converter kit for $139. This includes all parts (including an onboard 5V regulator not shown on the schematic), a circuit board, and a 19-inch, rack-mount front panel. The circuit board is larger than the one shown in **Figs. 3** and **4** and is designed so all switches, LEDs, etc., mount directly to the board. Some individual parts are also available from Hobby Electronic (circuit board, $35; programmed processor, $35; rack-mount front panel, $35). A built and

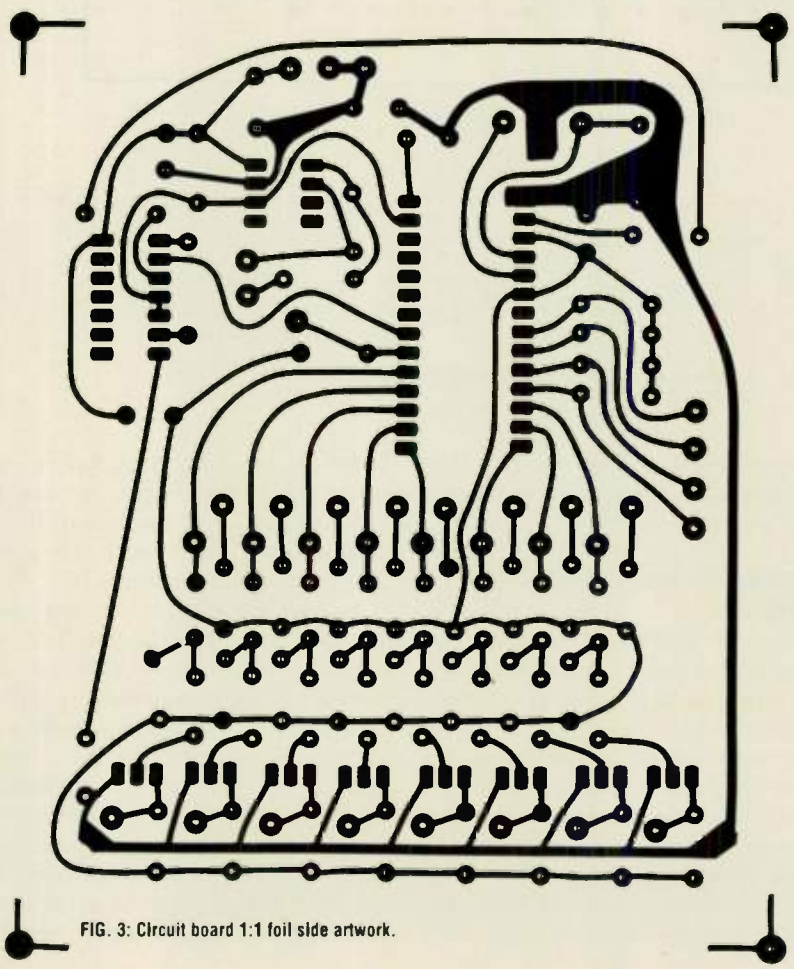
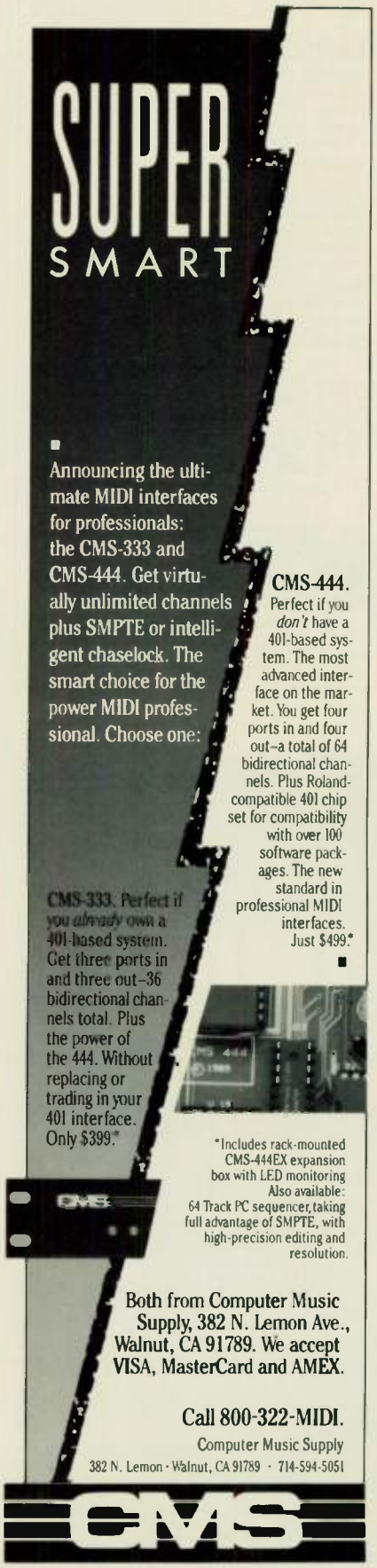


FIG. 3: Circuit board 1:1 foil side artwork.



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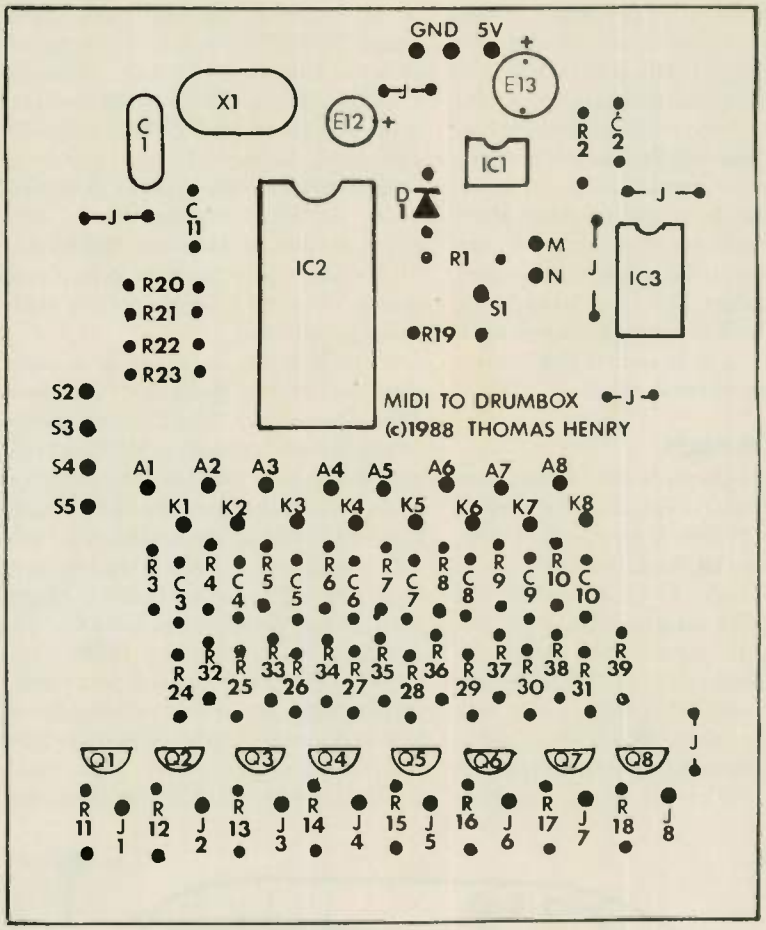


FIG. 4: Circuit board component layout.

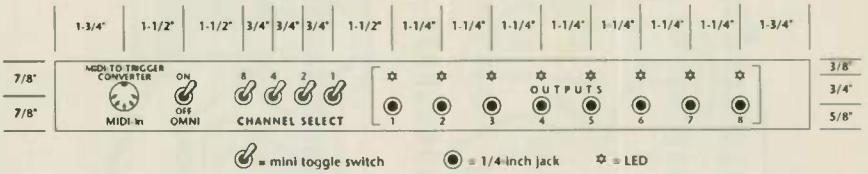


FIG. 5: Suggested front panel layout (rack format).

tested version is available for $175. Shipping is $8, and add tax where applicable; allow two to six weeks for delivery.

BUILDING THE MIDI-TO-TRIGGER CONVERTER

Use a circuit board for best results. Fig. 3 shows the foil pattern and Fig. 4 the component layout. If you wire-wrap instead of using a circuit board, run short and direct leads to the crystal, since extra capacitance will hinder speed. Do not build a rat's nest of loose wires.

When loading the circuit board, check polarities of the diodes, capacitors, ICs, and transistors (see Fig. 6). The PC-900 is a 6-pin device, but the circuit board provides pads for an 8-pin socket. Install the PC-900 in pins 1-3 and 6-8 (ignore the "lower" pin holes); fill the holes for pins 4 and 5 with glue so you won't accidentally use them.

To complete the circuit board, install the six wire jumpers, labeled "J." Don't confuse the jumpers with pads J1 through J8, which go to the output jacks.

Fig. 5 shows a drilling pattern for a 19-inch x 1¾-inch rack panel. Mount the 5-pin DIN jack in a ⅝-inch hole and use Fig. 7 as your wiring guide. Pad "M" on the circuit board goes to pin 5, and pad "N" goes to pin 4. Use shielded cable for the MIDI jack; ground the shield at one end only, and do not connect pin 2 of

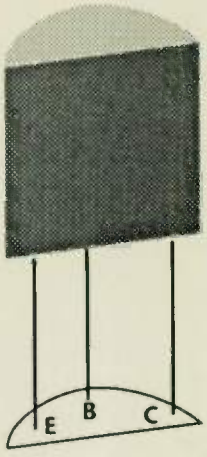


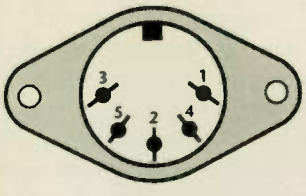
FIG. 6: Flat side of transistor shows orientation of emitter, base, and collector.

the 5-pin DIN jack to anything. Pads A1 through A8 connect to the anodes of the eight LEDs (outputs 1 through 8, respectively), and pads K1 through K8 connect to the LED cathodes. The output jacks get their signals from pads J1 through J8.

Switches S1 through S5 go to their respective circuit-board pads; a redundant ground (GND) pad provided on the board runs to the common switch terminals. Finally, the supply-voltage pads are labeled 5V and GND.

TESTING AND USING

Build the board, complete the panel wiring, double-check your work for solder bridges or questionable connections, then apply power. Connect a MIDI keyboard or equivalent to the input and set S1 to omni. The MIDI Trigger maps to MIDI notes 36 through 43 (C through G, two octaves below middle C). Play these notes in various combinations to confirm that the LEDs flash, and the trigger outputs actually fire something. Now turn omni off, select a channel, and confirm that the unit responds to data on that channel only.



Front View

FIG. 7: MIDI jack pin numbers.

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R2	270 Ω
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R11-R18	1 kΩ
R19-R23	4.7 kΩ (4k7)
R24-R31	10 kΩ
R32-R39	100 kΩ

CAPACITORS

C1	22 pF silver-mica
C2	0.01 µF (10n)
C3-C10	0.05 µF (5n) mylar
C11	0.1 µF (100n)
E12	1 µF electrolytic
E13	47 µF electrolytic

SEMICONDUCTORS

D1	1N914
D2-D9	Red LED
Q1-Q8	2N3904 transistor
IC1	PC-900 optocoupler
IC2	MC68705P3
IC3	7400 NAND gates

MISCELLANEOUS

J1-J8	1/4-inch, open-circuit phone jack
J9	5-pin DIN jack (180°)
S1-S5	SPST mini toggle switch
Other	Sockets, wire, solder, hardware, front panel, circuit board, etc.

If the MIDI Trigger passes all these tests, congratulations! Let your mind really sail and come up with some applications; to get you started, check out the sidebar. If you come up with any great applications of your own, send them to **EM**. In our next installment, we'll cover a MIDI-to-CV converter, so you can bring your old synths into the MIDI age. See you then.

Thomas Henry, *who started writing electronic music articles in 1979, taught himself electronic design by poring over the pages of* Electronotes. *In 1984, he was awarded a Master of Arts degree in mathematics from Mankato State University. His outside interests include etymology, amateur astronomy, and bird watching.*

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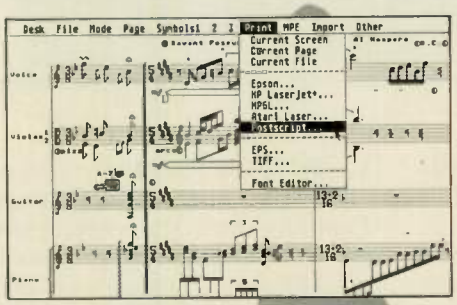

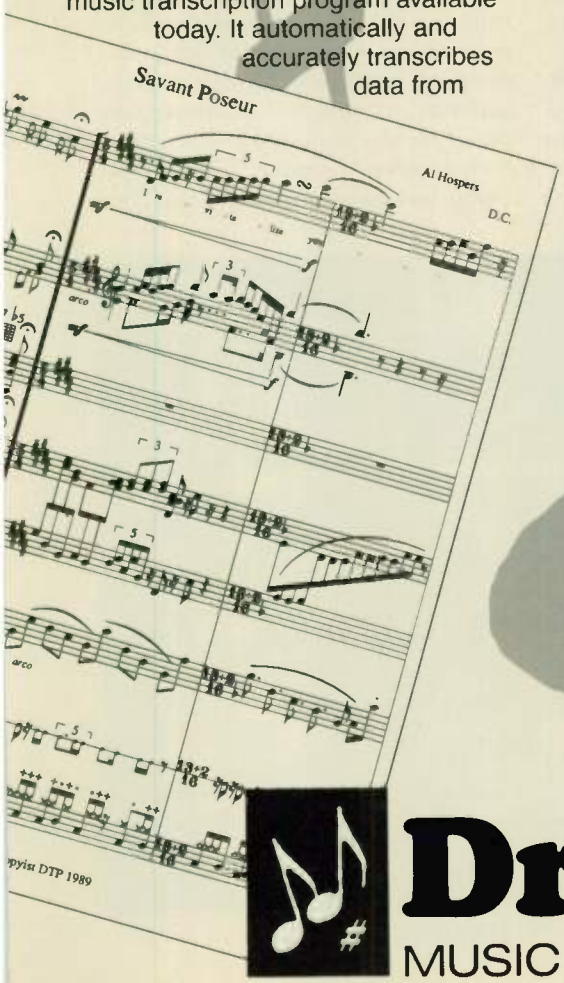

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- Smooth dynamics, and beams
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  - SMUS (Amiga)
  - Steinberg Pro 24 (Atari ST)
  - Texture (IBM)
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- Printer support:
  - Atari laser printer
  - HP Laserjet Plus
  - HP Plotters (ST and IBM)
- User-editable Macros
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- Part generator
- Scores to sequencer formats utility.
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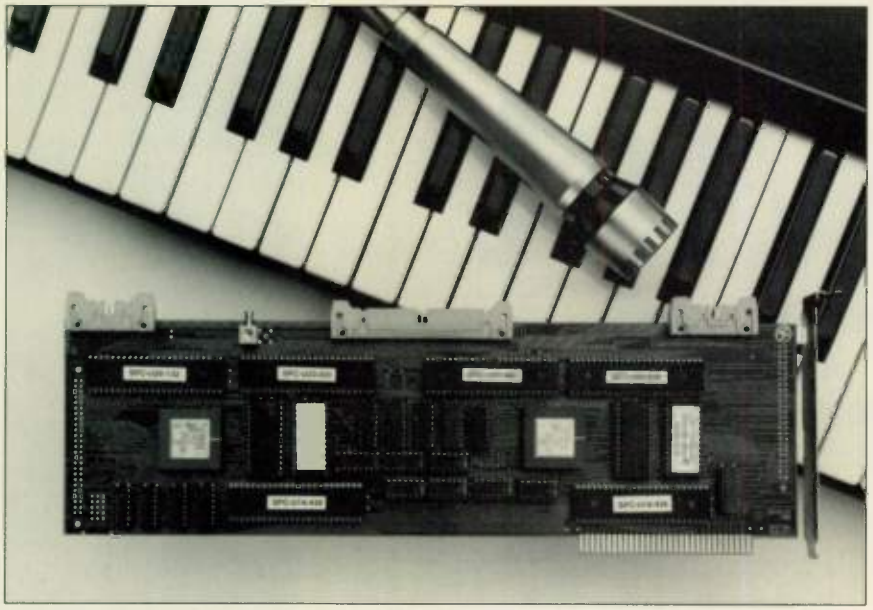

The Spectral Synthesis SynthEngine includes plug-in DSP SynthCards that use a high-speed bus.

noise. Sonic Solutions, 6115 California St., San Francisco, CA 94121; tel. (415) 751-8666.

The Spectral Synthesis **SynthEngine** is built around a rack-mount PC AT-compatible and includes complete controlling software, plug-in DSP SynthCards that use a high-speed FlyBy bus, and an optional tabletop control console. External, 16-bit modules sample up to 96 kHz; the system can process analog input or digital data and uses sampling and modular algorithmic construction to develop, process, and synthesize sounds simultaneously. SynthEngine digitally mixes multiple channels and outputs directly to SPDIF or AES/EBU-standard ports. A lower-priced *starter kit* for IBM-compatible PCs consists of a FlyBy bus controller, one SynthCard, and AudioCAD software. Spectral Synthesis, 15253 NE 90th St., Redmond, WA 98052; tel. (206) 882-0737.

The Steinberg Digital Audio **Topaz** is a rack-mount, hard disk recorder and editing system designed to be controlled by a companion Macintosh II. Up to eight units can be daisy-chained together for a maximum of sixteen channels under full time code synchronization. An optional remote-control surface features two servo-controlled faders and software-defined buttons for real-time gain control. Each unit houses a 360-megabyte hard drive and A/D-D/A cards for 32, 44.1, and 48 kHz sampling; total recording capacity is 65 minutes of mono audio at a 48 kHz sampling rate. The Mac II runs custom software that enables in/out ports, channel level, pan, 3-band EQ, filters, replay speed, pitch, and time correction to be controlled from the Mac keyboard or mouse. Steinberg Digital Audio, 17700 Raymer St., Suite 1003, Northridge, CA 91325; tel. (818) 993-4091.

The Symetrix **DPR-100 Digital Processing Recorder** is a stand-alone, high-speed, input/output device that, in conjunction with a Mac II, provides control and signal manipulation. Up to eight audio channels can be digitized, mixed, and cut-and-splice edited to a pair of analog or digital outputs. Audio ins/outs can be analog or AES/EBU and SDIF-2 digital. Real-time digital signal-processing tasks include level adjustment, pan, and 3-band parametric equalization; offline processing currently includes time expansion/compression. A 4-track version allows simultaneous 2-track recording and 4-track playback, while a larger 8-track configuration offers simultaneous 4-in/8-out. Future enhancements will include a dedicated controller console with digital faders, pan, solo, mute, software-definable keys, and multitrack recorder controls. Symetrix, 4211 24th Ave. West, Seattle, WA 98199; tel. (206) 282-2555.

The WaveFrame Corporation **AudioFrame** is a networked system of signal processing and recording modules connected to a master ALR 386 PC host controller and is capable of accommodating sampling frequencies between 32 and 50 kHz. Up to eight simultaneous channels can be input or output from each processing rack via analog and AES/EBU, SPDIF, SDIF-2, and other digital formats; additional racks can be connected to the host for extended capacity. A proprietary Digital Audio Bus designed specifically for digital audio applications, along with fixed-rate sampling, enables high-speed communications between the input, output, processing, and recorder subunits that com-

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A hard drive equipped with a SCSI asynchronous port will run at between 1.5 and 2 megabits per second, or from 11.2 to 15 megabytes per minute, so there are no problems in shuffling the data off to the recording medium. (WORM optical drives can only run at around 500 kilobits per second, so digital data needs to be buffered prior to being output; real-time playback of multichannel data from an optical system pushes its throughput capability.)

A 140-megabyte hard drive—the type found in some of the upper-end Mac IIx or IBM PS-2-based workstations—will hold just under fifteen minutes of two-channel audio. More SCSI-equipped, hard/optical drives can be added to provide, typically, a maximum of around 1.6 gigabytes of storage, equivalent to 2.5 hours of stereo audio. —*ML*

prise the modular AudioFrame system. Up to 355 track-seconds of onboard, RAM-based data storage are available at a 44.1 kHz sampling frequency (additional capacity is available with lowered sampling frequencies); SCSI-equipped hard disk and optical drives expand the amount of storage to 90, 150 or 300 MB. WaveFrame, 4725 Walnut St., Boulder, CO 80301; tel. (303) 447-1572.

Mel Lambert *has been actively involved with professional audio on both sides of the Atlantic for more than a decade and for seven years served as editor of* Recording Engineer/Producer *magazine. He now runs Media&Marketing, a consultancy service for the pro audio industry.*

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Secrets of the Steinberg/Jones Pro-24 III Sequencer

The Pro-24 may just be the most powerful sequencer available for the Atari ST. Here's an in-depth tour that can show you some great techniques.

By Geoffrey Ryle

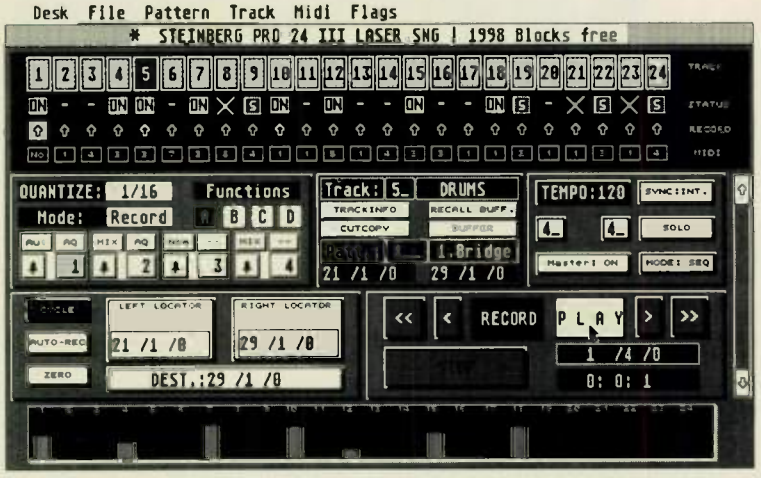

FIG. 1: Pro-24's Main Display Page is loaded with useful information. Note the MIDI activity meters at the bottom.

The Pro-24 III sequencer now has more than 30,000 users. But like any specialized program, it has several anomalies the potential power user must learn, and there are several available enhancements that can make life with this powerful sequencer more bearable.

As an employee of Steinberg/Jones, I've learned a lot about Pro-24, and I wrote the *Pro-24 III Handbook* so people could get the most out of the sequencer without losing patience. This article excerpts some of the book's most helpful tips and suggestions to give **EM** readers who don't know the program an idea of what it can do and put Pro-24 III owners on the road to becoming power users.

SETTING UP

Your goal in setting up should be to streamline the system's operation, encouraging productivity. The simplest MIDI setup keeps your master keyboard as a controller with no internal voices of its own. In this case, connect its MIDI out to the Atari's MIDI in. (Because it is not necessary to send information back to the keyboard, you don't have to connect anything to its MIDI in, if it has one.) You can now "daisy-chain," connecting the Atari's MIDI out to your first device, connecting that device's MIDI thru to the next device, and so on. Better still, connect the Atari's MIDI out to a MIDI thru box that simultaneously sends the signal to several devices. Finally, turn on the MIDI thru option in Pro-24's MIDI definitions window.

If your master controller is a synthesizer or sampler that makes sounds of its own, you may experience stuck notes (i.e., notes that sustain after the sequence stops) or similar MIDI thru problems. You can test for this by turning off the MIDI thru function. Atari decided to put a MIDI thru signal on a normally unused pin of its MIDI out port, so MIDI messages may still be coming from your ST when you think they shouldn't. Some MIDI cables short out two of their five pins, and MIDI thru will always be on if you use one of these cables, causing several problems. If you're sure you're using a five-lead MIDI cable on the Atari's MIDI out you'll be okay. Otherwise, you can build a "MIDI neutralizer" to solve the problem once and for all (see sidebar).

If your keyboard includes Local Control on/off, turn it off. In this condition, the synth's internal voices cannot be played directly from its own keyboard, but only through the sequencer, via MIDI in; however, playing the keyboard transmits MIDI data over its MIDI out port to the computer. This simulates the setup discussed above—using the voiceless controller—and minimizes problems such as double-triggering and stuck notes.

Most of the time, a stuck note occurs because you've hit Stop before the sequencer has a chance to send a note off command for that note. Sometimes, however, the culprit is a missing *sustain-pedal* off command. Likewise, MIDI pitch bend data may not return to zero when playback stops, transposing a synth by a random amount the next time you start the sequence. Selecting Reset On Stop from Pro-24's Flags menu fixes this by returning *all* controllers to the zero or off position whenever you hit Stop. I've found that keeping Reset On Stop selected (checked) at all times saves headaches.

Another part of setting up involves filtering data. Simple, piano-style comping chords or drum parts may not need pitch bend or aftertouch; but even if a given patch on your synth doesn't use a continuous controller, your keyboard, guitar, or wind driver may still send it and clog up your tracks (and memory) with useless data. The solution is to set up the sequencer's input filters not to record unnecessary data.

Select Definitions from the MIDI pull-down menu and click the left mouse

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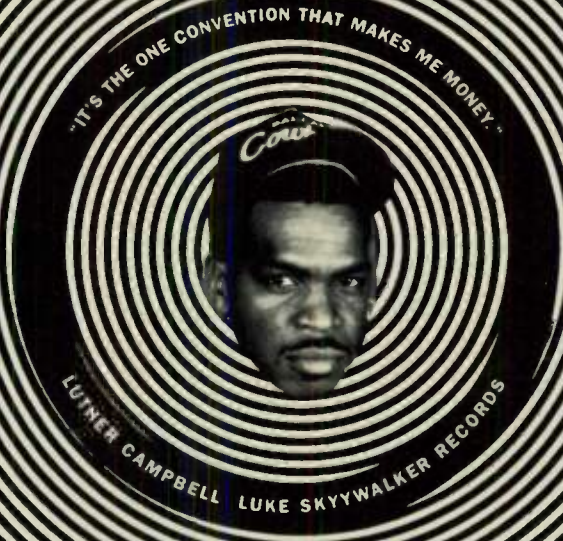

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button on the Rec. Filter box; a menu drops down showing several types of MIDI events you can filter from the recording. Keep the status of your MIDI record filters in mind all the time. Some parts (solos, dynamic pads, etc.) will benefit greatly from the expressiveness that controller data allows; when you want to record this data, turn the corresponding filters off.

THE LEFT, RIGHT, AND DESTINATION LOCATORS

These locators are the primary tools of Pro-24 III. Although the destination locator works only with the copy functions, the left and right locators dictate the boundaries for many of the actions you perform.

Whenever possible, let the computer do the work for you. For example, if you want to record 32 bars beginning at measure 137, you have to type only the values "L" and "137" into the left locator, and "R" and "+32" into the right locator, to define the recording region. Another of Pro-24's automated conveniences lets you use the mouse to drag virtually any position indicator on the main display page into the left, right, or destination locators. So if you wish to edit a particular pattern, you just drag the text "Patt.:" from the middle of the screen into either the left or right locator, which places a copy of the start and

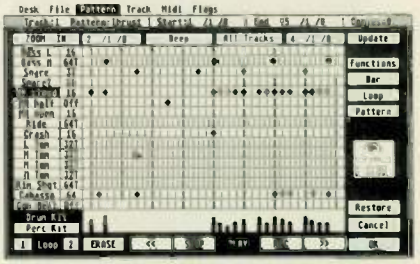

FIG. 2: You can use the Drum Edit window to divide any track into 96 monophonic tracks.

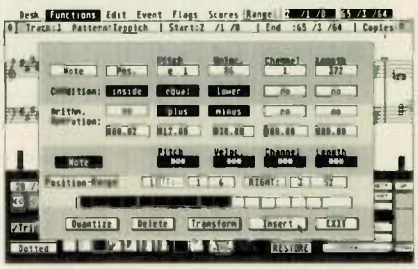

FIG. 3: The editor page lets you edit events based on any of a number of conditions.

end points of the currently displayed pattern into the locators. To edit an entire track, simply drag the text "Track:" into the locators. This is great for speeding up repetitive edits.

4-TRACK RECORDING

Pro-24 III can loop any number of bars and let you record onto four separate tracks in the looped section simultaneously, while hearing and modifying each track dynamically, somewhat like programming a drum machine.

If you assign *sub-track* A to a drum track, put it in Mix mode, and turn on Auto-Quantize (AQ), you can overdub new notes each time the looping pattern plays. If you want to erase a specific note,

THE ST MIDI NEUTRALIZER

The ST MIDI Neutralizer is a simple device that solves a common problem encountered using the Atari ST and Mega ST computers for MIDI applications. Atari has always insisted on putting a MIDI thru signal on a normally unused pin of its MIDI out port to avoid squeezing an extra plug into the ST's design. If you are using an incorrectly designed MIDI cable (one that shorts out the two outer pins), you will undoubtedly experience a number of problems, including stuck notes, locked-up synths, and so on. The ST MIDI Neutralizer connects to the Atari's MIDI out port and provides separate MIDI thru and out ports, with all MIDI thru data removed from the MIDI out. The MIDI Neutralizer also makes it possible to use *any* MIDI cable with its MIDI out.

The device is a simple Y-cord that attaches to the Atari's MIDI out port. Making sure you connect to the correct pins is the only tricky part.

Cut two 5-inch pieces of shielded-pair cable (standard two-conductor shielded mic cable will do). The wire can be of any gauge, but generally, the thinner the wire, the easier it is to handle.

With one piece of cable, connect pins 2, 4, and 5 of a standard, 5-pin DIN plug (male) to leads 2, 4, and 5, respectively, of a DIN socket (female). Pin 2 connects to the shield. This socket becomes the ST's MIDI out port. Connect the leads carefully; if pins 4 and 5 are reversed, the device will not work.

With the other cable, connect pins 2, 4, and 3 of the same (male) DIN plug mentioned above to leads 2, 4, and 5, respectively, of a second (female) DIN socket. Again, pin 2 connects to the shield. This socket becomes the ST's MIDI thru port.

Finally, label the Neutralizer's MIDI thru and MIDI out ports and use a continuity tester to check your connections before installing.

Parts:
- 1 5-pin, 180° DIN plug (male)
- 2 5-pin, 180° DIN sockets (female)
- 10 inches two-conductor shielded microphone cable

The completely assembled MIDI Neutralizer is available from both EM Bookshelf (see FYI page) and Creative Input (see end of article) for $16.50, including shipping. If you want to assemble it yourself, the Neutralizer's component parts are also available from the same sources for $11.50. (California residents add 6.5% sales tax.)

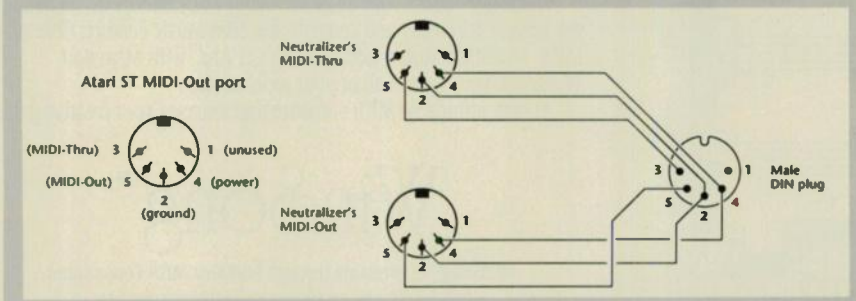

FIG 4: MIDI Neutralizer schematic.

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click on the box labeled "MODE: Record," which will switch you to "MODE: Erase," allowing you to delete that extra snare hit by playing it the next time it comes around. You can erase a drum out of the entire pattern by holding down the note while selecting Key Erase from the Functions pull-down menu.

Assign sub-track B to a bass track and put it into Auto mode, so once you have a good, basic drum pattern, you can move to sub-track B and start playing ideas for the bass. If you don't like your first run, select Delete Sub-Track from the Functions menu and start again. Or, since Auto is selected, automatically punch in anywhere in the pattern to change the ending, or simply play the whole part over again. If you didn't select AQ for sub-track B, you can quantize your bass pattern at any time by pressing "Q" on the Atari keyboard. Continue for the remaining sub-tracks, C and D, assigning them to the remaining instruments available. By clicking on the "bell" icon within each sub-track, you can individually mute each instrument to focus on a specific one. Once you learn how easy it is to create music while still "in the groove," you'll appreciate the power of this technique.

You should get as comfortable as possible with the Atari's function keys (F1-F10).

PROGRAMMING THE FUNCTION KEYS

You should get as comfortable as possible with the Atari's function keys (F1-F10), but unfortunately, the original Pro-24 manual doesn't mention how to program them. It's really simple, though: press and hold Shift and any of the function keys to store the current positions of the left and right locators. (The destination locator is not saved.) Always program the main sections of your song into the function key autolocators so you can get to them easily; press the appropriate function key and either an open or closed parentheses to move the position counter to the left or right locator position, respectively.

I like to program F10 to span the entire length of the current song (i.e., L = 1/1/0; R = 999/1/0, or any point after the end of the last pattern in the song). This is convenient for editing the entire song with global functions or mixing down to one track.

You can also store *muting groups* into alternate function keys, recalling them for group soloing, global edits, and so on by hitting the Alt key and a function key. Program these like you do the autolocators: select tracks by muting unwanted tracks, then hold Shift while pressing Alt and the function key. You can recall group muting masks instantly, even while a sequence is playing.

USING THE BUFFER

Before editing patterns, make a backup of the original pattern in case anything disastrous happens while editing. In the heat of creation it's all too easy to accidentally erase too many notes or quan-

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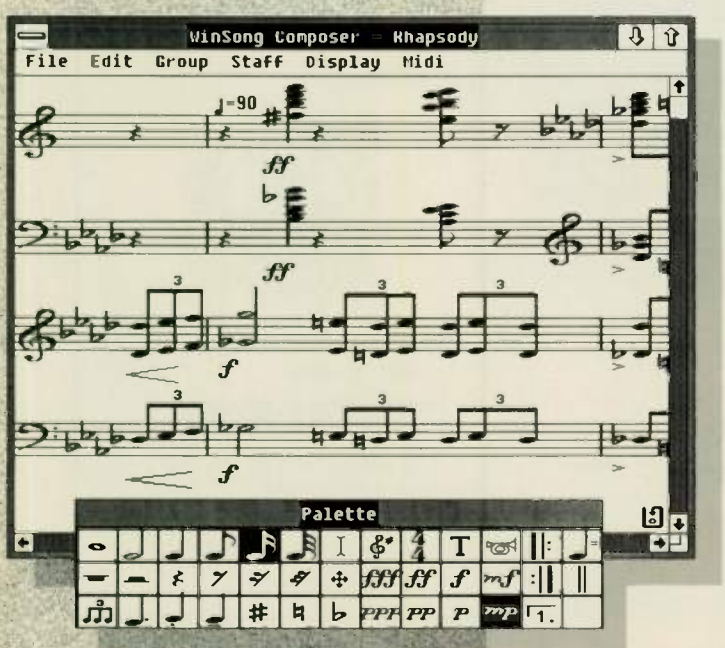

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tize to the wrong resolution. The edit pages' restore function recalls the original condition of a pattern, but once you've clicked on Okay to exit an edit page, those edits are permanent.

Pro-24 III's pattern buffer exists specifically for this purpose. Simply click on its track, adjust the fast-access box until it displays the pattern you want to back up, click on Patt, and drag it into the box labeled Buffer. To recall the pattern, click on the box Recall Buff, and the pattern will be placed on the track from which it came. Only one pattern can be stored in the buffer at a time. Double-clicking on Buffer will display the stored pattern's name, start and end locations, and its original track.

PATTERN LIBRARIES

Pro-24 is a pattern-based sequencer, where songs consist of a number of patterns. To save disk space, create *pattern libraries*: song files that contain several unrelated patterns. For example, build a drum-pattern library and store several different beats and fills from different songs. When you want to try a different drum rhythm, load the library. Choose the pattern you like and save it to disk as a pattern, then load it into the song. Storing all those drum patterns together makes it easier to audition several rhythms and locate patterns faster—just like the preset drum boxes of yore, but with infinitely more flexibility.

You can also create a *patch* library to store all your sys ex sound bank data in patterns, so that putting a given pattern in a song loads a bank of sounds into one of your synths when you need it. You can also use this feature to create a *reset* library—a collection of patterns that will reset specific sets of controllers to zero for different situations. There are many ways to use pattern libraries; experiment and customize your own.

KEY COMMANDS

Probably the best thing you can do to speed up working with the Pro-24 III is avoid excessive mouse motion by learning *all* available keyboard-equivalent commands. There are plenty. The Pro-24 III manual provides the most current list, but neglects a few.

When it discusses selecting tracks from the keyboard using Shift and a numeral, the manual doesn't make it clear that you have to use the numeric keypad, *not* the numbers at the top of the keyboard. This can cause problems.

Storing drum patterns together makes it easier to locate patterns faster.

If you press Shift and the 8 above the keyboard, Pro-24 starts recording, since this is the equivalent of the asterisk (*) key. You can mute a track quickly by pressing its track number on the numeric keypad and the Esc key.

Finally, if you want to change the solo assignment from one track to another (in either play or record modes), select the new track by using the numeric keypad and press Esc. However, this will not work when the program is set to external sync.

PRINTING A SCORE

To see bass and treble clefs simultaneously, select Splitpoint:C_3 from the Scores menu. Wherever you click in the grand staff becomes the split point between the bass and treble clefs.

Unfortunately, Pro-24's Select Printer feature is only compatible with a small number of available printers. If you haven't purchased a printer yet, I recommend any of the Epson FX Series or LQ printers, or a 24-pin NEC P-6 or P-7. Twenty-four-pin printers deliver more professional quality than the faster and less expensive 9-pin printers. For a professional printout, you can port your music to Steinberg's *Masterscore,* whose library of printer-drivers is compatible with many graphics printers and lets you modify or create your own drivers with any word processor. *Masterscore II,* due out from Steinberg/Jones in the near future, is slated to incorporate a complete desktop publishing program in addition to several more notation features.

FORMATTING DISKS

Because you can't format disks, or copy or rename disk files in Pro-24, always keep some blank, formatted disks on hand. Otherwise, get a copy of a program like *Diskmanager,* Steinberg's shareware desk accessory that allows you to format, copy, get info, delete, move, or rename any file while Pro-24 (or any other GEM-based program) is running. This comes in handy during those desperate moments when you've run out of formatted disks, but can't quit to format one because you'd lose your precious song. The software is free, save for the cost of the disk, shipping, and/or downloading time, each of which varies depending on the source. (See below for information.)

MISCELLANEOUS

Using a program like Steinberg's *Switcher* in an ST with enhanced RAM, or using a Mega 2 or Mega 4 ST can let you switch quickly between Pro-24 and another program. Steinberg's new *M.ROS* (MIDI Realtime Operating System) gives you true multitasking—the ability to run several programs simultaneously—assuming those programs are M.ROS-compatible. For example, you might want to run an automated mixing program (like Steinberg's *Mimix*), Pro-24 III, and a patch editor. An Atari 1040ST can be upgraded to four megabytes of memory, while 520s can go as high as 2.5 megs. Memory upgrades are not available from Atari, but many third-party developers around the world manufacture and install them (see "The Atari ST Power User" in the November 1988 **EM**). A hard disk is also a tremendous asset.

All these tips are just a small part of learning how to master Pro-24 III. Spend some time experimenting to get as comfortable with the program as possible. It has plenty of elements just waiting for discovery.

For more information on Pro-24 III, Diskmanager, the *Pro-24 III Handbook,* and related topics, contact:

Steinberg/Jones 17700 Raymer St., Suite 1002, Northridge, CA 91325; tel. (818)993-4091, FAX: (818)701-7452.

Creative Input, 3435 Ocean Park Blvd., Suite 201-#64, Santa Monica, CA 90405.

East Coast MIDI BBS, Data: (516) 928-4986; Data: (516) 474-2450; Voice: (516) 928-4284.

Geoffrey Rylo *has worked with the Pro-24 sequencer for more than two years. He has become an expert on the program, teaching Pro-24 classes out of Los Angeles and New York. He is always finding solutions to MIDI problems and founded Creative Input to offer them to the world.*

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*Rick Allen notwithstanding

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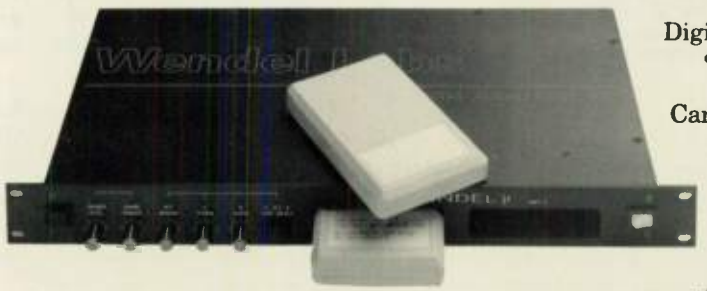

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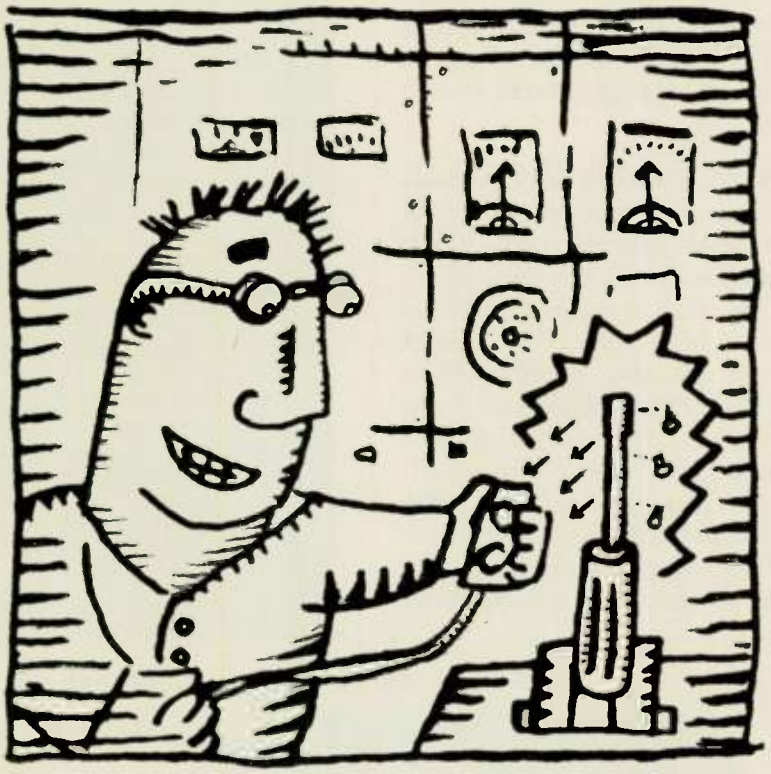
QUESTIONS & ANSWERS

Our talented tech talks Mirage key contacts and Poly-800 backup batteries and screws around with magnets.

By Alan Gary Campbell



Q. Some of my screwdrivers have become magnetized; they'll pick up steel paper clips and even small screws! How do tools become magnetized, and is such magnetization harmful to equipment being serviced with the tools? Can you demagnetize tools with a tape-head demagnetizer or a bulk eraser?

A. Tools made from iron, steel, and other ferromagnetic alloys are often magnetized by exposure to electromagnetic fields from equipment such as speakers, transformers, and motors. For general service work, this low level of inadvertent magnetism is inconsequential, but it is very undesirable when servicing magnetic tape recorders, disk drives, and video monitors. A head demagnetizer or a bulk eraser might or might not successfully demagnetize a tool, depending upon the field strength available; however, this is a nonstandard—and questionable—application for such devices.

For screwdrivers and the like, it's easier to use a magnet designed for this purpose, such as Radio Shack's Screwdriver Magnetizer/Demagnetizer (catalog no. 64-1870). You can use it to demagnetize, or to purposely magnetize, tools for screw-holding tasks, etc. *Caution: this device produces a strong magnetic field.* Do not place, store, or carry it near magnetic media such as diskettes, cassettes, ROM cards, and encoded credit cards.

Q. Will the Kurzweil K250-type diagnostic EPROMs work in the 250 RMX rack-mount sampler?

A. Yes, though you'll obviously want to skip those tests (keyboard, pedals, etc.) that only apply to the keyboard version. To install the diagnostic ROMs, you have to slide the 250 RMX out of the drawer and remove the front panel. Though the work space is cramped, it's not necessary to remove the boards or the internal partition.

Q. I'm using a Roland HP-100 Electronic Piano as a MIDI controller for my IBM PC and MT-32 MIDI sound module. This works fine with the Roland *Ease* software, but not with other sequencers, as the MT-32 assigns voices in nine-channel blocks—either 1 to 9 or 2 to 10—and the HP-100 transmits only on channel 1, providing no simple method of real-time control for timbres on the remaining channels. Is there any hardware that can alter the HP-100 output to transmit on any channel?

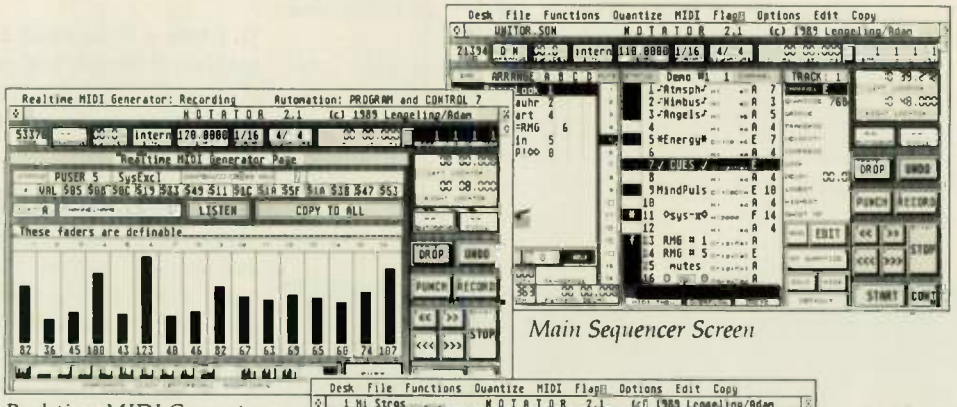
A. Both the Axxess Mapper and Yamaha MEP4 have such capabilities and will even send on more than one channel at a time. They are somewhat pricey solutions, but both do lots of other nifty things, too.

Q. My Korg Poly-800 synth loses its memory every time the batteries go flat, but a friend has a unit with a lithium battery inside to back up the programs. Did some of the Poly-800s come with a backup battery, and can I add one to mine?

A. Korg created the new board design, with onboard battery backup, for use in the EX-800 rack-mount version, which has no external batteries. For the purpose of inventory consolidation, the new board design was also used in later Poly-800s.

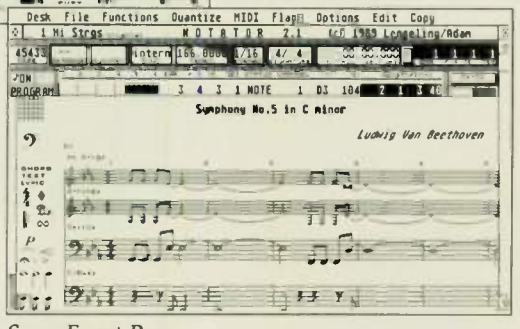
ILLUSTRATION BY ANDREW SHACHAT

MIDI PRODUCTION TOOLS



Real-time MIDI Generator

Main Sequencer Screen



Score Event Page

"This sequencer is going to have the competition scrambling to keep up..." *Creator, 1988*

"...it's an amazing piece of work – easy to learn, easy to use, and flexible..." *Notator, 1989*
Jim Aikin, *Keyboard Magazine*

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You can readily add a backup battery. Refer to a Poly-800 service manual. Remove D1 and R1 from the KLM-596 mainboard (de-solder or cut away these components) and connect a 3-volt, lithium battery to the memory backup circuit at diode D15. A type 2032 battery, available from many jewelry and camera stores or from Radio Shack (catalog no. 23-162), is adequate; use a 20-millimeter, spring-clip battery holder mounted with silicon sealer. (If you mount the holder to the Poly-800 chassis, glue some paper or plastic sheeting underneath, so the battery-holder terminals won't short.) You can order a compatible holder, part no. BH-800ND (alternate part no. 106K-ND), from Digi-Key Corporation, PO Box 677, Thief River Falls, MN 56701-0677; tel. (800) 344-4539. Write or call for a catalog and ordering information.

With the lithium cell in place, the Poly-800 will retain memory without the six bulky "C" cells. For stationary applications, you can power the 800 from an adapter; for strap-on use, it's probably most convenient to modify the unit to receive phantom DC power via the MIDI cable.

Aside: You can contact the Poly-800 Users Group by writing to Henry E. Schneider, 210 Woodcombe, Houston, TX 77062.

Q. I have a Mirage DSK-8 sampler with a problem of "double hits" on some keys, as if the contacts are bouncing. Is this a mechanical, electronic, or software problem? Can I fix it?

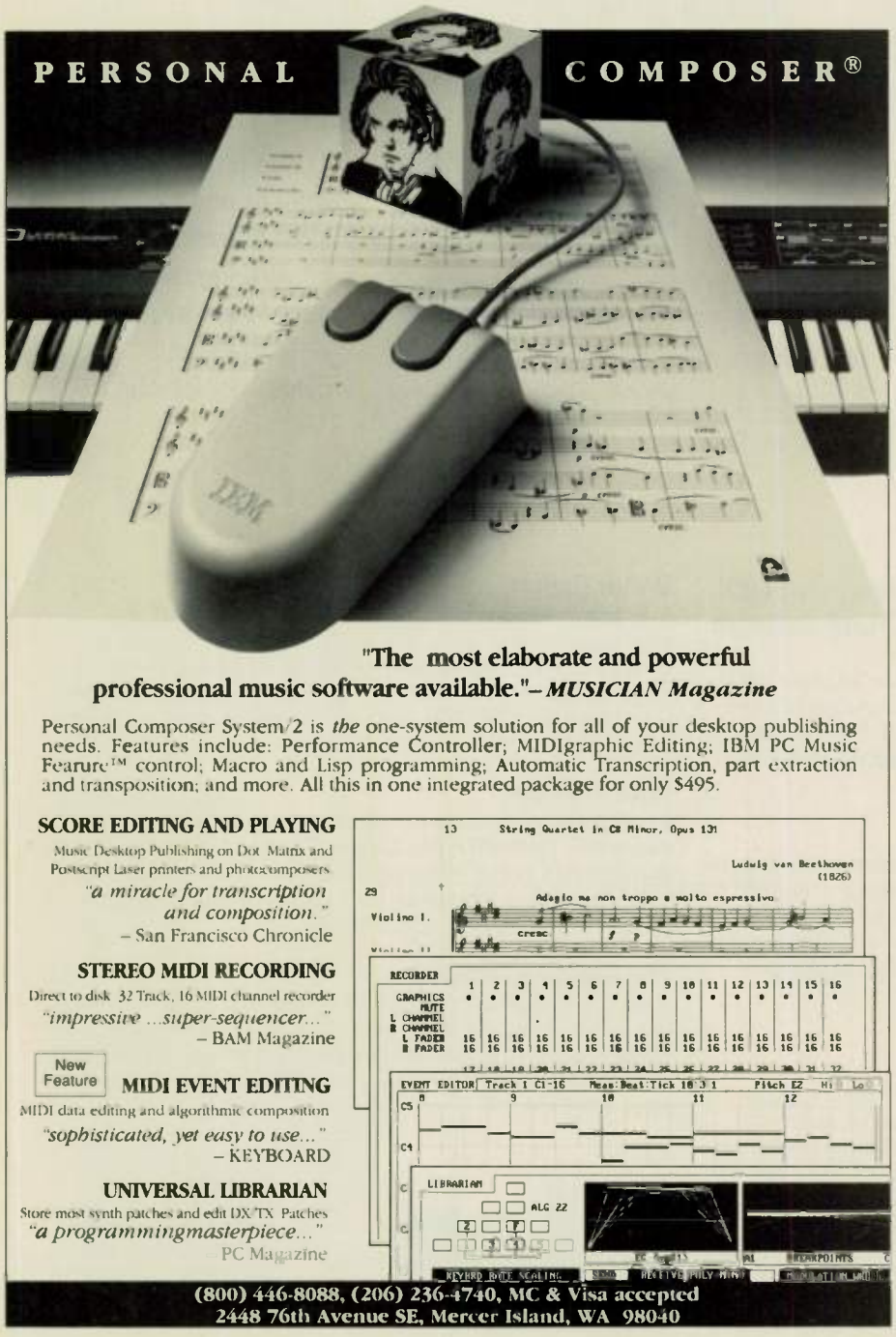
Q. I have one of the original, metal-cased Mirage samplers, and someone spilled beer into the keyboard. I took the keyboard apart and used some fine steel wool to remove the corrosion from the contacts, but I inadvertently removed the plating in a few places and now have several dead keys. What's worse, Ensoniq doesn't make parts for this keyboard mechanism anymore. Help!

A. The Mirage uses a standard, membrane-switch keyboard. Though the membranes are supposedly sealed hermetically, as the rubber ages, the seal weakens, and dirt and oxidation can contaminate the contacts, causing "double hits," velocity errors, and dead keys. Cleaning the contacts will usually fix the problem.

To clean the contacts, remove the keyboard from the unit. Remove the keycaps for the affected keys and any neighboring keys on the same membrane-strip segments. *Gently* remove the membrane strips. Rinse them off in clean, cool water and allow to dry. Clean the PC contacts under the strips with a cotton swab soaked in freon/silicon spray (Radio Shack TV Tuner & Control Cleaner & Lubricant, catalog no. 64-2315, or equivalent); then *carefully* reassemble.

Repairing plating damage on membrane-switch PC boards is more difficult. On the Mirage, the traces in the contact area are a special alloy that, under normal conditions, has lower contact resistance and resists oxidation better than copper, but can be easily abraded or even destroyed. I once pulled this boner myself.

To rebuild the contacts, you might employ some Bishop Graphics press-on, copper, printed-circuit strips and pads, available from electronics supply stores. These are intended more for prototyping than repair but are fairly strong. Another possibility is using "liquid con-



On the Mirage, the PC contact traces can be easily destroyed.

ductor" PC-board repair solution, such as GC Electronics Silver Print (catalog no. 22-201), carefully applied with a tiny brush. Silver Print is more conductive than, and hence preferred over, GC's Nickel Print (catalog no. 22-207), though the latter product costs less and might also work (the older product, Copper Print, is no longer available). I haven't tried either of the above techniques in this application (parts were still available at the time I screwed up), so consider them experimental.

Q. I broke a keytop on my Casio CZ-230s synth, and the dealer told me I'll have to replace the keyboard—at least that's what I thought he said. Is that right?

A. No, not the keyboard, the *keytops*. These come in two multi-key strips. The lower strip extends from low C to the second B; the upper strip starts at the adjacent (third) C and extends to high C. You can order replacement keytop strips from your Casio service center. Note that you have to disassemble most of the CZ components to get at the keyboard; it's advisable to have a CZ-230s service manual handy before proceeding.

ANTI-STATIC BUG SQUASHERS

Tired of readjusting recalcitrant ROM pins on the nearest table top, or practicing pin-spacing with cronophagic needlenose pliers? If you ROM-swap or have other intimate relations with socketed ICs, have I got a tool for you. Radio Shack's IC Pin Aligner (catalog no. 276-1594) easily and exactly sets the pin-spacing on regular and VLSI bugs (up to 48 pins); it's made of anti-static, conductive plastic, has a ground strap connector, and costs just $2.99.

Alan Gary Campbell *is owner of Musitech™ and is a contributing editor for* **EM**, *but he doesn't have an endorsement deal with Radio Shack, despite the number of times that company's products get mentioned in this column.*

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FIRST TAKE: Capsule Comments

This month, we check out a MIDI bass-in-a-box and a wireless MIDI system, and show you how to literally add spring to your ST keyboard.

the EM rating system

All EM reviews include 11-step "LED meters" showing a product's performance in specific categories chosen by the reviewer (such as ease of use, construction, etc.) and a "VU meter" indicating an overall rating. The latter is *not* a mathematical average, since some categories are more important than others. For example, if a guitar synth has great documentation and is easy to use, but tracks poorly, it could have several high LED meters and a low overall rating.

The rating system is based on the following values, where "0" means a feature is nonfunctional or doesn't exist, while a value of "11" surpassses the point of mere excellence (a rating of 10) and is indicative of a feature or product that is truly groundbreaking and has never before been executed so well.

Please remember that these are opinions, and, as always, EM welcomes opposing viewpoints. We urge you to contact manufacturers for more information, and, of course, tell them you saw it in EM.

360 Systems Professional Midi Bass ($499)

By Alan Gary Campbell

It's two o'clock in the morning. You've painstakingly processed each output of your drum machine to the point of cannon-shot realism. Everything's ready to go, except you've spent the last few hours tweaking bass sounds on synths and samplers. You finally give up in disgust and play the part on your aging Fender Precision while changing effects with both feet and punching in with your nose.

A preset bass-in-a-box is the next logical extension of a MIDI drum machine/sequencer-based rhythm section. Enter 360 Systems with the original Midi Bass, a monophonic sample player for bass sounds—timely, but lacking in fidelity and features and housed in one of those awkward, little, where-the-heck-do-I-put-this boxes.

The Professional Midi Bass (PMB) takes up where the original left off. It, too, is a monophonic sample player, but with better sound, more features, and a 1U rack-mount package. On the front is an on/off switch, an LCD, increment/decrement buttons, numerous parameter buttons, and a volume control. On the back is a non-detachable power cord, LCD viewing-angle adjust, and MIDI in, out, and thru jacks.

Like its predecessor, the PMB stores sounds in interchangeable, socketed ROM ICs, up to sixteen at a time. To get at these, you have to unplug the unit and remove the top panel. Most ROMs store one sound; some store two. The eight factory sounds are stored, along with part of the operating system, in five chips. (Chips 1 and 5 must remain installed, but you can swap the others, despite the warnings on the labels and in the manual.) You get Fingered Flatwound Precision Bass, Picked Flatwound Precision Bass, Rickenbacker, Fingered Steinberger, Funk Thumb, Funk Pop, Minimoog Squarewave, and Standup Pizzicato, a good cross-section for most jobs. (Note that chips from the original Midi Bass aren't compatible.)

If your bass needs are more than "bass-ic," there are dozens of alternate sounds from which to choose (read: "go in hock for"). These include Precision Bass, Jazz Bass, Rickenbacker, Steinberger, Ripper, Longhorn, BB300, and 8-string, in various flatwound-string, roundwound-string, fingered, picked, bridge-picked, and hammered (my favorite) versions. You can also get Arco Bass (*bowed*, that is), Upright Bass (a fatter Standup Pizz), Growl Bass (a "moaning" fretless—excellent!), six half-speed Telecasters, three clavinets, four DX7s, four Minimoogs, three pianos (including Muted and Struck), two saxes, Rhodes Bass, Pipe Organ, Tuba, Bass Clarinet, Bass Trombone, Tympani, Gong, and (for Weird Al fans) Bass Accordian. Remarkably, 360 Systems

doesn't offer bass harmonica.

The sounds are multisampled; the quality is good to excellent. The fidelity is a definite improvement over the original Midi Bass: a notch or two below a midline sampler (such as a Roland S-50 or Ensoniq EPS), but good enough to impart that "where's-the-bassist?" illusion. The ranges of the sounds vary from two octaves and an augmented fourth to three octaves and a sixth.

Sound ROMs list from $39.95 to $49.95, which isn't cheap. (I gave the alternate sounds a high rating for *quality*, cost excluded.) 360 offers a demo tape of the alternate sounds, sent out free when you return the warranty card. Some sounds are available as sound sets, with two sounds per ROM (e.g., Hammered/8-String) for $59.95, which saves money and chips.

What can you do with all these sounds? Although PMB plays only one note and sound at a time, its five-octave MIDI range can be split into two programmable, transposable zones, each with a different sound and a programmable velocity threshold, above which an alternate, "accent" sound is triggered. For example, in the lower zone, you could program Fingered Jazz Bass with Picked Jazz Bass as an accent sound and, in the upper zone, program Slap Bass with Pop Bass as an accent, producing a complete bass "tool kit" within the span of a five-octave controller. You can also program the volume, decay, release, and lowpass filter cutoff for *each sound*. Thirty programmable setups can be stored in nonvolatile memory and accessed via MIDI program change commands, but there's no patch mapping.

Global functions include tune (plus or minus two semitones); transpose enable; transpose interval (transposes MIDI notes, not sample-playback rate); MIDI channel select; pitch bend enable (fixed at a minor third—aargh!); patch change enable; MIDI volume enable; note priority (last, low, or high); voice cascade (for using two PMBs duophonically); test note (for triggering sans controller); and memory protect. The panel buttons are divided into program and master functions. The LCD prompts you for most operations. Hey, it's almost user-friendly!

I like the Pro Midi Bass: no disks, no wait, no tiresome tweaking, just power up and jam. All it lacks is adjustable pitch bend range and patch mapping. It's not for everyone; most cost-effective

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applications would be in a production environment or on a solo or duo gig. The alternate ROMs *are* pricey, but you're paying someone else to do the sampling, so you can concentrate on music. It's a fair trade-off.

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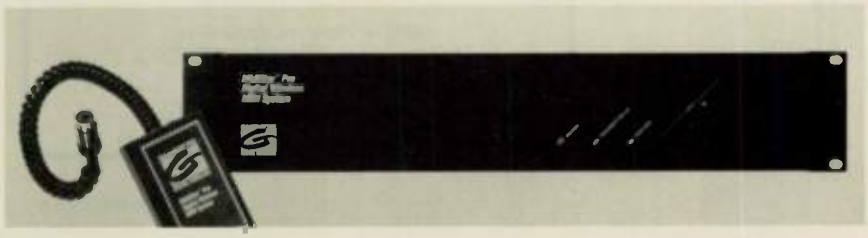
Gambatte! MidiStar Pro Wireless MIDI System ($2,995)

By Geary Yelton

When a guitarist walks off the stage playing the wireless guitar right in the lap of the audience, don't you MIDI keyboardists get envious? Just a little? Even if you have a strap-on, you're still tied to your setup by a MIDI cord, and no matter how long the MIDI umbilical is, that unfettered sense of freedom is still missing.

Take heart, dear reader. I have seen the future of MIDI, and it's *wireless*. In the past, more than one company has attempted wireless MIDI with less than impressive results. But an Atlanta company called Gambatte! (a Japanese expression of enthusiasm) has finally achieved success. For $2,995, it offers the MidiStar Pro, a transmitter/receiver combination.



The 6-ounce transmitter—not much bigger than a pack of cigarettes—fastens to your keyboard strap or belt. The receiver is a 2U rack-mount unit with a single MIDI out port and an antenna you can mount on a mic stand.

Skeptically, I tried a prototype MidiStar more than a year ago and was floored when it worked flawlessly. Note ons and offs, pitch bends, modulation, patch changes—all MIDI messages—were transmitted and received. It tracked beautifully, even through walls.

When I eventually took a production model home for torture testing, I wasn't disappointed. Risking the wrath of my neighbors, I cranked my stereo up loud enough to hear it a couple of blocks

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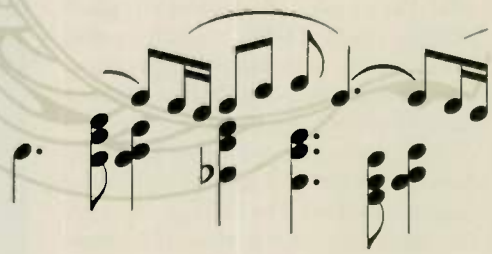

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I have seen the future of MIDI, dear reader, and it's wireless.

away, strapped on a Yamaha KX5, and took off down the street. I must have looked like an idiot: out in public, no headphones, no sounds, apparently playing look-at-me synthesizer to the music from down the street.

Gambatte! claims that MidiStar's range is 400 feet, but I was more than twice that far away before it dropped out. The only delays I detected could be blamed on the relative sluggishness of sound waves. "Wow," I kept thinking, "if only I could afford one of these someday."

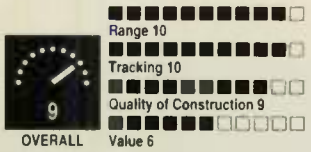
And that's the only problem I found with the device, unless you count normal battery wear (rated at six hours with a standard 9-volt alkaline battery). The MidiStar costs more than most synthesizers. Unless you're rich, or at least one heck of a performer, you'll probably wait until this technology trickles down to working stiffs like you and me, assuming it eventually does.

MidiStar works on a variation of *spread spectrum transmission*, a military technology that transmits over a wide band of radio frequencies, unlike normal radio's narrow bandwidth. Transmitting digital data over radio waves has never been very reliable, but Gambatte!'s FCC-approved, patent-pending techniques seem to solve the problems of digital wireless.

Let's get technical: standard, one-way wireless transmission doesn't work for MIDI. When radio signals are transmitted indoors, reflected signals interfere with direct signals in the form of *multipath fading*, which can cause data loss and errors in digital transmission—stuck notes, random patch changes, and worse—data errors that are simply intolerable in a wireless MIDI system. Gambatte!'s system overcomes this by transmitting a wide-band reference signal along with the MIDI data. The receiver locks onto the reference signal and rejects all interference, including multipath. MidiStar is just the first product employing this proprietary technique that Gambatte! plans to market.

Someday we will all be free of MIDI cords. In the meantime, the MidiStar Pro looks like the foundation for tomorrow's digital transmission, and it's available now.

Geary Yelton *'s entire life revolves around synthesis, MIDI, composition, and the Macintosh.*



Gambatte! Inc.
1442 Tullie Road NE
Atlanta, GA 30329
tel. (404) 325-4843.

Megatouch Atari ST Keyboard Modification ($11.95)

By Bruce A. Johnson

As one of the first Atari 1040ST owners, I was amazed at its graphics capability, loved having the built-in, double-sided disk drive, and was excited by the built-in MIDI ports. My major disappointment was the keyboard's "squooshy" feel, caused by the ST's keyswitches hitting a semicircular rubber cup that sits below each key. To make matters worse, this already-bad action deteriorates over time. There wasn't much an ST owner could do—except buy one of the new Mega STs, which has a greatly improved keyboard feel—until Diamond Designs offered a twelve-dollar solution.

When I called Regent Software (formerly Diamond Design) to order a Megatouch, the operator responded with, "Oh, the bag o'springs?" And she was correct; Megatouch *is* a bag of springs you install under your ST's keys, and they're great.

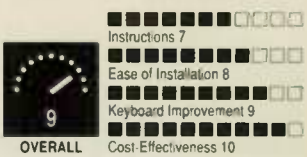
A Megatouch blurb claimed "ten-minute installation," but don't believe it. While fairly simple, installation of Megatouch took me about an hour and a half. It involved prying off most of the keycaps (no opening of the ST's case, though), untangling all the springs from one another, and installing each one so its narrow end encircled the base of the exposed keypost. The instructions suggest you install all the springs at once, then go back and snap the keycaps back on, but that would test the patience of Job, as the springs don't always sit straight up, and some even become retangled (don't ask me how). Eventually, I replaced the keycaps in sections: the numeric keypad, the arrow/help key section, and, finally, each row of the keyboard. For the forgetful among us, the instructions include a chart of the ST's keyboard layout (quick, where does the backslash key go?). After that, you are done.

Now for the downside: the instructions suggest that the function keys, the left shift key, the return key, and the space bar should not be adapted due to "infrequency of use and difficulty of removal."

I use my space bar and return key *quite* frequently, but usually with a slam of my thumb or index finger, so I don't much care about the touch on those keys; and the function keys are so designed that it's impossible to touch type on them anyhow, so that leaves the left shift unadapted. I can live with that, and if I feel like experimenting, the Megatouch package contains eight extra springs. (How many times have you seen that happen? Usually, kits are two screws short.)

How well does it work? Honestly, it's not quite the equal of the soft-click on the Mac or a good IBM-compatible keyboard, but compared to my three-year-old ST's feel, it's spectacular, and it's a cost-effective improvement to any non-Mega ST.

Bruce A. Johnson *is a MIDI musician and videographer/editor for WHA-TV in Madison, Wisconsin. He is often in the CompuServe MIDI forum, number 70346,130.*



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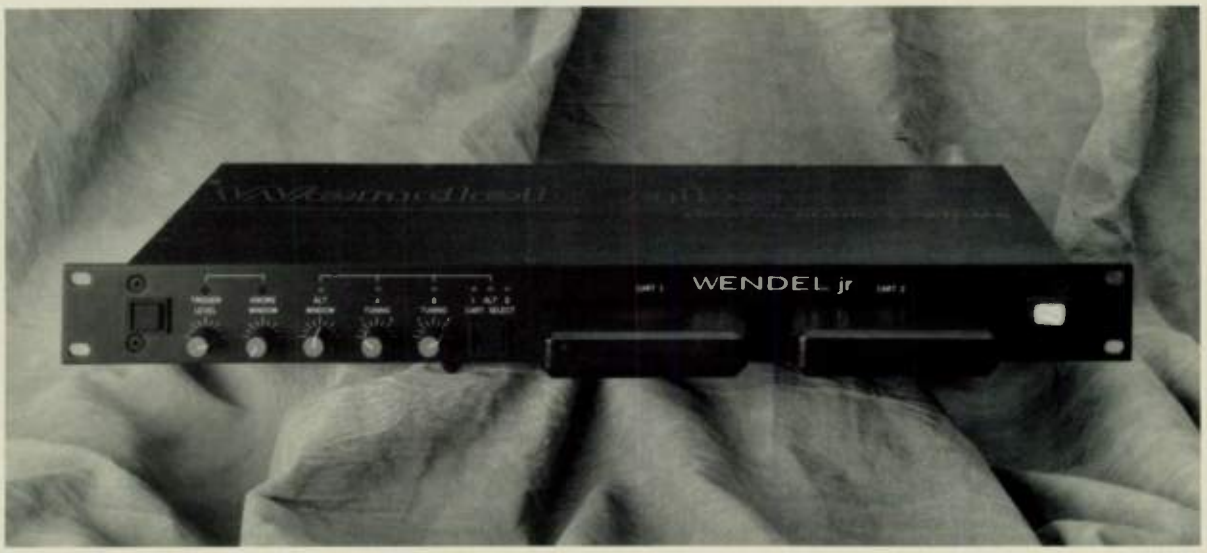
Wendel jr.: The Sample Playback Machine

Looking for the best drum samples you can find? This audio triggered module may have all the rest beat.

By Bob Hodas



C.R. KING

Roger Nichols has been using his minicomputer, Wendel, since December 1979, when his sampled drum and percussion sounds were featured on the "Hey Nineteen" track from Steely Dan's *Gaucho*. He has earned the reputation of one of the most experienced digital recording engineer/producers in the world today. He created Wendel Labs Ltd. to bring his sampling expertise to the recording industry in the form of a sample playback unit, aptly named Wendel jr., now manufactured and marketed by Industrial Strength Industries (ISI).

NOT JUST DRUMS

Wendel jr. is *not* a drum machine. While it contains perhaps the best drum samples you've ever heard, it can load *any* sound, store it on PROMs, and play it back. The potential of this machine extends beyond just playing drum samples. Its beauty is threefold: sound, speed, and triggering.

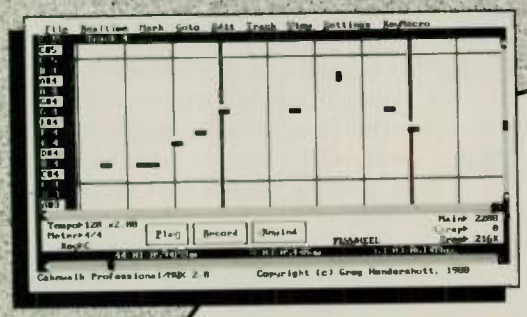
You can load samples into Wendel jr. via cartridges that go into slots marked Cart 1 and Cart 2. Three varieties of carts are available: single-sound carts, dual-sound carts, and long-sound carts, requiring two carts to hold the entire sound (Wendel jr. automatically senses the presence of long, two-cart sounds). Each cart can hold eight 256K or 512K EPROM chips. The latter can store a maximum of twelve seconds of sample per cart. Using cartridges means Wendel jr. has no moving parts (i.e., disk drives), and this means you don't have to worry about rough treatment in the truck or having samples erased by stray magnetic fields, making Wendel jr. an ideal road machine.

Compared to disks, Wendel jr.'s data carts are bulky, costly, and store fewer sounds. The trade-off is the quality of Wendel's sounds and flexibility in tuning. Nichols' drum-sound samples are recorded using absolutely no EQ, at a 16-bit resolution and 50 kHz sampling rate, then blown onto EPROM chips. Nichols took great care choosing the sampled instruments, the type of mic used, and mic position. The resulting tonal purity of Wendel jr.'s sounds lets you freely manipulate the sample with your own EQ, and makes most of the samples usable across the unit's full range of tuning, so you no longer need 30 snare drum samples. I found the rack-tom sample, for example, totally convincing tuned anywhere from an 8-inch rack tom down to an 18-inch floor tom; I could *feel* the head vibration.

OPERATION

On Wendel jr's. rear panel are three connections: two unbalanced phone jacks for line-level trigger input (at 10k ohm impedance) and audio output, and a DIN connector for a planned enhancement. The front panel controls of the 1U unit consist solely of a trigger button, level pot, and LED, and the Ignore Window, pot, and LED.

Command Performance



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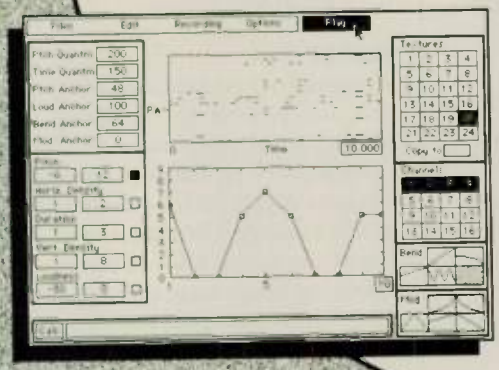

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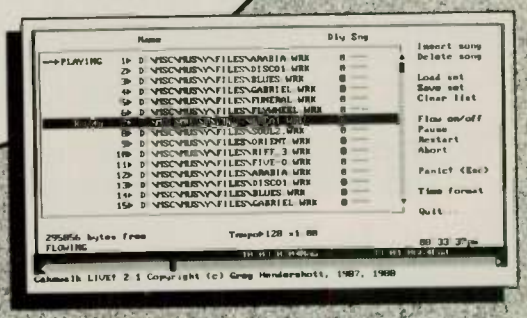

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A single button triggers the samples directly and can work *along with* the external trigger, so you can add extra beats to a track in real time. A pot controls Wendel jr.'s trigger level, and an associated LED indicates the unit has been triggered. The Ignore Window, a rotary pot, and an LED prevent retriggering while the trigger signal is present, or within a specified time period. This combination of controls provides versatility and enhances creativity when replacing existing tracks or creating new ones.

Two pots—A Tuning and B Tuning—tune the samples over approximately a two-octave range. Typically, A tunes the first sound while B tunes another (a second tuning of the same sample, a scond sample on the same cartridge, or a sample on the second cartridge). These controls can also be used with the Alternate Window—a clever, time-based function that controls the switching between two tunings to generate some lifelike musical feels. If, for instance, Wendel jr. receives a second trigger within the time set in the Alternate Window (an LED indicates the window length) then the alternate tuning is triggered.

The Cart Select button works with these other two pots to play a sample at its original or an alternate tuning. For instance, if you want two tunings of a single sample, set the Alternate Window to trigger tuning A on every quarter-note, and tuning B triggered by a dotted eighth-note, reverting back to A for the next quarter-note. I found this effective in giving a realistic feel to kick-drum tracks.

Another technique is to alternate between samples of a snare drum struck by alternating left and right hands, or an open and closed hi-hat, to set up a realistic single-stroke roll or a nice swing-jazz, hi-hat pattern. In addition, by triggering the hi-hat manually before the track started, I started the figure with an open hi-hat sound (the second sample on the cart), the way a live drummer would.

Because it uses a true audio trigger, you need no interface to trigger Wendel jr. from tape tracks or live drums. The unit can also be triggered by audio sources such as pulses, pads, and drum machines. This capability, combined with the trigger speed and "roadability," makes the device—in my book at least—the most serious contender around for the concert tour circuit.

SOUNDS

A number of excellent samples are available for Wendel jr., including kicks, snares, toms, ride, hats, woodblocks, cross stick, claps, timbales, congas, and cowbells. All are clean-sounding and full of life, boasting a 92 dB dynamic range. (I've been to the Zildjian factory twice, spending hours hand-picking cymbals, and I'm *still* jealous of Wendel jr.'s ride sample.) In addition to the existing sounds, ISI will blow custom EPROM chips for you, using sounds you supply, priced on an individual basis.

Another outstanding feature of Wendel jr. is its trigger speed; nothing on the market currently triggers as fast. The longest trigger delay to expect is a quoted 32 microseconds, drastically faster than what we've come to expect from MIDI-based units. The real test was recording live tracks of a speed metal band, in which the live snare mic triggered the snare sample. Wendel jr. followed some extremely fast and complex

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Product Summary

PRODUCT:
Wendel jr.
TYPE:
Sample playback machine
LIST PRICE:
$600; cartridges $50-$160
MANUFACTURER:
Industrial Strength Industries
13042 Moore St.
Cerritos, CA 90701
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patterns, and timing was right on the money. The rest of the band had no timing problems whatsoever. *(We've played with Wendel jr. and can vouch for the exceptionally fast triggering time—Ed.)*

Wendel jr. can only play one sound at a time, which means in live situations you have to use a separate unit for each drum you want to reproduce. You *can* use Wendel jr. cost-effectively on a session, however, by first recording the existing drums or drum machine, one instrument per track, and then replacing them one track at a time.

ISI is currently designing a MIDI and dynamics interface that will read MIDI to control all triggering and front panel operations, to be released soon. The company is also hoping to give Wendel jr. the ability to read real-time dynamics from live drummers or recorded tracks.

The manual for Wendel jr. is simple, informative, and quite humorous. There is little technical information available, so you will probably have to send the unit back if problems occur.

If you need to track an entire drum kit in one pass or sample a vast library of sounds, this machine is not for you. If you want to avoid the time lag other hardware exhibits, and want the highest-quality sounds you can get, you'll want to take a hard look at Wendel jr.

Bob Hodas *is an independent audio engineer whose credits include Windham Hill Records, The Doobie Brothers, The Village People, and Mickey Hart.*

Electronic Musician, November 1988:

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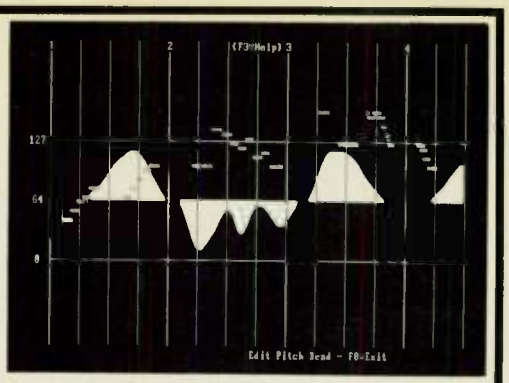

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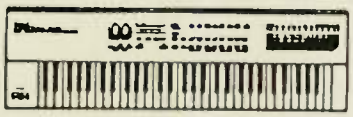

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Hybrid Arts EZ-Score Plus V. 1.1

A hip user interface on this solid scoring program makes notation on the Atari ST seem easy.

By Jim Pierson-Perry

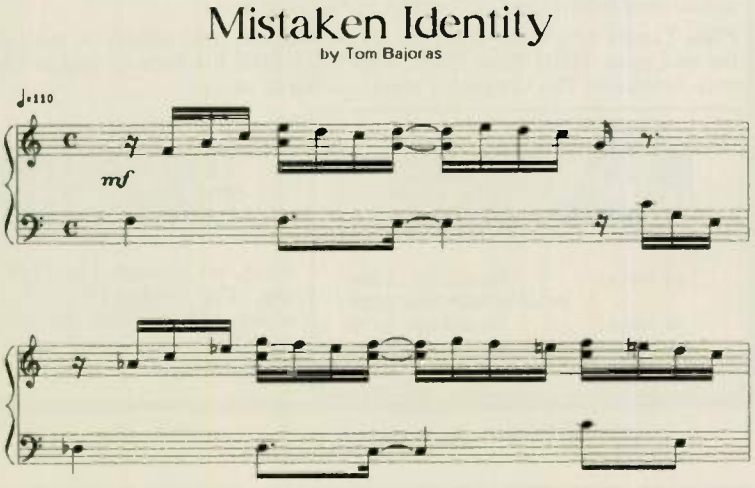

FIG. 1: Scores can be dot matrix-printed with excellent resolution.

EZ-Score Plus is an entry-level scoring program for scores with up to three staves. It boasts a facile user interface and clean, crisp printouts. With it, you can write music from scratch or transcribe song files created by Hybrid Arts' sequencer programs.

The program comes on two single-sided disks that use key disk copy protection and can be installed on a hard drive. All models of ST/Mega computers (both monochrome and color monitors) are supported; however, 520ST users have to use the input/editing and printing operations as separate programs due to the large memory requirement. The manual is thorough, well-written, and indexed. EZ-Score Plus is HybriSwitch-compatible; given sufficient memory, you can load it along with a Hybrid Arts sequencer. This eliminates the need to reboot when going from one application to another, but they do not currently share data. (EZ-Score Version 1.2 *includes a Total Control Package that allows data sharing.—Ed.*)

All operations are done from a single workscreen (**Figs. 2a** and **2b**) featuring dual menu bars. Command functions are selected from the upper menu, while notational symbols are selected from the lower one. Almost every program function can be called up from a keyboard equivalent. The screen display looks good and is easy to edit using a monochrome monitor; however, due to the resolution difference of a color monitor, symbols appear elongated on screen, and you need to do some vertical scrolling.

Typical program operation involves three stages: entering, editing, and printing the music data. The initial step is to define the score layout (you can create a default scoring file, with customized settings, that loads automatically when the program starts). Up to three staves may be used to give solo, piano, piano plus solo, or trio formats. All major and minor key signatures as well as time signatures from 1/1 through 99/64 are supported. Staves can be assigned as treble, bass, or no clef (e.g., drum parts). Spacing can be adjusted independently above and below each stave from one to 21 ledger lines. Score format options may be changed at any time.

There are three ways to enter music data. The most direct is to select a symbol (more than 140 provided) from the lower menu bar, using the mouse, and place it on the score. Click the left mouse button to place notes with stems pointing down or the right button for stems that point up. The second option is to use keyboard commands to position the mouse cursor and enter symbols. The third is to enter notes from a MIDI keyboard. You can tailor the program to respond to any of several MIDI controllers as specifying note duration, rests, bar lines, and moving between staves. Pitch bend is fixed to control horizontal mouse cursor movement. This concept is well-implemented and one of the best ways to step-enter music I have used. All three input modes can be used together, providing maximum flexibility and comfort for the user.

There are several levels of editing operations. *Global* actions affect the entire score (e.g., change the number of staves displayed). *Section* actions apply to a range of measures across all staves. They can cut or copy the section to the clipboard (although, oddly enough, you must go to insert editing mode to paste), create endings, and compress/expand space between every symbol in the section. I ran into a bug at this point with the clear-staff command: if you scroll past the beginning of a score and attempt to clear a staff on a Mega 4, you bomb the program. On other ST models, though, the cursor just gets lost, and you can recover with the locate command.

The next level is the *region*, a set of symbols on a single staff, defined by highlighting with the mouse. With the commands, you can edit beams, ties, n-

tuplets, and stem directions, as well as delete notes. *Micro* editing operates at the individual symbol level and is primarily for creating and inserting special symbols such as slurs, lines, and crescendos, and for altering spacing between two symbols. Palettes of guitar tablatures and chord names (up to twenty of each) can be defined, edited, and placed on the score. *Insert* editing is for adding manuscript-related (rather than note-related) symbols: clefs, time/key signatures, rehearsal marks, metronome marks, blank measures, and lyrics.

Probably the program's most exciting feature is the ability to autoscore files created with Hybrid Arts sequencers *EZ-Track Plus* and *Synch/SmpteTrack*. (*Note:* MidiMover, *a public domain program available free on many BBSes—or from Hybrid Arts at a small charge—allows the import of Standard MIDI Files into Hybrid Arts sequencers—Ed.*) The program takes each track from the song file and lets you specify a destination staff (or skip it), quantization (start and duration), whether beaming should be done, and whether to use a duplet or triplet clock. If desired, only notes associated with particular MIDI channels or that fall in a specified range will be scored, and others ignored. This is particularly useful when combined with the score-reformatting options to generate a set of lead sheets for individual instruments from a master sequencer file. Only notes and time signatures (if meter tracks are used in the sequence) are scored; other information, such as velocity, controllers, and program or tempo changes, are ignored.

The reverse function, playing scores to a sound generator, is partially supported. Scores can be played either through MIDI or the ST's internal sound chip voices. However, note pitches and durations are played with a

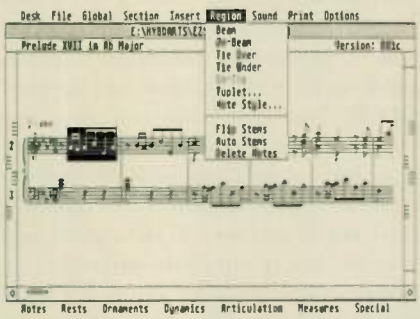

FIG. 2a: All operations are done on a single workscreen.

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fixed velocity, and no controller functions are implemented. Individual MIDI channels can be assigned to notes with stems up or stems down in each stave. This approach is of some use to proof a score but is not meant to be a sequencer replacement. Furthermore, scores cannot be converted into sequencer song files.

A text editor is available for lyrics. Syllables up to ten characters long are automatically centered over or under designated notes. If the note position moves (e.g., compress or expand operation), the syllable moves with it. Deleting a note or clearing the staff deletes all associated lyrics. Up to seven lines of text can display a title, author, copyright notice, etc. on the score's first page. Each line of text has its own font size (large or standard, no mixing) and justification (left, center, or right). GDOS fonts are supplied with the program for the standard and large title text and may be changed by the user. Version 1.1 of EZ-Score Plus introduced a free text feature that lets you place a ten-character text string anywhere on the score to designate instrument voicings, performance directions, and so on. If your eye is good, you can stamp different free text strings next to each other to beat the ten-character limit.

The program's most exciting feature is the ability to autoscore files from Hybrid Arts sequencers.

Scores can be printed on an Epson-compatible printer (9- and 24-pin) in one of three printing modes: rough, draft, and final. The results are excellent; even on a 9-pin printer (see **Fig. 1**), the resolution appears near laser-quality. You can specify the number of stave systems printed per page; titles, measure numbers, rehearsal marks, and page numbers can be printed or hidden independently. All output is formatted to portrait orientation on 8.5 x 11-inch paper, regardless of the printer carriage size. A proprietary printing routine is used, as Hybrid Arts does not support GDOS. The Atari laser printer is not supported, nor are there plans to do so.

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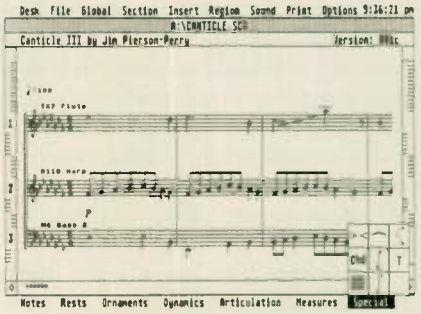

FIG. 2b: Notice that the synth name (e.g., TX7, D-110, or Matrix-6) can also appear on the appropriate staff.

As good as the program is, there is still room for improvement. Currently, you must either split the left and right hands into two tracks within the sequencer or manually specify note limits for each hand during the autoscore operation. Other improvements would be to allow user-defined symbols (e.g., pitch bend,

Product Summary

PRODUCT:
EZ-Score Plus V. 1.1
TYPE:
Scoring program
FEATURES:
Clean printouts; excellent user interface; HybriSwitch-compatibility; data entry through MIDI, mouse, or keyboard commands; autoscoring of Hybrid Arts sequencer files
HARDWARE REQUIREMENTS:
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PRICE:
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MANUFACTURER:
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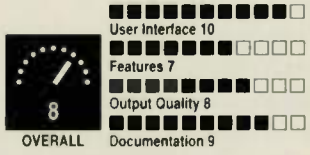
11920 W. Olympic Blvd.
Los Angeles, CA 90064
tel. (213) 826-3777



aftertouch, etc.), an undo command, and laser printer support. Major upgrades could include translating score files into sequencer song files, transposing, adding slanted beaming, and supporting more than three staves.

Is EZ-Score Plus right for you? For transcription, you have no choice if you use a Hybrid Arts sequencer. This is the only program that can read your song files. For writing strictly sheet music, the outlook improves. EZ-Score Plus has the best user interface of any scoring program available for the ST, and I recommend the program if your needs are relatively simple (remember the three-stave limit). If you have more elaborate scoring needs or want to write a score and convert it into a sequencer file, look elsewhere. No information is available at this time from Hybrid Arts concerning plans for future upgrades to EZ-Score Plus or its long-promised *MIDI-Score* professional-level scoring program

Staring in the face of sleep deprivation, **Jim Pierson-Perry** *is a research clinical chemist by day and a writer/programmer/musician by night. His wife is concerned, because she can no longer see his reflection in mirrors.*

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Lexicon CP-1 Stereo Processor

Now audiophiles have a tool for extracting the many ambience clues hidden in records, CDs, and videos.

By Peter Hirschfeld

C.R. KING

Surround-sound, the technique of using signal processing and multiple amplifiers and speakers to synthesize different types of listening environments, has become a hot trend in music reproduction. This isn't just warmed-over quad (a surround-sound technique of the early '70s that never caught on, partly due to compatibility problems between multiple, conflicting formats). The new breed of digital surround-sound processors can successfully synthesize a variety of acoustic spaces as well as decode surround-sound videos.

Current surround-sound systems for audio use don't require any special encoding during recording; the CP-1 simulates the sound qualities of a variety of acoustic environments—from small clubs to large cathedrals—with a combination of reverb, delay, phase shifting, and equalization. Therefore, compatibility is no longer an issue in audio applications. For video use, the source should be recorded in Dolby stereo; fortunately, the majority of recent film releases use this format.

Who should consider buying a surround-sound processor? The main market is videophiles who want the best recreation of a theater in the home and audiophiles who want to simulate the realism of live concerts. However, since much of the ambience generation relies on phase shifting and delays, it's also important for recording engineers to be aware of how an album or video sounds through one of these devices before sending the master off for duplication.

Lexicon, a name found on signal processors in most top studios (see "What's a PCM70" in the March 1988 **EM** and the LXP-1 review in the October 1988 issue), has taken its expertise out of the studio and into the home with the CP-1 digital audio environment processor. The CP-1 is essentially two distinct products that share a common architecture and chassis: an audio ambience extractor/generator and a video surround-sound decoder. We'll review each aspect separately.

The chassis is a standard, 2U size that can be rack mounted (with optional brackets) or sit on a shelf. The front panel contains a minimum of switches and an easily read alphanumeric display. A remote control (included) contains most of the controls. The back contains two sets of inputs (one main and a spare) and eight outputs for up to eight speakers. The CP-1 is strictly a digital processor with no internal amplification; each output requires its own amplifier and speaker.

The unit patches into a receiver's tape monitor loop or between the preamp and main amplifier of discrete components. The CP-1 is intended to control the system volume, although this can only be done with the remote; the unit itself contains no volume control.

AUDIO PROCESSING

The Lexicon CP-1 generates three basic effects for audio use: Panorama, Ambience, and Reverb. Each of these three effects has three preset variations and three user-definable variations for a total of eighteen selectable audio environments.

The Panorama effect expands the "width" of the perceived location of each instrument by canceling the crosstalk between the two channels (**Fig. 1**). This cancellation effect is similar to devices marketed by other companies under names such as "hologram generator" or "stereo expander." The Panorama effect requires only the two front speakers; the best description of the effect is that it simulates a giant pair of headphones—in fact, one of the three options for the Panorama mode is called "binaural" and is specifically designed for use with binaural recordings. (With binaural recordings, a dummy head with microphones inserted into each "ear" captures the phase and timing differences a person would hear in an acoustical space.)

The Ambience mode recreates the acoustics of three different-size concert halls by feeding special signals to the side and rear speakers. These signals simulate the reflected sound waves of anything from small jazz clubs to large symphony halls. The Reverb mode provides three levels of echo for creating the effect of being in large spaces, such

as cathedrals or stadiums.

Within each mode, a multitude of variables let you tailor the effect to your particular room and taste. Some of the adjustable parameters are: amount of the effect, amount of delay, cutoff frequencies, bass energy, and the angle of the speakers to the listener.

SETUP PROCEDURES

One of the CP-1's strengths is its wide range of adjustable parameters, which ensure optimal operation. However, this makes setting up and configuring the CP-1 a time-consuming, largely experimental process. This is an ideal product to buy on a Friday afternoon when the weather report is for a weekend of cold rain.

There are many possible speaker configurations for the CP-1, ranging from two speakers to seven full-range speakers plus a subwoofer (**Fig. 2**). Virtually any combination can be accommodated: two front and a single rear speaker, two front and two side speakers, one front center and two side speakers, three front and two rear speakers, etc. The manual describes how to connect most of the recommended combinations, yet neglects to indicate how to connect a single, rear speaker. Should it connect to the left-rear or right-rear output? Should it receive a summed signal or a difference signal? Hopefully, this oversight will be corrected in the next printing of the manual. For this review, I used the left-channel output for single, rear-speaker testing.

Speaker placement and choice is critical when generating environmental ambiences. I tried all the recommended configurations, from two to seven speakers (it helps to have speaker building as a hobby). I did not use a subwoofer, as the main speakers I use have flat response to 20 Hz. I found that using six speakers yields the best results for audio: two front, two side, and two rear. If you're limited to four speakers, use two front and two side speakers. I don't recommend using only two speakers (or using two front speakers with a single, rear speaker), because you won't be able to achieve enough of an audio illusion to justify the investment.

The quality of the side and rear speakers are quite important, as these channels contain a reasonable amount of bass energy to simulate reverberation. Small, cheap "ambience" speakers just won't cut it. Buy yourself some neutral-

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sounding, full-range speakers and ensure that you also have adequate amplification to handle the bass. To do it right, plan on spending a minimum of $200 for each speaker and feeding them with at least 25 watts RMS of amplification for each channel.

The front left and right speakers should be positioned at least three feet from any wall surface to avoid unwanted reflections. However, moving your speakers away from the rear wall will decrease the amount of bass, so find the right tradeoff between adequate bass and lack of reflections.

For the phase-cancellation of the Panorama effect to work properly, each front speaker must be *exactly* the same distance from your ears; even two inches either way will make a large difference. One trick I use is to tape a piece of string to the back center of the listening chair. Mark the string at the point it touches the center of the top edge of one of your speakers, then move the other speaker until the same point touches the mark. Both speakers will now be equidistant from your ears. With a group of listeners, each listener must sit in a line, as if sitting in a bobsled, to obtain the proper effect.

The side speakers also need to be at the same distance from your head, as there is no way to adjust the level of individual speakers (although the overall system balance can be altered, as can the level of each pair of speakers). This becomes important when the front speakers are equidistant but one side speaker

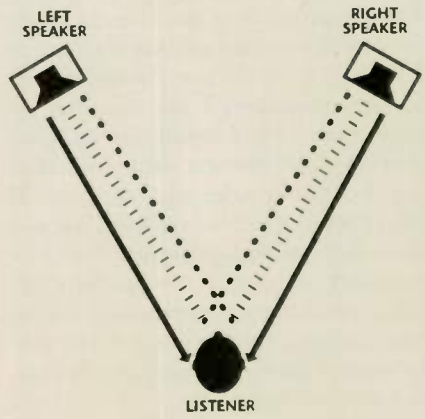

FIG. 1: Creating the Panorama effect.

is closer to you than the other. Either arrange your room so that your listening chair is centered, or else consider setting one side speaker on a stand out in the room. By the way, mounting the side and rear speakers close to a wall is sonically acceptable.

Once your speakers and amplifiers are set up (double-check that all six speakers are in phase), optimize the CP-1's parameters for your environment. This is a simple task, thanks to a built-in, white-noise generator and fairly clear directions in the manual. The only variance I found with the recommended parameters (and this might be only in my listening room) was that setting the speaker angle parameter to a level six degrees less than the actual angle seemed to give better performance; experiment with this parameter when setting up. All other parameters gave optimum performance at their recommended settings.

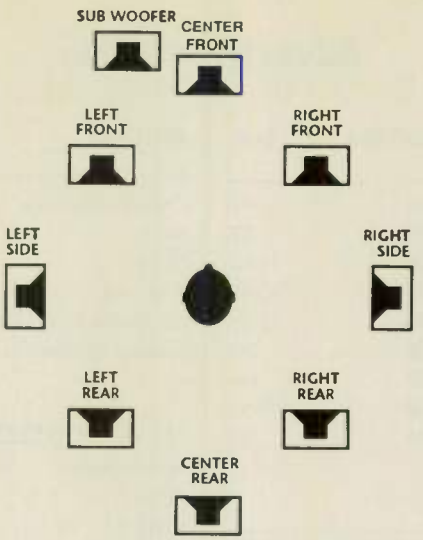

FIG. 2: Typical CP-1 speaker configurations. Note: choose between either two rear speakers, or one rear speaker.

LISTENING TEST: PANORAMA MODE

With most conventional stereo systems, all the instruments appear to emanate from a space between the left and right speakers. With the Panorama mode, you can create the illusion that some instruments are to the right of your right speaker and to the left of your left speaker. The effect is impressive with the appropriate type of music. I have used a "hologram generator" for several years, so I was familiar with the effect and had a basis of comparison for how well the CP-1 performed.

The CP-1 worked well in placing instruments beyond the conventional stereo field. I have heard similar devices that produce a noticeable timbre shift, but the CP-1 was superior in this respect. It produced only a slight timbre shift, with what appeared to be a mild lift around 5 kHz. This was barely noticeable, however, and present only in the Panorama mode, not the others.

A side consequence of phase cancellation is that it alters the soundstage (depth of instruments) from its normal position. With many other signal processors, the soundstage goes completely flat into a plane between the loudspeakers, but the CP-1 was more merciful. It shifted the soundstage from a recessed position behind the speakers into a forward placement within the room, but still managed to give some clues as to the depth of individual instruments. This might not be noticeable on many stereo systems, as re-creating any sort of soundstage in the first place requires quite complete phase coherency throughout all electronics and the speakers.

Pink Floyd's *Dark Side of the Moon* gave one of the most spectactular demonstrations of the Panorama effect. On "Time," you can hear twelve distinct bells in twelve discrete locations throughout the room. Another song that was pretty wild was Dave Brubeck's "Unsquare Dance." Handclaps and percussion were coming from all over. Although the effect was a little unnatural, it was still interesting.

Several classical music albums were preferable *au naturel*. It seems that the Panorama effect works best with recorded, processed rock, not recordings of acoustic instruments.

LISTENING TEST: AMBIENCE MODE

The Ambience mode simulates a variety of live halls with three different sizes and configurations. You can even choose between square and fan-shaped concert halls. The small hall setting most closely simulates a jazz club, the medium hall sounds about the size of a community theater, while the large hall approximates the acoustics of a major-city concert hall.

For testing the small hall, I listened to the re-release of Miles Davis's classic *Kind of Blue*. The Ambience mode added a nice "club" atmosphere, with an excel-

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lent degree of realism: I could almost hear the glasses clinking. Overall, the CP-1 performed flawlessly in this mode. Lexicon's experience in recording-studio electronics is evident in the sound quality. There was no discernible alteration of the imaging or soundstage of the primary speakers and no perceptible timbre change. The digital electronics within the CP-1 did not "digitize" the sound of my vacuum tube electronics.

Like any effect, less is more. The most realistic setting for producing ambience is to add only a subtle amount. Also, the ambience effect will probably be a greater improvement on average quality systems than on high-end systems, as top quality electronics and speakers are able to produce a large degree of ambience without any enhancement.

I could not find any type of music that I preferred to listen to in the Reverb mode.

The medium hall setting was a good illusion, although jazz and rock seemed more enjoyable in the small hall, and orchestral works sounded best with the large hall setting.

Ambience in the large hall was spectacular. Listening to Mussorgsky's *Pictures at an Exhibition* was worth the price of admission alone (my listening notes had the expression, "Wow!" several times). The staccato passages during the "Market Place at Limoges" and the dynamics and kettle drums in "Hut of the Baba-Yaga" created an extremely realistic and exciting concert hall experience.

LISTENING TEST: REVERB MODE

The Reverb mode synthesizes the feel of very large spaces, such as cathedrals and stadiums, and I tried several experiments to determine the best use of this mode. First, I put on an early Rolling Stones album and, yes, it was able to produce a good simulation of a high school gym (I stood against the wall, drank Boone's Farm wine for an hour, and thought I looked cool). Then I tuned in some Top 40 and tested that. The reverb program did a good job of creating an environment, but I could not find any type of music that I preferred to listen to in the Reverb mode. If you like organ recitals in church, though, or want to recreate the sound of the last heavy-metal stadium concert you went to, this effect could be for you.

VIDEO SOUND PROCESSING

The CP-1 really shines as a video surround-sound decoder. I'm a bit of a surround-sound fan and have listened critically to at least fifteen different brands of decoders, and the CP-1 is the most accurate and enjoyable video surround-sound decoder I have encountered to date.

The CP-1 has three video modes: Dolby Pro Logic, a home version of the professional decoders theaters use; Stereologic, which creates ambience for non-Dolby decoded stereo videos and TV programs; and Monologic, which creates a pseudo-surround effect from mono sources. Each mode has a factory preset and a user-definable setting.

One of the great attractions of the Dolby Pro Logic, compared to many other surround-sound systems, is the ability to "lock in" the dialog at the center of the picture. However, this requires a center-front speaker identical to the left and right speakers; otherwise, noticeable timbre changes occur when sound or music moves across screen. There is an option where the CP-1 creates a "phantom" center speaker using the circuitry of the Panorama mode. The seating limitation cited earlier is evident, precluding using the "phantom" speaker for group viewing of movies.

The recommended speaker arrangement for video is different, in many cases, from the arrangement for proper audio environmental processing. For optimum results, either you should have all seven speakers, or be prepared to rearrange your speakers as needed for different applications.

The most obvious effect of video processing was the feeling of being "drawn in" to the action on the film. Realistic environments were created around the room, while the Pro Logic kept the dialog centered in the screen. In *Return of the Jedi*, laser swords were darting around the room, while in *Romancing the Stone*, the jungle scenes had monkey calls emanating from behind, with rain sounds everywhere.

Although most movies are recorded and released in Dolby Stereo, many of them do not have much surround-

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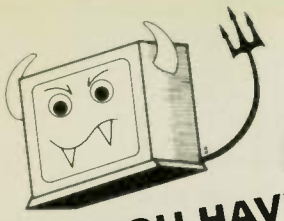

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sound information. Several other movies that I tested (such as *The Empire Strikes Back*) were disappointing in their lack of ambience encoding. Of course, you can only decode Dolby Stereo if you have a stereo VCR (preferably Hi-fi), stereo TV, or laser disc. Also, not every film created the most realistic effect by decoding the Dolby Stereo surround information; some music videos and concert films, such as *Stop Making Sense*, sounded better using the CP-1's Ambience mode. This points out one of the reasons to use a multidimensional processor like the CP-1 rather than a dedicated video surround-sound decoder.

CONCLUSION: IS IT LIVE OR IS IT...

Recreating the illusion of a live concert experience has been a goal of many recordings and stereo systems. Like any illusion, it is a fragile and elusive condition that is dependent on many factors, only one of which is the direct sound coming from the primary source. The reflected sounds and ambience contribute much toward creating this illusion.

The Lexicon CP-1 does an excellent job at creating the ambience of small and large concert halls, given the proper source material and judicious placement of your speakers. Extremely neutral sound and an absence of noticeable distortion allows the CP-1 to reside in the finest audio systems without obvious signal degradation. With several types of recordings, the CP-1 definitely enhances the overall listening experience.

As an audio processor, the CP-1 is not a "set and forget" type of component, but one which should be optimized for each different type of music. It is important to be able to arrange your room around the requirements of the CP-1 in order to get the most realistic effects.

My short wish list of changes to the CP-1 would include a mute switch on the base unit to activate during input switching, a master volume control on the base (rather than only on the remote control), and the previously mentioned independent output level adjustments. The manual had a good treatise on the theory of recreating effects but could be improved by giving a more thorough explanation on systematic setup of the speakers and how to evaluate each position. I'm not sure if the average non-audiophile would be able to set up the CP-1 optimally without more complete instructions.

As a video decoder, the CP-1 appears

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Product Summary

PRODUCT:
CP-1 Digital Audio Environment

TYPE:
Digital ambience generator and video decoder

SYSTEM REQUIREMENTS:
Additional speakers and amplifiers highly recommended; stereo VCR, laser disc, or stereo TV required for video functions

LIST PRICE:
$1,295

MANUFACTURER:
Lexicon, Inc.
100 Beaver St.
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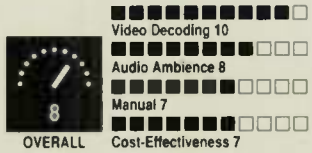
tel. (617) 891-6790



to be one of the finest available. The only limitation is the quality of recording on the video itself. The Pro Logic circuitry, which keeps the dialog centered, is a very strong point and differentiates the CP-1 from most other surround-sound decoders. Overall, I'd recommend this unit for the videophile who wants state-of-the-art decoding and can arrange the listening room to accommodate proper speaker placement.

One final issue is cost. A properly set up ambience system can easily cost close to $3,000 in addition to the cost of your basic stereo. This price includes the CP-1 ($1,295), four additional speakers ($200 each), and two additional amps ($350 each). At this price, you'll have to decide whether this will be the most cost-effective way to improve your stereo system: you can get some fine-sounding speakers and a new amp for that money. However, this is a generic question for all ambience processors and does not diminish at all the excellent quality of Lexicon's CP-1.

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Cambridge SoundWorks "Ensemble" Speaker System

If space and lack of bass are problems in your small studio, here's an innovative speaker system that solves both problems and some others as well.

By Craig Anderton

C R KING

Near-field monitoring, in which you listen to program material over small, full-range speakers sitting within a few feet of your ears, has become a popular way to monitor mixes. This is particularly true in small studios, where the unpredictable nature of room acoustics (how many garages and bedrooms were designed to be recording studios?) makes it difficult, if not impossible, to match a set of speakers to a room. By taking room acoustics out of the equation and mixing at moderate levels, you can get an accurate enough idea of what's going into your master to do a good mix. Unfortunately, it's difficult to get satisfying bass with small speakers, even though some models manage to meet the challenge effectively.

The Ensemble speaker system, while designed for hi-fi sound in the context of a consumer's living room, nonetheless—by accident or design—contains many features to recommend it for the small studio. Designed by hi-fi industry veteran and pioneer Henry Kloss, Ensemble is a four-piece speaker system with two small (8 x 5.25 x 4-inch) satellite units to handle the mid-range and highs (about 100 Hz on up) and two 12 x 21 x 4.5-inch woofers to handle the range an octave below that. Each satellite includes one 1.75-inch, direct-radiator tweeter, and one 3.5-inch, cone, mid-range driver; each woofer uses an 8-inch, acoustic-suspension speaker. Crossover frequencies are at 140 and 1,900 Hz, with passive crossovers. The concept of using satellites and separate woofers is not new, but this is the first time I've seen two separate woofers and not just a single-woofer design.

PUTTING SPEAKERS IN THEIR PLACE

The manual encourages experimentation with speaker placement and includes suggested setups to tune your room for the desired bass response. I dutifully experimented for several hours and managed to attain just about any kind of bass response I wanted during the course of those experiments. Positioning of the satellites (vertical and horizontal placements as well as nearness to a wall) also affects the response and is equally important.

In my studio, where the satellites sat in the place normally occupied by near-field monitors, the satellites initially tended to predominate over the woofers. I found three ways to compensate: making sure the satellites were at ear level; angling the two speakers so the right and left satellites pointed to a spot about a foot or two away from the right and left ears, respectively; and adjusting the woofers for maximum bass.

To describe how I adjusted the woofers, it's necessary to describe the studio's layout. There are two standard, bookshelf-type speakers mounted in the wall; located in front of the wall, about three feet away from the speakers, is a workspace that holds the mixer. There's also a narrow walkway between the workspace and the wall. What turned out best for me was to put a shelf at ear height, behind the mixer, and mount the satellites horizontally on that. I then placed the woofers about a foot apart from each other, with the speakers facing the wall and angled downward so they were pointing at the spot where the wall and

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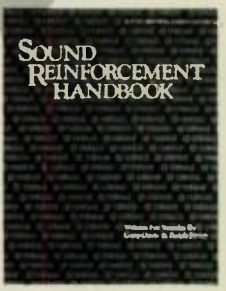

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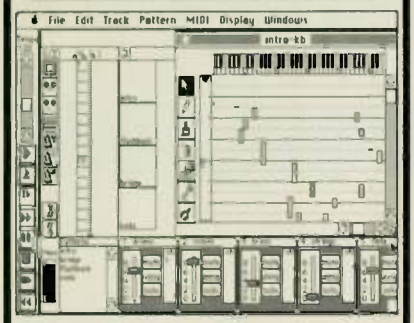

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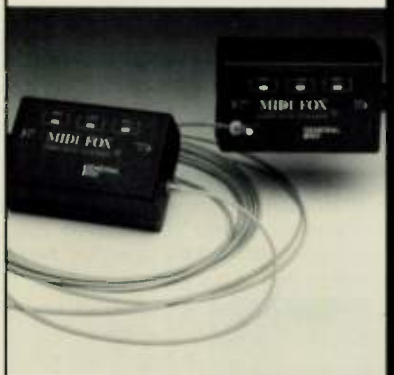

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● ENSEMBLE

floor meet. I know it's pretty strange, but it produced great sound over a wide frequency range.

Surprisingly, no matter where I placed the various speakers, the bass always seemed to emanate *from the satellites.* In fact, at first I thought the satellites just had real good bass response and were producing the bass I was hearing; disconnecting the woofers verified that it was indeed the woofers doing the job. I expected to hear a certain amount of disjointedness as a result of separating the high and low frequencies, but this wasn't an issue at all.

Another pleasant surprise was that placing the speakers as I did seemed to "tune out" differences in the listening environment. Unless I was right on top of the satellites, the bass response was very consistent throughout the room. With my wall-mounted conventional speakers, there are locations in the room where the bass is more prominent.

Regarding overall sound quality, this is where things get pretty subjective. The Ensemble has a very smooth sound and, assuming careful speaker positioning, an enviably flat response. The high end is a tiny bit bright; a tweeter control would be handy, especially for near-field monitoring applications. I found this advantageous in catching hiss and high-end distortion present in some synths and signal processors. When I just wanted to listen instead of listening critically, angling the satellites to point a bit away from my line of hearing brought the highs into perfect balance.

Surprisingly, no matter where I placed the various speakers, the bass always seemed to emanate *from the satellites.*

Each satellite/woofer combination is rated at a nominal 6 ohms, but this varies with frequency. The manufacturer recommends an amp in the 25- to 150-watts-per-channel range; I used a Peavey DECA 700 (a reliable and stable amp) to drive it, with excellent results. I did notice, however, that the speaker sensitivity is not all that high. When comparing Ensemble with other speakers, I had to turn up the level a notch or two to compensate. I don't consider this a problem, but for moderate to loud mixing-room levels, you'll want an amplifier that can deliver the goods.

THE "LOOK AND FEEL"

One of the big advantages of having two woofers instead of a single box is that each woofer is fairly small. You can even place them face down on the floor (using some provided spacers to give the woofers breathing space) and put a plant or some current magazines on top—a miniature coffee table. Both the satellites and woofers have metal grilles and are quite stylish; the satellites are finished in a gray, space-age material (Nextel), which provides a textured finish that resembles suede. The woofers are finished in a black laminate, so they tend to fade into the woodwork and not draw a lot of attention to themselves. I can see how something like Ensemble would be a big hit in the consumer market: the speakers fit easily in a small apartment, are not only unobtrusive but actually look pretty cool, and you can get a much "bigger" sound than you would expect from a system that, in its

Product Summary

PRODUCT:
Ensemble
TYPE:
Satellite/woofer stereo speaker system
MAIN FEATURES:
Small size; light weight; adaptability to listening environment; smooth sound; cosmetics
PRICE:
$499 plus shipping (factory-direct only)
MANUFACTURER:
Cambridge SoundWorks Inc.
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entirety, weighs about 50 pounds.

It's also worth mentioning that this is a class act all the way. The speaker connectors are gold-plated, and four coils of quality speaker wire (two 20-foot and two 30-foot) are included so you can experiment with placing the speakers in various locations. If you need a longer cable run, the manufacturer will send you whatever extra cable you need, within reason. There's even a toll-free, customer-service number if you have questions or require help in figuring out optimum speaker locations. Everything you need—including spacers, rubber feet, cable, wall-mount screws, and the like—is included, and there's a five-year, limited warranty for parts and labor.

COMING SOON TO A LIVING ROOM NEAR YOU

The bad news is that the only way to tell whether a speaker will work for you is to set it up in your listening environment and live with it for a couple of weeks. This is particularly so in the case of Ensemble, where it may take you a couple of afternoons to find out how to best place the speakers. But here's the good news: since Cambridge SoundWorks sells factory-direct only, part of the deal is you can audition Ensemble in your listening environment for 30 days. If you don't like what you hear, you can return the system for a full refund (even including the original shipping charges, but not the cost of returning it to the company—certainly fair enough). Another benefit of buying direct is that you don't pay a distributor's markup, which helps account for the relatively low $499 price.

I approached Ensemble with a certain amount of skepticism but came away very impressed. Cambridge SoundWorks, in trying to create a commercial product for the home hi-fi market, has, perhaps unwittingly, created a product with great potential for the electronic musician and home-recording enthusiast (by the way, keyboards sound great through a clean system like this).

If you're tight for space or bucks and need a robust, yet compact, speaker system for your home studio, this unique product has a lot to recommend it in terms of sound quality and adaptability to your listening environment. When you also consider the price, the no-risk, home-audition option, and the five-year warranty, it seems Cambridge SoundWorks has come up with a winner for the electronic musician on a budget. ■

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THE WORLD IS YOUR OYSTER

Although music is said to be the international language, it has been a language of many dialects. Only in the last few years has a sort of musical Esperanto emerged.

By Robert Carlberg

In 1887, Dr. Ludovic Zamenhof, a Polish ophthalmologist, introduced what he thought would be a great aid in promoting brotherhood among men. It was a new language he had invented, drawn from the roots common to all Indo-European languages (English, French, Spanish, German, Italian, etc.). He called his creation "Esperanto," which literally meant, in Esperanto, "one who hopes."

Unfortunately, the story of Dr. Zamenhof's proposed universal language reads less as a tale of hope than one of narrowness and bigotry. Nation after nation denounced his idea as an attempt to usurp their historical identities. After tireless but ultimately futile campaigning, Zamenhof died a pauper in 1917, in the midst of the worst conflagration the world had yet seen, World War I.

A hundred years later, what Dr. Zamenhof was unable to achieve for written and spoken language is gradually coming into existence for music. With the worldwide popularity of the cassette tape, the availability of distant types of recorded music, and the mobility of today's musicians, boundaries that have long defined "national identities" are crumbling before a new internationalism. Release after release celebrates the joyful crossing of time and distance, compelling music to fulfill its long-predicted destiny as the "international language."

This month's column will look at a number of recent albums that explore this new sense of community among musicians. Due to the number of releases, I will do little more than touch on most of them, but it is my fervent hope that you develop enough interest in one or two of them to participate in the worldwide movement by buying them.

I'll begin with an album that ranks high among my favorites. **Mark Isham**'s soundtrack to *The Beast* (A&M 3919) aggregates rather than pioneers, but it does so with enough grace and thunder that it easily becomes one of the paramount examples. Running his trumpet through a harmonizer, playing slow, moaning notes over an exotic backing of digital synthesizers and percussion instruments from around the world, Isham creates an otherworldly blackboard for Kevin Reynolds's film. The shimmery keyboard and guitar drones began their life in Eno's closet, with the trumpet style and percussion added to them by Jon Hassell, and the combination further explored by David Sylvian (*Alchemy*), Richard Horowitz (*Desert Equations*), and others. But in Isham's capable hands, the sounds have never seemed more compatible, nor the effect more powerful.

Rykodisc has reissued four "world music" albums that originally appeared on Mickey Hart's 360 Degrees Productions label. *Eclipse*, by **Hamza El Din** (RCD 10103, 1978) presents oud, dumbek, and singing from Sudan. *The Music of Upper and Lower Egypt* (RCD 10106) is a collection of folk music recorded in Egypt during the Grateful Dead's 1978 tour. *Sarangi* (RCD 10104) is comprised of two long duets for tabla and sarangi (a violin-like instrument), recorded in 1974, when musicians **Ustad Sultan Khan** and **Shri Rij Ram** were touring the U.S. with George Harrison and Ravi Shankar. *The Travelling Jewish Wedding* by the **Golden Gate Gypsy Orchestra** is a 1980 recording of a 13-member, San Francisco Bay Area conglomeration of doctors, engineers, sculptors, executives, and teachers who banded together to share and sustain a common love of Russian, Yiddish, and gypsy folk music. They really played Jewish weddings, too.

Rykodisc has also released, in the same "The World" series, a more recent album, *Drums of Passion*, (1986) by Senegalese drummer and vocalist Babatunde Olatunji and his group. Completing the series' initial issue is *Diga Rhythm Band*, the 1976 debut of the **Diga Rhythm Band**, a seminal combination of African, Indian, and jazz percussion (vibes and marimba).

Perhaps the greatest living exponent of world music is **Pandit Ravi Shankar**, who not only toured the U.S. with George Harrison and a selection of his country's greatest musicians, but composed a "Concerto for Sitar and Orchestra" in 1970, recorded with Yehudi Menuhin in the '60s, Susumu Miyashita and Hozan Yamamoto in the '70s, and Al Kooper and Frank Serafine for Private Music in 1987. His latest LP is *Inside the Kremlin* (Private Music 2044-2-P), recorded with the Russian Folk Ensemble, the Chamber Orchestra of the Moscow Philharmonic, the Government Chorus of the

USSR Ministry of Culture, and his own ensemble of students and disciples. At 70, Shankar continues to break down the artificial barriers to world understanding.

Another exotic offering is **Trilok Gurtu**'s solo debut, *Usfret* (CMP CD33). Gurtu, born in Bombay in 1951 (when Shankar was already well-established there), stepped into Collin Walcott's shoes as percussionist for the group Oregon upon Walcott's untimely death in 1984. Prior to that, he had appeared with Tri Atma, Codona, Don Cherry, Charlie Mariano, Philip Catherine, and a host of other "new jazz" practitioners. In *Usfret* (Sanskrit for "spontaneity"), he combines Indian ragas and classical vocal style—sung by his mother Shobha Gurtu—with the "post jazz" of Don Cherry on trumpet, L. Shankar (no relation) on violin, Swedish bassist Jonas Hellborg, and French pianist/synthesist Daniel Goyone. Truly a work of musical juggling.

Less exotic, but perhaps more germane to the point of this column, is *Under Northern Lights* by Japanese keyboardist **Keiko Matsui** (MCA 6274). Her piano and Yamaha synthesizer work, backed by veteran studio musicians such as guitarists Robben Ford and Grant Geissman, bassists Abraham Laboriel and Leland Sklar, and saxophonists Brandon Fields and Eric Marienthal, is middle-of-the-road pop jazz, complete with a couple slobbery vocals by others I won't mention here. In fact, the only tie to her native land is the shakuhachi played on two tracks by her husband Kazu Matsui, a sound that is in the digital memories of thousands of keyboards.

"Pop jazz" is the order of the day for **Brian Melvin**'s *Nightfood* (Global Pacific 40733). Heralded as Jaco Pastorius's last studio recording (on five of the nine tracks), drummer Melvin is joined by steel drummer Andy Narell, Grateful Dead guitarist Bob Weir, organist Merle

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Saunders, and a sextet of horn players. Four tracks (two of Jaco's) feature vocals, as befits the pop jazz appellation. Jaco Pastorius will be missed, but he won't be remembered for these tracks.

The style of Indian classical singing performed by Trilok Gurtu's mother is called "thumri." When she traveled to Germany to record *Usfret*, it was her first journey outside India. Another, quite similar, style of Indian vocal music is the ghazal, a love poem in Urdu. This style has been mastered by a young, UK-born singer named **Najma Akhtar** and presented on her album *Qareeb* (Shanachie 64009). Backing her distinctive vocals are a

fretless bass, Persian santoor, saxophones, synthesizers, violin (played Indian-style), and an Indian percussionist on tabla, dholak, and madhal. The combination—an almost jazz-like rhythm with Indian percussion and vocal—is typical of the sort of musical cross-fertilization taking place these days. Shanachie has several other records out on its "Word Beat EthnoPop" series, including Ashwin Batish's *Sitar Power* album (reviewed in the July '87 **EM**, in its independent release).

Several thousand miles away, Frenchman **Jean-Marie Giroult** (a test driver by profession) recorded thirteen basic tracks with vocals (in French), guitar, and synthesizer. The master multitrack tape was mailed to Quebec, where Richard Boulanger and Claude Giroux filled the tracks out with a full complement of synthesizers (Yamaha PF70 and DX7, Roland D-100 and MKS-20, Korg EX-800), drum machines (Yamaha RX7 with Roland Octapads and Simmons pads), and guitars (Fender Strat and Roland GK-1 and GM-70 MIDI guitar controllers). The result is international "light pop," made possible by MIDI synchronization and multitracking. *Jean-Marie Giroult* (the album) is available from Soudain les Arbres Publishing, 890A Boul. PIE XII Ste-Foy, Quebec

G1X 3T8, Canada, or on cassette from Missing Link Music, 6920 Roosevelt Way NE #328, Seattle, WA 98115.

Another Mark Isham release (can you tell I follow them?) is *Tibet* (Windham Hill 1080), a companion piece to a video about that country (or rather, an atmospheric look at its scenery). Aside from that, the music has little connection to the country, unless you count Isham's sampled percussion or Bill Douglass's bamboo flutes, which may also explain the haiku poetry. The geography may be a bit garbled, but we *are* talking about internationalism.

From Germany comes *Lightdance* (Higher Octave 7019), by **Nightingale**, which is, apparently, a partnership of four synthesists, each of whom has an album or two out on their joint label, Nightingale Records. The *Lightdance* compilation sounds like a single work of competent, but unadventurous, new age trivia: strictly 4/4 time signatures, a few major chords, sparkly DX7 voices, very contrived. It could have come from any corner of the globe.

As an example of synthesizer music that is not as predictable, American **Gene Rabbai Jr.**'s *Yosemite Soundscapes* (Paragenes 85700) should suffice. Utilizing a variety of digital synthesizers, but not drum machines, Rabbai was inspired by the photography of Ansel Adams to create eight moody, neo-classical suites. The majority are on the darker side, splashing large, minor-mode washes on a white canvas. Though developing some airplay in the new age market, *Yosemite Soundscapes* is more contemporary classical than new age, with serious undertones and studied grace. New age is rarely that intellectual.

Contemporary classical is rarely that listener-friendly, on the other hand. For example, *Shadow Box* (CentreDiscs 3288) is a new compilation of artists working in Montreal and Toronto. The five composers—one born in Hong Kong, another working in Paris, a third educated in Miami—contributed pieces for percussion and tape; accordion and electronic processing; digital synthesizers and oboe; soprano and percussion ensemble; and a *musique concrète* piece that utilizes synthesizer, violin, wind chimes, a Japanese bowl struck with a mallet, a baby crying, and various other sources. Grant-supported "new music" is seldom addictive the way more popular styles can be, but it is often brimming with unusual ideas that are absent from radio fare.

Only one more release, and then we must both get on to other things. Englishman **Bill Nelson**, originally a rocker with Be Bop Deluxe, then an ascetic staying at home with his synthesizers, has slowly emerged with a more cordial style. His latest, the aptly-titled *Optimism* (Enigma 73344-2), is a case in point. Like Byrne/Eno's *My Life in the Bush of Ghosts*, *Optimism* fits found vocal tracks to uptempo song skeletons, creating a hybrid dance music/*musique concrète* that crosses all boundaries. Nelson uses speech and singing in a number of languages, and his high-tech synthesizer latticework borrows heavily from Japanese, Arabic, African, and Indonesian music. Of all the releases I've mentioned here, *Optimism* is perhaps the epitome of a musical Esperanto, cribbing bits and pieces of cultures from around the world, taking, as it were, the pearls from that great heritage that is our true, universal language. And you don't even need a translating dictionary.

Pearls of wisdom as well as slimy shellfish of selfish ignorance should be forwarded for review to PO Box 16211, Seattle, WA 98116 for opening and filleting. If it stinks, I'll say so.

TEN BEST SO FAR

1. **Mark Isham** *The Beast* **(May)**
2. **Bill Nelson** *Optimism* **(May)**
3. **Najma Akhtar** *Qareeb* **(May)**
4. **The Janus Ensemble**
   The Janus Ensemble **(April)**
5. **Mark Isham** *Tibet* **(May)**
6. **Gene Rabbai Jr.**
   Yosemite Soundscapes **(May)**
7. **Either/Orchestra** *Radium* **(April)**
8. **Vernal Equinox**
   New Found World **(February)**
9. **Trilok Gurtu** *Usfret* **(May)**
10. **Bill Molenhof**
    All Pass By **(February)**

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THE GREAT ROM CONTROVERSY

Are equipment updates a right, or a privilege? There are no easy answers to that question, but perhaps there are some relatively easy solutions to the underlying problem.

By Craig Anderton

I was reading *MacUser* a few months ago and saw a list of current revision numbers for various pieces of hardware and software. I thought this was a good idea, and I approached some music industry manufacturers at a recent NAMM show about whether they'd be willing to help us compile, periodically, a list of software and ROM updates.

The software companies thought it was a good idea, but for hardware manufacturers, who make updates via ROM changes (which generally involve opening up the instrument and swapping an IC), I might as well have asked if they'd like to participate in an experiment to see how easy it is to catch leprosy. Simply stated, many manufacturers would prefer not to publicize some—and that's the crucial word—ROM updates. At first, this caught me by surprise, but as I talked with more manufacturers over the past few months, I was able to piece together the story from their point of view.

First, understand that there are two kinds of ROM updates. One kind fixes major bugs or offers enhancements to existing units and is either given free to registered owners, or made available at a fee (usually nominal, but if the changes are truly far-reaching and required extensive development time, the price goes up accordingly). These are updates manufacturers want to publicize, because it's good PR to provide customer support, and the user gets a more capable device for little or no extra cost.

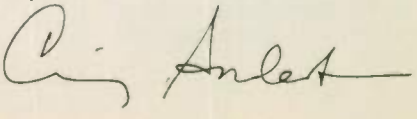
I'll call the other type of ROM update a "technical correction" update. This might fix an extremely obscure bug you'd seldom, if ever, encounter in normal operation, resolve some incompatibility with a specific (usually older) piece of gear, or accommodate a minor circuit design change such as a parts substitution. Most companies apparently don't want you to know about these, and here's why.

One might assume that if there's an update it should be installed; this is certainly the case for the first type of update mentioned above. But also remember the adage, "If it ain't broke, don't fix it." In many instances, the second type of ROM revision may not make any difference in performance, and sometimes a new ROM might not work at all unless the hardware is modified as well. Furthermore, a unit sent out for an update could get damaged during shipping, or your patches might be erased in the process of changing the ROM. In any event, the whole exercise may cost you money needlessly.

Manufacturers feel that if customers hear a new ROM is available, they'll assume it offers new benefits and, therefore, will want to obtain one for installation. Since many companies are committed to providing free upgrades, this can be a costly exercise for the company and, eventually, for the consumer. You not only get what you pay for, you pay for what you get. The cost of servicing gear is part of a unit's price, and if lots of people get ROM upgrades they don't really need, all customers will pay for this in the form of higher prices. Yet there are some people who are willing to pay for upgrades, no matter how minor, on the off-chance that the bug fix might apply to their situation, and it's not fair to penalize them because they had faith in a product and bought it before the manufacturer brought it to full maturity.

What's the solution? Since we all agree that it's in everyone's best interest to install the enhancement/major bug fix updates, there's no problem there. Regarding minor updates, perhaps companies can make these available to those customers who want them through the equivalent of a "service agreement." The customer would pay, say, $40 at the time of purchase, and receive any ROM updates for a two-year period, plus notification with an option to buy for updates occurring past that point. The customer would be responsible for the ROM's installation (and the consequences thereof) either as a do-it-yourself venture—which would void the warranty—or by an authorized service center, which would cost money. This way, those who, for whatever reason, want every single ROM revision can pay for that privilege and not impact those who are willing to wait for the major upgrades. Another option would be for manufacturers to select an independent third party as a ROM update center that would sell ROMs at a profit and offer services to justify that profit (such as maintaining a hot line to advise customers exactly what a particular ROM update does).

As long as our devices are based on computers, the question of ROM updates is not going to go away. What I've said here is an attempt find a solution and get the ball rolling. Comments, anyone?



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