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MUSICIAN

DECEMBER 1986

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Interview:



Shaeffer & Henry

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Reviews:



Deluxe Video, Mac Memory "Sidecar"



A MIX PUBLICATION

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STEREO PHASING MOD. DLY= 3.0ms	CHORUS A DM DEPTH= 50 %	CHORUS B AM DEPTH= 10 %
REV 1 HALL REV TIME= 2.6s	REV 2 ROOM DELAY = 20.0ms	REV 3 VOCAL LPF = 8.0 kHz
REV 4 PLATE HIGH = 0.7	EARLY REF. 1 TYPE = RANDOM	EARLY REF. 2 ROOM SIZE = 2.0
STEREO FLANGE A MOD. DEPTH= 50 %	STEREO FLANGE B MOD. FRQ= 0.5 Hz	STEREO ECHO Rch F.B = +58 %
DELAY L,R Lch DLY = 100.0ms	TREMOLO MOD. FRQ= 6.0 Hz	DELAY VIBRATO VIB RISE= 1400ms
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COVER

You can sample anything—even the Serpent Horn, an early 19th century musical instrument. To visually represent sampling and manipulation of sound, computer artist Jill Wilkerson sampled the image into an Amiga computer and added her own distinctive colorization. Photo courtesy Vancouver Centennial Museum, Vancouver, B.C. Thanks to Erwin Burger, Brass & Woodwinds, San Francisco, CA.

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Editor's Note



Letters, letters, letters... we get letters! And we do our best to answer them, too (although that gets more and more difficult as the magazine grows).

I guess everybody likes to receive mail from friends, and even though we haven't met most of you, a letter is "the next best thing to being there." From your comments, we get an idea of who reads **EM**, what kind of information you hope to find, what you like, and what

you don't like. Almost all of the letters are the kind that brighten up one's day—a story of how an article helped out a reader in a real-life situation, for example, or compliments to pass along to the authors of particularly popular stories. Some are less pleasant, like the ones we sometimes get from readers who are having trouble with an advertiser (this problem is pretty rare, but even once is too much), or those who are distressed that not every single article addresses their specific needs. Then again, many readers write because they have information to contribute. This month's letters page is the longest we've ever run, simply because so many readers had information to share. In a sense, since most of our articles are written by the readers, it's almost as if the whole magazine is one long letters column from people who are doing interesting things with musical electronics.

One thing that really impresses me is how open-minded you all are. I expected to get letters from keyboard players complaining that we had too many drum articles, or guitarists saying we had too many synth articles, or drummers saying we had too many recording articles... but no. It seems that there really is a new breed of "electronic musicians" who have a wide variety of interests. The results of our first reader survey bears this out; 52 percent of our readers play guitar, 53 percent play drums, 77 percent play keyboard synthesizers, 70 percent own a personal computer, 76 percent own recording equipment, and so on. These figures imply that there are a lot of musicians who double and even triple on instruments, play around with recording, and are familiar with computers.

By the way, we'd particularly like to thank those readers who tell manufacturers how much they like **EM**. Without dwelling on economics, suffice it to say that advertisers like to know where their ads are being seen, and mentioning **EM** makes it much easier to get the kind of strong advertiser support we enjoy. Since we all need each other in order to progress—advertisers need our readers to buy their products, readers need the useful information they find in **EM**, and **EM** needs its advertisers to fund the magazine—it is good when we communicate with each other.

Eventually, we'll reach the point where it will become increasingly difficult to answer everyone, but keep those cards and letters coming—we'll always have time to read them, even if we can't reply. And if you really do need a reply, help us by making things as easy as possible: include a self-addressed stamped envelope, and keep any questions as short and to the point as possible.

I was going to close out by reminding you that **EM** is your magazine; but judging by your letters, you already know that! Thanks to all who have written in for taking the time to participate in the process of fine-tuning the magazine—a process that will never cease. Many readers have said they feel each issue gets better and better, well, it's your criticisms and compliments that help us improve.

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Your Passport to MIDI Echo...

Many thanks to Tim Dowty for an informative article and a useful program ("MIDI Echo Delay," August '86). For those who would like to use the program with a Passport type MIDI interface, add these lines:

120 POKE 49187,8:POKE 49192,8:POKE 49307,10:POKE 49340,9:POKE 49346,1:POKE 49593,10

121 POKE 49615,8:POKE 49621,8:POKE 49652,8:POKE 49323,8:POKE 49190,45:POKE 49613,177

122 POKE 49650,19:POKE 49185,19: GOTO 800

The Passport interface uses these locations for in/out addressing. Thanks again, and keep up the good work!

Charles Pierce
Nederland, TX

More Passport Compatibility

I've received many calls and letters from readers asking whether the MIDI Delay program will work with their Passport C-64 interface. The good news is: yes, it will—with a few changes.

Make the following changes to Listing 1 in the August 1986 issue:

Line 5002, fourth byte, change from 00 to 08;
Line 5002, ninth byte, change from 00 to 08;
Line 5009, twelfth byte, change from 02 to 08;
Line 5010, twelfth byte, change from 00 to 08;
Line 5011, thirteenth byte, change from 01 to 09;

Line 5012, third byte, change from 03 to 09
Line 5027, tenth byte, change from 02 to 08;
Line 5028, sixteenth byte, change from 00 to 08;

Line 5029, sixth byte, change from 01 to 09;
Line 5031, fifth byte, change from 00 to 08.

And Line 100 should have CSM%=757.

Thank you to Dan White and Paul Wheeler for verifying the changes.

Also, please note that a postage/handling charge of \$1.50 should be added to all Xerbitron orders shipped to U.S. addresses. Orders bound for Mexico and Canada carry a \$2.50 P/H charge, and all other foreign addresses should add \$3.50.

Tim Dowty
Xerbitron
San Diego, CA

Don't You... Forget About Me

Congratulations on the expansion and all the improvements you've made in the magazine; it has become more interesting and informative with each new issue. One thing I've respected you for is your emphasis on the spirit of music-making rather than the most fashionable gear. Your May editorial was to the point. I am a musician who has no interest in writing a "hit song"; my film and video work is not aimed at MTV; I'm not likely to ever be commercially "successful." While it is amusing to read about Thomas Dolby and his many Fairlights, I hope you will continue

to take the time and space to serve those of us who are not addressed in other publications, those of us who, with the help of you and others with experience and expertise, are glad to "do-it-ourselves." Thanks for your encouragement over the years.

John Sonderegger
St. Paul, MN

Sampling Questions

I want to record a mono signal with the highest possible fidelity (say, for sampling later) and have a 4-track cassette recorder, is it advantageous to record the one track on all four tracks?

Bill Murray
Quesnel, B.C. Canada

Bill—Recording on four tracks would increase the overall signal level when mixed, but noise would increase by a corresponding amount. Also, if there's any azimuth misalignment at the tape head, combining those signals back in mono could cause phase cancellations. Still, for this application I would recommend sampling on more than one track; that way, you can choose whichever track sounds best (i.e. no dropouts or other mechanical problems), but I would not mix them together.

Frankly Speaking

I took exception to Robert Carlberg's review of Frank Zappa's *Mothers of Prevention* album. Instead of critiquing the good, listenable music ("Alien Orifice," "We're Turning Again"), he chose to center the whole review on "Porn Wars." Zappa was merely focusing our attention on the banality of the PMRC hearings. After seeing the proceedings on C-Span, it reminded me of my childhood days when a little child would run to his mother yelling "Mommy! Johnny said poop!" The idiocy of respected officials parroting dirty words was Zappa's message. As far as "shock value" goes (Rev.) Jeff Ling was more guilty of that charge than Zappa was. All those electronically treated voices belonged to our senators and were only sampled, not spoken by Frank. Wake up and smell the vapors!

Bradley S. Linton
Sandusky, OH

Button-Pushing?

(The following was received in response to our direct-mail subscription campaign, where we invited people to subscribe to EM.)

I think electronic devices, especially electronic drums, are fantastic as a means to an end, as they do give the musician more sounds to work with. What I find upsetting is that there will be little incentive to young musicians to work towards success when a few buttons can imitate their efforts. The young musicians are being cheated out of the joy of hard work, and you surely realize there are no short circuits to success. If you have the nerve, print this in your magazine.

Danny McInerney
Sagman, MI

Danny—No button can compensate for a lack of musical ideas; creativity is still the province of the human mind. You may be able to sample someone's drum sound, but that doesn't mean you can sample the soul of the person who created that sound, nor does it mean you can string those sounds together in a musical manner. Concerning cheating musicians out of the joy of hard work, I feel the type of work has changed, but not the degree. Learning about MIDI, recording, computers, and all the other accoutrements of modern music is not easy and in fact requires hard work. Also remember that this type of learning involves both art and science, and may ultimately develop the mind more completely than rote solfeggio training.

By the way, it is not necessary to dare us to print letters. As a communications medium for electronic musicians, EM welcomes the opportunity to print all kinds of letters, (pro and con) especially if they help generate discussion or have the potential to lead to new ideas.

Get Well

The WELL is an outgrowth of the publications of the Portola Institute, publishers of the *Whole Earth Catalog*, *Co-Evolution Quarterly*, et al. On-line since March of 1985, the WELL runs on a Vax, running Berkeley UNIX version 4.2, in the Whole Earth Review home on Gate Five Road in Sausalito. Jim Stockford, a researcher for the *Whole Earth Software Catalog*, started a music conference right away.

From the beginning, the music conference was active with discussion of the new MIDI software and its ramifications. Participants now include performers, composers, software developers, software users, and interested observers—all of whom have philosophical views to intersperse with reviews and announcements. We are currently developing a library of downloadable source code (as ASCII files or object code via the Kermit protocol) for music and MIDI programs. The WELL is a USENET node, linking us to universities, research institutes, and corporations throughout the world.

I invite you to check out The WELL. You can call direct at 415/332-6106 or try the new Pac-Tel packet switching scheme: dial 415/440-1444; at connect enter the sequence

“.”, (CR), “.”, (CR)

then at the “PPS-NET 495-xxxxxx” prompt, enter “495-4611199.” When asked for a log in, type “newuser.”

In addition to co-hosting the WELL Music Conference, since January I have been at Computers and Music in Daly City directing our foray into telecommunications. We are active on USENET (hplabs:well!dijg), CompuServe (73277,743), and PAN (CANDM).

David Julian Gray
Berkeley, CA

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So if synthesizers with MIDI, or SMPTE with film and video, is part of your business, check the specs and don't settle for less than the MX-70. Call your nearest Otari dealer for "Technology You Can Trust".

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520/1040 monitor hookup).

Well, if you look at an Akai sampler, you will notice that the connector that hooks the sampler to their synthesizer for sound processing has 13 pins. The Akai catalog lists the cable as part number "DD-X5013, 5 metres long" and a quick call to your local dealer should put one in your hot little hands to be butchered for an alternate monitor hookup. Hope this helps.

John C. Hosszu
McLean-Hannah Studios
Ontario, Canada

Ed. note: the Akai cables are manufactured to be dedicated audio cables and may not have proper shielding for RGB video lines.

Public Domain Amiga Software

Re: questions on Amiga Public Domain software, the AMICUS public domain disks (1 thru 8) were the first software I got for my Amiga, and found them quite nice. They are distributed freely as are another bunch of disks, the Fred Fish Disks (24 disks in all) that can be obtained via mail by sending \$7 per disk to Pim Publications, P.O. Box 869, Fall River, MA 02722. A complete listing of programs is available in the July issue of *Amazing Computing* (same address), a very important bit of monthly reading for any Amiga owner.

John Patterson
Austin, TX

Dud Droid?

As a not-so-happy owner of *DX Droid* by Hybrid Arts, I was surprised at your glowing "preview" (June '86) of a product that I consider to be flawed.

While I'm excited to see software appearing for the Atari 520ST, I think your readers deserve to know a little more about this program. You failed to mention some items which may disappoint potential users. First, the program makes no use of the GEM interface. This means no user-friendly icons or pull-down menus and extremely limited (token) use of the mouse. If you own other Hybrid Arts software, you know how their programmers prefer letter keystroke commands, and *DX Droid* continues this tradition, almost totally ignoring the availability of the point and click interface. Like other software, a running list of your last several commands clutters the bottom half of the screen (information which you never use).

Since the GEM interface is not used, the GEM desktop cannot be used to open, copy, or delete *Droid* files or disks. As a result, you cannot make copies of valuable data disks. The only way to make backups of voice data is to save something once, then use a command to change screens, then use a command to change data disks, change the data disks, another command for the new disk, change screens again, and re-save the data. This procedure must be used every time you want to make a backup of a single voice or bank!

Once during this procedure, I removed a data disk, replaced it with a different data disk and accidentally forgot to enter one of the commands. What happened? Somehow all my original data was lost. Of course Hybrid Arts wouldn't consider this a bug, after all you're warned in the manual not to change data disks unless prompted to do so. The problem is that Hybrid Arts handles such a simple operation in a totally unusual manner (which wasted a few hours work for me).

Another major limitation is the number of DX banks which can be stored on disk—only 18. By comparison, most every librarian program for the lowly Commodore 64 stores twice that amount. Hybrid Arts seems to feel that people are more interested in saving individual voices. As far as librarian features go, the software actually buffers only one bank of voices. If you want to make custom banks, there is a feature that allows you to mix sounds from the single bank buffer with one bank on disk, but that's as far as it goes. There are other nuisances like not being able to type spaces in any voice titles, and using two systems to designate voices in a bank—numbers only, and for some operations you must use numbers and letters.

The Set Test Tones function is extremely limiting. Your review alludes to this by saying only the lazy wouldn't reach over and play the DX7 to hear editing results, but what happens when you own a TX module and not a DX7? Then you've got to re-route MIDI signals, and play your master keyboard every time you want to hear what your editing does to a sound. Once again, a simple operation is now cumbersome.

The *Droid* function is interesting, but not especially useful. It tends to produce a myriad of sine wave variations and pitch sweep effects, but I doubt you'll find any *Droided* sounds on next year's albums.

Frank Leister
Mechanicsburg, PA

Tom Bajoras, the program's designer, offers the following comments: "*DX-Droid* does not fully take advantage of the ST's GEM operating system—mostly because *DX-Droid* was developed before the first STs were released in the U.S. However, careful software design makes *DX-Droid* as easy to use as if it had those GEM frills. No command words need be memorized; mouse-clicking takes care of that, and additional information is entered through single keystrokes in response to on-screen prompts. *DX-Droid* is no less user-friendly than an icon/mouse-oriented program.

"Regarding number of banks saved and such, even a powerful computer like the ST does not allow a program to do everything. Sure, it would be possible to write a program that saves over a hundred DX banks per disk, but that program would have no indexing scheme, very cumbersome cataloguing, and no automatic revision tracking. *DX-Droid*'s intention is to go beyond the capabilities of existing library/editor programs; if the program was written to allow many banks of sounds

to reside concurrently within RAM, that would not leave room for *Droid* functions or editors as powerful as *DX-Droid*'s. The program is about 109K bytes and requires well over another 100K of RAM for data storage. Increasing the program's size could cause problems with the worst-case scenario, a 520ST with TOS loaded from disk and using several desk accessories. At its current size, *DX-Droid* works with any ST configuration. Designing software involves compromises. *DX-Droid* might not be as good a patch librarian as it could be if it were dedicated to that function alone, but *DX-Droid* does much more. The program's popularity confirms that we have made the correct compromises.

"On the matter of backing up data disks: we now supply a data disk backup program on each *DX-Droid* program disk. Another program will translate *Droid* banks to and from the ST's standard file format; these programs will be available free of charge to current *Droid* owners through Hybrid Arts' "Midicom" network, or on disk for a nominal fee. *DX-Droid* uses a non-standard disk format to allow higher disk capacity, faster disk access, and prevent pirating of sounds—a feature which more and more sound designers are learning to appreciate. Incidentally, while the "change data disks" command does allow disk backup, that is not its intended function. It is best to backup disks using the program mentioned above. (Also, according to the manufacturer the test tone function is now improved—Ed.)

"Regarding the *Droid* functions, we recognized that a range of possibilities existed, from generating musically conservative but potentially uninteresting sounds to generating many ghastly sounds with a small chance of finding something really wonderful. We opted for something closer to the latter. Enough programmers know how to create simple sounds; the *Droid* function strives for more complex sounds, at the risk of stumbling through a certain percentage of "useless" sounds. But the *Droid* function was never meant to replace human programming! As the review stated, *Droid* gets you most of the way there, and if you find a sound you almost like, it's easy enough to use the program's editing functions to edit the sound to your liking.

"Our software exists to serve musicians, and we welcome constructive criticism so that we can serve musicians even better. While we appreciate Mr. Leister's concern and interest in the program, we do not anticipate any major program revisions at this time as the feedback from both users and reviewers has been overwhelmingly favorable."

Schnitzler Update

I enjoyed reading the concise history of German electronic music by Robert Carlberg in the May issue. I thought it was interesting to follow the Cluster Family Tree to see the development of the musicians and bands from their obscure beginnings to their current popularity. I also have some additional information about Konrad Schnitzler, one of the original members of Cluster.

Konrad Schnitzler has continued composing electronic music to the present. His main

focus has always been non-keyboard electronics, which may explain why he hasn't made it to the top of the family tree. Another reason is that he prefers to compose quietly at home. I do know that he just recorded new music which should be out now on Idiosyncratic Records. I hope this helps anyone who may have wondered "What ever happened to Konrad Schnitzler?"

Ken Montgomery
New York, NY

Advice Please!

I recently designed a device that allows for very flexible effects switching. The problem I face is that I do not know whether to patent the design (if it is indeed patentable), market and sell it myself, license it to a larger manufacturer, or what? Any advice would be appreciated.

Mark Luderman
W. Seneca, NY

Mark—You have my sympathies; making a decision about what to do with an invention is hard. I would suggest the following, but remember, other people would probably give you different advice.

1. Don't bother getting a patent unless you have invented something as fundamental as the zipper. It takes thousands of dollars and lots of time to obtain a patent, and in the long run, most patents that are challenged are overturned. The people who believe in patents the most seem to be patent attorneys.

2. Major companies do not rip off ideas. You can usually write a proposal concerning your idea—what it does, what you would want for it, and whether you would be available as a consultant or to join the company if necessary—and see what happens. Remember, though, you have to specify precisely what you want. A company will not be able to say "yes" or "no" if they don't know your terms and conditions—this means specific dollars and cents, and what you are offering to sell them in return for those dollars and cents. Do not divulge any technical "secrets" (if they're working on something similar, they don't want to be put in a position where they could be accused of stealing your ideas) but plainly describe what the thing does, approximate manufacturing costs, and so on. If you want to be respected as a professional, write a professional proposal.

By the way, parallel discovery is far more common than most inventors would care to admit. Don't be surprised if you submit an idea and six months later, the company produces something very similar; no one has a monopoly on solutions to common problems. Besides, it doesn't make economic sense for a company to develop a product from scratch based on someone's idea. It's a lot smarter to just pay the person and acquire the research for the product outright, and let the company engineers continue on with their existing projects.

3. You can always manufacture a short production run and sell a few custom items. This will let you gauge whether people are interested or not. The next step would be to exhibit your product at

a trade show such as NAMM. That would expose your product to major manufacturers, retailers, and the press, which if nothing else will make the negotiating process easier should you decide not to manufacture the thing yourself.

Good luck!

A Question of Ethics

I hope your Editor's Note on software piracy in the July issue gets reprinted in every major publication that mentions music, computers or software. The attitude of "I can get the program for free, so why should I pay for it" has run rampant throughout the computer industry for several years and is now infiltrating musical minds as well. Unfortunately, the best programs—those that really took someone a lot of time and effort—are the ones being copied most often.

If a product does the job well and is reasonably priced, the author should reap the benefits of writing the program. A programmer invests time or money into a program, just as with any product. A "product" does not necessarily have to be a manufactured item; it is the product of someone's imagination, money, and/or time.

As a software author myself, I don't want to get ripped off for all the effort I put into my software. I have spent almost half the amount of time trying to copy protect programs that I have writing them. My time could (should) have been used to write new software or enhance existing works.

Doug Slocum
Brick, NJ

1986 Univibe?

It seems that a lot of people are interested in obtaining the legendary (and no longer available) "Univibe"; I have some comments to pass along. Project #21 (Phase Shifter) in *Electronic Projects for Musicians* (available from Mix Bookshelf) comes very close to the sound Hendrix got from his Univibe. However, I feel the sound quality leaves the old standards in the dust. I did make some mods: I changed R28 from 27k to 22k to narrow the speed change, changed C9 from 10 μ F to 22 μ F to slow down the LFO, and reduced C7 from 0.22 to 0.1 μ F to reduce low frequency response. I do have one question: how can I cut down a bit on the high frequency response? Anyway, thanks for designing such a wonderful gadget.

Joe Varela
Houston, TX

Joe—Thanks for the mods, we are happy to pass them along to other readers. The easiest way to cut down on highs is to parallel R19 with a capacitor. Start with 1 nF and increase from there until you achieve the desired degree of dulling.

More on Syntauri

Re: the Apple II article in the October issue, we are the guys who sent you the

garbled message about a U.S. users group called the International Syntauri Users Group, founded in February 1983. The group consists of over 250 members worldwide, including S.U.N. (the Australian users group) with whom we exchange newsletters regularly. However, our newsletter is on an Apple II format disk called "SYNDISK," which has been published monthly by members of ISUG for over three years. It contains notes and information about music and computers, along with MCMS sound and song files, utility programs (notably for conversion to and from Soundchaser and Syntauri formats), and even Casio CZ and Yamaha DX sound files. We maintain our own BBS at 201/661-1249 and meet the first Tuesday of every month at New York University. We have been on-line with PAN (username ISUG) for nearly three years; our members include EM authors Freff, Paul Lehrman, and Tim Tully as well as Laurie Spiegel (Music Mouse) and Bob Hoover (Mimetics). Please direct any questions via e-mail to ISUG over the PAN network, or to ISUG, c/o Bill Lewis, Box 85, Shirley, NY 11967.

Bill Lewis
ISUG

More Apple II Resources

I was pleased to read Alan Gary Campbell's article "The Musical Apple II," as I have been a strong advocate of the machine for several years. There were, however, some omissions that I would like to correct.

Although Syntauri is no longer in business, various hardware and software components for the system are available from ISUG (see previous letter—Ed.) and Mimetics. Additionally, Mimetics has developed higher-quality replacement hardware for the Mountain Computer Music System cards, as well as software that can turn the Syntauri into a MIDI-control system.

Some other third-party software suppliers not mentioned in the article include Streifert Software (Northern Pines #134, RD#1 Lewis Rd., Ballston Spa, NY 12020); D&S Schiminovich (80 Chester Place, Englewood, NJ 07631); and my own company, LehrWare. We have developed a very successful program called "Metawave" which does sophisticated waveform editing as well as sample editing and resynthesis, in conjunction with the Decillionix DX-1 card.

Paul Lehrman
Boston, MA

Let's Make It Clear

In the September issue, "Sequential Drum Traks Mods" by Eric Barbour recommends obtaining a 20 nF or 100 nF capacitor for a particular application (page 59). A few readers had trouble obtaining this size capacitor... or so they thought. The problem arose because we stated parts size using the "International Parts Specification Standard" which is used

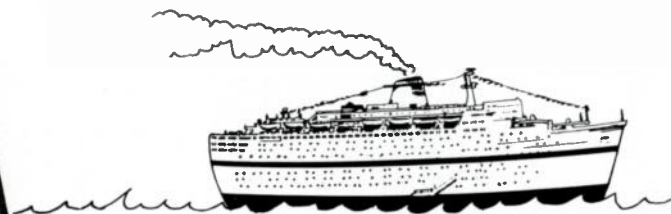
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throughout the world (except in the U.S.). This standard avoids the unnecessary use of zeroes, decimal points, and stating Ohms (Ω) or Farads (F) when implicitly understood. For example:

USA	Int'l
1.5 k Ω	1k5
2.2 M Ω	2M2
10 μ F	10 μ
0.01 μ F	10n
3300pF	3n3
0.0022 μ F	2n2
10pF	10p

where

k =	kilo = 10^3 Ohms
M =	Mega = 10^6 Ohms
μ =	micro = 10^{-6} Farads
n =	nano = 10^{-9} Farads
p =	pico = 10^{-12} Farads

Therefore, 100 nF is equivalent to 0.1 μ F; and 20 nF equals 0.02 μ F. Don't expect a parts clerk to know what a 20 nF capacitor is, though, because they probably know less than you do now. You may wonder why we use a system that is different from much of the U.S. electronics industry; well, I'll tell ya. First of all, EM's audience is worldwide and our politics

are far from being nationally exclusive. Second, not having to deal with all those zeroes and tiny decimal points greatly reduces the chance of typographical errors. Like the metric system, this is a better way of doing things so let's get used to it. How many teaspoons are in an ounce anyway? I can never remember. . .

Vanessa Else
Associate Editor, EM

Help for MXR and ARP fans

Re: all the Operation Help letters asking about MXR and ARP gear, recently I found that Kelsey-Pape Engineering (18 Wilmer St., Rochester, NY 14607; tel. 716/271-1990) bought out all of MXR's parts plus some almost-completed units. Jim Kelsey and John Pape will fix MXR gear or help find that obscure part.

Along the same lines, Music Dealer Service (4700 W. Fullerton, Chicago, IL 60639; tel. 312/282-8171) bought all the old ARP parts and repair stock. They may be able to help with your ARP needs—it depends on the model. They also have schematics, but you'll have to negotiate individually for these because some of the schematics are in such bad shape they cannot be copied. Ask for Sam Greco.

Craig O'Donnell
Chicago, IL

Beta is Better!

I was very excited by Tim Fluharty's article "Mastering with Beta Hi-Fi in the Home Studio" in the October issue. Having used a Sanyo 7200 since June 1985 for this purpose, I am amazed at the money I have saved in not having to buy a mastering deck with its expensive tape.

One drawback on my machine was the lack of a video signal generator for indexing times. I solved this by taping the cable time and temperature channel on video while mastering on the audio. Now I have the day, month, year, hour, minute, and second, and weather of when my masterpieces arrived. Great for finding things! Also, anyone using software for sequencing can record the monitor information on video in sync with the audio information recorded on the audio tracks. I read EM without fail!

Rick Morris
Lincoln, NE

Error Log

We neglected to mention the price of "Music Mouse" software for the Mac (October issue, page 17), which is \$59.95. Orders should be addressed to Laurie Spiegel (the program's author), not Music Mouse, at 175 Duane St., New York, NY 10013.

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Operation Help is dedicated to helping musicians help each other. If you need technical assistance, a schematic for some old piece of gear, or just want to connect with people having similar interests, send your name, address, phone number (optional), and nature of your request to Operation Help, Electronic Musician, 2608 Ninth St., Berkeley, CA 94710. There is no charge for this service, but we cannot guarantee that all requests will be published.

Dokoder Schematic: I am interested in obtaining a schematic for a Dokoder 7140 4-track reel to reel. Anyone who knows how I can obtain one, please drop me a line. Mark Osburn, 2500 South Tulsa, Fort Smith, AR 72901.

Gizmotron Bow-Wheels: I'm looking for nylon bow wheels for a bass Gizmotron (made by Gizmo, Inc.). Mine have worn out, the company is defunct, and all traces of this device have disappeared. I would appreciate any information that might lead to some replacements. I am also interested in any inexpensive bass guitar-to-MIDI conversion kits or schematics. Thanks! Paul Dickinson, 843 Auburn #3, Buffalo, NY 14222.

Oberheim DX MIDI Mod: I have a

DX drum made by Oberheim. Do you know of any hardware mods or kits to MIDIify the DX? Could you connect me with anyone having a similar interest? Greg B. Mittler, 45 Balliol St. #1013, Toronto, Ont. M4S 1C3, Canada.

Synthi Aks: Can anyone provide me with a schematic for the Synthi Aks "Synthesizer in a Brief Case", made in England by EMS? Jack Marek, 172 SW 62nd Terrace, Plantation, FL 33317.

MXR OMNI Effects Foot Pedal: I picked up an MXR OMNI Effects unit but it has no foot pedal assembly. I also have an Ibanez 405 with a pedal. The main problem is that the 405 uses a 14 pin connection to the pedal assembly and is a momentary solid state switching setup. The OMNI uses only a 1/4-inch phone plug as the pedal input. 1) Are each of the effects voltage controlled? Current controlled? 2) Are there schematics available anywhere? 3) Does anyone have a foot pedal to spare or for sale? Tony Rieman, 17643 N. 15th Ave., Phoenix, AZ 85023.

Mattel-to-Computer Conversion: I own a Mattel Intellivision piano keyboard. I've written Mattel for schematics without luck, but operating details must

be floating around somewhere. Would any EM readers have information or ideas on how this keyboard could be interfaced to a Commodore-64 or IBM-PC? Guy M. Stuller, 2144 S. 60th St., West Allis, WI 53219.

EVI to MIDI: I am interested in modifying the Steiner EVI for MIDI and lengthening the cord that connects the EVI to a synthesizer. I also heard the EVI was being modified for MIDI and would soon be available. What I need is any information concerning mods to the EVI, and schematics if possible. Thank you for your time and consideration. Gregory S. Michaels, 320 Alpine St., Bridgeport, CT 06110; tel. 203/367-3721.

CZ-5000 Users Group: I'm looking for a CZ-5000 users group and am particularly interested in alternate patch program on cassette. Al Trautman, P.O. Box 172, Lydia, LA 70569.

Breaking the Speed Limit: I need a variable speed modification for the Marantz Superscope CD-330 cassette recorder (these machines are servo-controlled and I have heard mods are possible). Raphael Walrond, 2 Store St., Mon Repos, San Fernando, Trinidad, West Indies.

Suggestion Box

Here's your chance to make suggestions to the industry. Send your complaints, complaints, and ideas to: Suggestion Box, Electronic Musician, 2608 Ninth St., Berkeley, CA 94710. We also welcome suggestions from manufacturers to users of individual pieces of equipment.

MIDI Program Change Footswitch:

One of the problems for guitarists using MIDI-controlled effects setup is footswitch configuration. Tim Dowty mentioned one solution in his article "The MIDI Program Change Footswitch" (June '86 EM), but is it possible that a MIDI bass pedal board could be converted from its function as a "foot keyboard" to a MIDI program change controller with individually programmable program changes commands for each key? The advantage, as I see it, would be the ability to label the programs and to jump easily between individual programs without having to cycle up or down a program list. This would also allow more spontaneity. David G. Brown, North Vancouver, B.C., Canada.

Crossfade, Program Changes, and

Better Mixers: With programmable instruments, I'd like to see a "crossfade

time" parameter that would specify the time it takes for the just selected program/preset to change from the last program. This would simply change the patch in smooth increments between the two different control settings of the two patches. Maybe this would also make a good performance knob/slider. Granted some software now has this function, but it would be good to see it included on the instrument itself (like Akai does with their programmable MIDI mixer).

Also, I dream about 256 program changes, and matching high-end programmable guitar amps with 256 MIDI addressable presets. And of course, a pedalboard that transmits 256 MIDI program numbers, with chains.

Finally, I'd like to see virtual keyboard/line mixers with, say, eight auxiliary sends per channel. These would be blank face rack mount boxes with 256 MIDI selectable presets. You would have the option of programming them by personal computer, or dedicated programmers like the MPG-80 for the Roland Super Jupiter (a great idea by the way, I wish there was one for every synth). And

while I'm here—how about more software with SMPTE capabilities? Bill Murray, Quesnel, B.C., Canada.

Towards More Modular Systems:

Having MIDI separate the keyboard from the sound-generating electronics was an important step. Now how about separating the left hand controllers from the keyboard? This would involve a series of small boxes with various controllers (wheel, lever, ribbon controller, pressure, etc.). Each would have a MIDI input and merge incoming MIDI data with controller data.

Another possibility is a series of "MIDI command" modules. These could provide simple functions (such as programming MIDI program change commands via a couple of buttons) or complex ones (MIDI start/stop, program change, note mapping or splits, etc.). Thus, a musician could buy a MIDI keyboard, the desired controllers, and a command module that controls the desired system functions as a modular system. This would simplify hardware upgrades, and give the musician more freedom in configuring a system. Craig Anderton, Berkeley, CA. **CA**

BY ROBERT CARLBERG

Send records, tapes, CDs, and videos for review to Robert Carlberg, P.O. Box 16211, Seattle, WA 98116.



Suzanne Ciani, *The Velocity of Love* (RCA 7125). Commercial work pays. It pays well enough that Ciani has amassed a 48-track studio and 28 synthesizers (including a Synclavier), paid for by the fizz of Coke, the snap of a potato chip and the whoosh of a new can of coffee. Does this qualify her as a composer? No, but it makes her conservative voice choices and undramatic music somewhat surprising. Perhaps this is what she does to "get away from the office." P.S. I thought "the velocity of love" was settled by Laurie Anderson in *Mach 20*.

A Day on Cape Cod: *Early Cape Morning* (Rykodisc 30014); ***Babbling Brook*** (Rykodisc 30015); ***Sunset Surf*** (Rykodisc 30016); ***Summer Rain*** (Rykodisc 30017). The first environmental recordings on CD, digitally recorded, one hour apiece. Compact discs are the perfect medium for ambient recordings: no surface noise, no wear, infinitely repeatable.

Peter Mergener/Michael Weissner, *"Beamscape"* (Innovative Communications 80.046); ***Software, Chip-Meditation*** (Innovative Communications 80.050); ***Double Fantasy, Universal Ave.*** (Innovative Communications 80.054). It might be easier to describe the differences between these albums than to detail their similarities. *Double Fantasy* includes electric guitar. *Software* has a one-minute spoken interlude (in German) at the end. "Beamscape" uses a wah pedal on the string chords. Otherwise, everything else is string-synth im-

Robert Carlberg is the national service manager for Audio Environments Inc., a nationwide supplier of original-artist music for restaurants and fashion stores. His hobbies are electronics and music, and particularly electronic music.

provisations over a Schulzean sequenced backing (even though Klaus Schulze is no longer associated with Innovative Communications). Looks like I.C. hasn't got much to say that hasn't been said before.

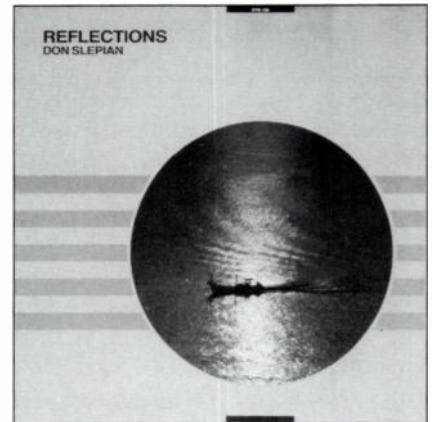
Peter Seiler, *Flying Frames* (Innovative Communications 80.057). Seiler doesn't fit the mold of the 3 I.C.s above. For one thing, it is more composed than improvised, and the backing tracks are played rather than sequenced. For another, each selection features different instrumentation: flute, guitar, electric piano, even a string orchestra on one track. Though not as tuneful as say, Eddie Jobson, Seiler's album is a bountiful collection of little mood/sound experiments.

Robert Fripp, *Live!* (Editions EG 43); ***Toyah & Fripp, The Lady Or The Tiger?*** (Editions EG 44). Robert Fripp is amazing. Trouble is, he thinks he's a little more amazing than he really is. Why else would he have the moxie to release two albums of his guitar class and call his students "The League of Crafty Guitarists?" *Live!* is basically fast unison playing with much skill and no feeling. *The Lady* is two Frank R. Stockton stories read by Toyah Willcox over Frippertronics (side 1) and The League (side 2).

Tangerine Dream, *Underwater Sunlight* (Relativity 8113). Something's happening in electronic music. It may have begun with *Tubular Bells* (1973) or *Steve Tibbetts* (1976), but more and more musicians are splicing together short musical ideas to form longer patchwork "songs" bristling with vitality. Even the originators of the "2-Hour Jam" have adopted this concise, fat-free style, as 24-year old Paul Haslinger replaces Johannes Schmoelling as the "one with chops" in the band.

The Tim Ski Project (cassette). Underground compilations are always fun because the participants are long on ideas (short on execution) rather than vice versa. This one includes such U/G staples as Arnold Mathes, Ron Slabe, Carl Weingarten, Rick Franecki and 11 others, with a mini-booklet of art and comment, addresses and other tapes available. Tim Ski, 8125 Bremen Avenue, Parma, OH 44129.

J. Greinke, *Over Ruins* (cassette). I erred in June when I described Greinke's *Cities in Fog* album as disorganized. His music is not lacking in organization; it's just a different sort. With no melody, no rhythm, no development and no glamour, his music concentrates entirely on elaborate drones and tape alterations which sweep in and slowly out. This style is actually long-established and still finds many fans. Intrepid Records, 612 1/2 N. 43rd Street, Seattle, WA 98103.



Don Slepian, *Reflections* (Audion 106). Sometime EM columnist was one of the pioneers of independent electronic music, so it's good to see him getting released on Fortuna, Narada, and now Larry Fast's Audion label. *Reflections* was recorded primarily on Ensoniq Mirage, with piano and acoustic guitar and a few parts recorded on Suzanne Ciani's Synclavier. Slepian is the master of the extended motionless drone that ripples like the sea.

Curtis Riker, *Keep To The Shadows* (cassette). Four songs (17 and one-half minutes) featuring Riker's optimistic lyrics and guitar work, plus bass/drums/synth/sax/b-vox by a cool dozen friends. Riker's a better singer than David Byrne with a similar voice, and his songs are proficient though conventional. 7904 Keswick, Austin, TX 78745.

The Portis-Cathers Ensemble, *Water from the Temple* (cassette). Guitar, tabla and violin fusion/world music from the same well as Oregon, Do'a or Tri Atma. Dan Portis-Cathers, guitarist and leader, writes pleasant hummable tunes and includes the very subtle use of an Emulator II. Deep Sea Music, 316 S. Center, Newberg, OR 97132.

Neil Nappé, *July* (Audion 107). Audion's sampler (last month) states that the label will be devoted to electronic music for the listener, as opposed to "academic exercises only for other composers to hear." Nappé is certainly a feather in that cap, creating upbeat powerful music around a guitar synthesizer and MIDI stack. *July* recalls Larry Fast/Synergy in the use of grand chords on string/sawtooth synthesizers, but Nappé relies a little more on a digital drum machine to keep things rolling, and his compositions are both looser and more immediately melancholic. Nappé's supposedly got some cassettes out; his address is on the jacket; I think I'll write. R.D. #1 Box 135 Fish Road, Jackson, NJ 08527. **CA**

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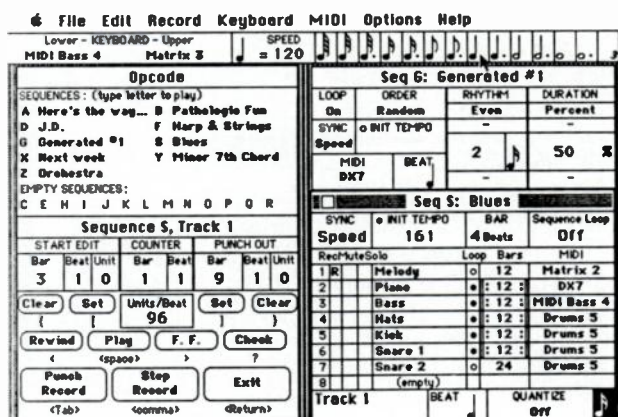


Sequencer 2.5 is the latest version of our Sequencer, which features music transcription. It won't gag if triplets and quintuplets and eighth notes are all in the same measure — but you can specify that you only want one kind of division. It understands the difference between 3/4 and 6/8 time and generates appropriate note durations without making flurries of tied sixty-fourth notes. Sequencer 2.5 transcribes your music into files for Electronic Arts' *Deluxe Music Construction Set* or Mark of the Unicorn's *Professional Composer*. It also reads files created by either program. Both programs allow printing, entering, and editing music in standard music notation, including graphics and lyrics. *Deluxe Music Construction Set* is one of the best values in music printing and supports up to 16 tracks on 8 staves. It allows very flexible symbol placement and it can play through MIDI itself. Sequencer 2.5 works with both the original version and the new version 2 which supports Adobe's new *Sonata* music notation font for Apple's LaserWriter. *Professional Composer* allows up to 40 staves, and has a vast library of musical symbols. It also has a number of automated capabilities including instrument range and rhythm checking.

Sequencer 2.5 also features MIDI Files. MIDI Files are a standardized way of storing MIDI sequence data, complete with velocity, pitch bend, precise timing information, and everything else, in a file which can be read or written by other programs. *M* and *Jam Factory* from Intelligent Music both use MIDI files. These files are fully documented so you can write your own composition or performance programs!

Sequencer 2.5 has all the other professional MIDI sequencer features, including: up to 26 chainable sequences with up to 16 loopable, mergeable tracks per sequence in each file; step entry; multichannel recording; innovative transpose capabilities and random-generated sequences; recording of tempo changes; MIDI Song Pointer for synchronization with SMPTE/MIDI interfaces.

Only Opcode gives you a sophisticated sequencer which works with your *choice* of music notation programs! Maximize your price/performance with our entire line of the best in Macintosh musicware, including MIDI Interfaces, the famous DX and CZ Patch Editors, or the industry's most complete line of Patch Librarians.



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444 Ramona
Palo Alto, California 94301
(415) 321-8977

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ACCESSORIES

►The **DX-RAM** (\$59.95) memory cartridge for Yamaha synths and drum machines features low-power CMOS RAM, includes battery backup, and uses a gold-plated edge connector said to conform to the instrument's own cartridge interface.

Digital Music Corporation
21787 Ventura Blvd. Suite 124
Woodland Hills, CA 91364
818/704-7879

►The **MA-100 Modem Adapter** (\$129 including batteries) allows portable computer owners to use non-modular phones. It folds to wallet size yet is adaptable to virtually any handset, including European models. While designed for 300 Baud operation, 1200 Baud is possible depending on the telephone, modem, and phone line quality.

Novation
20409 Prairie St.
Chatsworth, CA 91311
213/996-5060

AMPLIFIERS

►The **DAC-15B** bass amplifier, intended for home recording, rehearsal, and small clubs, provides 15 Watts, a three-band equalizer, and a 10-inch woofer.

RolandCorp US
7200 Dominion Circle
Los Angeles, CA 90040
213/685-5141

COMPONENTS

►The **SSM2031** (\$1.70 in 1000s) is a high frequency oscillator/voltage-to-frequency converter. Operating range is 0.001 Hz to 10 MHz with 0.1% linearity to 1 MHz.

SSM
2076 B Walsh Ave.
Santa Clara, CA 95050
408/727-0917

►New **Yamaha** chips include the **YM-2203** FM synthesizer, **YM-3526** sound generator suitable for telephone access information networks and other communications systems where digital sound generation is required, **YM-3014** serial floating D/A converter, **YM-2163** digital sound generator (works with host CPU), **YM-2149** sound generator chip (fully compatible with the General Instruments



Novation MA-100 modem adapter

AY-3-8910), **V-6355** video processor chip for controlling CRT or LCD displays (IBM-graphics compatible), and **V-9938** graphics processor (displays 256 colors simultaneously with 512 × 424 dot resolution).

Japan: K.K. Ewig Shokai
18-8, Shinsen-cho
Shibuya-ku, Tokyo, 150 Japan
(03) 464-7321, telex J26295 (EWIGKK)
Europe: Allied Electronics GmbH
Breite Strasse 155 D-5000
Koeln 1, F.R. Germany
(0221) 216050, telex 8886647

COMPUTERS

►The **Apple IIGS** (\$999) runs standard Apple II programs three times faster and boasts sophisticated sound and graphics. The sound chip, from Ensoniq, is the same used in the Mirage and ESQ-1. For graphics, a Super High Resolution mode offers 640 × 200 pixel resolution with four colors per line out of a 4,096 color palette, or 320 × 200 pixels with up to 16 colors per line from the same palette. The



This Apple IIGS home installation includes the AppleColor RGB monitor and 800K 3.5-inch external disk drive.

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Owatonna, MN 55060

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Kawai R-100 drum machine

standard machine comes with 256K RAM and 128K ROM, but can be expanded with extra cards to 8 Megabytes RAM and 1 Megabyte ROM. Data ports include two RS-422 serial ports, monochrome video, color composite video, analog RGB, and sound. Game I/O, joystick ports, and a new high-speed disk I/O allows connection of up to six disk drives; an optional SCSI drive card will be available. A headphone jack with programmable volume control is also included. Finally, Apple plans to offer a \$500 GS upgrade to Apple IIe owners in the spring of '87.

Apple Computer
20525 Mariani Ave.
Cupertino, CA 95014
408/996-1010.

►A new magazine for the GS, **Apple IIGS:Graphics and Sound** will debut in November from:

RCC
3381 Ocean Dr.
Vero Beach, FL 32963
305/231-6904

►Atari has announced the 2080STF and 4160STF, 2 and 4 Megabyte versions respectively of the 1040ST, as well as a custom Blitter graphics enhancer that inserts into existing ST computers.

ELECTRONIC PERCUSSION

►The R-100 digital drum machine (\$795) includes touch-sensitive buttons, 24 sounds (recorded using 12 bit companding with a 32 kHz sampling rate) each

with controllable tuning, pan, level, and sensitivity, and memory for up to 100 patterns, 100 songs, and ten chains. The MIDI implementation includes Song Pointer and MIDI data dump capability.

Kawai
24200 S. Vermont Ave.
P.O. Box 438
Harbor City, CA 90710-0438
213/534-2350

PUBLICATIONS

►The **Mix Annual Directory of Recording Industry Facilities and Services** (\$24.95), available in February 1987, is a resource guide for recording and sound professionals.

Mix Publications
2608 Ninth St.
Berkeley, CA 94710
800/233-9604 (outside CA)
or in CA, 800/641-3349

►**Music of the Spheres** covers the New Age scene and each issue includes a cassette sampler of New Age music. For information on subscriptions or submitting materials, write:

Box 1751
Taos, NM 87571.

►The **Drum Machine Book** (\$20) includes over 500 patterns and fills; chapters on getting the most out of drum machines; and arrangements from hit songs.

Bellwether Records
P.O. Box 22409
Minneapolis, MN 55422

►**Yamaha Easy DX100/27** (\$9.95) is an 88-page book that explains the operation of the DX100 and DX27 synthesizers. **Yamaha Easy DX7** (\$9.95) is a similar book for the DX7. The **MIDI Book—Using MIDI and Related Interfaces** (\$14.95) is intended as a reference book on the subject of MIDI.

Hal Leonard Publishing
P.O. Box 13819
Milwaukee, WI 53213
800/558-4774

SOFTWARE

►The **Copyist** (\$175 non-MIDI, \$250 MIDI) is a publishing-quality score editing/printing program for IBM PC/AT/XT computers. It requires 256K of memory, and a Hercules or color-graphics display card; the software supports the Hewlett-Packard Laserjet+, HP Inkjet, HP or Roland plotters, and Epson dot-matrix printers. A new high-resolution Epson printer driver has just been added.

Dr. T's Music Software
66 Louise Rd.
Chestnut Hill, MA 02167
617/244-6954

►New programs in EPROM for the **Eventide SP2016 Digital Reverb/Signal Processor** include stereo shimmer, random ambience, dynamic reverb, sub-bass synth, and several general purpose programs. Another program EPROM, the **Studio Toolkit**, includes a pink/white noise source, sweepable sine wave oscillator, SMPTE code filter/reshaper, phase meter, and mono-to-stereo synthesizer. The programs are packaged in various combinations in EPROMs and list for \$89.99 to \$199.99.

First Order Effects
206 W. 106th St., Suite 27
New York, NY 10025
212/864-5491

SYNTHESIZERS

►The **K3m Digital Wave Memory Synthesizer** (\$849) is a six-voice rack mount MIDI expander module that contains the same features as the K3 keyboard synthesizer. When combined with the K3, 12-voice operation is possible.

Kawai
24200 S. Vermont Ave.
P.O. Box 438
Harbor City, CA 90710-0438
213/534-2350

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When was the last time you used a microphone that performed so well you actually did a double take? You actually said, "Wow! This thing is fantastic."

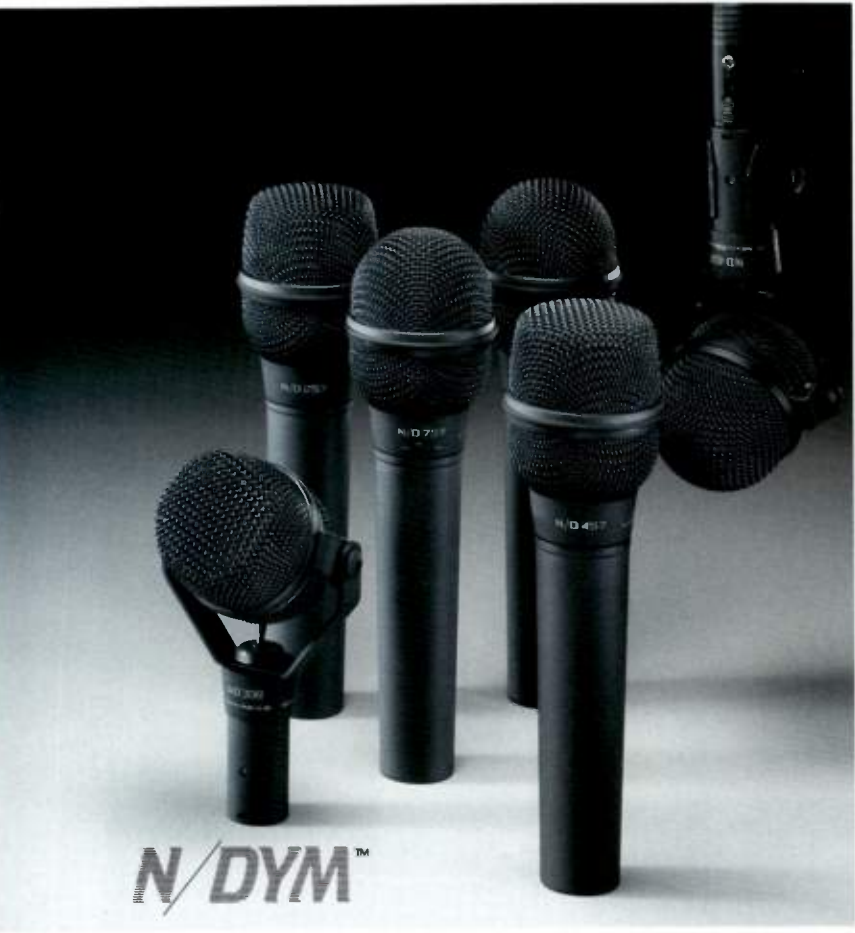
Chances are it hasn't happened in years. It hasn't happened because even though microphones have been modified and improved gradually over the years, there hasn't been any real breakthrough for over two decades.

The new N/DYM™ microphones are going to make you say "Wow!" This innovative series of vocal and instrument dynamics represents the first genuine advance in microphone performance in nearly a quarter century.

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To learn more about N/D Series microphones, see your Electro-Voice dealer or write Electro-Voice, Inc., Dept. N, 600 Cecil Street, Buchanan, MI 49107.

a MARK IV company

►The **X7000 Digital Sampling Keyboard** (\$1,695) features 12 bit linear sampling, 4 kHz to 40 kHz sample rate, six individual sample points, and a 61-key velocity-sensitive keyboard.

Akai Professional
P.O. Box 2344
Fort Worth, TX 76113
817/336-5114

►The **Studio 440** (\$3,999) combines a 12-bit linear 32-sound digital sampler, drum machine, 40,000 note MIDI sequencer, and interfacing for audio/video post-production (MIDI, SMPTE, MSMPTE, and timing pulses). A 3.5-inch disk drive is used for storage, and an SCSI interface allows for possible expansion to hard disks and CD-ROMs.

Sequential
3051 N. First St.
San Jose, CA 95134
408/946-5240

TELECOMMUNICATIONS

►An Akai S900 user's group and customer service hotline will appear as a SIG on the PAN network starting in November.

The PAN Network
P.O. Box 162
Skippack, PA 19474
215/489-4640

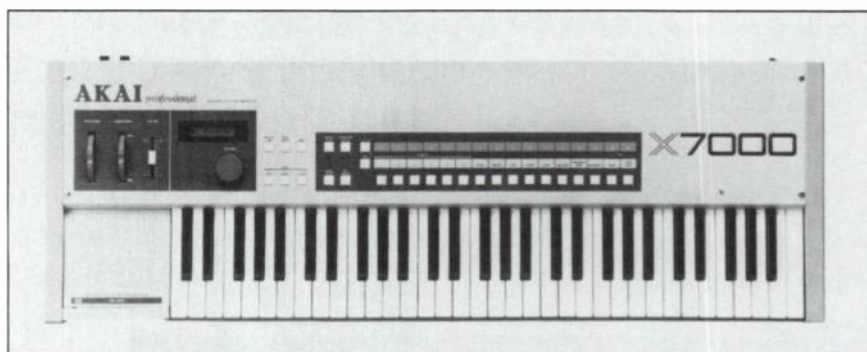
►**SynthBank** is now serving as an on-line dealer for the software necessary to upload and download SynthBank sounds. This currently includes OpCode, Digidesign, Mark of the Unicorn, Texture, Key Clique, and Ensoniq software librarians and waveform editors. Contact SYNTH-BANK on PAN or MCI Mail, BELL-US on Esi, BBELL on the Well or call Bill Hartman at 213/876-8609.

SynthBank
7731 Hollywood Blvd.
Hollywood, CA 90046

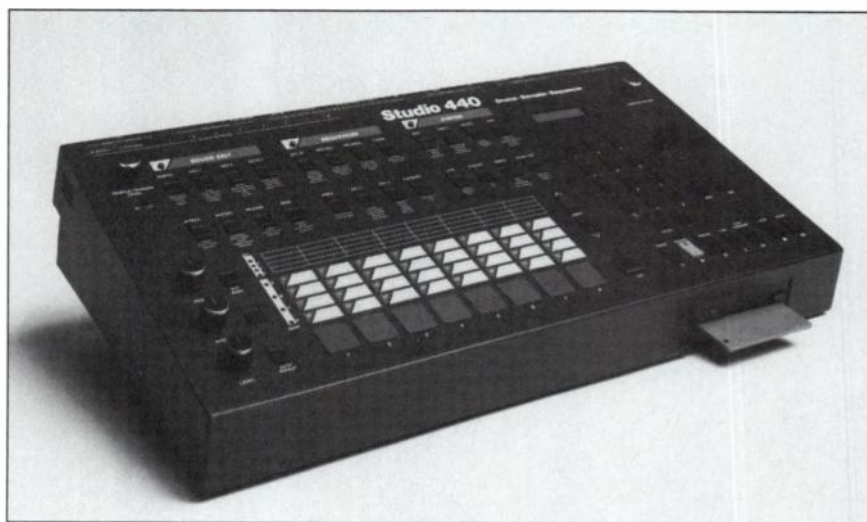
VIDEO

►Those who purchased the consumer-version LUMENA graphics system before 8/15/86 can upgrade to the LUMENA/8 Studio System (graphics and office management) for \$4,995 and receive a \$1,000 credit to apply towards software options.

Time Arts
3436 Mendocino Ave.
Santa Rosa, CA 95406
707/576-7722



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Sequential Studio 440



Thomas Beckmen conducting the L.A. Philharmonic.



Now you can afford to hear your tune on FM.

Introducing the Yamaha DX21 FM Digital Programmable Synthesizer. It brings you the rich, expressive astoundingly accurate sound of FM. Without the heavy-duty price tag.

The DX21 gives you two FM tone generators. So any two of its realistic voices can be combined and played simultaneously. Or split. Or even layered.

And you'll have 128 pre-programmed voices to start with. We say "start with" because the DX21 gives you a 32-voice RAM memory that acts as a voice workshop. You can combine any of the pre-programmed voices with your own original voices (saved and loaded via MIDI or cassette interface). Letting you create just the right sound with just the right feeling and nuance.

There's also an on-board function memory that lets you store play modes, keyboard split assignments, key shifts, pitch bends and detunes. While a built-in performance memory lets you call up voice combinations along with the performance parameters set for them.

And as if these musical tools weren't enough, the DX21 also gives you a true 2-channel stereo chorus effect. And complete MIDI-compatibility. So while the DX21 is an ideal first step into FM synthesizers, it can be your last for some time to come. Just add MIDI drum machines, sequencers, music computers, expanders and, of course, other Yamaha DX Series synthesizers when your musical ideas demand them.

For now, let your ears demand the best. Audition the DX21 at your Yamaha Digital Musical Instrument dealer now. Because the only thing better than hearing your tune on FM is being able to afford the instrument it's played on.

For complete information, write: Yamaha International Corporation, Digital Musical Instrument Division, P.O. Box 6600, Buena Park, CA 90622. In Canada, Yamaha Canada Music Ltd., 135 Milner Ave., Scarborough, Ont. M1S 3R1.



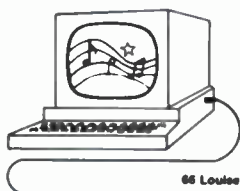
►The SL-HF1000 SuperBeta video deck (\$1,700) boasts better video resolution than ¾-inch U-matic machines, and includes on-board editing facilities that allow movement through video one frame at a time, in both directions. The dynamic range is 86 dB (6 dB better than standard Beta Hi-Fi), and an indexing system allows for rapid location of individual scenes.

Sony
Park Ridge, NJ
201/930-1000

OTHER NEWS

►Shure Brothers is offering cash rebates and free Shure jackets through 12/1/86 with the purchase of Shure's SM57-LC, SM58-LC, and SM48-LC microphones.

Shure Brothers Inc.
Customer Services
222 Hartrey Ave.
Evanston, IL 60202-3696
312/866-2553



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■ C64/128 AND APPLE PRODUCTS (*indicates C64/128 only)

KEYBOARD CONTROLLED SEQUENCER

C64 version	\$149
C128 version	\$225
Apple IIe/+ version	\$175

OTHER PRODUCTS

ECHO PLUS	\$89
ALGORITHMIC COMPOSER	\$99
MUSIC SHOP CONVERTIBLE (printing utility)	\$75
DX-100/27/21	\$99

PATCH EDITOR LIBRARIANS

C64 version	\$99
C128 version	\$99
C64/128/1000 etc.	\$99
CAGED ARTIST EDITOR/LIB	\$99
CZ-RIDER graphic editor	\$99
MATRIX 6	\$99
JX-8P	\$99
MODEL-T MIDI INTERFACE	\$89
CZ RAM CARTRIDGES w/64 sounds	\$60

■ KEYBOARD CONTROLLED SEQUENCER

ATARI ST VERSION \$195

Our Atari 520/1040 KCS is another advance in sequencer technology. Features include about 50,000 notes on a 520ST (TOS in ROM), 128 sequences, SMPTE interface through MIDI song pointer, and extensive help-screens. Three modes of operation:

SEQUENCE MODE: 48 tracks with "drum-machine-style" continuous recording, mute, solo, punch in/out, pause, auto-locate etc. TWO convenient forms of step-time entry.

FULL note-by-note and cut-and-paste editing, with transpose, invert, auto-correct, rechannelize, and time reverse options.

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Displays all parameters on a single screen in Casio or Dr. T's TIME FORMAT, envelope copying, level and rate scaling, and line copying. Includes GRAPHIC display of all envelopes and editing of parameters using the mouse and Dr. T's exclusive 'virtual slider'. Holds four sets of patches in memory at one time, and comes with 14 SETS.

■ UPCOMING PRODUCTS FOR THE ATARI ST

A series of CAGED ARTIST patch editor/librarians for the ST created for us exclusively by Bob Melvin, including programs for the DX7-TX7 family, the DX100/27/21/FB01 synths, and THE DUMPI (a full-featured librarian that will work with many synthesizers and drum machines). They will be integrated with the KCS, and will be able to play KCS sequences directly from their main screens! Initial releases available before Christmas.

LEVEL-2 (SUPER PRO) Atari KCS, with advanced edit features such as velocity scaling, automatic crescendos/decrescendos, harmonization, and all of the features from our C128 KCS, (reviewed in the October Keyboard). Includes a full-featured keyboard controller and MIDI mapper, which will allow you to create special effects directly from the synth keyboard, run most of the program from the synth keyboard if desired, and record system exclusive parameter change data from any MIDI wheel or pedal. Atari KCS users get a FULL trade-in allowance on purchase of the Level-2 program.

■ THE COPYIST

A publishing quality score-printing, editing, and music transcription program that interfaces with Roger Powell's TEXTURE SEQUENCER and Octave Plateau's SEQUENCER PLUS. Supports HP Laser-Jet+, HP Inkjet, Epson printers; and HP/Roland plotters. Requires 256K and either Color Graphics or Hercules Graphics cards. Ability to enter music via keyboard or mouse. Compositions can be played through MIDI. Coming soon on the Atari ST.

IBM PC or compatible \$195



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►Audion recording artists Emerald Web have been commissioned to compose and perform the music and sound effects for the PBS series Nova.

CALENDAR

►Charles Brown Music, Inc. and Future Access offer two intensive hands-on seminars featuring the NED Synclavier. Workshops will begin the first Saturday in January, and run consecutive Saturdays throughout the month. For registration information, contact:

Charles Brown Music
1349 East McMillan Ave.
Cincinnati, OH 45206
or call Jan at 513/281-5212

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Choosing the right sampler isn't easy...but one of our authors persevered in his search for the perfect sampler, and lived to tell the tale. Here's his story.

Choosing the Right Sampler

BY TIM TULLY

Wait a second...isn't that a piece from Herbie Hancock's "Rockit" in someone else's pop tune? And didn't Mr. Rockit himself sample Michael Jackson saying "beat" in one of his tunes? And where did Yes get those horn stings for "Owner of a Lonely Heart?" "Ev-ry-where I hear the sound..." as Mick the Ageless Rocker once said. But these days he might be talking not about fighting, but *sampling* in the streets. Everything from the crickets in the yard, to symphony orchestras, to the kids down the block, to sound effects from movies, is being digitally sampled and slid into the mix. In fact, we don't need to paraphrase Mick anymore; we can sample him.

I went sampler shopping recently, sampling the samplers offered at a sampling of local sampler shops, which meant reading specs and listening to pitches (both sales and scales). Quite soon I began to flounder amongst an array of specs, prices, terms, features, functions and enough generalized mumbo-jumbo to make one grab one's meager wallet and run. Well, what can a poor boy do? Then, as clearly as if wrought in 16-bit resolution, an insight came to me: to make any sense of all this, one must fight techno-fire with techno-fire. It was time to crank up the computer, design a data base that lines everything up in rows, and bring some order out of this chaos.

Scant weeks later, the tide of spec sheets, product reviews, discarded data base formats, and illegible notes began to subside. What emerged was The Matrix:

Tim Tully owns and operates Sound Suite, a compact studio in New York City's legendary Hell's Kitchen, specializing in bodacious audio for video and film. He is also leader and saxophonist of the renowned "Jr. T. & the T-birds."

a map of digital sampling essentials that should help orient any sampler shopper—especially the relatively innocent—to navigate the immense sea of samplers and its many digital dangers.

The Matrix is not an oracle; it will not answer all. What it will do is acquaint the neophyte with basic sampling concepts and the ways they interrelate. It also standardizes the sometimes free-form terminology and approaches used by the ever-growing well of manufacturers, and

consists of a list of the basic (and some not so basic) functions and features that comprise a sampling machine. This row in itself immediately removes one serious obstacle to intelligent shopping—it provides a pretty complete list of the things you may reasonably expect a digital sampling machine to do.

This list is arranged left to right, from the most basic and important categories (such as cost, sampling specs, and number of keys, if any) to the more arcane

Sampling Essentials

Sampling is like magnetic tape recording in that both technologies involve the capturing, storing, and recreating of audio (sound) waves. In fact, many of the standard terms associated with this technique (e.g. loop, splice, crossfade, etc.) have been borrowed directly from the world of

magnetic tape recording. Sampling is the digital equivalent of music concrete, wherein common sounds are manipulated (and sometimes integrated with traditional instruments) to produce musical compositions.

—page 30

it organizes the more standard capabilities of digital samplers into coherent categories. This way, a point-by-point comparison among machines is not only possible, but fairly easy.

The Matrix is a guide through the basics of judging one machine's capabilities versus another's. Then, once price and basic functionality have narrowed the possibilities down to two or three instruments, one's specific needs can be researched more precisely. In other words, if you need an axe that will generate laser holograms of sampled waveforms onto your audience's retinas and dynamically sync its crossfades to Laurie Anderson soundtracks, you got to go to the spec sheets yourself, pal.

Here's how to use The Matrix. Read the very top row and you'll see that it

and individualized. Related terms like "sample length" and "sampling rate" appear in what should be informative groupings. If you already have a basic grasp of sampling concepts, the explanations below each of these individual categories should make sense. If not, check out Tony Thomas's sidebar on Sampling Essentials.

Now look at the vertical column on the extreme left. Here you'll find a list of some of the most popular samplers around. The machines are arranged, top to bottom, by list price from the least to the most expensive. For reasons still unclear to me, incidentally, I found myself surprised that arranging the instruments by price this way showed an actual correspondence to quality, at least as far as specs go. It seems you *do* get what you



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DTR Software Library now available for CZ-101 and CZ-1000

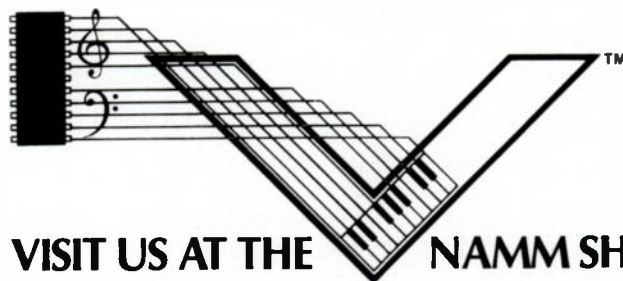
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Brand/Model	List price	Format	Voice/osc/cnfo	No. Keys/vel/AT
Casio SK-1	\$130	Keyboard	4/ /poly	32/no/no
Decillionix DX-1	\$349	Micro add-on	1/ /mono	5oct/no/no(MIDI)
Electro-Harmonix Super Repl	\$675		1/ /mono	
Korg SDD-2000	\$695	Rack DDL	1/ /mono	3oct/yes/no(MIDI)
Akai S612	\$995	Rack DDL	6/ /poly	5 oct/yes/no(MIDI)
Ensoniq Mirage Multi-Smplr	\$1395	Rack	8/2 digit/poly	128/yes/yes(MIDI)
Roland S-10	\$1495	Keyboard	8/8("Wave")/poly	49/yes/yes
Ensoniq Mirage DS Kybd	\$1695	Keyboard	8/2 digit/poly	61/yes/MIDI
Prophet 2002 Rack	\$2299	Rack	8/ /poly	88/yes/yes(MIDI)
E-mu/Emax Rack	\$2695	Rack	2 spls or voice/ /poly	61/yes/mono
Korg DSS-1	\$2495	Keyboard	8/ 2/poly	61/yes/yes
E-mu/Emax Keyboard	\$2895	Keyboard	2 spls pr voice/ /poly	61/yes/mono
Prophet 2000	\$2599	Keyboard	8/ /poly	61/yes/no
E-mu SP-12 drum/smplr	\$2745	Smplng Drum Machne	8/ /poly	8/yes/no
Roland S-50	\$2895	Keyboard	16/16("Wave")/poly	61/yes/yes
Akai S-900	\$2995	Rack	8/ /poly	6 oct/yes/yes
Hybrid Arts/ADAP SoundRack	\$3194 incl 1040	Rack+Atari 1040ST	6/ /poly	128/yes/yes(MIDI)
MDB Window Recorder	\$4995	Rack	1/ /mono	5 oct/yes/no
E-mu/Emulator II+	\$7995	Keyboard	8/ /poly	61/yes/no
E-mu/Emulator II+HD	\$8995	Keyboard	8/ /poly	61/yes/no
Publison/Infernal Machine	\$12,500	Rack DSL		
Kurzweil 250	\$17,950	Keyboard + Cmptr	12/ /poly	88 wood/yes/
PPG Wave 2. 3, Waveterm	\$23,445	Keyboard + Cmptr	/ /poly	61/
Fairlight/CMI/Series III	\$60,000	Keyboard + Cmptr	16/ /poly	73/yes/yes
Synclavier	\$72,000	Keyboard	32/ /poly	60ct+

The Sampling Matrix (Part 1)

pay for here. Why am I surprised?

Of course, at the bottom of the list come the Fairlight and Synclavier. Almost all the information you see here for these machines is at least misleading, because the Fairlight and Synclavier, if you don't know already, are much more than just sampling machines. They are sophisticated computer music systems and the categories here do no justice to their many capabilities, modes and configurations. They appear here only because just one of the many things they do is to sample sounds. (In fact, if you can cough up the requisite king's ransom these dream machines command, you'd be better off ransoming your nearest king and going to the nearest samplerey than sitting here reading such things as a price comparison matrix for the under-\$8,000 crowd.)

MEET THE MATRIX

Now we get to the "Matrix" part. Assume you're looking to spend around \$1,500 to \$2,000. Find the instruments in your price range, and read right to compare their specs—they'll be right on top of one

another. If something pops out at you as essential ("Whoa...I can't do without that neat-o On-Board Sequencer!"), you know what to do. If not, get out to Ye Olde Sampler Shoppe, play the machines you can afford, and buy the one that feels and sounds best.

“It seems you do get what you pay for here. Why am I surprised?”

Of course, aside from the “you get what you pay for” aspect of the Matrix, you must always address your own specific needs. The Akai S-900's 63 seconds of fairly low-rate sampling may be great for creating special effects or recording entire sections of a tune for practicing, but if you already own an Apple IIe computer, the sample-editing software that's available for the IIe may make the Ensoniq

Mirage a must.

One of the muddiest paths through the digital sampling forest is how to measure sound quality. The major bog on this path has always seemed to me to be comparing two or three instruments in terms of the relationship between their sampling rates (or frequency) and sample lengths.

“Sample length” is a pretty clear-cut concept that relates to the real musical universe we all understand. Simply stated, more is better; the longer a sample your machine will record, the more sound you have to work with.

So far, so good. But there's a finite amount of memory in a sampler, and you have two ways to use it up. You can either spend the memory on taking lots of samples of shorter sounds (fast sample rate and best fidelity), or fewer samples of longer sounds (slow sample rate and lower fidelity).

“Okay,” you say, “I'll just compare the specs and see who's got the best numbers in my price range.” But what you end up with is a confusing jumble of numbers involving minimum sample length, max-

Bit quantization	Spl rate: sel'bl/cont	Max spl length	@ MIN rate of	Max spl length	@ MAX rate of
8 bit PCM	Fixed	1.4 sec	9.38 kHz		
8 bit		10 sec	1 kHz	1 sec	36 kHz
12 bit					
12 bit		4.3 sec/3 octave	8 kHz $\pm$	1 sec/1 octave	36 kHz $\pm$
12 bit	Fixed	8 sec	4 kHz	1 sec	32 kHz
8 bit floating	Select'le x 6	8.8 sec	8 kHz	2 sec	30 kHz
12 bit	Select'le x 2	8.8 sec	15 kHz	4.1 sec	30 kHz
8 bit floating	Select'le x 6	8.8 sec	8 kHz	2 sec	30 kHz
12 bit	Select'le x 3	8 sec	15.6 kHz	3 sec	41.6
12 bit	Select'le x 8	52 sec	10 kHz	12.4 sec	42 kHz
6 to 12 bit	Select'le x 4	16 sec	16 kHz	5.5 sec	48 kHz
12	Select'le x 8	52 sec	10 kHz	12.4 sec	42 kHz
12 bit	Select'le x 3	8 sec	15.6 kHz	3 sec	41.6
12 bit		1.2 sec			
12 bit	Select'le x 3	30 sec(x 2banks)	7.5 kHz	14.4	30 kHz
12 bit	Continuous	63.3 sec	7.5 kHz	11.878 sec	40 kHz
16 bit	Continuous	125 sec	8 kHz	15 sec	65 kHz (mono)
16 bit	Fixed	12 sec	44.1 kHz		
8 bit floating	Fixed	34sec (2 banks @17sec)	27.7 kHz		
8 bit floating	Fixed	34sec(2 banks @17sec)	27.7 kHz		
16 bit	Fixed	21 sec	50 kHz		
16 bit	Select'le x 10	100 sec	5 kHz	20 sec	25 kHz
16 bit		13 sec	11 kHz		42 kHz
16 bit		140 sec			50 kHz
16 bit		54 min.	50 kHz		

The Sampling Matrix (Part 1)

imum sample length, bandwidth (if given), maximum sampling rate, minimum sampling rate, and to make matters worse, many of these are inverse relationships (e.g. a faster sample rate means less sampling time). Enough!

One of the best things The Matrix does is align four of the most important sampling specs in a way that makes their relationship clear and almost simple. First you'll see the maximum sample length available at the *lowest* sample rate, then the maximum sample length available at the *highest* sampling rate. This way it's easy to see how much time you have at what kind of rates, and what tradeoffs are involved. This is a pretty simple expedient, but it's much easier to compare the respective performance of the various samplers once these figures are laid out this way.

As for the "Bandwidth" (sometimes called "Playback Frequency Range") referred to in some specs, this can be misleading and in any case, I think it's redundant. Simply put, conventional sampling theory states that a sampler can accurately record sound frequencies that are

no greater than one-half its highest sampling rate. So a machine with a maximum rate of 30 kHz can cleanly record sounds up to 15 kHz. This machine is said to have a "15 kHz bandwidth." Does this mean you can set the sampler to record accurately a "band" of frequencies with a "width" of 15 kHz, for example a sound whose complete harmonic content ranges from, say, 10 kHz to 25 kHz? No. It means the machine can accurately record frequencies *no higher than 15 kHz*. For the purposes of the sampling musician, we are not talking about the "width" of a "band" of frequencies; we are talking about "top end." All the machines you will ever see can sample low frequency sounds just fine; it's the highs we stand to lose.

Cut a sampler's maximum sampling rate in half and you'll end up with the highest frequency it can sample without adding a lot of garbage to the sound. The Matrix refers to sample lengths and sampling rates exclusively, so no bandwidths need apply.

WARNINGS AND CAUTIONS

Any blank entries you may see in the

Matrix are not due to authorial inattention. They appear because new or unreleased models—yea, even some established ones—are occasionally stingy with their documentation. I know this may be hard to believe, but it's true nonetheless. Further, especially with newer instruments, some information may change by press time. You may also find the machine you're considering not listed in The Matrix. In any case, use your favorite writing implement to enter the correct information into blocks you may draw yourself, say, below the entries provided. You should find that just using the categories and arrangement scheme of The Matrix will help clarify sampling basics as well as to compare your chosen machine to the rest of the market.

While pulling together the information for The Matrix, my impulse was to standardize and simplify. I found this often went counter to the manufacturers' (altogether right-headed) impulse to make their product special and unique. Although most of the two- or three-word Matrix entries describe things quite ade-

—page 32

Brand/Model	No. setups:dsc/mem	Keyboard Splits	Cross fade	Editing	Controllers
SK-1	NA/1	0	No	Simple	
DX-1		0	No	Simple	
E-H					
SDD-2000	/1	0	No	Simple	
S612	NA/1			Standard	
Mirage-R	6/16	16	Wheel	Sophisticated	2 wheels
S-10	/4	3	Velocity	Sophisticated	Bender lever
Mirage R	48/16	16	Wheel	Sophisticated	2 wheels
2002-R	16/16	16		Sophisticated	Footswitches
Emax-R		122	Velocity etc.	Sophisticated	2 wheels, ftswtch, M
DSS-1	128/32	16	Velocity	Sophisticated	4-way joystick
Emax-K		122	Velocity & more	Sophisticated	2 wheels, ftswtch, M
2000	16/16	16		Sophisticated	Pitch & mod wheels
SP-12	/8 user spls	8	N/A	Very simple	8 faders
S-50	/16	16	Velocity x 4 spls	Very sophisticated	2-way assignable lev
S-900	65/8	32(2spls/split)	Velocity & positional	Standard so far	MIDI
ADAP	/64	64	Programmable	Sophisticated	MIDI
MDB	/1	0	No	Simple	MIDI
E-mu II+	500 k bytes/var'ble	60	Velocity	Sophisticated	2 wheels, ftswtch, M
E-mu II+HD	20megabytes/46 disks	60	Velocity	Sophisticated	2 wheels, ftswtch, M
PIM	NA/2Mbytes	64			
K250	NA/64	87		Very, very sophisticated	9 assignable
PPG					
CMI	120/8-14 Mbytes			Very, very sophisticated	Virtual
Syncl.				Visual wave	

The Sampling Matrix (Part 2)

—from page 27, *SAMPLING ESSENTIALS*

Sampling allows the musician to record sounds from other instruments, nature, or even non-musical sources, and transpose and play them chromatically on a standard piano or organ keyboard. This new and emerging technology greatly expands the creative horizons of the modern composer. In the words of Karlheinz Stockhausen: "Sounds previously classified as noise are now being incorporated into the vocabulary of our music... All sounds are music... music using all sounds is the music of today, not tomorrow, in our space age where the movement, direction, and speed of sounds are calculated elements of a composition. The object is to refresh our known world of sounds with the available means of our time, just as every period of history has done."

To understand sampling, one must develop a basic knowledge of the digital

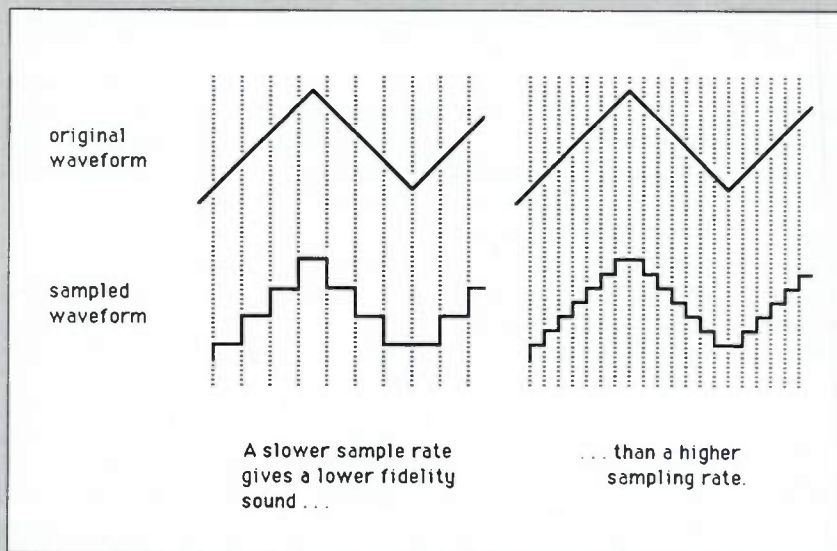


Fig. 1

recording techniques on which it is based.

How sound is generated: Sound is generated when an external force excites air molecules. The ear's sensory

apparatus detects these minute movements, which are then translated by the brain into identifiable sounds. When seen on an oscilloscope, each sound has its own identifiable pattern, called

Add'l sound source	Effx	Seq'r/sync	VCAs/VCFs/LFOs	Envelopes/stages
Synthesis	Vibrato		/ /1	13
22 pre-recorded		Yes/		
			1/ /1	
			/1/1	Variable release
		Yes/from external	4/1/4/	2/5
"Stacks" 4 smpls/voice	Multi-timbral	Arpeggiator/MIDI	8DCAs/1DCF/8	16x4
		Yes/from external	4/1/4/	2/5
On board waveforms		Arpeggiator	8/8/1	2/4
None	Stack voices	Multi-trak MIDI	8/8/8	16/5
128 hrmnic add'v synth	DDL x 2		8 kytk/8 switch1/	
None	Stack voices	Multi-trak MIDI	8/8/8	16/5
On board waveforms		Arpeggiator	8/8/1	2/4
17 drm sounds		5000 note/SMPTE/24pqn		
"stacks" 4 smpls/voice	Multi-timbral		16DCAs/1DCF/16	32x8
		No	8/8/1	8/4
None	DDL, revb, env fol	No	/4DCFs/	Virtual
None		0	0/0/0	0
None	Software updates	8-trak poly/SMPTE	8/8/8	16/4
None	Software updates	8-trak poly/SMPTE	8/8/8	16/4
30 factry sounds		12 trak/MIDI,SMPTE	/ /24	12/256 seg't
Auto & merge			/512 seg ?	
Synthesis		2/SMPTE	/dynamic/	
			/digital/	

Sampling Matrix (Part 2)

its waveform. Accurate sound reproduction depends on the introduction of as little distortion as possible into the waveform during the recording/storage/reproduction process.

Number crunching: Once we have a varying sound wave (generated by a microphone, synthesizer, or whatever), digital circuitry *encodes* these amplitude variations as a series of numbers. The quality of this "digitization" process depends on the *sampling rate* (which specifies the number of "snapshots" of the analog wave taken every second; see Fig. 1) and the *sampling resolution*, specified in bits (this determines the degree of resemblance of the digitized waveform to the original waveform). An 8-bit linear sampler allows 256 different values to represent the amplitude of a given waveform. A 16-bit linear sampler allows 65,536 different values to represent the amplitude of the same waveform, which means that its output waveform will look far more like the original than the 8-bit. (12- and 14-bit resolu-

tion allow for 4,096 and 16,384 different amplitude levels, respectively.) This is sort of like a connect-the-dots game, where more dots allow you to more accurately describe a particular shape. Some sampler manufacturers use a technique called *companding* to increase, through mathematical and/or electronic means, the apparent fidelity and signal-to-noise ratio of 8-bit samplers to the equivalent of 12- to 14-bit machines.

Limitations of sampling fidelity: Sampling's fidelity limitations show up most often in units with lower bit resolution (less than 16 bit) and lower sampling rates (less than 40 kHz). One inherent limitation is "aliasing." According to Nyquist's theorem, the sampling rate must be at least two times the highest frequency to be reproduced. If you try to sample a sound higher than the sampling rate will allow, a phenomenon known as "aliasing" will produce a spurious tone or sound which is usually not harmonically related to the fundamental. Other problems associated with sampling in-

clude excessive noise (every additional bit of resolution provides about 6 db improvement in signal-to-noise ratio; therefore, if 8-bit sampling provides a 48 dB signal-to-noise ratio, 16-bit sampling gives a 96 dB signal-to-noise ratio). Also, "quantization noise," which occurs due to the averaging that must take place to transfer from the analog domain to digital and back again, adds a dirtiness to the sound. Finally, if the sampler's memory is limited, complex waveforms (such as the piano) cannot be convincingly produced. Memory requirements are 32K of RAM for every second of sampled sound at a 32 kHz sampling rate. More memory is required for longer samples, or for an equivalent sample time at a higher sampling rate. "Looping," which repeats a small section of the sustained portion of a sound over and over again rather than record the entire sustained portion, can help save memory but generally gives a more artificial sound with acoustic instruments.

—Tony Thomas

Brand/Model	Cmptr Interface	MIDI	Dyn range	Disc size/drive
SK-1				/None
DX-1		Control option		/in Apple
E-H				
SDD-2000		Controlled		/none
S612		Controlled		/optional
Mirage-R	Ile, MAC	Controlled	96 dB	3.5"/built in
S-10	MIDI	In/out/thru		2.8"/built in
Mirage-K	Ile, MAC	In/out or thru	96 dB	3.5"/built in
2002-R	Mac/Sound Designer	88 key, in/2out/thru		3.5"/built in
Emax-R	RS-422	Born to it (Full)		3.5"/built in
DSS-1		Full		3.5"/built in
Emax-K	RS-422	Full		3.5"/built in
2000	Mac/Sound Designer	88 key, in/2out/thru		3.5"/built in
SP-12	Mac/Blank software	In/out/thru/disk		5.25"optional
S-50	On-brd mult-functn swtware	In/out/thru		3.5"/built in
S-900	Mac/Digidesign	Controlled	72 dB	3.5"/built in
ADAP	Req'd 1040ST	Full	96dB	3.5"/in Atari
MDB	IBM	In/thru		Optional
E-mu II+	Mac/Sound Designer	Full	96dB	5.25"/built in dblside (dual)
E-mu II+HD	Mac/Sound Designer	Full	96dB	Wnch'r hrd disk/built
PIM		Controlled		
K250	Mac option	Full (You bet!)	>100dB	
PPG	To Waveterm			
CMI	Included	Yes		
Syncl.	Hard disk			

The Sampling Matrix (Part 3)

quately, thank you, some naturally don't do complete justice to the more sophisticated aspects of some machines. If the latter case should arise, think of The Matrix as an information organizer and general guide, then go and read all the more specific material you can and, most importantly, *listen* to the way these machines sound. Your ears, not a bunch of printed data, should *always* be the final test.

Finally, this chart does not take into account software support, namely, how many sound disks are available for different machines, how much each disk costs, and how many sounds are on each disk. If you're not interested in doing a lot of sampling, this can be an important factor. But evaluating sound disks is even more subjective than evaluating hardware, so tread carefully. Just because sound disks exist doesn't mean they will fit will into the type of music you want to make.

CATEGORY COMMENTS

First, this is the place to look for explanations of some of the obscure abbreviations used in The Matrix. Also note that some categories have multiple sub-cate-

“When shopping for a sampler I began to flounder amongst an array of specs, prices, terms, features, functions and enough generalized mumbo-jumbo to make one grab one's meager wallet and run”

gories, separated by slashes. In the actual entries one or more of the sub-categories may be blank (e.g., “Yes/ /Programmable”). Just count the slashes and you won't get lost.

Now for the actual category explanations:

Brand/Model As you would expect.

List Price Manufacturers' list price at the time of writing, or projected list price in the case of models not yet on the market.

Format Keyboard: Standard piano/synth keyboard. **Rack:** 19-inch rack-mountable unit, usually controlled through MIDI by a compatible keyboard. **Rack DDL:** Rack-mounted digital delay line. **Rack DS:** Rack-mounted digital signal processor. **Rack + XXX:** Rack-mounted and requiring a computer, sold either by the sampler's, or a different, manufacturer. **Micro add-on:** As above, but not rack-mounted.

Voice/osc/config Voice: The number of

No. outputs	Display	Unique feature #1	Unique feature #2
1		Auto rhythms	1-finger chords
		Analog triggered	Hard to find
		Fine tune	Overdub
1	LED	Polytimbral	
1	LCD	Velocity layering	Flanging
1	LED	Polytimbral	
2	LED	Memory expander	Layer&stack sounds
8		Combine spls	Pgrmble outpt pan'g
	2-line LCD	Draw waveforms	Detuning
8		Combine spls	Pgrmble outpt pan'g
2	LED	Memory expander	Layer&stack sounds
9	LCD	Read/Wrt SMPTE	Tuning, autocorrect
4x5 modes	32 car FIP or ext montr	Vid out/graphic editor	Graphics tablet input
11 various	Backlit LCD	Voice out- to synth	Auto pitch bend
2	1040 monitor	CD quality sampling	Stereo in & out
1	LED	Reverse play, overdub	
18	Backlit LCD	Dbl # spls/memory	Sq'nce 8 MIDI insts
18	Backlit LCD	Dbl # spls/memory	Sq'nce 8 MIDI insts
		Reverb, pitch shift	Many, many others
	Backlit LCD	Too many to mention	Even with 2 categories
		Telecommunications	Fourier analysis
		Composition language	Fourier resynth

The Sampling Matrix (Part 3)

notes that can be sounded simultaneously. *osc* ("oscillator"): Any mechanism, often digital, that functions at all like an analog oscillator. *confg* ("configuration"): Mono-phonic or polyphonic.

No.keys/vel/AT No. keys ("Number of keys"): Either physical keys, or the device's note range in octaves, or the number of different notes the device plays via MIDI. *vel* ("Velocity sensitivity"): Whether the instrument responds to velocity sensitivity, via keyboard or MIDI. *AT* ("After-touch"): Whether the instrument responds to aftertouch information, via keyboard or MIDI.

Bit Quantization Number of data bits in each sample. Linear encoding is used unless otherwise specified; companding-type encoding produces much the same effect as adding more bits. Usually, more is better.

Spl rate:sel'bl/cont ("Sample rate: selectable or continuously variable") *Select'le* $\times$ *n*: Indicates that a machine's sampling rate can be selected from a number of pre-set options, where "n" is the number of options. *Continuous*: A machine's sampling rate is continuously variable. *Fixed*:

A machine's sampling rate is fixed.

Max spl length @ Min rate of- ("Maximum sample length / at the machine's lowest sampling rate")

Max spl length @ Max rate of- ("Maximum sample length / at the machine's highest sampling rate")

(The four previous categories appear in this order to show the length-to-sound quality tradeoff most clearly.)

No.setups: disk/mem ("Number of setups: on disk/in memory") A "setup" is all the samples a keyboard will play without reading more from memory. One setup (sometimes called a "program" or "pre-set") can come from one sample playable on all keys, or a number of samples "multi-sampled" across the keyboard. This category lists how many setups can be put on a disk and how many can reside in memory at any given time. "NA" means not applicable.

Keyboard splits The maximum number of samples that can exist in one setup. This also tells how many "multi-samples" you can fit into a setup. Since single samples sound weird if you transpose them over an entire keyboard, one ap-

proach is to take numerous samples and divide the keyboard up into smaller chunks. This means each sample doesn't have to be transposed over as wide a range. The more samples that can exist in a setup, the greater the potential for realistic sounds—although since all those samples use up memory, you can either have lots of short samples or a few long samples (or anywhere in between).

Crossfade The ability to fade from one sample to another on one key. This is usually tied to either velocity or footpedal/mod wheel setting.

Editing I've divided this into three general levels: simple, standard and sophisticated. "Standard" editing consists of the following functions: *Automatic looping*, *Truncate the beginning and end of a sample*, *Reverse a sample*, *User controllable input or output filters (where applicable)*

If a machine doesn't have at least these editing features as part of the machine itself, it's classified as having "Simple" editing. If it has these features and perhaps a small handful more, its editing capabilities rate a "Standard." If there are a genuine plethora of additional onboard

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editing tricks or if a recognized computer/software editor is currently available, the sampler gets a "Sophisticated."

Controllers This includes wheels, joysticks, MIDI magic and the like.

Add'l Sound sources On-board analog or digital synthesis, or neat-o ways of handling samples.

Efx- On-board reverb, delay and other fun items.

Seq'r/sync ("Sequencer/Synchronizable to:") On-board sequencer or related function/whether it can slave or be slaved to external devices, and how.

VCAs/VCFs/LFOs The number of voltage-controlled (or digital, as noted) amplifiers/filters/low frequency oscillators available. Key track is abbreviated as kytk.

Envelopes: No./Stages The number of envelopes and number of stages ("steps") available.

Cmptr intrfce ("Computer interface") This gives a specific computer, piece of software, or both if popular favorites exist; otherwise, it rates a plain old interface number or a "none" if that's all there is.

MIDI This comes in two flavors, "None" or "Full." "Controlled" means the sampler hasn't its own keyboard. Since MIDI implementations vary widely, this is an important place to read the individual specs.

Dyn range Dynamic range.

Disk size/drive Size of the disks used and how any disk drive is implemented.

No. outputs Some of the hipper machines are doing clever things here. Read the specs.

Display How you know what's going on inside your digital demon.

Unique feature #1 and Unique feature #2 Anything that sets one of these widgets apart from all the rest . . . in five words or less.

There you have it. My sense that The Matrix is pretty comprehensive was encouraged by my interviews of various manufacturers' representatives. As often as not, when I asked these people for their "Unique feature" suggestions, they mentioned something already covered under previous categories.

Good luck, and enjoy all your sampler sampling. There's a lot of good music out there to be played.

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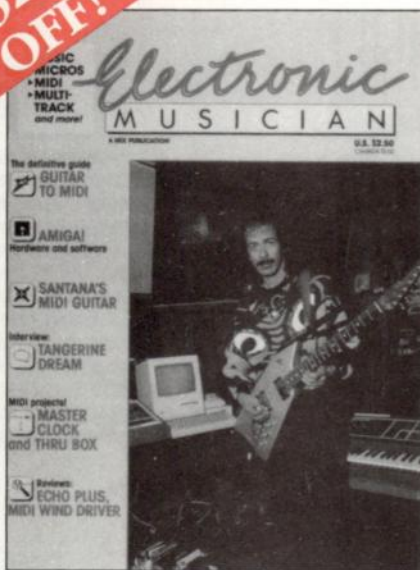
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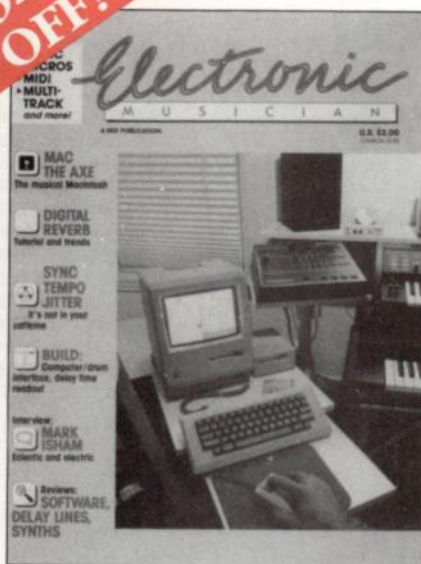
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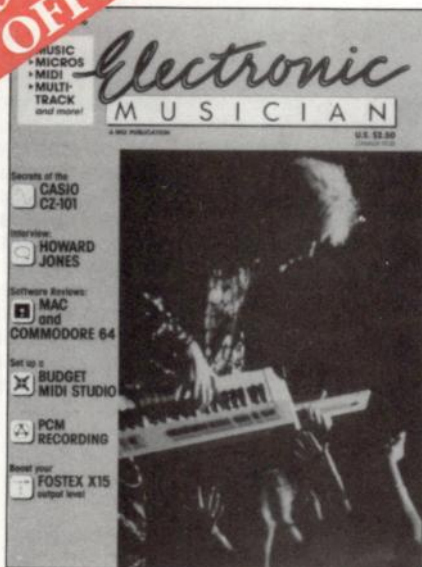
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Most people think of samplers as keyboard instruments. But within that deceptively normal-looking exterior lurks a bunch of digital audio recorders—and they sure can come in handy during mixdown.

Fix It in the Mix—With a Sampling Keyboard

BY CRAIG ANDERTON

Uh-oh. You're doing a mix and you start hearing things...like clicks, and pops, and out-of-tune parts, and even a fluffed note on the piano section in the second verse. And the singer didn't quite make that high D...

In the pre-sampling days, these problems would have meant either redoing a track, or getting intimately involved with a razor blade and splicing tape. But no more. Although most people look upon samplers as sampling keyboards, this is only one way to look at that these wonder boxes. In the studio, for example, you might be better off thinking of a sampler as a bunch of little digital audio recorders, controlled by switches that—just by coincidence—come in a piano keyboard's configuration. With our consciousness thus properly shifted, we're ready to "fix it in the mix" and get into some serious cut-and-paste work. Most of these applications involve recording a part from tape into the sampler, manipulating it within the sampler, then recording the part back on tape in place of the flawed original. Thanks to 12 and 16 bit sampling systems (or the better 8 bit systems), the loss in fidelity that occurs during the transfer is minimal—and is certainly preferred to whatever glitch you wanted to eliminate.

STOP THAT PLOSIVE!

One of the quickest ways to spoil a great vocal take is with a popped "P" or "B"

Craig Anderton has just completed programming and mixdown work for the Tingstad/Brewer/Rumbel album Emerald, scheduled for October release on Narada/MCA Records.

sound. Punching one word can be a Big Deal, since it's going to be difficult for the singer to get the same feel and match the level. Besides, what happens if sloppy engineering on the original session let through that exploding "P" sound, yet you have to solve the problem during the mix when the singer isn't around to re-do the part?

"In the studio... (think) of a sampler as a bunch of little digital audio recorders, controlled by switches that—just by coincidence—come in the shape of a piano keyboard"

Simple. Sample the offending word, complete with pop, into the sampler. Next, use the truncation function to cut off the pop at the beginning of the sample. Well, maybe not the entire pop; usually you want to leave in just enough to retain a bit of the P sound. When the plosive has been properly tamed, send the truncated sample back into the recorder and punch it in over the original word.

What? You say it's a short word and who can do that quick a punch? Then transpose the sample down an octave, slow the recorder down to half speed, and do the transfer. Or if the word is embedded in the middle of a phrase, sample the entire phrase and copy it to a second sample. Then, truncate the end of the first sample just before the pop, truncate the beginning of the copy just after the pop, and splice the two samples back together again and record it over the original phrase. Usually any pops are short enough that the few milliseconds lost in the splicing process won't significantly affect the overall timing.

THE TRANSPLANT

Thanks to the repetitive nature of most pop tunes, melody lines and parts often repeat in more than one place. Recently, I was mixing an album project where, in the second verse, there was an audible electrical click on one of the notes in a part. The musician who played the part was on tour, so she wasn't available to replay the line.

I checked back in the song and sure enough, there was an almost identical line in the first verse. We sampled it, and recorded it over the line with the glitch. The process worked so well it's impossible to tell which is the "transplant" and which is the original.

TESTING A SPLICE POINT

Do you get as nervous as I do when slicing up a multi-track master tape? It's no fun to slash a 2-inch tape into pieces, only to find that maybe that snare hit wasn't the right splice point after all.

The usual procedure is to test your

splice by recording a mix of the multi-track on to 1/4-inch tape, and then doing your "practice" splices on the 1/4-inch version. Once you find the right place, you then do the "real" splice on the multi-track master. This is all well and good, but no longer necessary if you have a sampler with a splicing function. Start by sampling a couple of seconds around each of the potential splice points. Truncate the samples to the splice points, then use the splice function to glue the truncated samples together. If it works, great—go do the splice. If not, re-truncate the samples and try again. When you find the right splice point, proceed to slicing and dicing the multi-track master.

FIXING THE OUT-OF-TUNE NOTE

Here is where a sampler can truly save a session. The singer has just given a stunning performance except... that last note was just flat enough to blow the take.

Or was it? Sample the note into the sampler, and punch over the existing

"This is the kind of salvage job that can make a singer your friend for life"

bad note. Only this time, artfully move the pitch bend wheel at just the right moment to bring the note up to pitch. This is the kind of salvage job that can make a singer your friend for life.

Incidentally, you can also use this technique during the recording process to help a singer hit a note outside of his or her range. Sample the highest note the singer can sing, and when it's time to hit that ultra-high note, play it on the sampler by transposing the sampled sound upward.

STEADY, STEADY...

What happens if the kick drum is just a shade off tempo? You guessed it: assuming the kick is on its own track, you can sample the sound, then during the transfer back to tape hit the sampler key at the right time so that the bass drum falls right into the pocket.

CURING THE NO-VIBRATO EFFECT

During mixdown, I heard a vocal line that was just crying out for a real heavy, thick, even vibrato at the end of a phrase. Unfortunately, not all singers can provide this... but a sampler can. Sample the note, and when you record it over the existing note, turn up the mod wheel for the desired amount of vibrato. You can even do some really bizarre things like simultaneous pitch bend and vibrato... pretty bionic sounding.

BUT I'VE RUN OUT OF DDLs!

You've got one DDL chorusing the lead vocal, one on the drum overhead mic, and your very last DDL doubling a sax solo. At this point the rhythm guitarist muses about how it would be nice to have a little 8th-note slapback every time he hits that fancy B maj 7th chord... you know, a tail of about three or four echoes that fade out nicely into the drum fill.

Here's where velocity keyboards come in handy. Sample the rhythm guitarist's fancy chord, and play the sample when the echo is supposed to come in. Play it once for each echo, and play the note a little softer each time so that the echo's level diminishes properly. If you have an open track, the echo can be recorded there and you won't have to think about it any more. If all your tracks are full, find someone to play the part in real time during the mix itself.

I must confess to using this technique a lot, even when I haven't run out of DDLs, since it allows for echo effects that would be just about impossible to achieve with standard DDLs (such as strange polyrhythms, echoes that get louder and then softer, and so on).

TESTING, TESTING...

And since we're in a mix-oriented frame of mind, we want to make sure everything is aligned level-wise. Sample a 100 Hz, 1 kHz, and 10 kHz tone into the sampler; they won't take up much memory since all you have to do is loop a few cycles. Then make up a little sequence that spits out these tones in the right order for calibration. Some samplers will have a hard time dealing with a 10 kHz signal, but if you sample at a fast sample rate and sample the tones at a moderate level, you should have something good

enough to use.

Keyboard players who would like to endear themselves to guitarists can sample an E = 164.8 Hz tone into the sampler. When transposed down an octave, this produces the right frequency for tuning the guitar's low E string. When transposed up an octave, you can tune the

"...not all singers can provide (heavy, thick, even vibrato)... but a sampler can"

high E. Notes for the other guitar strings (A, D, G, B) lie within this two-octave range. You can even make up a little tuning sequence—say, ten seconds on each note needed for tuning.

AND THERE'S MORE!

While technically not a fix-it-in-the-mix application, some samplers (e.g. Akai S900) let you slow the sampling rate way down, thus allowing very long sampling times (close to a minute!!). This can be a real boon to songwriters. I don't know about you, but I often come up with words by playing a chorus or verse over and over and over again until I've got most of the words filled in. In the Dark Ages, this meant rewinding your tape a lot. Now TASCAM, Fostex, and others offer "block repeat" functions where the tape will rewind back to a set point, play forward to another set point, rewind, play, and so on. But why torture your tape deck transport? Sample the entire verse, chorus, or whatever, and loop it.

TRUNCATE END

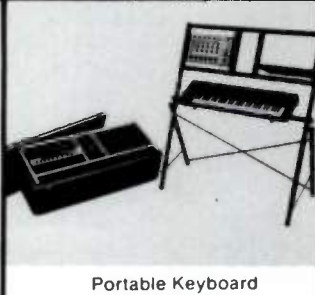
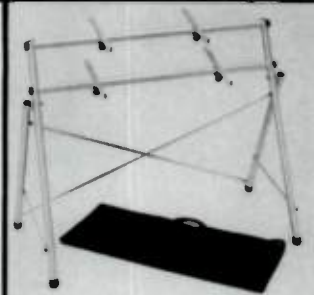
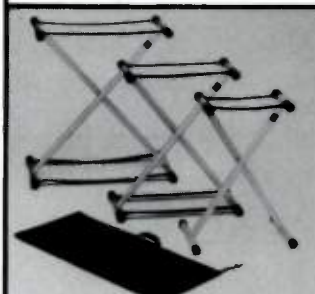
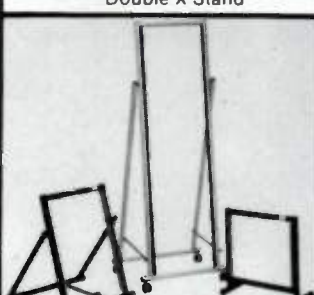
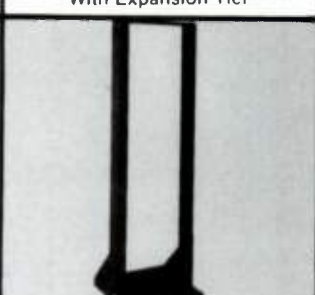
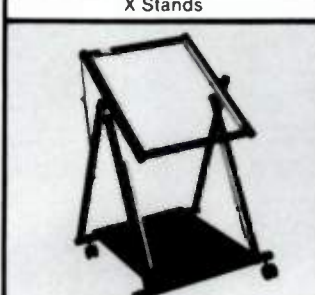
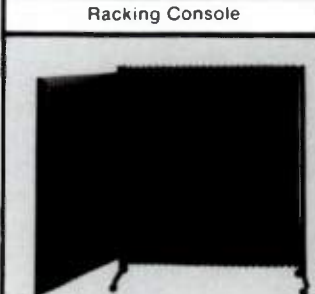
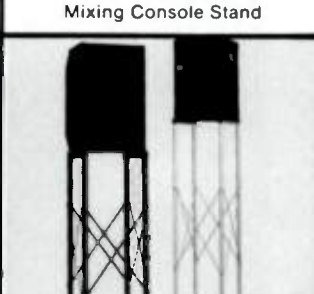
Samplers make great musical instruments, no doubt about that. But they also make versatile digital recorders with very useful editing capabilities. Next time you need to fix something in the mix, see if a sampler won't do the job in the quickest, simplest, and most cost-effective manner.

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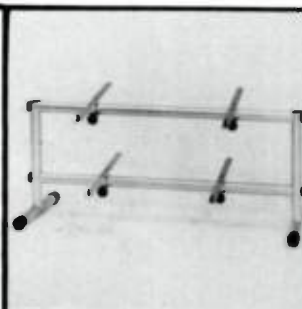
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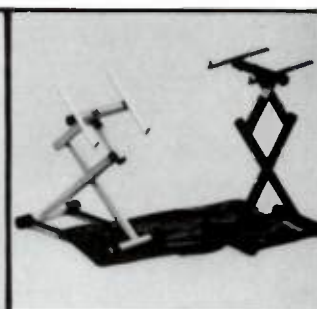
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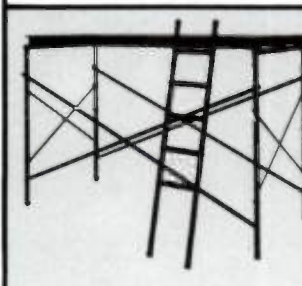
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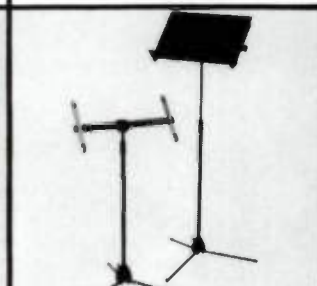
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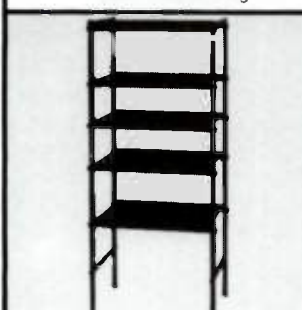
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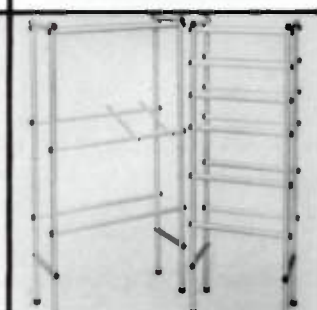
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Pan whang, extra milliseconds, fried disks, a happy ending for the Drums of Death, and soup slorp—here, revealed for the first time, are the...

Secrets of the Emulator II

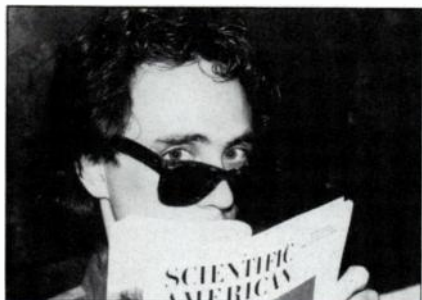
BY MICHAEL LEVINE

Let's see—you wowed 'em on that first pass when you used your Emulator II *Vegematic Revenge* disk MIDled to a retrofitted Roland 808, sampled the perfect hamster sneeze from the studio mascot, called up your patented *Drums of Death*, and—AAARGH!!! There it is again! Yes, when you called up the Drums, the dreaded **OverlayLoadError** appeared in its full LCD glory. You push every button in sight, you give the E-II a love tap or two, you even, in desperation, consult the manual—all to no avail. The producer awakens from what appears to be a drug-induced stupor, absent-mindedly extinguishes a cigarette on your "blank formatted" pile, and ominously intones "Are we ready yet?"

OVERLAY LOAD ERROR

Sound familiar? Well, don't give up hope 'cause we may be able to rescue that hamster after all. "OverlayLoadError" occurs because the E-II always accesses its operating system from the disk in the

Born in Tokyo, Michael Levine is a New York studio musician who has recorded with Joe Jackson, Rick Derringer, Boy George, and the Hooters. He is also believed to be the only techno-pop-keyboard-wiz-and-sampling-fool to have performed at Carnegie Hall four times as a classical violinist.



upper drive (unless you have no disk in the top drive, a non-formatted blank disk or non-E-II formatted disk in the top drive, or you've forgotten to put down the little plastic doohickey that locks the disk in place and stops that crazy light from blinking). So, if you replace your boot-up disk with one that has a different software revision (number), when the E-II goes to find its operating system on the upper drive it will find something it can't handle, and issue the "Overlay" message.

The solution is to replace the disk in the top drive with the disk you booted up with (or one with the same format rev) and try again. If you need to load in data from a performance disk with a *different* format rev, put it in the *bottom* drive and push Disk, then key in 2. Library disks should also go in the bottom drive, but this time select Preset Definition 11.

With a two drive unit, you can avoid the "Overlay" problem entirely just by leaving your boot-up disk in the top drive, and doing all other business in the bottom. Also, you can always update all your disks to the most recent software revision using special function 14 (copy software) without bulk erasing the disk (as you do when you format it).

If you have only one drive, the principle is the same. Put in your boot-up disk, go to the "Disk" function, then replace your boot-up disk with your data disk and key in 1 (Get Bank Disk 1). Once you've loaded your sounds, go back to the boot-up disk to perform normal operations.

DISK READ ERROR

Here's another goody—what do you do when you get a DiskReadError on your only copy of *Leave It To Beaver Outtakes*? First of all, try both drives. Sometimes due to weather, dirt, flaky electricity, or just plain omeriness, one or another drive won't be acting up to snuff that day. But,

assuming that it's an honest-to-God-your-disk-is-fried situation, you may still be able to salvage at least part of your data. Notice that when the drive is loading, it makes a steady click-click, but when it gets to the trouble spot it pauses a moment before giving you an error message. Well, count the clicks before the error, then load your disk again, keeping a formatted blank handy. When you get to the portentous pause, quickly pull the *Beav* and stick in the blank (and don't forget the doohickey to latch the drive!). The E-II will finish the load and, provided you've made a recent sacrifice to Nanoweber and Alias, most of your sounds will be saved.

(Incidentally, something analogous to this will work when you encounter a Format Conflict problem on the DX7 when trying to load from a cartridge. Put in a cartridge with a format the synth likes, go to Function and push Load. The DX will then pause and ask you: Load Memory/All of Memory? Switch the cartridge with the one that has the sounds you want, and the format your baby hates, and answer Yes.)

THE CASE OF THE EXTRA MILLISECONDS

How about that nasty E-II delay problem on certain percussive instruments that you assumed was more MIDlody? It probably wasn't, at least not entirely.

I've found that most samples, no matter how carefully you set your level and threshold parameters, have at least some silence or low-level ambience before the sound begins and can do with four or five milliseconds (about 110 to 135 bytes) truncation at the start. While this is not easily perceived as a delay, combined with five or so milliseconds of MIDI processing delay and a few more for an attack envelope, you start feeling a bit on the tardy side. Be careful, however, especially

you hotshots with the Digidesign visual editing software. The *output* electronics of the Emulator have their own idiosyncracies that won't permit you to hear anything for a few milliseconds no matter what the sample says. Therefore, if you truncate by sight you are apt to lose a little bit of the good stuff at the top. Shocking as it may seem, the best guide is your ear.

SOLVING THE PAN WHANG/ SOUP SPLORP DILEMMA

And what about your 16-second *Kitchen Kalamities* sample with the great pan whang at the front and the soup splorp at the end that you never use because all you want is the whang and the splorp—but when you copy the sample the E-II won't let you permanently truncate the stuff in the middle? You need those extra 14 seconds for the soufflé. What's a mother to do?

Simply copy the sample, save it to a library disk, erase the onboard copy, edit the onboard original to just a whang, and load in the copy from the disk. Now you edit the copy to just a splorp and you have lots of time left over for Julia Child.

FUN TIPS FINALE

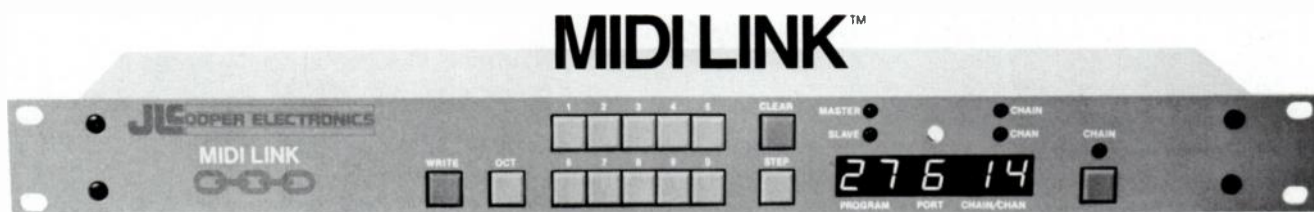
Enough of problems, let's have some fun. Want some great panning effects? Assign a couple of monophonic sounds (e.g. a woodblock and cowbell) to outputs one through four. On the board, assign pan locations to these inputs in the bizarre and perverse manner of your choice. Sequence rapid, syncopated parts and try to figure out where each instrument is going to come from next. One of my jingle clients loves this one. I haven't had the heart to tell him that most people's TVs are still mono.

Ever wanted to use one real time controller to do two things at the same time? With the E-II alone this is a no-can-do; however, with an external synth as the master keyboard it's a different ballgame. Picking an obscure example like the DX7, we all know (because of copious and readily available documentation, in Kanji and Hiragana) that the left wheel, right wheel, aftertouch, and Data Entry slider correspond to, respectively, pwh, #01, chp, and #06 in the E-II's MIDI section. But did you know that you could assign an external controller to more

than one MIDI receive (you know, A, B, or C in Preset Definition 30—MIDI Setup)? This means if you assign chp (aftertouch) to A and B, then go to the Real Time Control module and assign A to Filter (display reads 4:2) and B to LFO-to-Pitch (display reads 5:4), pressing hard on the DX7 will simultaneously brighten the horn voicing and increase the vibrato.

The DX can also come in handy when you have to transpose a sound more than the stingy octave the E-II deems permissible. You can use the left wheel to extend the range somewhat, but getting anything other than the full minor third transposition precisely in tune is a problem, as the wheel has a spring inside that makes intermediate positions unstable and difficult to find again. By contrast, the Data Entry slider on the DX (#06, remember?), doesn't move and has a graded (hence markable and repeatable) scale. Simply assign the E-II's pitch bend to receive information from the DX's Data Entry slider. The Store Controls feature of the sequencer can sometimes make life easier—but it has its own little pouts and tantrums that we won't explore today.

CA



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Many of these tips and techniques can be applied to any sampler and all of them will greatly help you in...

Getting the Most out of the Akai S900

BY STEVEN COX

The arrival of affordable samplers has opened up previously unavailable sound textures to musicians, and Akai's recent offering—the S900 Professional MIDI Digital Sampler—is a cost-effective rack-mount expander module (retail \$2999.95) for the musician who wants to jump on the sampling bandwagon without blowing the budget.

The S900 is a beautifully designed machine; its level of sophistication demands spending a little time in study and experimentation in order to get the most out of your investment. Good habits, in the form of proper computer and recording procedures, will make it easier to develop a library of samples that are as personal as your own fingerprints.

This article assumes you already own an S900 and have started to understand its possibilities via the operations guide disk and practical examples in the manual. However, those who don't own S900s can nonetheless apply some of these tips to any sampler. If you are already familiar with personal computers in general, so much the better; to a certain extent, all computers are similar in concept and design. The S900 is simply a *dedicated* computer designed to perform the task of digital manipulation of sound (and related tasking). Like all computers, the S900 has an *operating system* that ties together all the system elements, and un-

Steve Cox is engineer and operations manager of Good Review, Inc., a recording studio and BMI publishing affiliate. Along with his main interest, songwriting, he has produced accounts ranging from The Championship Wrestling Association to General Electric Corporation. He is also a computer data systems consultant for several regional businesses.



derstanding how this operating system works will give you maximum control of the instrument.

THE VERSION GAME

After power-up, the S900 dutifully identifies itself and gives the version number of the operating system ROMs (read only memory) installed within. When this article was written, 1.2 was the current version; there's a revised manual to go along with this version.

If you do not have version 1.2 software, then by all means obtain it from your dealer. The earlier version, 1.0, is missing some vital features (such as being able to turn MIDI program changes on or off). Version 1.2 also displays the audio bandwidth of existing samples in memory, something you had no way of knowing before; and when switching from program to program, version 1.2 can sustain one program while switching to another (up to the limits of the eight voices). After having to put up with the "klunk" that many synthesizers make when you change patches, it is wonderful to hear one program gently fade into (or sustain under) the next without "glitches."

By far the biggest new feature is the S900's newly acquired ability to be played from drum machines. The note duration of most, if not all, drum machines is *much* too short to allow the attack, sustain, de-

cay, release (ADSR) curve of the S900's envelopes to "kick in." The new One Shot Mode, on page 14 of the edit program section, insures that the sampler will respond to a trigger of *any* duration by playing the entire length of the sample (including ADSR, filter, warp, and so on). Thus, the S900 can now be triggered from virtually any MIDI device.

SAMPLING SAFARI (OR, BAGGING THE BIG SOUNDS)

Of all the electronic instruments you will ever play, the sampler alone offers a grip on reality. It cannot only sound like a string section but in a very real sense it is those strings. It is a near-perfect aural imitator and modifier—the ultimate parrot.

The ability to recognize a good potential sample when you hear it is a technique that improves rapidly with practice. Take the time to experiment with gathering new samples; this will teach you more about the nature and structure of sound as well as expand your library.

When on a sampling safari, always try to capture more sound length than you need, then edit later by using the S900's ability to discard unwanted portions of a sample. It is also a good idea to *save your memory to disk* before making drastic or irreversible changes to programs and samples. As you forge ahead and experiment, you don't want to burn

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PEARL

your bridges behind you.

One way to get started is to take samples from existing recordings. This may not be the most original route, but it provides excellent training in the art of sampling. While the CD player is the medium of choice due to both sound quality and ease of cueing, phonograph records or even high quality cassette tapes will do almost as well. The libraries of most colleges and large metropolitan areas carry a selection of classical music CDs and phonograph records that are available for rental at very modest fees. (Note: the copyright implications of sampling from existing recordings are not clear; EM does not endorse sampling or recording any copyrighted material. You should consider the moral and ethical implications of taking sounds from others' recordings regardless of whether or not you apply creative input to them.)

When sampling complex sounds such as loud, full orchestral textures from pre-recorded material, the quality of the playback medium is not so important. However, delicate textures (such as light strings, oboes, etc.) almost *require* that the actual instruments be played directly to the sampler, or sampled from a CD, due to the inherent noise levels of tape and vinyl.

When it's time to hook your system's stereo output to the S900's mono line input, adjust your mixer or balance controls for a 3 dB (or greater) difference between the left and right channels. This prevents phase cancellation from messing around with your high end and/or hollowing out the bottom. Also, watch your recording level very closely. If your meter reaches those six dots at the far right of the LCD record display, you have introduced digital distortion into the signal. You may not notice anything amiss at first; however, if you listen to the sample played an octave or more below its original frequency, the "garbage" will become evident.

I've found the best single instruments to sample are those with a fairly linear and consistent attack and decay envelope. The amplitude envelope for a flute or piano doesn't have to change with every note to still sound natural to the ear, even in a solo. But guitars or saxes exhibit a high degree of fluctuation in sound, especially in their attack, and they tend to sound much less natural when played from a sampler—especially when used "up front" in a mix. It can be

amazing how much a perfectly sampled recording of a sax can sound just like an accordion when you try to work with it on some ranges of the keyboard. That effect could be good, but only if you're after an accordion sound! (What works for me is to record the guitar or sax sound as "straight" as possible—no pitch bend or vibrato—then add modulation and pitch bending with real time controls such as wheels—Ed.)

For great orchestral samples, check the point of climax in a phrase or section

“By far the biggest new feature is the S900's newly acquired ability to be played from drum machines”

of music. Endings are also excellent places to find chords and "hits." Besides classical selections, soundtrack recordings are often ripe with musical textures that sample well and loop easily. And keep in mind that students of traditional instruments at nearby colleges and universities are often available for sampling sessions; sometimes all you need to do is put a notice on a music department bulletin board. There are no rules on where to look, only suggestions.

Drums and related percussion samples are everywhere! Beyond the obvious capability of sampling traditional drum sounds, practically *anything* can be used percussively if handled creatively. For example, sampling the sound of a screwdriver tapping a table with gated reverb produces an incredible explosive punch. Played an octave or so below the sampled pitch, the effect sounds huge! Coughs, chair squeaks, firecrackers, door slams, grunts, animal noises and even laughter can effectively "dress up" an otherwise routine drum kit. (Incidentally, a gated reverb effect is simplicity itself: sample the drum sound with reverb, then truncate the end to suit—Ed.)

With the 11.878 seconds of memory available at its maximum bandwidth of

16 kHz, the S900 can even be used for simple manipulation of vocal or instrumental parts within a song. Just sing or play that difficult phrase into memory and "presto," from then on you perform the entire phrase at the press of a single key whenever you need it in the song. Totally acceptable guitar samples can also be made with the bandwidth narrowed to around 9 or 10 kHz, thus providing over 21 seconds of sampling time.

CONCERNING THE DISK DRIVE AND RELATED COMMANDS

First and foremost, *be very careful!* The S900 (version 1.2) has no "double checking" to see if you *really* want to erase that file, memory, or disk, and that could spell trouble if you push buttons first and ask questions later. The advantage, of course, is that veteran samplers can save time by not having to answer those "are you sure?"-type questions. But always think before you act, since many pages in the S900 put you just one keystroke away from some form of annihilation.

You can avoid most serious mishaps by getting into the practice of consistently making backup disks of your most treasured samples, and write-protecting your "keeper" disks. Remember, a disk never fails until the most important session or performance of your life—so keep backups handy.

Another S900 disk operation quirk concerns the "return to home" error response. For example, if an error occurs when trying to save to a write-protected disk, the machine "locks up," blinks all its LEDs, and tells you the problem (and its solution) with a cute little message "OOPS! Disk is write protected. Take it out and close the switch in the corner." What the LCD *doesn't* mention is that upon recovering from the error by pressing the Disk button to unfreeze the machine, you are now in the Load From Disk option on page 1 (the exact opposite of what you wanted). Pressing the enter key at this point would cause the unit to *erase its memory* and attempt to load from the disk, thus throwing your hard work from memory into data oblivion! Always check that you have selected the right function before attempting to re-save.

Also note that in version 1.2, the S900 does not verify data after writing to the disk. If by chance you do save to a defective disk, you have no way of knowing that until you try unsuccessfully to load it

DESIGN *ANY* SOUND

SOUND DESIGNER™ provides all the tools you need to design virtually any sound. Used with your digital sampler and a Macintosh®, SOUND DESIGNER offers many powerful *digital* sound editing and processing features previously available only in very expensive computer music systems. And unlike other systems, SOUND DESIGNER is easy to use. It works like this:

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Use SOUND DESIGNER's Pencil tool to draw waveforms or "repair" flaws in sampled sounds. Combine sections of different sounds using Macintosh style cut and paste editing (barking guitars? plucked dogs?). Edit with an accuracy of 1/50,000th of a second—try *that* with a razorblade! A smoothing function makes edits seamless and easy.

SOUND DESIGNER's digital mixer includes a collection of *digital signal processing* functions unrivaled by other systems. Mix sounds in any proportion, or use the Merge function to create hybrid sounds that crossfade from one sound into another. Also included is a fully parametric, high quality digital equalizer.

Looping with SOUND DESIGNER is easy. You can assign loop points visually, quickly. And if the

sound lacks a "natural" looping area, use the cross-fade looping function to create a smooth loop. Rather synthesize than sample? SOUND DESIGNER includes direct digital synthesis—create sounds on the Macintosh, then transfer them to the sampler for playback!

Each SOUND DESIGNER program also includes a complete voicing program for adjusting all of the parameters of your sampling keyboard. Assign samples to the keyboard, adjust envelopes and filters and quickly setup all performance parameters using SOUND DESIGNER's graphic programming screens.

SOUND DESIGNER has many more features not listed here. Besides, why read a mere description of the program—use it! Send us \$15, and we'll send you a pair of Macintosh demo disks* with instructions. Once you see the creative power of SOUND DESIGNER, you'll want to design *your* sound. It's the toolkit of choice for modern musicians and sound mechanics.



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back into memory at some later time. Hopefully, a verify feature will be available as a later upgrade (hint, hint), but meanwhile, once again the solution is to make a backup any time you dump memory to disk. The odds against two bad disks in a row are pretty great, unless you spilled Coke on them or something equally as devastating!

Speaking of devastating, I recommend that you don't even think about

using Single Sided/Double Density (SS/DD) disks! They mess up regularly—and when you least expect it—when used in a double-sided disk drive like the S900. You are not saving money by buying SS/DD disks, you are buying aggravation and frustration. Use *only* Double Sided/Double Density disks (DS/DD).

The S900 allows up to ten characters for program and sample filenames. Take advantage of this and give your samples

descriptive names; this will make it much easier to locate them and swap sounds around from disk to disk. Naming the original sample pitch within the filename (e.g. FLUTE D3, TAH DAH C1, etc.) can also be a big help, especially when constructing multiple samples of the same instrument. It makes it much easier to assign the split points later when working within the program edit section, and also gives the sample an identity independent of the program that plays it.



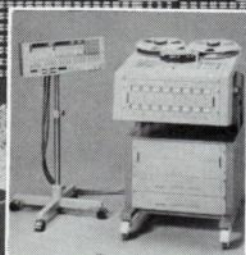
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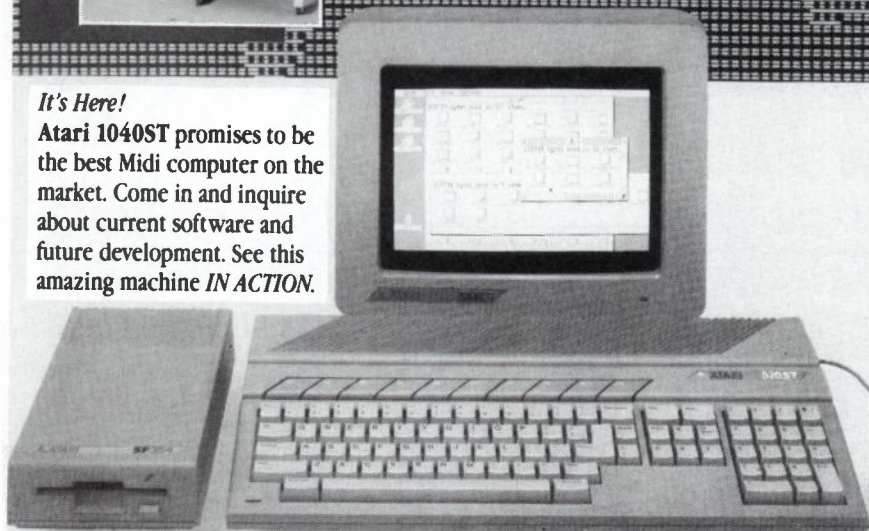
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“

... students
of traditional
instruments at
nearby colleges
and universities
are often avail-
able for sampling
sessions”

LEARNING FROM THE COMPETITION

Akai was faced with the traditional “cart before the horse” quandry when they made the big decision to release the S900 before developing their own extensive library of sampled sounds. However, the factory collection already has some breathtaking selections and it is still growing. Get in touch with your dealer every now and then, because new factory disks are expected to be released periodically.

I feel software support is very important. In fact, I attribute much of the staying power of E-mu's famous Emulator line of samplers to the vast amount of user-generated samples generated by the factory, and also by their very active users group. E-mu's support of their users goes so far as sponsoring sound swap parties. In my opinion, if the Akai S900 Digital Sampler is to thrive in today's hyper-competitive “here today and gone tomorrow” electronic music marketplace, it will need the support of its own users group actively backed by none other than Akai itself. Meanwhile, the S900 is quite a machine—especially once you learn its operating system well enough for it to do your bidding.

CM

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Some samplers can do a lot more than standard even-tempered scales—in fact, the right sampler can provide one of the quickest and easiest ways to experiment with alternate tunings.

Alternate Scales for Even-Tempered Samplers

BY CRAIG ANDERTON

At first glance, samplers appear to be exclusively even-tempered instruments—whenever you transpose a sample, this transposition occurs in accordance with the formula for an even-tempered scale. However, Dana Massie at E-mu figured a way around this problem for the Emulator II, and his technique is applicable to many other samplers as well. Although all examples are given in the E-II's syntax, those who would like to experiment with alternately-tuned samplers can often adapt these same concepts to their particular machines.

The trick is to take a single Voice (sample) and make a copy of this Voice for each note that differs from an even-tempered scale (you can also sample a different Voice for each note that differs from the even-tempered scale, but this can get pretty time-consuming and use up lots of memory). The E-II's voice tuning adjustment option, which can vary individual voices over a ± 50 cent range, allows each Voice to be offset from the even-tempered default frequency assignment. Generally, I sample synthesizer waveforms when creating alternate scales (see "Sampanalog Synthesis" in the May '86 EM) since these waveforms can be transposed over a fairly wide range without sounding too unnatural.

As an example, refer to the following list of frequencies for a just-intoned and even-tempered scale; the third column indicates the deviation in cents of this just scale compared to the even-tempered.

Interval	Cents from start point, J.I. scale	Cents from start point, E.T. scale	Deviation in cents
Unison	000.0	000.0	- 0.0
Semitone	111.7	100.0	+11.7
Second	203.9	200.0	+ 3.9
Minor Third	315.6	300.0	+15.6
Major Third	386.3	400.0	-13.7
Fourth	498.0	500.0	- 2.0
Aug. Fourth	590.2	600.0	- 9.8
Fifth	702.0	700.0	+ 2.0
Minor Sixth	813.7	800.0	+13.7
Major Sixth	884.4	900.0	-15.6
Minor Seventh	1017.6	1000.0	+17.6
Major Seventh	1088.3	1100.0	-11.7
Octave	1200.0	1200.0	- 0.0

Of course, there are many different types of just-intoned scales other than the one mentioned; this is just one example. Also, different microtonal scales are a rich resource of alternate tunings.

THE PROCEDURE

Creating an alternate scale isn't difficult, merely somewhat tedious. Suppose you want a scale that spans the range of C1 to C3. Here are the steps:

✓ Record the sample (let's call it Voice 01) at pitch C2 and assign Voice 01 to C1, C2, and C3. You would assign the same Voice three times; the assignment for these notes would be:

	Orig	Lo	Hi
C1	C2	C1	C1
C2	C2	C2	C2
C3	C2	C3	C3

✓ Copy the sample to Voice 02 and assign the copied Voice to two notes as follows:

	Orig	Lo	Hi
C#1	C2	C#1	C#1
C#2	C2	C#2	C#2

This places Voice 02 on notes C#1 and C#2. Now, select Voice Definition 24 (Attenuate/Tune) and offset Voice 02 by the desired amount—for the scale above, C# would be tuned 12 cents sharp compared to the default tuning (the E-II cannot resolve tenths of a cent, hence 11.7 cents would be set as 12 cents).

✓ Continue copying the original Voice to new Voices, assigning these new Voices to the desired notes of the scale, and varying each Voice's tuning for the desired offset. It will take a total of 12 Voices

to cover two octaves of the E-II's keyboard. Note that when the E-II copies a Voice, the copy does not use up as much memory as the original Voice; rather, the copy "points" to the original Voice, and simply stores a different tuning. While it is possible to run out of Voice memory, you'd be surprised how many copied Voices you can stuff in an E-II's memory bank.

✓ If more than a two octave range is required, sample some more Voices for the other octaves of the E-II and repeat the same type of Voice assignment procedure.

OTHER HINTS

One useful Preset is to assign two octaves of just intoned notes on the bottom two octaves. Then assign Voice 01 to C5, and transpose it over the range of C4 to C6 (i.e. Orig = C5, Lo = C4, and Hi = C6). Thus, the upper two octaves will be an even-tempered version of the just-intoned scale in the lower two octaves. This allows for easy side-by-side comparison of the "purity" of various intervals. The minor third, major sixth, and minor sev-

“ . . . thanks to MIDI there's no reason why you couldn't create your own customized controller to drive the . . . microtonally-tuned notes”

enth intervals sound quite different when compared to each other, with the just-intoned ones sounding smoother.

People often ask whether the lack of "beating" in a just-intoned scale makes for a more boring sound. However, my experience is that if you chorus a just-intoned scale, the sound is not only full and animated, but more accurate-sounding than a chorused even-tempered scale.

It's also easy to use the above mentioned technique to create microtonal scales, although of course a standard keyboard isn't optimized for this application. Fortunately, thanks to MIDI there's no reason why you couldn't create your own customized controller to drive a sam-

pler's microtonally-tuned notes.

As a convenient and flexible just-intoned instrument, the deviated sampler still leaves something to be desired. Transposition to other keys is usually possible via a transpose function, but this is, of course, an even-tempered transposition. Also, transposition may not be as convenient as you might like. But as a quick way to test out and understand different scales, a sampler with individual Voice tuning is invaluable. **CM**

Craig Anderton is the author of MIDI for Musicians, The Digital Delay Handbook, Home Recording for Musicians, Electronic Projects for Musicians, and Seven Simple Steps to Buying a Word Processor.

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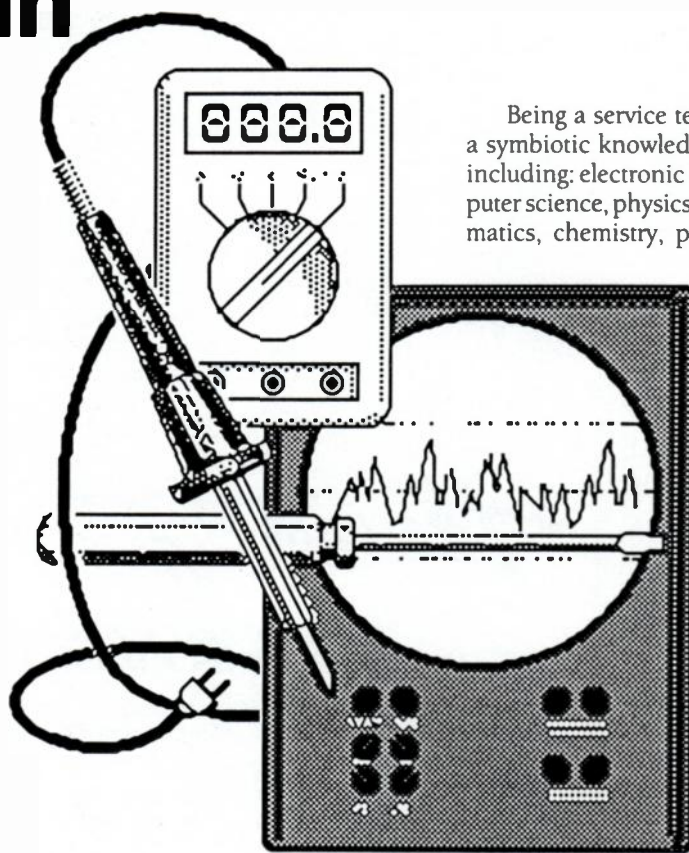
BY ALAN GARY CAMPBELL

If you love music and musical instruments, are technically inclined, and like to work with your hands, perhaps you've considered (or *should* consider) a career as an electronic musical instrument (EMI) service technician. Electronic music technology is one of the most eclectic, creative, challenging, stimulating, and *fun* fields there is. Imagine knowing more than any musician could about the inner workings of equipment; getting your hands on the newest, hottest gear—maybe even before the public does; and performing modifications to allow an instrument to produce timbres never before created. Sound exciting? It is.

TECHNICIAN, TECHNOLOGIST, OR ENGINEER?

A traditional "repair tech" fixes gear for a store or service shop, but an EMI tech's job can be anything *but* traditional. For example, an independent tech may spend as much time on mods or software development as on repairs; a tech employed by a manufacturer may be involved with quality-control testing or prototyping. These skills fall in between the definitions of service, technology, and engineering—techs may solve engineering problems while engineers "get their hands dirty."

Alan Gary Campbell is owner of Musitech,™ an electronic music consulting firm. Musitech is highly involved in electronic music service and modifications, and has been cited by Moog Electronics, Inc. as one of its top ten authorized service centers worldwide.



KNOWLEDGE & SKILL REQUIREMENTS

A formal technical education is not required to become a service tech. However, you must acquire the necessary knowledge, skills, and experience, by whatever method you choose. For many, college (or junior college) courses are the method of choice. Correspondence courses are available, too. But even the best courses are not, by themselves, enough since laboratory experience and an occasional mentor are helpful.

Being a service technician requires a symbiotic knowledge of many fields, including: electronic engineering, computer science, physics, acoustics, mathematics, chemistry, psychology, music, and English. To really master music technology, you not only get to study the many facets of our world, you *have* to study them. But don't let this seemingly large task of self-education discourage you. The depth and breadth of knowledge required varies with the intended application. Repairing guitar amps doesn't

require the same education and experience as troubleshooting a Fairlight, at least not yet!

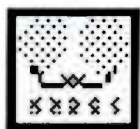
"Ideal" preparation for an EMI service career might consist of electronic music as a hobby—building electronic kits, performing custom mods, designing your own synthesizer, programming computers, playing in a band—coupled with an Associate of Science (two-year) or Bachelor of Science (four-year) degree in Electronics Technology.

With regard to personal characteristics, a certain amount of manual dexter-

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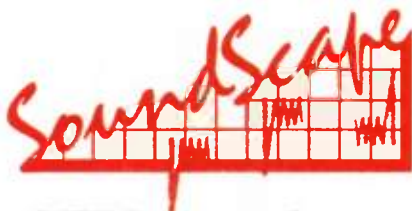


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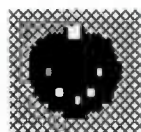
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ity is, of course, indispensable. You'll want to master good soldering and tool skills as early as possible. But, if you feel you're a hopeless klutz in this area, don't despair—persevere. Such skills are to a large degree *learned*, not something with which you are born. Playing a musical instrument can help, and some instrumental skill is mandatory. You can't test the keyboard response of a synth if you can't play.

Good close-up vision, with or without corrective lenses, is a definite plus. It's also helpful if you have the patience of Job and the people skills of a psychologist, but if you don't, working as a tech will give you a great opportunity to learn them!

As you proceed with your service education, you'll probably find that filling in the "gaps" is the most frustrating part. Those bits of knowledge that make the difference between a good job and a great one seem to be found only in the most obscure, unreferenced sources. Search out information on musical electronics and technology. Scan industry publications each month, for pertinent information. Peruse data books. Explore every new instrument, accessory, and personal computer you can. Brainstorm with other techs, engineers, and musicians. Listen to music of all styles, and be aware of the instrumentation and use of music technology. Keep information files and *keep a notebook*; if that's just *too* laboring, get a portable computer and keep records with it.

JOB PLACEMENT

Most entry-level EMI service jobs are found in music store service departments and independent service shops. As with any career move, it's wise to "try it first" before committing yourself. EMI techs are often in short supply, so you may be able to find a part-time tech job while you're still learning. Otherwise, get a few service manuals and cut your teeth on your own gear; or perform minor repairs and mods for friends. Keep accurate service records, for your own reference and to show to prospective employers. When you're ready to go full-time, these records can help you fulfill an employer's requirement for someone "with experience."

If you're a college student, your school's job placement office may be able to help you find a suitable position, but don't be too surprised if their database is more geared toward jobs with defense

contractors!

Your best technique for job placement is probably the direct method: Locate and evaluate reputable music stores and service shops in areas where you would like to live and work (criteria for evaluating service centers were outlined in the January '86 *Service Clinic*, "Obtaining EM Service"). Visit the selected shops (*in person*—phone calls will get you nowhere—and make sure you look your best) and present your case to the service manager or owner. Make absolutely certain that

“

... don't be too surprised if (your school's job placement) database is more geared toward jobs with defense contractors!”

you do not intrude upon these people at busy or inconvenient times. If you get a job interview, be on time and, again, look your best. Bring a professional resume and photocopies of service documentation for relevant work you have performed. If the employer seems interested, but isn't ready to commit, don't push matters. On the other hand, be prepared to accept the job if offered, but make sure that you completely understand the job parameters *first*. This includes salary, benefits, hours, vacation time, sick leave, overtime, and so on. Remember, you're shopping for a job. Don't let the lure of access to EMI technology entice you to accept a substandard position.

If you find it difficult to secure a position, or simply want to work for yourself, you might consider starting out as a self-employed repair tech. Be forewarned that, in addition to knowing about EMI technology, you'll need to know how to run a small business—which means learning about federal, state, and local business/tax regulations and record-keeping; capitalization and financing; warranty service authorizations and claims; insurance; inventory control; equipment storage; advertising; customer relations; and

even personnel management. If you're not careful, you'll wind up spending more time on paperwork than on service. It's probably best to start out part-time, supplementing your service income with another job, until you become familiar with small-business practice.

WHAT TO EXPECT

Technicians' salaries range from \$5 to \$15 an hour, or \$10,000 to \$30,000 a year, depending upon education and experience, and the job type and geographic location. For a self-employed tech, average hourly rates and warranty reimbursement rates range from \$10 to \$40 an hour (how much of that is *net* income depends upon operating expenses).

Working hours range from 9 a.m. to 5 p.m. for music store service departments, to an 11 a.m. to 7 p.m. schedule in some service shops. Self-employed techs generally have flexible, variable schedules.

A service tech's performance is measured by the number of units he or she can "turn around" per day, compared to the number of "call backs" (items not repaired properly) among those units. Turnaround is a primary consideration for most large service centers. This can lead to considerable stress for some technicians—each job has to be "just good enough," stopping short of excellence, in a push to move on to the next one. For many, just being indoors all day at a service bench is stressful. The combined factors probably account for the rapid turnover of techs in some metropolitan areas. However, a large metropolitan service center is the best place to learn service techniques for a wide variety of state-of-the-art gear. The aspiring technician can minimize potential stress problems by seeking employment with well-managed shops that value quality and common sense above money.

Turnaround requirements are usually less demanding in music store service departments. In this case, the problems that arise often stem from a lack of understanding of the service process, i.e., the justification for ordering service manuals *before* they're needed, the requirements for parts inventories, the need to consult the service department before quoting repair costs and turnaround time, and so on. Good communication between service personnel and the store manager can help alleviate problems of this sort.

For self-employed techs, turnaround is usually not a problem, but lack of work-

ing capital and insufficient floor space can be. Working at home can also result in somewhat of a lack of privacy. It can be helpful to designate a local music store as a service pick-up location, and pay the store a commission in return. Alternately, a group of independent techs might form a co-op, to provide better facilities at an affordable cost.

All techs can suffer from "burnout." Repairing equipment can induce stress not unlike that experience by a physician: the customer's gear is "sick" and has to be "cured" as soon as possible to allow the customer to continue to make a living. Unfortunately, all too many customers ignore warning signs that imply needed service, and wait until the last minute to bring in the defective gear, thus compounding the problem. It's extremely rare that equipment is brought in for *preventive* service. Although it can be hard to break away from work-in-progress, it's wise to take several short breaks during the day, and also to plan a periodic vacation, to help avoid "burnout."

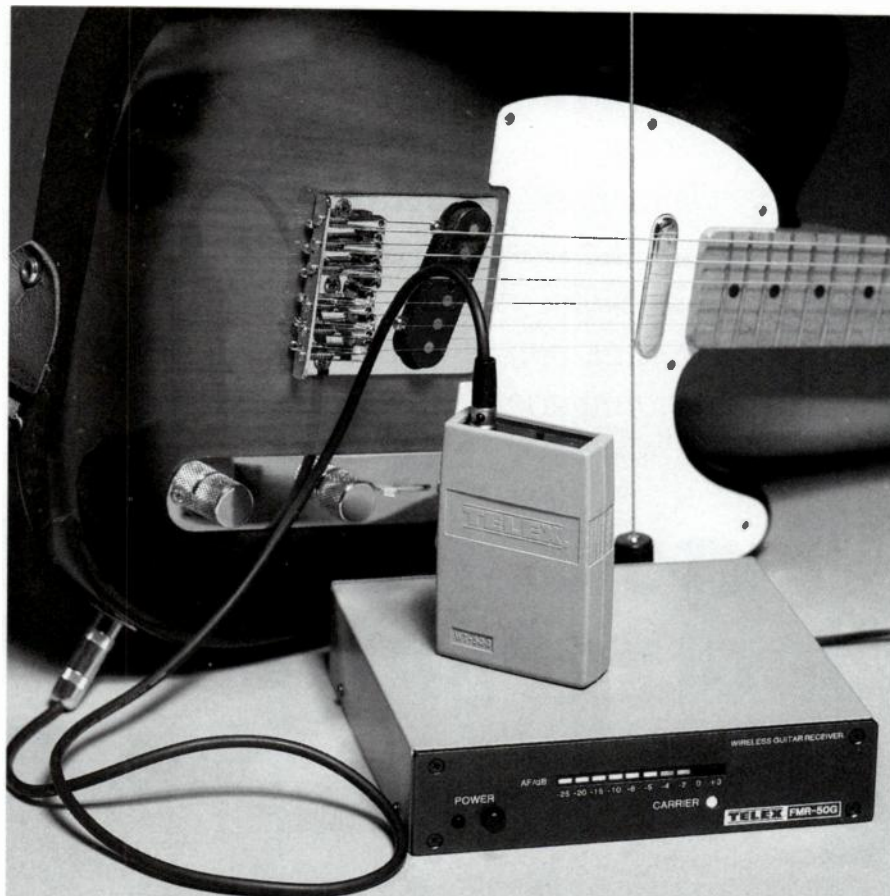
CAREER ADVANCEMENT

Many possibilities exist for career advancement in EMI service. Tenured techs can expect to become senior technicians, chief technicians, service managers, or engineering aides, with commensurate increases in pay. With further education, a tech may move into the position of technologist or engineer.

Employment in EMI service can provide access to high-tech equipment, technical literature, and service documents that would otherwise be unobtainable. You can use this access to increase your knowledge, skill, and efficiency. You must keep your knowledge of music technology current, or you won't be able to service current gear. Develop a habit of *continuous education*—don't get behind, since it can take too long to catch up. The key is to *read, read, read* (don't forget to upgrade your computer literacy, as well). Keep your knowledge of music current, too, in order to understand the contemporary musician's needs, and to engender better communication.

Always keep accurate service records, if not for your employer, then for yourself. These records become your own personal encyclopedia of service techniques. And most of all, never lose sight of what all this technology is for—that is, *making music*.

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Pierre Schaeffer & Pierre Henry: Pioneers in Sampling

BY JOHN DILIBERTO

Before Trevor Horn sampled a sound, Alvin & the Chipmunks squealed, or Run DMC scratched a record; when synthesizers were a twinkle in the imagination of Varese and Cage and at about the same moment that Eno formed his first infant gurgles, Pierre Schaeffer and Pierre Henry (pronounced: Ahn-ree) were transmuting the world of sound. In the mid-'60s, their techniques were arcane; by the early '80s they were nouveau-chic. But in 1948, they were revolutionary.

"Our direction was to turn our back on music and that is crucial," proclaimed Schaeffer in his elegant, old Paris apartment. "People who try to create a musical revolution do not have a chance, but those who turn their back to music can sometimes find it."

Shortly after World War II and shortly before the widespread use of magnetic tape (developed in Germany), Schaeffer and Henry began their revolt by recording sounds from the natural world onto phonograph discs, altering them through the primitive means available, and creating an alarming music that they dubbed "musique concrete" (pronounced: mu-zeek kon-kret), or concrete music.

Think of The Art of Noise without a rhythm box and you have a rough approximation of the first masterpiece of

John Diliberto is the producer of Totally Wired: Artists in Electronic Sound, a weekly program on electronic music produced for Pennsylvania Public Radio Associates and broadcast on public radio stations across the United States.

musique concrete, *Symphonie Pour Un Homme Seul* (Symphony for a Man Alone). Schaeffer and Henry created audio portraits for the end of the machine age and the beginning of the electronic age that burst with mechanical noises, orchestral hits, trains, and text-sound babble. Doors open and close on indecipherable conversations; engines start, stop and transform into screams and moans; disembodied pianists jam with mouth noise rhythm sections. Now, almost 40 years later, the scratches on the records they used give this vanguard work a charming, antique quality.

Their studios in the '50s and '60s were hotspots of experimentation. They formed the ORTF (French Radio) Experimental Studio in the '50s, and in 1960

Henry founded the studio APSOME and Schaeffer founded the Groupe De Recherches Musicales. Among his many students was French synthesist Jean-Michel Jarre, who regards Schaeffer as a mentor. "He was very important in my life," claims Jarre, "because he was the first man to consider music in terms of sound and not notes, harmonies, and chords."

Schaeffer despised the trends of classical music in the 20th Century, still embroiled in the 12-tone and serialist methods of Arnold Schoenberg and his disciples. "This made for a century," exclaims Schaeffer, "of the most boring music. Schoenberg, a teacher lacking genius, had a 'brilliant' idea. One was supposed to use all 12 notes without repeating any. One is sure in this way to avoid the



Pierre Henry and Pierre Schaeffer

PHOTO: JOHN DILIBERTO



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problems of tonality and to avoid copying Mahler's music.

"Unfortunately," he continues, "when you suppress the intervals between notes you suppress music. You make it insignificant. You take the feeling, the intelligence and meaning away."

It was Schaeffer who first developed the ideas of *musique concrète*. Though he was born into a musical family in 1910, his parents forbade him to study music. Instead he went to the *Ecole Polytechnic* (the French equivalent of MIT), and studied electronics, eventually winding up as an engineer on French radio. During World War II, he was an operator for the French Resistance Radio Network.

Schaeffer's method of returning meaning and emotion to music was to go into the world and the sound effects library of his radio studio. "I was actually concerned with the possibilities of radio art," he recalls. In the process, he became more interested in his sound effects for radio plays rather than the dramas themselves. "From the moment you accumulate sounds and noises, deprived of their dramatic connotations, you cannot help but make music," he insists.

Using disk lathes, Schaeffer went to locales like the Batignolle Railway Station and etched the rumble of trains into the record's grooves. "I was attracted to external events and impressive machines," he states with a grand sweep of his cigarette. "It was an emotional experience because the railroad carries many memories, many psychological and psychosomatic feelings. Sometimes these feelings can be very violent, deeply rooted in your childhood."

Unlike the earlier Futurist work of Russolo, Schaeffer wanted to remove the original meanings and definitions of his sounds and create a deeper psychological-emotional response. In works such as *Etude aux Chemins de Fer* (*Etude on Railroads*), *Etude Pathétique* (*Etude on Pathos*), and *Etude aux Objets* (*Etude on Objects*), the sounds were familiar, but rearranged into bizarre juxtapositions, in the surrealist style of the era. The techniques of speeding up, slowing down, reversing, editing, and looping were all used to create sonic "collages," as Schaeffer calls them, all before the advent of tape recorders, let alone digital samplers.

After recording their sounds, they went back into the studio and isolated them, re-recording them onto other disks with different manipulations, including

what they called "the locked groove," putting an intentional skip in the record so a sound would be repeated, not unlike a tape loop or sequencer. Schaeffer describes the recording process. "We would have seven or eight turntables playing together, but with only one sound playing on each. Then we would try different variations, montages with let's say, sound 'A' repeated twice, then a sound 'B' then 'C' repeated and so on. It was similar to an orchestra rehearsal where you would be trying different themes, different variations."

Schaeffer has the air of a French aristocrat, dabbling with sound as a philosophical exercise. Pierre Henry, on the other hand, is a classically trained musician and composer who diverged from the traditional route to join in Schaeffer's experiments in 1949. Henry is restrained and self-absorbed, convinced that he is on the only true musical path. Henry and Schaeffer's relationship has been turbulent. They are reputed to have broken up in a violent fight in the '60s, only resuming their friendship a few years ago. Now Schaeffer, who has since stopped composing, gives much of the credit for their music to Henry. Henry, on the other hand, sat silently during Schaeffer's interview and demanded his own session.

By 1951, they had tape recorders, a medium in which Henry still works almost exclusively. His studio contains a mixing console, two 8-tracks, several 2-track Studers and rooms full of reel-to-reel tapes of raw sounds. He now calls his work "electro-acoustic music." Both he and Schaeffer are disdainful of the electronic music that in many ways they helped spawn. "It is important to understand that there is no use of electronically generated sounds in our music," says Schaeffer. "It is concerned with the acoustics of recorded natural sounds on which we then have the power of transformation."

These statements aren't entirely true, however. Synthesizers appear on Schaeffer's 1978 *Etude aux Sons Animes* (*Etude on Animated Sounds*) and sitting unobtrusively next to Henry's mixing console is an analog synthesizer. "It is just a decoration," he says with a conspiratorial grin to his aide and translator. "It is not wired in. I do not use it, but it could happen."

Henry can appear like an "electro-acoustic" snob, but he has also been willing to place his work in a more pop context. In 1969, he added electronic

scribbles to the British hard rock of Spooky Tooth's *Ceremony*, and in 1967 collaborated with French rocker Michel Colombier on *Mass For Today*. Most recently, he worked with French avant-gardist Gilbert (Lard Free, Urban Sax) Artman.

Yet he considers himself part of the traditional classical music stream. He studied at the *Conservatoire National Supérieur de Musique* in Paris, and with Nadia Boulanger and Olivier Messiaen. "I am still a traditional composer," he insists. "It is not the recording of the sound that made me different."

Henry tends towards manipulations of musical instruments rather than natural sound. "In the *Symphonie Pour Un Homme Seul* all the instrumental parts, piano, percussion, were played by myself," he boasts. "It was a music that I played and then, only afterwards was this music fragmented, elaborated upon, using the techniques of the time. I was also experimenting at the time with objects, noises, anything you could create inside the studio, noise from composed objects, invented objects."

Their compositions sought a musical language that fell between natural sounds and instrumental ones. They wanted the sounds to stand apart from their original context, yet have the musical values and complexity of instruments. So a door wasn't a door, but a scraping wipe across a bleak landscape. A violin no longer played scales, but a descending drone into a personal hell.

"Music has to do with sounds," explains Schaeffer, "so we need to find them somewhere and it is preferred to find musical ones. You have two sources for sounds: noises, which always tell you something—a door cracking, a dog barking, the thunder, the storm; and then you have instruments. An instrument tells you, la-la-la-la (sings a scale). Music has to find a passage between noises and instruments. It has to escape. It has to find a compromise and an evasion at the same time; something that would not be dramatic because that has no interest to us, but something that would be more interesting than sounds like Do-Re-Mi-Fa. . ."

Works like his *Masquerage* (1952) and Henry's *Well-Tempered Microphone* (1951) were far removed from conventional musical scales or language. In the latter work, Henry prepared a piano à la Cage and used different miking placements to gen-

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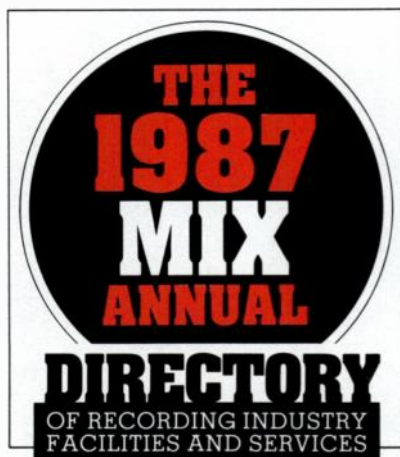
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erate a discordant orchestra. Remember that this was the early 1950s, and even the microphone was still a recent and relatively unexplored development.

"In the *Well-Tempered Microphone*," relates Henry, "the idea was to show all the resources of the microphone and of the instrument. By using the microphone for your recording, you could go further than with the instrument itself. The microphone could amplify and magnify the effect of the instrument and, if combined with other little acoustical transformations possible at that time, it could make this effect more magic."

Some of these performances would fit nicely into Looney Toons cartoons. The piano works in particular, like *Concerto des Ambiguités*, have the effect of Cecil Taylor on helium. At their best, they succeeded in removing expectations and preconceptions from music, allowing newer thoughts and feelings to prevail.

Schaeffer seized upon a fire engine squealing past his Paris apartment to illustrate their philosophy. "Let us use the example of the fire engine," he exclaimed. "What we are hearing is a musical third, a woodwind instrument, which is here a horn, and finally the siren itself. What the locked groove allows you to do is to conceal the fact that it is a fire truck, to forget that it is a musical third and it allows you to make the instrument sound like another instrument."

Although Henry worked sparingly with electronics on early compositions like *Haut Voltage* (1955), his best work bends acoustic material into seemingly synthesized designs. *Le Voyage* (1961-62) is a timbrally rich and varied excursion based on the Tibetan Book of the Dead,

with only violins and voice as its principal sound sources. "There was absolutely no electronically generated sound on *Le Voyage*," Henry insisted indignantly. "*Le Voyage* was a continuation of the experiments of the '60s, but it was done in a new studio. I think that people should consider me as a creator of music and sounds who worked in different studios that he personally designed. So if there is a difference between *Le Voyage* and *Haut Voltage* for instance, it was mostly due to the studio where I was working. The sound depends on the studio where you work."

The sound also depends upon the stage where you present the work. While Schaeffer's and Henry's first compositions were designed for radio concerts, their music caught the fancy of many choreographers and playwrights, chief among them, Maurice Bejart, with whom Henry has had a continuous relationship since the '50s. Their collaborations, including *Haut Voltage*, *Le Voyage*, *Mass For Today*, and *Variations for a Door and a Sigh*, brought Henry's music onto the concert stage where he would sit among his mixers, filters and tape recorders, performing live mixes and manipulations of his tapes, not unlike Stockhausen working his potentiometers or Brian Eno, who processed Phil Manzanera's guitar solos with Roxy Music.

In the '70s, Henry staged expansive works for the concert hall like *The Second Symphony*, which was "composed for a circular space, the Cirque d'Hiver," Henry explains. "It was a work for a 16-track recording, which was very ambitious for the time; we used eight stereo tape recorders, wired together and about 100 loud-

speakers that would diffuse the sound circularly. People would feel immersed and surrounded by the music." It makes you wish quadrasonic sound had caught on.

In a more recent work, *Futuriste* (1980), Henry channels his sound through a variety of acoustic spaces placed on the stage. He had room-sized boxes filled with speakers, bathtubs, old tanks, basins and pipes, all lending their own peculiar resonance to Henry's prerecorded scores. "It was a work of acoustic and electric diffusion," he proudly proclaims. "For me it was the best definition of an electro-acoustic concert. It was at the same time vibrant, live, and on tape."

Curiously, some regard these vanguard artists as anachronistic in the context of new music in general, and the French avant-garde in particular. Composers associated with Pierre Boulez's Institut de Recherche et Coordination Acoustique/Musique (IRCAM) in Paris, are reputed to snipe at Henry and Schaeffer like they were doddering old tinkers. For their part, Henry and Schaeffer take any opportunity to lampoon the high-tech computer music of IRCAM.

Schaeffer relates a Pierre Boulez story from the 1950s, illuminating the schism in French music circles. "One day we had the visit of a young and unknown musician, Pierre Boulez. At the time, I was involved in trying to create a solfege that could include many sounds and timbres. I thought we should classify the sounds in terms of their effect on the listener, of their psychological effect. We would classify them in high, low, hard, harsh sounds. Boulez objected to that. He refused to collaborate and left after composing one piece, as boring as usual, with one single sound (*Etudes*, 1952)."

Of course, with the sophisticated computers at IRCAM, like the 4X Real Time Digital Computer, Boulez and his disciples are able to work at a subtler, almost sub-atomic level of musical sound and structure than Henry and Schaeffer ever could.

Schaeffer, who has spent the last ten years composing philosophical treatises on the state of the world, relates to high technology the way people probably related to his own work when he began in 1948. "I am convinced that synthetic music, so fashionable today, is making a mistake feeding the ear with synthetic sounds. We need to come back to that."

—page 72

Schaeffer & Henry Selected Discography

Collaborations:

Symphonie Pour un Homme Seul/Concerto des Ambiguités (Philips 6510-012)
Bidule en Ut (London DTL93090)

Pierre Henry:

Le Microphone Bien Tempere (INA GRM AM 006.08)
Mass For Today/The Green Queen (Limelight LS-86065)
Variations for a Door and a Sigh (Philips 836898)
Dieu (Philips 6510-019)
Orphee (Philips L00.564)

Le Voyage (Philips 836 899)

Futuriste (Philips 6510 020)

Entite (Mercury LS 86048)

Batterie Fugace/Concerto des Ambiguités/Le Voile d'Orphee (London DTL 93090)

Pierre Schaeffer:

Objets Lies (Candide 31025)

Etudes; Variations sur une Flute Mexicaine (London DTL93090)

Parole et Musique (INA Collection GRM 9106 SC)



Whether it's destroying the *Death Star* over Alderon or shooting budget videos over at your friend's house, it helps to trust your feelings and go with the force.

Stochastic Video Editing

BY DON SLEPIAN

Recently, I created two new five minute videos in a single evening. Each piece had over 80 cuts (MTV style) placed exactly in rhythm to the music. Using normal video methods, these two pieces would have taken over 40 working hours and lots of money to create. Instead, we went from blank tape to broadcast copies in five hours. The session went smoothly, everyone had a splendid time, and the result was some very high quality work. This was made possible by the stochastic video editing technique I have been developing and using, which is the subject of this article.

Stochastic is a word used in mathematics to describe a process that involves a random variable, often found in the field of probability theory. It derives from

Don Slepian has been doing electronic music since 1970, and computer graphics and video since 1976; he has twice been sponsored by the French Ministry of Culture to perform live video synthesis in Paris and La Rochelle, and has given performances in New York and Philadelphia as well. He has several critically-acclaimed albums and tapes available, and frequently performs live.

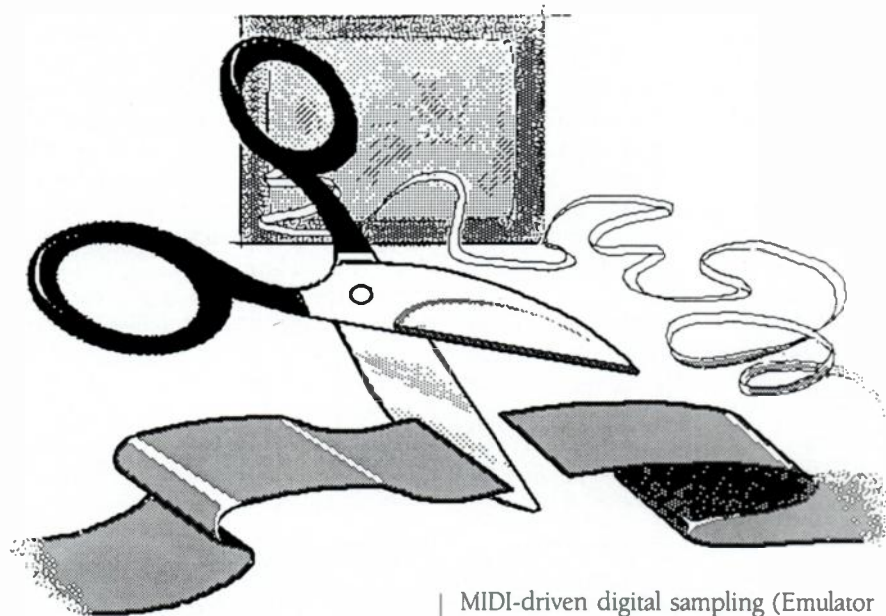


the Greek "stochasikos", meaning "skillful in aiming." In this video context, I use it to mean giving up exact control over the visual composition, and using a working method of controlled randomness—with the odds tilted strongly towards excellence in the final result.

The normal method of creating mu-

precision as the music, and I must be lucky enough to have good new material with every video insert. With some practice, I've gotten very good results with this method.

Mike and Lilly Lutgen make up the group "Nobel Gas," a very talented theatrical combination of processed vocals,



sic video is to shoot several performances on different tapes and then bring them into an editing suite to create the final product. SMPTE time code is used on all the source tapes so that the edited master will be in sync with the music. This method gives the producer a lot of choice and control over the final product, just like mixing music in a 24-track studio. The method I have been using is much more like live performance. I use a single machine with a single piece of tape, and do layers of inserts live from repeated performances. Since the editing is all live, I must perform the inserts with the same

MIDI-driven digital sampling (Emulator II, Drumulator, and Mirage), original songs, and even more original costumes.¹ They chose to work with two of their recent songs, "Possibly Maybe" and "Love In Space."

I arrived at their house at 6 p.m. (after work) and began setting up the equipment: a Sony 2860A ¾-inch Video Editing Deck,² the Adwar Special-Effects Keyer (video mixer and effects unit), the Chromascope (an English-made, audio-driven analog video synthesizer, somewhat like a video kaleidoscope), and some video lights. Mike and Lilly supplied a home VHS video system with a color camera, video monitor, Amiga com-

puter, and dinner. Missing but not at all missed were any type of SMPTE time code devices, sync translators, interlocks, pre-production meetings, storyboards, artistic arguments, money, or outsiders (just us musicians). Between 6 and 7:30, we set up, recorded a sync signal (video "black") onto the 3/4-inch video tape, and transferred the music. The music had been recorded "live" (MIDI sequencer plus live vocals and extra parts) onto a VHS deck using the Sony PCM 501 digital recording unit. I did some gain riding and limiting in the transfer to get the best television sound. The rest of the work for the evening would be video inserts, so I turned off the audio recording preselectors and taped them down to prevent accidental erasures. Lauri Paisley,³ a famous electronic musician from the planet Methyllunna, dropped in and began warming up on the VHS Video Camera. I set up audio monitors so Mike and Lilly could hear and perform to their music, and by 8:15 we were ready to go.

First we lit and set-up the living room for "Love In Space." I had Lauri set up the camera for a distance shot and we taped the song straight through. I set the Chromascope to generate patterns and colorizing effects based on the instantaneous amplitude of different frequency bands in the music, and used the keyer to blend and key it into the camera signal. Then I had Lauri move up close with the camera and make use of the zoom lens, and we went through the entire song three more times. From each of the performances I did dozens of video inserts (erasing a small portion of the old video by recording over it). The inserts always entered and exited on the beat, and varied from an entire musical phrase to a single eighth note in length. I was absolutely depending on Lauri to always be giving me interesting and high quality camera work, for there was seldom time to look at the preview monitor and make judgments. I was making the length and frequency of the inserts correspond to my feel of the music, however, if there was a particularly strong visual I would stay with the shot until the next appropriate cadence point before exiting the insert. After the fourth performance, we sent the talent out for a break and took a careful look at the video. There were three places that needed work, so we did fresh inserts over those spots to clean them up. After another break and costume change

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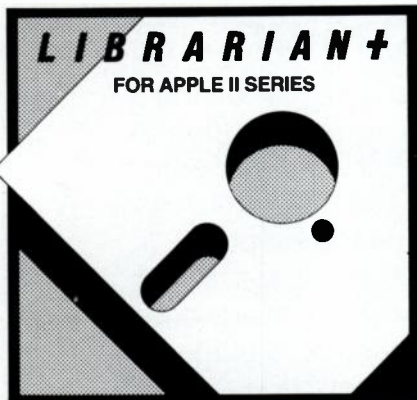
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we lit and set-up the kitchen for the song "Possibly Maybe," and went through the exact same procedures.

By 10:30 we were ready to hook up the Amiga computer and insert the credits and titles. Mike and Lilly had created some animations using Electronic Arts' package, "Deluxe Video." After some initial frustration and some rehearsal to coordinate the start of the animations with the video tape rolling up to speed and approaching the insert points, we learned the timing of the two machines and devised a system that worked. I made inserts from two passes of the animations to make their styles match the videos.

From 11 p.m. to midnight we ran VHS copies from the 3/4-inch master and partied. We submitted the video to a local magazine's "Video Talent Search," confident that it would at least look quite different from the rest of the entries.

Looking at the tape a few weeks later, I clearly see that it's not a commercial product. The Sony 2860A does not distinguish between field 1 and field 2 in a frame of video, so when an insert chances to enter on field 2, the edit point is marked by a single frame of glitch. It could be modified to overcome this limitation, and the new video machines don't have such problems. My videos contain some edit glitches. No professional video would ever be shot on a single tube home-style camera with unbalanced tungsten lights. The standards of technical quality in professional video are exceedingly high, which is one reason why it costs so much. However, all non video-professionals who are receptive to this style of music have loved this video without exception. So if this technique interests you I invite you to send away for the video and judge the results for yourself.⁴

RANDOM TIPS

I have been going through some rough times lately, and have lightened up considerably after some long and deep conversations with Mindscape's "Racter" program for the Commodore Amiga computer which utilizes the computer's speech synthesis capabilities.⁵ Under Racter's penetrating analysis, my fears and anxieties seem quite inconsequential (ha-ha, hic-hic, cough, and so on). Racter needs the Amiga kickstart disk version 1.1 or later to run, and will give you a printout of your conversations as well.

All you L.A. videoart people should join the Visual Music Alliance and check out their programs.⁶

Finally, I'd like to thank everyone for all your letters, homemade videos, and support this past year. It is inspiring to see artists and musicians starting to create video and computer art at home, just like the electronic music scene in 1976. Keep up the great work!

FOOTNOTES

¹"Nobel Gas," Mike and Lilly Lutgen, better known as Dr. Sirius and Lilly Laser. A cassette, "Love in Space" is available for \$5.95 postpaid from 103 Reservoir Road,

"The method I have been using is much more like live performance"

Parsippany, NJ 07054.

²This is an older generation Sony 3/4-inch editing deck that is generally available used for around \$1,200. A modern alternative in the same price range would be a Panasonic industrial VHS editing deck (not a home unit, made especially for editing). For real quality get a Sony 5850 for about \$5,500.

³Lauri Paisley, Methyllunna Music, 812 Murray Street Suite 2E, Elizabeth, New Jersey 07202. Write to her for her catalog. I also recommend sending \$5 to Synthetic Pleasure, Box 3154, Elizabeth, NJ 07207-3154 for your copy of the Synthetic Pleasure Contact List, a vital resource for contacting people in this field.

⁴My video compilation tape is available on VHS only for \$15. It includes these videos as well as some earlier work. Don Slepian, Box 836, Edison, NJ 08818.

⁵Mindscape's program "Racter" is available for the Amiga for \$31 from GO AMIGA, 1540 Oak Creek Drive #307, Palo Alto, CA 94304.

They also have Electronic Arts' program "Deluxe Video" for \$69. Call 800/BE-AMIGA for voice or 415/328-0183 for modem.

⁶Visual Music Alliance, Angie Pike, 8435 Geyser Avenue, Northridge, CA, 91324. Tel. 818/885-7316.

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You can't live with them and you can't live without them—this month Craig considers the pros, the cons, and ideas for the future of guitar synthesis.

Electronic Guitarist: State of the Synth

BY CRAIG ANDERTON

For ten years I wrote "The Electronic Guitar" column for *Guitar Player* magazine. When *Mix* bought *EM*, and *GP* canceled the column, I figured it was the end of an era and time to move on.

Well, a lot of you didn't agree. Since we aim to please around here, and about half of our readers play guitar (and I never wanted to stop writing the column anyway!), all I can say is... on with the show.

THE STATE OF GUITAR SYNTHESIS

Over ten years after they first hit the scene, guitar synthesizers are still having a hard time turning potential into reality. Yet while the guitar synthesizer is far from perfect, it has much to offer to some types of guitarists. The object of this article is to cover both what's wrong and what's right with guitar synthesizers, as well as speculate on another option that could overcome many of the existing problems with guitar synthesis.

WHAT'S WRONG WITH GUITAR SYNTHS?

Might as well get the bad news over with first:

✓ *They're expensive.* Sure, you can convert your guitar into something that can drive a MIDI synth for under \$1,000, but then you need a synthesizer (and few inexpensive models are designed with guitar in mind). The bucks don't stop there: you will also need a clean amplification system to do justice to those synth sounds and new kinds of accessories. Part of the appeal of playing guitar is its low cost, minimal maintenance, and easy portability. A guitar synthesizer system—and that's what we are talking about—is

none of the above.

✓ *Guitarists have to learn a whole new vocabulary.* Keyboard players, and electronic drummers for that matter, can buy neat and obvious little packages that do their functions very efficiently. Guitarists end up with a guitar interface whose instructions invariably begin with words of wisdom like "First, find an appropriate MIDI synthesizer and set it up correctly." But in fairness to the manufacturers, what else can you say? There's no way an instruc-

"In a world where tube amplifiers are idolized, it's good to learn about MIDI..."

tion book could cover all the permutations and combinations of products, much less give a complete course on MIDI (another prerequisite to successful MIDI guitar synthesis). Then there's the matter of programming the synthesizer; without sounds programmed specifically for guitar, a guitarist can end up sounding like a mediocre synth player.

✓ *Pitch-to-voltage (P/V) conversion, the predominant low-cost guitar synthesizer technology, is too glitchy.* Wait! Before all you guitar synth manufacturers call up and scream, hear me out. Yes, it is possible to play in such a manner that the guitar synthesizer can track your playing. But part of the joy of playing guitar is the reckless abandon with which you can play the instrument. Would electronic percussion be taking off

to such an extent if you had to hit a 2-inch circle in the middle of the pad? Strapping on a guitar controller means we have to play many parts for the benefit of the synth—not the audience, nor, for that matter, the muse.

After realizing the above, many guitar players give up. Don't, though, because we are about to look at...

WHAT'S RIGHT WITH GUITAR SYNTHESIZERS

✓ *There is an actual standard for synth guitars, developed by Roland in the early '80s and still valid.* Roland even encouraged the adoption of their standard, and made it as easy as possible for third party vendors to produce Roland-compatible guitars. The new Ibanez guitar controller uses the Roland standard, which I consider a wise move. And let's not forget that all the MIDI gear we're driving is generally standardized as well. Because of standardization, we can selectively upgrade system elements as the technology improves.

✓ *Guitarists have to learn a whole new vocabulary.* Yes, I know we already filed this under "what's wrong," but there's another side to the subject. In the conservative world of guitar where Les Pauls from the 1950s and tube amplifiers are idolized, it's good practice to learn about synth programming, and MIDI, and all that other 1980s kinda stuff. You might even end up playing synth as well as guitar (which is what happened to me). And, any MIDI knowledge comes in very handy when assembling a MIDI-based effects system (one of the most under-rated, and least discovered, aspects of MIDI for the guitarist as far as I'm concerned).

✓ *You finally have a passport to all those cool MIDI sequencers.* Being able to orchestrate entire compositions is great, but until the MIDI guitar synth, guitarists could only gaze on in envy. With sequencers, tracking and delay problems become moot thanks to editing (to remove any glitches) and auto-correct (to correct any delay errors caused by processing lag). Extra points to Ibanez, in fact, for the series of ads for their new guitar controller. These ads show a guitarist sitting down, Macintosh off to the side, busily *composing*. Yes, MIDI guitars are fantastic composition and orchestration tools, and for that reason alone they are welcome.

✓ *P/V technology is by no means exhausted.* The trek has been long and tedious, but incremental changes continue to be made in P/V units. And while a dedicated controller will give far better tracking and increased flexibility, one advantage of P/V technology is that it inherently lets you mix in the actual guitar sound. Keyboard players have known for years about the advantages of layering; now guitarists

can do it too. When layering, a guitar can glitch a whole lot without being even close to bothersome—after all, with that thick fuzzy stuff going on, a little octave jumping here and there isn't going to be serious. It may even sound cool.

IS THERE AN ALTERNATIVE TO STANDARD GUITAR SYNTHESIS?

The problems with guitar synthesizers involve tracking, retaining spontaneity in one's playing, and (unless you do some layering) obtaining rich sounds. The advantage, of course, is that synthesis opens up a whole new world of timbral possibilities. But is there some way to have your cake and eat it too?

Recently I've been working on the design for a hex processing guitar system as an alternative to standard guitar synthesis. The basic idea is to use a guitar with a hex pickup (a Roland-standard guitar, for example, or you could slap a hex pickup on your existing axe). Once you have these six outputs, you can do a variety of tricks. For a super-sweet fuzz sound, you can fuzz each string individu-

ally instead of fuzzing the overall output. Each output could feed a stereo mixer, too, so individual strings could be panned over the stereo field.

Although you can't have oscillators per se, it would be easy to add an octave divider/multiplier for each string. Since you're feeding a monophonic signal into the divider, and since you need cover only a two octave range, you don't have the usual octave divider glitching/tracking problems. A simple divide-by-three circuit can provide a fifth below, and simple waveshaping is also possible.

Using hex envelope followed filters, phase shifters, and so on gives even more sounds. And if you want unusual envelopes, it's not hard to add reliable trigger extraction when you only have to deal with one string at a time.

As far as I'm concerned, hex processing has the potential to give many of the advantages of guitar synthesis, with few of the disadvantages. There's more to say on this whole topic of hex processing... but we'll leave that for the next installment of "The Electronic Guitarist." **CM**

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Pickup design has generally been shrouded in mystery. Yet some aspects of pickups do lend themselves to scientific analysis, so let's take a closer look at...

What Makes Pickups Tick?

BY HELMUTH LEMME

An electric bass or guitar's sound depends greatly on its pickups. There are weighty discussions between musicians about the advantages and disadvantages of different models, and for someone who has no knowledge of electronics the subject may seem very complicated. Electrically, though, pickups are fairly easy to understand—so this article will examine the connection between electrical characteristics and sound.

There are two basic pickup types, magnetic pickups and contact pickups. The latter mount on the body of the instrument and pick up mechanical vibrations. They are not only sensitive to the strings' tones, but also to fingering noises and other sounds. With loud amplification, contact mics are prone to acoustic feedback. One advantage of contact pickups is that they work with all types of strings (steel, nylon or gut).

Unlike contact pickups, magnetic pickups—the subject of this article—are not sensitive to external sounds and mechanical vibrations of the guitar body (unless they are *microphonic*, usually an indication of poor construction or old age). Magnetic pickups work only with steel strings, and consist of magnets and coils. Single-coil pickups (Fig. 1) are sensitive to magnetic fields generated by transformers, fluorescent lamps, and other sources of interference, and are prone to pick up hum and noise from these sources. Dual-coil or *humbucking* (Fig. 2) pickups use two specially-configured coils to minimize this interference. Because these coils are electrically out-of-phase, *common-mode* sig-

Helmuth Lemme, in addition to his writing for German electronic music magazines, is the author of the book *Elektrogitarren* (Frech-Verlag, Stuttgart, 1982).

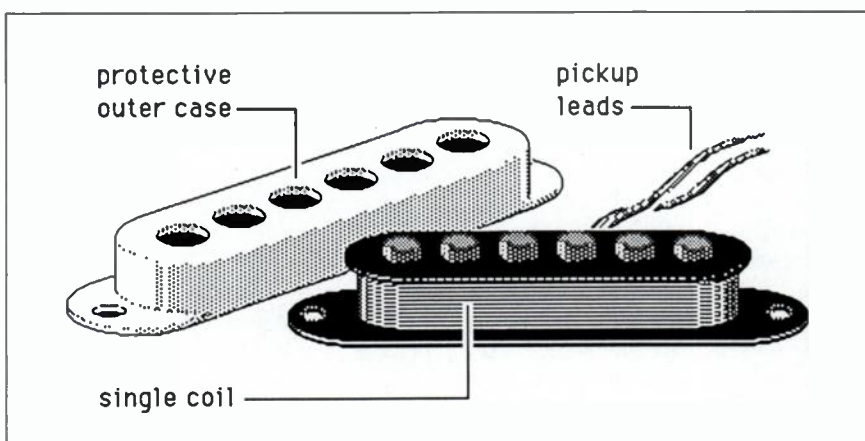


Fig. 1 Single coil pickup with six rod magnets in the coil, plastic cover removed.

nals (i.e. signals, such as hum, that radiate into both coils with equal amplitude) tend to cancel each other.

The arrangement of the magnets is different for different pickups. Some types have rod or bar magnets inserted

directly in the coils (see Fig. 3a and 3b), while others have magnets below the coils, and cores of soft iron in the coils (Fig. 3c and 3d). In many cases these cores are screws, so level differences between strings can be evened out by screw-

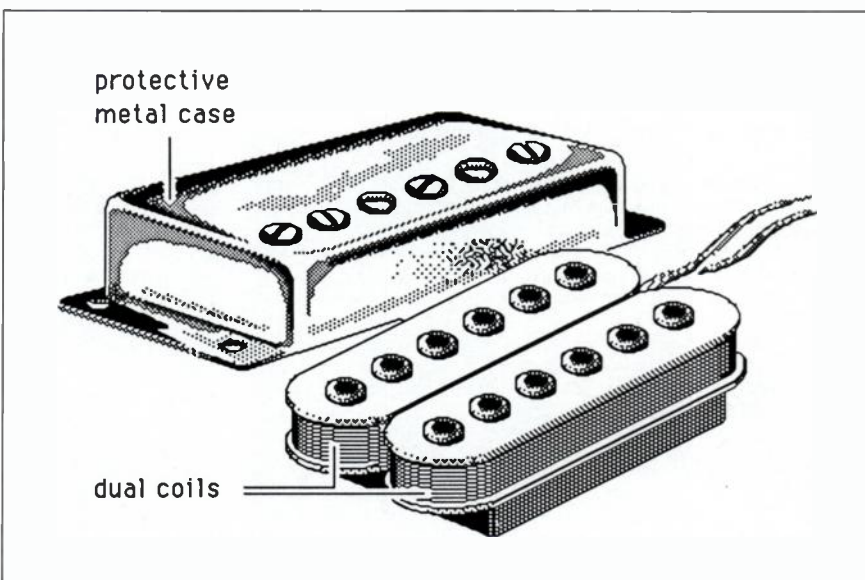


Fig. 2 Two double coil pickups (humbuckers). Front: open construction. Rear: closed construction. One of the coils has screws for adjustment, the other has fixed soft iron cores under the casing.



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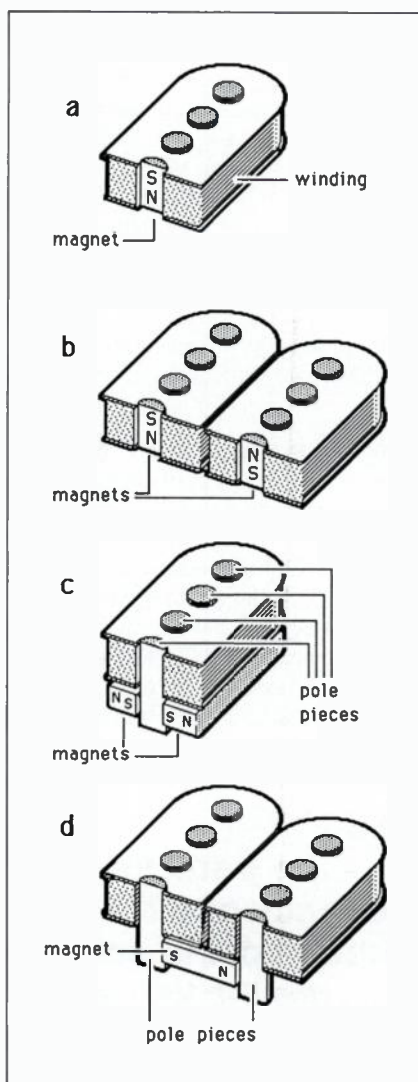


Fig. 3 The four main types of pickups in cross section: a) one coil, magnets in it. b) two coils, magnets in them (with opposite polarity). c) one coil, soft iron cores in it, two bar magnets underneath. d) two coils with soft iron cores in them, one bar magnet underneath.

ing the core further in or out. Some pickups have a metal cover for shielding and protection of the coils, others have a plastic cover that does not shield against electromagnetic interference, and still others have only isolating tape for protecting the wire.

The magnetic field lines flow through the coil(s) and a short section of the strings. With the strings at rest, the magnetic flux through the coil(s) is constant. Pluck a string and the flux changes, which induces an electric voltage in the coil. A vibrating string induces an alternating voltage at the frequency of vibration,

whose voltage is proportional to the velocity of the string's motion (not its amplitude). Furthermore, the voltage depends on the string's thickness and magnetic permeability, the magnetic field, and the distance between the magnetic pole and the string.

There are so many pickups on the market it is difficult to get a comprehensive overview. In addition to the pickups that come with an instrument, replacement pickups—most of them built by companies that don't build guitars—are also available. Every pickup produces its own sound; one may have a piercing metallic quality, and another a warm and mellow sound. Replacement pickups allow the guitarist to change sounds without buying another instrument (within the limitations of body and strings, of course). Different pickups also have different output voltages. High output models can make it easier to overdrive amplifiers to produce a dirty sound, while low output models produce a clean sound. The output voltage of most pickups varies between 100 mV and 1V RMS.

Unlike transducers that have moving parts (microphones, speakers, etc.), magnetic guitar pickups have no moving parts—the magnetic field lines change, but they have no mass. So, evaluating pickups is often easier than with other transducers. Although the frequency responses of nearly all available magnetic pickups are not linear (which creates the different sounds), they don't have quite as many adjacent peaks and notches in frequency response as something like a loudspeaker. In fact, the frequency response can be smooth and simple enough to be easily described with a mathematical formula.

THE PICKUP AS CIRCUIT

From an electrical standpoint, a magnetic guitar pickup is equivalent to the circuit in Fig. 4. The pickup acts like an AC voltage source with an inner impedance that is inductive. The external load consists of resistance (the volume potentiometer in the guitar, and any resistance to ground at the amplifier input) and capacitance (due to the capacitance between the hot lead and shield in the guitar cable). The cable capacitance is significant and must not be neglected. This arrangement of passive components forms a low-pass filter (specifically, a second-order low-pass filter). Thus, like any



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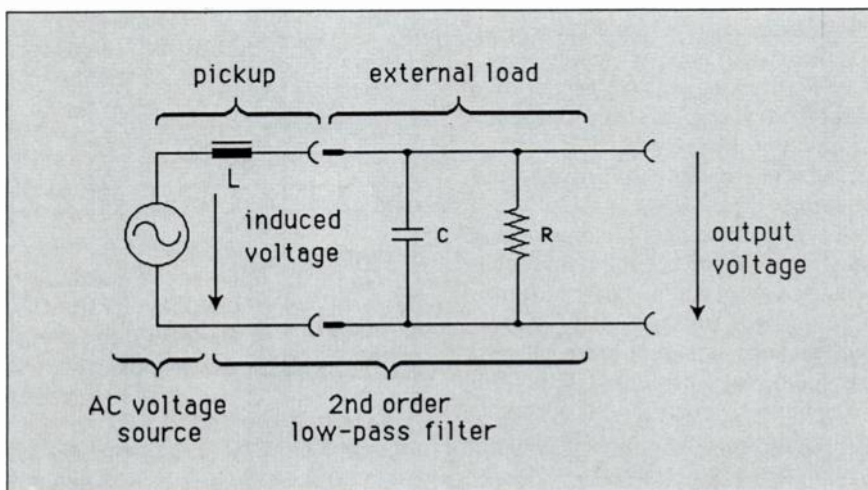


Fig. 4 Electrical equivalent circuit of a magnetic guitar pickup. Because of the inductive inner impedance and the capacitive load, this circuit forms a second order low-pass filter.

other similar filter, it has a cut-off frequency f_g ; this is where the response is down 3 dB. Above f_g , the response rolls off at a 12 dB per octave rate, and far below f_g the damping is zero. There is no low frequency rolloff; however, a little bit below f_g there is an electrical resonance between the inductance of the pickup coil and the capacitance of the guitar cable. This frequency, called f_o , exhibits an amplitude peak. The passive low-pass filter works as a voltage amplifier here (but doesn't amplify power because the output impedance becomes correspondingly high, as with a transformer). Fig. 5 shows the typical contour of a pickup's frequency response. Although pickups with twin resonance peaks are available (such as those made by EMG), we will

concentrate on the more basic single-peak types.

If one knows the resonant frequency and height of the resonant peak, one knows 90 percent of a pickup's sound characteristics; these two parameters are the key to the "secret" of a pickup's sound (some other effects cannot be described with this model, but their influence is less important). The following mathematical formula describes the frequency response of a second-order low-pass filter:

$$\frac{V_{out}}{V_{in}} = \frac{1}{1 - (f/f_o)^2 + j(1/Q)(f/f_o)}$$

With a pickup, V_{out} is its output voltage, V_{in} the induced voltage correspond-

ing to the string vibration, f the frequency, f_o the resonant frequency, Q the height of the peak, and j equals the imaginary number the square root of -1. At the resonant frequency where $f = f_o$, the phase difference between V_{out} and V_{in} is 90 degrees.

What all this means is that overtones in the range around the resonant frequency are amplified, overtones above the resonant frequency are progressively reduced, and the fundamental vibration and the overtones far below the resonant frequency are reproduced without alteration.

HOW RESONANCE AFFECTS SOUND

The resonant frequency of most available pickups lies between 2,000 and 5,000 Hz. This is the range where the human ear has its highest sensitivity. A quick subjective correlation of frequency to sound is that at 2,000 Hz the sound is warm and mellow, at 3,000 Hz brilliant or present, at 4,000 Hz piercing, and at 5,000 Hz brittle and thin. The sound also

“The peak frequency and the height of the peak . . . are the key to the ‘secret’ of a pickup’s sound”

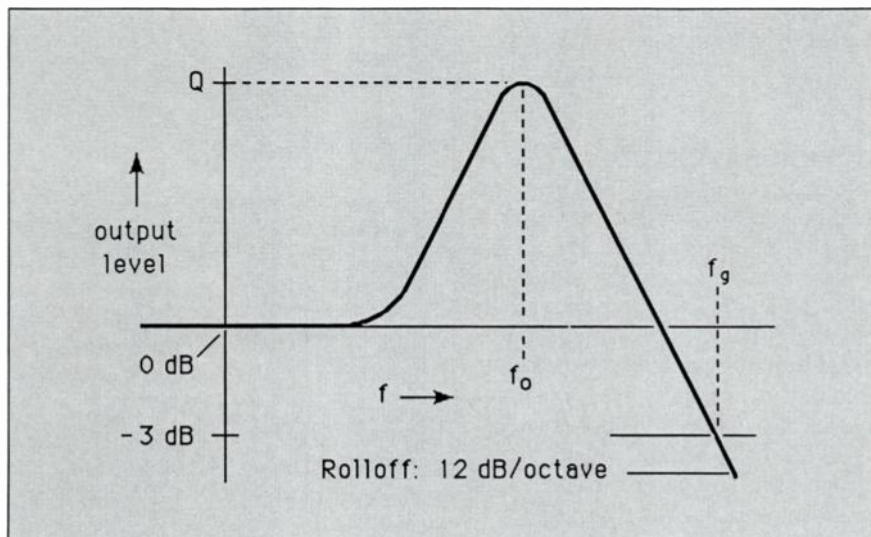


Fig. 5 Fundamental frequency response of a magnetic pickup. Position and height of the peak vary from type to type (logarithmic scale).

depends on the height of the peak, of course. A high peak produces a powerful, characteristic sound; a low peak produces a weaker sound, especially with solid body guitars that have no acoustic body resonances. The peak heights of most available pickups range between 0 ($Q = 1$) and 12 dB ($Q = 4$).

The resonant frequency can be calculated with the well-known formula:

$$f_o = \frac{1}{2\pi\sqrt{L \times C}}$$

L is the inductance of the pickup's coil (in most available pickups, between 1 and 10 Henries); C is the sum of the winding capacitance of the coil (about 80-200 pF) and the cable capacitance (about 500-1,000 pF). Since different gui-

tar cables have different amounts of capacitance, this formula shows that using different guitar cables with an unbuffered pickup will change the resonant frequency, hence, the overall sound.

ALTERING PICKUP SOUND

Basically, there are three different ways to change a guitar's sound as it relates to pickups:

1. *Install new pickups.* This method is most common, but also the most expensive.

2. *Change the configuration of the built-in pickups.* This is possible with nearly all humbucking pickups. Normally, both coils are switched in series. Switching them in parallel cuts the inductance to a quarter of the initial value, so the resonant frequency (all other factors being equal) will be twice as high. Using only one of the coils halves the inductance, so the resonant frequency will increase by the factor of the square root of 2 (approximately 1.4). In both cases, the sound will have more treble than before. Many humbucking pickups have four output wires—two for each coil—so different coil combinations can be tried without having to open the pickup. Some single coil pickups have a coil tap to provide a similar flexibility.

3. *Change the external load.* This method is inexpensive but can be very effective. With only a little expense for electronic components, the sound can be shaped within wide limits. Standard tone controls lower the resonant frequency by connecting a capacitor in parallel with the pickup (usually through a variable resistor to give some control over how much the capacitor affects the pickup). Therefore, one way to change the sound is to replace the standard tone control potentiometer with a rotary switch that connects different capacitors across the pickup (a recommended range is 470 pF to 20 nF). A four- or five-position rotary switch will give you much more sound variation than a standard tone control. Also, adding an internal buffer amplifier can isolate the pickup from some of the loading effects of cable capacitance, thus giving a brighter sound with more level.

Table 1 correlates some well-known pickups and their average electrical characteristics. However, note that pickups are not always precision devices, and that old pickups in particular (e.g. Fender and Gibson pickups of the '50s) vary so much that

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almost each one sounds different from the next. Thus, the values of the resonant frequency in the table are rounded to the nearest 100 Hz. Also note that peaks become very large below 1,000 Hz.

The height of the resonance peak depends on the external load resistance (volume pot, tone pot and amplifier input resistance). Lowering this load (e.g. by switching resistors in parallel to the pickup) lowers the height. For raising the height of the peak, the load resistance must be increased. In many cases this is only possible by installing a FET or other high-impedance preamp in the guitar.

MEASURING FREQUENCY RESPONSE

To precisely measure a pickup's frequency response, it would be necessary to measure the vibration of the string and compare it with the output voltage at every frequency. Practically, this is very difficult to do. An alternative to moving the string is to subject the pickup to an outside magnetic field. This induces a voltage by changing the magnetic flux through the coils. Remember the pickup is equivalent to a low-pass filter, so we must induce a voltage whose amplitude is inversely proportional to the frequency.

Fig. 6 shows one experimental arrangement. A sine wave voltage feeds an integrator circuit (which consists of an op amp, two resistors, and a capacitor) to

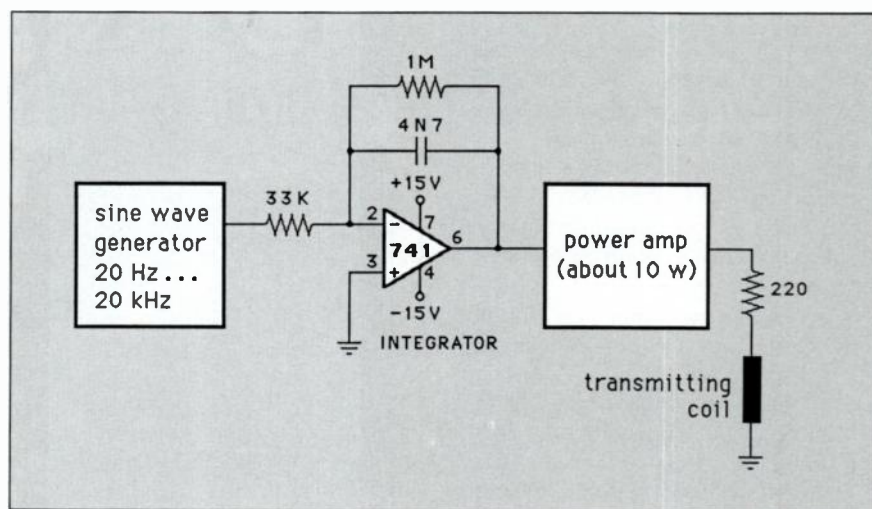


Fig. 6 Experimental arrangement for measuring the frequency response.

produce an output voltage that is inversely proportional to frequency. This signal then goes into a power amplifier (about 10 Watts) and then to a transmitting coil that actually couples the signal into the pickup. A current-limiting resistor, which must be much greater than the impedance of the coil at the highest measuring frequency to avoid throwing off the measurements, is placed in series with the transmitting coil. This coil consists of a pickup bobbin wound with about 50 turns of enameled copper wire (approximately 0.5 mm, or 0.002 inches, in diameter). It is mounted above the pickup so

that it radiates its magnetic field into the pickup coil(s) as fully as possible. With single coil pickups, the axes must be in line with each other; with humbucking pickups, the axis of the transmitting coil must be perpendicular to the axes of the pickup's coil, as shown in Fig. 7.

To plot the response, vary the sine wave frequency from about 100 Hz to 10 kHz and measure the pickup's output voltage with a multimeter or oscilloscope. The absolute value is not important; what matters is the position of the resonance peak and its height above the overall amplitude at lower frequencies. The effect of different

	Pickup type	Inductance (H)	Winding Capacitance (pF)	Resonant frequency for various parallel capacitors							
				470 pF	680 pF	1 nF	1.5 nF	2.2 nF	3.3 nF	4.7 nF	6.8 nF
Electric Guitar	Fender Stratocaster	2.2	110	4.4	3.8	3.2	2.7	2.2	1.8	1.5	1.3
	Fender Humbucker	5.0	80	3.0	2.6	2.2	1.8	1.5	1.2	1.0	0.9
	Gibson P90	6.6	95	2.6	2.2	1.9	1.5	1.3	1.1	0.9	0.7
	Gibson Humbucker	3.8	130	3.3	2.9	2.4	2.0	1.7	1.4	1.2	1.0
	Di Marzio (series)	6.4	80	2.7	2.3	1.9	1.6	1.3	1.1	0.9	0.7
	Dual Sound (parallel)	1.6	200	4.9	4.2	3.6	3.1	2.6	2.1	1.8	1.5
	Bill Lawrence (series)	11.2	160	1.9	1.6	1.4	1.2	1.0	0.8	0.7	0.6
	L500 Lead (parallel)	2.8	320	3.4	3.0	2.6	2.2	1.9	1.6	1.3	1.1
Electric Bass	Rickenbacker	1.9	85	4.9	4.2	3.5	2.9	2.4	2.0	1.7	1.4
	Fender Jazz Bass	3.6	150	3.4	2.9	2.5	2.1	1.7	1.4	1.2	1.0
	Fender Precision Bass	6.0	16	2.9	2.5	2.1	1.7	1.4	1.1	0.9	0.8
	Gibson EB 0/1/2/3	65	160	0.8	0.7	0.6	0.5	0.4	0.3	0.3	0.2

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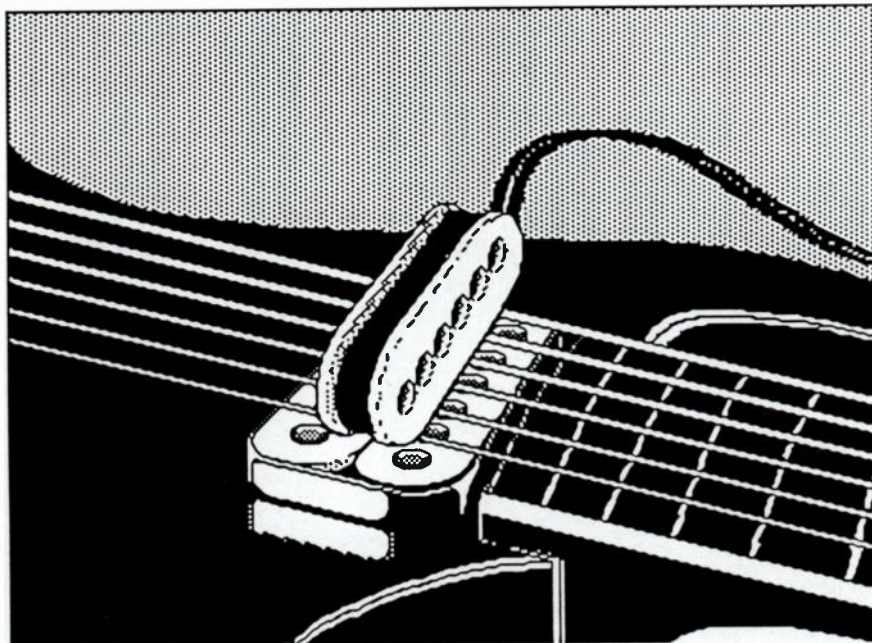


Fig. 7 With a transmitting coil an alternating magnetic field is induced in the pickup. The picture shows the best arrangement for a humbucking pickup.

load capacitors (cables) and resistors is easy to examine with this setup. One of the main advantages of this measuring method is that no modifications on the guitar are necessary, and the pickups need

not be removed from the guitar.

The measured result is really precise only with single coil pickups. Humbucking pickups have certain notches at high frequencies because the vibrations of the

strings are picked up at two points simultaneously. High overtones where the peak of the waveform occurs over one pole and the trough (valley) of the wave occurs over the other can produce cancellations. These notches are at different frequencies for each string and cannot be described with a single curve. Furthermore, this measuring method does not take into consideration the nonlinear distortion of a pickup. This also has an influence on the sound. Nevertheless, testing a pickup in this manner gives useful information on a pickup's characteristics. With this knowledge, you can find which type of sounds appeal to you the most, and possibly bend and shape the frequency response with external capacitors and resistors to "tune" pickups to your liking (and for the best match to the body and strings).

Pickups are interesting not just from a musical standpoint, but from an electrical one as well. Hopefully this article has taken some of the mystery out of guitar pickups, and will encourage you to perhaps do some experimentation of your own. **CA**

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—from page 59, SCHAEFFER & HENRY

Schaeffer may get his wish with the abundance of digital samplers on the market, taking sounds from the acoustic world with their harmonically richer structures, and manipulating them into new shapes. Yet, when queried about it, neither Schaeffer nor Henry seemed very interested in the new technology. But embracement of new technology isn't really the point. Technique ultimately is not music. Henry's methods may be archaic by contemporary standards, but the resulting music is powerfully evocative by any standards. Popular artist Bill Nelson records his personal music this way, claiming it has an intrinsic and emotional value not unlike woodcarving. He's joined in this opinion by Brian Eno and Holger Czukay.

Pierre Schaeffer and Pierre Henry made a contribution that has helped shape music for the last 38 years, be it the early tape music works of Otto Luening and Vladimir Ussachevsky at Columbia, and Stockhausen in Germany, the Beatles in their *Sgt. Pepper* days, or producers Arthur Baker and Martin Rushent today. They owe their genesis to the sounds of a world rearranged by Pierre Schaeffer and Pierre Henry. **CA**



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All I'm doing is tapping the signal going from the amp to the speaker (or to the dummy load if the speaker isn't used), and sending that signal through a voltage

divider into a power amp. This way I can set my Fender amp however I want, and have my guitar as loud as I want onstage. This circuit also works well for sending a signal to the main PA instead of miking the amp. The only caution is to make *absolutely sure* that the units being interfaced have no AC leakage. Use a Voltmeter or similar tester to check for any potential difference between the units *before* the ground connections are completed.

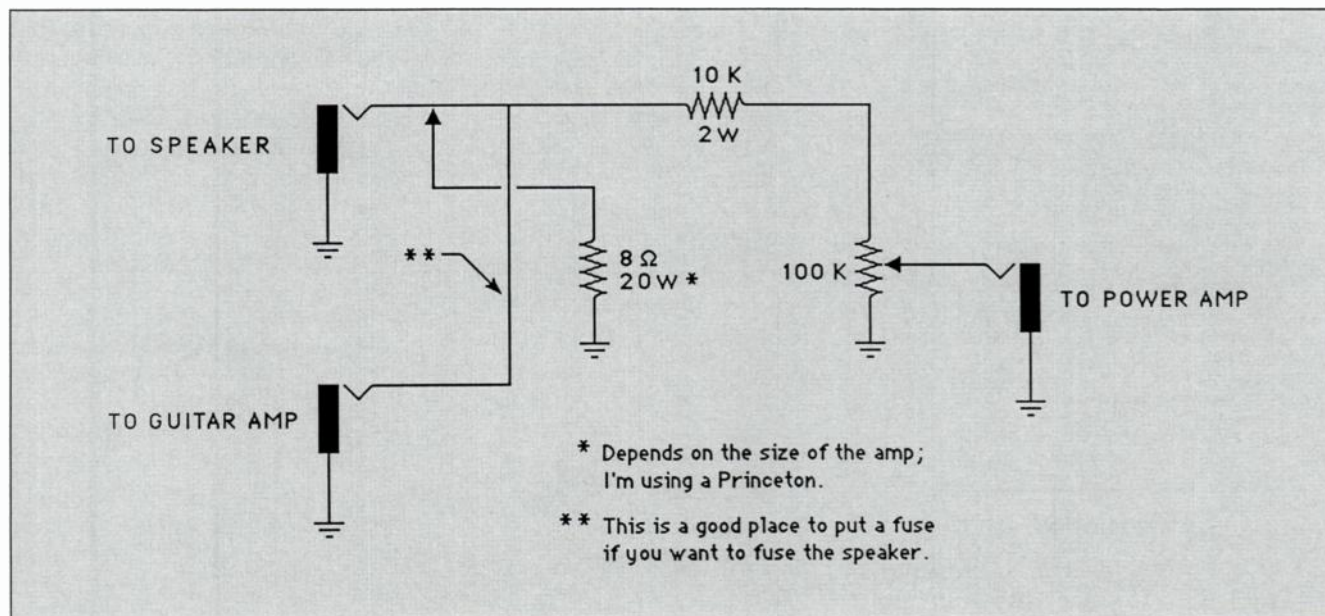
MIDI Tip

BY LES PENNER

I recently purchased my first synthesizer, a Roland Alpha Juno-2. At this time, it is the only MIDI instrument that I have. Of course, I spent hours playing

with the settings trying to learn as much as I could about its features but I soon realized that I was unable to test out a major portion of its electronics—the MIDI interface. I was concerned that the 90 day parts and labor warranty could lapse before I ever had a chance to try the MIDI interface. There was nothing my instrument could talk to. Or, so I thought.

While playing around with the MIDI settings, I set MIDI Local Control to Off. That much worked; the keyboard no longer operated its own sound generation circuits. Then I realized that I now had two independent modules: a keyboard that could send out MIDI data and a synthesizer that could receive it. I connected a MIDI cable between the MIDI Out and MIDI In jacks and the system came alive even in the MIDI Local Off mode. It was easy to check out other MIDI features such as Pitch Bend on/off,



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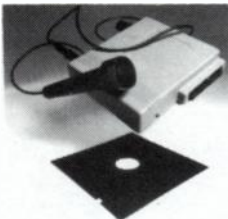


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Hold on/off, Program Change, and so on while watching the instrument behave accordingly. By pulling out the MIDI cable while holding down a key, I was able to cause a note to "stick" since the synthesizer couldn't receive the "key released" command.

This idea should work with most synthesizers that have Local Control on/off capabilities, and I thought other newcomers who have only one instrument might be interested in this method of checking out their MIDI interface electronics.

The El Cheapo Continuity Tester

BY MATT McCULLAR

At work, we have about 500 projectors, a dozen staff members, and one multimeter. Most of the time, the only reason we need the meter is to see if a wire is broken or if a light bulb is shot. At home, I need it to see if the cat has somehow broken a patch cord.

A good multimeter can do many things, but if all you need to do is check whether a wire is good (continuity), a meter is a waste of money. That's why I built the El Cheapo Continuity Tester.

The Tester is very simple: it has two test leads, an LED, a 9-volt battery, a 350 Ohm resistor, and a momentary push-button switch. My prototype fitted nicely inside a boullion-cube jar.

When you connect a conductor between the test leads, nothing happens until you press the button. Then an electrical circuit is completed and the LED lights. The button keeps the battery from going dead if the leads somehow short themselves together when you're not look-

ing, and the battery should last for months. The resistor keeps too much current from zapping the LED. As for packaging, be creative. The only large component is the battery, so you can cram the whole thing almost anywhere: a transistor radio casing, a vitamin pill bottle, or a photo cube. If your friends can see through it, they will ask what it is... and you can then use your imagination for a reply.

I have used the tester to test fuses, light bulbs, extension cords, joysticks, and even LEDs by checking their polarity. No doubt you can think of some neat uses for it also.

PARTS LIST

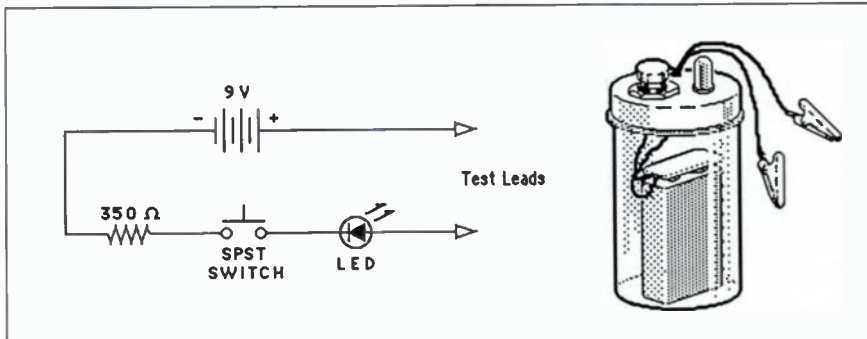
- 1 - 9 v battery
- 1 - Battery Clip
- 2 - Test Leads
- 1 - 350 ohm Resistor (see text)
- 1 - Single-pole, single-throw pushbutton switch
- 1 - LED (Red, yellow, green; it's up to you)

Headphone Monitor

BY MIKE BUTTERFIELD

Here's a simple headphone monitor in-line device for PA systems. After some disappointing experiments using monitor speakers, I adapted a stereo junction box for headphones and speakers to be used with the PA. The results? No more feedback from the monitor, and the columns can be placed in a more audience-oriented position.

For the monitor headphones, I used a pair with built-in volume controls and removed the cushion and speaker (driver) from one side of the pair. Thus, one



El Cheapo continuity tester

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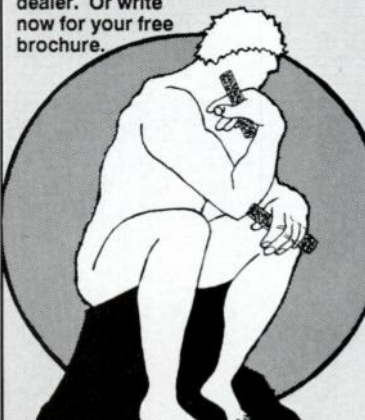
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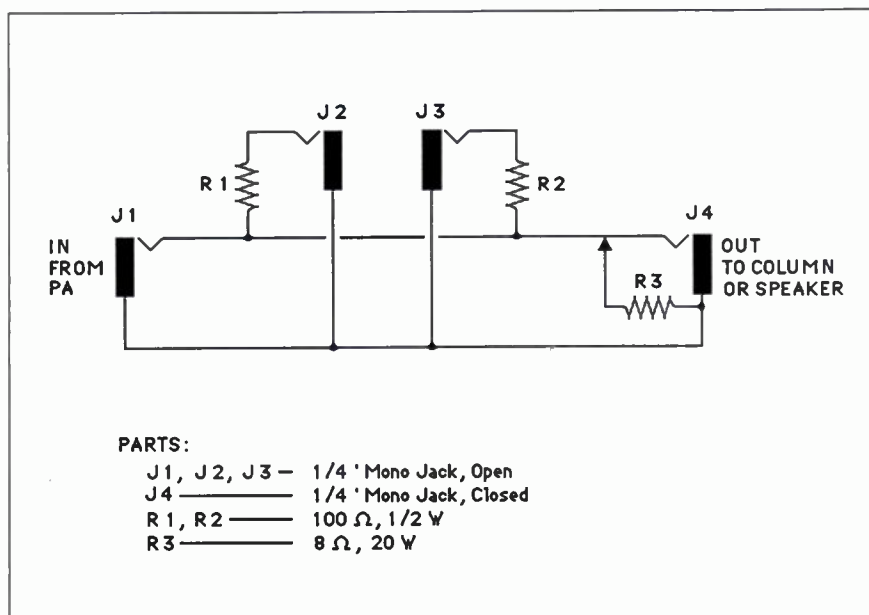


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Headphone monitor circuit for PA systems

ear hears the monitor signal, and the other the live sound. Having volume controls allows for lower volume on those extra loud numbers. In practice, this system has worked out fine. The impedance match is pretty close on up to three or four headphones.

Patch the PA output to the input of the box, and plug the speaker column directly into the output of the box. When the speaker column is not connected, R3 becomes the 8 Ohm load. Because R1, R2, and R3 are in parallel, the impedance match stays around 7 or 8 Ohms at all times.

Building the Mono Monitor

BY MIKE SOKOL

As most of us involved in any kind of on-air production know, your mix changes a lot when it's squeezed down to a single 4-inch speaker up under the dashboard. In reality though, this is where the meat and potatoes of advertising lies.

The best solution is to monitor your mix on a variety of speakers, thus simulating the final listening situation. You've probably got a good set of full range studio monitors, and these are very good

for determining the ultimate qualities of the mix, but they will let you down most of the time when you need a mix for a mono car radio. What you need is a cheap way to monitor with both your big speakers and a cheap, sleazy little car speaker hanging in your rack.

Here's an easy way to do it that will cost about \$5 to build (excluding the speaker). Referring to Fig. 1, you can sum the signal with a pair of 10 Ohm, 10 Watt resistors. Now I realize that this is a very inefficient way to derive a mono signal in terms of lost amplifier power, but in this application it works very well. That's because we don't want several hundred Watts of amplifier power for that little speaker. You won't have true volume perspective at that power level, and the first thing that you do wrong will result in a totally fried speaker. The 10 Ohm resistors reduce the power to about 20 percent of what the amplifier was putting out.

You can build the circuit on any convenient panel in your rack or put it in a little metal project box if you desire. Fig. 2 shows the circuit pictorially. Just remember to use a ventilated box because there is a certain amount of heat generated by this circuit. All of the parts are available at your local Radio Shack store or electronic shop. Use 14 or 16 gauge wire for hookups, so as to not compromise the signal to your main monitors. You can use the old speaker

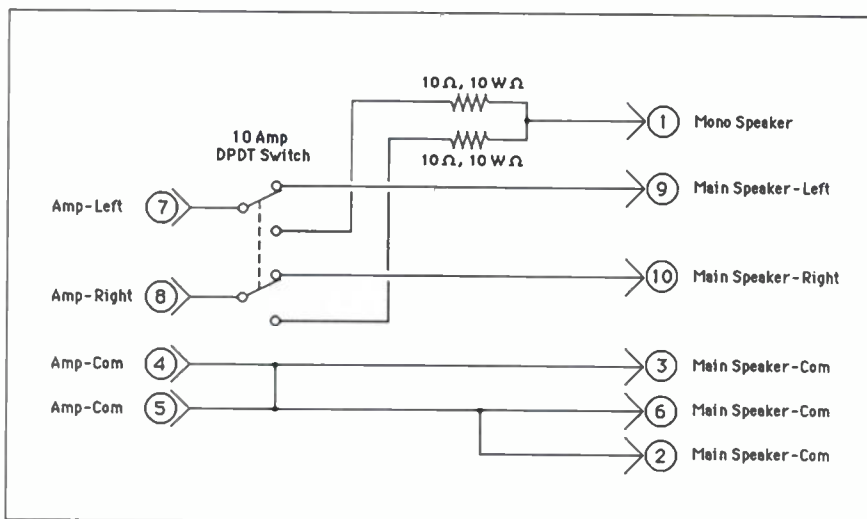


Fig. 1 Mono monitor schematic

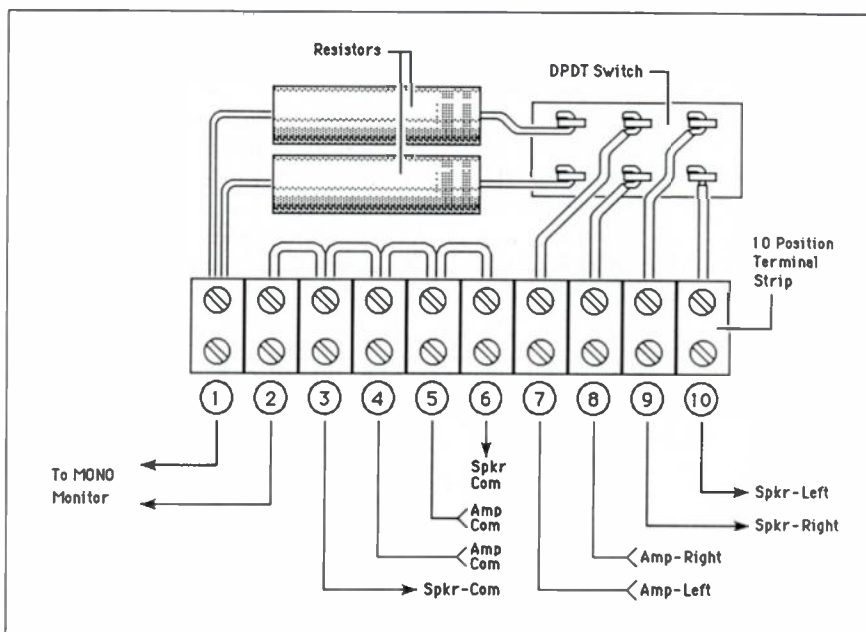


Fig. 2 Mono monitor wiring diagram

from your sister's Toyota that was left over from the tape installation. Also make sure that your monitor amplifier has common speaker ground returns between each channel (I've never seen a modern amplifier that didn't, but check first as this circuit *should not be used* unless the amp has common speaker grounds.)

To use mono monitoring most effectively, listen to each instrument individually in both your main speakers and your mono monitor as you set any equalization or effects. During the final mix, listen to your mono monitor to make

sure there are no phase reversals or effect cancellations that will ruin your mix. A truly great mix will sound good on almost any speaker and excellent on a full range system. A parts list is included, but you may be able to build this from your junk box.

PARTS LIST

Resistors (10 Watts)

R1 10 Ohms

R2 10 Ohms

Miscellaneous

Terminal strip

DPDT Switch

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You've got quite an investment in your gear...now take the time and effort to make it more secure.

Keeping Honest People Honest

BY JAMES CHANDLER

It's the same old story: You arrive for your gig at the Pink Flamingo Lounge in the fabulous Downtown Family Inn Hotel. You reach for the drum machine to kick off the first song, but...no drum machine! After making the ritual police report and fumbling through four sets without a drummer, the hotel manager informs you that the hotel can't accept responsibility for the thousands of dollars worth of stuff you leave in the lounge every night. Your lawyer says you could sue and collect, but the club would probably fire you in retribution and gigs don't grow on trees (sigh). Time to analyze the situation. The recently departed drum machine was a year old...let's see, new price of \$600, depreciated to \$200 via double declining balance, minus the \$100 deductible on the insurance. Hmm, lately the insurance company has been canceling musicians with claims—maybe it would be better to buy a new drum machine out of pocket, and save the insurance for a bigger claim.

The common connections available on music accessories include audio and MIDI jacks. Another connector should be standard on electronic gear, but surprisingly isn't: the anti-theft connector. Any item of audio or computer gear should have a built-in hasp so it can be tied down. Perhaps this is something the MIDI associations should adopt as part of the interface standard! Small MIDI accesso-

James Chandler Jr., though educated in psychology, has been a professional musician for 15 years, doing gigs ranging from honky-tonk solo piano to funk-rock bands and electronic lounge duos. Other activities include electronic repair and design, computer programming, writing, and piano tuning.

ries are close to the per-ounce value of precious metals and quite easy to steal.

Clubs, hotel lounges, auditoriums and the like are common repositories for high-tech music equipment. Many of the employees of such establishments are young, minimum wage workers who are there only until their garage band gets a steady gig. Your equipment can be a powerful temptation to those who need music gear and are temporarily a little short on funds. There are even certain unscrupulous fans and music lovers who might see an opportunity to steal some small item from the stage during a crowded happy hour

or in the confusion after a show.

It is not a good idea to subject these people to a daily temptation. It could get some kid in trouble, create bad feelings between you and your employer, and even cause your insurance to be canceled. Crime authorities claim that if you make property inconvenient or risky to steal, a thief will usually pass it by for easier pickings—so I decided to make my equipment a little harder to steal.

Considering the large market for locks, burglar alarms, and other security equipment, I was surprised to find no commercial products ideally suited to

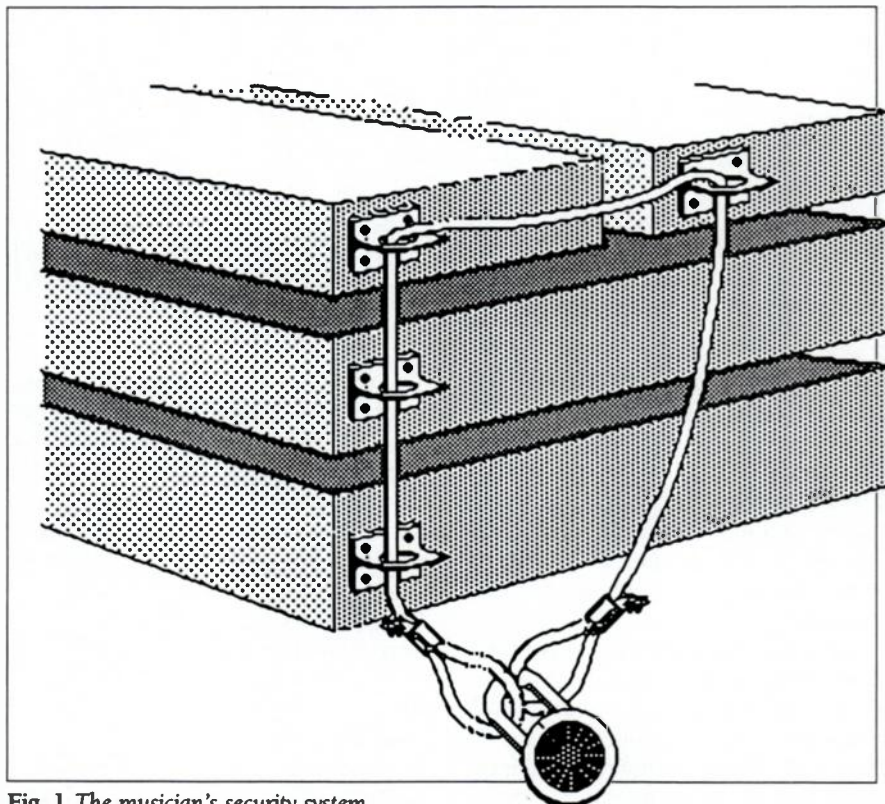


Fig. 1 The musician's security system

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The 32 kHz sampling rate insures a wide frequency bandwidth, which makes it perfect for any musical application, even making compact discs.

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Inside the R-100 are twenty-four individual sound recordings, including three different snare and bass sounds, separate high, mid, and low toms, as well as six cymbals. There are open and closed hi-hat sounds and a footswitch to change between them. A full complement of percussion sounds are also included, such as conga, timbale, tambourine, shaker, agogo, clave, and handclaps.

Besides velocity, each note is programmed with its own pitch and stereo pan setting. This enables you to create a monster drum set using the three toms tuned

to 20 different pitches that pan across from left to right, for example.

Professional Features

The R-100 also has features that professional musicians require, such as eight individual outputs, synchronization to MIDI, tape, and a variety of clock sources, as well as a full MIDI implementation including Song Pointer (a must for film scoring).

The R-100 has memory for 100 Patterns and 100 Songs. If you play live, you'll appreciate the Chain mode, which lets you group songs together. You can even overdub drums within a song. And it's easy to save and load your data on memory cartridges, tape, or via MIDI.

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“Not finding any keyboard locks marketed by synthesizer manufacturers or other obvious potential vendors, I installed a ‘musician’s security system’ made from hardware store parts”

protecting the contents of a keyboard rack. Computer security devices (which have an adhesive panel connected to locking steel cable, so equipment can be chained to a desk) are about \$30 each and lock only one item; it could easily cost hundreds of dollars to outfit an entire keyboard setup with such kits, and you would have to keep an entire inventory of keys in your pocket.

Not finding any keyboard locks marketed by synthesizer manufacturers or other obvious potential vendors, I installed a “musician’s security system” made from hardware store parts. The basic idea is to put steel hasps (described more fully later) on all your equipment. Then wire the units together with steel cable and a combination lock, like chaining a motorcycle to a telephone pole (Fig. 1). Short of using bolt cutters or spending quite a bit of time practicing hacksaw technique, a potential thief must lift everything on the rack at the same time, which is nearly impossible. Since a thief serious enough to bring in bolt cutters will probably make off with the whole setup, the only time I should have to worry about making an insurance claim is for a total loss.

ASSEMBLING THE MUSICIAN’S SECURITY SYSTEM

Purchase a 15- or 20-foot length of plastic-coated (so it doesn’t scratch your equipment) steel aircraft cable from a hardware store. I found 16-inch cable with a 100-pound work load (400-pound breaking load). The next bigger available size was 3/16th-inch cable (3/32nd-inch when stripped of plastic), with a 200-pound working load and 800-pound breaking load. Using piano wire cutters, I was able to cut the 16th-inch cable in about two minutes. On the thicker cable, I chewed on the cable for about five minutes with-

out making much progress, and finally gave up.

To be secured with a padlock, each end of your cable must end in a loop. If you select cable much bigger than the 3/16th-inch size, you will have trouble finding hasps with a hole large enough to pass the looped cable end. Actually the part of a hasp you will be using is called a staple (Fig. 2), but your hardware salesperson probably will not know that term

so we’ll just use the term hasp too. I was able to find hasps with a 3/4-inch inside diameter for about \$3 apiece, and my cable cost about 20 cents a foot.

Seek a balance of strength between your cable, hasps and padlock. For instance, half-inch cable would require a 2-inch inside diameter hasp, which would look rather inappropriate on anything smaller than a warehouse door. Big bolt cutters cut large cable just as easily as small cable.

Referring to Fig. 3, cut the plastic a few inches away from the cable ends so the end loops can be the smallest possible diameter. Then hammer each end loop in place with a ferrule (ferrules are metal tubular connectors for fastening cable). If you hammer the ferrule too flat, it may not go through your hasps. Electrical supply companies usually have crimping guns, so for a more attractively crimped ferrule you could take your cable to a supply house. A perfectionist would put

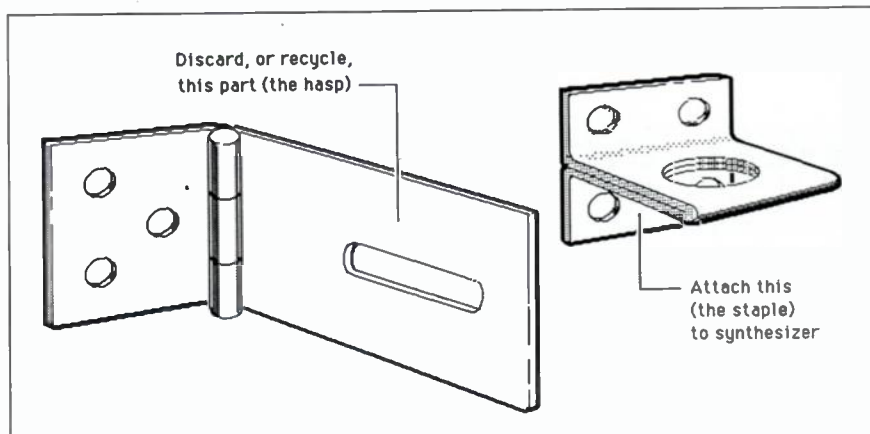


Fig. 2 Typical door hasp and staple

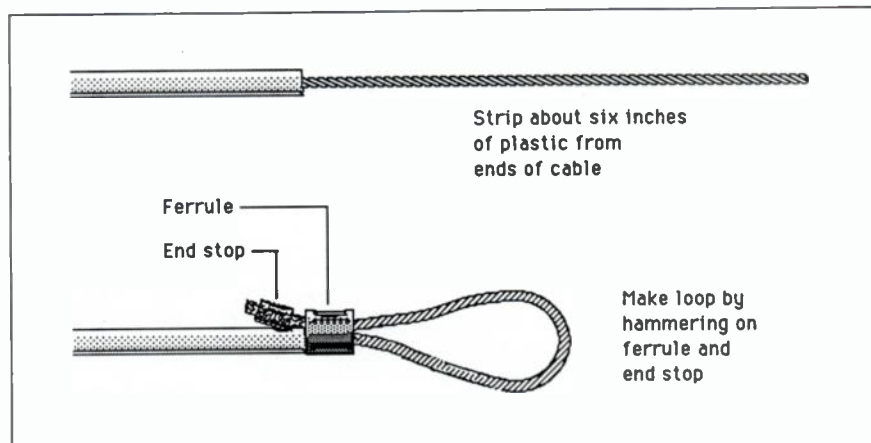


Fig. 3 Looping the cable

heat-shrink tubing over the ferrules to cover rough metal edges.

For small items of equipment, particularly those with plastic cases, you can effectively attach hasps with epoxy glue. Quick-setting epoxy tends to be brittle and therefore not tough enough for this application. The most impressive adhesive I have seen is PC-7 epoxy paste, made by Protective Coating Company of Allentown, PA. This is an official-looking dark gray goo, probably made from nuclear waste by-products (just kidding). Your local hardware store may carry PC-7 or an equivalent epoxy (with a long setting time). Make sure to test the glue you purchase. I used a dead Radio Shack Color Computer and had to destroy the case to remove the hasp. I haven't repeated this test on any other equipment, but all my glued-on hasps seem firmly attached.

On larger pieces of equipment, especially power amps or synthesizers with

rivets or screws could damage the instrument's electronics; of course, neither the author nor magazine can accept responsibility for failures or losses you experience. Most equipment insurance does not cover instrument fatalities during repair or maintenance, so use caution when drilling on a chassis, and use a sharp drill bit. Vibration from drilling could damage circuit boards, especially on units with thick steel chassis. Although it is common procedure to start holes with a center punch, you may want to drill without center punching, to avoid the additional vibration caused by hammering on the case. Beware of loose metal chips left in the chassis—a microscopic metal sliver on a circuit board can cause strange intermittent failures and almost-impossible troubleshooting problems. Use additional caution, and expert advice, if riveting a hasp to a computer monitor. Monitors harbor high voltage, and hasp rivets may provide an inadvertent discharge path.

The purpose of strapping everything down with steel cable is to keep honest people honest. A dedicated thief will be off with your gear anyway, but anyone who has dealt with insurance companies knows that putting in a claim is frequently tantamount to a request for cancellation.

SPEAKING OF INSURANCE...

The most economical equipment insurance I have found is the group policy available through the Musician's Union. This policy's premium is about 30 percent of a comparable policy through Lloyds of London. If you are not a union member, the money you save on equipment insurance may in itself justify membership dues. You should keep detailed pictures or videos of all your equipment, a recent dealer appraisal, and a complete list of equipment serial numbers. If you open any of your equipment, or have it opened by a technician, always leave some sort of identifying tag inside. It is highly unlikely that you will ever recover stolen equipment, but you need a positive identification method on the off chance that your gear is ever found.

Perhaps some day the standard anti-theft connector will be available on all equipment. Until then, at the minimal cost of a day's work and a few dollars of hardware, you can install a homemade security system and add a little peace of mind to the pleasure of owning all that nifty MIDI gear.

CM

“A perfectionist would put heat-shrink tubing over the ferrules to cover rough metal edges”

metal chassis, a thief could possibly hammer off a glued-on hasp without excessively defacing the instrument. If you don't trust glue on large items, you must disassemble each piece of equipment (thus voiding the warranty in the process). If you are unwilling to risk attaching hasps, you may be able to get a service technician to install them for you. Pop rivets make a firm attachment, but headless bolts with locknuts will also suffice. With pop rivets, use rivet washers on both sides of the chassis. Plastic is likely to crack when riveted, yet I have successfully riveted hasps to plastic chassis by using additional half-inch washers on the inside of the chassis. These spread the pressure over a large surface to protect the plastic from cracking.

Be aware that you run a small but finite risk that the process of installing a hasp with

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If you like the Mac but are frustrated by its sometimes s-l-o-w disk operation, try breaking the speed limit with a dash of DASCH.

DASCH

BY CRAIG O'DONNELL

Tired of grinding drives? I was. Grrrrrr—that's my teeth, not a drive! With fat MIDI programs or complex applications, your Mac is going to need more storage (an 800K external drive at the minimum). Speed is a problem too; I've lost files on occasion because the floppy takes so long to save I didn't bother with backups.

Luckily, 99 percent of the speed problem is simply slow drives, and we can ameliorate it. Apple's \$299 upgrade 800K internal drive is speedier than the 400K original; you get the troublesome new 128K ROMs in the bargain, though, so you've got to use a Mac+ 3.2 System/5.3 Finder and toss out a lot of Desk Accessories (DA for short)...but that's another blues tune. What if you're happy with the System you've got?

DASCH-ING TO THE RESCUE

Okay, you can choose an external disk drive, internal RAM upgrade, or a hard disk drive. Floppy drives, which sell from about \$200 to \$350, are handy but slow and noisy. RAM upgrades can be costly. Hard disk drives are fast but bulky, noisy, a little unreliable and certainly fragile—by and large they do not travel well, defeating Mac's luggability quotient. The cheapest serial port hard drive checks in at \$500 (discounted) anyway, with the faster SCSI drives around \$800 to \$1,000.

But now there's another option. Western Automation's DASCH (is silent, fast like a hard drive, compact like a floppy drive, and totally electronic). It's not a

Craig O'Donnell has written about musical electronics and computers for a variety of publications, and serves as technical editor for Option magazine. A multi-instrumentalist and member of the group Scientific Americans, he loves surf music, cheap drum machines, and analog synthesizers.

Product Summary

Product: DASCH (Disk Acceleration/Storage Control Hardware)

Type: Memory expansion for the Mac
Price: 500K, \$395; 1 Meg, \$450; 2 Meg, \$545

Connection: Mac Printer or modem port

Manufacturer: Western Automation,
1700 N. 55th Street, Boulder CO 80301
Tel. 303/449-6400

substitute for a hard drive if you need one, but it's at the top of my list as a must-have peripheral after a Mac, printer, and (maybe) modem. It certainly subs for the 800K floppy drives sold to Mac owners. DASCH offers:

- ✓ More memory—one or two Megs
- ✓ Up to +700 percent faster speed
- ✓ Cost-effectiveness
- ✓ Programmable printer buffer
- ✓ Auto boot, copy and backup
- ✓ Compatibility—works with every Mac and third party upgrade, 128 to Plus, and virtually all software
- ✓ Flexibility—connects to modem or printer port; DASCHs stack for multi-megs and will run with external floppy/hard drives
- ✓ Crash resistant RAM (has its own power independent of the Mac)
- ✓ And perhaps most important, it's bulletproof, small, and solid state.

WHAT IS IT?

A DASCH has 500K, 1M or 2M of dynamic RAM packed inside. List prices are



Craig O'Donnell's DASCH in action.

PHOTO: POLIC LOFSTROM

THE EMULETTER

Issue Number 6

"One for the Whales. Five for the ugly suit."

December 1986

EMULATOR II™ LOOPING TECHNIQUES

JANIS CHAFFIN

E-mu Sound Technician

As a Sound Technician at E-mu, I spend most of my time staring into the amber screen of a powerful Unix-based couter, manipulating individual samples which are digitally stored on Beta tape and custom interfaced with signal processing software developed by Design Engineer Dana Masle. After each sound has been isolated in the computer, and most of the processing is completed, I devote the majority of my concentration to discovering optimal loops.

Not every sound needs to be looped, and certainly not every sound requires the same type of loop; occasionally, some work best with backwards/forwards loops, and some even require what we call cross-fade looping (we use Sound Designer™ from Digidesign). But a surprising majority of solo instruments can be looped successfully with the forwards algorithm on the Emulator II.

I've had excellent results using simple forwards-loops on many sounds, including solo strings, horns, electric basses and guitars, and simple synth patches; sounds without complex waveshapes, containing very few harmonics, and possessing a fairly steady sustain portion usually work best. (Section sounds and those with a great deal of amplitude or frequency modulation generally require more drastic measures.) In fact, most solo horns and acoustic strings can be looped in a single phase. Yes! You can actually reduce the length of a loop down to a single cycle of the waveform and produce seamless connections, while saving tons of machine memory. That's right, no all-too-familiar pops, clicks, or thumps! Of course, you're going to lose some of the sound's characteristic timbre at the loop, resulting in a thinner, more static sustain. But if the loop is placed far enough away from the attack, the timbral difference will be minimal. In

addition, you can use the E-II's VCA and Filter envelopes to reduce the amplitude before the loop begins. Actually, in a musical context, the timbre change should be completely unnoticeable.

How do you know the exact length of a single period? Well, you could first determine the frequency of the sample in Hertz, divide into 1, and do some other math, or you could save some time and use the Emulator's Auto-Loop function. Suppose you have a fairly low frequency solo clarinet voice at least 20,000 samples long. (Preferably recorded without vibrato, as it loops better in a single period, and vibrato can be added later with LFO.) For now, let's set a start loop point about 10,000 samples into the sound (well after the attack). Make the loop length about 250 samples and listen. You should hear a frequency shift up or down at the loop start, and then a really grungy buzz for the duration of the loop. Now press Auto Loop. Listen again. Chances are that the Emulator has selected the best loop points in that range, and the pitch change has either been eliminated or significantly reduced. Hopefully, the gruzz has also vanished. If the pitch is still shifted slightly at the loop start, move the loop start further from the attack, to say 15,000 samples, until the change in pitch is less noticeable, and press Auto Loop again. The loop length may have changed by a sample or two, as the exact length of a single period may vary throughout the duration of the sound, but the result should be a perfect loop. If however, you still notice a growl or buzzy sound in the loop, Auto Loop may have selected a loop twice or three times as long as a single phase. Sometimes this longer loop may be acceptable or even preferable, but if not, try manually selecting a loop half, or even a third the length of the one currently chosen, and again press Auto Loop.

If the loop were longer, say 10,000 samples, you'd hear a repetitive thump or click instead of a buzz, indicating that the loop points are not both in phase, that is, not occurring on the

same side of the zero axis—and not both moving in the same direction towards either the positive or negative curve. Usually, a higher-pitched, less severe click indicates a better phase match. By moving the loop start fader very gradually, the thump can be reduced to a mere tick, and occasionally even made to disappear.

Of course, the length of a waveform's cycle becomes smaller as the frequency increases, and this creates an interesting situation when trying to single-phase loop a high sound: the smallest loop length the E-II can arrive at manually is 64 samples. So what do you do when the cycle length is less than that?—you trick the Emulator. Using a high register clarinet voice, try moving the loop start closer to the attack than usual, say at about 2,000 samples. Manually create a loop of 64 samples, and press Auto Loop. The loop length should now be smaller than 64 samples. Since the loop start may be too close to the attack to sound good, try manually moving the loop start fader away from the attack, listening for least pitch shift. Avoid pressing Auto Loop again, as it may produce too long a loop, if moved from the attack very far. Generally, higher pitched sounds are harder to loop within a single period, and should be looped somewhat closer to the attack than lower frequency sounds.

Basically, by adhering to such general rules as looping far enough from the attack, but not too far into the decay of the sound (staying in the steady part of the sustain), moving loop start and length to reduce both the pitch change around the loop start, and the frequency of the loop gruzz, and finally, using Auto Loop to fine tune loop lengths, you should have a lot of luck using single phase loops with many solo sounds, and be amazed at the memory you save when you truncate after the loop! (Note: Be sure not to replicate or copy voices before looping, or any truncations made after the loop won't be permanent, and won't free up any sampling, preset or sequencer room.) Good Loop—er, Luck, that is!

For additional information about this newsletter, please call E-mu Systems, 408-438-1921.

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\$395, \$450, or \$545 respectively. I understand the \$395 model is discontinued (but still available), because it's more cost-effective to spend the additional money and get the extra memory. Don't buy 1 Meg with the idea that you can upgrade; the charge is more than what you would save. DASCH is not user-expandable, like some Mac internal memory upgrades.

The box is 7½ × 9 × 2 inches, in MacBeige plastic. Placed next to the Mac on the right, it brings your external floppy drive up to a reasonable height. You can put DASCH anywhere—even on its side, for a tiny 2 × 9 inch footprint—except atop the Mac, for cooling reasons. You could take some self-stick Velcro and attach it to the side of your Mac if you wanted to.

Strangely, DASCH fits under the Mac sideways but not frontways. Western Automation's DASCH wizard, Bob Cone, says "Well, we didn't think of that." No sweat. Buy a packet of half-inch stick-on furniture feet and move Mac's tootsies in a little. Voila! And the screen is up to a comfy height.

The front is kinda garish, a metallic faceplate with a single red status LED. As long as there's AC, the LED glows. Read/write operations make it blink rapidly. As DASCH does its optional "memory check on start" routine, it blinks slowly for about 20 seconds.

A cooling port with black mesh grille runs the length of each side. It's from the 50s, for sure; Raymond Loewy would be proud. On the rear you'll find a power

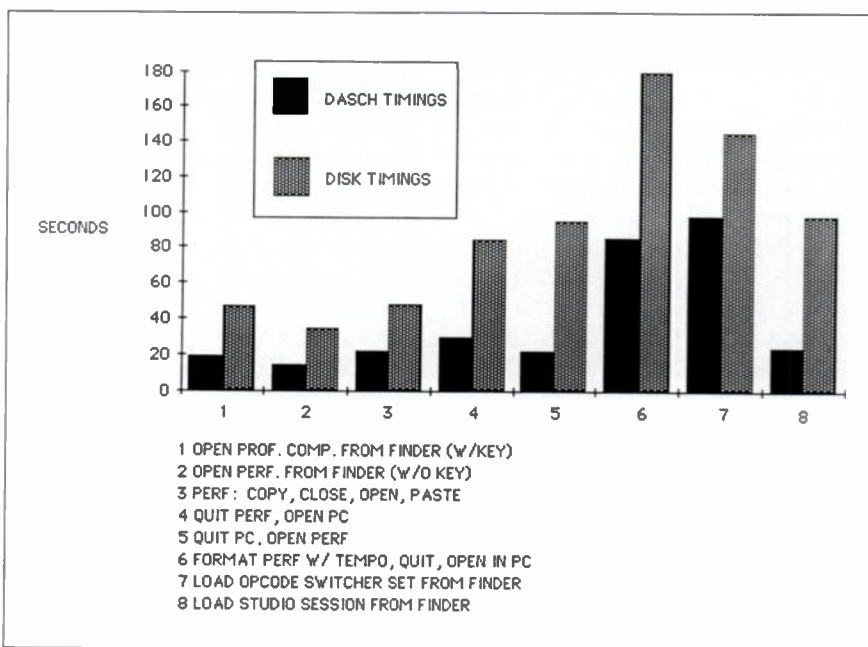
toggle switch, connector for the cord-mounted AC transformer, printer port/stacking jack, and attached input cable which goes to the Mac's printer or modem port.

DASCH thinks it's a 9,600 Baud serial hard drive, so it's quite fast and you can install pesky, protected applications on it using Copy II Mac's *Copy II Hard Disk* or proprietary HD installers like *Excel-to-HD*. Since we're dealing with a PROM-controlled smart drive, you don't need special drivers on disk or in the System file. Just pop in a DASCH-Start disk to boot, autoload (if necessary), and DASCH off. Apple's HD20 driver will reboot DASCH if you've shut off only the Mac or crashed the system.

That's it. Take it out of the box, connect it to the printer port, boot, and you're running in no more than five minutes. If you don't use a modem, and don't care about print buffering, throw DASCH on the modem port.

MAKING MAC MORE THAN A MUSIC COMPUTER

During disk calls Mac is asking the program or system disk "what next?" and then scarfing up data. You're captive to your floppy/hard drive's speed, or lack thereof. This seems especially true for music and desktop publishing software with their bulky files. You wait, wait, and wait some more as the disk grinds away. Coffee, tea, or milk? Beer? Whiskey? Vodka? Clear grain alcohol? Head cleaner? Zzzzzzz...



Comparison of time required for DASCH operations versus disk operations.

But now, you can store several programs in DASCH and have almost immediate access. It no longer takes forever to run, save, and print files. We can use simple, low-cost programs to take care of the tedious side of musicmaking—phone logs with autodial (!), expense records, address and phone listings, boilerplate promo and bio, letters, posters and flyers (using *ReadySetGo*, *PageMaker*, *ComicWorks*, or CE Software's shareware *Billboard*), and on and on, without having to constantly access the disk. Mac for more than MIDI is indeed the word.

RAMDISK TO THE RESCUE?

Why do we need DASCH if the most economical way to accelerate programs is with RAMdisk software? This software is free from a bulletin board; the RAM is already in your 512K Mac. And the speed improvement is truly astounding. Before DASCH, I constantly used the excellent public domain RAMStart with specially-sized RAMdisks on application-specific boot disks—MacWrite, MacDraw, MacPaint, Red Ryder, etc. Why bother to spend \$399 on a DASCH RAM drive?

Convenience is one good reason. I fuss and fidget to fit the Finder, the Imagerwriter Driver, a custom System with just the right fonts and Desk Accessories, and the application software all on a 250-350K RAMStart disk (on a 512K Mac). This customizing takes an immense amount of time-consuming trial-and-error. To make things worse, a 512K may not have enough room for both the RAMdisk (which decreases the amount of usable program RAM) and your big application. Professional Composer, Performer and PageMaker are just like that. On a 512K using PageMaker, the best you can do is stick in a tiny 64K RAMcache (I use Nevins Microsystems' excellent Turbo-Control 2.0).

Then there's safety. RAMdisks are volatile RAM. Crash and you've truly and forever lost everything since the last save. You could get Levco's MonsterMac 2 Meg internal memory like I did, set up a 1 meg RAMdisk, and work RAMdisk fast; you still lose it all in a crash. But finally, there's easy file management. Why make a separate RAMdisk boot floppy for each application when I can hold MacWrite/Paint/Draw plus Red Ryder and Font/DA Mover and a bunch of other stuff on the DASCH? I can set up a System that has all the fonts and DAs I'll need for all of my programs and leave it in the DASCH. No more shufflin' floppies. More room on my

Performance Software for the Atari ST

MIDIPLAY from **Electronic Music Publishing House Inc.** (List \$49.95) is a boon for performers! Records all MIDI system and channel data from any MIDI source on all 16 channels simultaneously with full polyphony and touch sensitivity in "real time." MIDIPLAY is ideal for downloading performances from other MIDI sequencers, fulfilling the same function for MIDI information as the "master mix-down" machine used in traditional audio recording studios.

The unique ability to load multiple files into memory allows the creation of "medleys" up to three hours long for playback in performance situations—no more embarrassing waits while the computer loads the next song from disk!

As a compositional aid, MIDIPLAY's graphic keyboard screen display shows the notes being recorded or played back. Markers can be inserted while recording, allowing sec-

tions of music to be independently stored to disk for re-assembly into an arrangement or medley using the multiple file loading feature.

MIDIEDIT, also from **EMPH** (List \$89.95) has all MIDIPLAY's features PLUS the ability to edit MIDIPLAY files. Among the additional features are step mode entry, insertion and deletion of events, blocks of events and markers, punch-in, punch-out, and auto-channelizing.

Professionally recorded performances for entertainment and education called **MUSIDISCS** (List \$19.95 ea.) are also available. These include Classics Vol. 1, Beatles Vol. 1, Hits of '86, Movie Themes and Christmas Music.

For more information, write or call: **ELECTRONIC MUSIC PUBLISHING HOUSE, Inc.**, 2210 Wilshire Blvd. #488, Santa Monica, CA 90403.

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disks! Hooray!

CATCH UP WITH RAMCACHE

A "cache" stores repetitive disk calls during, say, font size changes or file searches so your program moves much faster. But set aside over 64K, and PageMaker goes on

strike faster than Rupert Murdoch's London pressmen. Unless you have a meg of RAM already, sizing RAMcaches is frustrating: your program won't load, or will crash in the middle of things, or get sluggish, or give you an 'out of memory' alert.

RAMdisks accelerate program execu-

tion if you stuff the System, Finder, and application into it, but a RAMdisk doesn't speed saves, it's limited to under 350K on a 512K Mac, and it's subject to data loss in a crash. You may get "disk full" messages if you don't leave around 20K empty on the RAMdisk for Mac's temporary files to roam about. The RAMcache concept works very well, though, in tandem with the DASCH.

Report from the Trenches

BY DOUG LOFSTROM

When a composer enters into the professional world (commissions, film scores, arrangements and jingles), deadlines become the enemy. Decisions must be made confidently and quickly, and product must be delivered on time. Any delay due to technical problems or the necessity to perform time-consuming menial tasks quickly becomes intolerable.

My Macintosh music system uses Mark of the Unicorn's *Performer* and *Professional Composer*. The most efficient way to obtain printed copy with this system is to carefully format a sequence in *Performer*, transfer the file to the *Professional Composer* disk, and reboot. This involves time-consuming disk-swaps, quits, and reboots. Unless you have a SCSI hard disk or a megabyte of memory minimum to load these programs into *Switcher*, look forward to three or four minutes of computer catatonia every time you want to check your work in notation. If you do several rough drafts of each piece, as I do, wasted time adds up quickly. Other musical tasks with these programs are nearly as time-consuming.

When accessing data in these and other music programs from DASCH instead of the Macintosh floppy drives, I found a considerable increase in efficiency. (In general, with tasks that the computer performs mostly in RAM, the improvement in time is negligible.) Cutting and pasting between documents and the above-mentioned procedure for notation formatting ran roughly twice as fast. Opening programs from the Finder ranged from 150 percent faster for the Opcode DX Librarian/Editor/*Switcher* to 400 percent faster for MacNifty's Studio Session!

I encountered only one glitch

while using the DASCH. When I first tried to load a *Performer* document from the DASCH, the Mac would crash. After perusing several *Performer* manual updates, I finally found special instructions for using the program with a hard disk accessed through the printer port. Apparently *Performer* broadcasts MIDI data through both the printer and modem ports unless instructed not to. This default was easily changed to modem port only, after which I experienced no problems.

I also question DASCH's assertion that the unit could be left on indefinitely with the data intact, thus acting as a quasi-hard disk. While this is true in a technical sense, the heat generated by the DASCH (at least as hot to the touch as the Mac) seemed to indicate that it was drawing a large amount of current. Those inclined towards energy conservation, or who are nervous about leaving on something that generates a fair amount of heat, take note.

Probably the best way to use DASCH is to format several disks with frequently used applications and put a hefty system file on the DASCH startup disk. This would necessitate a few more minutes startup time for operations, but once the work environment was set up all the benefits of the DASCH would be available—not the least of which is the blissful absence of grinding disk-drives!

Doug Lofstrom is a Chicago-based composer and a musician. He is music director for Free Street Theater and teaches Jazz Improvisation and electric and acoustic bass at Columbia College. He is currently composing his first opera under a grant from the National Endowment for the Arts.

THE USES

DASCH's 2 Megs of fast RAM hold a session's applications, a big giant monster huge Godzilla overkill System folder (mine's 347.1K now) and the work files too. Unless the house power goes off (a hopeless situation anyway) DASCH won't fail. I can save a 19K MacWrite file (like this one) while I grab a sip of coffee or reread a paragraph (three seconds). That's compared to 13.4 seconds on my external PKI 800K drive and 10.7 seconds on the 800K Apple internal drive. The time adds up. Now you can get down with some good backup habits!

If your software runs under Apple's *Switcher* (unfortunately, some won't) or the inexpensive DA "Launcher" you'll DASCH through multi-applications at light speed. You cannot do this with an internal RAMdisk or cache due to memory limitations. With four applications in *Switcher* on a 512K Mac, only some of each program resides in the Mac's RAM so it calls drives a lot.

To alleviate this, put all four on DASCH and give each a little space in your Mac. (Refer to your *Switcher* documentation to figure out how to best set this up; I could do an entire article on *Switcher*, there's just not space here.)

THE UTILITIES

It takes a few days to comprehend DASCH's "Configure" and "Backup" applications. No sweat. To get going, connect the box, boot with the supplied DASCH Start, and start moving applications and files onto DASCH as if it's an external floppy disk.

Copy DASCH Start's contents to your 400K or 800K disk(s). You can replace the System folder provided (latest Mac+ items) with your own. Make multiple disks so you have one to use with MacWrite/MacPaint, another with your MIDI sequencers and patch librarians, another for whatever arcane software you might have. By the way, if there are too many

THE INTERFACE

Volume 1, Number 7

PASSPORT DESIGNS, INC.

December, 1986

Editor's Note

By Brent Silveria

There's a new Master Tracks in town. **Master Tracks PC**, an advanced software sequencer, is now available for IBM and PC compatibles. **Master Tracks PC** gives you the ease of use expected of Passport products, plus the speed and versatility of the PC.

Perhaps the biggest innovation in this program is a feature called **Dynamic Phrase Allocation™** developed exclusively for Passport by Wild Rose Technology. This feature goes beyond common tape recorder mimicry, to allow you to combine or extract pieces of music and use them at any point in any piece.

Master Tracks PC stores music the way a composer thinks of it, in sections of varying length that are assembled, repeated, and refined until an entire song is produced. But more importantly, it lets you play at length, then grab a section from anywhere in the piece to save and build on. Now you won't say "what was that part in the middle? How did it go?" Master Tracks PC lets you capture the eight measures of pure genius that occurred after ten minutes of playing, then eliminate all that rambling and fishing before and after.

Another thing we've all been waiting for is Master Tracks PC's "Song List" window. Once you have created your songs, you can retrieve them from disk and create a set list for playback. This gives a live performer an opportunity to use his computer on stage without constant delays for disk access. Is a 40,000 note capacity enough for your needs?

IBM, Macintosh, //GS, and Atari users will be joining the ranks of us Apple/Commodore "Master Trackers" soon. So ears up and eyes open for ideas, articles and commentary. Plus, we'd like to hear from any of you working with PC "clones." Since their numbers seem to multiply more quickly then we can test them, your user input is the fastest way to spread the word. We also would like to once again extend our invitation to the readers of **The Interface** for articles. Remember, this is your forum, and your input is very welcome!

Ask Banana

By Lowell Levinger

How do I get rid of a stuck note at the end of an otherwise terrific sequence?

Sometimes the "stuck note" may not be discovered until all sequences are assembled in the **Song Mode** and if the track in question is playing a patch without a lot of sustain, it may only be noticed when the note is retriggered. Usually the reason for the hang up is that the space bar was pressed to end recording before the note was released so there was no **"Note Off"** command recorded by **Master Tracks**. There is a simple solution. Convert the offending track to a **Quikstep** file and then back to a track again. No editing is necessary. A **"Note Off"** command will automatically be placed at the end of the last note on the track. This will eliminate the "stuck note" problem.

MASTERTRICKS

by Denis Labrecque

Punch In Tips

"Hey man! I just recorded a primo track—except for that little part..."

Here's a few tips on how to fix that track with Master Tracks:

1. COPY THE TRACK

You should first link the original track to an empty track to copy it. This lets you compare the altered track to the original and also makes sure that you still have the original if you mess up the punch. (Please refer to your Master Tracks Users' Manual if you are not familiar with linking tracks.)

If you do not have enough memory left to copy the track—SAVE the whole sequence to disk before you alter the track! If you really blow it you can just re-load the sequence.

2. ERASE THE BAD STUFF

I have found it easiest to first erase the unwanted note(s), then record the correct note(s) on an empty track. You can even record several different "takes" on other tracks and compare them—then mix your best one into the original track. (Or just leave the new stuff on a track set to the same channel and preset as the original track.)

3. PUNCHING IN and OUT

Please remember to first select your punch in track from the Utilities Menu, then set the track to play before you try any of the following.

The traditional way to punch in/out is in real time. Play the track then Press [RETURN] to punch in then [RETURN] again to punch out—do not even try to play, just erase! If you don't like the punch, erase the copied track from the Edit Menu, and re-link (or re-load) the original track.

My favorite way to erase the bad note(s) is to convert the original track to Quikstep, delete the bad note(s) into the file or insert a rest so I can do a new "live" part on another track.

Make sure you insert a note or rest of the EXACT same number of clocks you erased to ensure that the track will stay the same length.

Another way to punch to a track is to hit [ESC] to pause as it is playing and use the arrow keys to find the beginning and end points of the material you want to erase. Next press [RETURN] to punch in to an empty spot* before the note(s) you want to erase then advance the clock past the bad note(s) and hit [RETURN] to punch out.

*NOTE: You should check out your punch points with an organ-like sound to determine exactly when you actually lifted up the key. With short, non-sustaining sounds like bass or percussion, it is difficult to hear exactly when the MIDI "note off" command and the note will stick on forever! If a note does "hang up," convert the track to a Quikstep file then delete the note. Make sure you then add either a rest of the same duration or insert a new note of the duration you want. This ensures that you do not screw up the timing of the rest of the track.

If you punch out on a note, that note will be deleted because you will have erased the "note on" command. Again, convert to Quikstep and insert the note if you want it back in your file.

If you have any specific problems, situations or tips of your own please write to THE INTERFACE c/o Passport, 625 Miramontes, Half-Moon Bay, CA 94019.

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files to copy on Start and DASCH runs out of room, it just stops transferring and tells you so. It's up to you to get to the Finder and straighten things out: there's no system crash or anything.

Each Start disk boots, starts DASCH, and copies its contents; it can be configured to ask for more disks to copy, automatically. "Configure" changes Start defaults. "Backup" is a smart-save utility that resaves files that have been opened, when you run it. And Backup's no fool: it remembers which files you'd like excluded (applications, formats, boilerplate, static data files, Finder and Image-writer Driver, most likely the System, etc., etc.) after the first time it runs. It even remembers where the data files came from, and asks for that disk!

DOUBLE TROUBLE: THE FREE PRINT BUFFER

It's a gas to begin this paragraph with the printer cranking away on a draft copy of the article! Amazing. To use the DASCH

as a print buffer, connect it between the Mac and your Imagewriter via the printer port. Draft print exploits this feature best; Standard benefits some; High Quality benefits not at all. Graphics usually benefit enormously from buffering.

Working with only a Meg of memory can get a bit complicated when you're juggling all these different programs. If you think you'll buffer a lot, say for scores and parts printouts, get the 2-Meg DASCH and hold 300 to 500K in reserve.

DON'T DASCH TO THE STORE

DASCH is a good candidate for mail order purchase since it's solid-state, UPS-proof, and doesn't require any real dealer support. Typical mail order prices (as of August '86) are \$339 to \$399 for the 1 Meg model, and \$399 to \$449 for the 2 Meg variety.

THAT LEAD ZEPPELIN

Is there anything wrong with DASCH? Well, maybe. I know that TMaker's "Click-

Glossary

DA: short for Desktop Accessory, a RAM-resident program that is part of the system folder. By residing in RAM, a Desk Accessory is not subject to the slowdowns (i.e. disk rotation, stepper motor movement, etc.) that occur when accessing a program stored on disk. Typical desktop applications include *Clipboard*, *Calculator*, and *Scrapbook*.

RAMdisk: a partitioned area in the computer's RAM (memory) which looks just like a disk drive to the program using it. Can speed program execution up to 1,000 percent because there are no mechanical operations involved and the data travels at the Mac's internal bus speed. Best bet: public domain *RAMStart* program. Also (but not on Macs with the new Apple ROMs) Assimilation's *MacMemoryDisk*.

RAM cache: RAMdisk's cousin—an area of RAM set aside to hold frequently accessed disk operations so that the program doesn't have to keep accessing the disk but can instead access the routines from RAM. Speeds repetitious operations, such as searching a database or editing music, several hundred percent. Doesn't do much for disk calls that happen once every ten

minutes. See: Nevins' *TurboCharger*, and the Mac+ *Control Panel System Ram Cache*.

Hard Disk: a disk drive with typically (for the Mac) 10 to 20 Megabyte capacity. The storage medium is a rigid magnetic disk in a sealed enclosure. Serial disks operate from the printer, modem, or external disk drive port. Faster SCSI (pronounced "skuzzy") disks operate from the SCSI bus.

SCSI: Small Computer Systems Interface, a standardized computer bus.

Shareware: try-before-you-buy software. You usually copy a version from a BBS (bulletin board) by modem; if you like the software you pay a nominal fee for a license and, usually, a diskette with documentation and the latest version on it. This is a great concept—Scott Watson's *Red Ryder* telecommunications program, CE Software's *Mock* series, and *Packit II* file compressor are standouts.

Public Domain programs: free software available from user groups and bulletin boards. Some of the best stuff for the Mac is public domain, like Bill Atkinson's *QuikFile* database.

Art Effects" for MacPaint crashes the system every time—if you've installed this DA, use it on a regular RAMdisk with the System, Finder and MacPaint. Your files and stuff can still live in the DASCH.

Bob Cone tells me applications that get lost on hard disks will still get lost on DASCH (magazine reviews will usually warn you of these).

A new word processing application called "Word Handler" crashes if I try to print Best quality through the DASCH connected to the printer port; and I had trouble with an old version of Don Brown's "MockWrite" DA. MockWrite is part of an excellent shareware program packet—the "Mock" series. Support Don, try it out, and pay him. The old version (under version 4.2) sometimes wrote empty text files to DASCH while writing fine to floppies. If you use it as a text-clipboard editing aid or a place to throw notes, you could be in for a nasty surprise since the filename exists in the Finder (so you write to it) but it's empty and won't open later. Don's latest version has had no problems, and the difficulty could well have been with Apple's new ROMs.

BREAKING THE SPEED LIMIT

Faster and with more storage than a floppy drive, safer than a RAMdisk, and cheaper and as fast as a hard disk, DASCH is perfect for speedy program execution with large applications from *Excel* to *PageMaker* to *Professional Composer* and *Performer*. I won't split seconds the way hacker mags do; with DASCH my Mac now keeps up with me—reliably. That's what counts. Without DASCH, I feel lost...like Mac and I were firing on only seven cylinders.

The short manual is concise, turgid, and has an incredibly annoying stiff binding. You'll only need it for a few days, though; DASCH is easy to learn. You register for software upgrades with a \$10 fee.

Anyone who wants more speed (and that's all of us) without the complication and expense of a hard drive should look into DASCH. I'm damn close to what the mags call a "power user" and now thanks to DASCH, I don't need a hard drive (at least, not yet). And even if I get one, I can use DASCH for hot storage (a new Mac-Concept: utilities, DAs, Fonts just seconds away) or a 2 Meg dedicated Imagewriter buffer. Imagine! Two floppy drives, an internal RAMdisk, and the DASCH—no more Zzzzzzzzz, but instead, Zoommmmmmmmm. (And tell them you saw it in EM!) **EN**

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It only took one computer, the Macintosh, to get the world hooked on desktop publishing. Will the Amiga do the same for desktop video?

Deluxe Video

BY MATTHEW LEEDS

The title floats in space, rotating on three axes. When it reaches mid-point in one rotation, it changes into a different title. The credits float up from off-camera, and then an eight point grid pattern wipes across the screen to show the first picture—a house in the suburbs. We zoom into the house, in steps. Then another wipe, this time from the side, shows a different house, as we

Product Summary

Product: Deluxe Video Construction Set

Type: Desktop video animation program

Price: \$99

Hardware requirements: Commodore Amiga computer expanded to 512K, disk drive (second disk drive recommended), Version 1.1 Kickstart disk.

Software Requirements: An Amiga paint program such as Electronic Arts Deluxe Paint, Aegis Images or Commodore Graphicraft is needed if you want to generate images other than those supplied on the Parts/Utility Disk.

Tracks: Five (Video, Background, Foreground, Control, and Music)

Manufacturer: Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404; tel. 415/571-7171.

Matthew Leeds, fed at an early age by a diet of science fiction and tinkering, has a background in English literature and commercial photography. He has written for Amiga-World, Microtimes, and Commodore Publications. He belongs to a few user groups and is co-producer of The Commodore Show, a Commodore-specific trade show.

pull back (reverse zoom) until the house becomes a point on the horizon. It then fades, a logo comes up onscreen, zooms, splits, and fades through the color spectrum to black.

This is not a description of a prime time real estate ad, or the opening of a feature film; it is one of the demos that will be on Deluxe Video, a program designed to make serious computer generated videos. Images from a variety of sources—Deluxe Paint, images from the Amiga video frame grabber, music from Deluxe Music Construction Set and other programs—can be combined into a single computer generated output to create custom videos. Animations, titles, business presentations, and special effects are suddenly in reach of the home, small business, and small studio market.

Deluxe Video's developers, Mike

Posehn and Tom Casey, are software artists with Electronic Arts. Aside from considerable software experience, between the two of them is over 50 years of television watching experience, a pool of knowledge that has come in handy during the development of Deluxe Video.

WHAT'S A DELUXE VIDEO?

Deluxe Video consists of three disks:

✓ The *Maker* disk, which lets you create a video and play it back, is copy-protected using a key disk technique that lets you make backups against possible damage.

✓ The unprotected *Player* disk, which will only play a video and can (must) be copied to any disk that contains a video you've created. You can therefore give away copies of the videos you design, and create stand-alone videos that can

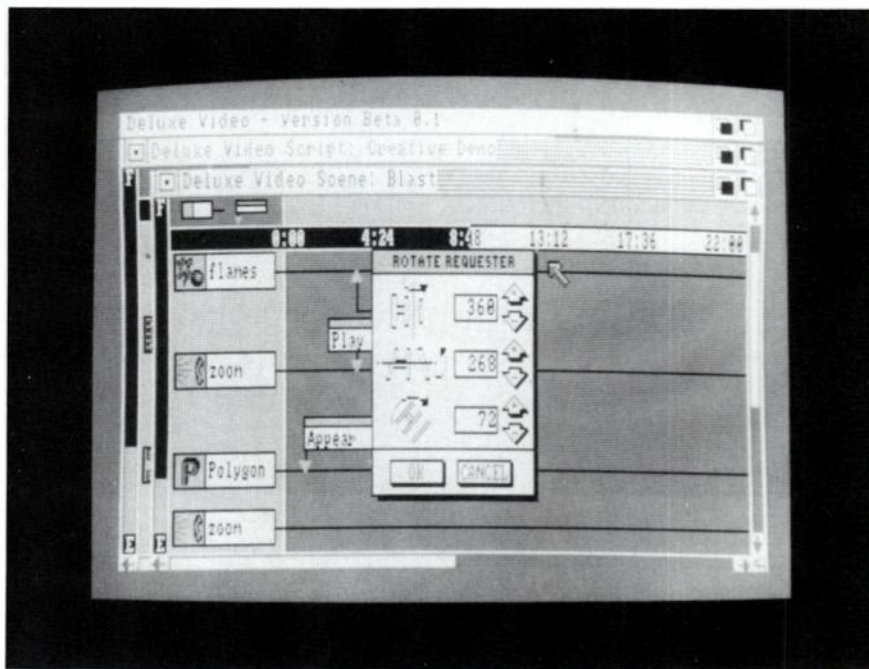


Fig. 1 Rotate requester.



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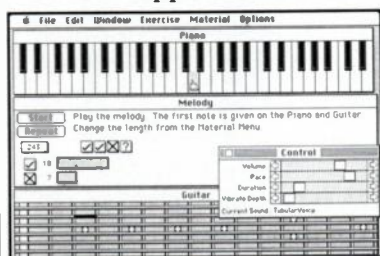
But because of Yamaha's musical experience, the real accomplishment of our new microphones is certainly greater than the sum of the parts. You might even think of them as musical instruments in themselves.

For complete information, write Yamaha International Corporation, Professional Audio Division, P.O. Box 6600, Buena Park, CA 90622. In Canada, Yamaha Canada Music Ltd., 135 Milner Ave., Scarborough, Ont., M1S 3R1.



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be enjoyed by anyone.

✓ The *Parts/Utility* disk contains various utilities, and a library of files you can use to create new videos.

Deluxe Video is such a visual program that it is difficult to describe how it

works with only words. Think of a film cutting bench, with pieces of scenes to be cut and pasted into place. The starting point is a blank slate, called a *scene*. Five types of *tracks* (Video, Background, Foreground, Control, and Music) can then be



Fig. 2 A digitized still video frame provides the background for this video.

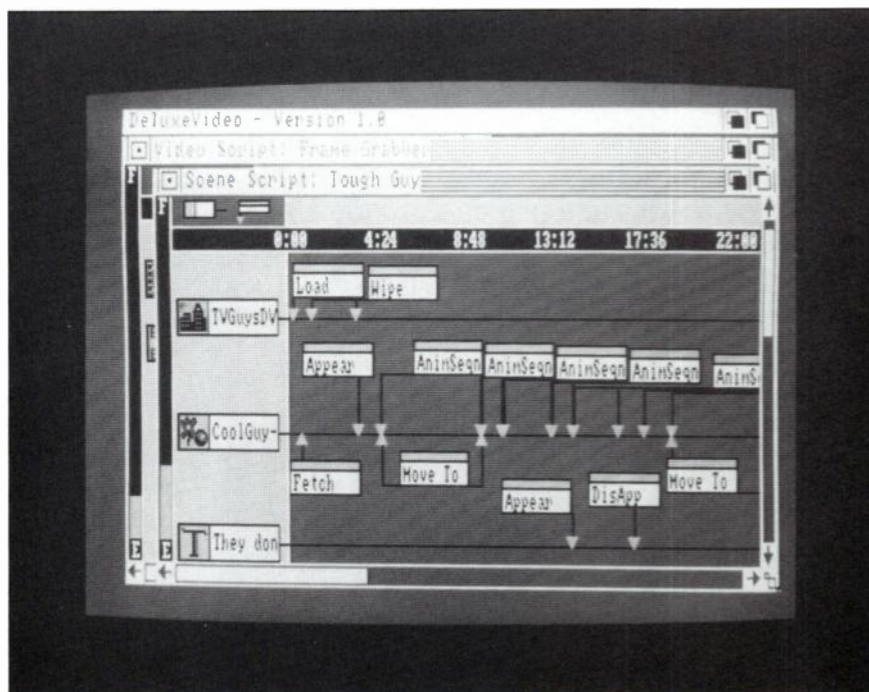


Fig. 3 Script for the video based on the background show in Fig. 2.

Requesters and Hierarchies

Requester: When an Amiga program needs more information, it puts up a requester. Requesters are boxes that ask for you to make a choice, indicate the next event, input text, insert a disk, turn on the printer, or whatever. With Kickstart Version 1.1 you must move the mouse cursor into the active area of the requester and click the left mouse button to make the requester active before you can enter text. Kickstart Version 1.2 eliminates this need, but check with software manufacturers to be certain their programs can support this.

Hierarchical structure: A hierarchical structure is a method of organizing events, data, and so on in an orderly way. A good analogy is that of the tree-branch-leaf structure. If you travel down a branch to a particular leaf, you must travel back up the branch to find a different leaf, or at least define that path. Hierarchical structures are used to maintain disk directories in some kind of logical order, and are also used in software (menus for example) to give an order to events and processes. Creating an orderly procedure can encourage a more intuitive interaction with the program, thus making it easier to learn and use.

layered on top of this scene. On to each type of track you place *effects*. Time runs from left to right across the tracks, and the time over which an effect occurs is controlled by the two arrows attached to its identifying box. These arrows are movable, so that you can set the time an effect starts and ends. Each effect has its own requester (controller); Deluxe Video uses a hierarchical structure (see sidebar).

Each effect's requester contains options that expand Deluxe Video's potential. For instance, the *wipe effect* requester has several options: up, down, left, right, diagonal, grow from a point, or break up in horizontal positions. The *sound effect* requester controls the sounds using slider controls. Some of the changes that can be made to Deluxe Video's library of sounds include stereo movement (pan), sound

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pitch (rate), and volume. In addition, there are requesters for Size, Appear, Disappear, Move, Fade, Strobe, Rotate, Animate, and several other options. Fig. 1 shows the screen display produced by the rotate requester.

“Deluxe Video makes great title sequences for videos. It also can create video business presentations, stand-alone point of purchase displays, self-running demos, electronic message boards, low-cost animated TV commercials, flip charts, animated storyboards, and slide shows”

Background tracks (landscapes, cities, buildings, shapes, etc.) are full screen pictures. They may be created using a paint program like Deluxe Paint, or visually “sampled” using the Amiga video frame grabber. Fig. 2 shows a digitized still video frame used as a background; Fig. 3 shows the script for the scene using this background. Backgrounds are summoned with an *appear* effect, and can be manipulated using various wipes or other effects. *Foreground tracks* control objects of less than full screen size. There are quite a few effects available as well for the control of objects. *Music tracks* are mostly self-explanatory; Deluxe Video will accept music from most Amiga music programs, or if you are going to record your video on a VCR you can dub music from any source on to the tape.

Deluxe Video can display eight colors in the background, and eight in the foreground. On-screen “slider” controls for modifying the colors can change the red,

There's no telling what a drummer might do with a Mirage ...

If you're a keyboard player, don't ever let a drummer borrow your Mirage . . . you might never get it back. If you're a drummer, ask a keyboard playing friend to lend you his Mirage . . . "for a while." In either case, if you're into percussion, there's a score of good reasons to get your hands on a Mirage.

The buzz on the buzzword

"Sampled Percussion" is a pretty catchy buzzword. Some high-end electronic percussion systems offer sampling as a creative option. Others offer a selection of sampled sounds on ROM's that plug into the system.

The Mirage can sample any sound in the percussion family — or any other family, for that matter. There's also a wide range of percussion sounds on 3.5" diskettes in the Ensoniq Sound Library, from acoustic and electronic drums to kalimba and Fu Yin gong.

The Ensoniq Percussion Library

Sound Disk	Sound
4	Acoustic Drums, Electronic Drums, Orchestral Percussion
10	Tabla & Bayan Drums
11	Rack Bell, Kalimba, Wind Gong, Slit Drum
14	Cup Gongs, Che Cymbal, Crotales, Orchestral Bells
16	Latin Percussion
18	Fu Yin Gong, Opera Gong
20	Ambient Drums

MIDI makes the magic

Now that we've gotten all these great percussion sounds into a Mirage, how do we get them out? Naturally, all the sounds can be played in real time from the keyboard. Since the Mirage can hold up to 16 samples, you can play a full drum set or complete percussion at any one time.

You can use the on-board sequencer to build up patterns, or use an external MIDI sequencer to create and edit complete songs. Just play the part on the keyboard or, if your sequencer has step editing, write the appropriate MIDI note number on the right beat and lock in a solid groove.

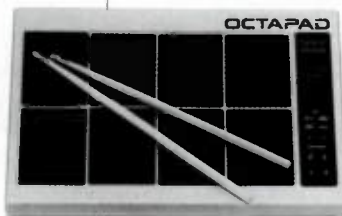


How to become an Octaman

Most drummers will argue that playing percussion is no fun unless you get to hit something. We agree. MIDI features that can put you in touch with a Mirage are showing up on electronic drum kits. And our friends at Roland have come up with a MIDI percussion item that's simple and inexpensive — the Octapad®.

As the name implies, the Octapad gives you 8 pads to hit and each pad can be assigned a MIDI channel and MIDI note number. Add a Mirage, a MIDI cable and a pair of drum sticks and you've got a potent percussion instrument.

Let's start by creating an electronic drum kit. Connect the MIDI out of the Octapad to the MIDI in of the Mirage and load Sound 2 (Electronic Drums) from Sound Disk 4. The Mirage now has 12 distinct electronic percussion



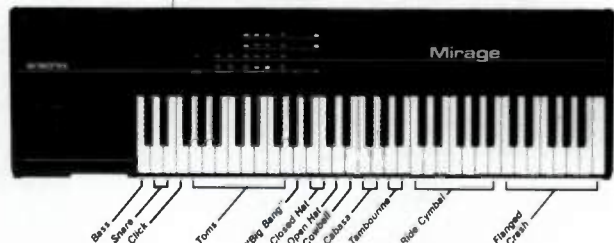
sounds ready to go, including full octaves of toms, ride cymbals and flanged crash cymbals. Set the Octapad and Mirage to the same MIDI channel and choose any 8 sounds by entering the MIDI note number into the Octapad for each sound. The keyboard map shown here will give you a guide. You've now got an 8-piece electronic drum kit that's ready to record, sequence or play live.

Mirage means melodic percussion

You can follow the above procedure to use any of the Mirage percussion sounds with the Octapad — but why stop there. One of the strongest advantages of the Mirage/Octapad combo is the ability to play percussion using any sound in the Ensoniq Library.

By selecting MIDI note numbers you can easily program scales into the Octapad to use with Mirage steel drum, marimba, hammered piano, bass, harp, vibes or whatever. Because the Octapads are velocity sensitive, you'll be able to control the dynamics just as you would any acoustic percussion instrument.

If you want to get a bit more outside, try playing brass and orchestra hits, guitar power chords, sound effects and pipe organ through the Octapads — there are over 300 sounds in the



Ensoniq Library just waiting to get pounded.

All this and a keyboard, too

As you can see, the Mirage isn't just a great keyboard, but a versatile drum machine, too. With some additional MIDI gear, it can be downright amazing. Visit your authorized Ensoniq dealer for a full demonstration. There's no telling where a Mirage and your imagination can take you.

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green, and blue component of any color on the screen. Several sets of pleasing color combinations are included, and you may also create and store your own. There is full support for the system fonts, or additional fonts created later, and a custom font known as "Polygon Text" used for larger text displays and text rota-

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The program requires a working understanding of the Akai S-612 Sampler, a Commodore 64, 64CSX64 or 128 with one 1541 disk drive and monitor, a MIDI adapter (either the Sequential Circuits™ Model 242 or the Passport™ Model C-64 MIDI interface), two MIDI cables and an Atari® type joystick.

Almost all SampleScope operations are handled by joystick control. Users can look at the entire sound sample at different magnifications while editing, including the sample loop-point and end-point. The sample may be freely edited or changed. A special processing feature lets the user improve the overall sound sample dynamics. Once you start using this program, you'll find it to be an indispensable tool for getting the most out of your Akai Sampler. Musicians can now see what they're doing and do it precisely.

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tions. The program will recognize a second disk drive (for additional data storage), and plans are under way for support of hard disks and RAM disks. Templates for exploding pie charts, bar charts, slide shows, scrolling titles, etc., are also included, as are several full length demo videos. Finished videos can be set to loop, or to chain and call other videos. In addition, full access to the Amiga's Workbench is available.

Deluxe Video also includes *Framer*, an animation tool that uses traditional cel animation to produce simple animated events for inclusion in Deluxe Video. You create a series of cels for your animation, and the Framer turns them into an animated object like a flip page book. You can control the order in which each page is played back, and the rate of playback. Other effects can create movement and the illusion of perspective.

One question that often comes up is the maximum possible length for a video. Of course, this depends on available memory, complexity of animation, and many other factors—some technical and some artistic. A typical video can run

IFF and the Amiga

As the Amiga was reaching completion, Electronic Arts and Commodore began talks to establish a file standard for data on the Amiga. It had become apparent that text, graphics, sound effects, and music would all need to be shared by programs running in the Amiga's multi-tasking environment. The *Interchange File Format* was the result. This open-ended file standard has been accepted by software developers, and has thus created a rich interchange between applications. Graphics created by Electronic Arts Deluxe Paint, Aegis Images, Commodore's Graphicraft, and other paint programs all use the same file structure. The same applies to digitized sound files and musical scores; Mimetics, Future Sound, Electronic Arts, Activision, Commodore, etc. have all produced products for musical applications on the Amiga.

three to five minutes; however, it is possible to make longer videos, sometimes by chaining several together. As to doing cel animation at great length, I'd say generally this is not practical in real time. The cel animation option is good for what it does, but is limited by the number of cels you can draw on a single screen. Using multiple animated objects and chaining videos can help get around this, but once again, real time animation gets complicated.

Deluxe Video will accept IFF standard sound and music files (see sidebar). Several companies are producing programs for the creation of musical scores and digitized sound effects. Many Amiga music programs use digitized samples as instruments, and the result is a very real sound.

APPLICATIONS

For starters, Deluxe Video makes great title sequences for videos. It also can create video business presentations, stand-alone point of purchase displays, self-running demos, electronic message boards, low-cost animated TV commercials, flip charts, animated storyboards, and slide shows. Since it can respond to

keyboard commands, it could be used to create simple interactive video teaching programs. Think of it as a programming language for graphics on the Amiga, or as a *video processor*—a "word processor" for images that outputs video, instead of printed text, for hardcopy. Imagine CD-ROM based libraries of clip art, animation sequences, and sound effects for Deluxe Video. Imagine a new kind of *video desktop publishing* revolution, using images instead of text.

On a more down-to-earth level, you can create animated storyboards for MTV-style videos. By producing your own Amiga-based videos as tests or storyboards, you can try out your concepts, and have a very effective demo to show to prospective producers. Amiga-generated videos could also be used during a live performance as part of a light/video show.

NO ONE'S PERFECT...

There are some shortcomings to Deluxe Video. A serious one is the overscan border. When computers were first connected to video displays (there was a time when we only had printer output), a decision was made to keep text away from the screen's edges. Some video monitors have slightly different display characteristics, and to keep from losing characters, the video display output of all computers includes a built-in border. This border shows up in Deluxe Video and keeps the action from ever occurring anywhere near the edge. If you mix Deluxe Video videos with video from other sources, it looks odd.

Speed is also a consideration, as complicated graphics on any computer take time. The Amiga is the first microcomputer capable of the computations needed by a program like Deluxe Video, but it's possible to build videos that slow down the Amiga. There are some ways to work around this, but be advised that not everything you imagine is possible. Remember, there's a big difference in cost between a \$60,000 animation workstation and an Amiga.

Provisos aside, Deluxe Video is a remarkable program. By now, most Amiga user groups will have sample videos in their public domain library, and retailers will have the program in stock on their shelves. If you're at all interested in the concept of video desktop publishing, I suggest that you ask for a demo. **CM**

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How do you put musical energy into drum programming?



"Whether or not you're a drummer, a drum machine should play like an instrument, not a machine. These pads respond dynamically in smooth and realistic increments. Until now, I haven't seen a machine with these features in this price range."

*Jimmy Bralower,
Studio Drummer/Programmer
(Steve Winwood, Billy Joel, Cyndi Lauper)*

Start with a great set of PCM digital sampled sounds, developed with leading players, producers and engineers. Then assign them to 14 long-throw pads that respond to your touch. Program dynamics, tuning and decay for every drum on every beat, or edit them with the data slider in real or step time.

Set cymbal, drum or percussion sounds to retrigger with each hit or to

overring and decay naturally. Then bring those sounds to life. The DDD-1 is designed with powerful, responsive, easy controls that let you cut through mechanical programming to build massive beats or supple grooves — spontaneously, while your ideas are fresh.

For building blocks, use any sound you can think of. Korg's growing library of "credit card" ROMs covers any musical situation, every musical attitude with a full range of acoustic and electronic drumsets and percussion instruments, many sampled with state-of-the-art effects. The DDD-1's internal memory and four ROM card slots hold up to 48 sounds, each one assignable to any pad. The optional 3.2 second sampling card lets you add your own sounds.

Program and play the DDD-1 from MIDI keyboards or drum electronics, or use the assignable audio trigger input. Store program memory (including 100 patterns and 10 songs of up to 9999 measures) on tape, on RAM cards or via MIDI System Exclusive to Korg's disk-based SQD-1 sequencer. On playback, assign any sound to stereo outs with seven step sweepable panning, or to one of the six assignable programmable multi outs.

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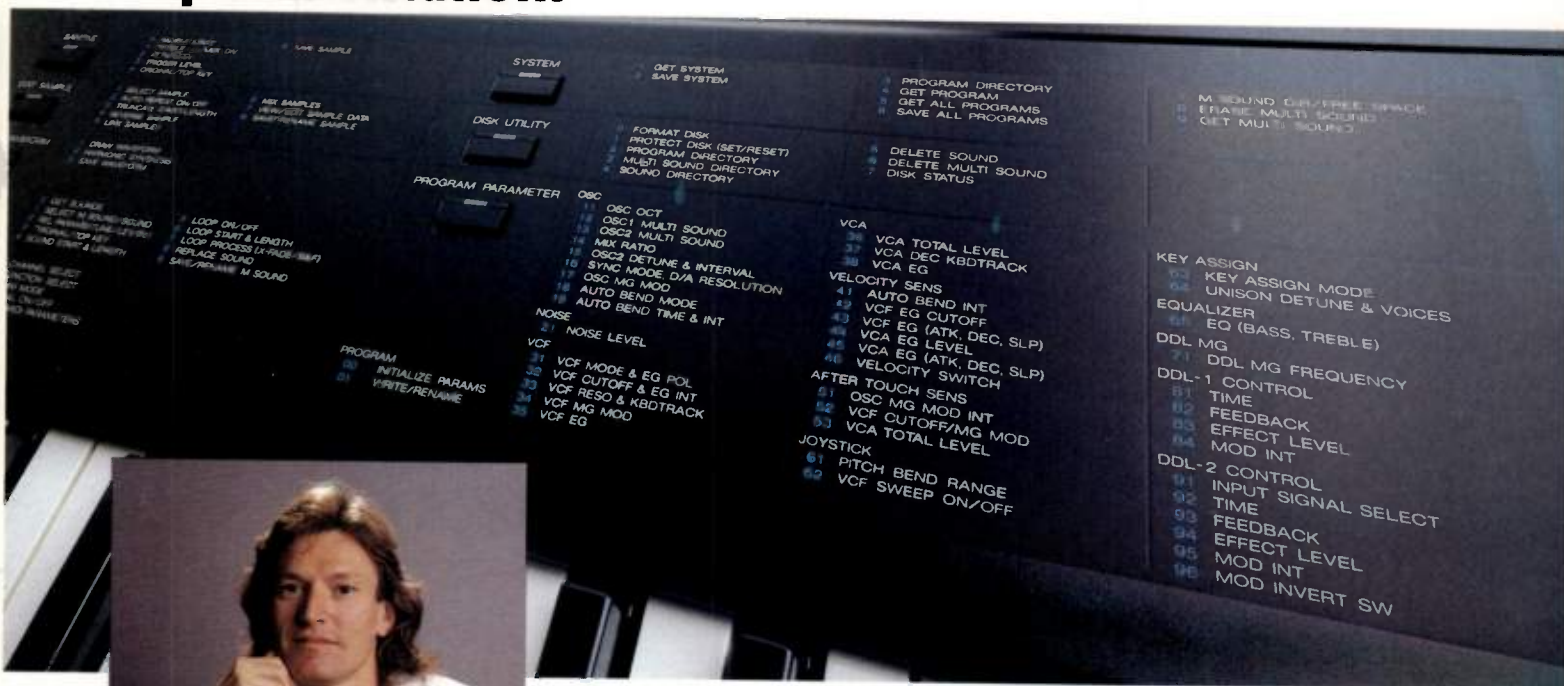
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DDD-1



Why should a sampler and a synthesizer be combined? Experimentation.



I need to get to my sounds quickly and also create new patches when I'm on tour. The DSS-1 gives me that flexibility. It's a very responsive instrument.

*Steve Winwood
Multi-Instrumentalist, Vocalist, Composer*

Korg combines the realism of sampling with the flexible control of synthesis to create a new kind of keyboard with unlimited possibilities for musical experimentation: the DSS-1 Digital Sampling Synthesizer. The DSS-1 recreates sounds with digital precision. But it also shapes the complexity and variety of sampled sources into new dimensions of sound.

Exceptional Range The DSS-1's extraordinary potential for creating new sounds begins with three sound generation methods. Digital oscillators sample any sound with 12 bit resolution. Two sophisticated waveform creation methods — Harmonic Synthesis and Waveform Draw-

ing — let you control the oscillators directly. Use each technique independently, or combine them in richly textured multisamples and wavetables. You edit samples and waveforms with powerful functions like Truncate, Mix, Link and Reverse, plus auto, back and forth or crossfade looping modes. Then apply a full set of synthesis parameters, including two-pole or four-pole filters and Korg's six-stage envelopes.

Exact Control Choose from four sampling rates between 16 and 48 KHz, with up to 16 seconds of sampling time. Configure the keyboard with 16 splits assignable over the full 127 note MIDI range. Layer or detune the two oscillators on each of eight voices. Then process your sounds with a complete synthesizer architecture and two programmable DDLs.

The DSS-1's power is easy to use, so you can work with sound and music, not programming manuals. The backlit 40 character LCD display takes you through the total sound generation process with options and instructions at every step. Software that talks your language and a logical front panel menu help you go beyond synthesis, beyond sampling — without dictating your direction.

Expression The DSS-1's five octave keyboard is velocity- and pressure-sensitive,

for precise touch control of Autobend, VCF, VCA, envelope rates and other parameters. Velocity Switch lets you play completely different sounds as you change your attack.

Unlike other samplers, the DSS-1 lets you access 128 sounds without changing a disk. Each disk stores four Systems of 32 sounds. Within each System, your programs combine up to 16 sample groups and/or waveforms with complete sets of synthesis parameters and keyboard setups. In effect, the DSS-1 becomes a new instrument every time you call up a System. The library of easily available 3½" disks is already substantial and growing fast. Four disks — each with 128 sounds — are supplied with the DSS-1 to start your comprehensive Korg sampling library.

By combining the best of digital sampling with familiar and flexible control of synthesis, the DSS-1 allows the modern synthesist to experiment with new sounds never before available.

Start exploring the fusion of sampling and synthesis now, at your authorized Korg Sampling Products dealer.

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DSS-1



63 Sound effects. From the obviously necessary to the quite bizarre. Pre-packaged and MIDI selectable. Single and multi-tapped delays... with filtering and reverb ambient outputs: Perfect for vocals and instruments. Stereo effects that get attention. Reverb effects that don't exist on the plane of current reverb understanding. Interested? We call it

MIDIFEX

MIDIFEX. And to get the effect of MIDIFEX without one, you'd need a very capable digital reverb, a few dozen digital delays, a couple of parametric equalizers and quite a few extra channels on your mixing board. By presetting the variables, we programmed the MIDIFEX to produce these effects at instant recall...at the front panel or through MIDI patch change. The polished sound You could work hours to get is now here. And like MIDIVERB...The best part is the price...



...suggested list price

\$399⁰⁰

