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Electronic MUSICIAN

FEBRUARY 1988

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A MIX PUBLICATION

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REVIEWS: *Roland VP-70 • Akai EWI • JL Cooper PPS-1 • Harmony Systems SynHance MTS-1 • Korg DSM-1 • TX81Z Pro Editor/Librarian (Mac) • Coda MacDrums • Roland GP-8 • Public Domain ST Programs: DXLIB, CZLIB, FB-PATCH and DX7PATCH • Book: FM Theory and Applications*

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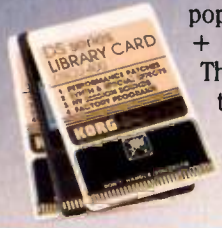
Korg 707 proves good design is good design, on the outside as well as the inside. Looks *count*. So we created a powerful and cost-conscious FM synth with sleek, modern lines. Chic push-button controls, performance editor sliders and pitch/mod/volume wheels make total control look better than ever. 707 is even available in special colors for maximum visual impact.

The *sounds?* 707 is multi-timbral. It comes with 100 sparkling FM sounds and 10 dynamic combination programs. 707 also reads our popular DS8 Rom cards (400 sounds + more to come).



The 49 note velocity and after-touch sensitive keyboard feels as good as it looks. With split, layering, zones and multi combinations for infinite variations. 707 is a *performance* instrument.

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Special Introductory Offer:
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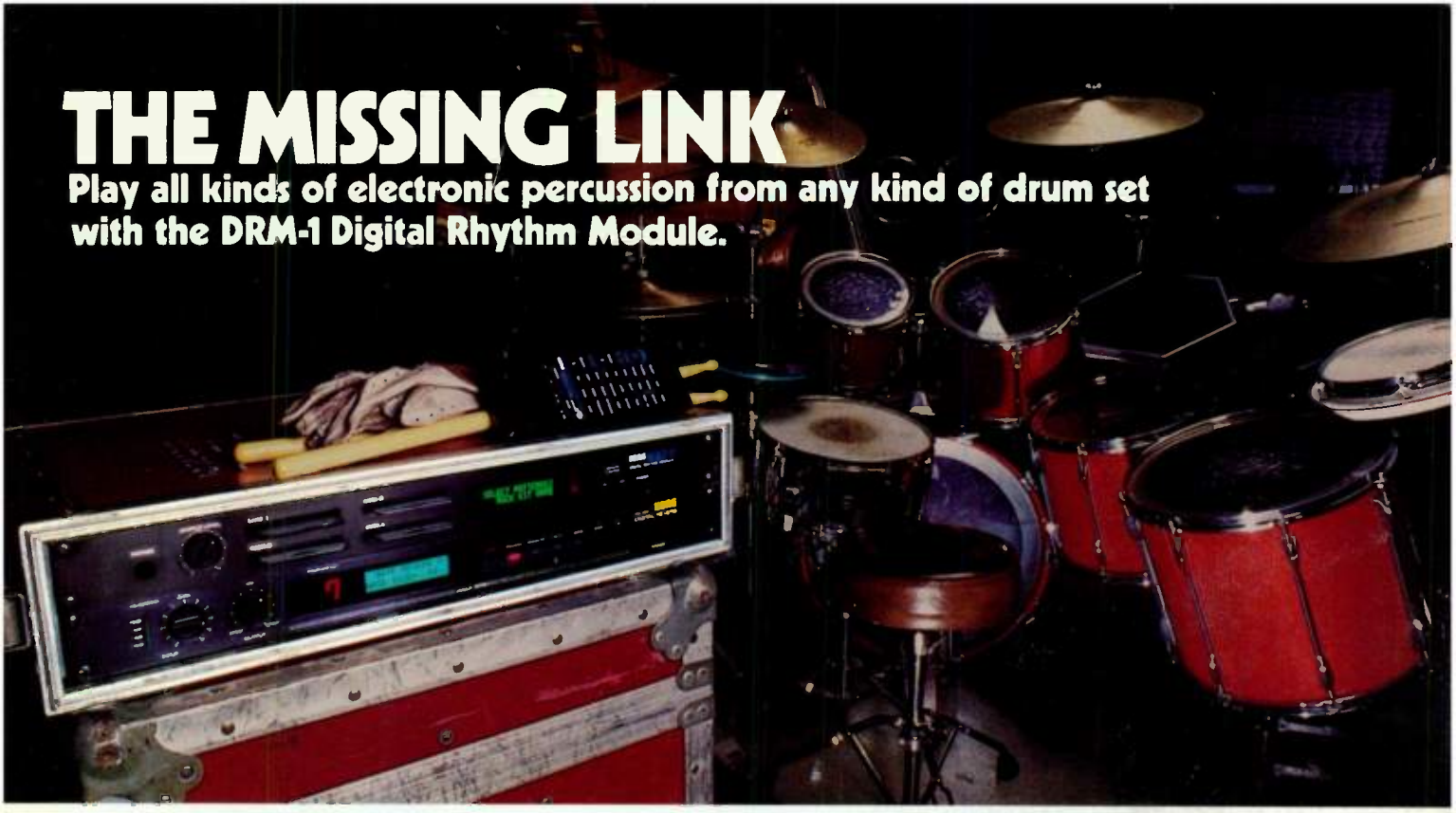
THE MISSING LINK

Play all kinds of electronic percussion from any kind of drum set with the DRM-1 Digital Rhythm Module.



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The DRM-1 Digital Rhythm Module does both. With inputs that read audio signals, piezo triggers, analog or MIDI electronic pads, the DRM-1 is your link to the full spectrum of modern percussion. Through MIDI, it's your link to whatever the future brings.

Digital Reinforcement: Stronger Sound, Wider-ranging Sounds

With up to 55 sounds (including the DDD Series ROM card library), the DRM-1 is your link to the realism of PCM digital sampling. Plus all the power and response of Korg's Digital Dynamic Drums. There's everything from pro-quality kicks, snares and cymbals to sound effects, orchestra hits and a global collection of hand percussion. Your touch can control tuning and decay along with volume and panning.

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DRM-1 Features

Wireless remote control. Seven inputs, eight multi outputs plus stereo outputs. 16 pattern, 5000 note real time sequencer with record, overdub, punch in and looping functions. Three ROM card slots, one RAM/ROM card slot. Assignable pedal and footswitch jacks. Tap Tempo footswitch jack. 23 PCM sampled internal sounds, 12 bit D/A conversion. Sounds can be dual-assigned for layering, flanging, velocity-controlled switching effects. Programmable tuning, decay, dynamics and panning controllable in real time. Audio, voltage and MIDI inputs. Trigger-to-MIDI converter. MIDI clock with MIDI Song Pointer. Memory storage via MIDI or on quick-loading Korg RAM cards.

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THE IEQ WITH Smartcurve™

Not Just Another Programmable Equalizer With MIDI™

The IEQ with Smartcurve™ is a programmable, high performance graphic equalizer that includes a video output. For those who wish to enjoy the video output of the IEQ, ART makes the IEQ Video Monitor.* Smartcurve™, proprietary software developed by ART gives you instant actual frequency response as easy as the push of a button.

The IEQ Family consists of both the 2/3 octave and the 1/3 octave graphic equalizers. Both types come in two varieties, Controllers and Satellites. A Controller is a self-contained programmable intelligent graphic equalizer capable of controlling 15 satellites at once. IEQ Satellites are exactly the same unit except the front panel controls are eliminated.

IEQ Model Specifications:
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- Dynamic Range - ≥ 100dB typical
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***IEQ Video Monitor Features**

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- NTSC compatible monochrome monitor
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- Standard RCA jacks for easy connections

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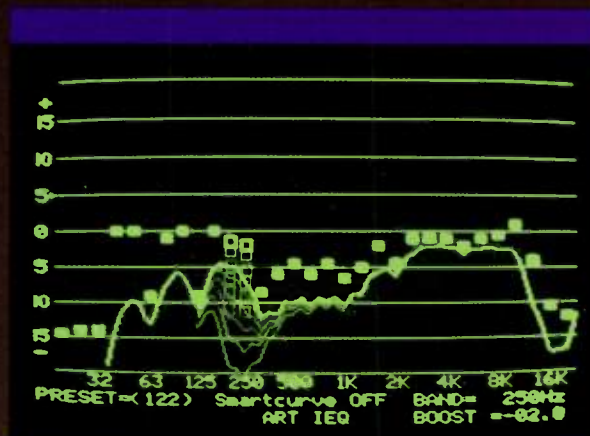
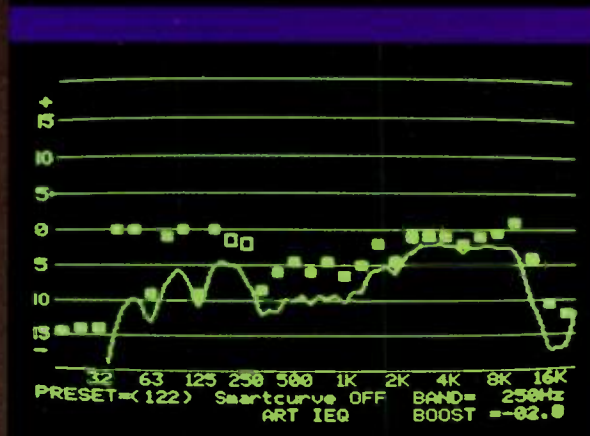


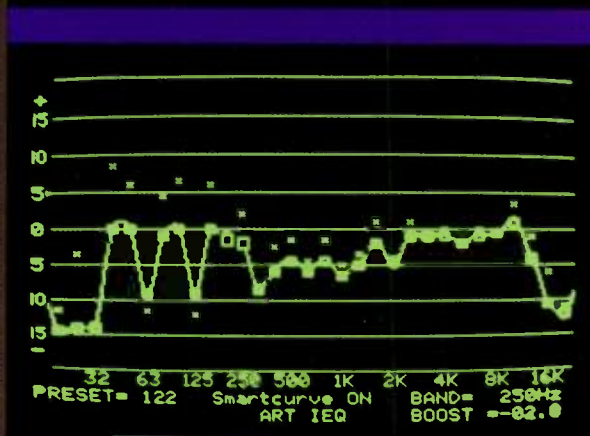
1 See the Sound

This is a video output of the IEQ as the unit is being adjusted. The sliders can be moved ± 15dB in 1/2dB steps to get the exact response you need. With the simple push of a button, complex equalization can be done in seconds with incredible accuracy.



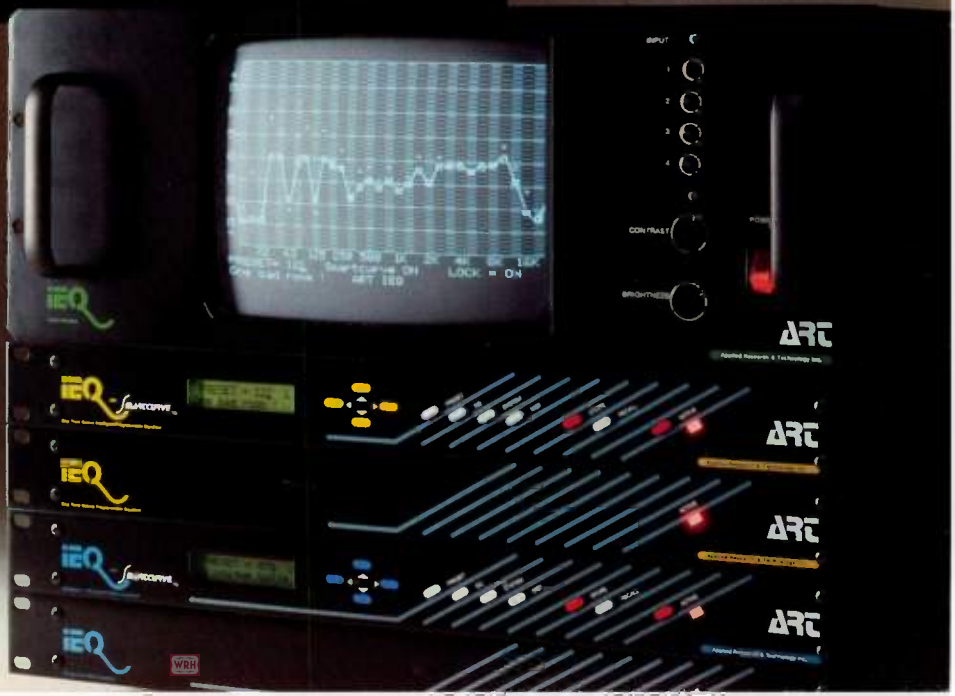
2 Hear the Sound

The power of the IEQ readily becomes apparent as the video display plots the frequency response due to the slider settings. The IEQ offers high quality constant "Q" equalization. The video graphic display shows the correlation between the sliders and the frequency response.



3 Perfect Sound

Turn Smartcurve™ on and perfect equalization is at your fingertips. Note the difference between the second frame, (Smartcurve™ OFF) and this frame. The position of the sliders represent the actual frequency response of the EQ. Interaction between bands is virtually eliminated. Incredible! Just think, now when you adjust the EQ you get exactly what you need. The "perfect" EQ? Let your eyes and ears decide.



VOL. 4, NO. 2 FEBRUARY 1988

Electronic MUSICIAN

A MIX PUBLICATION

DEPARTMENTS

COVER

All musicians want their music heard in the best possible light—and the optical CD medium is the ultimate showcase. Now you can bring your music into the digital age on a medium with no hiss, no wow, no flutter, and razor-flat frequency response. It's easier than ever to make your own CDs; the sound quality has never been better, the manufacturing process more predictable, or the prices lower. Our cover represents the process of music turning into CDs, which we suspect more and more electronic musicians will be doing in the months ahead. (Artwork courtesy of Disctronics Inc.)

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Display advertising rates, specs and closing dates are available upon request.

ARTICLES

Editor's Note

If you're familiar with my writing, you know that I try to maintain a positive attitude—that I look for the best in people, and that I believe goodness is inherent in the human heart. Some people might not agree with this philosophy; but to my way of thinking, to believe otherwise would be to abandon hope.

I think of these things because I think about technology, and how the same technology that brings us closer together has the power to tear us apart. Yet those are extremes. Often, technology's main function seems to be to provide a means of escape, and that's the topic I want to address.

The couch potato who watches eight hours of TV a day is only the most blatant example. Tough day? Boot up the computer and cruise around in a flight simulator. Lonely? Sign on to a telecommunications network and enjoy the advantages of friendship without emotional involvement. Angry? Put on Flipper or the Clash, and let them do the work for you. Or watch Clint Eastwood blow somebody away.

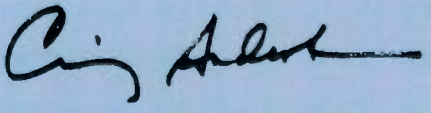
One of the biggest promoters of technology-as-escape is the media, which include record companies and magazines. Ideally, the media would inform, enlighten, and promote intelligent debate about our alternatives. Instead, we are treated to presidential contests that are covered in the same way as sporting events, and sporting events covered with all the gravity of international politics. Something's out of balance here.

EM readers are not only conversant, but intimately involved with, technology. How are we going to use this knowledge—to play with our toys for our own selfish gratification? To try and express our deepest feelings? To enlighten? To educate? Or merely to take what we can from what's out there? Are we going to steal someone else's samples, or compensate people for their creative work if we don't program our own sounds? Write about the same love lost/gained cliches of which record company executives seem so enamored, or strive for something original?

There's a lot wrong with this world. Mothers watch their children die by starvation, by war, or by torture. "Civilized" countries pour countless thousands of tons of carcinogenic and toxic waste into the earth, the air, and the water, causing what could be irreversible damage to our planet. Far from being revered as elders, old people are considered disposable (and don't get sick if you can't afford it). Meanwhile, some highly paid elected officials debate such lofty topics as whether or not backwards messages purportedly contained in songs will warp the consciousness of our youths.

The next question is "What can I do about it?" Thankfully, a lot of you *are* doing something about it—not by putting on a Superman cloak and trying to save the world, but by sharing your knowledge, donating software on a public domain basis, and generally acting in ethical ways . . . by helping someone who knows less to know more, by being, say, a salesperson who is more concerned about the client than the commission. Little by little, these acts of kindness can multiply into a mindset where instead of making an action pass the test of "what's in it for me," the action must pass the test of "how is this making the world a better place?"

And how does this tie into technology-as-escape? Simple. We all know about Nero fiddling while Rome burned. If we're going to play our synthesizers while the world takes a wrong turn, let's at least play something that might help make a difference.



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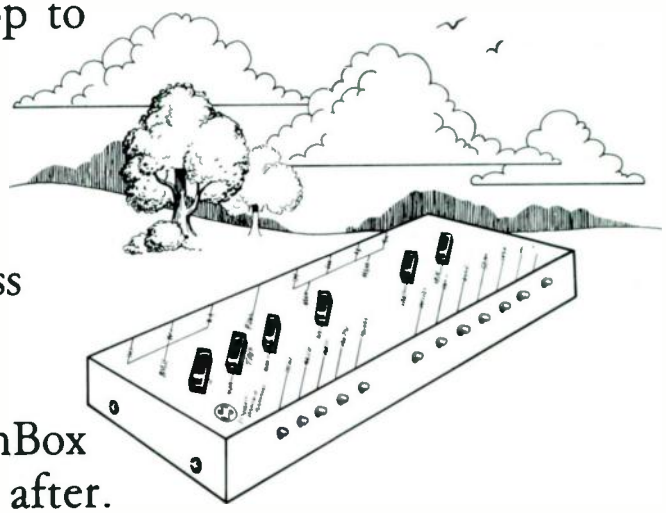
Once upon a time, Southworth Music Systems invented the JamBox/4™. Never before had a synchronizer done so much and cost so little. Not only did it let you SMPTE lock your MIDI sequencer to tape, but it let you position anywhere on your tape and lock up in less than a second, and stay locked for hours. As if that weren't enough it came with a built-in MIDI merger that let you record four MIDI instruments at the same time. And it let you filter out the MIDI you didn't want.

Everyone said the JamBox would only work with a fancy professional tape deck. They were wrong. It worked great with any tape recorder, even a home VCR.

But, alas it only worked with the Apple Macintosh™. The people using Performer™, and Q-Sheet™, and Cue™ and MidiPaint™ were all happy. But the people using the IBM PC, Commodore, Atari and hardware sequencers were all sad because they still had to spend thousands of dollars for a sync box that couldn't do nearly as much as the JamBox.

This made the people at Southworth sad too. So they worked night and day in their workshop to find a way to make a new JamBox that could work with any computer or hardware sequencer. They invented the JamBox/2. And it cost even less than the JamBox/4.



Pretty soon everyone had a JamBox and they all lived happily ever after.

SOUTHWORTH
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"Illegal" Sweetener Revisited

The letter by Jon Sanserino of Aphex Systems, Ltd. (Nov. '87 EM) inadvertently recommends one of the best information services an electronic musician can have: the U.S. Patent Office. A copy of the "Aphex" patent (U.S. No. 4,150,253), or any other U.S. patent, can be obtained by sending its number and $1.50 to the Commissioner of Patents and Trademarks, Washington DC 20231.

Ever wonder how a particular device works? Get the patent number from the back panel. One of my hobbies is attending the Audio Engineering Society Convention with notebook in hand searching for patent numbers on the latest gear. The *Journal of the Acoustical Society* also publishes abstracts of many electronic music patents. Reading these abstracts helps to sort the wheat from the chaff, as most patents for synthesizers are not interesting enough to justify the $1.50 cost of a copy.

But (. . . and this is a big but), don't build any patented circuit for sale or use for profit. Experimenting with such circuits, however, is encouraged, since it is in the public interest to advance the state of the art. That's why patents are published and copies are available at such a low price. There is another interesting point about patents: they only last 17 years *(assuming, of course, that the patent is not challenged and overturned during that time—Ed.)*. So on April 17, 1996, when we're all old and gray, we can dust off the Sept. '87 issue of EM and build our harmonic sweetener. On that day the "Aphex" patent expires.

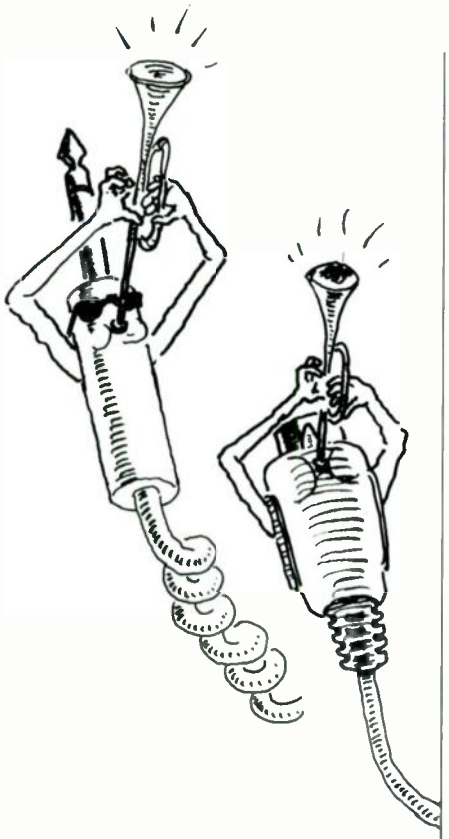
Devlin M. Gualtieri

The DAT Controversy Rages On

The fact that a publication such as EM would devote an editorial to the CBS-DAT controversy serves to point out just how many people this issue touches. Far from being simply a matter of whether or not it will be possible to dub your CDs onto DAT, the outcome of this debate will have far-reaching implications. I believe two considerations are fundamental to the issue:

1. The legislated mandate to install switches into any type of consumer recorder, with those switches capable of disabling the recording functions in situations that are outside of the user's control sets a bad precedent. The film industry has been working to require this same sort of switch in VCRs; if the recording industry is successful with the DAT legislation, the cause for the VCR switch will receive a significant shot in the arm.

It doesn't take a great deal of imagination to come up with other uses for these switches once they are in place. If they can be triggered by recorded material, they could also be triggered during any broadcast that someone has decided shouldn't be recorded. We are not just talking music and movies: the ability of any broadcaster (or government) to turn off



the nation's audio and video recorders with the flip of a switch is not an appealing prospect.

2. Those of us for whom the accurate reproduction of music in our homes is of significant importance in our lives have realized from the start that the CD format, such as it is, is far from the perfect medium it was made out to be. LP records are demonstrably better with respect to high frequency response, phase accuracy, and a variety of unquantifiable phenomena that affect the listening experience. The present makes clear, however, that the future is dark for the LP, and the CD, with its low sampling rate, gross quantization and sharp filtration, is what we all will *have* to live with. To further subject this format to a 3.8 kHz notch filter is unthinkable to listeners and to record companies that take pride in their products. It is apparently not unthinkable to CBS or other companies, though, who are supporting the legislation. *(I'm curious to see what will happen to the copy-code scheme now that CBS Records has been acquired by Sony, one of the major corporations pushing DAT—Ed.)*

I don't believe there is anyone who would not eventually be affected by the passage of this legislation, and certainly the readers of these pages would feel the effects more quickly and to a greater degree than others. I would urge any reader who feels as I do to make your feelings known, both to your representatives in Congress and to CBS.

Charles Williamson
Missouri

Sync-to-Tape Plus Carlberg Compliments

In response to Deb E. Danger's letter in the Nov. '87 EM concerning sync-to-tape, I would like to say that I had a similar problem with a Syntech C-64 MIDI interface with tape sync. It *never* worked! I went through several interfaces and tried everything you can imagine to get it to sync with no success.

I solved this problem by purchasing a Yamaha YMC10 MIDI Converter. This wonderful low-cost little box makes tape sync a pleasure. The YMC10 converts MIDI clock to an FSK sync tone and outputs MIDI clock from tape sync and it always, *always* works perfectly!

I use the YMC10 at home with my Tascam Model 38 and the level is a perfect -3 VU. At work I use the YMC10 on various 24-track recorders through a console channel preamp to bring it up to -3 VU at +4 dBm. Again, it works perfectly. It has never failed, skipped a pulse, or in any way done anything nasty. Long live Yamaha! Oops, sorry, I got carried away there.

Next, I would like to thank Robert Carlberg for his flattering review of my band Mastermind in the Aug. '87 EM. I loved it! The review has helped us gain some national attention and we sold quite a few tapes as a result. *So why isn't his column in the Nov. issue? (Glitch in the system—Ed.)* The little guy needs more help than ever in the corporate-controlled music world. Robert Carlberg deserves a medal!

Also, thanks for the review of the IVL PR7000 Mk II 4.3 software update in the Oct. '87 issue. I never would have known about it if it wasn't for the article by James Betts. That little bit of info alone is worth the price of an EM subscription.

In closing let me say that I think EM is a fine publication. It's kind of quirky, but it feels like *people* more than *business* and I like that. Keep up the good work and get Robert Carlberg back.

Bill Berends
New Jersey

Carlberg Criticisms

I usually don't get too excited over record reviews. After all, they're only one person's opinion, right? But when I read Robert Carlberg's review of Emmett Chapman's *Parallel Galaxy* (Oct. '87 EM), I just had to say something.

The statement "Chapman may not be as virtuosic on his own Stick as, say, Tony Levin, but . . ." is absolute crap. No offense to Mr. Levin, but he is a *bassist*. Granted, he is a very good bassist and one of my favorites, but he plays bass lines on his Stick and rarely even has the melody half of his instrument plugged in. Tony Levin uses The Stick as a synthesizer. Would you compare his synth playing with Wendy Carlos? Of course not. And to say that he is a Stick virtuoso is just ridiculous and shows Robert Carlberg's ignorance of the mu-

ILLUSTRATION BY DOUG BOONE

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The ACXEL is the very first system to use Artificial Intelligence for simulating musical sounds. Simply enter your sound; the ACXELIZER (Acxel's sound analyzer) will *automatically* program a large number of "Intelligent Synthesis Cells" (ISC) and combine them so as to form your *resynthesized* sound.

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The ACXEL is not a sampler: the resynthesis process is comparable to the way the *"human brain"* actually perceives a musical sound. To settle for anything less could stifle your musical creativity. . .

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sic and the instrument.

The Stick's range covers both bass *and* melody. Emmett Chapman takes full advantage of its range and tuning with a two-handed independence and interdependence.

Mr. Carlberg's dismissal of this landmark recording as "interesting" and "somewhere between jazz and bluegrass" demonstrates the fact that he didn't listen to the record. *(I can assure you that unlike many reviewers, Robert does, in fact, listen to records all the way through —Ed.)* The only song with even the slightest reference to bluegrass is the first one, "Back Yard." If he had listened further, Mr. Carlberg would have discovered a world of sounds and styles that is rare in these days of carbon copy musics. The songs on *Parallel Galaxy* range from a heavy and extremely emotional Stick/drums performance of "My Favorite Things" to a beautiful solo of John McLaughlin's "A Lotus on Irish Streams." Mr. Chapman's technique on "his own" Stick is *unmatched* and the performances on *Parallel Galaxy* are mind-boggling—often sounding like two or three musicians playing at once.

Emmett Chapman's *Parallel Galaxy* is a beautiful album, full of innovative sounds and techniques, and rather than being "heavily guided by the capabilities of The Stick itself" Mr. Chapman pushes his instrument into areas here no one else has yet to venture.

Barry F. Chabala
New Jersey

Barry—I think, as do you, that Emmett's playing is truly exceptional. I also think David Torn is a great guitarist, and Robert and I butted heads over that one too. But people hear what they hear; as someone who has listened to Parallel Galaxy *a lot, I don't think his comment about "somewhere between jazz and bluegrass" is off the wall. Emmett's music defines a very broad sweep, and the space between bluegrass and jazz is very large indeed. The intricate picking does recall a lot of bluegrass technique, and the improvisation recalls jazz. Let's just agree that for whatever reason, different people perceive different music differently. I'm glad you have written in to express your opinion.*

Having said that, I'd like to add that I have yet to hear a recording that truly captures the magic Emmett generates live, and I feel that those who have seen him live will derive the most enjoyment from his albums. If any readers get a chance to see Emmett in person, go for it—his act is all the more amazing by virtue of him relying solely on his musicianship and consummate technique to attract, hold, and ultimately mesmerize an audience's attention.

Poor Man's Split Defended

(In the Nov. '87 issue, we published a letter from an irate reader who blasted a program submitted by Les Penner, and said that the software EM *publishes is "worthless." The reader didn't sign his or her name, which was probably a good idea considering that the reader hadn't applied the program properly, as explained by Les in his thoughtful response. Here is one reader's opinion on the letter from the "mystery upset reader.")*

I hope this will be only one of many letters you get in support of Les Penner's "Poor Man's Split" program published in the Aug. issue. I found the program extremely useful since it provided all the necessary subroutines to access the MPU-401. It saved me quite a few painful hours trying to translate the C examples from the Voyetra 4001 manual into Turbo Basic. I can understand the mystery reader's frustration with a program that does not work. (I used a separate controller and sound generator so I did not have the echo problem described.) However, I *strongly* disagree with the notion that the program was useless. It is unrealistic to expect that a fully functional application would be presented in such a context. The author clearly stated the limitations of the program, and stressed the applicability of the subroutines for use in other programs. This is exactly what I needed, and I hope similar articles on the IBM PC/MPU-401 combination will be included in future issues. Please pass on my positive comments to Mr. Penner, and thanks for printing the only music magazine that I never throw away.

David Trubitt
Sylvan Systems
California

Thanks, Wendy

After the enthusiastic article Walter Daniel authored, "Alternate Scales on the Commodore 64: A Tuning Demonstration Program" (Oct. '87), a fine, imaginative idea, and the many flattering comments he makes about my tuning ideas, I am really embarrassed to have to write this letter. But just because "facts is facts," and for those readers who may attempt to hear the two fortuitous accidents of scale building I discovered, Alpha and Beta, it should be pointed out that the tuning tables listed in the article are in error.

Due to the colloquial nature of my interview with Freff (Nov. '86 EM), the 78.0 cent scale of Alpha may have looked like the number was a rounded-off value to the nearest cent. What was really rounded-off was the term "minor third" (as the interval being split). This is a *nominal* minor third I was using, and did not mean to equate it to an exact 6/5 minor third, as is interpreted for me in the article. I said 78.0 cents (in my mind) and it was written 78, no decimal, and that happens to be the correct value to use for Alpha, i.e., a division of the octave into 15.385 equal steps. Beta is 63.8 cents/step, or 18.809 equal steps per octave (oh, alright, Gamma happens to be 35.1 cents/step = 34.188 steps/octave). The value of 78.91 used in the article does split the perfect 6/5 just minor third into four equal parts, but only by ruining the major third and

perfect fifth. Alpha is *not just intonation*, only a surprisingly close approximation, with the added bonus of equal-sized steps. Unknown to me at the time is the close match to the 8/7 so-called "super second," which means that Alpha is in fact preferable to Beta for excellent versions of the dominant harmony (in third inversion) of 4:5:6:7, using the wonderful harmonies of 7/4.

Although an approximation, the 78.0 cent scale has very small errors, and thus leads to the very slow beats of "mistuning" by a max. of 2 to 4 cents, which, as Daniel aptly notices, "gives . . . a chorusing sound I rather like." Yup—perfection down to the 10th decimal is unnecessary, and systems like those now coming on-line with an accuracy of only about 1½ cents are musically fine. Our ears rather like the small rounding-off that this may result in, and mathematically it's certainly convenient to remain within this approximately 16-bit arithmetic.

So, the correct table for Alpha ought to be:

Note	Cents
0	0.0
1	78.0
2	156.0
3	234.0
4	312.0
5	390.0
6	468.0
7	546.0
8	624.0
9	702.0
10	780.0
11	858.0
12	936.0
13	1014.0
14	1092.0
15	1170.0
16	1248.0

Note that this table uses the standard convention of counting the steps above the reference note (= 0), and is *one less* than the table on page 41 of Daniel's article. I also have not included the ratios here, but if anyone wants them, they are easily gotten from:

R = exp(C*ln(2)/1200)

where C is the cent value, and R is the equivalent ratio.

In the above table the value for the perfect fifth lies nine steps above the tonic note, and is nearly perfect (0.045 cents sharp!). The major third is at five steps up, and is a respectable 3.68 cents too large. The minor third is at four steps, and is a symmetrical 3.64 cents too small. The inverted 7/4 seventh lies at three steps down, and this is only 2.34 cents small. If you play a dominant seventh on note 5, say, that will require the four notes:

2 + 5 + 10 + 14

with an amazingly agreeable result, as you ought verify for yourself. With the slightest interesting timbres having tiny vibratos and subtle ditherings as most digital gear includes anyway, the chord is rich and just-sounding, the small beatings being slow and "chorusy," if audible at all in such rich harmonies. All this in a scale with only 3.385 steps more per octave than good ol' "12 times the square root of 2" equal temperament! (You do have to work out external ways to get the 2/1's of octaves, however—no free lunches here.)

Given equipment that can quickly retune from moment to moment, you ought also explore the *Harmonic Scale*. Here is the full table of that:

HARMONIC SCALE ON C TABLE

Note	Ratio	Cents
Cnat	1/1	0.000
Db	17/16	104.955
Dnat	9/8	203.910
D#Eb	19/16	297.513
Enat	5/4	386.314
Fnat	21/16	470.781
F#	11/8	551.318
Gnat	3/2	701.955
Ab	13/8	840.528
Anat	27/16	905.865
Bb	7/4	968.826
Bnat	15/8	1088.269

This is an awfully good scale for those of you who, like me, find the "classic" form of just intonation rather a bit bland, and want both the purity and lack of rough intervals (*surds*, they're called) of just, but with more exotic harmonies and wonderous new chords, some very thick and "tall." Another variation combines both the *Harmonic Scale* and the *Classical Just*, in a truly *"Super Just"* set of 12 pitches (use 6/5 = 315.641 cents on note D#/Eb, 4/3 = 498.045 on note F, and 5/3 = 884.349 on note A; *the rest stet*).

This is a rather difficult topic to get into in so little space. But fortunately, there really aren't an infinite number of variations which are also:

1. Audibly quite different from one another
2. Great sounding, or nicely exotic
3. Fit practical bounds of hand, instrument and brain
4. Whatever else I've forgotten . . .

It's all rather like an analogy in the timbre world to finding great sounds on any powerful synth: these are usually little islands floating in a large sea of (infinite?—hah!) "possibilities," most of which are musically useless, even if impressive on a manufacturer's literature sheets!

Since I try to make my living as a composer, not a teacher or musical theoretician, I am not the person to be writing about this, anyway. Like all of you, I'm just out here "trucking along" and have no real care about the path it may take me along, just as long as my curiosities are satisfied, and the *evidence-of-passage* (read: compositions) are of sufficiently high quality (read: the best I could do at the time). For me the rest is vanity. And you know what? I suspect that that's also how it was for Bach, for Mozart, for Stravinsky, for them all. . . . Music ultimately isn't a lot of facts and rules, these come later. Initially it's the music, *just the music*. It stands and falls not on the scales and tuning used, nor the timbres contrived and orchestration these may permit. Rather it stands on the mini & masterpieces that may result and make use of these tools, but go beyond them to the human ear and heart. If it moves the hearer, that justifies the means, however difficult, time-consuming, clever, or even facile these may be. (Omigod—a speech! Cue the organ music. . .)

All this said, there is a fairly long article of some of my own personal observations about the tuning and timbre arena in the *Computer Music Journal* that came out late this past spring: Volume 11, No. 1, pages 29 through 43. Despite some ridiculous reductions of the original art work (bring a loupe) there may be a few useful thoughts buried therein, if you're interested. Meanwhile, hey, this "brief letter" with the tables has cost me five hours worth of composing time, so I must take my leave and get on with it! For the intent, ideas, and good stimulus, Walter Daniel, thanks for your article. And I'm certainly sorry to have to pick these nits over a welcomed, useful piece.

By the way, if you can get one to try, the Kurzweil 150 with Ralph Muha's latest software revision 1.6 has a lot of my tuning tables in it already, and a real convenient retuning algorithm to make them practical (lowest 12 MIDI notes, fairly useless things in themselves, retune the 150's table for that key). You can store the changes in a sequencer, even add them *after the playing is done*, and get auto retuning within the 144 resulting notes! Plus Hal Chamberlin's new *Sound Modeling Program* lets you build complex additive voices. Not perfection, for sure, but a fine tool for these jobs. And there's always the *MuLogix Slave 32*, a very modest investment, if you can find one. Happy woodshedding!

Wendy Carlos
New York

Additions and Corrections

The program "Groovestore" (Feb. '87 EM) has worked perfectly for some readers but not for others. Thomas Beutel, the program's author, tracked down the problem and writes:

"Please make the following corrections to lines 4010 and 4020:

```
4010 dim buf(265): bufadr# = varptr(buf(0)):
     midbuf# = 3518
4020 poke midbuf#, bufadr#: poke 3522,530
```

"As stated in the article, these lines modify

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*— **Frank Zappa***

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518-434-4110

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the ST's MIDI input buffer to allow more data to be received before the buffer overflows. With the original program, the buffer's address was only valid with the disk-based operating system. When Atari released their ROM-based version of TOS, the buffer was moved to a different address (which they are allowed to do, although I was not aware of it at the time).

"The address used above is valid for the ROM-based version of TOS dated 11-20-85. Check the date by booting up without a clock card installed. So what happens when there is another release of TOS? Atari provides a routine named IOREC in the XBIOS portion of TOS that tells you where the MIDI buffer is.

"Unfortunately, there is no easy way to call IOREC from ST Basic, but IOREC can be accessed from assembly, C, or some of the newer compiled BASICs. If you are considering any serious MIDI programming, you should buy one of these. The following, written in LDW BASIC, shows how to get the MIDI buffer address directly from the computer without worrying about what version of TOS you are using.

```
10  defdbl a
20  a# = xbiosl (14, 2)
30  print "The iorec address is ";a1#
40  a1# = peek (a#)
50  print "The MIDI buffer address is ";a1#
55  def seg = a#
60  size% = (256*peek (4))+peek(5)
65  def seg = 0
70  print "The size is ";size%
90  print "Hit any key . . ."
100 if inkey$ = "" then goto 100
110 end
```

"I hope these changes/corrections are helpful." Thanks, Thomas

In case you wondered who did the excellent illustrations for the Nov. and Dec. '87 letters columns (the credit line was inadvertently omitted), let's thank Lanee LaShagway, whose fine artwork has graced EM's pages in the past and will continued to grace our pages in the future. Also, the photo that usually heads up the editor's note was a close-up of a promotional photo of me taken by Vesta Copestakes.

In the Jan. issue, in "25 Hot MIDI Products for Under $500," a reference was made to free public domain programs that could be downloaded from telecommunications networks such as PAN. Some people misread this and thought that not only the public domain programs, but PAN's services, were free (ah, wishful thinking!). PAN—like CompuServe, Esi, and many other services—charges for connect time and maintenance of the user's electronic mailbox. For more information on how telecommunications services work, see the Sept. '86 issue. EM

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

Pre-recorded Organ Disks: I was just given a Technics organ (EX 70M, with a SDY5 3.5-inch hard disk recorder). As of yet, I am no musician and will take my first lesson this week. Is there a company that sells pre-recorded songs for this disk drive? If so, please let me know. Thanks! N.W. Portale, Jr., 602 SE Evergreen Terr., Port St. Lucie, FL 34983.

GR-700 MIDI In: Two years ago I purchased the Roland G-707/GR-700 MIDI guitar synthesizer combination and recently purchased a Yamaha CX5M music computer system. I would like to use the GR-700 as a peripheral MIDI sound source for the CX5M. However, the GR-700 has no MIDI In, only MIDI Out. Is there a modification available that will allow the GR-700 to be driven via MIDI? Thank you for any information you can pass on. Tom Cormier, 60 Zion Hill Rd, Salem, NH 03079.

Fairchild Equalizer: I am looking for schematics and documentation for a Fairchild-Robins 644B Equalizer Module. This information or leads as to where I may find it would be greatly appreciated. Phil Cibley, 138 E. 38 St., New York, NY.

Album Query: In 1975, Mort Garson produced an album by Ataraxia called *The Unexplained*. Was Ataraxia a permanent group, or just studio musicians put together for this album? Are there other albums by them? If so, how can I get them? (I don't want used ones.) I would like to avoid import albums, since I have a very hard time getting imports here. Can you help? M.J. Cline, 825 Watson, Topeka, KS 66606.

Maestro USS-1: I need schematics for the Maestro USS-1 Universal Synthesizer and Gibson/Maestro Fuzz-Phazzer Pedal (the schematic info is on the inside of the pedal's bottom plate). Pedro "Capt." Bell, PO Box 208309, Chicago, IL 60620.

E-H Octave Multiplexer: I have an Electro-Harmonix Octave Multiplexer foot pedal. It has a high filter, blend, bass filter, and bass switch. It has "Electro-Harmonix 1975" printed on the PC board. I need at least the schematic and parts board layout, although I am after any and all information I can get to service this effect. Ronald G. Ortiz, 1020 Brickyard Rd., Lot A61, Seaford, DE 19973.

MIDI Users Group: I am looking for MIDI groups in my area, especially ones with a slant toward the Mac. Can you help? I've tried contacting the American MIDI UG with no success. Thanks. Derek Kueter, 181 Ada Ave. #49, Mountain View, CA 94043-4904.

MXR Pitch Transposer/Delay Schematic: I need the schematic or owner's manual for repair of the transposer and display; the ART schematic may also be compatible. If you can help, please contact me. Erik Hayes, Purdue University, Cary Quad Box 379, West Lafayette, IN 47907 or call 317 / 495-2583. EM

ACCESSORIES

▶Two Macintosh desk accessory patch librarians ($40 each), **TX81Z Filer** for the Yamaha TX81Z and **ESQ Filer** for the Ensoniq ESQ-1 and ESQ-M, are always available from the Apple menu. You can send banks of sounds to your synthesizer, receive banks from the synth for storage on computer disk, and swap between banks to create custom collections of voices, without having to quit your sequencer.

Austin Development
227 Marin Street
San Rafael, CA 94901
☎ 415 / 454-9620

▶The **TRIPP Strip** ($299) has two separate functions. As a MIDI-programmable linear performance controller, it sends any number of MIDI continuous controller messages over any number of MIDI channels. As a master MIDI manager for synthesizers and electronic keyboards, it stores up to 255 setups, consisting of channels and program changes. The strip is a 30-inch long × ¾-inch wide hard-coated touch surface that mounts just behind the keys of any electronic keyboard. It sends MIDI messages for new sound articulations from a light, natural touch of a finger at any point along its length. Dozens of fixed point switching applications for mixing sounds, shading voices, transposing, and other effects are also possible. Parameters are built, edited, and stored with the device's built-in natural language editor or a personal computer with MIDI System Exclusive commands.

Perfect Fretworks Co.
PO Box 731
Rockport, MA 01966
☎ 617 / 546-6232

Roland M-160 mixer.

▶The **M-240** ($1,495) and **M-160** ($1,095) audio line mixers provide multiple inputs for electronic musicians who need to mix a large number of electronic instruments. Both units have pro level (+4 dB) balanced XLR inputs, and unbalanced phone jack outputs. Each channel has three stereo effects sends and a mono aux send (with pre/post selection), pan and fader. There are three stereo returns and one mono return with a pan pot. Input channels 1 and 2 accept mic level signals. Both units have level meters and peak indicators, a headphone jack, and are compact enough for on-the-road needs. The M-160 is a 4U rack mount, and the M-240 a compact console-style mixer.

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

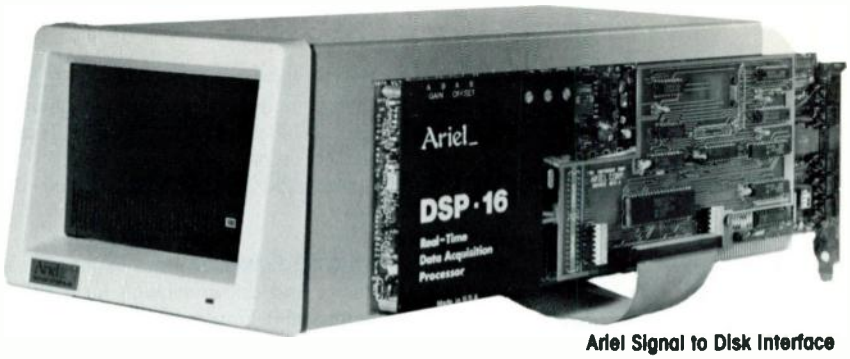
▶The **MT9500 Mini Thru** ($54.95) is a one-input, four-output MIDI Thru box with an active data input light. The **MT8500 Multi Thru** ($89.95) is a two-input, six-output MIDI Thru box that features assignable independent color-coded outputs, dual active data input lights, and gold-plated data switch contacts. Both feature a one-year limited warranty, power supply, and full implementation of MIDI Spec 1.0 for compatibility with all MIDI systems.

Price Technology
PO Box 60773
Longmeadow, MA 01106
☎ 413 / 567-5969

ELECTRONIC PERCUSSION

▶The **ddrum 2** ($3,900) is a 5U rack mount, integrated system for use with ddrum pads. It features a 16 kHz-bandwidth sound module (with individual and master outputs) that stores 80 drumkits of sounds internally, supplemented by a large library of "intelligent" cartridges. Programmable parameters include pitch bend, decay, dynamic filtering, bass and treble, volume, and panning/effects send. The *Link* function will trigger several sounds from one hit. The unit features a built-in, programmable eight-channel mixer, programmable MIDI interface, special functions for triggering from audio sources, and separate mix out and headphone levels. The complete kit ($5,380) includes the ddrum 2 brain, pads (with Remo heads) for independent-rim snare, kick, and three toms.

ddrum USA
PO Box 166
25 Lindeman Drive.
Trumbull, CT 06611
☎ 203 / 374-0020



Ariel Signal to Disk Interface

DIGITAL RECORDING

▶**SDI**—the Signal to Disk Interface System (from $3,495)—works on an IBM PC or compatible to record two-channel, 16-bit linear PCM data in real time at a sample rate adjustable from 1 to 50 kHz, using three-pole Chebychev anti-aliasing filters with a rolloff at 20 kHz. The unit uses an Ariel DSP-16 Data Acquisition Processor, a SCSI interface and the Ariel DSPDISK software to provide the PC with the speed and storage capacity needed for digital recording. The system records directly onto as many as seven memory devices —50- or 250-MegaByte internal or external hard disks or 800 MegaByte optical (WORM) disks—to provide hours of recording. With a mouse or cursor and function keys, users can graphically view and edit the recorded signal using zoom, repeat, attenuate, delete and move. Upgrade kits for existing DSP-16 processors are also available.

Ariel Corporation
110 Greene Street, Suite 404
New York, NY 10012
☎ 212 / 925-4155

LANGUAGES

▶Developed at the Center for Contemporary Music at Mills College, the **Hierarchical Music Specification Language** ($150) is an object-oriented set of extensions to the Forth language for Mac Plus, SE and II, and Amigas with 1 Meg or more of RAM. HMSL includes tools for exploring algorithmic composition, intelligent real time instrument design with full MIDI control and response, and musical cognition and perception. HMSL can treat musical parameters as abstract numeric "shapes" that represent melodies, profiles of harmonic complexity, intervals and other user-defined parameters, and can be edited graphically while being performed. Shapes, user-written routines, real time tasks and other musical objects can be embedded in a complex hierarchy and executed. The Amiga version provides a toolbox for local sound generation, playing back samples, and alternate tunings based on ratios or pre-calculated periods. HMSL comes in source code that must be compiled on the Mac with Mach 2, Version

AFTERTOUCH™
OFFICIAL NEWS FROM THE YAMAHA USERS GROUP FEBRUARY, 1988.

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YAMAHA® HAS JUST GIVEN MUSICIANS new control over sampled sounds with the TX16W Digital Wave Filtering Stereo Sampler. It's a 12-bit sampler with full stereo capability.

The TX16W lets you sample any sound you can hear—up to a 50KHz sampling rate—and then modify it, using an exclusive Yamaha technology called Digital Wave Filtering. This provides the cleanest possible method for creating tonal effects: filtering samples while they're still in digital form.

Up to 32 sampled sounds can be assigned to one voice. And you can create even richer programs by layering as many as 16 of these voices. A Key-Crossfade function lets you assign voices to different sections of the keyboard, with gradual tonal changes. While a similar Touch-Crossfade function lets you blend up to 16 voices in and out as a function of key velocity.

There are 32 individual LFOs, one for each of the available 32 timbres that make up a voice. There's also an LFO for each of the 32 digital filters, and a global voice performance LFO.

The TX16W has a built-in 3.5" disk drive and 1.5 megabytes of memory, which can easily be expanded to 6 megabytes using plug-in modules.

Given its stereo sampling power, the TX16W's most amazing feature may be its USA suggested list price of $2895.00. It's available now at authorized Yamaha Digital Musical Instrument dealers.

YAMAHA TX16W DIGITAL WAVE FILTERING STEREO SAMPLER.

Hot Tips

Using a Breath Controller with the FB01 FM Sound Generator.

The FB01 accepts Breath Controller data only to control modulation. But if your keyboard has assigned controller functions, you can also control envelope. Just assign the Breath Controller to control the FB01's volume, so blowing harder or softer will result in a louder or softer tone. This is similar to the use of the Breath Controller when assigned to the EG Bias on a DX7. But it's different, too, because if the voice has touch sensitivity, the volume of each note will depend on both key velocity and the Breath Controller.

Questions

The RX17 drum machine is capable of storing 100 patterns. I haven't saved nearly that many, but for some reason, I'm getting a "ptn memory full" message. What's going on?

The memory in your unit is an "event memory." That is, it remembers each musical event (in this case, each note) that you program. There's enough room so that you can, in fact, create 100 different patterns. But we emphasize the word *can*. After all, memory can never be infinite. And if your patterns are extremely complex—containing many events—you'll run out of memory before you reach the limit. Basically then, the choice is yours. You can create a large number of short patterns, or create a smaller number of long, complex patterns.

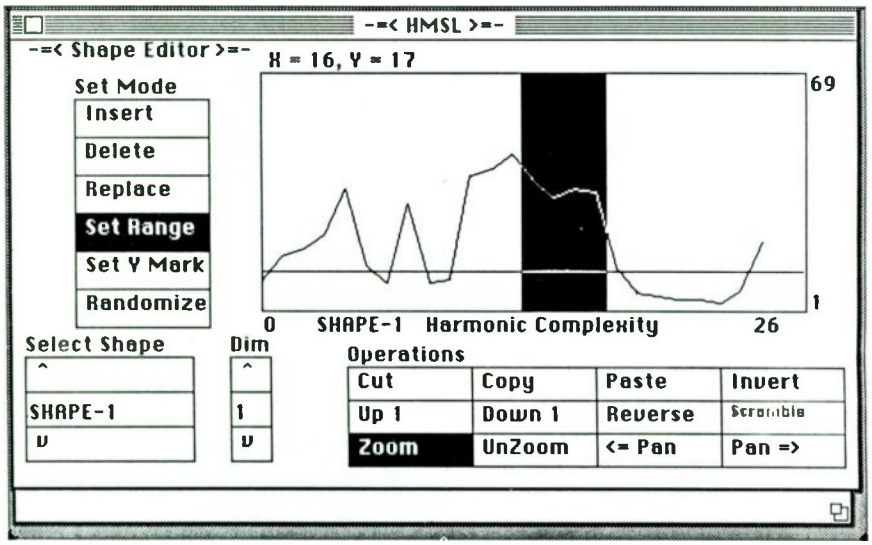
I've heard that some non-Yamaha RAM cartridges for the DX7 tend to wear off the gold on the internal contacts, leading to costly repairs. Is this true? And if so, which ones are safe to use?

Yamaha's Service Division has nothing on record to suggest that there's any kind of problem with other manufacturers' cartridges. If you really need more assurance, you might try to get a guarantee on a cartridge before you buy it.

AFTERTOUCH is a monthly newsletter filled with the latest on Yamaha products. Get a year's subscription free by writing to: AFTERTOUCH, P.O. Box 7938, Northridge, CA 91327-7938.

YAMAHA

Yamaha Music Corporation, USA, Digital Musical Instrument Division, P.O. Box 6600, Buena Park, CA 90622.



Frog Peak Music HMSL Shape Editor

2.12 or higher ($99.95 from Palo Alto Shipping) or on the Amiga with JForth ($99.95 from Delta Research).

Frog Peak Music
PO Box 9911
Oakland, CA 94613
☎ 415 / 485-6867

LIBRARIANS

▶The **FB-01 DataFiler** ($92.50 incl. s/h) for the Commodore Amiga (a $75 version for the C-64/128 is also available) provides complete access to all the Yamaha FB-01's resources, including those not available from the front panel. The program has full functions for editing, organizing, and documenting voices and configurations, along with dynamic updating of graphic displays of envelopes and algorithms. Change parameter values with slider gadgets, alphanumeric entry and mouse clicks; audition edits from external MIDI devices, by mouse or by function keys. The program supports voice swapping and printer output, includes original voices, and adheres to all Amiga standards and will multitask with other Amiga software (including SoundScape and DMCS sequencers).

Triangle Audio
PO Box 1108
Sterling, VA 22170
☎ 703 / 437-5162

SIGNAL PROCESSORS

▶The **H3000 Ultra-Harmonizer Pitch Change and Effects Processor** ($2,395) offers 16-bit, 44.1 kHz sampling with a 5 Hz-20 kHz frequency response as well as pitch-shifting and many programs for reverb, flanging and chorusing. Its new *Diatonic Pitch Shift* program shifts an input to a musically correct interval based on a user-specified key. One input can be shifted to two separate intervals to create triads from single notes. The H3000 has a 40 character × two-line backlit LCD, "soft" knob, and a direct-entry keypad. MIDI programmable functions include Program Change, parameter editing, parameter modulation (allowing parameters to be modified in real time during performance), loading, levels for automated mixing, bypass relay and synching delays to MIDI clock. Fifty onboard presets are supplemented by up to 64 locations for user programs.

Eventide Ultra-Harmonizer®

Eventide Inc.
One Alsan Way
Little Ferry, NJ 07643
☎ 201 / 641-1200

SYNTHESIZERS

▶**Oasis ST** ($249), a graphic sample editor for the Ensoniq Mirage and any of the Atari ST computers, allows for faster and easier looping and greater editing accuracy. Oasis displays a sample's waveform on screen and includes a zoom in/out feature for easier editing. Editing features include fade in/out, add, copy and invert. Oasis can manipulate multi-samples, reverse ramp scales, rotate samples from left to right, and do amplitude and time scaling. Each of the 64 keyboard splits has individual velocity and looping parameters, and displays mouse commands. Samples and program parameters are saved on Atari disks whether formatted for the Mirage or not, and a full-feature sound Manager can transfer up to seven samples.

Hybrid Arts, Inc.
11920 W. Olympic Blvd.
Los Angeles, CA 90064
☎ 213 / 826-3777

▶The **K-5 Synthesizer** ($1,995), and the **K-5M** rack mount ($1,495) are functionally identical, affordable additive synthesizers that combine an intuitive approach and unprecedented control. Each digital voice has two digital harmonic generators with control of 126 harmonics for realism in piano, brass and string sounds. Each voice has a digital filter and amplifier, 14 six-stage envelopes, digital EQ, and extensive modulation. The two units are fully multi-timbral, and voices can be set to play over a note or dynamic range, so brass, piano, bass and lead lines could play simultaneously and still leave notes for live performance. The keyboard of the K-5 is sensitive to both attack and release velocity along with aftertouch. Velocity response is selectable and can be programmed to change voice patches.

Kawai America Corporation
PO Box 9045
Compton, CA 90224-9045
☎ 213 / 631-1771

Kawai K5 Digital Multi-Dimensional Synthesizer

THE DRUM MACHINE WITH TODAY'S SOUNDS, TOMORROW'S FEATURES AND YESTERDAY'S PRICE

Assuming you haven't already heard its incredibly low price, the first thing that will impress you about the new Roland TR-626 Rhythm Composer is the sound. We went back to the studio to create all-new high-resolution PCM samples of the finest percussion instruments to give you the latest in today's sounds. And that's just what you'll find on the TR-626: round woody-sounding basses, tight full snares (even including a gated-reverb snare) toms deep enough to please a Phil Collins, clear, vibrant cymbals, and the most complete selection of latin percussion instruments that'll really add some spice to those dance tracks. Thirty digital samples altogether, and each one is tunable as well as level programmable.

Then, since we'd come up with all-pro sounds, we just had to balance it out with the state-of-the-art in pro-performance features: like the most musically-natural and accurate programming software anywhere — combining the best of real-time and step programming with visual accuracy through its sophisticated LCD Display Window. To make the rhythms sound as real as the samples, we've included shuffle, flam and accent features.

On the TR-626 you'll also find songs up to 999 measures, eight assignable outputs for separate processing of the instrument samples, stereo mix, tape sync, MIDI sync and trigger out. Finally, in a fit of nostalgia, we threw in a price so low it sounds like the good old days: just $495.00.*

But probably the most important performance feature is one you won't find anywhere else — and it's an idea that makes the TR-626 the first drum machine that's really usable in live performance. We've added a Memory Card Interface that allows you to load-in stored songs and patterns as fast as you can push a button. Up to 18 songs worth of drum data can be saved and loaded in a flash from the credit-card sized M-128D Memory Card.

If you think all this sounds like the most exciting drum machine to come down the pike in a long while, you're right. Because while the idea of a drum machine isn't new, the idea of a drum machine with some really new ideas of sounds, features and price is positively revolutionary. See and hear the TR-626 today at your Roland Dealer. *RolandCorp US 7200 Dominion Circle, Los Angeles, CA 90040 (213) 685-5141.*

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*Suggested Retail Price.

YOUR BEST VALUE IN 4-TRACK

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With an X-30, you'll be recording tighter tracks and mixing better sounding tapes faster and easier than ever.

What you see, hear and touch are so completely integrated, so beautifully engineered, you won't have to work a puzzle.

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Dolby B* NR gives you true compatibility with your existing tapes, and Dolby C NR will help you make outstanding live recordings. Unlike full bandwidth processors, which can interfere with kick drums and bass lines, Dolby C circuits ignore these low frequencies and eliminate tape hiss, which is only present in the mid and high frequencies.

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Call the **Fostex X-30** technology high, hip or hot -- it's your best 4-track value today by far --because it's all yours for just **$499.00**†.

*Dolby is a registered trademark of Dolby Labs Licensing Corp.
†Actual retail prices are determined by individual Fostex Dealers.

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SOFTWARE

▶The **Ad Lib Personal Computer Music System™** ($245) for the IBM PC, XT, AT and compatibles, lets the user compose and play back music with up to six melodic and five percussive instruments. It consists of a *Music Synthesizer Card*; *Visual Composer*, a program that lets users with no musical training create, modify and play back their own compositions; and *Juke Box*, a program that plays music already created on Visual Composer. To compose, the user selects an instrument and draws a line on the screen that denotes pitch and duration by its length and position. The synthesizer card puts out audio via a headphone jack, an amplifier capable of driving small speakers, and a volume control. Also available are **Music Championship #1: Basic Concepts** ($39.95), an interactive game for ear-training, and **Instrument Maker** ($49.95), which allows the user to create additional instruments.

Ad Lib Inc.
50 Staniford Street, Suite 800
Boston, MA 02114
☎ 800 / 463-2686

▶**The Golden MIDI System** ($19.95/title) is a line of MIDI-sequenced hit songs designed to sound good on even low-cost equipment. Students, amateurs and professionals who want to play or sing along with sequences of hit tunes can mute the parts they want to play, and use the other parts as a MIDI backup band. A 106-page manual ($49.95) explains how to set up a playback system using commercially available sequencers, drum machines and tone generators. It explains channel assignments, octave registration, pitch bend and velocity sensitivity, and other setup details, including calibration/diagnostic sequences to maintain a reference setup independent of the equipment used. Sequencers currently supported are the Roland MC-500, Yamaha QX5 with MDF-1 drive, and Promidi for the IBM PC/compatibles. Support for Sequencer Plus, Texture and Cakewalk should be available soon. Drum machines supported are the Yamaha RX5, Roland TR-626 and TR-505, and the drum/percussion section of the Roland MT-32. Variant sequences are available for the ESQ-1 sequencer and SQX-10 expander. Tunes include, "Addicted to Love," "Eye of the Tiger," "The Heat is On," "Midnight Hour," "When Doves Cry" and more.

Golden MIDI Music and Software, Inc.
1020 15th Street, Suite 29K
Denver, CO 80202
☎ 303 / 534-4055

▶**AudioMaster™** ($59.95), a digital sound sampling and editing program for the Commodore Amiga 500, 1000 and 2000, will sample up to two minutes of sound with 512K RAM (five minutes with the Amiga's eight Meg maximum) using any Amiga sampling input hardware. It will internally re-sample samples to be compatible with other music programs, display waveforms for on-screen cut, copy and paste editing, re-tune samples, and save samples in 1-, 3- or 5-octave formats. Features include zooming in and out to view either small segments or an overview of a sample, adding echo, reversing a sample, low pass filtering, and adjusting the sample rate.

Aegis Development Inc.
2210 Wilshire Blvd., Suite 277
Santa Monica, CA 90403
☎ 213 / 392-9972

Tom Oberheim, founder of Oberheim Electronics and inventor of the Oberheim line of electronic music equipment, has announced the formation of his new company, *Marion Systems Corporation* (Santa Monica, CA), that will be actively involved in the marketing of new products for the musical instrument industry. As he has done for a quarter of a century, Mr. Oberheim will be working closely with musicians to insure musically useful products. He will also provide broad-based consulting services to the industry. EM

Okay, so it's just a bunch of numbers and letters—but we're talking about a *real useful* bunch of numbers and letters. If you work with MIDI, you'll find this to be an invaluable reference.

MIDI By the Numbers

BY DICK VALENTI

THREE HUNDRED AND FIFTY THOUSAND! That's when I stopped counting how many unique MIDI messages can be put together using the current MIDI specification. When you include the added confusion of binary versus hexadecimal versus decimal notation, the simple task of looking up a specific message in the MIDI spec can be quite time-consuming.

The attached tables should help you find your way around the MIDI maze. **Table 1** lists all the MIDI status bytes, along with the binary, hex, and decimal value for each. **Table 2** lists the specific note numbers (by octave) used for note event data. The channel Control and Mode changes (status bytes 176-191) are further expanded by function in **Table 3**.

What good is all this? Aside from the tutorial benefits of being able to see the complete spectrum of MIDI commands at a glance, I found I needed these tables to make computer interfacing easier. For example, I use a PC to control all the patches of our home setup. If I want, say, to change the patch on channel 5 to patch number 23 with a volume level of 50, I would transmit the following sequence: 196 (channel 5 program change), 23 (patch number), 180 (channel 5 control change), 7 (main volume), 50 (most significant byte, or MSB).

Of course, you will still have to refer to a piece of equipment's MIDI implementation chart to understand how that gear responds to particular commands. For example, to change a DX7 patch you would have to subtract 1 from the number you see on the DX7 control panel (patches 1 through 32 require commands 0 through 31). Similarly, if you want a DX7 cartridge patch, you would have to add 31 to the number on the panel. Nobody said MIDI had to be simple! But hopefully, this chart will make your MIDI life go a little bit easier.

***Dick Valenti** is a retired electronic engineer. His wife Dorothy received her degree in classical organ music. Dick believes that classical music lovers have yet to discover the power of MIDI. His home system boasts, among other things, a full 32-note pedalboard converted to MIDI from an old classical organ.*

TABLE 1: Summary of Status and Data Bytes

STATUS BYTE					DATA BYTES	
First Byte Value			Function		Second Byte	Third Byte
Binary	Hex	Dec-imal				
10000000	80	128	Channel 1	Note off	Note	Note
10000001	81	129	Channel 2	"	number	velocity
10000010	82	130	Channel 3	"	(0—127)	(0—127)
10000011	83	131	Channel 4	"	see	"
10000100	84	132	Channel 5	"	table 2	"
10000101	85	133	Channel 6	"	"	"
10000110	86	134	Channel 7	"	"	"
10000111	87	135	Channel 8	"	"	"
10001000	88	136	Channel 9	"	"	"
10001001	89	137	Channel 10	"	"	"
10001010	8A	138	Channel 11	"	"	"
10001011	8B	139	Channel 12	"	"	"
10001100	8C	140	Channel 13	"	"	"
10001101	8D	141	Channel 14	"	"	"
10001110	8E	142	Channel 15	"	"	"
10001111	8F	143	Channel 16	"	"	"
10010000	90	144	Channel 1	Note on	"	"
10010001	91	145	Channel 2	"	"	"
10010010	92	146	Channel 3	"	"	"
10010011	93	147	Channel 4	"	"	"
10010100	94	148	Channel 5	"	"	"
10010101	95	149	Channel 6	"	"	"
10010110	96	150	Channel 7	"	"	"
10010111	97	151	Channel 8	"	"	"
10011000	98	152	Channel 9	"	"	"
10011001	99	153	Channel 10	"	"	"
10011010	9A	154	Channel 11	"	"	"
10011011	9B	155	Channel 12	"	"	"
10011100	9C	156	Channel 13	"	"	"
10011101	9D	157	Channel 14	"	"	"
10011110	9E	158	Channel 15	"	"	"
10011111	9F	159	Channel 16	"	"	"
10100000	A0	160	Channel 1	Polyphonic	"	Aftertouch
10100001	A1	161	Channel 2	aftertouch	"	pressure
10100010	A2	162	Channel 3	"	"	(0—127)
10100011	A3	163	Channel 4	"	"	"
10100100	A4	164	Channel 5	"	"	"
10100101	A5	165	Channel 6	"	"	"
10100110	A6	166	Channel 7	"	"	"
10100111	A7	167	Channel 8	"	"	"
10101000	A8	168	Channel 9	"	"	"
10101001	A9	169	Channel 10	"	"	"
10101010	AA	170	Channel 11	"	"	"
10101011	AB	171	Channel 12	"	"	"
10101100	AC	172	Channel 13	"	"	"
10101101	AD	173	Channel 14	"	"	"
10101110	AE	174	Channel 15	"	"	"
10101111	AF	175	Channel 16	"	"	"
10110000	B0	176	Channel 1	Control/	See	See
10110001	B1	177	Channel 2	mode change	table	table
10110010	B2	178	Channel 3	"	three	three

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Playing an instrument with Poly-Key pressure is a musical treat. Each individual note responds vividly to your touch. You can control the modulation of pitch, vibrato, brightness or loudness—even the mix between two different sounds—all by varying the pressure of individual keys. So, instead of just playing a chord, you can command an entire string section. Or give horns real individuality. Or play dozens of other expressive effects you never could before.

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Another new means of expression—Instant Patch Select—lets you choose alternate wavesamples or programs instantly in real time. With two patch select buttons located near the pitch wheel, you can instantly add expressive variations to a sound as the spirit of the moment moves you.

In addition, the EPS has 20 dynamically assigned voices, 20Hz to 20KHz audio bandwidth, 16 bit data format, 13 bit sample converter, 24 bit internal processing, floating point output with 96dB dynamic range and a built-in 8-track MIDI sequencer. And since the EPS can convert and play Mirage sounds, there's a ready library of over 2500 sounds available right now.

The Ensoniq SQ-80 — Studio technology with the performance touch

In addition to expressiveness, your instrument needs sounds that can cut through a stage full of amplified instruments. The Ensoniq SQ-80 Cross Wave Synthesizer cuts like a sharp knife.

Cross wave technology involves grafting the transient attack characteristics of one sound onto the beginning of another. The SQ-80 has a total of 75 sampled and synthesized waves on board, including multi-sampled bow, pick, breath and hammer attack transients, as well as inharmonic loops and sampled and synthesized sustain waves. So you can create thousands of sounds that not only cut, but sing and soar as well.

There's also an 8-track MIDI sequencer and built-in 880K disk drive for program, sequence and MIDI system exclusive storage. Each disk can store up to 1728 different programs and 10 full sequencer or MIDI system exclusive blocks. With one disk, you can be set up and ready to play before the guitar player tunes up.

Discover a new level of performance. Step up to an Ensoniq EPS Performance Sampler or SQ-80 Cross Wave Synthesizer at your authorized Ensoniq dealer, today. For the name of your nearest US dealer call toll free: 1-800-553-5151.

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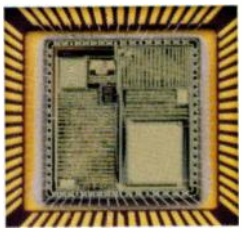


Freedom of Expression.

The 1000 Series' generous polyphonic capabilities free you from the expressive limitations of 12-voice or 16-voice systems. The 1000 PX and K1000 offer the power of 24 voices while the 1000 SX, 1000 GX and 1000 HX each have 20 voices. And, if you need more voices, you can combine all four 1000 Series modules to create an 84 voice, 8-output super-system. So go ahead. Stack voices to your heart's content. Build complex, multi-voiced sequences. Go for those big, two-fisted chord shapes. The 1000 Series modules give you miles of sonic territory to roam at will.

Freedom of Choice.

The 1000 Series is truly democratic too. Three different operating modes let everyone—from novices to advanced programmers—benefit from the 1000 Series' bountiful capabilities. In Play Mode, you can use those great Kurzweil sound programs just as they are. Simply select a program and play. The Compiled Effects mode lets you apply a variety of popular effects to any of the preset sound programs. And the Modular Editing mode takes you deep inside the 1000 Series' voice architecture.

So stand up for your rights. You owe it to yourself to check out the 1000 Series. For more information, visit your nearby Kurzweil dealer. Or write to us at Kurzweil Music Systems, Inc., 411 Waverley Oaks Road, Waltham, MA 02154, (617) 893-5900. In Canada, write to Heinl Electronics Inc., 16 Mary Street, Aurora, Ontario L4G 3W8, (416) 727-1951.

KURZWEIL™
Music Systems

*$1995 suggested retail price for 1000 SX and 1000 HX. $2,395 suggested retail price for 1000 GX and 1000 PX. $2,595 suggested retail price for K1000. All specifications and prices subject to change without notice.

TABLE 1: Summary of Status and Data Bytes

STATUS BYTE					DATA BYTES	
First Byte Value			Function		Second Byte	Third Byte
Binary	Hex	Decimal				
10110011	B3	179	Channel 4	Control	See	See
10110100	B4	180	Channel 5	mode change	table	table
10110101	B5	181	Channel 6	"	three	three
10110110	B6	182	Channel 7	"	"	"
10110111	B7	183	Channel 8	"	"	"
10111000	B8	184	Channel 9	"	"	"
10111001	B9	185	Channel 10	"	"	"
10111010	BA	186	Channel 11	"	"	"
10111011	BB	187	Channel 12	"	"	"
10111100	BC	188	Channel 13	"	"	"
10111101	BD	189	Channel 14	"	"	"
10111110	BE	190	Channel 15	"	"	"
10111111	BF	191	Channel 16	"	"	"
11000000	C0	192	Channel 1	Program	Program #	None
11000001	C1	193	Channel 2	change	(0—127)	"
11000010	C2	194	Channel 3	"	"	"
11000011	C3	195	Channel 4	"	"	"
11000100	C4	196	Channel 5	"	"	"
11000101	C5	197	Channel 6	"	"	"
11000110	C6	198	Channel 7	"	"	"
11000111	C7	199	Channel 8	"	"	"
11001000	C8	200	Channel 9	"	"	"
11001001	C9	201	Channel 10	"	"	"
11001010	CA	202	Channel 11	"	"	"
11001011	CB	203	Channel 12	"	"	"
11001100	CC	204	Channel 13	"	"	"
11001101	CD	205	Channel 14	"	"	"
11001110	CE	206	Channel 15	"	"	"
11001111	CF	207	Channel 16	"	"	"
11010000	D0	208	Channel 1	Channel	Aftertouch	"
11010001	D1	209	Channel 2	aftertouch	pressure	"
11010010	D2	210	Channel 3	"	(0—127)	"
11010011	D3	211	Channel 4	"	"	"
11010100	D4	212	Channel 5	"	"	"
11010101	D5	213	Channel 6	"	"	"
11010110	D6	214	Channel 7	"	"	"
11010111	D7	215	Channel 8	"	"	"
11011000	D8	216	Channel 9	"	"	"
11011001	D9	217	Channel 10	"	"	"
11011010	DA	218	Channel 11	"	"	"
11011011	DB	219	Channel 12	"	"	"
11011100	DC	220	Channel 13	"	"	"
11011101	DD	221	Channel 14	"	"	"
11011110	DE	222	Channel 15	"	"	"
11011111	DF	223	Channel 16	"	"	"
11100000	E0	224	Channel 1	Pitch	Pitch	Pitch
11100001	E1	225	Channel 2	wheel	wheel	wheel
11100010	E2	226	Channel 3	range	LSB	MSB
11100011	E3	227	Channel 4	"	(0—127)	(0—127)
11100100	E4	228	Channel 5	"	"	"
11100101	E5	229	Channel 6	"	"	"

TABLE 1: Summary of Status and Data Bytes

STATUS BYTE					DATA BYTES	
First Byte Value			Function		Second Byte	Third Byte
Binary	Hex	Decimal				
11100110	E6	230	Channel 7	Pitch	Pitch	Pitch
11100111	E7	231	Channel 8	wheel	wheel	wheel
11101000	E8	232	Channel 9	range	LSB	MSB
11101001	E9	233	Channel 10	"	(0—127)	(0—127)
11101010	EA	234	Channel 11	"	"	"
11101011	EB	235	Channel 12	"	"	"
11101100	EC	236	Channel 13	"	"	"
11101101	ED	237	Channel 14	"	"	"
11101110	EE	238	Channel 15	"	"	"
11101111	EF	239	Channel 16	"	"	"
11110000	F0	240	System exclusive		*	*
11110001	F1	241	Sys common undefined		?	?
11110010	F2	242	Sys common song position pointer		LSB	MSB
11110011	F3	243	Sys common song select (song #)		(0—127)	none
11110100	F4	244	Sys common undefined		?	?
11110101	F5	245	Sys common undefined		?	?
11110110	F6	246	Sys common tune request		None	None
11110111	F7	247	Sys common end of sys exclusive (EOX)		"	"
11111000	F8	248	Sys real time timing clock		"	"
11111001	F9	249	Sys real time undefined		"	"
11111010	FA	250	Sys real time start		"	"
11111011	FB	251	Sys real time continue		"	"
11111100	FC	252	Sys real time stop		"	"
11111101	FD	253	Sys real time undefined		"	"
11111110	FE	254	Sys real time active sensing		"	"
11111111	FF	255	Sys real time sys reset		"	"

** Note: System Exclusive (data dump) 2nd byte = Vendor ID followed by more data bytes and ending with EOX.*

TABLE 2: Summary of MIDI Note Numbers for Different Octaves

Octave #	Note Numbers											
	C	C#	D	D#	E	F	F#	G	G#	A	A#	B
0	0	1	2	3	4	5	6	7	8	9	10	11
1	12	13	14	15	16	17	18	19	20	21	22	23
2	24	25	26	27	28	29	30	31	32	33	34	35
3	36	37	38	39	40	41	42	43	44	45	46	47
4	48	49	50	51	52	53	54	55	56	57	58	59
5	60	61	62	63	64	65	66	67	68	69	70	71
6	72	73	74	75	76	77	78	79	80	81	82	83
7	84	85	86	87	88	89	90	91	92	93	94	95
8	96	97	98	99	100	101	102	103	104	105	106	107
9	108	109	110	111	112	113	114	115	116	117	118	119
10	120	121	122	123	124	125	126	127				

***Note:** "Middle C" equals MIDI Note Number 60; "A440" equals MIDI Note Number 57*

TABLE 3: Status Bytes 176-191; Control and Mode Changes (per channel)

SECOND BYTE VALUE			FUNCTION	THIRD BYTE	
Binary	Hex	Dec-imal		Value	Use
00000000	00	0	Continuous controller #0	0—127	MSB
00000001	01	1	Modulation wheel	0—127	MSB
00000010	02	2	Breath control	0—127	MSB
00000011	03	3	Continuous controller #3	0—127	MSB
00000100	04	4	Foot controller	0—127	MSB
00000101	05	5	Portamento time	0—127	MSB
00000110	06	6	Data entry	0—127	MSB
00000111	07	7	Main volume	0—127	MSB
00001000	08	8	Continuous controller #8	0—127	MSB
00001001	09	9	Continuous controller #9	0—127	MSB
00001010	0A	10	Continuous controller #10	0—127	MSB
00001011	0B	11	Continuous controller #11	0—127	MSB
00001100	0C	12	Continuous controller #12	0—127	MSB
00001101	0D	13	Continuous controller #13	0—127	MSB
00001110	0E	14	Continuous controller #14	0—127	MSB
00001111	0F	15	Continuous controller #15	0—127	MSB
00010000	10	16	Continuous controller #16	0—127	MSB
00010001	11	17	Continuous controller #17	0—127	MSB
00010010	12	18	Continuous controller #18	0—127	MSB
00010011	13	19	Continuous controller #19	0—127	MSB
00010100	14	20	Continuous controller #20	0—127	MSB
00010101	15	21	Continuous controller #21	0—127	MSB
00010110	16	22	Continuous controller #22	0—127	MSB
00010111	17	23	Continuous controller #23	0—127	MSB
00011000	18	24	Continuous controller #24	0—127	MSB
00011001	19	25	Continuous controller #25	0—127	MSB
00011010	1A	26	Continuous controller #26	0—127	MSB
00011011	1B	27	Continuous controller #27	0—127	MSB
00011100	1C	28	Continuous controller #28	0—127	MSB
00011101	1D	29	Continuous controller #29	0—127	MSB
00011110	1E	30	Continuous controller #30	0—127	MSB
00011111	1F	31	Continuous controller #31	0—127	MSB
00100000	20	32	Continuous controller #0	0—127	LSB
00100001	21	33	Modulation wheel	0—127	LSB
00100010	22	34	Breath control	0—127	LSB
00100011	23	35	Continuous controller #3	0—127	LSB
00100100	24	36	Foot controller	0—127	LSB
00100101	25	37	Portamento time	0—127	LSB
00100110	26	38	Data entry	0—127	LSB
00100111	27	39	Main volume	0—127	LSB
00101000	28	40	Continuous controller #8	0—127	LSB
00101001	29	41	Continuous controller #9	0—127	LSB
00101010	2A	42	Continuous controller #10	0—127	LSB
00101011	2B	43	Continuous controller #11	0—127	LSB
00101100	2C	44	Continuous controller #12	0—127	LSB
00101101	2D	45	Continuous controller #13	0—127	LSB
00101110	2E	46	Continuous controller #14	0—127	LSB
00101111	2F	47	Continuous controller #15	0—127	LSB
00110000	30	48	Continuous controller #16	0—127	LSB
00110001	31	49	Continuous controller #17	0—127	LSB
00110010	32	50	Continuous controller #18	0—127	LSB

TABLE 3: Status Bytes 176-191; Control and Mode Changes (per channel)

SECOND BYTE VALUE			FUNCTION	THIRD BYTE	
Binary	Hex	Decimal		Value	Use
00110011	33	51	Continuous controller #19	0—127	LSB
00110100	34	52	Continuous controller #20	0—127	LSB
00110101	35	53	Continuous controller #21	0—127	LSB
00110110	36	54	Continuous controller #22	0—127	LSB
00110111	37	55	Continuous controller #23	0—127	LSB
00111000	38	56	Continuous controller #24	0—127	LSB
00111001	39	57	Continuous controller #25	0—127	LSB
00111010	3A	58	Continuous controller #26	0—127	LSB
00111011	3B	59	Continuous controller #27	0—127	LSB
00111100	3C	60	Continuous controller #28	0—127	LSB
00111101	3D	61	Continuous controller #29	0—127	LSB
00111110	3E	62	Continuous controller #30	0—127	LSB
00111111	3F	63	Continuous controller #31	0—127	LSB
01000000	40	64	Damper pedal on/off (Sustain)	0=off	127=on
01000001	41	65	Portamento on/off	0=off	127=on
01000010	42	66	Sustenuto on/off	0=off	127=on
01000011	43	67	Soft pedal on/off	0=off	127=on
01000100	44	68	Undefined on/off	0=off	127=on
01000101	45	69	Undefined on/off	0=off	127=on
01000110	46	70	Undefined on/off	0=off	127=on
01000111	47	71	Undefined on/off	0=off	127=on
01001000	48	72	Undefined on/off	0=off	127=on
01001001	49	73	Undefined on/off	0=off	127=on
01001010	4A	74	Undefined on/off	0=off	127=on
01001011	4B	75	Undefined on/off	0=off	127=on
01001100	4C	76	Undefined on/off	0=off	127=on
01001101	4D	77	Undefined on/off	0=off	127=on
01001110	4E	78	Undefined on/off	0=off	127=on
01001111	4F	79	Undefined on/off	0=off	127=on
01010000	50	80	Undefined on/off	0=off	127=on
01010001	51	81	Undefined on/off	0=off	127=on
01010010	52	82	Undefined on/off	0=off	127=on
01010011	53	83	Undefined on/off	0=off	127=on
01010100	54	84	Undefined on/off	0=off	127=on
01010101	55	85	Undefined on/off	0=off	127=on
01010110	56	86	Undefined on/off	0=off	127=on
01010111	57	87	Undefined on/off	0=off	127=on
01011000	58	88	Undefined on/off	0=off	127=on
01011001	59	89	Undefined on/off	0=off	127=on
01011010	5A	90	Undefined on/off	0=off	127=on
01011011	5B	91	Undefined on/off	0=off	127=on
01011100	5C	92	Undefined on/off	0=off	127=on
01011101	5D	93	Undefined on/off	0=off	127=on
01011110	5E	94	Undefined on/off	0=off	127=on
01011111	5F	95	Undefined on/off	0=off	127=on
01100000	60	96	Data entry +1	127	
01100001	61	97	Data entry -1	127	
01100010	62	98	Undefined	?	
01100011	63	99	Undefined	?	
01100100	64	100	Undefined	?	
01100101	65	101	Undefined	?	

TABLE 3: Status Bytes 176-191 Control and Mode Changes (per channel)

SECOND BYTE VALUE			FUNCTION	THIRD BYTE	
Binary	Hex	Decimal		Value	Use
01100110	66	102	Undefined	?	
01100111	67	103	Undefined	?	
01101000	68	104	Undefined	?	
01101001	69	105	Undefined	?	
01101010	6A	106	Undefined	?	
01101011	6B	107	Undefined	?	
01101100	6C	108	Undefined	?	
01101101	6D	109	Undefined	?	
01101110	6E	110	Undefined	?	
01101111	6F	111	Undefined	?	
01110000	70	112	Undefined	?	
01110001	71	113	Undefined	?	
01110010	72	114	Undefined	?	
01110011	73	115	Undefined	?	
01110100	74	116	Undefined	?	
01110101	75	117	Undefined	?	
01110110	76	118	Undefined	?	
01110111	77	119	Undefined	?	
01111000	78	120	Undefined	?	
01111001	79	121	Undefined	?	
01111010	7A	122	Local control on/off	0=off	127=on
01111011	7B	123	All notes off	0	
01111100	7C	124	Omni mode off (all notes off)	0	
01111101	7D	125	Omni mode on (all notes off)	0	
01111110	7E	126	Poly mode on/off (all notes off)	*	
01111111	7F	127	Poly mode on (mono off; all notes off)	0	

** **Note:** This equals the number of channels, or zero if the number of channels equals the number of voices in the receiver*

You too can crank out persuasive percussive patterns by the bucketful— or rather, your computer can.

DRUMBOX
The CZ/ST Connection

BY DAVID SNOW

A vision of things to come:

It is morning, sweet and glorious, as sunlight filters through the pines and spreads across the rolling landscape of my estate. I am taking breakfast on the piazza, my only companions a copy of the Enquirer *and a French poodle named Sasha. Perusing the "Arts and Leisure" section, I refrain from devouring my last bite of Twinkie long enough to scan the paper's review of my latest symphonic creation, "Poem of Near-Ecstacy, or At Least Feeling Real Good About Myself." The familiar hyperbole virtually leaps from the page: "...brilliant...magnificent...a work of profound, almost shocking originality and significance...worthy of Liberace."*

Meanwhile, the PC in the music room is chugging out another masterpiece, running under my favorite algorithmic composer software, Opus 1 2 3.

I put down the paper and sigh. Ah, the good life...

While life may not be all poodles and Twinkies for most composers, the idea of cranking out chart busters by the bale is appealing, *especially* if it makes you rich. After all, music has as much to do with process as it does with sound, and any compositional process, even an automated one, is fine if it works for you.

The use of computers to generate musical material has been covered before in EM, usually with an apologetic note about randomness being no substitute for talent (sez who?). But I present you here with an unrepentant opportunity to explore the netherworld of creativity: Drumbox is a program written in ST BASIC that generates, plays, and sequences random rhythmic patterns on your CZ synthesizer, and—if you're not a purist—allows you to edit them to your heart's content. It owes a debt to Tim Ebling's Random Rhythms program (April '87 EM), and to Lucky Westfall's June '87 article on using the CZ-101 as a drum machine. Thanks, guys. This thing works! It's fun! It's musically useful...and it's free!

***David Snow** studied electronic music at Yale University with Jacob Druckman. His composition credits include: awards and grants from BMI, ASCAP, and the National Endowment for the Arts; several commissions; and performances in Washington, New York, and Tokyo. His recording of "The Passion and Transfiguration of a Post-Apocalyptic Eunuch" with the NEW HIPPIES! is on the Opus One label.*

ABOUT THE PROGRAM

Drumbox has three main modules:

✓ The *Randomizer* generates four-part polyphonic rhythmic patterns. Each pattern is divided into two to 16 pulses (a pulse is a beat or sub-beat, depending on how you hear it). Up to 20 different patterns can be generated and stored.

✓ The *Editor* allows alteration of the rhythmic or pitch content of each pattern.

✓ The *Sequencer* links patterns into sequences, and chains sequences into larger units; sequences can contain up to 16 patterns, and up to 20 sequences can be stored; chains can be up to 85 sequences long.

The degree of randomness for each of the four voices in each pattern is selectable and input as a percentage; only the rhythmic placement of notes or "hits" in each pattern is randomized. The default pitch for each hit is middle "C." Once a pattern is generated, it is displayed on the screen as a grid that can be edited and played back. Once modified to suit your taste, the pattern can be stored and incorporated into sequences.

BASIC isn't the language best suited to real-time tasks like MIDI sequencers since it can't deliver lightning speed. Even so, Drumbox performs quite well, since it limits its commands to note on/off commands on only four channels. Although unison hits won't be perfectly simultaneous, the effect is a natural one given the imprecision of live ensembles.

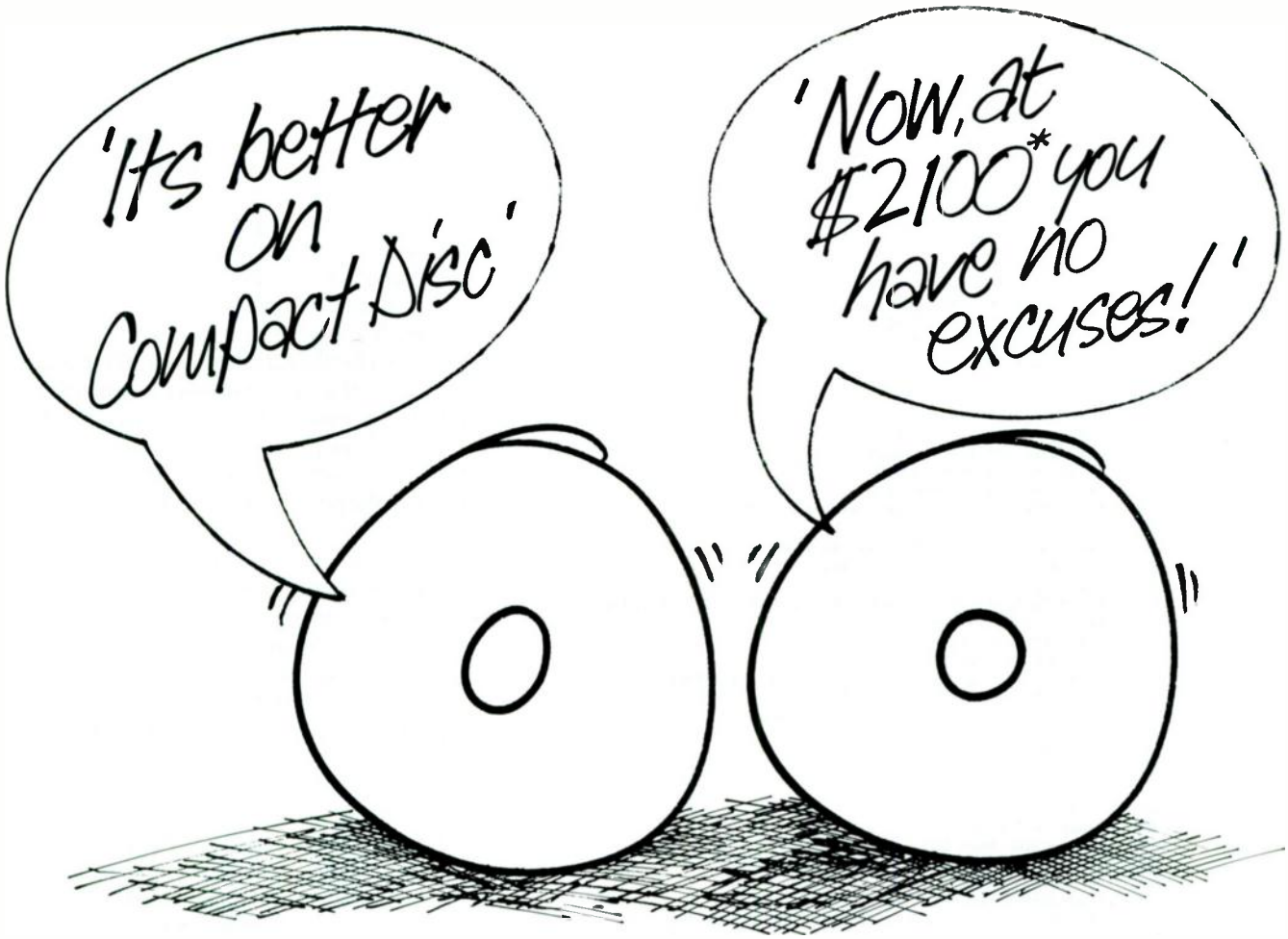
HOW IT WORKS

Referring to the program listing in **Fig. 1**, here's the blow-by-blow description:

Lines 80 through 130 adjust the size of the output window, initialize variables, and set up arrays that store rhythmic patterns and sequences.

Lines 160 through 290 set up the

Have you heard ?



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List of DRUMBOX.BAS

```
10    '*** ST DRUMBOX by David Snow ***
20    '
30    '    THIS PROGRAM GENERATES AND EDITS
40    ' SEQUENCES OF RANDOM RHYTHMIC PATTERNS,
50    ' AND PLAYS THEM ON MIDI CHANNELS 1 TO 4
60    '
70    '*** INITIALIZE VARIABLES ***
80    option base 1: randomize (0)
90    dim array(20,4,16): dim seq(20,16)
100   a#=gb: gintin=peek(a#+8): gintout=peek(a#+12)
110   addrin=peek(a#+16): b#=addrin: c#=gintin+4
120   tempo=150
130   width(80): fullw 2
140   '
150   '*** MAIN MENU ***
160   title$=" ST DRUMBOX ": gosub 2100
170   clearw 2: gotoxy 0,3
180   ? tab(34); "1. RANDOMIZE"
190   ?: ? tab(34); "2. EDIT
200   ?: ? tab(34); "3. SEQUENCE"
210   ?: ? tab(34); "4. SET TEMPO:"
220   ?: ? tab(38); "(1-50)"
230   ?: ? tab(38); "[";int(50-(tempo-50)/10);"]"
240   gotoxy 17,16: input "OPTION: ",option$
250   if option$="1" then 380
260   if option$="2" then 1540
270   if option$="3" then 710
280   if option$="4" then 310
290   goto 170
300   '
310   '*** SET TEMPO ***
320   gotoxy 18,13: ? " __ "
330   gotoxy 17,13: input tempo$
340   if len(tempo$)=0 then 170
350   if val(tempo$)>50 then 170
360   tempo=10*(50-(val(tempo$)))+50: goto 170
370   '
380   '*** RANDOMIZE RHYTHMIC PATTERN ***
390   title$="RANDOMIZER": gosub 2100
400   clearw 2: gotoxy 8,8
410   input "STARTING AT WHICH PATTERN NUMBER (1-20)? ",pattern
420   if pattern<1 or pattern>20 then 400
430   for pattern=pattern to 20
440   title$="RANDOMIZER": gosub 2100
450   clearw 2:gotoxy 15,1: ? "PATTERN NUMBER";pattern
460   ?:? "  NUMBER OF PULSES (2-16) ";
470   input "[HIT 'RETURN' FOR MENU]: ",n$
480   if len(n$)=0 then 150
490   n=val(n$): if n<2 or n>16 then 450
500   ?: ? "  PROBABILITY OF HIT (1-100):"
510   ?: for track=1 to 4
520   ? tab(32); "TRACK";track;
530   input "= ",prob
540   if prob>100 then 520
550   if n<16 then array(pattern,1,n+1)=129
560   for pulse=1 to n
570   rand=int(rnd*100)+1
580   if rand<=prob then array(pattern,track,pulse)=60
590   if rand>prob then array(pattern,track,pulse)=128
600   next pulse
610   next track
620   gosub 1720
630   '
640   '*** EDIT/SAVE DIALOG BOX ***
650   poke gintin,1: option$="[2][Edit pattern?|][EDIT|SAVE|RETRY]"
660   poke b#,varptr(option$): gemsys(52): p=peek(gintout)
670   if p=1 then gosub 1970: goto 640
680   if p=3 then 440
690   next pattern
700   '
710   '*** SEQUENCER ***
720   on error goto 2150
730   title$="SEQUENCER": gosub 2100
740   clearw 2: gotoxy 0,0
750   '
760   '*** SEQUENCER DIALOG BOX 1 ***
770   poke gintin,3
780   option$="[2][A: CREATE SEQUENCES|B: CREATE SEQUENCE CHAINS"
790   option$=option$ + "|C: QUIT TO MENU][ A | B | C ]"
800   poke b#,varptr(option$): gemsys(52): p=peek(gintout)
810   if p=2 then 1190
820   if p=3 then 150
830   clearw 2: gotoxy 8,8
```

FIG. 1: Program listing for "Drumbox."

menu from which all program functions are accessible.

The tempo-setting routine in lines 320 through 360 calculates a variable which is used in a delay loop in the playback routine.

The randomizer starting at line 410 initially asks for an identifier number from 1 to 20 to give the first pattern to be generated. As each pattern is produced, edited, and stored, the number increments automatically, up to 20. Lines 460 to 470 ask for the number of pulses the pattern will have, then lines 510 to 610 ask for the probability (0 to 100%) of a hit for each of the four parts. A random number from 1 to 100 is generated for each pulse of each track, and if that number is less than or equal to the probability entered for that track, the pulse is recorded as a hit, and given the default pitch value of 60 (middle "C"). If the random number is greater than the probability, it is given the value of 128, which the playback routine interprets as a rest. These values are used so that you can edit the pitch to any valid MIDI note from 0 to 127.

Starting at 840, the sequencer asks for an initial sequence number (1-20) which is incremented as each sequence is stored. In line 950 you input a string containing the numbers of the patterns you want in your sequence. To make the string simple for the program to interpret and to keep it legible, each number is entered as two digits separated by a space or any other character (e.g., 02 04 04 11 12...). Each sequence string can contain up to 16 patterns and can either be stored or written over, but not edited.

At line 1270 you enter a string containing the numbers of the sequences that you wish to chain together. The sequence chain can consist of up to 85 sequences, since a string has a maximum length of 255 characters.

Lines 1430 to 1520 comprise the playback routine. For each pulse in the pattern to be played, the array element corresponding to that pulse in each track is examined. If the value of that element is less than 128, it is valid MIDI pitch data and is output to the synthesizer in line 1460. If it equals 128, then it is a rest; if it equals 129, it is an end-of-line marker indicating that the pattern has fewer than 16 pulses and is finished. After the pulse data is examined, a delay loop in line 1500 creates a pause dependent upon the value of the tempo variable. After the

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MUSIC, COMPUTERS & SOFTWARE, August 1987

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Ted Greenwald, KEYBOARD MAGAZINE, August 1987

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pause, the next pulse is examined and so on, until the end of the pattern.

Line 1470 is an optional note-off command for each hit. Percussive synthesizer patches with no sustain don't require it, and since we want to speed things up as much as possible, it's desirable to omit it.

The commands in lines 980, 1300, and 1920 turn off the ST's GEM interface. This is done to speed up data output during playback, and to enable the keyboard buffer-checking routine in lines 1020, 1350, and 1940. As the program is configured, if a key is pressed during playback, playback will be terminated at the end of the current pattern. If GEM were left on while the program was running, it would "steal" the data in the buffer before the program could get to it, and the program would never know that a key had been pressed. GEM must be turned on again in lines 1050, 1380, and 1950 to resume normal operation.

A grid display of each rhythmic pattern is constructed in lines 1760 to 1900, showing the position and pitch value of each hit. Rests are depicted as blank spaces.

Lines 2110 to 2130 identify the current program function in the output window's title bar so you know what's going on.

Lines 2160 to 2180 catch sequencer-string entry errors so that the program doesn't come to a grinding halt if you mis-type.

Typing It In

This is a long program, and the possibility of entering a typo is great. Save the program to disk before you run it. The worst that can happen with an ordinary BASIC program with a bug is that it just stops or won't run if you attempt to run it. Unfortunately, Drumbox uses AES (Applications Environment Services) routines to draw dialog boxes which, if mis-typed, can cause crashes and force you to reset the machine.

The following comments should clarify most typing questions:

✓ Line 320: The characters between the quote marks are a space, two underlines (shifted dash), and two spaces.

✓ Line 650: The characters between the quotes must be typed in exactly as written. Note the use of square brackets. The vertical lines around the words (solid

```
840  input "STARTING AT WHICH SEQUENCE NUMBER? (1-20) ",m
850  if m<1 or m>20 then 830
860  clearw 2: gotoxy 0,0
870  ?: ? "  EACH SEQUENCE MAY CONTAIN NO MORE THAN 16 PATTERNS."
880  ?: ? "  ENTER PATTERNS BY NUMBER (1-20)";
890  ? "  [HIT 'RETURN' FOR MENU]:"
900  ?: ? "  (Use 2-digit format with spaces between ";
910  ? "numbers [e.g. 02 02 11 08...])"
920  n=77: border$=string$(n,"_"): ? border$
930  for m=m to 20
940  ?: ? "  SEQUENCE NUMBER";m
950  ?: input sequence$
960  if len(sequence$)=0 then 150
970  if len(sequence$)>48 then sequence$=left$(sequence$,48)
980  poke systab+24,1
990  for e=1 to len(sequence$) step 3
1000 pattern=val(mid$(sequence$,e,2))
1010 gosub 1430
1020 if inp(-2)<>0 then 1040
1030 next e: goto 1050
1040 j=inp(2): if inp(-2)<>0 then 1040
1050 poke systab+24,0
1060 '
1070 '*** SEQUENCER DIALOG BOX 2 ***
1080 poke gintin,1
1090 option$="[2][Save sequence?][SAVE|RETRY]"
1100 poke b%,varptr(option$): gemsys(52): p=peek(gintout)
1110 if p=2 then 950
1120 e=1
1130 for f=1 to len(sequence$) step 3
1140 seq(m,e)=val(mid$(sequence$,f,2))
1150 e=e+1: next f
1160 if e<17 then seq(m,e)=0
1170 next m
1180 '
1190 '*** CHAIN SEQUENCES ***
1200 clearw 2: gotoxy 0,0
1210 ?: ? "  ENTER SEQUENCES BY NUMBER (1-20) ";
1220 ? "[HIT 'RETURN' FOR MENU]: "
1230 ?: ? "  (Use 2-digit format with spaces between ";
1240 ? "numbers [e.g. 02 02 11 08...])"
1250 ?: ? "  (Enter '*' to repeat previous chain of sequences.)
1260 n=77: border$=string$(n,"_"): ? border$
1270 ?: input chain$: if len(chain$)=0 then 150
1280 if chain$="*" then chain$=old$
1290 old$=chain$
1300 poke systab+24,1
1310 for g=1 to len(chain$) step 3
1320 for e=1 to 16
1330 pattern=seq(val(mid$(chain$,g,2)),e)
1340 if pattern>0 then gosub 1420 else goto 1370
1350 if inp(-2)<>0 then 1380
1360 next e
1370 next g: goto 1390
1380 j=inp(2): if inp(-2)< 0 then 1380
1390 poke systab+24,0
1400 goto 1270
1410 '
1420 '*** PLAY RHYTHMIC PATTERN ***
1430 for pulse=1 to 16
1440 for track=1 to 4
1450 if array(pattern,track,pulse)>127 then 1480
1460 out(3),track+143: out(3),array(pattern,track,pulse): out(3),64
1470 '(OPTIONAL NOTE OFF)out(3),array(pattern,track,pulse): out(3),0
1480 if array(pattern,track,pulse)=129 then 1520
1490 next track
1500 for delay=1 to tempo: next delay
1510 next pulse
1520 return
1530 '
1540 '*** EDIT ***
1550 title$="EDITOR": gosub 2100
1560 clearw 2: gotoxy 0,8
1570 ? "  ENTER PATTERN NUMBER TO EDIT (1-20) ";
1580 input "[HIT 'RETURN' FOR MENU]: ",pattern$
1590 if len(pattern$)=0 then 150
1600 if val(pattern$)>20 then 1560 else pattern=val(pattern$)
1610 for n=1 to 16
1620 if array(pattern,1,n)=129 then 1640
1630 next n
1640 n=n-1: gosub 1720
1650 '
1660 '*** EDITOR DIALOG BOX ***
1670 poke gintin,1: option$="[2][Edit pattern?][EDIT|SAVE]"
```

```
1680  poke b#,varptr(option$): gemsys(52): p=peek(gintout)
1690  if p=1 then gosub 1970: goto 1660
1700  goto 1560
1710  '
1720  '*** DISPLAY RHYTHM GRID ***
1730  title$="EDITOR": gosub 2100
1740  clearw 2: gotoxy 17,1: ? "PATTERN";pattern
1750  ?:? "   PULSE:";tab(14);
1760  for pulse=1 to n
1770  hit$=right$(str$(pulse),2)
1780  ? hit$;"  ";: next pulse
1790  border$=string$(13+n*4,"_")
1800  ?: ? border$
1810  for track=1 to 4
1820  ? "  TRACK";track;tab(13);"|";
1830  for pulse=1 to n
1840  hit$=right$(str$(array(pattern,track,pulse)),3)
1850  if val(hit$)>127 then hit$="   "
1860  if len(hit$)<3 then hit$=" "+hit$
1870  ? hit$;: ?"|";
1880  next pulse
1890  ?: next track
1900  ? border$
1910  gotoxy 0,11: ? "  [HIT 'RETURN' TO STOP PLAY]"
1920  poke systab+24,1
1930  gosub 1420
1940  if inp(-2)<>-1 then 1930
1950  j=inp(2): if inp(-2)<>0 then 1950
1960  poke systab+24,0: return
1970  gotoxy 0,11: ? "  TRACK TO EDIT (1-4) ";
1980  input "[HIT 'RETURN' TO START/STOP PLAY]: ",track$
1990  if track$<>"" then 2010
2000  goto 1920
2010  if val(track$)>4 or val(track$)<1 then 1920
2020  ?:?"  PULSE TO EDIT ( 1 -";n;")"; :input pulse
2030  if pulse>n or pulse<1 then 2020
2040  ?: input "  ENTER PITCH NUMBER (0-127) OR REST (*): ",pitch$
2050  if pitch$="*" then pitch$="128"
2060  if val(pitch$)>128 then 2040
2070  array(pattern,val(track$),pulse)=val(pitch$)
2080  goto 1730
2090  '
2100  '*** OUTPUT-WINDOW TITLE ***
2110  title$=title$+chr$(0)
2120  poke gintin,peek(systab+8): poke gintin+2,2
2130  poke c#,varptr(title$): gemsys(105): return
2140  '
2150  '*** ERROR TRAP ***
2160  poke systab+24,0
2170  ? "  >>>ERROR IN SEQUENCER ENTRY<<<"
2180  resume 950
```

lines on the screen, broken when printed) "|Edit Pattern?|," and between the words "EDIT|SAVE|RETRY" are typed by shifting the back slash key, which is to the right of the RETURN key.

✓ Lines 780 to790 and line 1090: See the comments for line 650 above.

✓ Line 1470: This line is printed as a REMark statement, and will not be executed when the program is run unless the apostrophe and the characters "(OPTIONAL NOTE OFF)" are deleted. Type it in as written for now.

✓ Line 1670: See the comment for line 650 above.

✓ Line 1750: There are three spaces before the word "PULSE."

✓ Line 1780: There are two spaces between quotes.

✓ Line 1820: There are two spaces before the word "TRACK." The vertical line in quotes at the end of the line is a shifted back slash.

✓ Line 1850: There are three spaces between quotes.

✓ Line 1870: The vertical line in quotes is a shifted back slash.

Using Drumbox

Typing the listing is the hard part, but the program is simple to use. It was written on a 1040ST monochrome system, though there shouldn't be any resolution problems running it in color. I don't know whether it is necessary to turn off buffered graphics on a 520ST with 512K of RAM in order to conserve memory.

The first thing to do is to set your synthesizer to Mono mode on channels 1 to 4 (refer to your owner's manual, or re-read "Casio's New Drum Machine—The CZ-101?" in June's **EM**). Assign patches with contrasting timbres and no sustain to the four channels. **Fig. 2** includes a good selection of patches by a variety of authors to get you started.

Load BASIC from your language disk and run Drumbox. You first need to generate some patterns, so enter option 1, *Randomize*. You will be asked to enter a number from 1 to 20 to assign the first pattern. If you're starting a session, enter 1. If you have already generated a few patterns and then quit to the main menu in order to edit, enter the number where you left off. You will then be asked to enter the number of pulses you want for the pattern, and the probability of a hit for each of the four tracks. The pattern is then generated and the screen displays a grid that shows the relative position of each hit with its MIDI pitch value. The synth will play the pattern over and over until you hit a key, and a dialog box asks if you wish to edit, save, or re-try. If you click the mouse pointer on SAVE, the pattern is stored and the entry process repeats for the next pattern. If you click on RETRY, a new pattern will be written over the current one.

To edit, click on the EDIT box, or hit the RETURN or ENTER keys. You will be asked for the track and pulse you wish to change, and the new pitch value. Enter a value from 0 to 127 for a hit, or "*" for a rest. The grid will be redrawn and the pattern played until a key is hit, and the dialog box again asks for your next move.

Once you have saved some patterns to your liking, return to the main menu and select option 3: SEQUENCER. Click the mouse on box "A," type the numbers of the patterns you wish to link together in the format indicated, and hit ENTER or RETURN. The sequence will play and you will be given the option to save it or try again.

When you have assembled some sequences, return to the menu and select option 3 again, but click on box "B" to create chains of sequences. Type the numbers of the sequences you wish to chain and hit ENTER or RETURN.

Don't move the mouse while patterns are playing, since the mouse interface generates interrupts that slow down the program.

Playback can be interrupted at any time by hitting a key. It will terminate at the end of the current pattern.

To set your tempo, select option 4

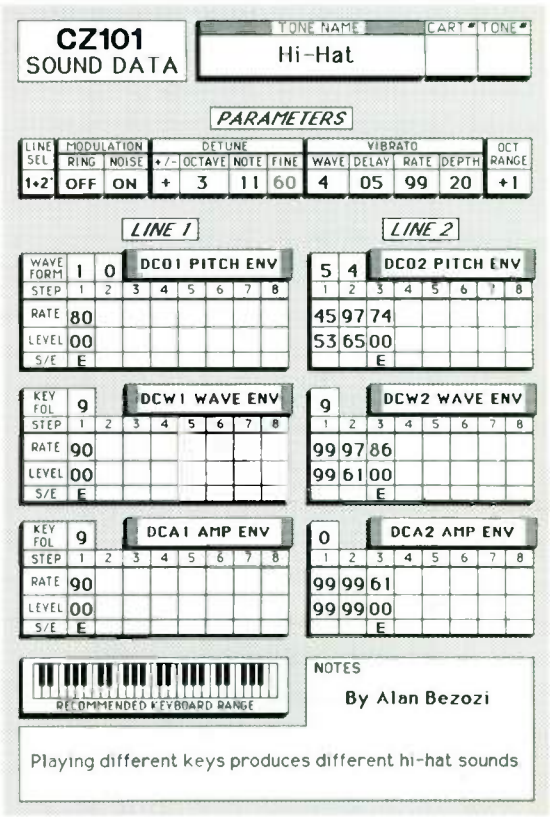
from the menu and enter any value from 1 (slow) to 50 (fast).

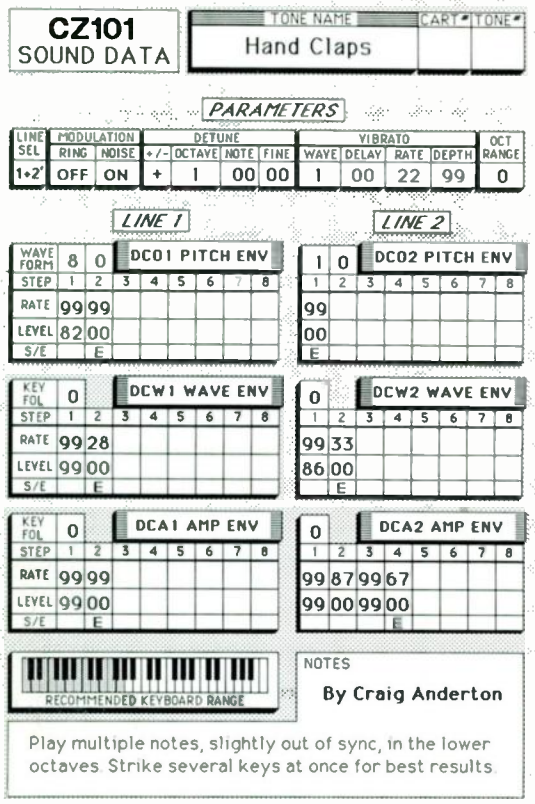
Final Musings

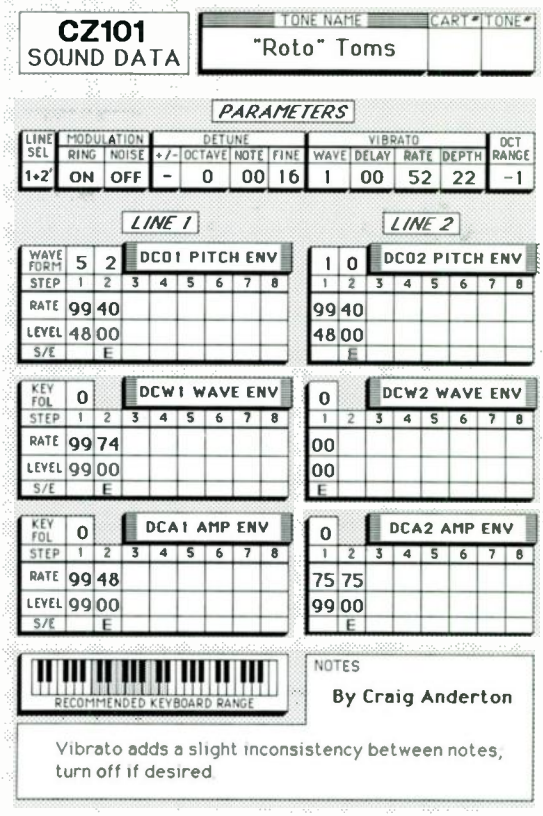
You may find that in order to get the most satisfying results, the more pulses you assign to a pattern, the lower the overall range of hit probability should be. A 16-pulse pattern seems to work best with probabilities in the range of 15 to 45, while an eight-pulse pattern works better in a 35 to 65 range. You can assign 100% probability to a track in order to get hits on every pulse, or 0 to leave a track blank. Patterns longer than 16 pulses can be made by sequencing two or more shorter patterns together. Changing the patches assigned to each voice can alter the character of a rhythm radically. There are more possibilities than you've got days to live. Experiment!

The implications of randomness are fascinating. If you put 100 monkeys on 100 STs, the chances are that one of them would come up with Varese's "Ionization." I wonder how Edgar would have felt about that? EM

Note:
The following pages contain patch sheets of some tested and recommended drum sounds for the Casio CZ-101. These can be used as they are, or can provide excellent starting points for developing distinctive drum sounds for your own CZ percussion library. Blank, full-sized versions of these patch sheets were provided in the November, 1987 issue of *Electronic Musician*. While the author designed the Drumbox program with the CZ-101 in mind, any synthesizer with multi-timbral capability and at least four voices could be used in place of the Casio, offering an endless number of musical variations.







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TASCAM

CZ101 SOUND DATA

TONE NAME: Cowbell | CART | TONE

PARAMETERS

LINE SEL	MODULATION RING	MODULATION NOISE	DETUNE +/-	DETUNE OCTAVE	DETUNE NOTE	DETUNE FINE	VIBRATO WAVE	VIBRATO DELAY	VIBRATO RATE	VIBRATO DEPTH	OCT RANGE
1+1'	ON	OFF	+	1	03	00	1	00	00	00	-1

LINE 1

WAVE FORM	2	0	DCO1 PITCH ENV							
STEP	1	2	3	4	5	6	7	8		
RATE	99	16	00							
LEVEL	70	60	00							
S/E			E							

KEY FOL	5	DCW1 WAVE ENV							
STEP	1	2	3	4	5	6	7	8	
RATE	99	80	99	80	50				
LEVEL	99	10	80	50	00				
S/E					E				

KEY FOL	0	DCA1 AMP ENV							
STEP	1	2	3	4	5	6	7	8	
RATE	99	45							
LEVEL	99	00							
S/E		E							

LINE 2

DCO2 PITCH ENV

1	2	3	4	5	6	7	8

DCW2 WAVE ENV

1	2	3	4	5	6	7	8

DCA2 AMP ENV

1	2	3	4	5	6	7	8

RECOMMENDED KEYBOARD RANGE

NOTES

By David Snow

CZ101 SOUND DATA

TONE NAME: Big Tom | CART | TONE

PARAMETERS

LINE SEL	MODULATION RING	MODULATION NOISE	DETUNE +/-	DETUNE OCTAVE	DETUNE NOTE	DETUNE FINE	VIBRATO WAVE	VIBRATO DELAY	VIBRATO RATE	VIBRATO DEPTH	OCT RANGE
1+1'	OFF	ON	+	0	00	09	1	00	00	00	-1

LINE 1

WAVE FORM	1	2	DCO1 PITCH ENV							
STEP	1	2	3	4	5	6	7	8		
RATE	99	40								
LEVEL	25	00								
S/E		E								

KEY FOL	7	DCW1 WAVE ENV							
STEP	1	2	3	4	5	6	7	8	
RATE	99	80	99	65					
LEVEL	99	50	80	00					
S/E				E					

KEY FOL	6	DCA1 AMP ENV							
STEP	1	2	3	4	5	6	7	8	
RATE	99	43							
LEVEL	99	00							
S/E		E							

LINE 2

DCO2 PITCH ENV

1	2	3	4	5	6	7	8

DCW2 WAVE ENV

1	2	3	4	5	6	7	8

DCA2 AMP ENV

1	2	3	4	5	6	7	8

RECOMMENDED KEYBOARD RANGE

NOTES

By David Snow

CZ101 SOUND DATA

TONE NAME: Rock Kick | CART | TONE

PARAMETERS

LINE SEL	MODULATION RING	MODULATION NOISE	DETUNE +/-	DETUNE OCTAVE	DETUNE NOTE	DETUNE FINE	VIBRATO WAVE	VIBRATO DELAY	VIBRATO RATE	VIBRATO DEPTH	OCT RANGE
1+2'	OFF	ON	-	3	00	00	1	00	00	00	0

LINE 1

WAVE FORM	3	0	DCO1 PITCH ENV							
STEP	1	2	3	4	5	6	7	8		
RATE	99	99								
LEVEL	99	00								
S/E		E								

KEY FOL	0	DCW1 WAVE ENV							
STEP	1	2	3	4	5	6	7	8	
RATE	99	28							
LEVEL	60	00							
S/E		E							

KEY FOL	0	DCA1 AMP ENV							
STEP	1	2	3	4	5	6	7	8	
RATE	99	64							
LEVEL	99	00							
S/E		E							

LINE 2

4	0	DCO2 PITCH ENV							
1	2	3	4	5	6	7	8		
99	64	50							
55	65	00							
		E							

0	DCW2 WAVE ENV							
1	2	3	4	5	6	7	8	
99	50							
21	00							
	E							

0	DCA2 AMP ENV							
1	2	3	4	5	6	7	8	
99	43							
99	00							
	E							

RECOMMENDED KEYBOARD RANGE

NOTES

By Lucky Westfall

Play lowest note; other notes work too

CZ101 SOUND DATA

TONE NAME: Heavy Snare | CART | TONE

PARAMETERS

LINE SEL	MODULATION RING	MODULATION NOISE	DETUNE +/-	DETUNE OCTAVE	DETUNE NOTE	DETUNE FINE	VIBRATO WAVE	VIBRATO DELAY	VIBRATO RATE	VIBRATO DEPTH	OCT RANGE
1+2'	OFF	ON	+	0	00	24	1	00	00	00	-1

LINE 1

WAVE FORM	5	2	DCO1 PITCH ENV							
STEP	1	2	3	4	5	6	7	8		
RATE	99	40								
LEVEL	62	00								
S/E		E								

KEY FOL	0	DCW1 WAVE ENV							
STEP	1	2	3	4	5	6	7	8	
RATE	99	74							
LEVEL	99	00							
S/E		E							

KEY FOL	0	DCA1 AMP ENV							
STEP	1	2	3	4	5	6	7	8	
RATE	99	48							
LEVEL	99	00							
S/E		E							

LINE 2

4	0	DCO2 PITCH ENV							
1	2	3	4	5	6	7	8		
99	29								
69	00								
	E								

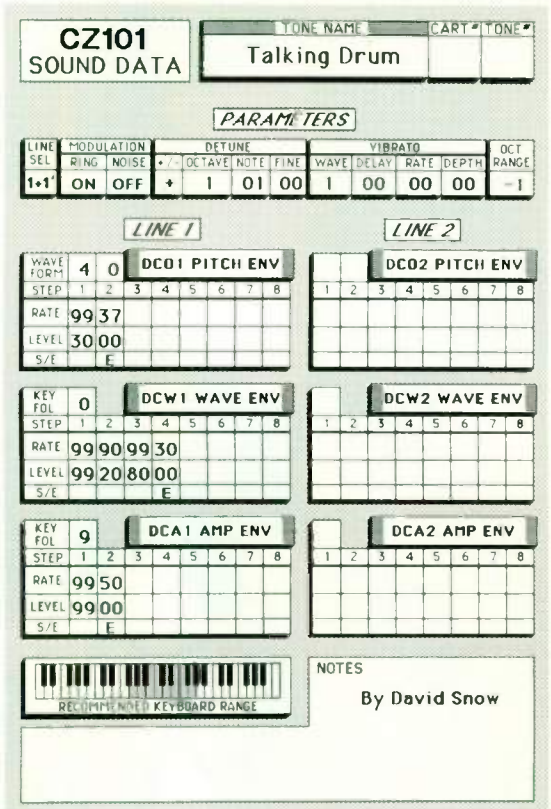
0	DCW2 WAVE ENV							
1	2	3	4	5	6	7	8	
99	39	27						
18	90	00						
		E						

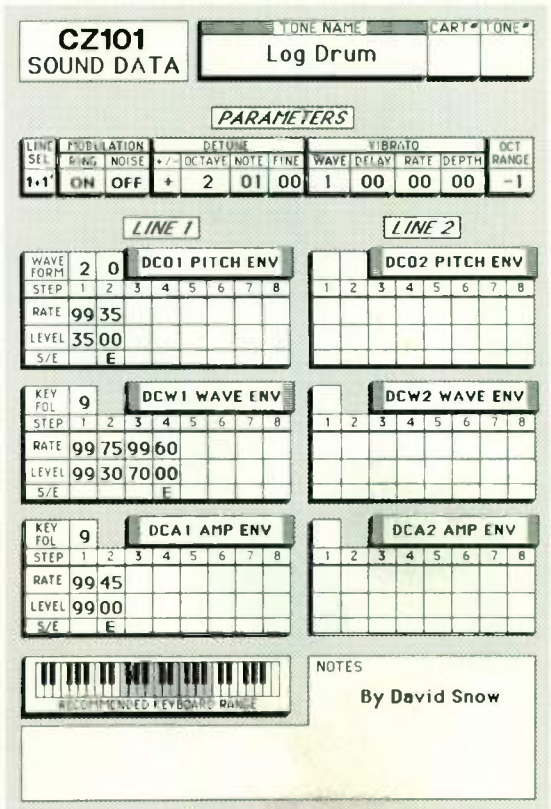
0	DCA2 AMP ENV							
1	2	3	4	5	6	7	8	
99	52							
99	00							
	E							

RECOMMENDED KEYBOARD RANGE

NOTES

By Craig Anderton





You know the kind of instrument we're talking about: one that inspires you and makes you want to play. But how does an instrument make the transition from musical to magical?

Making MUSICAL INSTRUMENTS Magical

BY CRAIG ANDERTON

(Editor's note: Musicom, probably the best trade show I've ever attended, was a fixture on the Dutch music scene from 1983 to 1986. I gave seminars at all except the first one, but the talk that seemed to go over the best was the one I did in '86 on music and magic. Several people who heard the talk said I should really run a transcription of it in EM *sometime, and when a lengthy discussion of the lecture was published in a Belgian electronic music magazine, I figured, what the heck. I hope you find this excerpt interesting; if you'd like to see a report on the complete lecture and can speak French, refer to issue #61, October 1987, of* Les Cahiers De l'Acme *[99, avenue Du Cor de Chasse/B-1170, Bruxelles, Belgium].)*

"I'D LIKE TO TAKE A SORT OF DIFFERENT APPROACH this morning, and talk not just about machines, micros, MIDI, and music, but also about motor cars and magic. We have a lot of machines here at this exposition, and sometimes people tend to forget about the magic that can exist within these machines, and the magic that music is supposed to be all about. So, the first part of this talk is going to be about understanding machines from a philosophical standpoint . . . how to approach a machine, and what a machine really is . . . what kind of personality it has, and how you can learn that personality.

"The people selling the machines you see here will be more than glad to talk about specifications. To some folks, these machines are just things. Some people take matters a little further, and say that within these machines lies *success*. How many times have you heard someone say 'if only I had a Fairlight/Synclavier/Emulator (fill in the blank), then I could make the kind of music that I, and other people, want to hear.' But the machine is not the point. You don't pull success out of a machine; you put success *into* the machine, by putting your own personality into that machine, and by having an intuitive understanding of what that machine can and cannot do. When you reshape the machine according to what you want it to do, when you exploit its potential to

ILLUSTRATION BY BUD THON

express *your* ideas rather than merely accepting the factory presets or samples that came with it, then there's a chance that you might actually be able to pull some success out of that machine because *your* ideas will be amplified by the machine's capabilities.

"I also want to talk a little bit about what makes a machine a *magical* machine. We're all rational, 20th century western-type people, and the metaphysical has sort of taken a back seat in our lives. But, machines have personalities and maybe even consciousness; perhaps a story or two would help illustrate this point.

"Many years ago, I was buying my first car and all I knew about cars was that they rolled, you had to put gas in them, and that they had tires—that was pretty much it. I was just about as intimidated about a car as most people are about synthesizers. So I put an ad in the paper saying that I was looking for a car that cost around $500 and received several replies, and a lot of the cars for sale happened to be Volkswagens. So I test-drove them around and the first thing that struck me was even though they all came from the same factory, at pretty much the same time, they were all different—they seemed to have acquired their owner's personalities. Some of them drove very smoothly and some of them rode kind of rough; some hadn't been maintained and some had. Although all these machines had started off as just a brand new pile of parts, some turned into grouchy old machines that had a hard time starting, while others turned into real happy machines that could zoom on down the highway. So I ended up getting a Volkswagen from a guy who loved his machine. And I really got into it; I couldn't afford tune-ups or anything so I learned how to do it myself (which I recommend for anybody who buys a synthesizer; learn about that machine, learn how to tune it up and maintain it, and treat it right). But I never could get the horn to work properly.

"One day I was pulled over by the side of the road by a policeman. They used to inspect cars in California by just randomly pulling you over by the side of the road. One of the things they checked was your horn. I was trying to think of an excuse I could give, like 'well gee, it worked this morning,' or, 'gosh, I'm on my way to the service station to get it

fixed,' or something. So I pressed down on the horn and—it beeped! I still don't quite believe it. I often think the horn wouldn't have beeped had I been driving a 'grouchy' car.

"Now, a somewhat more musical machine story happened when a friend of mine bought me a second-hand Telecaster guitar for my 25th birthday. I really didn't have the heart to tell him that every Telecaster I ever played, I hated. So I took the Telecaster home and it wasn't half bad, but what was really interesting was that I'd always been a fuzztone/power chord kinda guy, yet for some reason, this guitar made me turn off the fuzz tone, turn up the treble, and start playing some pretty funky types of chords. I found myself playing with an R&B feel. I figured it was probably because a new neck shape made me play differently, but then six months later I found out who had owned the guitar before me: a woman rhythm guitarist in an R&B band who loved that guitar and had obviously put her soul into it. And somehow, when I took the guitar out and played it, maybe there was some residual personality left in the guitar that she'd put there. I found that very intriguing, not to mention a bit puzzling. Maybe we're talking coincidence; maybe not. I don't know.

"'So how does this relate to synthesizers?' you might ask. To me, the most interesting aspect of synthesizers is that they're basically computers, and computers are little beings we've created in our own image. They respond to stimuli—when you turn a dial, close a switch, or hit a key, they're listening! Your synth is saying, 'What key are you playing?' 'What knob are you twisting?' 'What parameter have you chosen?' And you tell it. And it outputs things too. It has these complete input-output structures that are the computer's equivalent of hands and eyes and such. But most important of all, a computer has a memory.

"When a synthesizer or sampler comes to you, it is an empty slate—a blackboard with no writing on it. It may have a little personality from someone at the factory who came up with some patches and thereby put his or her personality into it. That person may have gotten the synthesizer just a week before it was scheduled to ship and programmed in a bunch of thrown-together sounds, or the personality could have come from somebody who really worked on the machine and cared for it.

"But the best thing to do with a new synthesizer, after you've gotten familiar with how it works, is to *erase all the programs*. Save them on cassette or something first but if you can't do a mass erase, program the most boring sound you can devise and copy it over into all the patch locations so that you *have* to take that sound and work with it, and play with it, and put your personality into that synthesizer. At that point, it stops being a thing, it stops being a machine—it starts becoming part of you. And I think that *that* is the entire *raison d'etre* for this type of musical machine.

"The synthesizer that comes out of the store is basically a stranger with good looks. It has a sexy front panel, some LEDs; someone spent a lot of time trying to make it look nice. How you respond to the machine and what you put into it determines whether it becomes a grouchy, old machine or becomes a faithful, trust-

ed friend that allows you to express what you want to express. In many respects, the *sampler* is the epitome of what I'm talking about. Most samplers don't make any sound at all when you turn them on—nothing. Zip. You have to put in a disk to give it a personality.

"People ask me all the time, 'tell me what synthesizer I should buy.' I respond that's like saying, 'recommend a girlfriend.' You just can't. There's a chemistry you have to take into account. Sometimes you meet someone and have an intuitive feeling that that person is really interesting, somebody you'd like to get to know, and I think you need to trust your feelings when you're checking out an instrument for the first time, too. Does it have a personality? Do you want to play it? Do you *want* to touch those buttons? The question is not whether it makes the kind of sounds you want right out of the box, but does it have the *potential* to make the kinds of sounds you want to make?

"And what about the color? It's difficult to play something that is truly ugly. Guitarists have known about this for years. They develop a *relationship* with their instrument; that 1955 arch top Les Paul...that '62 Strat...the grooves that are worn in the frets and neck have adapted themselves to the hands of the player and the playing style. I once had a chance to play one of Hendrix's Strats after a session, and even before I knew whose it was, it felt different. Here was somebody who played the same kind of guitar that Buddy Holly, or any one of a number of other people played, yet he managed to do something completely different with the same instrument that everybody else played because he put his personality into his machine.

People ask me all the time, "tell me what synthesizer I should buy." I respond that's like saying, "recommend a girlfriend." You just can't. There's a chemistry you have to take into account.

"'I hear so many boring *oscillator sounds*,' as a friend of mine says. You hear a Top Ten song and go, 'oh yes, the lead voice is Factory Preset 16 on a DX7. And the bass sound is Preset 02 off the Emulator bass disk.' Is that what music is about? I don't think so. I would much rather hear someone reaching for something that's just beyond their reach, rather than going for the easy and convenient route that everyone else has trodden.

"Before we go, I want to make one more point: a machine is your interface to the muse. It's hard to define the muse: a friend, a lover, maybe a parent—maybe it's a religion—whatever comes out of the sky and makes you want to write a song, what-

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☐ Sound sources include sampling, preset waveforms, additive synthesis, hand drawing of waveforms and cyclic waveforms made by cutting sample data.

☐ True 16 bit linear PCM sampling. Highest sampling rate of 36 kHz gives 14.5 sec of memory. Other sampling rates/memory offer 29.1 secs at 18 kHz and 58.2 secs at 9 kHz.

☐ Stores up to 64 voices (samples), which are organized into 8 banks (presets).

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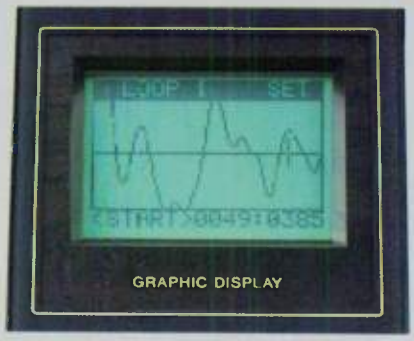

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☐ MIDI in/out/thru; multitimbral, according to keyboard voice/bank configurations.

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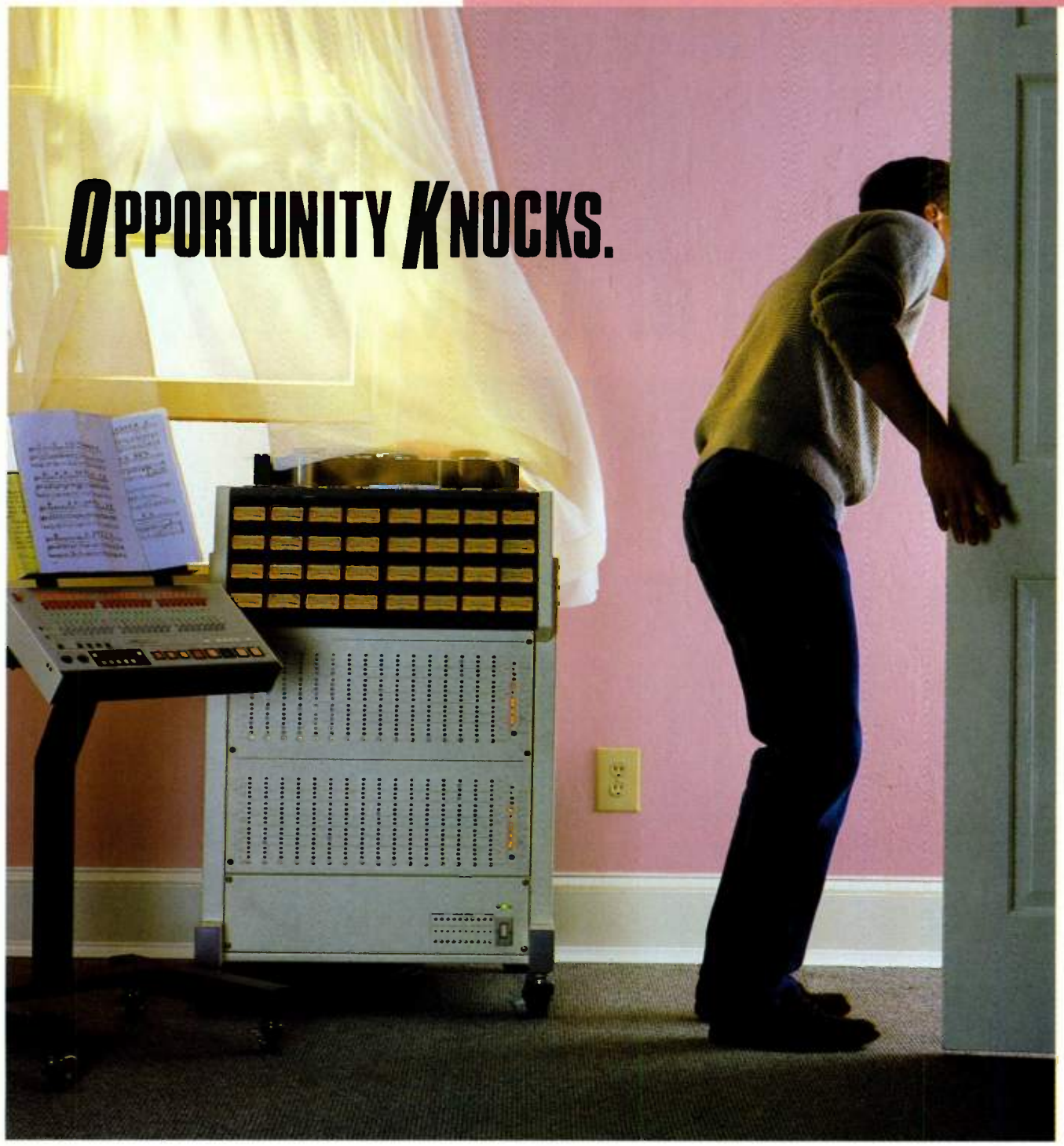

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ever makes you say, 'I have to express something.' And that machine is your link. Unfortunately, the machine can also be the *weakest* link. Why? Because the music in your head, the music that comes in while you're walking on the beach or driving a car or standing in the shower, is always going to be better than what comes out on tape. The machine has to serve as **your** link, and that machine has to be strong with your personality.

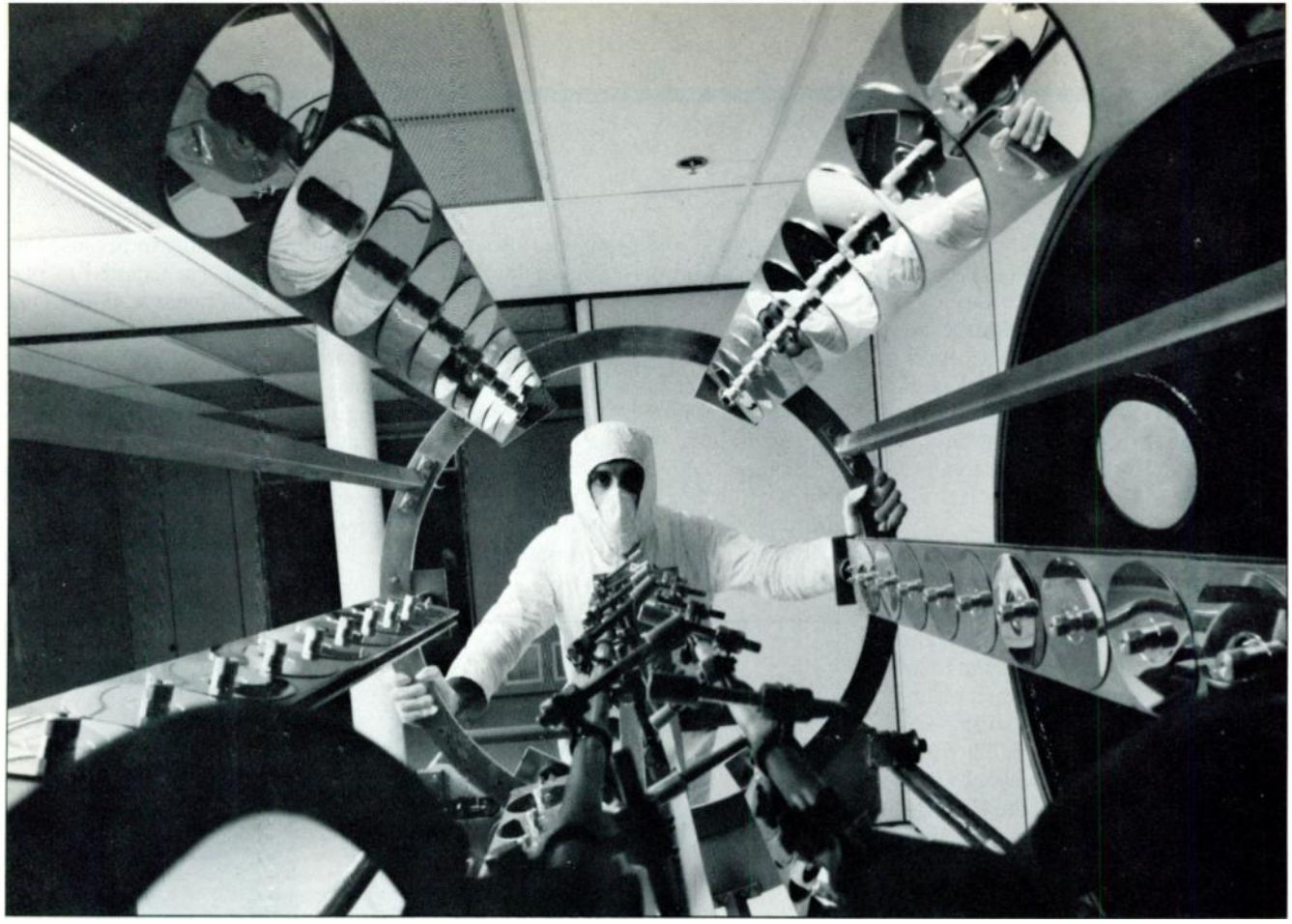
"I said we were going to talk about magic. What does this have to do with magic? *A magician takes the ordinary and renders it extraordinary.* There's nothing extraordinary about a rabbit, but there is something extraordinary about pulling a rabbit out of a hat. There's nothing extraordinary about an orange, but there is something extraordinary about juggling four or five oranges. And there's nothing extraordinary about a musical instrument; *you* have to have the magic to make that instrument really sing, and truly express your personality. How do you know if your machine is magic? Well, it's actually pretty simple. If you get a rush of excitement every time you turn on that on/off switch, if you find those 15 seconds while waiting for it to tune itself up or load a disk to be an intolerably long wait, if you seem to write a new tune every time you sit down at that instrument and play, then chances are, you have some magic in that machine already.

"I don't know how many of you saw Tom Metcalf's lecture on looping yesterday (Tom Metcalf is an Ensoniq employee who has created many of their most popular factory disks), but he wanted to create a loop that didn't work so he could fix it and show how to loop something properly. But he *couldn't* make a bad loop! The Mirage is his machine, he knows it inside and out. It's almost as if he couldn't make a bad sound on it without trying as hard as some people do to make a good sound. I find that significant, a definite sign that he's put some magic in his machine. If a machine makes you play better, then there's magic in it. I had that experience recently with a Paul Reed Smith guitar; I strapped it on and instantly, I was playing better. It was *helping* me play.

"The 'magic factor' is important and I urge you to consider it as you play with MIDI. You're not just connecting together 'things'—you're creating a central nervous system with your patch cords. When you're programming a synthesizer, you're not just trying to come up with a sound, you're putting pieces of yourself into that synthesizer.

"I also don't think it's necessary to feel you have to keep up with the state-of-the-art. A 1971 minimoog is still great; I'd rather hear a minimoog player who's been playing the instrument for ten years than a DX7 player who just got the instrument yesterday. In fact, I've had to make some decisions myself as to what tools I wanted to use to express myself. I constantly have new equipment coming in because I review it, and often I'm tempted to purchase some of the better stuff. But I just had to say 'Wait a minute, I'm going to take three or four or five instruments that I really like, that have magic, and I'm going to learn those instruments thoroughly, and I'm going to stay with them. They're going to become my friends, and they're going to express what I want to express.' I've never regretted that."

EM



Removing aluminum-coated discs from the vacuum metallizing chamber at Discovery Systems.

Compact Disc Production *for the* Independent Musician

BY DR. TOBY MOUNTAIN

Thinking of pressing your own album, or duplicating your own tapes? Surprise—it may actually be more cost-effective to get your music pressed on CD. It's not impossible at all, as this article shows.

ON RECENT TRIPS to your local record store you've undoubtedly noticed that those shiny little compact discs are taking up more and more space. And as you pass by the cashier stand, more and more customers are going out with CDs under their arms. The compact disc is replacing vinyl as the main music playback medium more quickly than anyone anticipated; sometime this year (two years earlier than predicted) sales of compact discs will surpass the LP.

As a musician, perhaps you've entertained the thought of putting your own music on compact disc. But if you have no idea how or where to start, you may be somewhat apprehensive about such an endeavor. Surprisingly, *CDs may not cost you much more than LPs*, yet your return will be much greater. Manufacturing costs have dropped almost 50% in just the last year (from $3 to well below $2 per disc) while retail prices have remained the same ($13 to $15).

What follows is basic information about getting compact discs made. The general steps are not unlike making LPs, but the specifics, outlined below, are new and different. Hopefully, the guidelines presented here will make your venture into CD production a little easier, less painful, and more successful.

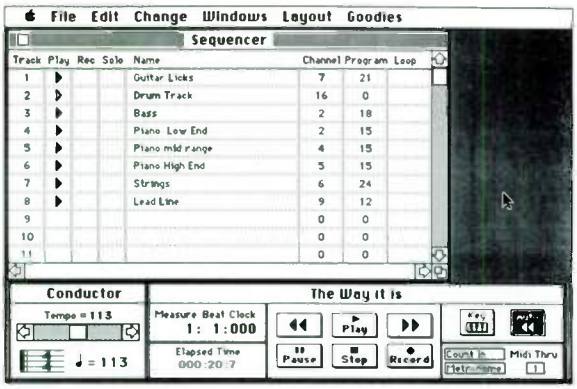
Initial Planning: Marketing

First of all, it is very important to map out a *marketing strategy* before you commit yourself to a CD release. How will you sell your compact discs? Cassettes and records are less expensive and seem to sell better at live gigs. CDs sell best in record

"Your song sounds great, but . . .

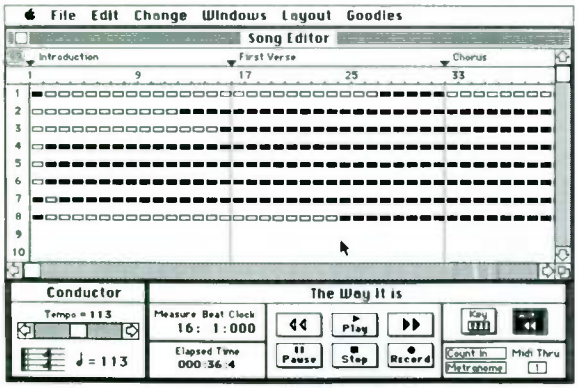
I'd like you to change a few things. The bass needs to be doubled or thickened up a bit, and repeat the horn-fill on guitar in bar sixty-eight. You went a little overboard with the pitch-bend in the middle of the solo, but I think it'll sound fine if you bring up the velocity on each chorus. Oh and by the way, I need it three seconds shorter, but don't cut anything. . . and I'd like to hear the changes by morning."

Demanding response like this from conventional Macintosh™ or Atari ST™ MIDI sequencers will guarantee you an all-night session. With Passport's MASTER TRACKS PRO™ for Macintosh™ or Atari ST™, you can tackle complex sequencing problems in **minutes**, not hours. That's because MASTER TRACKS PRO™ provides you with fast, visual control over your music unrivaled by any other sequencing system.



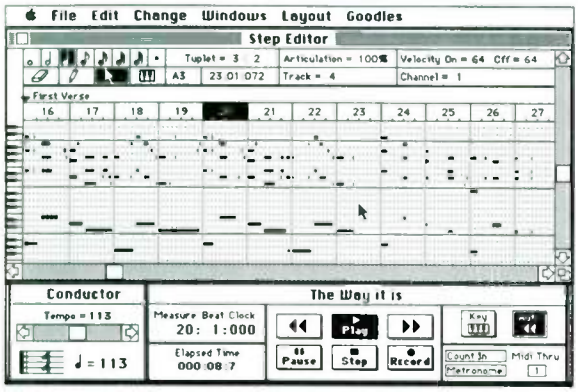
Multi-Track Sequencer

- Record or play from any point in the song
- Control sequencer using on-screen transport
- Sync to SMPTE via MIDI song pointer



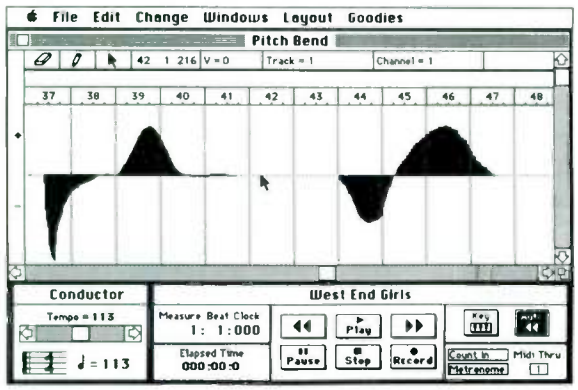
Song Editor

- See the structure of your song over time
- Select meter, tempo and beat for each measure
- Use cut, copy, paste and mix editing to build songs



Step Editor

- See and edit tracks of MIDI data
- Step input notes using mouse or MIDI controller
- Edit individual events or entire phrases



MIDI Data Editor

- Plot Pitch Bend, Aftertouch, Modulation MIDI data
- Zoom in and out on individual events
- Draw changes on screen to edit MIDI data

- 64 tracks for real-time or step-time recording
- Complete implementation of all standard sequencer features
- Extensive control over all MIDI events
- Visually display MIDI events over time
- 240 clocks per quarter-note resolution
- SMPTE sync via MIDI song pointer
- Independent track looping
- Data filtering on input or while editing
- Select areas to edit using mouse
- Change duration, velocity, channel, continuous, transpose
- Cut, copy, clear, paste and mix editing of all data
- Insert or remove time anywhere in a piece
- Display elapsed time of a given section
- Rebar any section to any meter
- Automatically adjust tempos to fit a given time
- Quantize while recording or editing
- Sysex librarian for MIDI system exclusive data
- Store presets, sounds, samples, drum patterns on diskette
- MIDI keyboard can control sequencer
- Windows scroll automatically on playback
- **Now reads and writes Industry Standard "MIDI FILES"**

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Available now for Macintosh™ and Atari ST™.

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(415) 726-0280

Passport International Distributors:

CANADA	AUSTRALIA	NEW ZEALAND
Musicware	Audio Logic	Tekram Agencies LTD.
416-785-3311	03-5872224	03-792-111

GERMANY/EUROPE	ITALY
MEV Musik & Elektronik	Music Pool
089/835031	02 738 6517

Requirements.
Macintosh 512, Plus or SE, or Atari 520 ST or 1040 ST, MIDI interface and MIDI instruments.

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MASTER TRACKS PRO™

PASSPORT®
The Speed of Sound.™

Photo by Jim Lowe, courtesy of Nimbus Records

CD plating (transferring the data on the laser-etched glass master to metal stampers) is an electroforming process performed under strict clean room conditions.

stores or by mail order. Therefore, it is critical to set up a clear plan of advertising and distribution in advance.

More specifically, you should know where your type of music fits into the compact disc market. This means targeting your potential buyer in advance. Find out what distributors and stores carry and specialize in your type of music. If it's "new age" synthesizer-based material, you may want to advertise in one of the high-tech music periodicals. If it's folk, it might be worth your while to be present at the many folk festivals around the country. If it's rock, emphasize the uniqueness of a local rock band on compact disc to regional DJs.

Finally, if your recording is not yet completed, it may be worth spending extra money to record or mix your project onto digital to get that extra edge in quality. Remember, the person who reviews your CD will have the equivalent of your master tape, including any audible flaws like tape hiss or distortion! Most CD reviewers weigh sound quality equal to performance.

There are also compelling marketing reasons to "go digital." The word "digital" can make a hungry CD buyer's eyes light up, so don't be bashful about advertising it! Be sure to display the SPARS code on the disc label and packaging. This is a simple three-letter code representing each step of the recording process: initial recording, mixing, mastering. For instance, a project recorded on a 24-track analog machine, mixed down to a Sony PCM-501 digital converter and mastered digitally for CD would be ADD (Analog-Digital-Digital). Customers look for such things before buying.

When your 2-track master—either analog or digital—is done, your next step (and the first step in the CD production chain) is "pre-mastering."

CD Pre-Mastering

CD *pre-mastering* refers to the final conversion to digital tape before the project goes to CD replication. It is the last time any changes—such as editing or level adjustments—can be made in the program. In the case of an older analog tape, it allows a final opportunity to correct possible problems of equalization, balance or tape hiss. In the case of digital mixes, it may simply mean sequencing the tunes or adding a few additional tracks to take advantage of the CD medium's 70-plus minute available playing time.

The de facto standard for compact disc pre-mastering is the Sony PCM-1610 or 1630 digital format, which is encoded on a ¾-inch (U-matic) videotape. Other digital 2-track formats exist, such as JVC, Mitsubishi X-80 or X-86, Sony PCM-F1 or ¼-inch DASH, but most CD manufacturers accept only the Sony 1610/30 format.

The following are typical costs for converting a two-reel analog master onto a digital tape and creating a master for CD production:

3-4 hrs.	Transfer to PCM-1610/30 and CD Formatting	$320
2 hrs.	¾-inch videotapes (U-matic), transfer and master	$ 80
	Total:	$400

If your tape is on another digital format, often it can be transferred digitally to the PCM-1610/30 for editing and CD pre-mastering without any loss in quality. This is true of the ever-popular Sony PCM-F1 (-701, 601, or 501) format recorded on ½-inch videotape. For other digital formats call the mastering facility to see if they can handle it (see **Fig. 1**).

When your PCM-1610/30 master is completed, be certain to make a digital copy (clone) before sending the master off to the CD plant. Your copy can be either another ¾-inch 1610/30 tape or a ½-inch PCM-F1. A 1610/30 copy is preferred, but the latter also makes for a nice economical digital reference for the producer or musician. In another year or two the controversial DAT format (digital cassette) will gradually supplant the role of the F1 and make for a very popular reference. So let's factor in the following cost:

1 digital copy of CD Master (including tape)	$125

The tape mastering facility will ask you to provide titles of each of the tracks you wish to be accessed on the disc. The engineer must log the exact begin and end timings (SMPTE time code) of each

Now everyone can enjoy MIDI!

Are you thinking about getting into MIDI? Looking for something fast and powerful, yet easy to use? You'll find the **MIDI Starter System**™ was designed for *you*. It is a complete hardware and software solution that uncomplicates MIDI. And, it's amazingly affordable.

Just install the **MIDI Co-Processor Card** in your IBM PC, XT, AT or compatible, plug in your MIDI keyboard or MIDI guitar, and you're ready to roll!

The **Easy-8 Sequencer** then puts you at the controls of an 8-track digital tape recorder. Record your tune a track at a time while hearing previous tracks. Perfect your music with powerful cut, paste, copy, merge, auto-correct, and transpose operations. Then, play back and enjoy!

Easy-8 includes an **Accessories Box** where you can put other music programs to be run from right inside the sequencer. For owners of the popular Casio CZ and Yamaha DX-21/27/100 or DX7 synths, we've installed **Editor/Librarian software** to help you manage voice patches. There's also a **MIDI Trace Utility** so you can check out your gear and learn more about MIDI.

But that's just the beginning.
You'll be glad that the Accessories Box holds up to 12 programs, since the Co-Processor Card **runs most IBM PC music software** designed for the MPU-401. So, you'll have plenty of room to grow!

The MIDI Starter System™

- MIDI Co-Processor Card
- Easy-8 Sequencer
- CZ Editor/Librarian
- DX-21/27/100 Editor/Librarian
- DX7 Editor/Librarian
- MIDI Trace Utility

Introductory Price $199

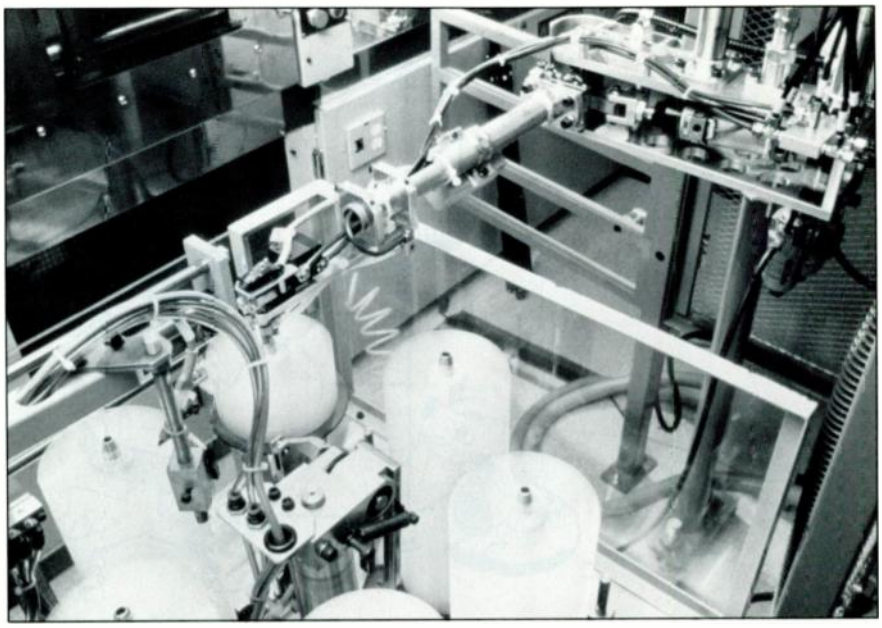
See your local computer or music dealer

Music Quest, Inc. 1700 Alma Drive Suite 260 Plano, Texas 75075 (214) 881-7408

track onto a cue sheet which will accompany the tape to the CD plant. These timings are offset slightly before being encoded onto the disc during the glass mastering process (see below). For instance, if the musical begin time of track 4 is 15:35:20 (15 min. 25 sec. 20 frames), you may want the CD player to start playing at 15:34:20 (one second prior). Any special needs you have should be communicated to the engineer. If you're unsure, here are some guidelines: since some of the inexpensive disc players are slow at unmuting, a safe offset is 15 frames (½ second); but a "live" program may warrant something a little tighter, such as five to ten frames (⅙ to ⅓ second).

Compact Disc Production

Compact disc production is a highly technical/non-musical process, but you should have a general idea of how it works. It all begins with glass mastering (not to be confused with tape mastering). This is the most critical part of the entire replication process and requires ultra-clean work rooms. As the master tape is played back on the 1610/30, the digital information flows to a laser cutting machine which exposes tiny pits on the surface of a large glass disc. After the glass disc is sprayed with nickel, an electro-metalization process creates metal parts which are used in the injection molding process. Once the discs come out of injection molding, they are sprayed with aluminum and covered with a protective plastic surface. Labels are then printed using a silk screening process (see section on CD Artwork).



The robotic arm of an injection molding machine stacks encoded CD blanks at LaserVideo.

The following are approximate costs for CD production. I say "approximate," because prices have been changing (going down!) since last year. In fact, there is a literal price war going on now between CD plants, so I would definitely shop around. Also ask them to send you a sample of their product.

Glass Mastering (not charged at some plants)	$1,000
1,000 discs with 1 or 2 color label (@ $1.60)	$1,600
1,000 jewel boxes (@ $0.30), including insertion of printed materials	$300
Total:	$2,900

It is important to emphasize that the CD replication process is a very perfunctory, non-musical process. The final prod-

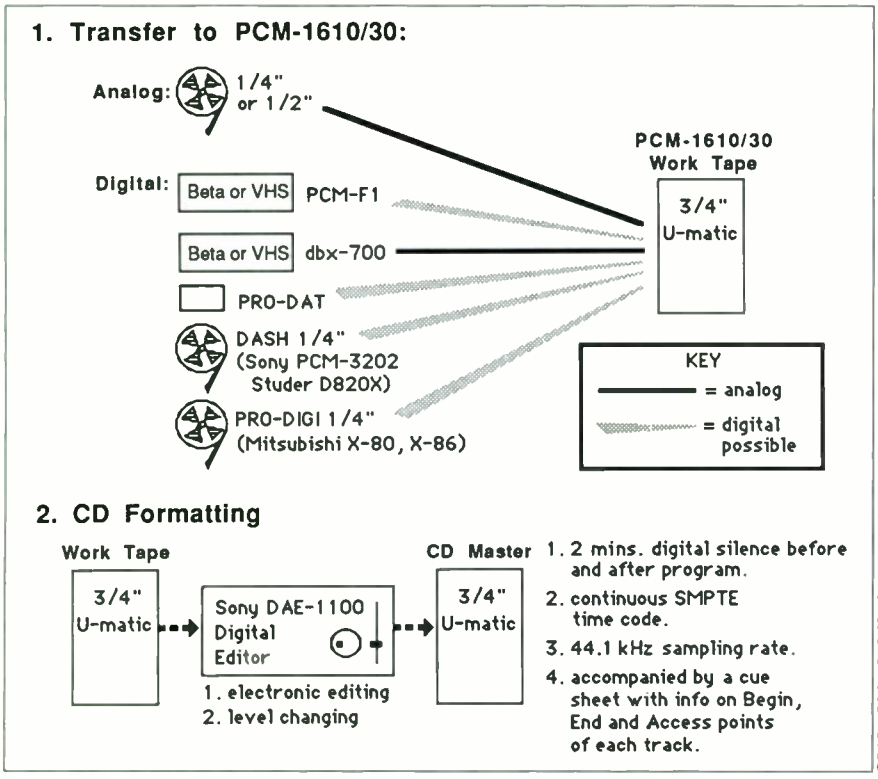


FIG. 1: Tape formats and CD formatting

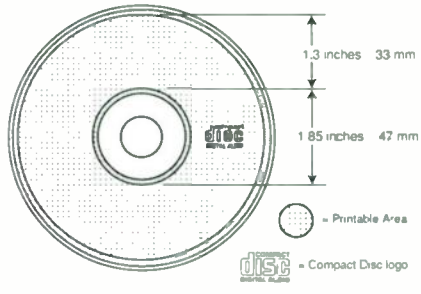


FIG. 2: "Safe" printable area for CD label

One good thing deserves another...

Sequencer Plus Mk III

$495

and another...

Sequencer Plus Mark II

$295

and another.

Sequencer Plus Mark I

$99

PC MAGAZINE EDITOR'S CHOICE

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Sequencer Plus Mark III (Sp3) is a *"No Compromise" powerhouse!* 64 music tracks with independent offsets, tempo track, song position pointer, chase mode, extensive and selectable MIDI Filtering, 17 transform functions, block editing of multiple tracks, 11 memory buffers and a list of additional features that reads like a computer musician's wish list!

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Sequencer Plus Mark II (Sp2) is the perfect production tool for just about all of your most demanding musical creations. 32 music tracks, tempo track, 6 memory buffers, programmable play range, Song position pointer, intricate MIDI data editor, individual track load/save, and more!

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GETTING IT ON DISC:

The EM CD Pressing Directory

BY GEORGE PETERSEN

Currently, the manufacturing capacity of CD plants worldwide is at an all-time high. A number of new facilities are presently under construction, and existing CD suppliers are upgrading and expanding for higher output. Fortunately for musicians and independent record labels everywhere, this situation has led to a glut of available pressing time, resulting in lower prices and a faster turnaround time. It is now possible to drop off your properly prepared and correctly labeled tapes, art materials and cue sheets, and pick up completed CDs in a matter of weeks, rather than months (which was an "acceptable" turnaround time just a year ago).

By now, you've read Toby's article, have all your tapes properly formatted, edited and coded for optical transfer, and with graphics in hand and a bulging wallet, you're ready to enter the brave new world of compact disc production. At this point, only the most important question remains—who will handle the CD pressing?

The following is a list of independent North American compact disc facilities, along with some U.S.-based offices for offshore CD plants. The range of services offered by these companies varies widely—all offer CD pressing/packaging, while others also include pre-mastering, editing, printing, drop-ship and fulfillment among their many services.

AMERIC DISC INC.
2525 Canadian Street
Drummondville, QUE, Canada,
J2B 6V4
☎ 819 / 474-2655
Contact: Andy Nagy or Reggie Rutherford

CINRAM LTD.
2255 Markham Road
Scarborough, ONT, Canada,
M1B 2W3
☎ 416 / 298-8190
Contact: Wendy Anderson or Kim Zenga

DAIO CORPORATION
1150 Calle Suerte
Camarillo, CA 93010
☎ 818 / 884-1268
Contact: Kuni Yashiro

DENON DIGITAL INDUSTRIES, INC.
1380 Montecello Road
Madison, GA 30650
☎ 404 / 342-3425
Contact: Eric Fossum

DISCOVERY SYSTEMS INC.
7001 Discovery Road
Dublin, OH 43017
☎ 614 / 761-2000
Contact: Mike Ward

DIGITAL AUDIO DISC CORP.
1800 N. Fruitridge
Terre Haute, IN 47804
☎ 812 / 466-6821
Contact: Scott Bartlett

DISCTRONICS
8439 Sunset Blvd., Suite 401
Hollywood, CA 90069
☎ 213 / 654-5550
Contact: Jeannie Brinkman

JVC DISC AMERICA
#2 JVC Drive, Tuscaloosa, AL 35405
☎ 206 / 556-7111
Contact: JVC Disc Sales
☎ 213 / 466-4212, 212 / 704-9267

LASERVIDEO
1120 Cosby Way, Anaheim, CA 92806
☎ 714 / 630-6700
Contact: Sales Office
☎ 818 / 953-7790

MEMORY-TECH
5800 Summit, Plano, TX 75074
☎ 214 / 881-8800
Contact: Scott Ross or Shinobu Toyota

NIMBUS RECORDS
Box 7305, Charlottesville, VA 22906
☎ 804 / 985-1100
Contact: Peter Miller

PHILIPS/DUPONT OPTICAL
Box 400, Grover, NC 28073
☎ 704 / 937-7941
Contact: John Kiernan
☎ 212 / 764-4040

PRAXIS TECHNOLOGIES
950 Verbena Road
Mississauga, ONT, Canada L5T 1T6
☎ 416 / 673-9544
Contact: Alun Elias

SANYO LASER PRODUCTS
1767 Sheridan
Richmond, IN 47374
☎ 317 / 935-7574

SHAPE OPTIMEDIA
Route 9 and Eagle Drive
Sanford, ME 04073
☎ 207 / 324-1124
Contact: Dennis Hannon

SKC AMERICA
201 Route 17 North
Rutherford, NJ 07070
☎ 201 / 438-8787

TECHNETRONICS
Box 496, Matlack Industrial Park
201 Carter Drive
West Chester, PA 19381
☎ 615 / 430-6800
Contact: Dave McQuade

TECHNIDISC
2250 Meijer, Troy, MI 48084
☎ 313 / 435-7430
Contact: George Giankulis

3M OPTICAL DISC PROJECT
1425 Parkway Drive
Menomonie, WI 54751
☎ 715 / 235-5541

TZURU TECH
c/o US Abex Laboratories, Inc.
13042 Moore Street
Cerritos, CA 90701
☎ 213 / 404-6315
Contact: Jacqueline Dispoto

uct that you receive from the plant should sound identical to the CD tape master. Defective discs may have any of the following symptoms: muting of audio, laser mistracking ("skating around"), poor accessing, or audible ticks which weren't in the program. If this happens, the CD plant will give you credit for any rejects.

Artwork and Printing

You should begin planning artwork during your final stages of mixing or mastering. Adhere to a rigid schedule for getting the printing done on time. Nine times out of ten, it is usually the printing of booklets, inlay cards or cardboard boxes which holds up a CD release.

It's recommended that you do all your artwork locally so you can oversee the process as you go along. Find a graphic artist you trust and who is familiar with the CD medium. As with LPs, the artwork can be an integral part in selling that product. Much care and patience must be taken in making sure all of the proper information gets printed on the disc label, the booklets, and the inlay cards.

First consider the disc label (**Fig. 2**). Most CD plants require that the label film be sent with the CD master tape. A positive, "emulsion side up" film must be supplied for every separate color on the label. Since the label is printed with silk screening, there is usually a minimum thickness of the lettering (typically 0.5 mm). The label must include the following:

- ✓ Logo and name of the record company
- ✓ The official compact disc logo
- ✓ A notice as to where the discs are manufactured, ie. "Manufactured in U.S.A. by..."
- ✓ Titles of all tracks with proper timings.

Use the timings from the cue sheet of the digital master tape since they will be most accurate. Also be sure to get a "spec" sheet from the CD plant concerning their particular label film requirements since different plants use different printing methods. Your CD plant can provide you with paste-up ready artwork for items 2 and 3.

A four-panel booklet consisting of one sheet of medium weight stock folded in the middle is a common and inexpensive booklet format (**Fig. 3**). This usually consists of a two- to four-color front page, printed information (one color) on the interior pages, and a listing of the songs with timings on the back page. The inlay card, which is scored at the edges and fits underneath the gray tray holding the CD, often duplicates the information on the back page.

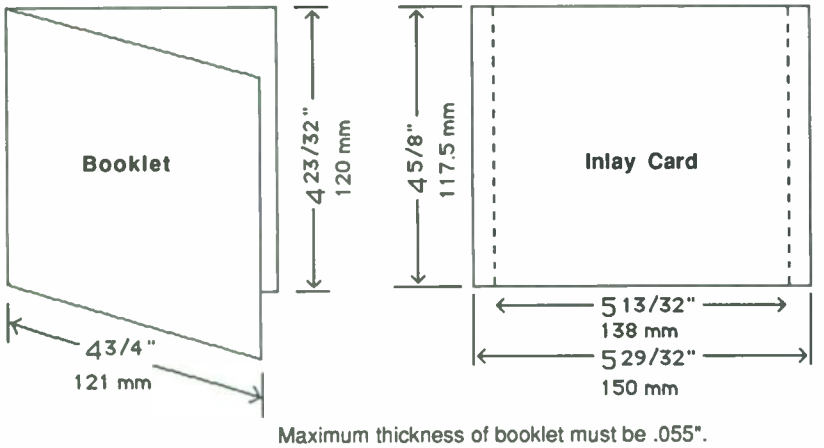
Choose a printer who has had experience with CD booklets, and make sure you supply the manufacturer's exact dimension requirements for cutting. Some plants have automated packaging machines that have difficulties inserting materials that aren't precisely sized. The dimensions included in **Figs. 2** and **3** for booklets, inlay cards, and the label film are all *sample* sizes—check with your CD plant concerning their specific measurement requirements.

CD Packaging

There are several alternatives for compact disc packaging, depending on how you plan to distribute and sell your discs. If you're pressing only a small quantity mainly for demo purposes (250-500), it may be most economical to order the CDs in bulk (packed in sleeves) and do the packaging of the disc, booklet and back card into the jewel box yourself (a good excuse to invite a few friends over and have a CD-stuffing party!). If the CD plant does the packaging, they will usually give you shrink wrap for no extra charge. Either way, this sort of basic packaging is adequate for selling CDs at gigs and in small specialty stores, but if your music is being distributed in larger stores, more elaborate steps will be required.

The reason for special CD packaging is to cut down on theft at music stores. One liability of the handy CD medium is the ease with which one can fit a jewel box into a large coat pocket. To prevent this, most record stores and mainstream distributors require elongated CD packaging, either in a "blister pack" (see-through

CD Booklet and Inlay Card



GRAPHICS BY CHRISTINE LAURIAT

Maximum thickness of booklet must be .055".
Thickness of inlay card must be .0050" - .0055" or 0.13 mm.
Compact Disc logo must appear on both booklet and inlay card.

FIG. 3: CD booklet and inlay card dimensions

plastic) or a 6 × 12-inch cardboard box (also known as a "spaghetti" or "tuck" box). While many 6 × 12-inch boxes have artwork printed on them, economical generic boxes with just the "compact disc" logo are also available. The following are typical prices for packaging, if handled by the CD plant:

Packaging (per 1,000):

Blisterpack with jewel box insertion (@ $0.35)	$350
Insertion of jewel box into cardboard box (@ $0.40)	$400

Now that we've covered all aspects of printing, let's tabulate some costs for printing and artwork assuming the discs will be sold in cardboard boxes. Since artwork and printing costs vary so much, consider the following an approximation.

Artwork and printing:

Label Design and Film	$150
Design, layout, and typesetting	$375
Color separations (for one color photo)	$250
2,000 four-panel booklets (one color photo), inlay cards	$650
2,000 6 × 12-inch four-color cardboard boxes (@ $0.30)	$600
Total:	$2,025

Even though you may be pressing only 500 CDs, you might as well have at least 2,000 booklets, inlay cards and cardboard boxes manufactured, since the one-time printing cost goes down drastically with quantities. You will then have these extra materials on hand when you make reorders. Spares will also ensure that, even with a slight overrun, all of the CDs pressed will be completely packaged and ready for distribution on schedule.

SUMMARY

Now that we've gone through all aspects of CD manufacturing, it is perhaps a good idea to summarize. Let's add up the costs and see how much this is going to set you back.

CD Pre-mastering: PCM-1610/30 master and safety	$525
CD Replication: 1,000 discs in jewel boxes with inserts	$2,900
Printing: label film, 2,000 booklets, inlay cards, 6 × 12 boxes	$2,025
Packaging: Inserting jewel boxes into cardboard boxes	$400
Total:	$5,850

You may also have to figure in extra costs (such as mechanical royalties on non-original compositions, generally $0.05 per song per disc), and also any artists' royalties which are a negotiated percentage of the retail selling price of each disc. Unless you are pressing your project at a local plant, you'll also have to include shipping charges in your budget. However, since these are variable costs, we won't figure them into the equation.

Your basic cost comes out to about $5.85 per disc. You may be selling a fair number directly to people for the asking price ($13-15), but most discs will be sold to either a distributor or a retail store for less ($8-10). Assuming some discs will be given away as demos, you should be able to easily cover all CD production and some recording costs with the sale of the first 1,000 discs.

It is important to note that over half

—continued on page 138

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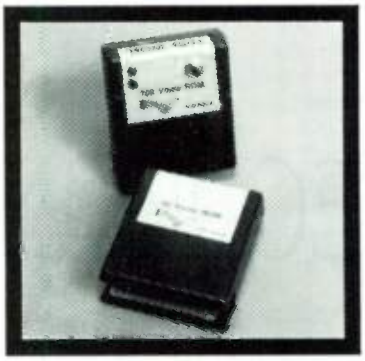

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Recording with both a multi-track and a MIDI sequencer offers both power and flexibility—but you have to make the right connections.

SYNCHRONIZED RECORDING *with* VIRTUAL MIDI TRACKS

BY GARY OSTEEN

I just recently finished recording six LP-bound songs for a band called Section Eight. What made the project unusually interesting was the recording technique we used. We synched an 8-track tape deck to *virtual MIDI tracks*, and got unlimited freedom to experiment with different combinations of both keyboard and percussion extravagances—all without committing the result to tape until mixdown. The secret was using seven tracks of the tape recorder (for vocals and such non-MIDI instruments as guitars) and synchronizing the deck with a computer sequencer that could play as many MIDI instruments as we could lay our hands on

The band has three players on ten instruments: Jeff, on keys and vocals; Eric, on bass and guitar, and James on drums. The group is conceptually similar to many bands today in that it uses a MIDI sequencer in live performance. Jeff's Compaq portable computer (an IBM clone), loaded with the sequencer, Texture, leads the band with multiple, pre-performed keyboard and bass parts. Eric's guitars are non-MIDI, taken direct to the board, and the drums are played live by James, instead of being programmed—probably a big reason why this band's sound differs from so many other groups of this type.

From the start the band had learned to solve two problems: to overcome the natural tendency to let the sequencer do most of the playing for them; and to maintain their rhythm while following the perfect meter of the sequencer. Many musicians tend to have difficulty playing to the regimented, pre-determined rhythm of a sequencer, but these guys were as natural with "absolute" timing as any musicians with whom I have worked. They purposely orchestrate their songs

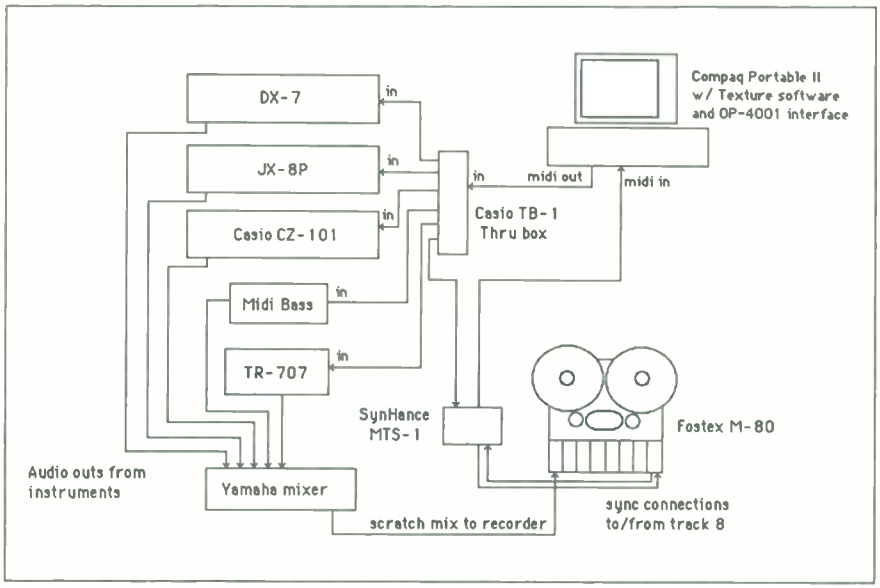

FIG. 1: System hook-up for recording sync and scratch tracks.

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TURN THE PAGE

with a generous amount of real time playing in order to present an active stage appearance, and on live gigs, their audiences don't even seem to wonder about where the other instrumental parts are coming from.

The Process

We recorded the first session at the band's rehearsal studio. We decided to tape the sync tracks first, and temporary ("scratch") tracks of keys, vocals and drums last. Then, using the scratch tracks as a reference, we would re-record the other instruments' final tracks at CompuSound, a showroom/studio with all the gear required for the rest of the session.

To lay down the sync track ("stripe the tape"), we connected the MIDI Out of the computer into a SynHance MTS-1 sync box (see **Fig. 1**). As each song was played back separately on the sequencer, the MIDI timing signals it generated drove the sync box to produce an audio timing code, similar to SMPTE. This signal was recorded on track eight.

With the timing code established, we set Texture to receive *external* sync, connected the MTS-1's MIDI Out to the MIDI In of the computer, and rolled the tape. The MTS-1 converted the playback of the tape sync signal into MIDI Song Position Pointer information, which then controlled all the computer's timing, start, and stop commands. As each song played back, we recorded a scratch mix of the keys on channel one. We did the same for rough vocals and guitar parts on two other channels.

We were now ready for the drummer's tracks.

The Big Switch

We changed the sequencer software to Sequencer Plus Mark III for the recording of the drum pad data because it records in a linear format, like a tape recorder. This makes it better at recording long passages of uninterrupted MIDI data than is Texture's "modular" format.

James plays a five-piece Simmons set with acoustic cymbals. His pad hits are transformed into MIDI data by a Phi-Tech voltage-to-MIDI converter, which then triggers a Roland TR-707 in place of the Simmons's sound module. As James played to each song's scratch track, his pad hits went through the MTS-1 sync box and were recorded into Sequencer Plus as MIDI note data, while the cymbals were recorded on tape (**Fig. 2**). A hi-hat mic and two overhead cymbal mics were mixed to stereo and fed to tracks five and six of the 8-track. James managed to record almost all of his tracks on the first take, making my job a lot easier.

Session Two: CompuSound

Now that the drum tracks were recorded in Sequencer Plus, we needed to get all the keyboard track data into it from Texture. We did this, and all the rest of the session, at CompuSound. Sequencer Plus will only record one track at a time, assigning all data for that track to one MIDI channel. Because of this, I had to transfer each instrument's MIDI data from one sequencer to the other, track by track. This was a long and troublesome task. I hope that MIDI software writers will soon decide on, and implement, a common format in which to write their song files in order to make transfers like this easier (see sidebar).

Double For Nothing—Nothing For Free

After assigning the keyboard parts to their respective channels, we sent the sequenced kick, tom and snare drum hits to Kawai R-100 and Roland TR-707 drum machines and a Prophet 2002. But then, listening to the drum sequences play back, we heard a problem. The Phi-Tech converter had actually created *two* MIDI note-on events for most of the drum hits, making every drum hit sound flammed. I had two choices: either edit out each false trigger one at a time; or transfer the drum tracks to yet *another* sequencer, one with a *global editing* capability that would remove all the extra notes at once.

I knew Mark of the Unicorn's Performer (for the Macintosh) could handle this problem, so there I was again, transferring all the drum data into another computer. Performer's "split notes" editing feature let me specify all notes with durations of less than 20 "clicks" (480 clicks/quarter note), and remove them in one fell swoop. I then noticed that the *velocities* of the remaining notes ranged variously from 64 to 127, a dynamic range that would produce drum sounds from a tap to a hard hit. So while I was in the program I called the "change velocities" window and limited the *minimum velocities* of each note to 110, giving the tracks a dynamic feeling more like that of a real drummer.

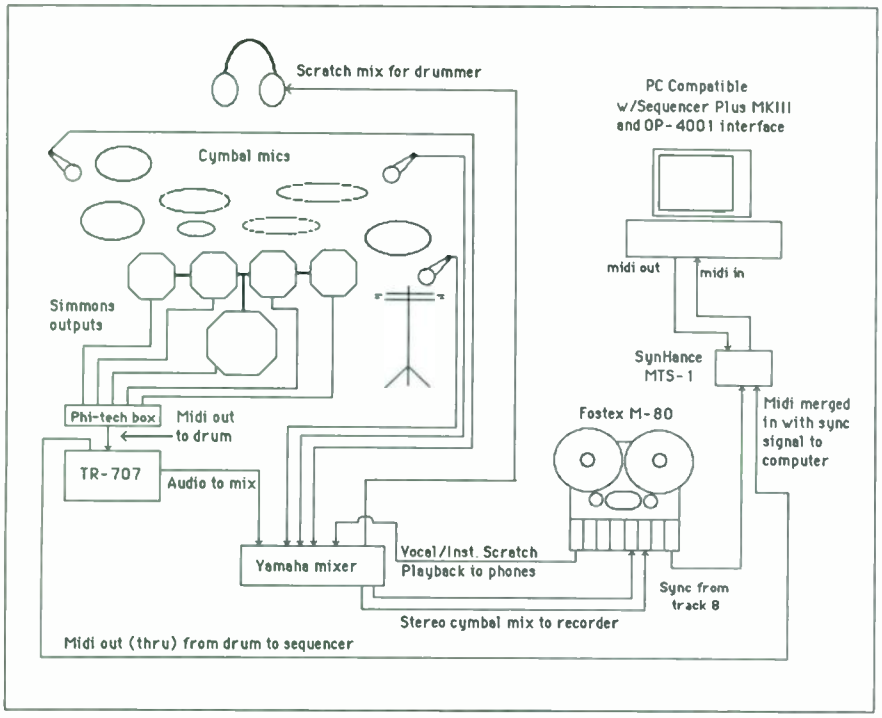
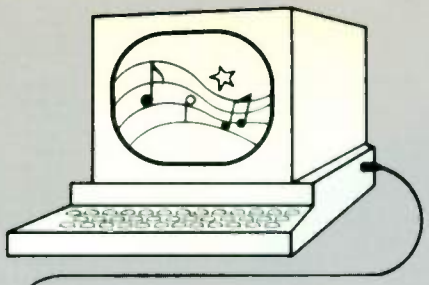


FIG. 2: System hook-up for recording drums and cymbals.



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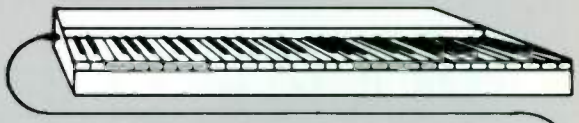

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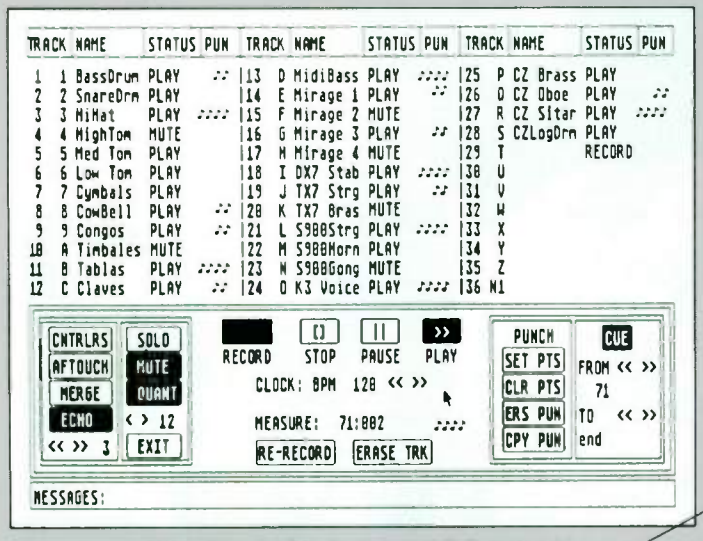

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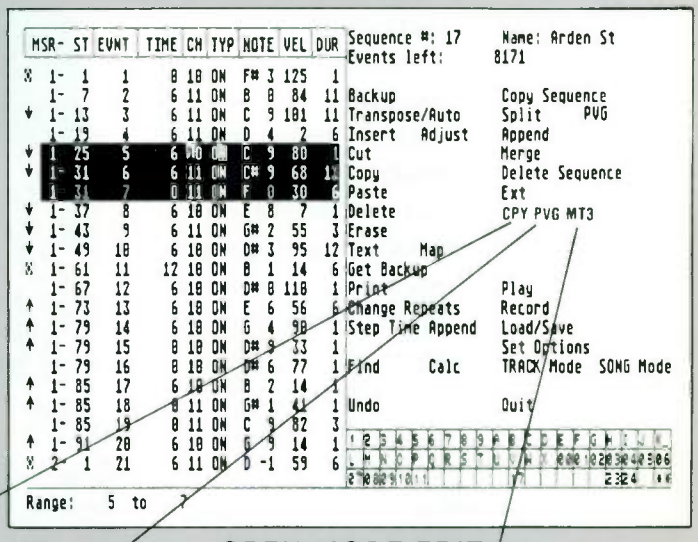

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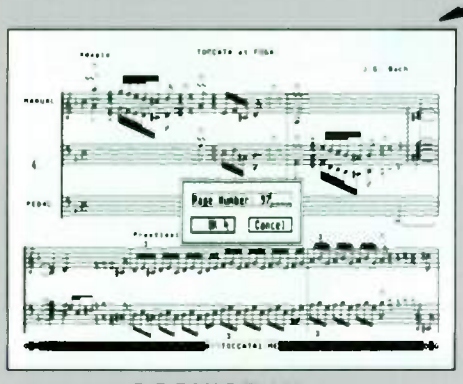

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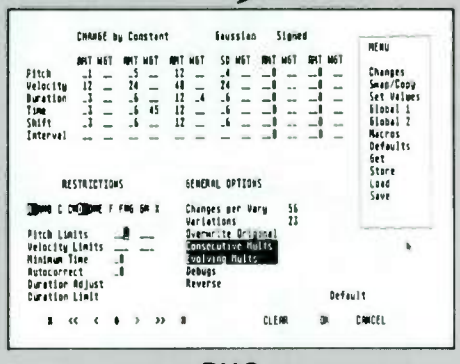
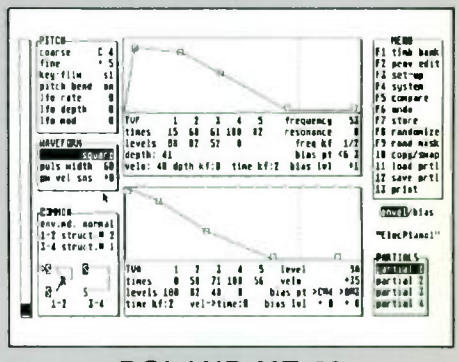


PVG



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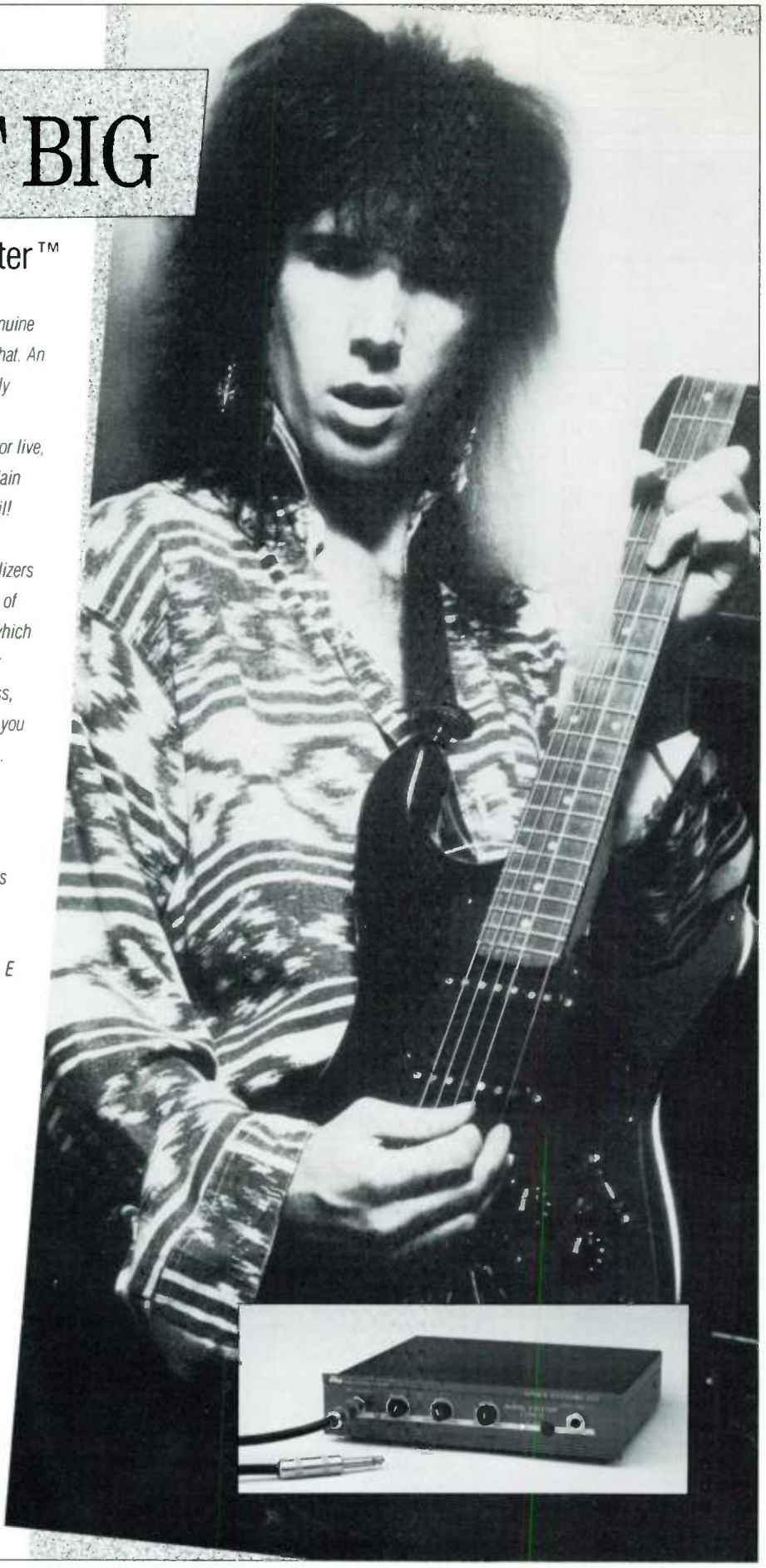

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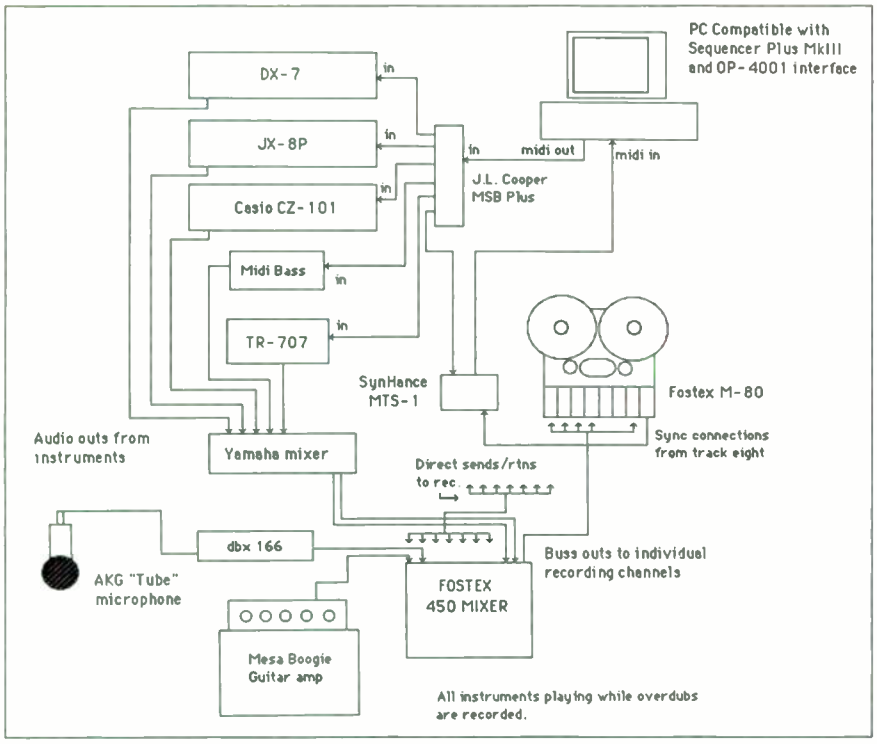


FIG. 3: System hook-up for recording vocals and guitar.

ONE STEP FORWARD, ONE STEP BACK

It was then time to transfer the drum tracks *back* to Sequencer Plus on CompuSound's main computer, and we set up the live keyboards to play the same as in performance. Since CompuSound had all the instruments the keyboardist used, Jeff just loaded all his sounds onto a ProLib disk and brought *that* to CompuSound, where we loaded them into the different instruments.

Once the sounds were in the MIDI instruments, we chase-locked the sequencer to the tape to compare the synched drum track with the recorded cymbal parts. As anticipated, the triggered drums sounded slightly late. Since we wanted to preserve the "human" feel of the drums, we hesitated to quantize the tracks, and decided instead to use Sequencer Plus's "time offset" feature to pull all the MIDI drum data *back* in time just enough to align it with the cymbal hits. It sounded great.

Virtual MIDI Equipment—Real and Wished-For

For all the nifty technological gizmos Gary used in his MIDI/multi-track session, he mentions one item that only exists on wish lists: a way to transfer MIDI files from one sequencer to another faster than the "one track at a time playing in real time" method. *MIDI Files* is just this thing. When this format—recently proposed by the MIDI Manufacturers' Association—is adopted as a standard, a System Exclusive message will be able to send files created by any PC-based MIDI sequencer or intelligent instrument to any other at the standard MIDI transmission rate of 31,250 Baud. The people who make MIDI software are studying the proposal now, and it may be adopted by the time you see this. When we know, you'll know.

Here's a rundown of the "realware" used in Gary's project.

■ The **SynHance MTS-1** is a clever little box that synchronizes MIDI sequencers and tape decks. See Craig Anderton's review of the MTS-1, coincidentally in this issue.

■ The Phi-Tech **Translator 2** has six drum pad inputs that accept signals from drum pads, drum triggers, or a line level audio signal, and an input that accepts MIDI data. These signals go respectively to its six drum pad outputs (these generate analog voltages for non-MIDI sound generators) and its one MIDI Out on any of channels 1 to 16. Basically, the Translator 2 turns anything a drummer might reasonably beat on into a signal that can trigger things that make noise—in this case, a number of drum machines and a sampler.

■ **Sequencer Plus Mark III** for IBM/clones is Voyetra's top-of-the-line ($495), 64-track super-sequencer. Seventeen transform functions, 11 memory buffers, Song Position Pointer and more make this a hefty pro unit.

■ **Texture** is a sequencer for IBM/clones that records "patterns," which are finally strung together into "songs." Like a drum machine, the patterns can repeat any number of times, conserving memory. Texture's modular approach came from the days when computers with more than 128K of RAM were rare, and had trouble holding a whole composition or looping individual tracks. It is not meant to record a whole song in one performance, but rather, piece by piece.

■ The **Kawai R-100** and **Roland TR-707** are drum machines whose own internal clocks were not used in this project. Rather their sounds were triggered at mixdown by the sequencer, using the MIDI data that the drummer had recorded into the sequencer earlier.

■ The **Prophet 2002** is a rack mount sampler, loaded with percussion-type samples, which was also triggered by the sequencer to record drum sounds.

■ **Performer**, by Mark of the Unicorn, is a sequencer for the Macintosh. It was used because of its excellent *global editing functions* that allow it to find all occurrences of a certain specifiable type of data—in this case notes of a certain duration and of a certain velocity—and then move, copy, delete or otherwise manipulate them.

■ **Prolib**, by Club MIDI, is a universal patch librarian for IBM and compatibles that works with over 30 synths and drum machines. ***—Tim Tully***

This done, we turned to the vocals (see **Fig. 3**). And boy, did the singer *really* appreciate the extra tracks, freed up by MIDI, available for his voice—tracks that would normally have been used for the keyboards and drums. Even after recording the other parts, he still had as many as *four* first-generation tracks left for doubling and harmonies.

Using the "SPP chase" mode on the sequencer, we were able to perform vocal punch-ins *anywhere* in the song while listening to all the instruments play, and never had to worry about lining up the sequencer to start at a particular place. Starting the tape about four bars ahead of the punch-in point was all that was necessary. The sequencer fell into sync at the right place every time.

Graphic Midi

Our biggest difficulty was making sure the musicians were satisfied with their own performances. For the guitar and vocals, standard punching-in was the only way to fix a part, but the percussion

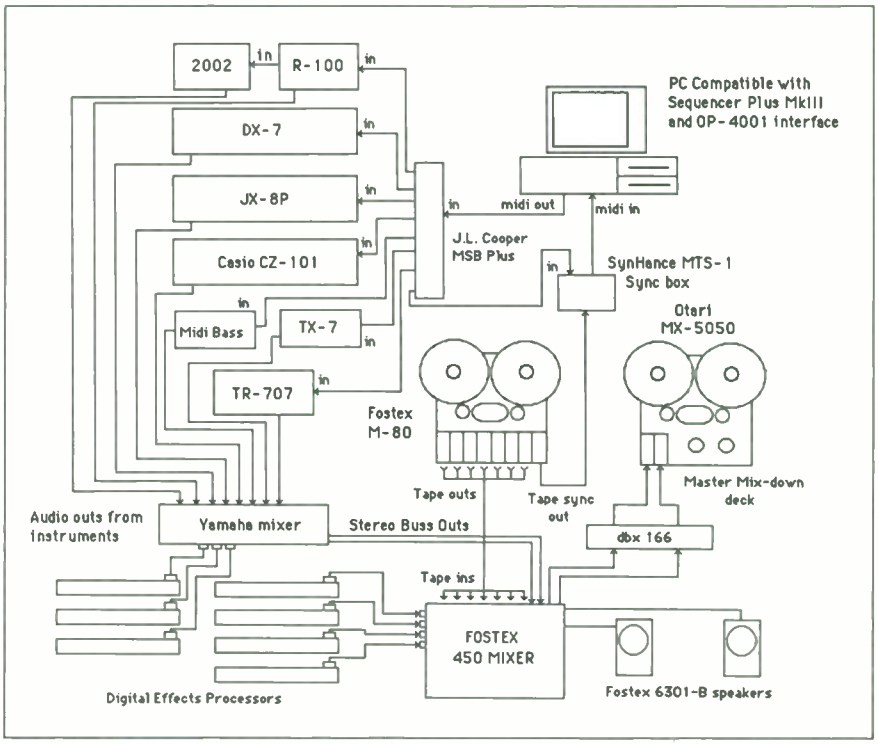


FIG. 4: System hook-up for the final mixdown.

section had a much more efficient method: graphic MIDI editing.

In edit mode, Sequencer Plus shows notes as horizontal bars whose lengths represent duration; their position top to bottom, pitch—with the note names appearing on the left side of the screen. As the music plays, the screen scrolls, and you see each note as you hear it. This made it very easy for the drummer and I to pinpoint each individual hit that he considered mis-played in his performance—as long as we matched all the cymbal and hi-hat hits already recorded on tape.

When the drummer was happy with the sounds we selected, the rhythm was tight with the keyboards, and the vocalist and guitarist were satisfied with their recorded tracks, we were set to mix.

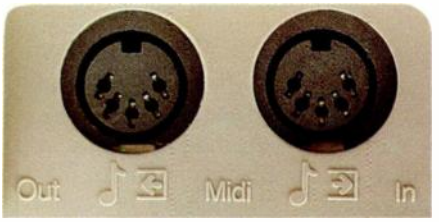
The Mix

For maximum flexibility, we had recorded all the tracks dry, without effects. Since all the synths and drum machines would now be going "live" to the final mix (not from a pre-recorded multi-track to which we could have added effects before the mix), they needed signal processing here too. Although this method requires a lot of effects units together at one time (usually an expensive proposition), our combined resources provided three digital reverbs and four digital delays (see **Fig. 4**). Once these were hooked up, the mix went down. Aside from having to edit a few stuck notes (MIDI note-on messages not followed by note-offs) sprinkled about in some of the keyboard parts due to the multiple MIDI transfers, it went very well.

The advantages of using a synchronized mixdown of multiple tape and MIDI tracks are many, and should definitely be explored by any electronic musician with a sequencer and a multi-track tape recorder. Although it sometimes seems like more trouble than it's worth, once you get your recording method organized, the rewards are quite gratifying, especially when you hear the clarity of those first generation keyboard and drum parts. Implement this technology and those extra tracks into your setup, and all *kinds* of ideas become reality. EM

(If any **EM** *readers would like to hear the results of Gary's session on cassette, send $5 to: Steve Carroll, 2002 Monterey Parkway, Dunwoody, GA 30350. Please allow four to six weeks for delivery.—Eds.)*

Gary Osteen *studied recording at Criteria Studios in Miami, Florida, after which he served as synthesizer and recording product specialist at several large music stores in the South. With ten years' experience in these areas, he now operates CompuSound, a store dedicated entirely to music software/computer sales and service.*



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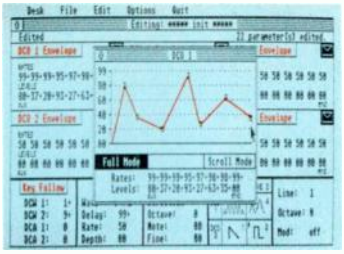

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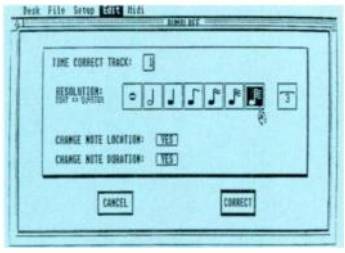

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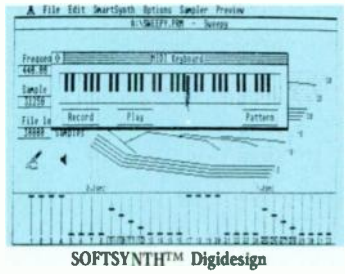

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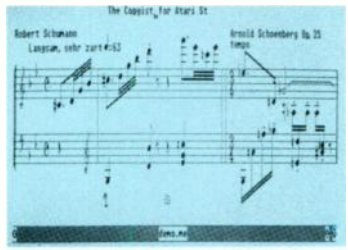

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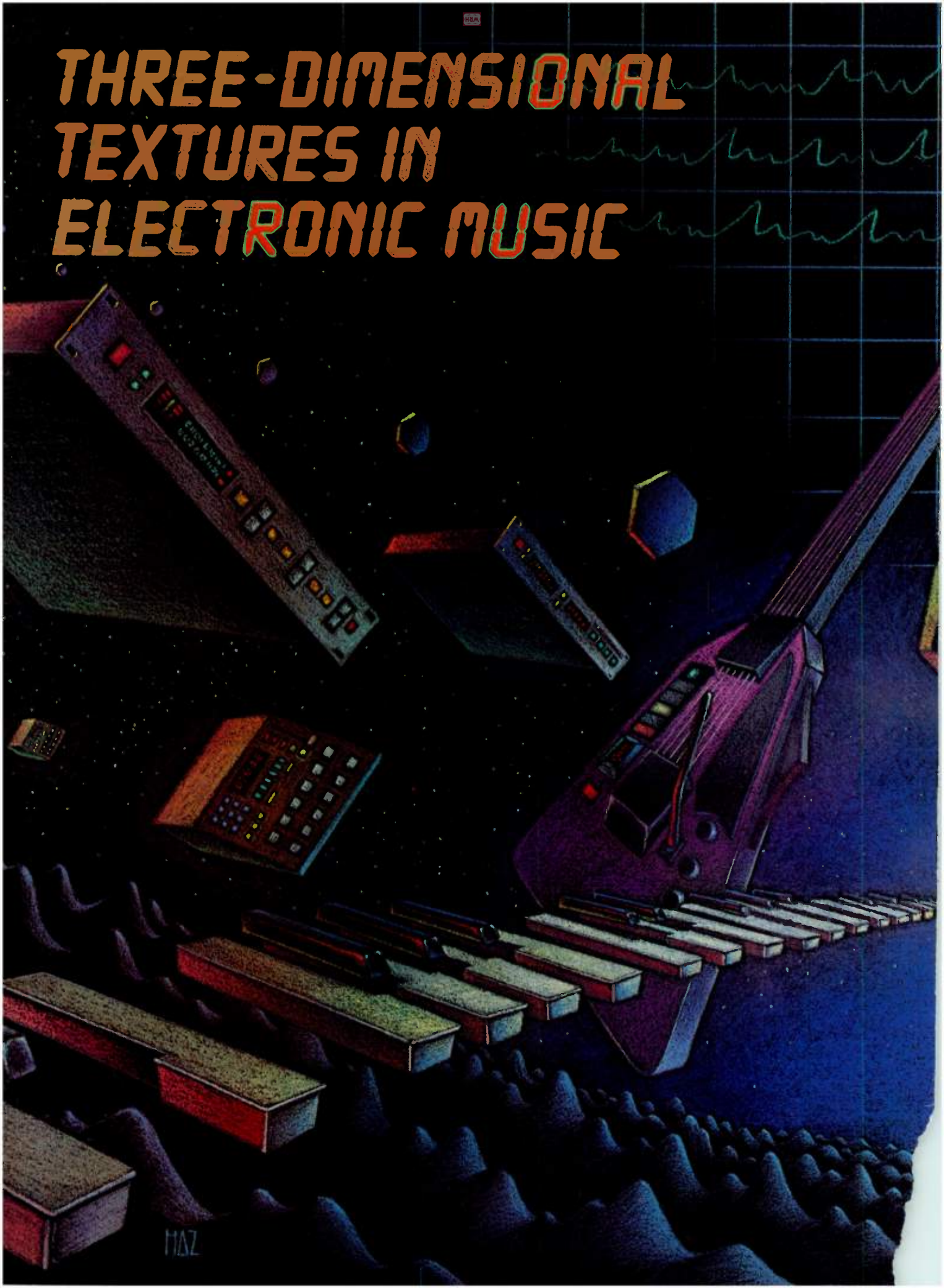

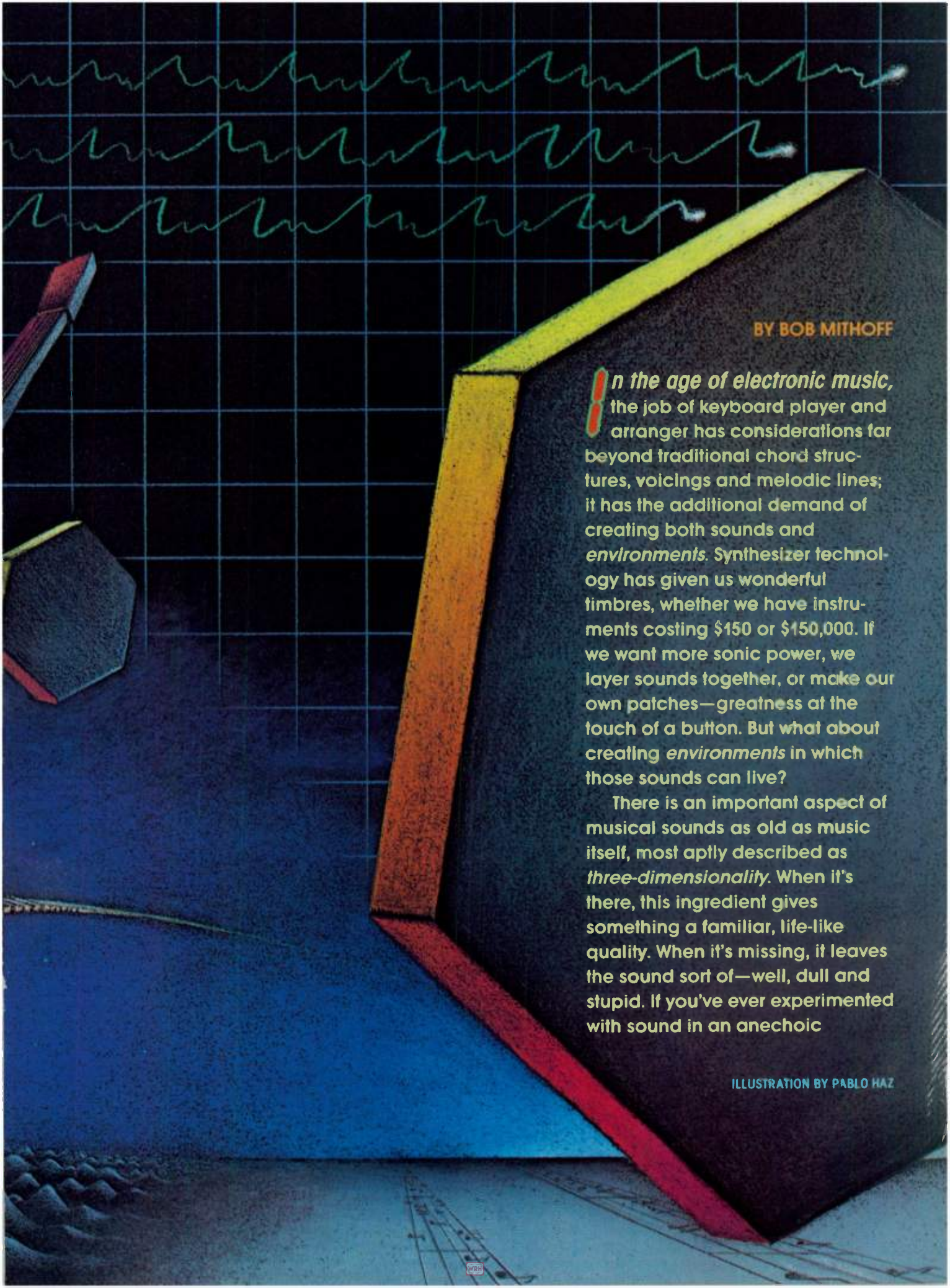

BY BOB MITHOFF

In the age of electronic music, the job of keyboard player and arranger has considerations far beyond traditional chord structures, voicings and melodic lines; it has the additional demand of creating both sounds and *environments*. Synthesizer technology has given us wonderful timbres, whether we have instruments costing $150 or $150,000. If we want more sonic power, we layer sounds together, or make our own patches—greatness at the touch of a button. But what about creating *environments* in which those sounds can live?

There is an important aspect of musical sounds as old as music itself, most aptly described as *three-dimensionality*. When it's there, this ingredient gives something a familiar, life-like quality. When it's missing, it leaves the sound sort of—well, dull and stupid. If you've ever experimented with sound in an anechoic

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chamber (the acoustical testing environment that comes as close to an absence of reflections as possible), you know what I mean. The anechoic chamber is a fabricated two-dimensional environment; in this environment, even a nine-foot Bosendorfer sounds two-dimensional (and dull and stupid).

Electronic Dimensions

Electronics is basically a two-dimensional phenomenon: electrons start somewhere and go somewhere and don't really expound on any worthwhile artistic endeavors beyond that (luckily for us). Demonstrate this to yourself sometime—I try to do it often so I don't get too immersed in a purely electronic realm. Play a monophonic sound on your favorite keyboard, and don't use reverb or effects. Then compare it to a CD of a great stereo direct-to-disc or digital recording (I like to use the Leonard Bernstein recording of Stravinsky's *Rite of Spring*).

There's *no* similarity at all between the two in terms of space, dimension or any other life-like qualities. Now add some reverb to your keyboard and play again; there's still no real comparison. The orchestral recording has life and *motion*. Your keyboard and reverb together remain essentially a two-dimensional affair.

I'm not talking about merely emulating real instrument sounds—the state of the sampling art is very high. If I want a real-sounding violin solo I can use a 100kHz velocity-sensitive stereo sample on my Synclavier, and it really does sound like a violin. Or I could hire Itzhak Perlman for a whole lot less money, and get a better solo.

The point is, whether you are using a sampled violin or your own *Winds of Arcturus* patch, you are still rendering it via a two-dimensional medium, and it will continue to sound that way unless you take some actions to goose these two-dimensionally oriented electrons into creating some life for you. In my 18 years of programming and playing electronic instruments, I have come across a few techniques that do this and could be useful to you.

Layering Dimensions

The main way I achieve three-dimensionality is to give each sound its own position in space by providing some *motion* relative to the listener. Here are some examples.

One of the easiest techniques is layering. Let's start with the layering of drum sounds. If you listen to the drum solo in "Neutron Dance" from the Pointer Sisters' *Break Out* album, it sounds like a great drummer really going for broke in a big room, but there was neither a great drummer nor a big room—just me with two LinnDrums in tandem (plus the mixing genius of Bill Schnee). The LinnDrums both played the same sequence and the same samples. But the samples in the second machine were tuned *slightly differently* from those in the first.

Since the same sample was being played at a different pitch on each Linn, the decay times, reverb response values and the times at which different frequencies seemed to reach the listener were not the same for each sample—that is, each part of the drum layer. These factors created the sense that the two drum layers

were at different distances from the listener, *in a dimension different from that created by panning*. That is, they gave the sense of a slight *motion* from front to back (travelling from near the listener to farther away), and consequently created a position in space for the drums. Think about this technique for awhile and you'll probably come up with other applications.

Keyboard Layers

Layering keyboard sounds has even more three-dimensional possibilities. You've probably created synth patches by layering different timbres to make up some great "fat" sounds. But let's make this fat lady sing in three dimensions by playing around with the ADSR envelopes of the different timbres, and putting them in slightly different positions on the Left-Right spectrum (don't put them hard left and right unless you want space opera). For example, give your *sampled* string patch a faster attack and decay; then use a thinner *analog* or *digital* component with a slightly slower attack and more release (**Fig. 1**). Pan the two slightly apart, and you not only get an apparent front-to-

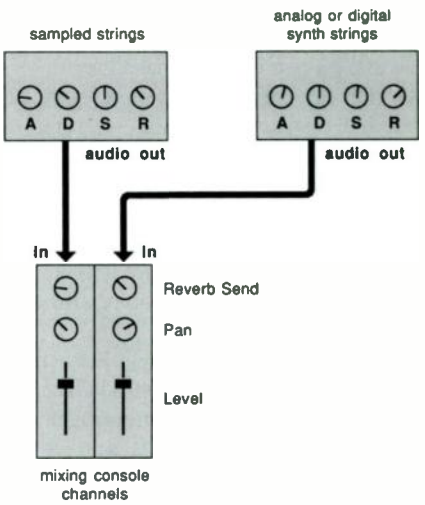

FIG. 1: Giving space and motion to string patches.

back motion caused by the different time and frequency components of the two partials, but a slight left-to-right motion from the pan. If you then put different reverbs (or different amounts of the same reverb) on each of the components, you've increased the magnitude of the effect into something that solidly locates the string section in space.

There's a reason why reverb units (no matter how good they are) do not by themselves completely create a realistic three-dimensional space for electronic instruments. Reverb units are mathematically perfect; life isn't (just ask my banker). In real life, instruments and players are in slight motion during the performance, and any room reflections will vary constantly with the performance. Put some motion into your patches and you will be completely amazed. I used the above string patch technique in doing the Rose Royce *Greatest Hits* album, and the strings sound almost more "real" than real strings.

Any time you put different effects on different frequency or harmonic components, you are creating space for that instrument and bringing it to life.

Exciting Space

I also used the Aphex Aural Exciter Type A, a harmonic synthesizer/sweetener, to create motion and space on that same Rose Royce record. The Exciter generates additional harmonics pitched higher than the program material you feed it, and is a bitchin' device because it opens up a huge number of ways to create space. Feed a stereo mix through the Exciter, and it will give the effect of separating the various components of the mix, thus lending it more "air" and separation. This by itself is great, but try sending just *some* of the instruments to the unit (in their correct stereo position) and then bringing the Exciter back to the stereo bus with the Left-Right configuration *reversed*. You can do really bizarre things like put the kick drum on your forehead, or make the string section fly up to the ceiling. These might not be socially acceptable results, but they do give you some ideas as to the amount of motion possible. You can even lay your tracks to multi-track this way—it doesn't have to be done in the mix. Or, get farther out by adding effects to the stereo exciter returns (normal or reversed). Try delaying each of the returns differently, or putting a slight amount of reverb on each one.

Any time you put different effects on different frequency or harmonic components, or mess with their normal Left-Right position in relation to the fundamental, you are creating space for that instrument and bringing it to life.

Another very good technique for creating space (although somewhat goofy and less "real" sounding) comes through combining different effects. I arranged a tune on the last Pointer Sisters album called *He Turned Me Out* that contains lots of weird little backwards and unreal kinds

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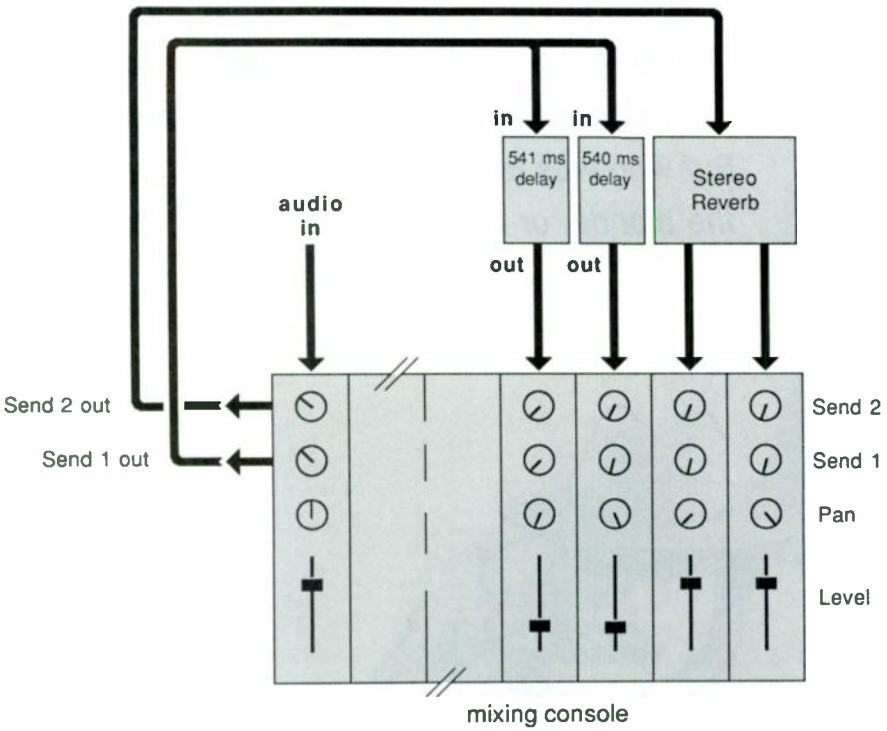

FIG. 2: Using delay lines and reverb to create unusual spatial effects.

of sounds; to give these some space, I fed them on one send to a pair of Roland SDE-1000 delays hooked in parallel (in other words, the same signal went to the input of each delay unit; see **Fig. 2**). I set the delays to play a quarter note repeat (dividing 60 by the tempo gives the delay time for one quarter note in seconds) with a little bit of feedback on the delay so that each repeat would sound four or five times before dying out. In this example, the tempo was 111 BPM; 60 divided by 111 gives 0.5405405 seconds as the quarter note delay time. So I set one delay to 540 milliseconds (ms) and the other one to 541 ms, and brought them back to the console panned hard Left-Right. Because of the 1 ms difference in the Left and Right delays, the repeats seemed to travel across the Left-Right spectrum. Then I put some reverb on the original sound and left the delay returns dry. This made the sound travel from back to front —instant huge motion! These little sounds appear to be moving around in front of you, and in time to the music. *(Editor's note: not all delay lines are accurately calibrated with respect to delay time. Use the formula mentioned above to put you in the ballpark, but you may need to tweak the delay time a bit to have repeats that sound exactly "in the pocket.")*

I used the same tricks, but more extensively, in "What is Love" from my *Mac the Rapper* album. If you check out the breakdown section, there are four or five of these unnatural sounds moving around each other. Since everything on the album was synthesized, and the vocals were sung by my Macintosh computer, making this tune life-like was a little bit more problematic (kind of like giving birth to a three-headed bicycle). So, I needed all the tricks I could get. I was not trying to emulate a natural effect—backwards cymbals don't occur in nature, and if they did they probably wouldn't dance—but I borrowed a characteristic of nature, three dimensions (what a concept) and applied it to something that doesn't exist in nature, to give life to a whole new entity.

And that is probably what our job is all about. EM

***Bob Mithoff's** compositions range from cable network features to Las Vegas shows. He pre-produces, arranges, and programs for Berlin, the Pointer Sisters, and others. Classically trained, he started his association with electronic music in 1970 with a Moog, and now has a state-of-the-art recording facility in his Hollywood Hills home.*

It was clearly a set-up job. And the drop-dead blonde in the high heels knew who to call: Larry Cheeseman, ace alignment specialist. But who was really being set up—Cheeseman, the blonde, or the Frabulator Mark VII?

THE ALIGNMENT CAPER

BY MIKE BABBITT

THERE ARE A MILLION PEOPLE out there in the big city, each one with a story. Some are hard, with sharp edges that can cut. Others . . . well, not so hard. My name's Cheeseman, Larry Cheeseman. I'm a collector of stories—the hard ones are my specialty. I'm on call day or night, rain or shine. Most people have never seen my world of dust and dirt, of panic and deceit . . . the world I call home. But that's my job. I'm a tech.

I was frolicking in the surf with a fabulous redhead when the phone

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Imagine if Mozart were alive today how technology might maximize his creative genius. The production process has always maintained the same goals: shaping creative ideas into a finished product. Today's technology not only allows you to be more creative, but more efficient in your productions through the use of automation, synchronization and computer sequencing and editing. And at remarkably affordable costs.
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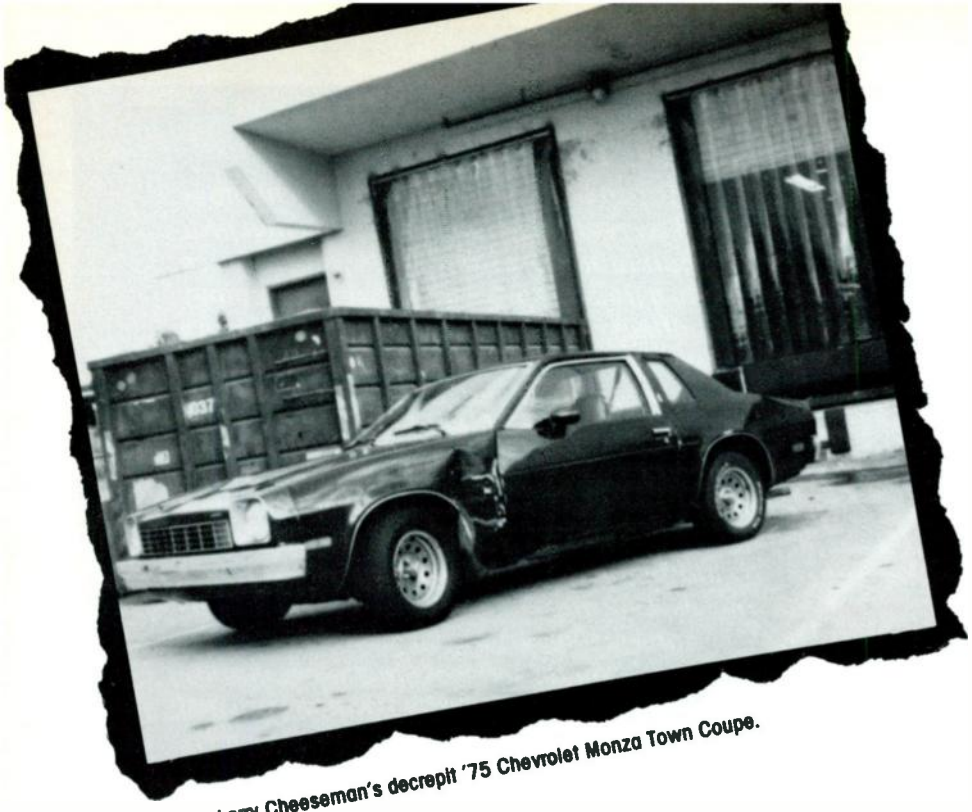

FIG. 1: Larry Cheeseman's decrepit '75 Chevrolet Monza Town Coupe.

rang. I wiped the sleep from my eyes and took stock. It was one of those foggy nights where you need something sharper than a butter knife to cut through, or maybe the fog was in my head, I couldn't tell. At least I seemed to be in one piece after last night's session with Wanda—a rare occurrence. I answered the phone.

Just my luck, an emergency call that would require me to put on my trousers. After a short search, I found them, grabbed my tools, jumped into my decrepit '75 Chevrolet Monza Town Coupe (**Fig. 1**) and wound my way to Burritt Street and a quick 65 bucks if I was lucky.

I reached Burritt Street and entered the *We B Records* recording studios. Immediately I saw the problem. The owner had just upgraded her consumer-quality tape deck to a real live professional machine, and it was a beauty: a Super Frabulator Mark VII 2-track mastering deck. Up to now I'd only seen pictures of it in trade magazines, and those pages had long since stuck together. I took stock, and determined my course of action.

"Okay, lady, what's the problem?" I said, with a knowing lilt to my voice.

"Well Cheeseman," she replied, "I have the 'Mutant Biker Chicks' coming in in a few hours to start their new picture-disc album, and I want to use my new toy here. I need you to check all its alignments and put them into factory spec. Do you mind if I stay here and watch while you work?"

One golden rule I almost always live by: get rid of any spectators who might learn something and put me out of business. But after checking out the new owner of this powerful machine, I decided to make an exception.

In a flash I had found the service manual for the Frabulator. But now that I had the machine of my dreams in front of me, I couldn't do the sensible thing and read the documentation. I needed *instant gratification*. Using years of tape machine servicing experience, I began the standard method of alignment, one that had proven itself to hold true for *any* machine, no matter how exotic. It was only later that I learned, the hard way, that people write manuals for a reason.

I started to align the head assembly, and that meant checking the head wear patterns. Knowing that the patterns I was about to check would be affected by azimuth (**Fig. 2**), I thoroughly cleaned and demagnetized the tape path and threaded a reproduce alignment tape. I quickly found the azimuth section of the tape, located the *azimuth adjustment screws*, and adjusted the azimuth of both the record and reproduce heads. I wound off the test tape and found some junk tape that I could thrash. Now the fun would begin.

Grabbing my ink pad and using a cotton swab, I covered all three heads—erase, record and repro—with a thin film of ink. Good thing my hands weren't shaking from last night's escapades; you don't want to put on blobs of ink, just a thin, even layer. I put the machine into play mode, sat back, and took stock.

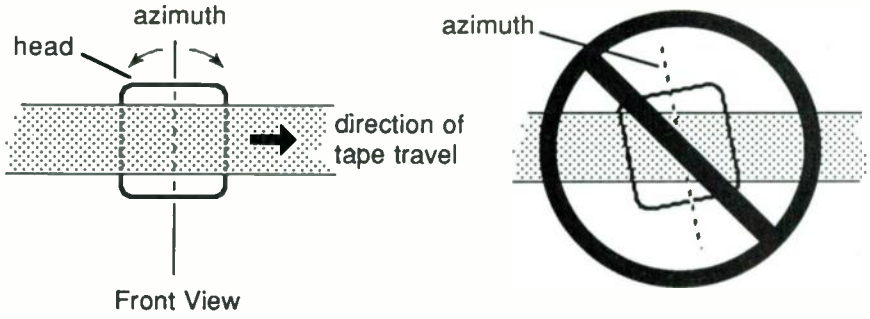

FIG. 2: When viewed from the front, the tape head should be exactly perpendicular to the direction of tape travel. Improper azimuth alignment means that the head will be tilted towards one side or the other.

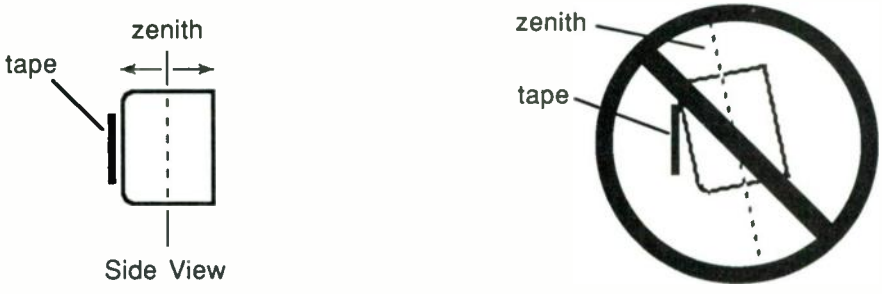

FIG. 3: When viewed from the side, the tape head should be exactly parallel to the tape. If zenith is off, the upper or lower part of the head will "lean" into the tape.

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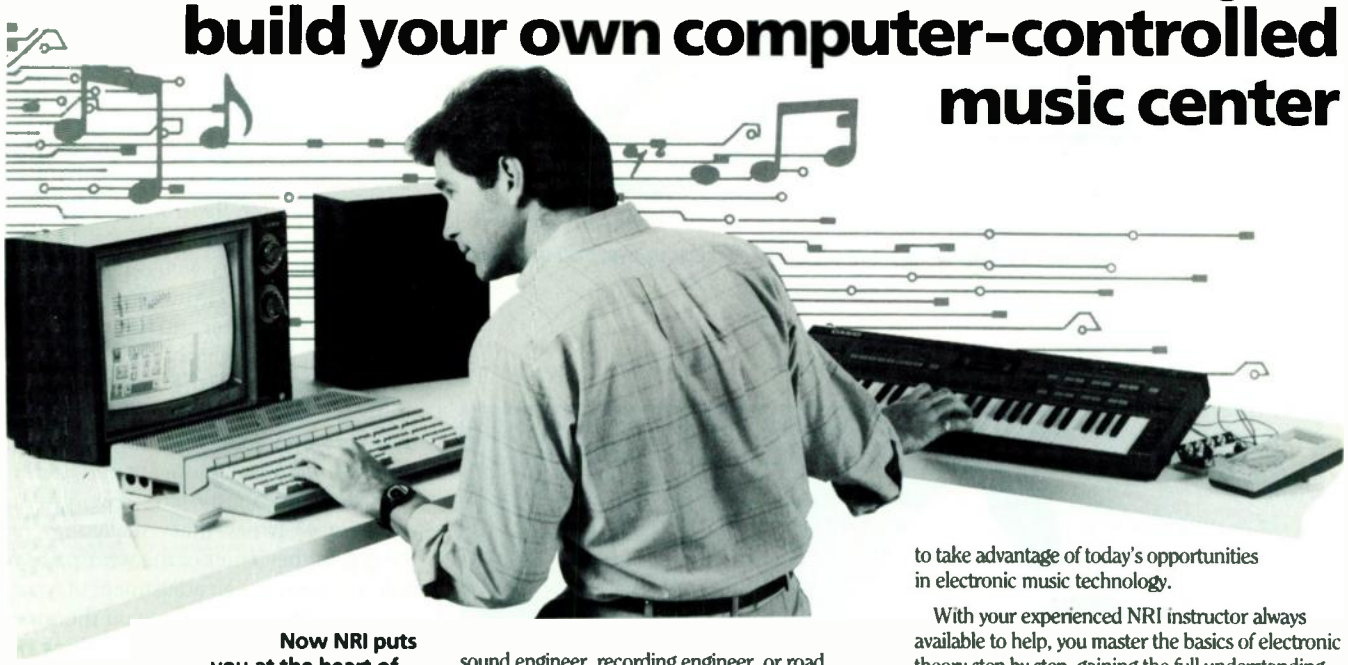

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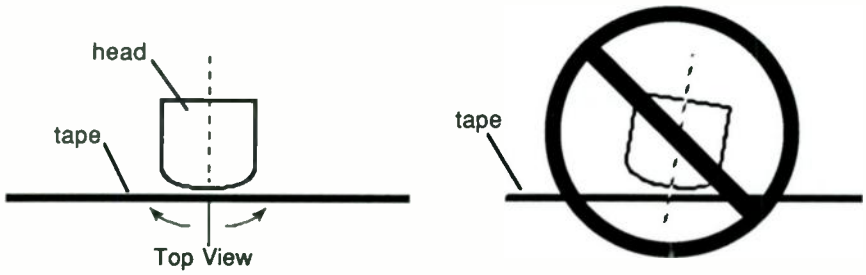

FIG. 4: The wrap adjustment insures that the tape contacts the head precisely over the head gap.

If the wear pattern on any head was trapezoidal—thinner at one end and wider at the other—I would have to adjust the zenith or "lean" of the head (**Fig. 3**). Anticipating this, I looked through the manual and identified the *zenith adjustment screws* on the head assembly. Since these adjustment screws happened to be under the heads, I understood that by adjusting both the front and the rear adjustment screws I could achieve the proper zenith. This would also change the head height so I prepared myself to adjust this parameter and hoped that my eyes hadn't lost their accuracy.

But wait! What if the head gap wasn't in the center of the wear pattern? A drop of sweat gathered on the end of my nose. I consulted the manual again and identified the *wrap adjustment screws*, just in case (**Fig. 4**). I knew that visually aligning the gap in the center of the wear pattern only gets you a rough adjustment of wrap, and only a test tape gives you the most accurate adjustment, but I was taking no chances. I had to be prepared to swing at any curve this high-tech machine might throw me.

Two minutes had gone by, so I stopped the tape and unloaded the machine to view my handiwork. The thin layer of ink had worn away where the tape had run across the head, thus exposing the wear pattern for the whole world to see. All three heads had straight, clean lines where the ink had worn away and the gaps of the record and reproduce heads seemed to be in the center of the wear pattern. But the gap of the repro head was more difficult to see. I knew then and there I had a professional machine in front of me. Since a wider gap works better at putting signal *onto* the tape, and a thinner gap works better at reproducing this signal, record heads on professional machines have wider gaps than repro heads. And that's just how the Frabulator was set up: each head was optimized for its individual functions.

Loading up the tape on the transport, I continued my head alignment procedure by checking the height of the heads. By lightly pressing on the top and then on the bottom of the tape as it crossed the heads, I exposed the upper and then the lower edge of the head gap. By doing this, I could get a rough idea of where the tape was riding on the heads and adjust the height accordingly. In another situation I would have recorded a 10 kHz tone

on all tracks of the tape, then turned the tape over, played it back and seen how much the level changed. But this method would've taken longer and the owner was still looking over my shoulder. So I made it look as magical as possible; I'm very careful not to give away any tricks to anyone watching me. In any case, the Frabulator required no adjustment for height—this machine had been set up by a *pro*.

My next step was to perform a *reproduce alignment*. I wound off the junk tape and again cleaned and demagnetized the tape path thoroughly. I started to reach for the test tape when, one by one, the questions began hammering at me like a Scotch and soda hangover on a Sunday morning. What reference fluxivity do I use to determine the level at which the machine records? Isn't it vital to learn this *before* the machine is aligned? Sure, a lot of machines recommend a particular reference fluxivity, but some machines can accommodate whatever fluxivity the owner wants, and the Frabulator was one of those pro-level machines. I pegged betty as the kind of person who'd want to hit the tape hard, but not outrageously so. And which speeds should I align: some or all? Turning to the attractive owner by my side, I posed the question every tech was born to ask:

"What's your flux level?" I rasped. One look at those ice cold eyes told me I was in trouble.

"Two hundred fifty nano-Webers per meter, Cheeseman."

I didn't like the tone of her voice.

"Oh," she said, "and set up all four speeds, please. I want 3.75 ips at IEC equalization, and 7.5, 15 and 30 ips set up at NAB EQ."

"What's your flux level," I rasped. One look at those ice cold eyes told me I was in trouble.

Ha! She had made her first mistake, and I wasn't about to let her off the hook.

"Listen," I said, "there is no NAB standard for 30 ips. The only equalization curve used at 30 ips is the AES curve. I'll set it up for that."

My little victory seemed to turn those ice cold eyes into red hot pokers. She turned and stomped out of the room, off to study back issues of the AES Journal or contemplate the empty chassis of an old Sansui amplifier, no doubt. It was just as well—I always work best alone.

Reaching for the 3.75 ips repro alignment tape, I threaded the tape and wound through to the azimuth section. I had already checked the azimuth of the heads, but I wanted to double-check the head wrap. Playing the high frequency designated for azimuth alignment, I lightly pressed on either side of the head with a cotton swab, searching the VU meters for any increase in output level, knowing that I would have to change the head wrap if there was any. If the gap was off center of the wear pattern, the output level of the machine would increase when I pressed the tape onto the gap. The output *decreased* when I touched the tape, and my respect for the tech who'd set up the machine went up another notch.

Now it was time to wind back to the reference gain portion of the tape, so I pressed back play—I'm not the kind of guy to fast rewind through a test tape that set me back a couple hundred bucks. I stopped and took stock. All the reproduce and record alignments were on the front panel of each audio card, clearly marked. Not only that, but there were *individual reference gain adjustments* for each speed. Most machines get by with *one* gain adjustment shared by all speeds. With a setup like that, each time you change speeds you have to decide which speed you want the machine to operate at, *and* re-align the repro section; not a serious problem, but inconvenient. That *wasn't* the case here. This expensive machine was definitely worth the dough.

I quickly aligned the reference gain according to the levels specified on the test tape, then played through the tape to the high frequency equalization alignment portion. Again, this was a case of adjusting for a specific meter reading at a specific frequency, as described on the tape. I then tweaked up the high frequency EQ at 3.75 ips and repeated the procedure for each of the next three speeds.

The next step, and the final step in any routine audio alignment, was to align the record section. I knew that the next generation of the Super Frabulator Mark VII, the Mark VIII, was rumored to have automatic record alignment, but thankfully the Mark VII did not. I needed some extra money after paying off all my back alimony and I wasn't about to take any shortcuts.

Starting the record alignment, I first had to adjust the record bias. Put simply, bias—a crucial adjustment in any record alignment—prepares the tape for recording. The very high frequency bias signal (usually more than 150 kHz) overcomes the resistance to change held by the particles of oxide on the tape. When a signal is recorded on tape, the particles of oxide move as the input signal switches the north-south magnetic poles. Since the bias frequency is so high, it overcomes the inertia of the oxide and makes the tape sensitive to low level signals as well as high. When the bias is adjusted properly, the distortion is low and the output is high. Too much or too little bias can increase distortion and decrease the tape's output (**Fig. 5**). Unlike some cheaper machines, the Frabulator had separate bias adjustments for each of the four speeds. This machine made me drool.

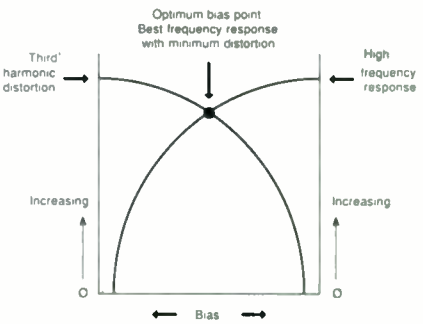

FIG. 5: How bias affects distortion and output.

Threading a virgin reel of Ampex 456 tape on the machine, I set the internal oscillator for 5 kHz, set the input level for -10 VU, and put the machine into record. At 3.75 ips, the overbias spec (clockwise

to the peak and past it) for 456 was 6.5 dB. I slowly turned the bias trimmer clockwise to increase the bias level, and carefully noted the meter reading at the peak. But I didn't stop there, and kept turning the trimmer until the response had fallen 6.5 dB compared to the peak, just like the overbias spec said. The Frabulator's manual had a chart showing the bias for various speeds and tape types, and I silently thanked the tech writer who wrote it.

After adjusting the bias, I quickly set the oscillator to 1 kHz at -20 VU input level, and then set the record gain so that the output level equalled the input level. Again the Frabulator had individual record gain adjustments for each speed—I wanted this machine, badly! Punching up 10 kHz in the oscillator, I adjusted the high frequency equalization so that I wasn't getting any more, or less, out than I was putting in.

I repeated the record alignment procedure for each of the next three speeds; 7.5 at -10 kHz reference and 15 and 30 ips at 0 VU reference level. When I was through, I quickly ran a record sweep at all four speeds. In each case, the Frabulator was a flat as a pancake.

Finished with the alignment, I kicked back and began to read the manual. The manual was as impressive as the machine. It was readable enough for a novice but technical enough for any professional, even *me*. How many suckers end up with half the recorder they should have just because they don't read the manual, I thought. Well, no point in complaining. If they all read their manuals, I might have to look for a real job.

Getting into the guts of the documentation, I found that the Super Frabulator Mark VII had several adjustments for the reel and capstan motors, or servos. If I was to service this machine in the future, I had better know all about this fabulous toy, so I read the transport alignment section thoroughly.

Then I almost panicked. I saw that, on the printed circuit board, there were audio adjustments *in addition* to those on the front panel. Since this was a new machine, I realized that, not having adjusted these onboard trimmers, everything I had done so far had been a waste of time. Well, not exactly a waste of time, since I was on an "emergency" call and earning 65 bucks an hour.

I read further and saw that there were

input and output level adjustments as well as record and erase bias transformer adjustments. These babies *also* had to be adjusted before the normal audio alignment. In spite of my chagrin, I realized again how truly professional the Frabulator was—adjustments for every parameter made the machine as compatible as possible to any format. The input and output level adjustments were provided to change what the machine considered as its reference level. The bias transformers, or *tanks*, were used to optimize the record and erase bias for different head assemblies.

Realizing I'd need an extender card for these adjustments so that I could pull the innards out of the deck for easy alignment yet still have them electrically connected to the main board, I searched frantically for the extender card. I didn't want to bug the owner again; after all, she was paying the bill. Finally locating the card, I got to work again.

Luckily I come prepared on these late-night emergencies. Running out to my thrashed Chevy, I grabbed my custom-made, all-in-one test jig (I call it "the Framis"). This baby has an oscillator, AC volt meter, oscilloscope, and a television, all in one convenient package. Sneaking back into the studio so as not to disturb my client, I plugged in the Framis, turned on an old *Twilight Zone* rerun, and hooked up the oscillator to the input and the meter to the output of the Frabulator.

After turning off the Frabulator and extending the first audio card, I turned the recorder back on and adjusted my oscillator for a +4 dBm output. Locating the input adjustment trimmer on the machine's circuit board, I adjusted it for 0 VU referenced from my +4 dBm input. The machine was less than ¼ dB off, which could be attributed to different meter calibrations. I noticed that the Frabulator had a test jack for an external oscillator and also an adjustment on each audio circuit board for the input level from this external source. After plugging my oscillator into this orifice and checking to make sure that it was still putting out +4 dBm, I adjusted the VU meters to read 0 VU.

Rod Serling was doing his intro by now so I took a break to see what tonight's episode was all about. Fortunately for my client, this was one I had seen before, and since Merv was interviewing David Lee Roth again, I turned the television off.

Now, with the oscillator on my Framis putting out +4 dBm, the chosen reference of my client, I could adjust the output level of the Frabulator. With the external meter plugged into the line output of the tape machine, I located the output level trimmer on each audio card and adjusted it until its output showed +4 dBm on my external meter. Looking at the schematics, I knew that the output level trimmer was the last adjustment in the audio path

How many suckers end up with half the recorder they should have just because they don't read the manual, I thought.

so it would not affect the reading on the VU meters, since it was post-VU meter amplifier. This is typical of most high quality, professional tape machines.

After completing the input and output level adjustments, I began to adjust the bias tanks. Turning on the oscilloscope portion of the Framis, I attached the hook probes to where the manual said the erase head test points were. The 456 was still threaded, so I made sure no signal was going into the machine, put it into record and looked at the scope. The erase bias looked as I had expected; a somewhat noisy, sinusoidal wave form. Using my plastic alignment tool, I tweaked the transformer until I was sure that I had reached the peak level. To double check, I switched the probes to the AC voltmeter and verified the peak. With the machine still in record, I moved the probes to the record head and repeated the tank tweaking.

After repeating the process for all the remaining audio channels, I had to realign the previously made audio adjustments since I had changed the reference of the machine and the bias tanks. Cursing my stupidity for not reading the manual first, I went through the entire audio alignment at all four speeds again. At least the next time I align a Super Frabulator, I'll know where each adjustment is.

Fortunately, I'm pretty quick when it comes to audio alignments. I finished up and grabbed the latest copy of *Women of Audio* and kicked back for a few. Unfortunately, the owner came back just when I had gotten to the pictures.

"You're all set to go, lady," I said, quickly regaining my composure.

"Thanks, Cheeseman. You know, this machine is so new to me, and I know you're an expert, could I . . . well, could I perhaps make an appointment with you to go through it step by step so I could be more familiar with it?"

Normally I would have told her to pound sand, but her offer made me hesitate. With the machine of my dreams in front of me as well as a chance to make some big dough tutoring her, I couldn't pass it up.

"Sure, lady," I said. "Whatever you say. Here's my card and I'll send you a bill for tonight. Give me a call and we'll set up a time."

Some saps would have fallen for her smile right there, but I was all business. Taking one last glance at the Frabulator, I packed up my gear and drove into the fog. I had to become a Super Frabulator expert, and fast.

I was hoping she wouldn't notice her manual was missing. EM

***Mike Babbitt** is currently employed as an MTR Service Technician at Otari Corporation, and also works as a freelance technician for his company Technical Audio Services. Mr. Babbitt had considered a career in the petroleum product distribution field but decided to pursue professional audio, where he has been involved in live performance, studio, and corporate capacities for seven years.*

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Quality MIDI music software is starting to appear for the Amiga, but you'll need an interface to take advantage of it. Fortunately, building your own is simple, economical, and educational.

AMIGA 1000 MIDI Interface

BY MARK D. BRAUNSTEIN

The Commodore Amiga is an amazing machine to watch in action; if you're thinking of buying a computer, check it out and you'll see what I mean. Serious music software is still new to the Amiga, but the list of vendors is growing steadily. It seems that the word on the Amiga is finally getting around, so stay tuned.

The Amiga supports a serial interface port with a maximum bit rate of 31.25 kiloBaud (or kBaud, roughly meaning 1,000 bits per second): exactly the MIDI data rate. However, the port operates with RS-232 signal levels and conventions that necessitate an external interface to convert the signals to and from MIDI. Commercially available interfaces sell for approximately $50 but you can build your own interface for about half that. The interface described below makes a good weekend project, and besides, it's fun!

PARTS LIST

***Resistors* (all ¼W, 5%)**

R1, R3	2k2 (2.2k)
R2, R4, R5	220 Ohms
R6	3k3 (3.3k)

Capacitors

C1, C3	10n (0.01μF), Polyester Film
C2, C4	2μ2 (2.2μF), Tantalum

Semiconductors

U1	DS1488 Quad Line Driver
U2	6N138 Optocoupler
U3	DS1489 Quad Line Receiver
U4a, U4b	7405 Hex Inverter
D1	1N4148 Silicon Diode

Other Parts

J1, J2	MIDI jacks; 5-pin DIN female (Switchcraft #57GB5F)
P1	DB25P RS-232 connector
Case	Radio Shack #270-284

THEORY OF OPERATION

The RS-232 signalling convention uses a voltage range of -3V to -25V to represent a logic "1" and a voltage range of +3V to +25V to represent a logic "0." MIDI, on the other hand, relies on the presence and absence of *current flow* to register

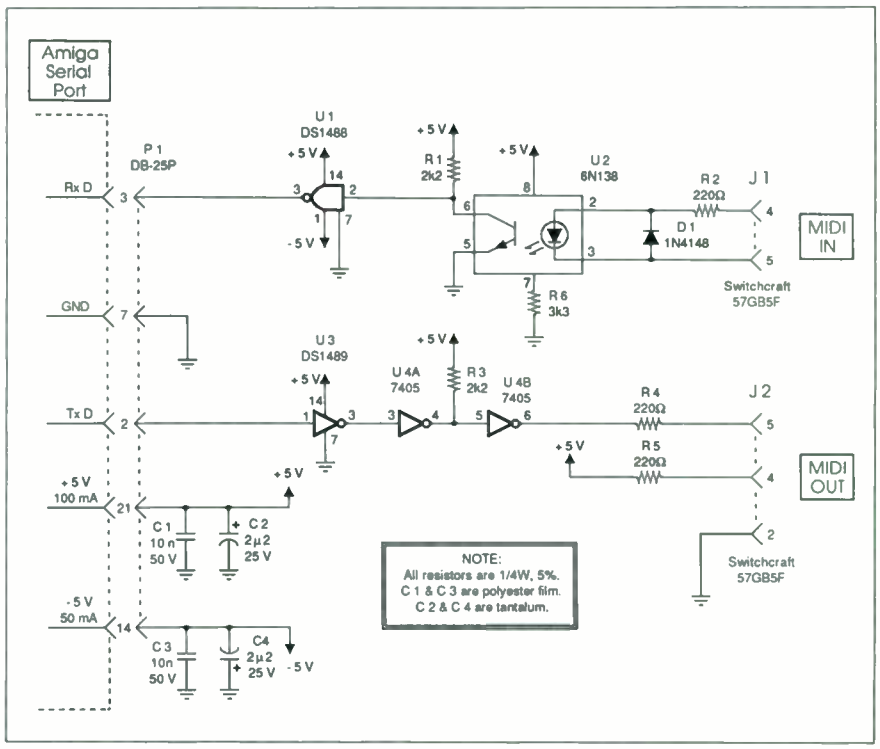


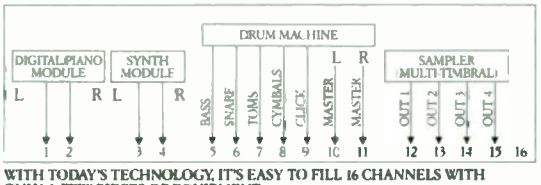
FIG. 1: Schematic of the Amiga 1000 interface.

FOR THE ELECTRONIC MUSICIAN WHO HAS EVERYTHING: THE WAY TO CONTROL IT.

ACTUAL DIMENSIONS: 19"W x 9¹⁵/₁₆"D x 7"H

Actually, it's not even necessary that you have everything. Even if you have just a stereo keyboard, a sampler and a drum machine with separate voice outputs, you've already exhausted the capabilities of a conventional eight-channel mixer. And that's the reason behind the new M-160 and M-240 Line Mixers from Roland: modern electronic equipment demands modern mixers.

Never before have so many channels of control been produced in such convenient packages — perfect for the MIDI studio or the road. But it's the impeccable signal quality and low noise you'll appreciate once you put the M-160 or M-240 to work. The M-160 (16 channels) can be rack-mounted right in with your MIDI Modules and effects, while the sleek M-240 (24 channels) can be positioned in any electronic musician's set-up. M-160's and M-240's can even be ganged together for 32, 40 or 48 channels of control.



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You might think with all of these features that we didn't leave a thing out. But we did — on purpose. There's no equalization. Why? Because MIDI keyboards and modules already offer much more tonal contour than the shelving equalization found on conventional mixers. Most importantly, adding EQ to a mixer inevitably adds noise — and the M-160 and M-240 were created with low noise as a design requirement, not an afterthought.

Nicest of all, you'll find the price tags on these mixers amazingly low for the features packed inside them. So, if your current mixer is starting to look like a wimp in the face of all your new MIDI equipment, it's time you checked out the new mixers that were designed specifically to handle the load. Today. At your Roland dealer.

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logic 1s and 0s. A MIDI logic 0 is represented by a flow of 5 mA and a logic 1 by no current flow (0 mA). The MIDI interface is responsible for making the appropriate signal level conversions without altering the data in any other way.

Referring to **Fig. 1**, optoisolator U2 performs the conversion from current loop levels to TTL signal levels. IC U1 converts the signal levels from TTL to RS-232. The output then presents itself to the serial port's Received Data (RxD). The process is reversed with ICs U3 and U4; IC U3 converts the RS-232 signal level (Transmitted Data TxD) to TTL signal levels, IC U4A performs a logic inversion to obtain the proper current loop polarity, and U4B acts as the current loop driver. For pinouts of the various ICs used in this project, refer to **Fig. 2**.

R6 adjusts the optoisolator's bandwidth to keep the TTL logic level signals "square" and relatively free of distortion (such as the lengthening or shortening of the data 1 and 0 periods). This adjustment works by preventing the output transistor from saturating any more than is absolutely necessary, thus reducing the amount of base charge that must be removed during the LED's off conditions. R6's value was found empirically and is dependent upon the input current level and data rate. If you want the ultimate in MIDI performance you could put in a potentiometer and tweak the circuit for exactly the right on and off periods (or you could live with the less than 2% distortion and not worry about it).

Capacitors C1 through C4 bypass the power supply lines. Unlike most RS-232 interfaces, the Amiga supplies power (±5V) at pins 21 and 14. We can use these power lines to operate the interface so we don't have to build or buy a separate power supply to run the unit. Good show, Commodore! I did test the interface without the bypass capacitors and things worked great, but I would recommend using the capacitors for those "just in case" situations.

The RS-232 interface specification states that the maximum data rate is 20 kBaud and the maximum cable length is 50 feet. The cable length is actually determined by the total capacitance of the line (2,500 pF max). Since we are running the interface well above the 20 kBaud limit, I recommend keeping the cable length to under ten feet. In my system the cable length is only about six inches.

Construction Hints

The interface was built in a Radio Shack plastic enclosure (part no. 270-284). The case includes a perfboard, which simplifies construction greatly. I cut down the height of the mounting posts with a Dremel tool to allow the components to sit on the top side of the board. Choose the enclosure you like, or build the interface in a one-piece enclosure like the commercial units and plug it directly into the serial port. Be creative! The unit is simple to construct; wire wrap techniques are perfectly acceptable. Layout is not critical but keep wire lengths as short as possible as a matter of good practice.

The interface is transparent to any MIDI software and should not pose any compatibility problems.

Testing

If you want, you can go directly for the "smoke test" by plugging the interface in and cranking up some software, or you can test the interface in an "end-to-end" configuration. First, check for +5V and -5V, as appropriate, at each of the ICs. Next, disconnect the wire from pin 2 of the RS-232 connector leading to pin 1 of U3. Connect a MIDI cable from the MIDI In jack to the MIDI Out jack. While watching the voltage at U1 pin 3, connect a clip lead from U3 pin 1 to +5V. The voltage at U1 pin 3 should go toward +5V. Now connect the clip lead from U3 pin 1 to -5V. The voltage at U1 pin 3 should go toward -5V. Reconnect the wire to U3 pin 1 and remove the clip lead and MIDI cable.

Adding A MIDI Thru Port

Many of the commercially available MIDI interfaces contain MIDI In, Out, and Thru ports. When I designed this interface I didn't see the need for a Thru port to be located at the computer, relying instead on the Thru ports mounted on the music equipment. If you want to add a Thru port, duplicate the circuitry involving U4A, U4B, R3, R4, R5, and J2 and connect the input to pin 6 of U2 (the optoisolator output). Since U4 contains four other unused inverters, no additional ICs are needed. The Thru port is electrically equivalent to an Out port but (functionally) it repeats information present at the In port.

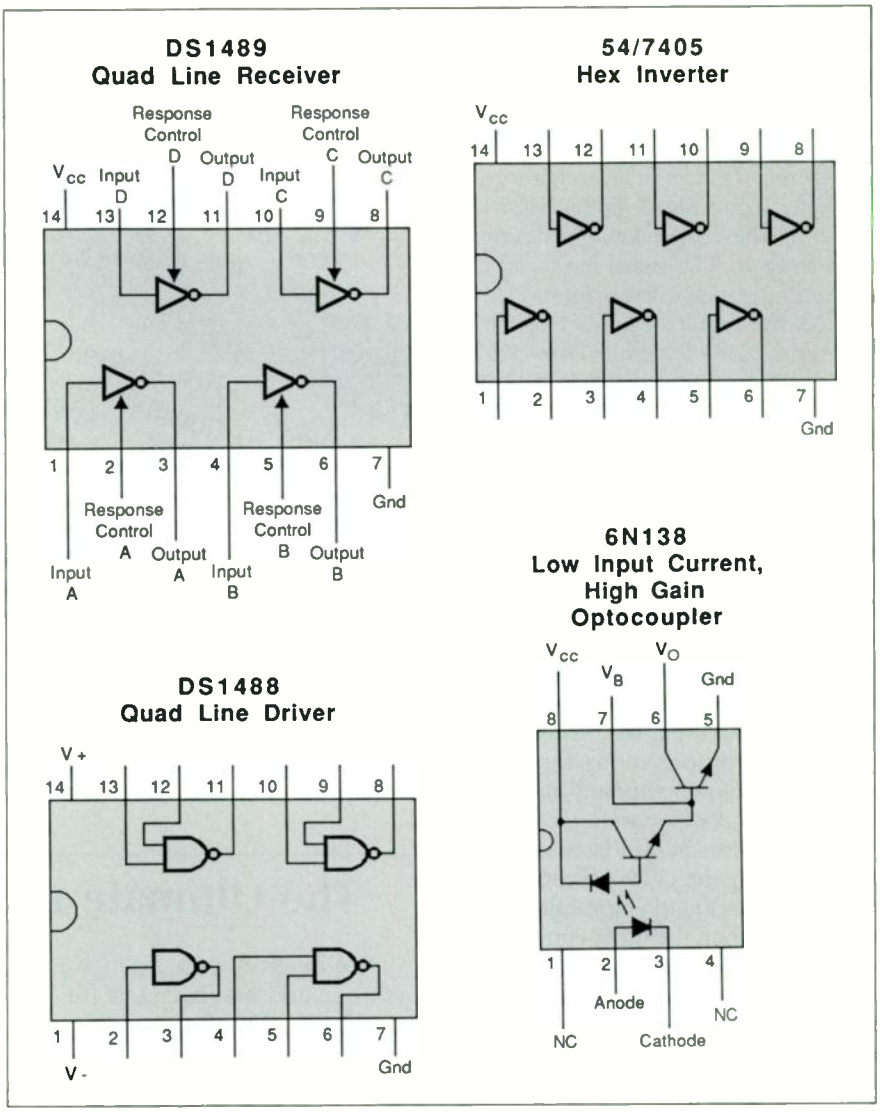

FIG. 2: Pinouts for the various ICs used in the project.

Conclusion

I've used this interface for several months now and have had no problems. My DX7, EX8000, and Amiga work well together and have been run from programs such as Mimetics' *Pro MIDI Studio* and Activision's *Music Studio*. The interface is transparent to any MIDI software and should not pose any compatibility problems.

I hope you enjoy building and using your interface with the Amiga. The Amiga is a great machine and as more software becomes available, things should get even better. EM

Mark D. Braunstein holds a BSEE degree and works as an analog design engineer. He is still new to the music scene and feels he has a lot to learn. He enjoys designing and building hardware projects and has many neat ideas still locked in his head, just waiting to get out.

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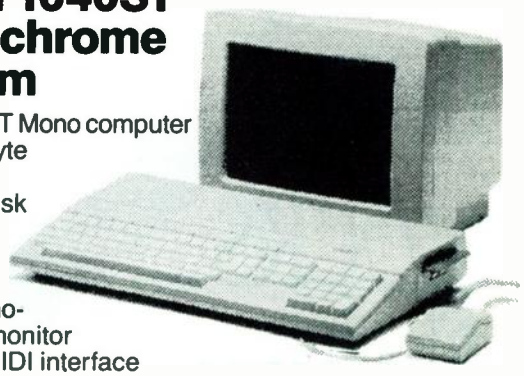

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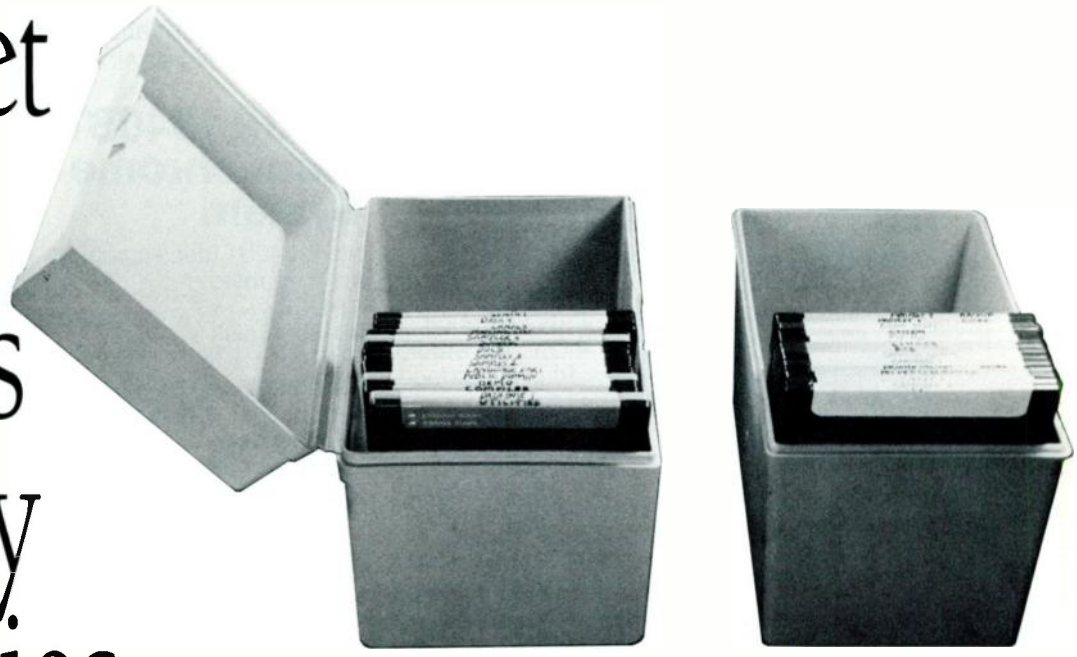


BY STEVE TISCHER

Are all those 3.5-inch floppies making for a sloppy work environment? We not only present a solution—but a cheap, fast, and easy one.

Life in this information age can be both complicated and *expensive*. A case in point are those handy 3.5-inch floppy diskettes used in every electronic music device from samplers to sequencers. I am convinced these disks multiply by themselves; I see more around my computer every day, and things can get pretty confusing when two or three different machines occupy the same area, all using the same size disks. Luckily, there is a simple, amazingly cheap solution to these problems.

Floppy Disk Storage For Under Two Dollars!

Your total expense in money *and* time may actually exceed $2, but the total cost for an attractive plastic box that will store 45 of your disks will be less than the cost of this magazine, thus making it quite possibly the world's cheapest way to keep your small diskettes organized.

The basic idea is to store your disks in 4 × 6-inch plastic file boxes, the kind made for file cards. You can modify them to suit their new purpose with very little trickery, and they are available for about $1.75 each in grocery, department, and office supply stores.

There are two different designs you can use. If you'll be using the disk box around a stationary computer, the *topless* design should work well. If you need the box to go with a piece of portable gear, then you'll probably need the *closable top* option. (See **Fig. 1**). In the former case you will need to cut off the top, and the latter, you'll leave the top on.

Gimme Some Space

There's one more mod that will help make file card boxes better disk holders: put a piece of approximately half-inch foam rubber (or similar material, such as a folded-up washcloth or piece of cardboard). This spacer makes the disks stick out enough to be easily grabbed, and protects their movable parts from possible damage. (Fabric supply stores are a good source for foam, since they usually offer materials for making foam pillows and beds.) I wouldn't use styrofoam because it has a tendency to disintegrate, leaving small pieces on the disk that could be carried into your disk drive.

The spacer also serves another function. Some, but not all, boxes are a little too narrow on the bottom for the disks, and the foam moves the disks upwards, raising them above the narrow part. To cut the foam to size, simply put the box down on the foam and trace the bottom with a felt tip pen. Cut it out with scissors and stick it in the bottom of the box.

If you are going the closable top route,

get the more squared-off type of file card box because it is a little bit wider on the bottom. Take a disk with you when you go shopping so you can check for size, and remember to take the size of the foam spacer into account. The manufacturers I contacted assured me that their products are available all over America and Canada, as well as many other countries, so you should have very little problem finding the styles shown in Fig. 1.

To Cut or Not To Cut

To make the topless stationary version, carefully cut off the boxtop, cut and install the foam piece, and enjoy. If you're able to find the larger boxes and are going for the portable version, just install the foam and be done. Make sure you exercise the "Always Cut Away From You" rule to keep your fingers intact—a fingerless musician would be a theoretical musician indeed.

Some manufacturers offer as many as seven different colors including pink, but the color closest to most computer plastic is usually called *putty*. Take your decor into account, but note that using different colored boxes for different machines or applications (e.g. computer disks in brown boxes, synth disks in black, etc.) can help keep things organized.

The total cost for an attractive plastic box that will store 45 of your disks will be less than the cost of this magazine.

Once you have your disks in the box, you'll notice that the ends sticking out have a label space on them. If you write the disk name on that little space, life becomes easier still.

That's about it for the design. Good luck with it, and happy gadgeteering.

EM

Steve Tischer makes his living playing a five-string, self-built electric bass, and did musical interludes for National Public Radio's "All Things Considered" with bass and a computer-synth rig. An inveterate gadgeteer, he is presently applying for two patents, and speaks and studies German for the sheer love of it. Contact him on MCI E-mail system.

Yamaha would like to go on record about the new WX7.

After all these years, there's finally been a change in the winds.

Thanks to our new WX7 Wind MIDI Controller, reed players can now drive tone modules, synthesizers, drum machines—all the MIDI technology that Yamaha has developed over the years.

And the beauty of it is, if you play a woodwind instrument, you already know how to play a WX7.

Its 14 keys are light and responsive, and follow the traditional Boehm layout. They're also adjustable to suit your own playing technique.

But when it comes to controlling sound, the WX7 Wind MIDI Controller is anything but traditional.

For example, it lets you play over a range of 7 octaves. Hold one note while you play another. And bend pitch effectively even in the lowest register.

With the WX7, it's actually easier to play trills than it is with a regular saxophone. Because you use the same whole- and half-note trill keys no matter what octave you're playing in.

It also has a sax-like mouthpiece that senses both breath and lip pressure. Which, with the right settings on your tone module, can be assigned to control such parameters as volume, tremolo, vibrato, tone and articulation.

All the expressive control that you demand as a woodwind player.

Of course, news of this magnitude is often hard to swallow.

In theory, there's a demo record bound into this ad. But, if after a careful search you still can't find it, just write us at the address below (Attn: WX7 Demo Record) and we'll send you another one. No questions asked.

So to help convince you, we're enlisting the aid of two of your most trusted friends. Your ears.

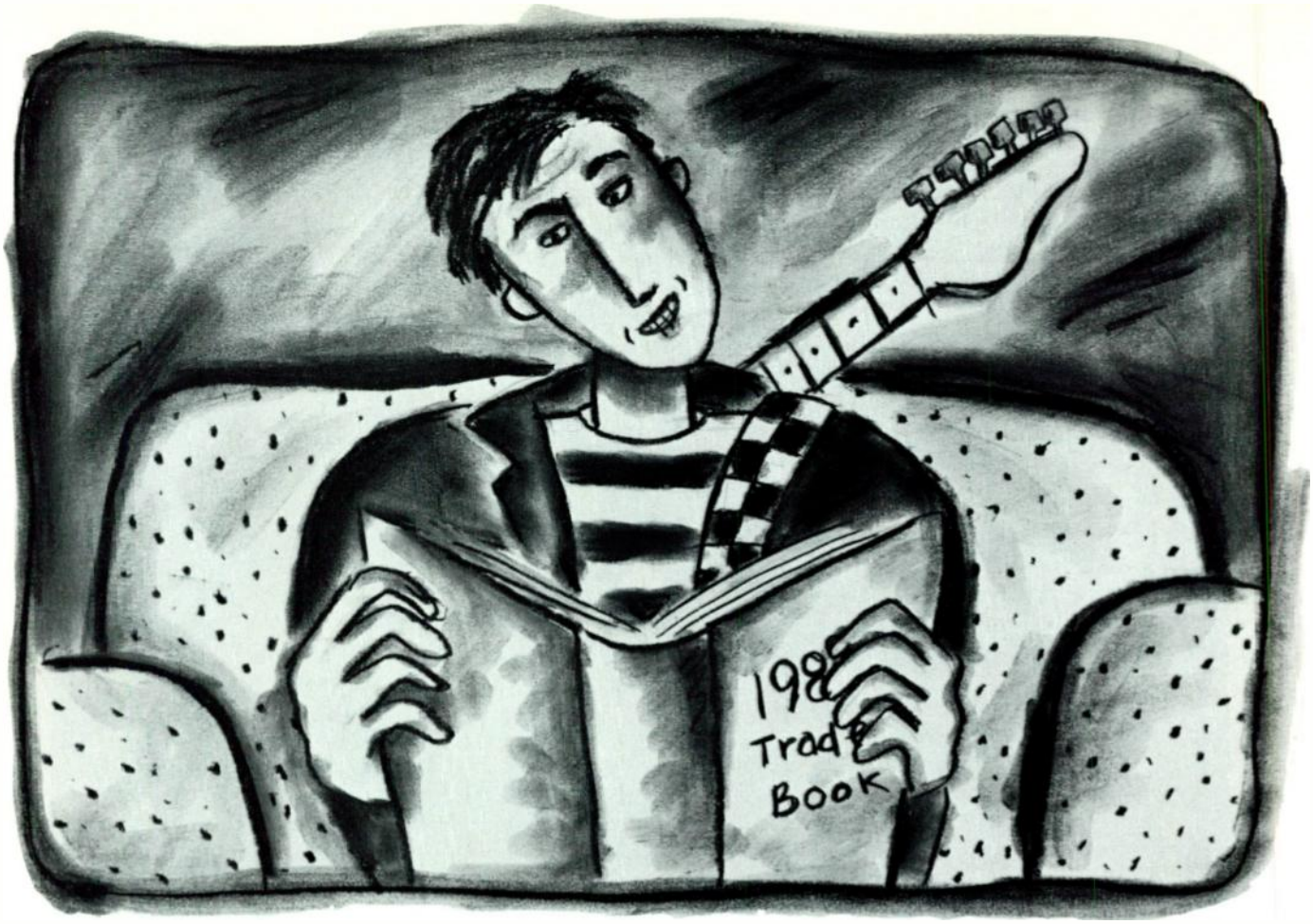
Just remove the attached soundsheet and hear for yourself what our new controller can do.

As we said earlier, the WX7 Wind MIDI Controller has brought about a real change in the winds.

We stand by that statement. In fact now it's a matter of public record.

YAMAHA

Yamaha Music Corporation, USA, Digital Musical Instruments Division, P.O. Box 660[illegible] Park, CA 90622.
In Canada: Yamaha Canada Music Ltd., 135 Milner Avenue, Scarborough, Ont[illegible]



Breaking Into Commercial Music

BY HAL GOODTREE

You have the talent, you have the equipment—but you don't have the clients. Don't give up yet; if you understand the music industry better, you too can maximize your music business potential.

THE FIRST POINT TO UNDERSTAND is that the music industry is made up of *hundreds* of narrow specialties. Would it surprise you to hear that people have careers as drum pre-programmers, sound effects specialists, and "knock-off" artists who imitate more famous entertainers? John Van Eps, a successful songwriter and producer in New York, says, "The people I know who are really breaking into the business and making a living got there because they picked something they could do, did it well, and did it quickly."

Van Eps, who studied to be a percussionist, now plays the Synclavier for Hip Pocket Productions, a small business tucked into studio C of New York's famous *Blank Tapes* studio (where Talking Heads' *Speaking in Tongues* was recorded). According to Van Eps, he does "everything. Sound effects, Muzak, sweetening, rough production for advertising and records." He also has over 80 writer's credits for stock music with Long Island's Omnimusic. This veteran feels making it in the music business involves two things: (1) understanding what you have to offer and (2) finding people who need it. Let's begin with how to find the people who are ready to buy your skills.

ILLUSTRATION BY LANEE LA'SHAGWAY

Oneness is a vision shared by anyone committed to the art of sampling. One source, one library, one program. One universal sample editing program which transcends the boundaries isolating existing sampling instruments. One program visionary enough to instill the life of stereo into monophonic samples, evoking images of sonic dimension still virgin to many samplers. One program with the power to reduce samples to their essential spectral components and the will to transform them through resynthesis. This embodiment of oneness and transformation is ALCHEMY, the first universal stereo sample editing network for the Apple Macintosh and supported samplers, available now from Blank Software.

alchemy

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SOFTWARE

1477 Folsom Street San Francisco, CA 94103 · Telephone (415) 863-9224 · Telex 650-2608198 MCI

Scoping Out The Market

Music is all around us. You can't turn on any broadcast medium, see a film, ride in an elevator or walk through a department store without music—and all of it means work for musicians.

But who makes elevator music, or documentary film music? How do you find the right person? The answer is simple: look in the *trade books*. In a given industry, trade books provide a list of suppliers for the people who are buying production (the music business uses the books listed in the sidebar). Ad agencies, television producers, audio-visual companies, just about everybody uses these books to find music suppliers. You can use these books too, but from a different angle.

These music suppliers are your potential employers. Most of the gigs they offer are freelance or by the session, so you'll want to build a repertoire of clients. Following is a listing and explanation of the broad fields within commercial music:

Jingles Advertising music with lyrics, also known as jingles, is a specialty business. If I need a jingle for my next commercial, I go to a jingle house. If you're an independent player or composer, you go to a jingle house for work. Emphasis is placed on stylistic range and the ability to work quickly. Maureen Regan, a part-time musician and full-time rep for Dick Lavsky Music says, "People who want to be in commercial music need to be *versatile* musicians. You'll get more work if you can play different styles."

For the would-be professional, jingle houses and stock houses can provide a good entrance into the field.

Stock music Think of it as one-size-fits-all instrumental music; music under sports programs and the news often comes from stock sources. Stock music is sold on a per-use basis from proprietary libraries for wide application as underscores for anything from educational films, to fashion shows, to car commercials. Stock houses commission works from musicians and cover the cost of studio time, but no more. Musicians make their money from licensing and residual fees. Budgets for stock music are extremely modest, so the emphasis is on efficient production, and a lot of it. Electronic music is involved in most of the stock field because a single person can do the whole job with the right assortment of machines.

Effects and sweetening Custom-made sound effects are a big source of business for electronic musicians. The range and complexity of synthesized sounds, as well as their ease and economy of production, makes them part of this growing market. Effects can include anything from the songs of whales to the sound of a VW Bug. Audio sweetening is like relief pitch-

ing in baseball—you're called in when something is wrong. Sweetening may involve filling in a track with violins and horns; it may cover an obnoxious element in the ambience; in fact, it could be anything a producer needs tomorrow. The need is there, and electronic instruments lend themselves to the application. Effects and sweetening are most often handled through recording studios, although in larger markets, independents exist.

Records Record companies hire electronic musicians as composers, session players, and demo producers. If your thing is dance music, call up a hundred of the dance labels listed in *The Songwriter's Market*. Records can pay well, but they tie you up for weeks.

These are just a few of the markets for commercial electronic music. Television commercials, feature films, banks, hospitals, and airports all consume music. For the would-be professional, jingle houses and stock houses can provide a good entrance into the field.

If You've Got It, Flaunt It: The Demo Tape

The demo tape is the universal tool for getting work. First, decide what you want to do. Do you want to compose jingles? Be a session player? Are you an astounding drum programmer? Second, make the very best demo tape you possibly can, showcasing the ability you want to market. Third, research all the appropriate music suppliers in your area. Fourth, call up each music house, explain that you're a musician looking for work, get the producer or creative director on the phone, and ask if you can bring over your demo tape.

A typical demo tape should begin with your best work *in short form*. John Van Eps believes, "it should start out with your best stuff. Twenty seconds of something killer, then right into 20 more seconds of something equally killer. You can't give someone a six-minute tune where the best part is the bridge two minutes in." Van Eps continues, "It's gotta be fast and furious—something for a guy with a short attention span who's busy and heard it all before. He has to be blown away right from the start, and immediately blown away again."

Two things can happen at this point:

one, the producer interrupts you after about 60 seconds and says he doesn't need what you've got. You *immediately* follow with: "What *do* you need?" (At least you'll get some information out of the interview.)

The second possibility would be that the producer likes your stuff. If so, play the full versions of the excerpts you just played. Always remember to ask *four* things:

✓ What did the producer like best?
✓ What needs are hardest to fill?
✓ Does the person have any current projects that could use your skills?
✓ Can the producer recommend any other producers who should listen to your tape?

What you put on the tape depends on how you're trying to market yourself. Let's say you have a CZ-101, a Mac Plus, and are good and fast at multi-tracking. With this set of equipment and skills, stock music might be a good territory. Include multi-track instrumentals you know you can pull off in an hour or less. If you have a sampling drum machine and a vivid imagination, market yourself as both a player (percussionist and pre-programmer) and a source for unusual sounds, and build a tape exclusively around your drum sounds. Note that there is no need to demonstrate your skills in a finished musical environment; that can come later. The sound or skill you are selling has to be up-front, compelling, and unmistakable. Hit every music house in the state. If you have some interesting sounds and can play your instrument, your telephone will ring.

A few practical notes on demo tapes:

✓ Make them no longer than ten minutes, except in the record biz, where 20 minutes is acceptable.
✓ Graphics on the cassette and box add appeal.
✓ All presentations should include a list of what's on the tape.
✓ A business card as a leave-behind is helpful.

The sound or skill you are selling has to be up-front, compelling, and unmistakable.

Marketing Yourself

A good way to decide which of your talents are most commercial is by talking to a producer. Call up someone on the list of jingle houses or stock music suppliers. If you call up 50 people and follow up a couple of times, you will undoubtedly get at least ten appointments. Bring your demo tape. Explain your particular skills and interests. Listen carefully to what each producer likes and needs. After about six interviews, a consensus will begin to emerge and you'll have a much sharper sense of how to market yourself.

You'll have to learn and use standard business practices if you become a successful commercial musician. This includes *invoicing* clients, *signing contracts* and *paying taxes*. A helpful overview of doing business in the arts appears in *The Artist's Guide to the Art Market* by Betty Chamberlain. If you find yourself doing business but don't know about subjects like profit structure and cash flow, see an accountant. Another important consideration is that the personal computer, friend of many electronic musicians, can be an enormous help in running your business.

Briefly, a word about unions. Unions exist to collect payment for artists in certain regulated communications industries such as broadcast television. Unions can also be a healthy resource for contacts and various types of industry support. But you don't need to be a member of any union to play your demo tape for a producer, or get a gig. If you do need to be in the union, then go ahead and pay your dues, and you're in the union.

After you start taking your tape around, you may find that what interests *you* is not what's most interesting to potential *employers*. They may, for example, have no work for you as a songwriter but like your electronic horn arrangements. If you want to be successful in commercial music, mix a new tape of electronic horn arrangements and take it back to the same producers—soon. You'll get work, make contacts, and be in an improved position to present other skills.

Finally, remember that every gig is a showcase. Sandy Corbet, a television producer at DDB/Needham, finds some of her best material through sources other than demo tapes. "Demo tapes tend to sound alike," she says. "I find some of the most innovative music suppliers through the movies, through radio, even through other people's commercials." The point is that every job a musician plays is an opportunity to be heard, and therefore, an opportunity to meet a new client.

All Together Now

If you have the talent, there is no shortage of places to go and people who will listen to you. The gap between talented amateurs and working professionals is bridged by these two concepts: *knowing who you are and what you have to offer*, and *knowing who wants to buy it*. Keep your demo short and attractive. Pick up the phone and call every producer or music house in your area. Play your demo for the people who respond, and listen to their feedback. Refine your approach, and keep at it until you start getting gigs.

See you 'round the studio. EM

Hal Goodtree works as a television producer in the advertising industry. In his spare time, he records 4-track music with electronic and acoustic instruments.

Books Listing Commercial Music Suppliers

These books are available from the publishers and in the reference section of many public libraries:

Back Stage Annual. Back Stage Publications, NY.
Millimeter Production Buyer's Guide. Penton Publishing, NY. (Annual)
The Creative Black Book. Friendly Press, NY. (Annual)
The Songwriter's Market. Writer's Digest Books, Cincinnati, Ohio. (Annual)
The Motion Picture, Theater and Television Directory (commonly known as "The Yellowbook"). Motion Picture Enterprises Publications, Tarrytown, NY, 10591. (Semi-annual)

RACK ATTACK

Buy any two Alesis Micro Series Signal Processors and get a free Micro Rack Adapter. Ask your Alesis Dealer for details.

FOR THE ABSOLUTE BEGINNER TO THE ABSOLUTE PROFESSIONAL ...THE ABSOLUTE BEST

In the few months since the Alesis Microverb was first released it has established itself as the new **digital reverb standard** in personal and professional music studios around the world.

Bold statements need factual support. How about these facts:

The design of Microverb is based on years of exhaustive research into the phenomena of spatial acoustics so that the sound of Microverb rivals even the most expensive digital reverbs. And Microverb has been nominated for the 1987 Technical Achievement and Creativity Awards of MIX Publications...other products nominated cost as much as 40 times more than Microverb! What's our secret? The heart of Microverb is an Alesis designed custom VLSI signal processing microchip using 16 bit linear PCM encoding with 90dB dynamic range. In other words, Microverb is **technically superb.**

Alesis digital reverb programs are legendary for their uncolored accuracy and warmth. 6 small reverb programs, 7 large, 2 gated and 1 reverse. Plates, rooms, halls, chambers, caverns and deep space. All these sounds are available to help you create deep, rich drums, lush strings and keyboards, super funky and tight rhythm tracks, or a brilliant sheen on lead instruments and vocals. Serious users tell us our reverb programs are the acoustic foundation on which they build their mixes. In other words, Microverb is **superbly musical.**

Front panel rotary knobs control input, mix and output levels. A continuous rotary knob selects the programs. Stereo input as well as output are provided on ¼" jacks. Plus, there's a defeat jack for convenience. Microverb accepts any level from the weakest guitar or mic signal to professional +4dbv console output levels. The dry signal is conveniently maintained in stereo allowing series connection of several Microverbs when you're not using a mixer. So an ambient program can be utilized to create body for drums and instruments through the first Microverb, and a plate, hall or chamber can be used on the second Microverb for a spacious reverb with smooth decay. In other words, Microverb is **instantly and effortlessly accessible...and flexible.**

The one third rack space extruded aluminum case is 19" rack mountable with the Microverb Rack Adapter. You can rack mount one, two or three or simply set them free standing on your amp, mixer or keyboard in only 5¾" of space. In other words, **you can take this digital reverb anywhere.**

And you will. Because like every other Alesis product, Microverb is a breakthrough not only in design and performance but also in price. This means that you can afford to dedicate a Microverb to vocals, another one to drums, one for keyboards and guitars, and a spare for last minute creative urges. The sound of multiple digital reverbs (the sound you hear in every major record production done today) is now affordable to *anyone* who loves to make music. Your music deserves it.

Don't settle for anything less. You can afford the absolute best.

Microverb's suggested retail price is $249. Alesis provides free educational materials and brochures to help you get the most out of our products and music processors in general. We encourage you to take part. Ask your Alesis dealer or write to:

LOS ANGELES:
Alesis Corp. PO Box 3908
Los Angeles, CA 90078

LONDON:
6, Letchworth Business Center,
Avenue One, Letchworth,
Hertfordshire SG6 2HR

ALESIS
STUDIO ELECTRONICS

If you're just getting into musical electronics, you're probably overwhelmed by all the new concepts and terminology. So why not learn the easy way, from those who have "been there before?"

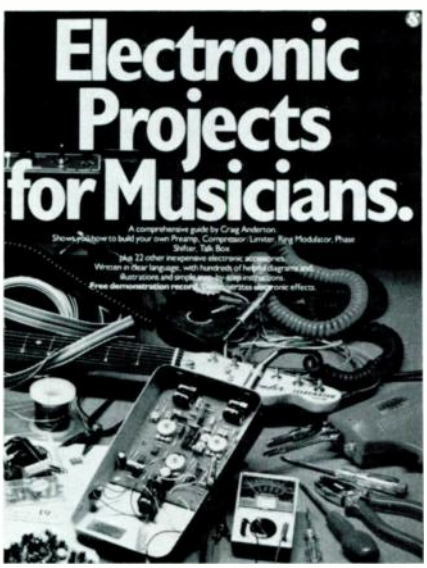
SOURCES

BY ALAN GARY CAMPBELL

The question that readers, customers, and lecture attendees most frequently ask me is "Where can I learn more about this stuff?" Electronic musicians have inquiring minds, and they want to *know*! To that end, and to provide a common frame of reference for Service Clinics to follow, I've assembled this list of information and parts sources. I don't pretend that it's complete or comprehensive; in fact, I've deliberately ignored certain areas (e.g., home recording and video technology). Nonetheless, the sources cited have proven to be relevant and useful to musicians, technicians, and electronic music hobbyists. Listings are given in approximate order of difficulty, by category, and I've provided explanatory notes in most cases.

Electronic Music Circuits and Software

Electronics Projects for Musicians, Revised Edition, Craig Anderton, Music Sales, 1980. An excellent introduction to fabrication techniques and do-it-yourself (DIY) musical electronics; assumes little or no prior knowledge. Concentrates on effects devices, audio processors, and accessories. Kits for most of the book's projects are available from PAiA Electronics.



Written by EM editor Craig Anderton, *Electronic Projects for Musicians* offers 25 designs for building useful accessories such as preamps, compressor/limiters, ring modulators, phase shifters, noise gates and more.

Electronic Music Circuits, Barry Klein, Howard W. Sams, 1982. Guide to analog and hybrid circuits in general. Material resembles that from many industry sources, but it's convenient to have it all in one place.

The Byte Book of Computer Music, edited by Christopher P. Morgan, 1980. Reprints from *Byte* magazine.

Musical Applications of Microprocessors, Hal Chamberlin, Hayden, 1980. This is the *bible* of hybrid and digital electronic instrument design—there's nothing else like it. The technical level is rather high, but the hobbyist with some electronics and math knowledge should be able to get a lot out of it. Unfortunately, as we went to press, *M.A.M.* was temporarily unavailable. Howard W. Sams & Co. purchased the rights to Hayden's technical titles last year, and has not yet decided whether or not to re-release this book. Write to them and complain!

MIDI

Magazine articles:

"MIDI: What It Is, What It Means to

You," Bob Moog, *Keyboard*, July 1983.

"What MIDI Means for Musicians," Jim Wright, *Polyphony*, June 1983.

"MIDI Hardware Fundamentals," Stanley Jungleib, *Polyphony*, June 1983.

"Making MIDI Work for You," Alan Campbell, EM, June 1985

"Mind over MIDI," Jim Cooper, *Keyboard*. Monthly column.

Books:

The Revised MIDI Specification, International MIDI Association, 1984. The standard MIDI reference. Published by the IMA; available with IMA membership, or separately.

MIDI for Musicians, Craig Anderton, Music Sales, 1986. Good musician's introduction.

ELECTRONICS FABRICATION

Heathkit Continuing Education Course: *Soldering*. Covers the basics in hands-on fashion.

Electronics Assembly & Fabrication Methods (2nd Edition), Duarte & Duarte, McGraw-Hill, 1973. The title of this book is misleading; the text actually covers both assembly/fabrication *and* basic electronics, in separate sections.

Laboratory Manual for Electronic Shop Practices, Avtgis & Megow, Prentice-Hall, 1968. A lab manual only in the sense that the text also includes step-by-step instructions for performing the described procedures in a hands-on learning situation.

Introduction to Modern Sheet Metal, Edward R. Kraftel, Reston Publishing Co., 1976. Covers metals, tools, punching, shearing, braking, embossing, finishing, etc.

Building Speaker Enclosures (2nd Edition), David B. Weems, Radio Shack, 1984.

Electronic Prototype Construction, Stephen D. Kasten, Howard W. Sams, 1983. Covers everything from PC board layout to enclosures. A very comprehensive reference for the professional or serious hobbyist.

ELECTRONICS THEORY

Getting Started in Electronics, Forrest M. Mims III, Radio Shack, 1983. A good musician's introduction to electronics; easy to read and inexpensive.

Basic Electronics Technology, Evans, Mullen, and Smith, *et al*, Radio Shack, 1985. A concise but comprehensive survey course on semiconductor electronics, covering: basic components, amplifiers, power supplies, test equipment, digital circuits, audio, video, radio—even microcomputers and computer interfacing. Semi-technical; some math. A good choice if you want to purchase only a single text on electronics.

Engineer's Mini Notebook: Basic Semiconductor Circuits, Forrest M. Mims III, Radio Shack, 1986.

Engineer's Mini Notebook: Op Amp Circuits, Forrest M. Mims III, Radio Shack, 1985.

Engineer's Mini Notebook: Digital Logic Circuits, Forrest M. Mims III, Radio Shack, 1986.

Engineer's Mini Notebook: IC Timer Circuits, Forrest M. Mims III, Radio Shack, 1984.

Engineer's Mini Notebook: Optoelectronics Circuits, Forrest M. Mims III, Radio Shack, 1986.

The *Mini Notebooks* essentially replace Radio Shack's older *Engineers Note-*

Where to Find Books

Most of the books listed can be ordered through any bookstore, and some can be ordered directly from the Mix Bookshelf. All the Radio Shack titles are available from any Radio Shack store. Public and college libraries often hold a surprising number of semi-technical titles, and sometimes subscribe to industry publications.

Howard W. Sams Co. publishes so many relevant technical titles that you'll probably want to write for a catalog (credit-card customers can also order books by phone): Howard W. Sams & Company, Inc., 4300 West 62nd Street, PO Box 7092, Indianapolis, IN 46206, ☎ 800 / 428-SAMS

The IMA's address is: The International MIDI Association, 11857 Hartsook Street, North Hollywood, CA 91607.

The Heathkit *Soldering* course (catalog number EI-3133) is available from: Heath Company, Benton Harbor, MI 49022 (write for a catalog and ordering information).

books I & II, now out of print. Lots of easy-to-modify circuits. Great topical references for DIY projects.

Manual for Integrated Circuit Users, John D. Lenk, Reston Publishing Co., Inc., 1973. Assumes you know rudimentary DC/AC/transistor concepts, and shows you how to use ICs. DIY/actual-use-oriented; covers linear and digital ICs in separate sections.

Introductory Circuit Analysis, Robert L. Boylestad, Charles E. Merrill, 1982. DC and AC circuit theory; technical non-calculus treatment.

Electronic Principles, Albert Paul Malvino, McGraw-Hill 1983. Covers diodes, bipolar and field-effect transistors, amplifiers, ICs, etc.; standard community college text. Assumes knowledge of basic DC and AC circuit theory (e.g., *Boylestad*).

Digital Logic Fundamentals, Thomas L. Floyd, Charles E. Merrill Publishing Co., 1977. Covers number systems, codes, logic families, gates, Boolean algebra, combinational logic, flip-flops, counters, registers, memories—the works. Technical but readable.

Microcomputers

The Howard W. Sams Crash Course in Microcomputers, Louis E. Frenzel, Jr., Howard W. Sams, 1983. A fairly fast-access programmed text. A good book, but if you don't like programmed texts, pass on this one.

Don Lancaster's Micro Cookbook, Volume 1, Don Lancaster, Howard W. Sams, 1982. Buy it.

Don Lancaster's Micro Cookbook, Volume 2, Don Lancaster, Howard W. Sams, 1983. Ditto.

Assembly Cookbook for the Apple II/IIe, Don Lancaster, Howard W. Sams, 1984. Semi-painless introduction to Apple's 6502-based assembly language, and assembly language programming in general.

Test Equipment

Using Your Meter, Alvis J. Evans, Radio Shack, 1985. Includes info on VOMs, DVMs, component and circuit measurements, and a glossary of terms.

Know Your Oscilloscope, Robert G. Middleton, Howard W. Sams, 1980.

Math and Physics

Basic Technical Mathematics, Allyn J. Wash-

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Welcome To C.A.P.O.E.S. Station C1- Fair
field, New Jersey
        The Casio
              Automated
                 Parts
                    Order
                       Entry
                          System

Are you using a CASIO FP-1000? (Y/N):N

YOUR ACCOUNT NUMBER PLEASE:B6A0000

  ACCOUNT :B6A0000
       NAME:Musitech Inc.

    ADDRESS:2107 Huff Place
            P.O.Box 3717
            Chatanooga        TN 37404

  TELEPHONE:615-555-1212
SERVICE MGR:Alan Gary Campbell
```

Manufacturers should not be overlooked as a source for finding parts. The screen displays here show Casio's on-line ordering system.

ington, Benjamin/Cummings, 1985. Emphasizes applications and topics that actually get *used*.

Basic Technical Mathematics with Calculus, Allyn J. Washington, Benjamin/Cummings, 1985. As above, but includes additional chapters covering applied differential and integral calculus, and Laplace transforms.

Quick Calculus, Kleppner/Ramsey, John Wiley & Sons, Inc., 1986. Brief topical survey that accesses the basics quickly.

Applied Physics, Paul E. Tippens, McGraw-Hill, 1984. Algebra-based text covering mechanics, thermodynamics, acoustics, optics, electricity and magnetism, and modern physics.

Musical Acoustics

Magazine article:

"Imitating Musical Instruments with Synthesized Sound," Don Lancaster, *Popular Electronics*, August 1975. I've listed this article because it's remarkable that it was ever printed in a hobby-type magazine. Includes amplitude envelopes and formant response graphs for 13 acoustic instruments. Go to the library and photocopy this one.

Books:

A Guide to Musical Acoustics, H. Lowery, Dover (reprint), 1966. Covers basics, including temperament, in a very concise, readable form.

The Sounds of Music, Charles Norton Taylor, Charles Scribner's Sons, 1976. A wonderfully entertaining, informative, well-written, and well-illustrated book. A good choice for a mostly non-technical but thorough introduction to musical acoustics.

Practical Guide for Concert Sound, Second Edition, Bob Heil, Melco Publishing, 1978. Popular reference regarding concert audio. Very readable; only semi-technical. Almost anyone who works with live sound should find it of value.

Music, Physics, and Engineering (Revised), Harry F. Olson, Dover (reprint), 1967. Somewhat dated, but frequently cited technical reference. Unique in that it contains propagation plots for many acoustic instruments.

The Physics of Music, various authors, W. H. Freeman and Company, 1978. Consists of reprints of relevant articles that have appeared in *Scientific American*. Contains material not covered in most texts; semi-technical and very interesting.

On the Sensation of Tone, Herman R. Helmholtz, Dover (reprint), 1954. Incredibly lucid translation of original text; technical, but worth the effort for serious students.

Miscellaneous

Dictionary of Electronics Terms, with Illustrations, Thomas B. Lukers, Radio Shack, 1984.

Dictionary of Microcomputer Terms, with Illustrations, Thomas B. Lukers, Radio Shack, 1984.

Both Radio Shack dictionaries are concise, well-written, and well-illustrated. A good selection of terms for dictionaries of this size.

Understanding Telephone Electronics, Fike & Friend *et al*, Radio Shack, 1983.

Understanding Data Communications, Fike & Friend *et al*, Radio Shack, 1984.

```
ENTER PART CODE NUMBER PLEASE:23010097

I GOT IT!
23010097   DIODE 1S2473
     0.33 *
How Many Do You Need?2

CONFIRMED!
23010097   DIODE 1S2473
     0.33 *  2 =   0.66

Enter five question marks ????? if you
don't know the part code number.
Enter an asterisk * to display your enti
re order.
ENTER PART CODE NUMBER PLEASE:25203186

I GOT IT!
25203186   EMI FILTER DSS710D223S12-22
     0.88 *
How Many Do You Need?2

CONFIRMED!
25203186   EMI FILTER DSS710D223S12-22
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These are a must for modem addicts. The books in the "Understanding..." series were developed and published by the Texas Instruments Learning Center.

Enercell Battery Guidebook, (authored by the staff of Master Publishing, Inc.), Radio Shack, 1985. Non-technical introduction to battery technology; includes reference data and selection guides for Enercell-brand batteries; reviewed in the February '87 EM.

Cookbooks

When you get past the stage of cloning others' circuits, and want to modify them or design your own, the Sams cookbooks are an indispensable reference. They present electronics concepts in an applications-oriented, plug'n'chug-formula format, with much accessible explanatory material. (Note that the *Micro Cookbooks* above are rather different, emphasizing a more conventional text.)

IC Op Amp Cookbook (2nd Edition), Walter G. Jung, Howard W. Sams, 1980.

Active Filter Cookbook, Don Lancaster, Howard W. Sams, 1975.

TTL Cookbook, Don Lancaster, Howard W. Sams, 1974.

CMOS Cookbook, Don Lancaster, Howard W. Sams, 1977.

IC Timer Cookbook (2nd Edition), Don Lancaster, Howard W. Sams, 1983.

Audio Op Amp Cookbook, Walter G. Jung, Howard W. Sams, 1980.

Design of Phase-Locked Loop Circuits, with Experiments, Howard M. Berlin, Howard W. Sams, 1978. While not strictly a cookbook, this is an excellent text that resembles that format.

Databooks

At some point when you're working on mods or new designs, you'll need technical info on the ICs and other components. While pinouts and brief specs on many ICs are found in the *Cookbooks* (above), complete specifications are found only in *databooks*.

The most common databook of all is Radio Shack's *Archer Semiconductor Reference Guide*. They publish a new one each year (you can often get "last year's" edition at close-out prices at the end of the year). The *Guide* only covers components carried by Radio Shack, but it's still quite useful, and inexpensive.

Manufacturer's databooks, however, are expensive; though if you work for an electronics-related firm you can often get them free by requesting them from sales reps or by writing to a distributor on your company letterhead—just make sure that your request is for legitimate work-related stuff. Otherwise, you can purchase the more common databooks from the components sources listed later. You'll probably need databooks on linear, CMOS, TTL, and memory ICs; and reference guides for any microprocessors that you plan to work with (note that manufacturers do not necessarily put out new editions each year; e.g., the 1984 National Semiconductor *Linear Databook* is the *current* edition).

Additionally, you'll want to get individual spec sheets on specialized devices that are incorporated in common gear, such as the Sharp PC900 optocoupler (often used with MIDI input circuits) and SSMT or Curtis Electromusic ICs.

You'll also need tube and transistor substitution guides (from Sams, Tab Books, or Radio Shack); and for transistor specs, the following books are indispensible:

Tower's International Transistor Selector, T. D. Towers, Tab Books, 1974.

Tower's International FET Selector, T. D. Towers & N. S. Towers, Tab Books, 1978.

Electronic Components

Of the many good mail-order sources for components, I've listed these because they've provided me with fast, reliable service and reasonable prices (but don't ignore Radio Shack as a possible nearby source). Write for catalogs.

Digi-Key Corporation, PO Box 677, Thief River Falls, MN 56701, ☎ 800 / 344-4539. Good selection of solid state components and metal-film resistors.

Jameco Electronics, 1355 Shoreway Road, Belmont, CA 94002, ☎ 415 / 592-8097. Great selection of ICs, and RV4-type potentiometers; some computer stuff.

JDR Microdevices, 1224 South Bascom Avenue, San Jose, CA 95128, ☎ 800 / 538-5000. Great selection of solid state components; lots of computer stuff.

Mouser Electronics, 2401 Highway 287 North, Mansfield, TX 76063, ☎ 817 / 483-4411 or Mouser Electronics, 11433 Woodside Avenue, Santee, CA 92071, ☎ 619 / 449-2222. Great selection of solid

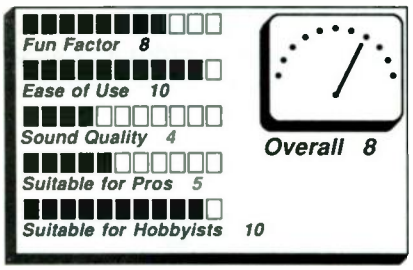
—continued on page 138

FIRST TAKE

THE RATING SYSTEM: *First Take* is just that—people's first impressions of some of the latest products. Two different sets of ratings are provided by each reviewer according to their particular standards. The 11-step "LED meters" show a product's rating in a *specific* category (ease of use, documentation, construction, etc.; categories are chosen by the reviewer), while the 11-step "VU meter" shows the *overall* rating. The latter is not a mathematical average, since the reviewer may judge some specific categories as having more weight than others. For example, if a guitar synth is well-constructed, has great documentation, is easy to use, but doesn't track worth a hoot, it could have several very high LED meters but a low overall rating.

We would like to remind you that these are opinions, not gospel, and as always, **EM** is a communications medium that welcomes opposing viewpoints. We urge you to contact manufacturers for more information and, of course, tell them you saw it in **EM**.

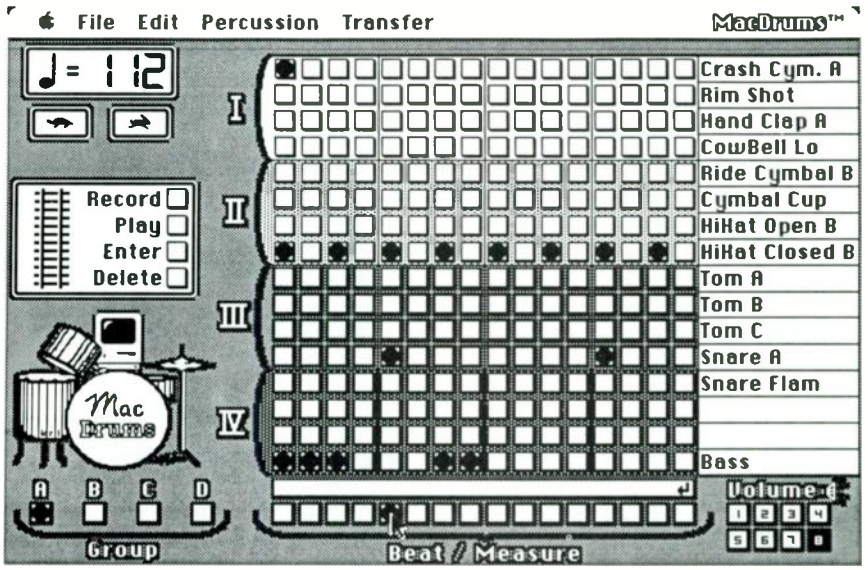
MacDrums by Coda Music Software ($49)



MacDrums, by Kris Livingston and Tom Cavanaugh, turns your Mac into a four-voice drum machine that's fun, easy to use, and inexpensive (not counting the computer!). The program combines sampled drum sounds along with a sequencer "grid" where rhythmic patterns are written. There are two screens: the standard *MacDrums* screen, and the *MacDrums MIDI* screen (more on this later).

The sequencer is a 16 × 16 grid; columns are nominally defined as 16th notes (thus allowing one measure on screen at a time), and the rows correlate to various drum sounds. These are arranged as four groups of four sounds, and given that the Mac uses four-voice architecture, only one voice within a group of four can play at any given moment when using the Mac's internal sound generator. However, it is easy to create new drum sets from the folder of 35 individual instruments, so if you want to play two sounds at once that happen to be in the same group, simply shift one of those sounds over to another group. Any custom drum sets you create can be named, saved to, and loaded from disk.

Note that you could just as easily treat the 16 columns as quarter-notes, in which case the grid would represent four measures instead of one. You can also reduce the number of columns. For example, you might want to use 12 columns and consider that as four measures of ¾, with each column representing a quarter note.



MacDrums screen dump

Programming the grid (we'll call it a "measure," since most people will probably treat the grid as one measure of 16th notes) is simple: click on the crosspoint of column and row to play a particular sound at a particular time; click again to turn off. After programming the measure, it can be named, saved to, and loaded from disk. A total of 64 measures, arranged as four groups of 16 individual measures, can be programmed. Measures can also be cut, copied, and pasted if you want to duplicate a particular measure and program variations on it.

A *track* function (usually called *song mode* on drum machines) lets you string together up to 999 of the 64 recorded measures. Tracks can be looped, named, saved, and loaded, but editing is primitive: if you want to remove a measure from the middle of the track, you'll have to delete all the way back to the middle, then re-specify the subsequent measures. Tempo for measures or songs goes from 001 to 900, but there are fairly wide jumps (e.g. 100 to 112 to 128 to 150).

Incidentally, an extremely useful attribute of the program is that almost all parameters can be changed in *real time*. You can click on drums with total abandon and hear the results instantly.

Regarding the sounds, the default is a Latin percussion set (castanets, cabasa, guiro long/short, agogo hi/lo, cowbell hi, rim shot, conga high closed/open, conga mid, conga lo, timbale hi, timbale lo, hand clap A, finger snap). A second disk contains additional drum sets: Rock Drums (toms, snare, cymbals, hi-hat, kick, etc.) and a mixed set made up from the Latin percussion and rock drums. The sounds are 8-bit linear and not exactly hi-fi (the high end is also rather dull), but

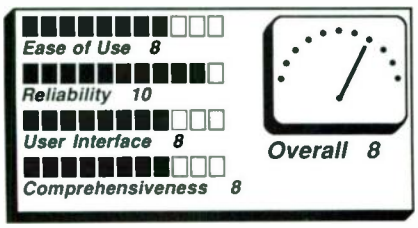
fortunately, the *MacDrums MIDI* screen lets you assign each of the 16 instruments its own MIDI note number, channel, and velocity (of course, you'll need a MIDI interface to take advantage of this). The MIDI parameters can also be changed in real time (yeah!), which is great for identifying which external drum sounds correspond to which MIDI note numbers. A master velocity control is available, as is a solo button for each instrument so that you can listen to one drum sound by itself. When using MIDI, the number of voices is limited by the drum machine you're using, not the Mac's internal voice architecture. However, the MIDI function serves only as a way to hear different sounds. There are neither sync in nor sync out options, so if you've programmed some great pattern, you will not be able to transfer it smoothly over to another MIDI device.

Professionals will find *MacDrums* a fun toy with a hassle-free user interface, but the inability to export sequences to a "real" machine is a limitation (one that, according to rumor, will be addressed shortly when Coda develops their "second generation" *MacDrums*). However, for the "potential musician" and hobbyist, this is one heck of a deal—for under $50, you get a nifty little drum machine, a solid and understandable manual, and a lot of fun. And while you can indeed (as advertised) start making music two minutes after opening the box, I also think the novelty wouldn't wear off for quite some time. This is the kind of program that will get more and more people started on the road to being electronic musicians.

—*Craig Anderton*

Coda Music Software
1401 East 79th St.
Minneapolis, MN 55420-1590
☎ 800 / 843-1337

Digital Music Services TX81Z Pro ($139; demo disk $5)



TX81Z Pro, for the Macintosh, is a comprehensive editor/librarian for Yamaha's TX81Z. The program is window-intensive, and you can open up any of the following 13 windows simultaneously: voice, performance, microtuning, and/or utility parameter editors; two voice libraries; two performance libraries; voice bank; performance bank; two microtuning banks; and a utility bank. Pulling files from disk and stuffing them into various windows is a simple procedure. For example, you can partially fill up a voice bank from the two available voice libraries, then close those libraries, pull two more libraries from disk, and continue filling up the rest of the voice bank. To help manage all these windows, a thin, additional "sidebar" window contains icons representing each of the 13 windows. Clicking on an icon summons the chosen window. There are also ten time-saving "templates" for commonly used window configurations (e.g. editing voices in library 1, microtuning, etc.).

The way TX81Z Pro handles the saving of voice and performance edits is wonderful. If you do something that would normally trash the results of an edit (such as select another voice), the current edit (voice or performance) is "auto-stored" to your choice of either library, or you can "auto-store" over the existing edit (these choices are set in a Preferences menu). You can similarly store an edit manually. Any time an edit is stored to a library, you *do not overwrite any existing patch* (unless, of course, you've chosen to auto-store over existing edits). This is *great* when developing new voices—you can work on a voice and save as often as you like, then go back and compare each and every save to find the best of the lot.

As a librarian, the program does its job well. Each of the two voice and performance libraries holds up to 200 voices or performances, and moving these between libraries and banks is simple using the standard Macintosh cut-and-paste conventions. The program can also sort entries alphabetically, and remove duplicates.

As a voice editor, the program is utilitarian—there are no random patch generators or other bells and whistles. You can play notes from the Mac keyboard, or merge synth keyboard information in with the program (there are no provisions for recording test sequences, however). Although all parameters can be modified via the Mac keyboard as well as the mouse, you still have to move the mouse around to select parameters to edit. I like working from the Mac keyboard, but would have been happier if DMS had enabled the cursor control keys as an alternate means of parameter selection. This is a minor complaint, though (especially since I haven't seen *any* similar Mac program that implements the cursor keys as well as the mouse); overall the voice editing screen does exactly what it's supposed to do. For editing performances, TX81Z Pro is equally easy to use. And for what it's worth, the program has never crashed on me.

Overall, TX81Z Pro lives up to its name—this is indeed a pro level program, yet it manages to retain a civilized user interface. While it doesn't have a lot of frills, it delivers what it promises, and lets you adjust *all* parameters (including effects, memory protection on/off, and so on). And it never asks "Are You Sure?"—it just goes ahead and saves anyway, just in case. I like that. The TX81Z has so many adjustable parameters that you definitely need some computerized assistance if you're going to get the most out of this useful expander module, and TX81Z Pro is an excellent choice.

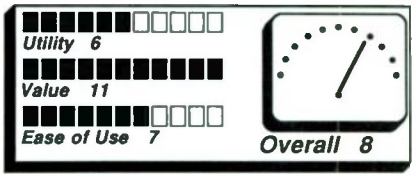
—*Craig Anderton*

Digital Music Services
23010 Lake Forest Drive
Suite D334
Laguna Hills, CA 92653
☎ 714 / 951-1159

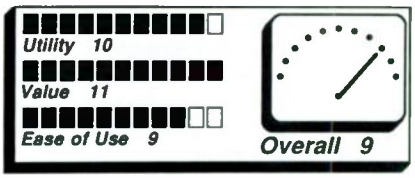
Atari ST Public Domain Patch Editors and Librarians

(free except for download time and connect charges)

CZLIB and DXLIB



FB-PATCH and DX7PATCH



One unfortunate aspect of the current boom in cheap-but-powerful digital synths is their hidden costs: books to explain the concepts that the manual's translators couldn't handle; commercial patches that go beyond what the factory programmers could come up with; and—not the least—patch editing and librarian software.

If you work with a number of different synthesizers, getting the best available librarian/editor can be a real chore—especially if you only use a certain synthesizer once in a blue moon and might not want to drop $100 for a commercial patch librarian. So we're all lucky that there is a less glamorous, but *far* cheaper alternative.

Public domain (PD) patch librarian software is available for many different synths these days, either from a bulletin board service (BBS), or from one of the many user's groups. While such programs are nowhere near as powerful or pretty as the commercial programs, and while there are many not worth the downloading time, some are genuinely useful.

Recently, I downloaded four Atari ST patch librarians from General Electric's GEnie network which are quite a bit more useful than the average PD program. Two of the

programs, *CZLIB* and *DXLIB*, are librarian/random patch generators for the Casio CZ-101 and Yamaha DX100. The other two, *FB-PATCH* and *DX7PATCH*, are librarian/editors for the Yamaha FB-01 and DX7. All four have their flaws, but they're lifesavers for the techno-musician on a budget.

My favorite of this bunch is FB-PATCH, primarily because it provides a function the FB-01 sorely lacks: patch editing. All the parameters of a voice are displayed in a chart, and one edits parameters with mouse-driven point-and-clicking. This sophistication is surprising in a public domain program, especially one written in BASIC.

Another nice feature is the "test area" of the screen, where point-and-clicking plays notes on the FB-01, obviating the need for an external keyboard and merger to hear the results of your editing. Single patches can be transferred from the synth to a disk and vice-versa, but there is no provision for handling banks. Configurations cannot be edited, though the documentation states that this will be added in a later version (my copy is version 0.10).

Other problems are that edited voices are not sent to the synth automatically, but must be sent manually by selecting a menu item (no big deal), and that the FB-01 must be set to MIDI channel 1. Nonetheless, configurations and voice banks *can* be organized with any of the many PD generic data dump programs out there, so none of these shortcomings are more than minor annoyances—considering the price of the software.

Though written by a different author, DX7-PATCH is almost identical to FB-PATCH, and shares most of its good and bad points. Written in GFA BASIC, DX7PATCH requires a run-time module (included) to operate. Apparently, the author of FB-PATCH simply modified DX7PATCH to make it work with the FB-01, and then compiled it for speed, though DX7-PATCH is surprisingly fast without compilation. This means that DX7PATCH could conceivably be easily modified to work with any synth, as long as a copy of the System Exclusive documentation for that instrument and a copy of GFA BASIC are available.

CZLIB and DXLIB are substantially different from the previous programs, primarily because they have no voice-editing functions, and because they abandon the GEM interface in favor of a more primitive, yet easy-to-use command menu.

Voices are stored in a special library file, preloaded with 36 voices for the CZ-101 or 95 voices for the DX100. Single voices can be sent to or from the synthesizer, and the library has a number of commands for rearranging the voices or searching for a voice by name.

The nicest feature of these programs, though, is the *random patch generator*. Pressing a single key generates a random voice, according to a parameter called the "weirdness factor." A weirdness factor of one yields video game noises, while a value of *3,000* generally produces organ and accordion sounds. The sounds from the CZ version of the program were pretty good, and the DX random patches, though consistently low in volume, otherwise sounded good.

Fortunately, the data controlling the random patch generation is contained in a file that can be edited with any word processor, and the documentation contains a very short description of how each program works, so you can tailor the patch generator to meet your needs.

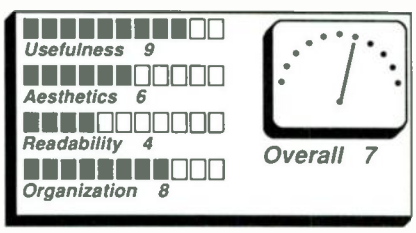
All of these programs can be found in GEnie's Atari ST library, and will probably be available on all but the most backward MIDI-oriented BBSs by the time you read this. On GEnie, look for files 3972, 3628, 2083, and 2009 for the FB-01, DX7, DX100, and CZ-101 programs, respectively. (You'll also need files 1271 and 1272 from the Utilities library to "un-crunch" these files.) If you don't want to spend the time and money needed to get on-line these days (believe me, I don't blame you at all), join your local Atari ST user's group and make friends with someone who has a telcom package. As a third alternative, send the authors a blank disk and whatever cash you think such a program is worth ($10 to $20 is probably right), and ask them to send you a copy. The CZLIB and DXLIB documentation don't include the author's name, so this won't work, but the author of FB-PATCH is Harry Wootan, 2204 Rushmore Way, Birmingham, AL 35226. DX7PATCH was written by Mark Salewsky, 2467A N. 61st Street, Wauwatosa, WI 53213. You won't get any user support on these programs, there may be bugs, and the documentation is sketchy, but they do work, and are handy enough to be well worth the effort needed to track them down.

—Jim Johnson

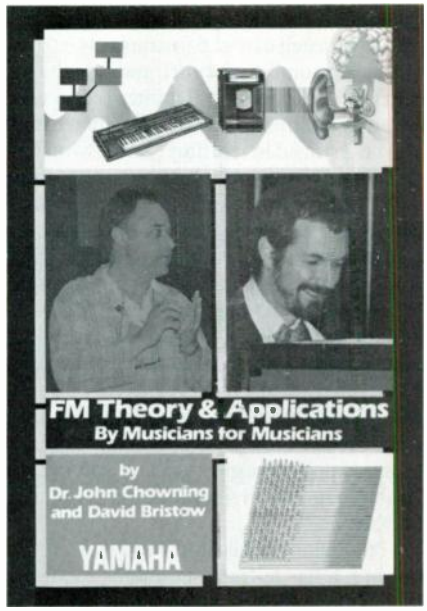
GEnie
☎ 800 / 638-8369 (modem)

FM Theory & Applications: By Musicians for Musicians

by Dr. John Chowning and David Bristow, Yamaha Music Foundation (192 ppg. $29.95 hard cover)



To the vast majority of electronic musicians, the art and science of programming Yamaha's DX series of synthesizers still remain shrouded in mystery. Much like reading and writing in the Dark Ages, the secrets of algorithmic timbre-building are held by a relatively small number of fanatical devotees. Getting a solid background in FM programming requires that you seek out the answers to a lot of questions. Equally important is finding the time to experiment, so anything that points you in the right direction is worth more than a hundred pre-programmed patch banks.



FM Theory & Applications

John Chowning, the founding father of FM synthesis, has collaborated with Yamaha programmer Dave Bristow to write *FM Theory & Applications: By Musicians for Musicians*. This hardbound book published by the Yamaha Music Foundation is full of all the FM theory and hands-on guidance you may ever need. To realize fully the education being offered, you should have a DX7 in front of you as you read.

Beginning with a few acoustical basics, the text quickly progresses to the theoretical mathematics behind frequency modulation. Sine waves, the building blocks of FM, are examined in some detail, followed by a discussion of their effect on one another. Fifty tutorial "X-amples" dictate settings on your synthesizer so you can hear what you're reading about. Explanations of harmonic ratio, bandwidth, residual pitch, low-frequency carriers, and envelopes fill the two chapters on simple FM. A chapter on complex FM goes from complex carriers to parallel and cascade modulators. The applications section discusses noise and inharmonic spectra, formants, feedback, the effect of envelopes on bandwidth, and selecting algorithms to build finished sounds. Practical descriptions of how to replicate the various elements of acoustical musical instruments are among the most useful information. Dozens of rules, formulae, charts, and diagrams illustrate the concepts explained throughout. Seven appendices are

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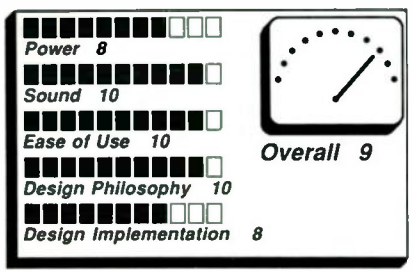
If you have an inborn fear of math, this may not be the best book for you. Soon after it promises no more than basic mathematics, it assumes you've studied trigonometry—pretty basic trig, admittedly, but a probable turn-off to anyone who's never been exposed to it. On the other hand, if you're into acoustical physics, you're going to love every page. Obviously, digitally generated sound is by its nature wrapped up in numbers and the musical things they can be forced to do. Though perhaps a bit tedious for the average rock and roller, *FM Theory & Applications* should be required reading for college-level studies in electronic music. If you're willing to buckle down and learn what this book has to teach, you will surely be a better synthesist for your effort.

—Geary Yelton

Hal Leonard Publishing Corp.
PO Box 13819
Milwaukee, WI 53213
☎800 / 642-6692

Korg DSM-1



The Korg DSM-1 Digital Sampling Synthesizer Module is a 3U rack unit that is as much "the next generation" as "the rack version" of Korg's keyboard sampling synthesizer, the DSS-1. To its credit, Korg seems mostly to have profited from experience, and, while cleverly using existing DSS-1 technology and architecture as a basis, has expanded the new unit's functions, *greatly* eased its operations, and definitely improved the manual.

Like the DSS-1, the DSM-1 does 12-bit sampling at 16, 24, 32 and 48 kHz with maximum sample lengths of 16, 11, 8 and 5.5 seconds respectively. It allows up to 16 *Sounds* (samples) per *Multisound* and offers an extensive collection of digital, synthesizer-style processing features that tailor the Multisounds. It too will digitally generate (great-sounding) waveforms with 128 adjustable harmonics for an elementary form of harmonic synthesis, but offers 17 waveforms to the DSS-1's five.

Memory improvements include space for holding 32 Multisounds and 32 *Programs* (patches)—both double the DSS-1's capacity. Even better, it will simultaneously load four Multisounds, and assign each of them to: one of four MIDI receive channels; one of 32 Programs; any of 16 voices; and one of many configurations of audio outputs, using the single *Mix* out and/or one of the 16 individual outs. Each of these arrangements of Multisounds and functions is called a *Timbre*, and up to four Timbres can be assigned at once to any section of the keyboard—either alone or sharing it with the other three Timbres—and to any number of the 16 voices not used by the other Timbres. When Timbres share parts of the keyboard, each Timbre can sound simultaneously, or individually, as determined by either MIDI input or key velocity. Four Timbres, assigned in all these ways, make up a *Combination*, and memory stores up to 32 Combinations.

Korg DSM-1

Confusing? Initially, yes—but we're talking *powerful*. The only limitation I can find to this apparently fantastic flexibility is that each voice is hard-wired to one of the 16 individual audio outs, so whenever you use the individual outs, there's no dynamic allocation of voices among them, and the tails of previously played notes are cut off by subsequent notes in many cases. If you load four Timbres (or three, or two), you get dynamic allocation only when using the single Mix out. So your tradeoff is true polyphonic voices (dynamic allocation) for the the ability to route Timbres separately. This is fine for sampled drumkits, sound effects, and spoken dialog, but is less than great for having four polyphonic instruments in one box. Aside from that, the DSM-1 is almost like four DSS-1's in a box, with individual outputs.

The onboard waveforms include two electric pianos, two basses, three sawtooths, electric guitar and more—of a generally superb quality. I did hear what sounded like aliasing in the low end of the "Brass" wave, but it was a snap to use the harmonic synthesis function to edit out a few high harmonics and clean this sound out. Assigning these to Multisounds is an easy, one-step process, much improved over the earlier unit. (For a complete rundown of those features shared by these two units, see the article on the DSS-1 in the Sept.'87 EM.)

Like its harmonic synthesis functions, most, if not all, of the DSM-1's functions are simpler, faster and more intuitive than its predecessor's, due to a couple of factors. In addition to faster internal operation, there's a very handy "data entry wheel" that works like the Roland's "alpha dial"; the keys that control the cursor, numeric keypad, increment/decrement and yes/no replies are laid out in a reassuring, at-your-fingertips way, and are further assisted by a "resolution" button that lets you change numbers either by single digits, 100 digits or 1,000 digits at a push (great when editing sample numbers that go into the ten-thousands). The LCD screens are mostly procedure-oriented and throw fewer "Are you Sure?" messages at you, so when you complete one step, the screen for your next step appears with a sensible message. All this significantly eases recording, editing, and saving samples; assembling Multisounds; and building Timbres and Combinations.

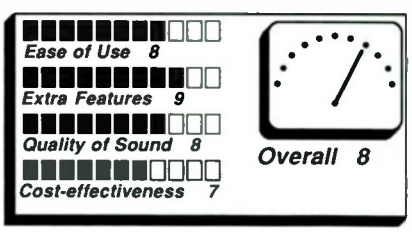
A few features are notable by their absence. Although one might expect otherwise, the increase in memory does not allow longer samples. If you really want a 64-second sample, record your source as four individual 16 kHz samples, assign each to a Timbre, and hit four keys to play them back. So it's not a Tapeless Studio; big deal.

DSS-1 features not included are the two digital delays, the white noise generator, filter resonance, the Waveform Drawing function (which never proved that useful to me) and the two-oscillator architecture (although the multiple outputs tend to make up for the last). Still, the DSM-1 more than holds its own thanks to the additional goodies. This unit is a lot of fun—go out and play with one.

—Tim Tully

Korg USA
89 Frost St.
Westbury, NY 11590
☎ 516 / 333-9100

Roland GP-8 Guitar Effects Processor ($995)



The single rack-space GP-8 includes the equivalent of eight microprocessor-controlled, series-connected Boss effects boxes. In

order from input to output, these effects are *Dynamic filter* (with parameters for sensitivity, cutoff, Q, and down/up), *Compressor* (attack and sustain), *Turbo Overdrive* (tone, drive, and "turbo" on/off), *Distortion* (tone, distortion), *Phaser* (rate, depth, and resonance), *Equalizer* (high, mid, and low levels), *Digital Delay* (effect level, delay time, and feedback), and *Digital Chorus* (rate, depth, effect level, pre-delay, and feedback). Every parameter of every effect can be memorized and stored as part of a patch; in addition, you can assign *any* one parameter per patch to foot pedal control using the EV-5 pedal ($79.50)—a fabulously useful and convenient feature. There's also a programmable Master Volume control, as well as two programmable gate outputs for turning external logic-level controlled devices on or off.

Programming patches is quite simple, thanks to Roland's "alpha dial" system of calling up and editing parameters. Roland is to be congratulated for popularizing this simple, effective way to do front panel editing—spin the dial until you find the parameter you want to edit, click a switch, then spin the dial again to select the desired value.

The GP-8 stores 128 patches in Roland's standard protocol of two banks of eight groups of eight patches. I always thought this was a silly way to do things, but when using the GP-8 with the optional FC-100 footswitch ($295), it makes sense to logically group patches for easy access—this is certainly easier than tapping out, say, program 1-1-6 with a footswitch numeric keypad. Programs can also be selected by MIDI Program Change commands; a rear panel switch chooses between MIDI or the FC-100. (Incidentally, the FC-100 is quite a nice unit, but I really wish it had an extra switch that would instantly return to a default patch—basically, a bypass function. As currently configured, you need to either program the default patch as one of the patches in a group of eight, or switch to a different group to access the default patch, which takes more than one switch-press.) Regarding connections, there is a mono input, stereo outputs, effects loop send/return (located between the EQ and delay), MIDI In/ Out/Thru, and the aforementioned dual external control outputs.

The sound quality is what you would expect from Boss pedals, which is quite good. Even though I'm incredibly picky about effects (which is why I usually build my own), these measure up well. It was easy to tweak the factory presets I didn't like into something useful, and there are no ROM presets (hurray!)—you can fill the *entire* memory up with your own sounds. The only problem I encountered was occasional distortion on the peaks of my playing, and padding down the input solved that (an input level trimpot, even an internally mounted one, would have been welcome). Also on my wish list, it would have been nice to be able to switch the order of some effects—in particular, to place the dynamic filter post-fuzz, or the EQ post-loop. Any elaborate switching would have probably driven up the price, though.

In terms of cost-effectiveness, $995 will buy a fair number of individual effects. But integrating them all into a single rack-space package, with patches easily selectable by MIDI or footswitch—and no worries about level-matching or batteries—is a convenience that is well worth a bit extra. The bottom line is whether you like the sounds of the effects, and whether $995 fits in your budget. If so, this is the box for you. And kudos to Roland for continuing to develop products specifically for electronic guitarists.

—*Craig Anderton*

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Los Angeles, CA 90040
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Akai EWI1000/EVI1000 *and* EWV2000

Rumor becomes reality: mass-market wind-to-MIDI is finally here. Our ace resident saxophonist checked out the initial entry in the field, and once we tore him away from the instrument, he filed the following in-depth report.

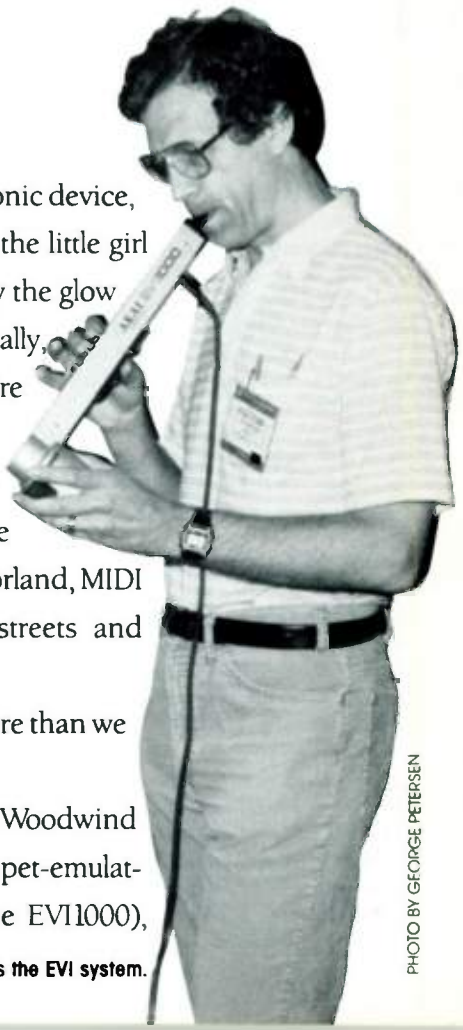
BY TIM TULLY

Staring intently at the face of the electronic device, mesmerized by its sound and light, the little girl gradually turns to face us. Framed by the glow of the machine, she grins enigmatically, then squeals with an eerie glee: "They're he-e-e-ere."

Yes, gentlemen, ladies and electronic saxophiles everywhere, they're here indeed. Out of the mists of vaporland, MIDI wind drivers are at last on the streets and available.

Well, at least *one* is, and that's more than we could say last month.

Akai's saxophone-like Electronic Woodwind Instrument (the EWI1000); the trumpet-emulating Electronic Valve Instrument (the EVI1000),



Inventor Nyle Steiner demonstrates the EVI system.

PHOTO BY GEORGE PETERSEN

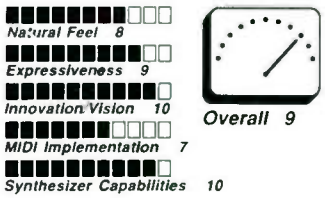
PRODUCT SUMMARY

PRODUCT:
Akai Electronic Woodwind Instrument (EWI1000), Electronic Valve Instrument (EVI1000) and EWV2000 synthesizer.

TYPE:
Breath-driven synthesizer controllers and included synthesizer module.

LIST PRICE:
$1,999.95 for one of the wind controllers plus the synthesizer.

MANUFACTURER:
Akai, PO Box 2344,
Fort Worth, TX 76113
☎ 817 / 336-5114



and the EWV2000 synthesizer module that serves as companion to both, are now in the stores and ready to bring electronic sound synthesis to the lips of the world's until-now largely unMIDIfied horn players.

Other than adding a potentially interesting twist to the getting-old-fast controversy over synthesists putting horn players out of work, this instrument—and no doubt the others coming hard on its heels—will wreak some significant changes, both in the ears of the listening public and in the ways music is played and produced.

Getting Down To Brass Tracks

This type of instrument addresses one of the badder raps that has dogged electronically produced music from its beginnings: that synthesizers produce inexpressive, robotic music. Akai goes a *long* way towards taking the wind out of that contention's sails by loading the EWI with the ability to respond precisely to the voice-oriented controls of breath, lip and tongue that give acoustic wind instruments their great expressiveness. In addition, the EWI also expands the musical, compositional, production and economic power of MIDI into the hands of a whole new section of the music population.

Concerning the first point mentioned above—expressiveness—without exaggeration the EWI has the potential to change the face of recorded music. The second point, at least for *this* sax-playing MIDI fan, is nearly as exciting a prospect as finding undiscovered tapes of unknown Coltrane-Dolphy sessions. At last I may be able to *play* into my sequencer, not just stumble along with my inchoate keyboard chops—and turn off the step-entry function forever. Regarding production and economics, the more I work with this instrument, the more I'm impressed with its potential, and potential is about the best deal you can get anywhere.

The Three Questions

It seems to me there are three major questions to ask about the EWI, or any instrument that claims to do what the EWI does.

First, does the ability to play the sax (or other woodwind) help a player to get functional on the instrument? Notice that I'm not asking the instrument to play *exactly* like a saxophone. I think it's reasonable to expect new instruments—and that's what this is—to require a player to learn some new techniques (just as piano players have to develop some new chops to play a synthesizer keyboard to its full potential). But taking that into consideration, the instrument should nonetheless offer the sax player a good deal of comfort and familiarity. The degree to which it *fails* to do this without offering some tradeoff (additional control over the sound or some other capability), is the degree in which an instrument will fall short.

The second question is: does the instrument *respond musically* when asked to do so, and how well? Will it put out the wide range of "expressive" control offered by wind instruments—from subtle nuances of pitch to broad-stroked timbral changes—over the tones it generates? Does it really have the potential to play music that sings along with the breath, embouchure, tonguing and the many other vocal sorts of controls that make the sax, for example, the unique instrument it is?

Third, how fully does the instrument give the sax player an entrance to the world of MIDI? Does it offer a way for someone with sax chops to not only blow hot fusion-bop lines in a session, but to do the rest of the things—and in some cases *more* of the things—a fully MIDI-fied keyboardist can do? Can it control *other synthesizers*; play *chords*; and control sequencers, signal processors, and drum machines?

Any of the alternate (non-keyboard) MIDI controllers that are beginning to emerge can be evaluated this way. But before we look at the first question, a word on the instrument itself.

Sax In Drag, Electronically

The EWI consists of two pieces: a *controller* and the synthesizer it controls. The controller—the EWI1000—is the thing you actually blow into and finger and play, almost as if it were a sax or one of the other woodwinds. It is a metal box about 17 inches long and an inch and a half square, weighing a negligible few ounces. In place of the standard keystacks, onto one side (the front, if you will) are screwed a row of six rings that look exactly like chrome-plated Lifesaver candies; six pencil-thick metal tabs—five of which emulate a woodwind's fifth-finger (pinky) keys, a sixth that raises any note a half-step; and one crescent-shaped bar between the "B" and "A" Lifesav...uh, keys. These are all non-moving parts and respond simply to being touched (more on this later).

At the bottom of the EWI's opposite side is the jack for the cord that connects to the EWV2000 and a "cord clutch" (thank you). This is to take the brunt of other band members stepping on your cord as you begin to walk, freely and mic-less, around the stage. Above that, in place of the thumb rest, are four metal plates (again, non-moving): one above the thumb for upward pitch bends; one below it for downward bends; one controlling portamento ("glide"); and the "earth plate."

The "earth plate" has nothing to do with planetary mechanics or residual hip-

For All You Brass Players...

DESPITE THIS REVIEWER'S obvious bias towards overt saxuality, the Electronic *Valve* Instrument not only exists but did so prior to the EWI. (Harumph.)

It too is married to the EWV2000, and their relationship is identical to the one EWV enjoys with the Electronic Woodwind Instrument. It's just that the valve instrument talks to it differently. Its fingering is, of course, like that of a trumpet, in that there are but three keys on the front (or "top," from a brass player's point of view), and an object on the end of the instrument that looks, for all the world, like a large-sized tuna fish can. This device (called a "can"), is held by the player's off hand (the one not on the keys). A metal ring on the can drops the pitch a fourth when touched, emulating a trumpet's mid-octave embouchure change. Rotating the can moves the player's thumb along the rollers to produce octave changes of the same range as the EWI's.

As opposed to the EWI's vibrato, the sensor in EVI's mouthpiece produces a *glide* effect. The EVI's Vibrato comes from rocking one's thumb on the *vibrato control* near the "earth plate" (like doing a "shake" on a trumpet).

pie mentality, but rather, uses the British term "earth" where us American types would say "ground." The manual exhorts us to "always keep (our) right thumb (on the plate) when . . . playing," presumably to insure that the capacitive touch plates work as intended. Farther up, looking like it should be the thumb rest, is the tab to which you hook your neck strap, and above that, a row of eight rollers that change octaves as you roll your left thumb up and down along them. Finally, extending about five and one-half inches above the metal body is a plastic piece ending in a flexible-plastic nipple consisting of two connected tubes, the right-hand one having a small hole in its top. Into this, we blow.

It's All The Same, But Different

The key setup, going downward from open C#, is identical to that of a sax but for a couple of fingerings, and alternate fingerings, on the two left-hand and three right-hand pinky keys. These keys—low D# through low A#—are useful and easily mastered and, by the way, *can* be played in *each* octave, not just the lowest, offering a convenient alternative fingering. The only problem this setup gave me was that the keys respond at the slightest touch, so if you're used to resting your fingers lightly on open keys—normally considered good technique—you have to lose that habit right away, or hear a lot of falsely triggered notes whenever a finger brushes against an "open" key. This is a pain, but not the end of the world. Nyle Steiner, who invented the EWI (see sidebar), said he'd advised people who'd been bothered by this to paint the keys with clear nail polish, somewhat desensitizing them to touch, but the people had all grown used to the EWI before getting to the cosmetics counter, and no one had ever actually tried it.

The octave rollers are another story. My left thumb does not *believe* it has eight octaves available to it; it wants to go up one, then back down. No more. It's hard for me to play fast through more than two octaves and make that thumb just keep grabbing for more. But aside from my bad personal habits, the EWI's range is one of its great features. Having *eight* full octaves under your fingers is a powerful thrill; one that's absolutely worth re-educating your fingers for.

Still, there are some unfamiliar quirks in this feature. I find myself triggering false notes when changing octaves, especially downward. Tonguing every octave change helps but adds a limitation to expressiveness. I'm told the instrument's circuits sense the *speed* at which the fingering changes (if this is a change from low D# to the C below it, we're talking six fingers and a thumb) and one's fingers soon get fast enough to play the octave changes smoothly. Judging from some of the live demos I've seen, I tend to give this theory no small credibility, and plan on spending more time in the woodshed very soon.

If you're used to resting your fingers lightly on open keys you have to lose that habit right away, or hear a lot of falsely triggered notes whenever a finger brushes against an "open" key.

The mouthpiece is weird, but workable. Though the many parameters of the sound *do* respond to your blowing harder or softer, your air doesn't actually go through the mouthpiece. It's more like trying to blow up a lead balloon—no give at all—so you have to keep your embouchure loose enough that air escapes around the sides of your mouth. Another difference from "normal" mouthpieces is the way one does hard tonguing ("ta-ta-ta") and staccato tonguing ("tat-tat-tat"). These have to be attacked on the roof of your mouth, not on the mouthpiece itself; double-tonguing ("ta-ka-ta-ka") works too. Emulating the way an acoustic instrument's reed responds to varying lip pressure by producing vibrato, the parameters of the *Vibrato* feature are sensitive to changing pressure on the mouthpiece. Gently biting, then releasing with your teeth, will produce a vibrato, a tremolo, or modulate the filter level or the pulse width, in any combination you set. Do it faster to increase the effect's speed; do it harder to increase the effect's depth. You can't get the *exact* shadings or the *entire* palette of nuances that come even from lightly running your tongue along a sax reed, but the Pulse Width Modulation can be haunting and the filter sweep a powerful effect. This is definitely a strong point.

Since the mouthpiece responds to motion—*changes* in embouchure pressure—it's not effective for a single bend, a "scoop," or other non-vibrato pitch changes. For this, two small metal plates —one just above and one just below the right thumb—work just fine. A knob on the EWV's panel, along with one of the parameters of the *Vib/Bend* button, set the depth to which you can bend. Once these are set, the more of a bend plate your thumb covers, the more the pitch goes up or down, stays there if you hold it, and comes back if you let it go.

And speaking of your right thumb, a quick roll to the left of its normal position on the earth plate lets you touch the "glide plate," producing a portamento effect, where the pitch slides smoothly from one note to the next. The depth and duration of this effect are also programmable, and the more area of the plate your thumb covers, the greater the effect. Overall, this is the most accessible and most intuitively controllable portamento I've ever worked with on any synthesizer. Unlike keyboards, where the portamento control is always somewhere away from the keys, this control is right there, in whatever dosage you want, and your fingers never leave the keys. Very nice.

Hold Your Breath

The feature I was most eager to see implemented was breath control . . . no, not breath control, but *Breath Control*, as in getting a living, breathing, musical response from living breath.

A reed player's breath provides control over an enormous number of sound parameters (usually thought of as one phenomenon—"tone"—by the player), but to implement such power in an electronic instrument requires a huge amount of engineering. Multi-stage envelope generators *approach* recreating these effects, but in a stiff, predictable way.

What's been done here is clever and effective. The EWV2000 does have one

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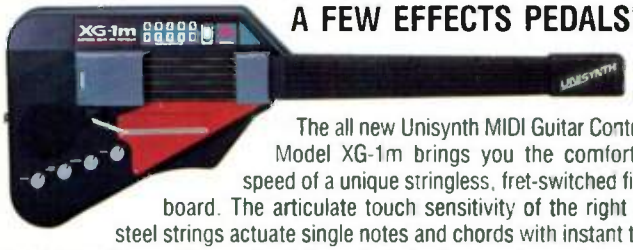

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standard four-stage envelope generator (EG) apiece for each oscillator's VCF and VCA, but they seem vestigial, left over from an earlier evolutionary stage. More to the point, about 20 seconds of button-pushing is all it takes to defeat the EGs and set the levels to which the intensity of your breath will affect volume, filter cutoff, resonance, pitch, or pulse width modulation—once again, in any combination you want. You can blow in a slow crescendo, and the sound will swell from silence to *ff*, follow any number of decrescendi and crescendi you care to blow, then fade to silence again—all with perfect smoothness. If you want to play the very next note staccato, there are no buttons, no sliders, no problem. Hit it hard, then cut the air off sharply, just like normal, and you get immediate attack and immediate release. To create more complex effects, add some filter sensitivity, a touch of resonance—whatever's not covered by embouchure pressure, perhaps—and you can blow the sweetest string lines, hot preachin' blues, or even give life to the "Ahs" and "Ohs" in your sampler.

To have such a range of attacks, swells, bends, effects and releases *immediately* available, without having to turn the knobs or hit the buttons or move your hands from playing position in the middle of a performance, is essentially unheard-of in synthesis. If no other sax simulation had been successful in the EWI, I would see it as a powerful tool just by dint of its response to breath control. Taking into account all the rest of its capabilities, the EWI begins to look like a contender.

The Synth

The required companion to the EWI, or the EVI if you're a valve kinda player, is the EWV2000, a 4U rack mount (it can also stand on a horizontal surface), two-oscillator, analog synthesizer with an eight-octave range using four waveforms: sawtooth, square/pulse, triangle, and saw plus triangle. The oscillators can be synched; tuned from one cent to four octaves; and oscillator two can modulate the frequency of oscillator one to produce metallic sounds. Each oscillator can be separately high- and low-pass filtered and shaped by its own four-stage, keyboard tracking, ADSR envelopes (one each for both filter and volume). The EWV2000 holds 64 sound patches that can be off-loaded to tape cassette and replaced with your own patches. Overall, the EWV is a fine-sounding analog synth (it uses the same oscillator chip as Akai's AX60 and AX73 synthesizers), with the addition of specifically tailored controls that give good, sensitive breath control over pitch, volume, and low-pass filtering of its sound.

Programming patches will require a learning curve if you're unfamiliar with synth basics (if you are, see the Nov. '87 **EM** for Craig Anderton's lucid introductory "how to" on analog synthesizers), but programming the EWV2000 will be a snap for anyone who knows basic analog synthesis. The only surprises are the extras, and they're gravy: two high-pass filters and two trigger modes. There's also a "compare" function that switches between a patch and its edited version; this is real helpful when you're modifying a patch. A "backward" button steps you *back* to the last parameter displayed, ameliorating some of the clumsiness of programming with a smallish (16-character) LCD. More help in this realm comes from eight knobs on the panel (yes, real, physical *knobs*!) that let you control such performance-oriented functions as breath sensitivity and vibrato, pitch bend, and glide parameters without going through the clumsier edit screen while you're playing.

Three features make the EWV2000 not only unique, but uniquely appropriate to working with a wind controller (limited to the EWI and EVI, due to the non-standard, non-MIDI cable that connects controller to synth—so don't start thinking those interfacing thoughts just yet.) Two of these features come in the MIDI section below, but the third has to do strictly with the EWV2000.

The Formant Filter

One of the things that gives strings and woodwinds, among other acoustic instruments, their characteristic sound is that they naturally *resonate* more strongly at one given frequency (a *formant* frequency) than at others. (See Jim Johnson's "The Lost Art of Synthesis" in the Jul. '87 **EM** for a fuller explanation and bibliography of this phenomenon.) Press button number eight, the "effect" button, on the EWV2000, and you'll get the choice of setting a filter to "1" (recommended for string sounds), "2" (for bassoon-type timbres), or "3" (both combined). This filter adds a fixed-frequency resonance to any of the EVW's patches you want, and does amazing things to certain timbres. It's effect is quite apparent as you play a melody line at and around the formant frequency which, especially with wind- and string-type patches, creates strikingly realistic, non-synth-like textures.

But Does It Speak MIDI

The EWV2000 has but one MIDI port: an Out. Through this, on any one of the 16 MIDI channels, it sends other MIDI devices the information you'd reasonably want it to: Program Change (can be disabled), note data, Velocity (this is curiously fixed at 40H or 64 decimal, the common default velocity value for non-velocity synths), though Akai says a new software release will make it programmable), Pitch Bend, and one of the following continuous controllers: Channel Aftertouch, Breath, or Volume. A *Threshold* parameter interacts with the Breath control to set the sensitivity of the MIDI output to your breath.

With these, the EWI/EWV team controls one-note-at-a-time firing of other MIDI devices pretty well. However, of the three Continuous Controllers—Aftertouch, Breath, and Volume—only *one* can be active at a time. At the very least, this requires you to be especially careful in choosing the additional MIDI synths you'll want to control with the EWI. Since your expressiveness *after* you attack a note is limited to one MIDI controller, it's important that your external synths respond to what the EWI sends.

Two of the unique functions mentioned earlier are directly related to the EWV's relationship to the MIDI world.

One At A Time's Just Not Enough

This is a so-near-and-yet-so-far function. You can set the EWV so that when you play certain notes, it will play chords on another MIDI synth. You can set these chords to include up to four notes, and set each note at *any number* of up to 12 half steps up or down from *any* note on the EWV. You can set each note to play a completely different chord. All of this is great. Allowing a wind player to actually play *chords* verges on curing the most noxious of the wind player's limitations:

The Man Behind the Instrument: Nyle Steiner

NYLE STEINER, the inventor of the EWI and EVI, is a studio musician working in Los Angeles who has played his EVI on the soundtracks of such films as *Apocalypse Now, Witness, Star Trek III, The Color Purple* and *Fatal Attraction*; the TV series *Remington Steele* and *Knots Landing*; and albums by Stephanie Mills and Neil Diamond. In 1980, at Ars Electronic in Linz, Austria, he won the award for the best new instrument.

Originally a trumpet player, Steiner began developing the EVI (Electronic Valve Instrument) in 1965, and came up with his first working prototypes in the early '70s. By 1979 his experiments had produced a professionally usable instrument, and before he teamed up with Akai, his Salt Lake City company had produced about 20 EWIs and several hundred EVIs.

"I played with pitch followers and never did like that concept very well," Steiner said. Later, "when I first started to make an electronic trumpet my initial thought was to make something that responded to embouchure. But that wasn't too practical and so I decided to go with a different but related technique. The mouthpiece (used on the present Akai instruments) turned out to be better." His sense is that with the differences between the brass and among all the woodwind mouthpieces—sax, oboe, flute, clarinet—the present EWI/EVI mouthpiece serves all equally.

In designing the EWV2000 synthesizer, Steiner and Akai concentrated on breath parameters, feeling it was better to build a synth module specifically for EWI/EVI controllers. As a result, the EWV's emphasis is less on Envelope Generators and LFOs, and more towards its ability to assign breath control to its various parameters.

Steiner began working with Akai in 1986, and feels that in developing his instruments, they have stayed very close to his "basic philosophy," and have even improved on some features, especially the software and programmability of the synth module. Incidentally, the one problem he expressed with the EWI was the manual instructing the player to use "lip pressure" on the instrument's mouthpiece and *not* to bite with the teeth. Steiner said you *should* use your teeth, not just your lips, to activate the mouthpiece sensor.

As to the future, Steiner said he may do more work with Akai, but at the moment is pursuing his career as a studio musician, and contemplating making an EVI album.

chronic pianist envy.

But you can't shut it off. Once set, every time you hit a note that's chord-programmed, the chord sounds. This is fine for playing parallel harmonies, but it won't let you play a single chord and let it swell or sustain behind you while you blow a line over it, then hit another chord a bar later, play over it, and so on.

Short of Akai doing an upgrade or some clever EM author designing a footswitch that would allow some sort of self-accompaniment technique, this feature remains a unique, flexible, interesting, almost-great implementation.

External In

This feature rates four stars. If there are limitations to the EWV's MIDI Continuous Controllers, this feature may solve them entirely, at least for live, non-sequenced performances. Connect the EWV's MIDI Out to another synth, then connect that instrument's audio out to EWV's *External In*. The breath control parameters you've set on the EWV—volume, filter cutoff and so on—will now affect the sound of the other synth in the same way, and the processed sound of the external unit comes out the EWV's audio out, mixed with any or no amount of the EWV's sound. With the right programming of the two synthesizers, this can give you a lot of music for your money.

What this feature doesn't solve is the lack of a MIDI In port on the EWV2000. In going for the maximum breath-driven expressiveness, Akai chose to go with *analog* control. They believe the 127-step resolution of the MIDI Continuous Controllers is not fine enough to give the expressiveness over pitch, volume, and timbre provided by analog circuitry, and did not set the EWV2000 to receive MIDI data. So if you do sequencing and use the EWI, the lines you record can only be played back by external MIDI instruments. The expressiveness you gain thereby—their response to your breath—will be limited to *either* the MIDI Breath, Volume, or Aftertouch your EWI has sent the sequencer, and will suffer the limitations of the MIDI medium in playback. I understand Akai's point about the smoothness of analog controllers, but I wish they'd added a MIDI In to the EWV2000 and let me have the option.

But within these limitations, for sequencing bass, lead, percussion or any monophonic line, the EWI makes a fine MIDI controller for woodwind players, and offers real liberation from the keyboard. Further, the chord function *will* let woodwind players lay down polyphonic parts in a sequence; again, without touching a keyboard. As long as you're content hearing the same inversion each time you hit a chord, this is certainly a step forward. In a multi-instrument, multi-effects MIDI environment, this amounts to the EWI showing more than a few abilities of a master controller, but not all, or perhaps even most. As always, there are tradeoffs, and a player's individual needs are the prime consideration.

Conclusions

What the EWI does, it does superbly. It feels like a woodwind instrument, though not *exactly* like any particular woodwind. It truly provides breath and embouchure control over its own and—to a lesser degree—other synthesizers; again, in both familiar and in some unfamiliar ways. Unquestionably, it enables a sax player to make music that would be impossible with a keyboard. Its MIDI implementation is less than I'd hoped, but by no means unworkable.

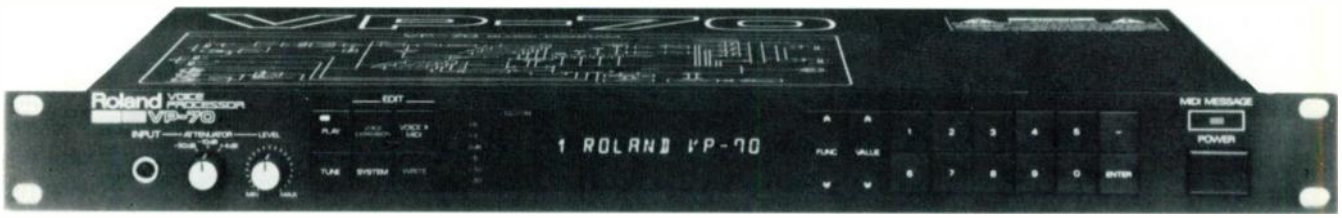
I think we're going to hear a lot of EWI music in the next few years.

EM

Tim Tully is a much, much happier and well-adjusted member of society now that he can trigger MIDI instruments with something other than a keyboard. He laughs at people who say "I've got a really good sax patch I want you to hear."

Pitch-to-MIDI may not be perfect yet, but it's not from lack of trying—and Roland's latest generation takes the genre further than ever.

Roland VP-70 Voice Processor



BY PAUL D. LEHRMAN

PRODUCT SUMMARY

Product:
Roland VP-70
Type:
Pitch-to-MIDI converter, and MIDI-controllable harmony synthesizer/vocoder
List Price:
$1,495
Accessories:
FC-100 foot controller, $295
Manufacturer:
Roland Corporation
7200 Dominion Circle
Los Angeles, CA 90040
☎ 213/685-6141

Value 7
Flexibility 8
User Friendliness 8
Pitch-to-MIDI Accuracy 6
Harmonizing/Pitch Changing 9

Pitch-to-MIDI conversion. The phrase conjures up all sorts of wonderful images: playing a dazzling guitar lick, and listening back to it perfectly replicated by a sampled English horn; hooking up your record player to your computer and watching it spit out instant transcriptions of Coltrane's wildest solos; singing your heart out with a whole orchestra of synthesizers hanging—literally—on every note.

The idea of turning any sound into a source of MIDI data has made the pitch-to-MIDI converter one of the music industry's Holiest Grails. But it's not an easy job, as companies from Canada to Australia will tell you. Extracting a fundamental from a sound rich in harmonics, or choosing whether to interpret a small pitch change as vibrato or as pitch bend, or determining when a sound is a new note or when it is a continuation of the last note, are just some of

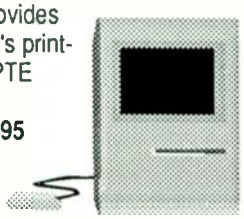
The
INTERFACE
A Newsletter for the Passport User Network

Vol. 3 Number 1 Passport Designs, Inc., 625 Miramontes Street, Half Moon Bay, CA 94019 (415)726-0280 Winter 1988

Editor's Note *by Brent Silveria*

New Products for Macintosh™ and Atari ST®

MIDI Transport™ Is Passport's new Macintosh MIDI Interface with SMPTE capability. It features 2 MIDI IN's and 5 MIDI OUT's and fits under your Macintosh. The interface provides Timecode Sync capabilities via the Mac's printer port with your choice of FSK or SMPTE sync.



Model # MH-02M **$459.95**

Master Tracks Jr.™ is a new entry level sequencer for the Macintosh and Atari ST. Fully compatible with our popular Master Tracks Pro for Mac and ST, this new program provides 64 tracks for real or step time recording, MIDI Song pointer, 100K plus note capacity with a Meg. of memory, auto punch-in and out, step input MIDI files and many other features not found on low cost MIDI sequencers.

Model # MS-15M (Macintosh Version) **$149.95**
MS-15ST (Atari ST Version) **$129.95**

Master Tracks Pro 2.0 for the Macintosh and Atari ST has a few new tricks up its sleeve. The New Punch-In and Out feature offers you a dialogue window to set auto-punch in and out points for your music. You can also set the punch-in/out region by highlighting the area in the Song or Step windows. The new Conductor Track Data Window has been added to the windows menu. It graphically reflects changes made to the Conductor Track from the change window, or with the pencil and eraser tools. Improvements have also been made to the Elapsed Time Indicator, Quantize window and measure insertion. Version 2.0 is now Mac II and Multifinder compatible.

Model# MS-14M/MS-14ST **$349.95**

Attention Commodore™ and Apple //™ Owners, You Are Not Forgotten!

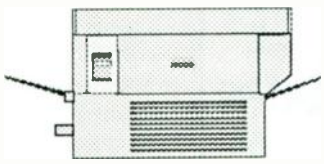
With all the talk these days about Mac, Atari, and IBM, it's easy to get the impression that software developers are ignoring other computers: NOT TRUE. Passport continues to support the Commodore 64/128 and the Apple // plus, //e, //gs, and Laser 128 with a complete line of professional MIDI Software and Interfaces. Programs like Master Tracks Pro with MIDI song pointer, and Polywriter for real-time transcription provide you with the features you need, without asking you to spend $1000 or more on a new computer. Explore the possiblities—contact Passport today for a free product catalog. Just call **(415) 726-0280.**

Here's the SCORE *by Perry Devine*

Managing your Music

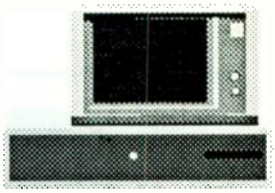
With this issue of the Interface we welcome a new group to the Passport family, the SCORE owners. For those of you who don't yet know, SCORE is the most complete and powerful music printing program that has ever graced an IBM PC or compatible and it's available exclusively from Passport. In this new column we will provide tips and insights that we hope will help you to use SCORE more effectively as well as answer any specific questions you might have. So send in your questions and let's get on with the show.

This time we're going to talk about SCORE graphics files and a modular approach to building up complete manuscripts. A SCORE graphics file is the normal means of saving your work and it is created with the "SA" command or with the "SAVE" function of the Disk Section. Do not confuse this with an Input command file which can be saved during the input process. Since a single SCORE graphics file can contain, at most, 16 staves of music, a complete manuscript will often consist of many files. How those



files are organized and how they are named is the key to using all of the SCORE programs effectively.

Since the size, placement and grouping of staves within a SCORE graphics file is totally free form, a single SCORE graphics file could contain a single staff system or a complete page containing several staff systems. Either way will work fine with SCORE or SPRINT but if you need to process the files with PAGE for either page layout or part extraction then there must be only one staff system per file. It is for this and other reasons that we highly recommend a modular approach to manuscript building, with the basic module being a SCORE graphics file that contains a single staff system. As tempting as it is to create full page files for viewing or playback, you



should resist the urge, at least at first. Instead, input each staff system one at a time and save each one as a separate file. Once you have created all the individual modules that make up a page you can always use the COMbine command to merge them all in to a single file, assuming that the total number of staves and memory limitations are not exceeded. The original modular files will remain intact to be later processed by PAGE or re-combined in some other configuration. Modular files are also inherently smaller and are therefore quicker to load, edit, sort, re-compute and save. This whole modular approach just makes good computer sense. If some unforeseeable disaster causes a file to be irretrievably damaged, then a much smaller portion of the complete manuscript is lost.

the decisions the pitch-to-MIDI device has to make.

So far, pitch-to-MIDI converters have either been very expensive, like Fairlight's Voicetracker, or they have been designed for specific applications, like IVL's adaptations of its Pitchrider for Kramer guitars, Zeta violins, and the Chapman Stick.

Roland's *VP-70* is unlike most other pitch-to-MIDI devices. By offering very flexible operating software, it makes an attempt to be a general-purpose converter, but it does a lot more. It's really two units in one: a converter, and a MIDI-controlled harmony synthesizer and vocoder—and it can perform both of these functions simultaneously.

Setting It Up

The VP-70 is a 1U rack mount with two sets of square buttons, two knobs, a six-segment LED input level indicator, and a 16-character green LED programming display. The entire unit is software-controlled, and the settings for a particular effect (both the conversion and harmonization parameters) are stored in 128 internal registers, numbered—in traditional Roland fashion—from 11 to 88 and -11 to -88. (The unit comes with 27 factory settings, which can be overwritten.) These registers can be called up via the front panel buttons, accessed by MIDI program changes, or selected by Roland's FC-100 11-pedal foot controller. There are also momentary footswitch jacks for incrementing and decrementing the current register. MIDI and FC-100 control cannot be simultaneous—a back-panel switch chooses between them.

Individual parameters within a register are adjustable with the usual microprocessor syntax: select a function, then change its value. A *System* button handles overall system information, including MIDI receive channel, mode, and bulk loading and saving of registers. A *Write* button stores edited registers, and various combinations of buttons handle such functions as write protection and register naming.

Audio signals feed either an unbalanced ¼-inch jack on the front panel, or a balanced XLR jack on the rear (there is no phantom powering on the XLR jack, an unfortunate oversight). An attenuator switch selects the input signal range from -50 dB (mic level), to -10 dB (instrument), to +4 dB, and a continuous level control provides fine adjustment.

The unit has two unbalanced high-level outputs, and the software contains an internal mixer for sending the direct or processed signals to either or both of the outputs, and controlling their relative levels.

Generating MIDI

When an audio input signal crosses the VP-70's trigger threshold (as set by the level controls), and is sufficiently strong to fire the lowest-level LED on the input display, a MIDI Note-On is generated with velocity corresponding to the instantaneous level of the signal. When the signal drops below the threshold, it sends a Note-Off and, in keeping with general Roland philosophy (although *not* that of the official MIDI spec), an All Notes Off command (controller #123) as well.

The VP-70 generates other data as well: MIDI volume (controller #7), which corresponds to the continuous incoming signal level; aftertouch (channel pressure) on the same basis; and pitch bend, whose range is adjustable from one to 24 semitones. If you sing a note and then slide to another within the pitch bend range, the unit will *not* send a new Note-On command, but will just send pitch bend information. However, if you breathe, or go outside the range, a Note-Off and Note-On will be sent. (Of course, the pitch bend range on the receiving synth should be set to the same range as the VP-70.) If the pitch bend function is turned off, the VP-70 will trigger a new note when it detects any change in pitch greater than a semitone.

There is also a transpose function, which can be set to any interval up to plus-or-minus two octaves, so that you can have your synth play parallel fifths while you blow your flute.

The minimum *conversion delay* (the time between the beginning of the audio signal and the generation of the equivalent MIDI note) is about 8.5 milliseconds. That's with a sine wave at 1,000 Hz or higher; conversion time can be longer, depending on the nature of the audio and the pitch. A sine wave at 20 Hz takes 94 ms to convert, or not quite two full cycles, which is about the same as similar devices. The *dynamic range* of the MIDI function (the difference between the point at which the input triggers a MIDI signal and the point at which it clips) is

about 30 dB, which is not tremendous, but adequate.

A Harmony Synthesizer and a Vocoder

But pitch conversion is only half of what the VP-70 does, and in some ways it's the boring half. While one part of the unit is busy generating MIDI data, the rest of it can do weird things to the incoming audio signal. You get a choice of two functions, *harmonize* and *vocoder* (unfortunately not simultaneously). In the former mode, the unit changes the pitch of the incoming signal by a specified interval. In the latter mode (referred to as "vocoder" even though it doesn't really do what a vocoder does), it changes the signal to a specified pitch. Both the harmonize and "vocoder" functions have four *voices* (or processors) available, so you can generate four-voice chords from any incoming sound. Each function can be controlled internally—with fixed values for intervals or notes specified in the particular patch—or externally, so that incoming MIDI notes determine the interval or notes.

When you use the *harmonizing* function with internal control, you can set each of the four voices to its own interval, within a range of plus-or-minus one octave, in semitone steps. You can adjust each voice further with a detune control, which operates in steps of 1/32nd of a semitone. Setting all of the intervals to zero and adding some detuning creates a glorious chorusing effect. With internal control of the *vocoder* function, you set a *note* for each voice (instead of an interval)

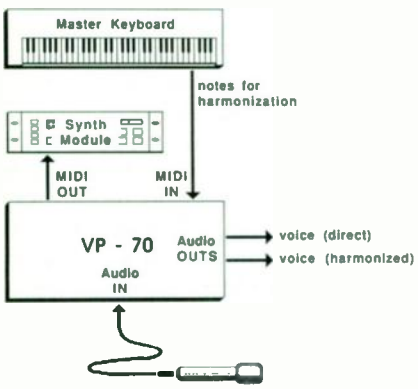


FIG.1: Using the VP-70 to add vocal harmonies, with the harmony notes determined by a MIDI keyboard.

from C0 to G9, along with a detune number if desired.

But, it's in the ability to control these functions *externally*, via MIDI, where the VP-70 is unique. In the vocoder mode, you can specify either *unison* or *poly* operation. In unison mode, the number of simultaneous MIDI notes the unit will respond to is limited (confusingly enough) to two, with each note triggering two voices—but those voices can be detuned independently, giving a chorus effect. In poly mode, you can trigger four notes. So if you play a four-voice chord on your MIDI synth, sequencer or other controller and sing into the VP-70 through a mic, the VP-70 outputs *your voice*, singing both your original note *and* the chord your MIDI device sent to the VP-70 (**Fig. 1**).

The unit can respond to pitch bend data; pitch bend sensitivity can be as high as two octaves. You can offset the incoming MIDI information up to plus-or-minus two octaves, in steps of an octave, and can specify low and high MIDI key limits, outside of which the MIDI data will be ignored. In normal operation, the vocoder works only while a MIDI key is down, but a *key hold* function will keep the vocoder turned on after the key is released, and hold the pitch until the next key is pressed. (If you have the unit holding a chord, all of the notes will cut off when the next key is pressed.) You can also have the VP-70 send out a specific MIDI Program Change command whenever its program is changed, either from the front panel, the footswitches, or via MIDI.

In the harmonization mode, the unit considers Middle C (MIDI note number 60) as the zero point. Sending that note over MIDI will result in no harmonization, while sending it any other note will result in a pitch shift equal to the difference between that note and Middle C. For example, if you send it an A-flat (MIDI note 68), the pitch of the incoming audio will be transposed up a minor sixth. If you send it an F (MIDI note 53), the pitch will be transposed down a perfect fifth. In the Poly mode, you can send the unit four MIDI notes at once. If you want to construct a diminished seventh chord on a Tibetan temple horn sample, just send the sample to the audio input and play the notes C, E-flat, G-flat, and A on your MIDI keyboard.

The harmony synthesizers have a limit of one octave up or down, and so playing keys more than an octave away from Middle C will do you no good—either the unit will transpose the played note an appropriate number of octaves to bring it within range, or it will get hopelessly confused. There are two exceptions to this limit, however. You can use pitch bend to extend the range of the harmonization, up to three octaves in the downward direction (one octave transposition plus two octaves of pitch bend, assuming the pitch bend range is set to 24), and up to an octave plus a perfect fifth upwards.

You can also use the detune function, which in the harmony synthesizer mode acts to "stretch" the harmonization interval. If detune is set at 32 (the maximum), and you send a Middle C (MIDI note 60), there will still be be no change, but if you send a C (72), then instead of an octave, the harmonization interval will be a minor 9th. Smaller intervals will be offset proportionately: an F# (66) would yield an interval of an augmented fourth plus a quarter-tone. If you're still with me (hey! *wake up!*), consider that if you are in the unison mode, the detuning function will work on two voices simultaneously, stretching one interval and shrinking the other, so that the aforementioned F# (66) would give you an augmented fourth plus a quarter-tone and an augmented fourth minus a quarter-tone (A half-augmented fourth? A demented fifth?).

The harmonizing mode also allows keyboard offset by octaves, key hold, and key limits.

Other Matters

The audio quality of the processed sound is excellent. The response is very fast, and there is absolutely no audible glitching. Frequency response is flat to about 8 kHz, and then sensibly rolls off to -6 dB at 16 kHz. Hum and noise are a comfortable 64 dB below maximum output level.

While the VP-70 is quite useless as a guitar-to-MIDI converter, as will be explained below, Roland included one feature—MIDI Mono mode—specifically for guitarists. When this is switched on, each of the four voice processors, instead of all responding to the same MIDI channel, will respond to its own MIDI channel—in conventional Mono-mode fashion—to channels n, n+1, n+2, and n+3. This means that a MIDI guitarist whose axe assigns a different MIDI channel to each string, can have each processor follow its own string.

The manual, as is depressingly typical for Roland, is written by someone with a

good English dictionary and no grasp whatever of English syntax. Thankfully, there are plenty of diagrams, and if you stick to those and ignore the text, you can learn your way around the unit in a reasonable amount of time. What the manual could really use, however, are examples of creative uses of this device.

A useful tuning feature allows you to specify a reference frequency for the device from 430 to 450 Hz in 0.1 Hz steps for use with non-440 instruments, and it will also display the pitch name of the incoming audio signal, and whether it is sharp or flat.

Where the VP-70 shines and rates a solid A+ is in its MIDI control of the audio processing functions.

In the two months I tested the VP-70, the unit performed flawlessly, even though it was one of the first off the boat. I couldn't get it to fail, although I did get it to go crazy, temporarily, by setting the MIDI send and receive channels to be the same, and then looping the MIDI Out to the MIDI In. Although this sounds like a stupid thing to do, it's actually very easy to make happen until you realize that the MIDI send and receive channels are set in different places, and that while the *receive* setting is global, the *send* must be set for each patch. Removing the MIDI cable corrected the problem, with no damage done.

Using It

The Roland VP-70 is an absolutely fascinating device. As a pitch-to-MIDI converter, it rates a B. The flexibility provided by the software means that you can adjust the unit to behave well with many sound sources, and I was able, with some effort, to find ways to make it work decently with various wind instruments and with my voice. But it's finicky. Even when I had what seemed to be an ideal setting, I still had to be careful not to change my volume or my position relative to the microphone very much, or the unit might miss notes or play too many. You also have to design your synthesizer voices very carefully, paying close attention to attack time, decay time, velocity sensitivity, portamento, and mode (mono or poly), if they are to sound at all natural.

Some instruments are not at all usable as input devices. Sounds that have a long decay time, like acoustic guitar, can do horrible things, because as the sound level starts to drop below the trigger threshold, it tends to send out literally dozens of false triggers. What would help would be a gate-time control, with which you could specify the minimum time between MIDI note events. One not-terribly satisfactory way around this is to turn on the VP-70's pitch bend function, but leave the pitch bend on your receiving synth off, so at least minor changes in pitch, which often accompany a decaying note, don't trigger new notes.

While the unit is pretty good at extracting the fundamental frequency out of a dense sound, like an FM "Tubular Bell" patch, it gets hopelessly confused when confronted with multiple notes, even at very different levels, and tries to play all of them, which further complicates using something like acoustic guitar. When the VP-70 gets that confused, it will occasionally miss a Note-Off (or maybe it just sends it so fast that the rest of my setup misses it, something that doesn't happen often) and you end up with stuck notes.

The MIDI aftertouch function is very hip, but the MIDI volume function is not terribly useful, as it tends to restrict the dynamic range of what you play. A scaling or limiting function on the MIDI volume would help, as would a way to switch off the velocity.

Where the VP-70 shines, however, and rates a solid A+, is in its MIDI control of the audio processing functions. I performed with the unit in several concerts recently, singing a medieval Spanish chant with three-part harmony provided by the VP-70 under the control of a sequencer. The hardest part of the preparation was figuring out the right notes to put in the sequencer to achieve the correct harmonization over each sung note. Having a chorus, perfectly in tune, following you precisely through every breath, syllable, and slide you make, is an awesome experience. (At the same time, I had the unit follow my voice to trigger a long, metallic, whisper-like DX7 patch. I'm told it was pretty terrifying.)

Although I'm not sure I would want to use the VP-70 as an input device for a sequencer (the VP-70 generates a lot of data, and would require plenty of editing), for live performance this unit is a gas. I could see anyone who sings or plays a wind instrument on stage benefitting in some way from this clever little box. It's a brilliant use of MIDI technology, and I hope it spurs others to think of even more outrageous things to do with MIDI. EM

Paul D. Lehrman composes and performs folk and other avant-garde music in his home computer studio. He writes music for film and video, designs and sells computer-music systems, and pens articles bemoaning the fact that music hardware and software manufacturers never quite get it right. He is a reformed bassoon player.

SMPTE can simplify life in the studio—but it can also make balancing your checkbook much more difficult. Fortunately, if you have champagne synchronization tastes and a beer budget, here are two highly cost-effective solutions.

MTS-1 vs. PPS-1

BATTLE of the BUDGET SYNCHRONIZERS

BY CRAIG ANDERTON

PRODUCT SUMMARY

PRODUCT:
MTS-1
TYPE:
Intelligent MIDI sync-to-tape converter
PRICE:
$229
AUXILIARY FEATURES:
MIDI merger, rack mountable
MANUFACTURER:
Harmony Systems
PO Box 2744
Norcross, GA
30091 ☎ 404 / 662-8788

Speed 9
Reliability 10
Ease of Use 10
Cost-effectiveness 10
Overall 10

SMPTE is great for synchronizing audio to video, but adding this capability still tends to be a rather pricey proposition. By default (there weren't any better alternatives), SMPTE has also been used for purely musical purposes, usually to synchronize sequencers to tape. In this application, the tape is "striped" (recorded) with SMPTE time code; on playback, this code drives a *SMPTE-to-MIDI converter* that relates SMPTE time to *MIDI Song Position Pointer* data (see sidebar). Since SMPTE is an "intelligent" sync track that contains timing data, you can start a SMPTE-striped tape anywhere and within a second or two, the SMPTE-to-MIDI converter will read the timing data and start sending out appropriate Song Position Pointer messages. These messages allow the sequencer or similar device to "chase" (autolocate to) the timing information recorded on tape, by relating the number of

PRODUCT SUMMARY

PRODUCT:
PPS-1
TYPE:
Intelligent MIDI sync-to-tape converter
PRICE:
$199.50
AUXILIARY FEATURES:
SMPTE-to-MIDI Time Code conversion, SMPTE generation
MANUFACTURER:
JL Cooper
1931 Pontius Ave.
West Los Angeles, CA
90025 ☎ 213 / 473-8771

Speed 10
Reliability 10
Ease of Use 9
Cost-effectiveness 10
Overall 10

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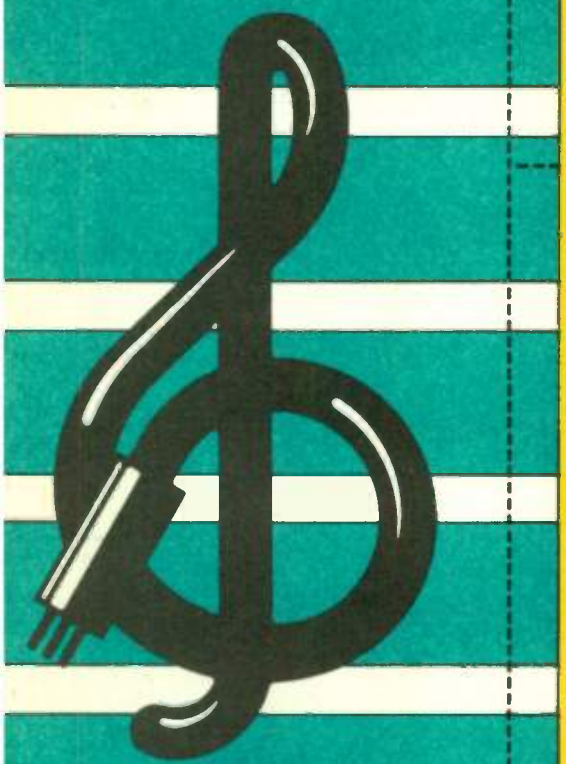

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1/16th notes since the song has elapsed to SMPTE time code.

Usually synching to SMPTE is a fairly straightforward process, unless the tempo of your composition varies. If so, you will have to enter a "beat map" that tells the SMPTE-to-MIDI converter where to make the desired tempo changes. While this is no big deal, it can be time-consuming. It's also necessary to save any beat maps you create in case you want to come back to a particular tune at a later date.

Synchronizing a sequencer to tape offers several advantages, but the number one benefit is that the sequencer can drive electronic instruments while the recorder plays back acoustic tracks. This not only increases the effective number of tracks in a studio, but since electronic instruments need not be recorded on tape (the sequenced tracks are considered "virtual tracks"), the outputs from these instruments can be mixed directly into a 2-track master along with the taped sounds.

In terms of cost-effectiveness, both units scored an impressive victory over other synchronization methods.

Sync-to-tape that provides autolocation is extremely useful, yet has attained limited popularity due to the expense of adding SMPTE control. However, times are changing. Thanks to the two accessories profiled in this review, audio-only, MIDI-oriented studios can sync sequencers to tape—reliably and with full chase capabilities—for around $200.

How They Work

As you play a sequence into either the Harmony Systems MTS-1 or JL Cooper PPS-1, they convert the sequence's MIDI Song Position Pointer data into specially encoded audio tones. Recording these tones on one tape track provides a sync track for your MIDI gear. On playback, the same box you used to record the sync track re-converts these tones back into Song Position Pointer information to which a sequencer (or drum machine) can auto-locate. For example, suppose you start a tape somewhere in the middle of a tune. The sync track will identify where you are on the tape—let's say 57 measures into the song—whereupon the sequencer will use that information to auto-locate itself to measure 57. Gone forever are the days when synchronization meant starting a tune from the top every time!

Let The Games Begin

Since the MTS-1 and PPS-1 (which stands for "Poor Person's SMPTE") cost about the same amount and provide similar functions, we thought it would be interesting to stage a match between the two. We put boxing gloves on both units, hooked them into the middle of a sizable MIDI setup, and started taking notes. Here's what happened.

Round 1: Output level. The PPS-1 could kick a +4 dBm machine (the Tascam Model 58) over to only about -10 VU, even with the output patched directly to the recorder channel input. Fortunately, this is adequate for most applications; but if you want to stripe at a hotter level, you'll need a preamp. The MTS-1 puts out gobs of signal, so with this box all you need to do is trim the recorder's input control. Since it's easier to trim a control than add a preamp, the first round goes to the MTS-1. Still, it would have been thoughtful if both units had provided trimpots to adjust input and output levels.

Round 2: Cables and connectors. The MTS-1 uses a custom DIN-to-dual-phono-plugs cord to get audio to and from tape, and the labels on the unit's various connectors are cryptic (get some sticky-back labels and make your own—you won't regret it). The PSS-1 uses standard ¼-inch phone jacks for the audio, and the jacks are labelled unambiguously, so the PPS-1 takes this round.

Round 3: Merging and keyboard "thru" (echo). Either unit will merge data appearing at the MIDI In connector with the timing data that makes its way from tape to the unit's MIDI Out port. However, unlike the PPS-1, the MTS-1 can also serve as a general-purpose merger to mix synchronization and controller data (probably the most common merger application) if you're willing to re-patch a few cables. Both will allow keyboard "thru," but the MTS-1 lets you disconnect this feature if desired (although you do have to take apart the box and change a jumper). The MTS-1 now pulls ahead, two rounds to one.

Round 4: Thru box capability. Both units offer two MIDI outputs, so this round is a tie.

Round 5: Documentation. The PPS-1 and MTS-1 both have more than adequate documentation. The PPS-1 manual has a well-done section on theory of operation, but the MTS-1 documentation includes lots of information on using the device with specific sequencers, so the MTS-1 manual gets a very slight edge.

Round 6: Packaging and cosmetics. The PPS-1 is functional, but not particularly aesthetic. The MTS-1 comes in a designer blue package that can be rack mounted using the Boss Micro-Rack system. The MTS-1 is also designed for a set-and-forget installation; with the PPS-1, you have to disconnect the sequencer MIDI Out from the PPS-1 MIDI In when merging keyboard data to prevent a MIDI feedback loop. The MTS-1 goes ahead four rounds to one, with one tie—but now the PPS-1 starts showing its stuff.

Round 7: Blinky lights. The PPS-1 has Power and Lock LEDs. The MTS-1 has a single LED to indicate power on, but it does double duty by flashing in time with the tempo when the device is locked. Nice try from Harmony Systems, but Cooper's blinky lights are more functionally useful, and making the lock LED green gets extra points in my book. This round goes to the PPS-1.

Round 8: Ease of use. It took about five minutes from unpacking the units to successfully synching to tape—that's *fast!* Both devices worked perfectly the first time, which earned them very high marks and a tie round.

Round 9: Speed of lock. The PPS-1 has a switch for fast or slow sync; the MTS-1 doesn't, and generally takes a second or

two longer to sync up. Maybe the difference isn't all that much, but over the course of a year, a second here and a second there can add up. Note, however, that some popular sequencers cannot use the PPS-1 fast position, thus negating this advantage. Thanks to faster locking under some conditions, the PPS-1 pulls within one round of the MTS-1. (Note: Over weeks of work on actual sessions, I did experience a momentary glitch or two where lock-up didn't occur properly. However, these glitches were *extremely* rare, and may have been due to sequencer or other MIDI problems, not the sync boxes.)

Round 10: MIDI Time Code. The PPS-1 translates incoming SMPTE time code (any type or frame rate) to MIDI Time Code, which is of interest if you have something that supports MIDI Time Code (I don't, so I couldn't confirm how well this feature works). In addition, the PPS-1 can stripe a tape with SMPTE (30 frame non-drop format only, with the time always starting at 00:00:30:00). The MTS-1 doesn't relate to MIDI Time Code or SMPTE. This round goes decisively to the PPS-1, which evens things out at four rounds each with two ties.

Round 11: Power sources. Both use AC wall adapters (oh well, it does keep the cost down). Tie round.

Round 12: Tracking and locking. I recorded signals from both units at -3 VU onto a 2-track, -10 dB mastering deck, and checked locking and tracking for varying degrees of tape output levels and speed control variations. Both would lock and track accurately down to below -20 VU (it seemed like the PPS-1 might have been able to cope with signals a couple of dB lower, but my meters ran out of resolution under -20 VU). Either the PPS-1 or MTS-1 could take as much signal as the recorder was capable of generating. The deck used for testing can do speed variations of ±12%; both synchronizers tracked and locked at the extremes of the speed control, and accurately followed any tape speed changes. Since the overall performance was so similar, we'll close out with a tie round.

It took about five minutes from unpacking the units to successfully synching to tape.

Post-Game Analysis

In terms of cost-effectiveness, both units scored an impressive victory over other synchronization methods. Being able to record tempo changes on tape is simple; you don't have to figure out any "beat maps" or anything, just prepare a sequence with the desired tempo changes and record that sequence timing data on tape. Both units operate quite "transparently," too. Once you get into your session, you really don't have to pay attention to the sequencers much at all—just run the tape normally, and the sync boxes will cause the sequencers to follow right along.

Although neither device scored a decisive victory over the other, there are good reasons why one might be better suited to your particular application. The MTS-1 is, on the whole, more of a "set-and-forget" type of device where once cables are plugged in, they need not be unplugged. The PPS-1 slow/fast switch does save time, but represents just one more adjustment that will have to be made at least once; and unless you have a MIDI switchbox (not a bad idea anyway), some re-patching will be required from time to time. If you don't have a merger, then the MTS-1 might be a good choice since it can do double duty as a two-in, two-out MIDI merger—but if you need a SMPTE-to-MIDI Time Code converter as well as a synchronizer, then the PPS-1 is your only option. And let's not forget packaging. Nonstandard-sized boxes aren't welcome in a lot of studios, and I suspect some people will be attracted to the rack mountability of the MTS-1.

Either box will do its main function—synchronizing a MIDI device that accepts Song Pointer to tape—so your purchasing decision will depend solely on which of the ancillary features are most important to you. In both cases, though, the devices work as advertised and *greatly* simplify the process of integrating MIDI into the home studio. **EM**

Craig Anderton has authored a bunch of books and played on, or produced, a bunch of records. Astrologically speaking, he is a Stereo with Dolby rising.

What's Song Position Pointer?

Song Position Pointer is a System Common MIDI message that affects all MIDI channels. This message sends out data that describes how many "MIDI beats" (16th notes) have elapsed since the beginning of a composition. As one application, suppose a sequencer capable of sending Song Pointer data feeds a drum machine capable of receiving Song Pointer data. If you start the sequencer halfway through a song, it will determine how many 16th notes have elapsed since the beginning of the song, and tell the drum machine to autolocate itself to that point in the song. Note that without Song Pointer information, it would be necessary to start both the sequencer and drum machine at the beginning of the song, since one device would not know where it should be with respect to the other except at the very beginning of the tune (once started, they would maintain sync by virtue of being driven by the same timing reference).

Incidentally, you might wonder why one doesn't simply record the MIDI Song Position Pointer data directly on tape. The problem is that MIDI's bandwidth far exceeds the response of the average tape recorder, thus necessitating some form of conversion process into audio tones that lie within the bandwidth of the recording medium.

(The above is excerpted with permission from MIDI For Musicians, *AMSCO Publications, 24 E. 22nd St., New York, NY 10010.)*

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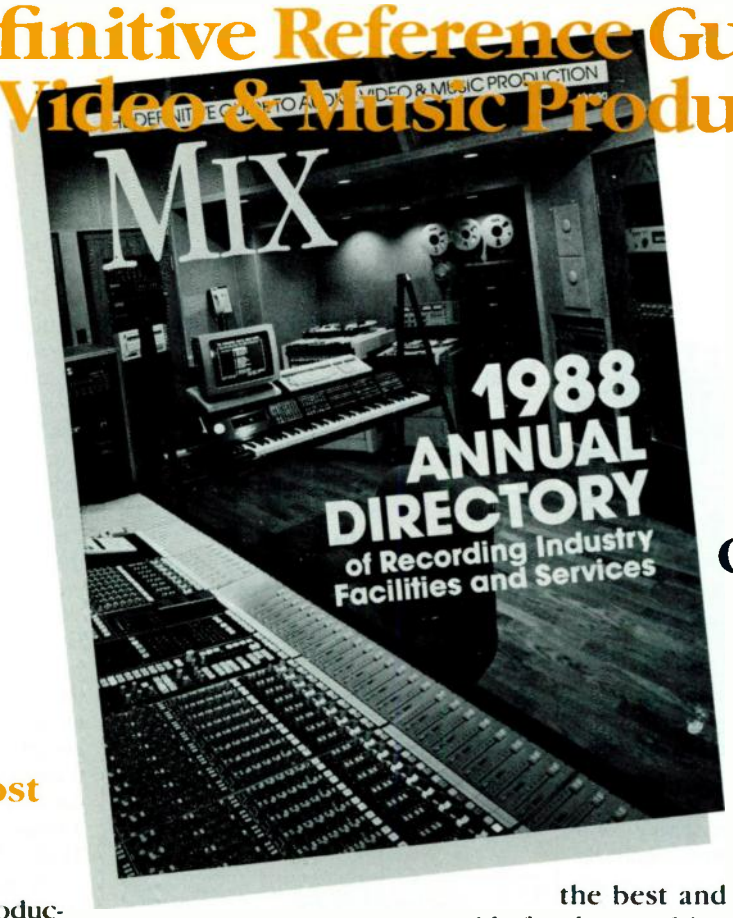

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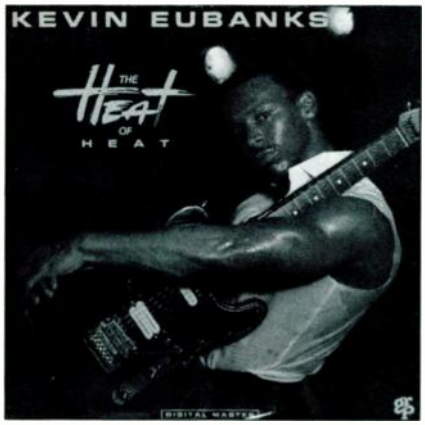
BY ROBERT CARLBERG

My train of thought departed, set in motion by the arrival of a new Kevin Eubanks album, ***The Heat of Heat***. It's an utterly conventional "pop jazz" album, except for the



fact that five of the eight tunes feature Synclavier samples. They are spectacularly realistic—the Synclavier acoustic piano sounds exactly like a real piano, the acoustic bass sounds like a bass, and the Synclavier strings are eerie, they're so perfect. In fact, there's only one track ("Sorrir/Smile," in which his guitar controls a vocal sample) where you get any idea that some high-tech sleight of hand is occurring. Elsewhere, although admirably performed, the samples beg an important question: if you're only going to mimic another instrument, why use a sampler at all?

My train of thought made its first whistle stop: you don't hear much interesting work being done with samplers.

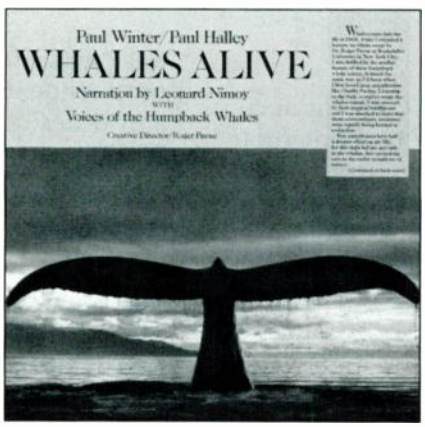
Back in the old Moog modular days (Patchozoic Era), popular press had it that "synthesizers can sound like any musical instrument—or entirely new instruments!" So what were they used for? It sounded to me like a combo organ with a thyroid problem. Keith Emerson's solo on "Lucky Man," The Beatles' "Maxwell's Silver Hammer," or Dick Hyman's "The Minotaur" were all sad, sad wastes of potential. Each could have been executed on a Lowrey Genie at a fraction of the cost. As soon as Bob Moog slapped a keyboard on the pre-patched minimoog, BANG ZOOM, people looked at the synthesizer as just another keyboard instrument.

My train of thought rounded its first bend.

Perhaps we are hearing interesting sampler work and just don't recognize it. Reports keep filtering out of the studios of engineers and producers "fixing" the flat note, correcting the missed cue, moving the pocket around using a Fairlight or Synclavier. Perhaps the major studios (those that can afford these mansion-cost behemoths) are busily rearranging their midnight-to-dawn sessions with bleary-eyed musicians, using the tools to perform the ultimate "fix-it-in-the-mix" where it doesn't even matter what the musicians played (or sang). As long as their sound is in memory, the engineer can create a take that resembles the tune.

My train made a second whistle stop: maybe that's why music sounds so lifeless these days. It isn't played by musicians anymore; it's assembled like an erector set.

What would I want to hear done with samplers? The imagination can run pretty wild. Several years ago a single was released of "Jingle Bells" spliced together from differently pitched dogbarks. Too novelty? How about tuned dog howls as backdrop to a blues tune? Pink Floyd's "Seamus" hints at the idea. Disney's ***Lady and the Tramp*** soundtrack includes a doggie barbershop quartet (albeit by human imitators). Or how about whale songs, rearranged to sing choruses at human pitch in 4/4 time? Paul Winter's new album ***Whales Alive!*** includes a duet for whale and pipe organ. How about a chorus of birds,



pitched and timed to provide four-part harmony? The closest to these I've heard is Bernie Krause's two Nature Company releases, ***Equator*** and ***Nature***, where animal sounds and ambient recordings are propped up by synthesizer. But the music is definitely fitted to the nature recordings, not vice versa. The potential for inter-species music-making is largely unexplored.

The train rounded a second bend.

You wouldn't have to go that far afield (literally) to break new ground. Standard old human instruments are available now on compact discs for sampling into your miracle machine. Has anyone done classical music on a sampler? How about Barber's "Adagio for Strings" done perhaps on bowed psaltery, or Satio's or Joplin's delicate piano pieces transcribed to marimba or tuned timpanis? One could take a symphony and reassign all the parts, just to see how it sounds.

Third stop: music is full of all sorts of traditions, and transgressors are usually not treated well.

Gregory Alan Taylor (602 Russell Street, Madison, WI 53704 ☎ 608 / 246-9621) has released his fourth cassette, ***Virtual Terrain***, in which he microtonally tunes his DX7 to explore Javanese scales. The music is, I suspect, less successful than it could be, but the extensive liner notes are highly intelligent and thought-provoking. In them he states, in part, "the introduction of new technologies like Grey Matter Response's new E! updates and the new Yamaha DX7II series within the last year have made non-tempered and non-Western tunings possible, marketable and fashionable (so that) we all have the option of being Postmodern and gleefully plundering the cultural archives of the whole globe." He makes an important point here. It's not enough to have a sample of a dumbek or crwth in your memory; to sound like a dumbek or crwth player you must phrase and articulate like a dumbek or crwth player. That's why drummers make the best drum machine programmers, and reed players the best Lyricon players. Music is full of all sorts of traditions.

The train pulls into a fourth station: the best ethnic-electronic album I've heard is by Wendy Carlos (***Beauty in the Beast***) and it's not even sampled.

Today it is theoretically possible to sample John Coltrane's saxophone off an old recording and have him "play with the Ramones"; or have Jimi Hendrix soloing with The Cars. Tomorrow Hendrix may sing with The Cars, or Janis Joplin with Led Zeppelin—recombinant DNA (Dead Noncopyrighted Artists). Laurie Anderson didn't know how her voice would be used when she allowed Jean Michel Jarre to sample her for ***Zoolook***. Jon Anderson wasn't even notified before Herbie Hancock's ***Sound System*** appeared. Clearly things could get out of hand here.

Fifth station: sampling may finally force the 1986 copyright laws to acknowledge subsequent changes in technology.

So samplers today have finally realized the promise of old Moog days. They can sound like any instrument in the hands of a skilled performer. They can even sound like another skilled performer, to an extent. So what are they used for? The present day equivalent of the combo organ. You don't hear much interesting work being done with samplers.

Oops, I think this is my stop. EM

Robert Carlberg is a neato guy (at least his mother thinks so).

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Complete CZ Collection of 128 professionally developed sounds for your CZ. Natural sounding strings, woodwinds, brass, keyboards, percussion, basses, and effects, used daily in an electronic scoring studio. Customer's responding: "Most musically useful I've found!" Your package includes a **cassette** of 3 CZs demonstrating all **128 patches,** a **booklet** explaining alterations and **data sheets** for $26.95 (or disk C-64, Dr. T). Same package as above with 32 assorted sounds for $12.95. Above cassette as demo $5.00 (credited towards order). **Music For Business,** PO Box 11131-0131, Philadelphia, PA 19136.

Affordable music software from SoundWare. Generic librarian, $19.95. MIDI 4+/8+ sequence editor, Studio One sequence editor, Juno 106 librarian, DX7/TX7/DX7s librarian, DX21/27/100 librarian, $14.95 each. Send check or money order to: SoundWare, PO Box 1913, Nederland, Texas, 77627. Please include $2.50 shipping and handling.

MIDI sequencing software for **IBM-PC** and compatibles . . . introducing **Tape 'n Step,** a full function sequencer and composer. MPU-401 format. Completely professional in features; the price/performance leader at $150. Demo available, write for specifications. Authorized distributor: **Silver City Midi,** PO Box 173-E, Middlefield, CT 06455. 45th St., Chevy Chase, MD 20815.

Korg DSS-1 disks: DX-7 $12.50; D-50 $17.50. Lee Holderman, 406 E. Walnut, Nappanee, IN 46550 (219) 773-2678.

Roland D-50: 64 new **Solid Sounds** patches. Incredible brass, strings, percussion, plucked, more. Data sheets/your RAM $30.00. RAM card $130.00. Demo cassette $5.00. **Xpander/Matrix-12** volumes one and two. Great reviews by *Keyboard* and *User's Group.* Tap the power! 100 patches per volume on cassette. Specify volume $30.00. Both $50.00. Solid Sounds, 7207

World's finest **Casio** and **Sequential** sounds. Ultimate, uncompromising quality and perfection. **Multi-trak** and **Six-Trak:** 135 professional voices: $17.95 Split-8: $15. **CZ-Gold** 3 sets containing 64 **multi-sound** treasures ea. set (1 alone includes over 400 sounds): $15 ea.—sheets/C-64 disk with librarians. Loaded RAMs: $45. **Adrien Nash Creations,** 101 West Fremont Square, Montebello, CA 90640.

CZ-1000/101 professional editor/librarian for IBM compatibles $38. $5.00 demo (refundable with purchase). Also, **MT32** and **FB01** editors, write for details. Rigamer Productions, 2470 Prentiss Ave., New Orleans, LA 70122.

Steinberg 24 sequencer program for Atari 1040ST—color or mono—sacrifice at $175. 222N 1200 W. #10, Orem, Utah 84057, (801) 224-8247.

Prophet 2000/DPX-1: Over 175 exceptional acoustic/electronic solo and ensemble sample disks now available! $8.95-$12.95. Absolute highest quality. No hype/no junk! Demo cassette and sample disk $6.50. Free catalog. Miller/Blake Digital Samplers, 2801 18th Ave., Sacramento, CA 95820.

Roland MT-32 editor/librarian for the Commodore-64. Edit timbres, patches and rhythm setups. Save/Load banks or individual sounds. Built-in random patch generator $59.95. Demo $3. Add $2 p/h. Blue Ridge Music Software, Route 8, Box N55, Charlottesville, VA 22901, (804) 978-7415.

Professional synth patches—**TX81Z:** 128 voices/$25 (cassette—includes 96 performance settings.) **DX100/DX27/DX21:** 176/$25 (cassette). **FB-01:** 128/$20 (sheets). **DX7/DX7II/DX7S/TX7/TX802:** 128/$20 (sheets). **CZ-series:** 128/$20 (sheets or cassette). **DSS-1:** 128/$25 (disk). **D-50:** 64/$30 (Dr. T's or Hybrid Arts GenPatch ST disk). **Prophet-2000:** 10/$65 (ten disks). **Xpander/Ma-**

trix-12: 100/$25 (cassette). **Matrix-6/6R:** 100/$25 (cassette). **Juno-1/2:** 64/$20 (cassette). **Juno 60:** 56/$20 (cassette). **Jupiter 8:** 64/$20 (cassette). **Chroma Polaris:** 132/$25 (cassette). **Prophet-5:** 40/$20 (cassette). **Prophet-600:** 100/$25 (cassette). **DW-8000:** 128/$20 (cassette). **Memorymoog:** 100/$20 (cassette). Many software formats also available. Programmers include Richard Viard, Walter Whitney, Donald Fish, Timothy Hunter and Sebastian Niessen. Free 1st-class shipping. **Music Design,** Box 28001, Crystal, MN 55428. (612) 537-5457. Catalog and lists available.

Introducing: **X-LIB.** A professional Commodore-64 ten-bank librarian system compatible with all Yamaha's DX/TX synthesizers: **DX81Z/DX21/DX27/DX100/DX7/DX7II/DX7S/DX1/DX5/DX9/TF1/TX816/TX216/TX7**—all in one program! All at the same time! Features auto loading/transmitting of all ten banks, ultra fast action, nice handling, MIDI: thru/rechannel/sample'n'play, voice: copy/swap/rename, printer support, file compatibility with most other programs and much more. We have truly designed this program to be the most versatile and useful on the market—it's software you'll use every day! Supports Passport-type and Sequential-type MIDI interfaces. $45 complete with **10 banks of new DX/TX sounds** (160 4-operator and 160 6-operator patches). Free 1st-class shipping. **Music Design,** Box 28001, Crystal, MN 55428. (612) 537-5457.

Rhythm tapes: **RX5/RX11/RX15/RX21, TR-505/TR-707/TR-909, DDD-5.** Each contain hundreds of patterns and fills programmed with a "human" touch. $30 each complete with extensive application materials. Free 1st-class shipping. **Music Design,** Box 28001, Crystal, MN 55428. (612) 537-5457.

MIDI software & synthesizer programmers. We are interested in publishing quality, musician-oriented MIDI software programs and patch libraries. All computers (especially Commodore-64/128 & Atari ST) and all synthesizers. Contact: **Music Design,** Box 28001, Crystal, MN 55428. (612) 537-5457.

"LA Patch™" for the D-50/550. **"Xpandit™"** for the Xpander/Matrix 12. Exquisite voices for exquisite synthesizers. These are musically useful, professional, critically-acclaimed patches. $24.95 ea. ($49.95 on Roland ROM card.) Specify format. Send for our catalog containing the most extensive listing of MIDI soft/hardware and computers. All Mac, Atari, PC and Commodore titles available. **The Midi Station™,** 119 Rockland Center, Suite 275, Nanuet, NY 10954.

Why program when you could be **playing?** Livewire has professional, alternative synthesizer sounds for **Memorymoog, Roland JX, Juno, Jupiter 6, D-50,** Korg **Poly800, DW8000, DS-8,** Casio **CZ,** Ensoniq **ESQ-1,** all **Yamaha** synthesizers & **SPX90.** Affordable prices! Top-notch **Ensoniq EPS, Mirage, Casio FZ-1** samples from $8.95. Demonstration cassettes available for most synths/samplers. **Computerized?** We're dealers for Sonus, Digidesign, more. **New: Atari ST** public domain disk. MIDI demos, desk accessories, modem program, games, more. Only $9.95/$2 shipping. Two single-sided disks: $12.95. Free information: send SASE, specify your synths and/or computer. Livewire, Box 561, Oceanport, NJ 07757.

The only **MIDI Arpeggiator** available, only $40! Real-time control over pattern and speed. Full MIDI sync. Allows multiple pattern repeats with programmable transposition. New: **TX81Z** and **FB-01 Editors** for C64, features full voice and performance editing with graphic envelope editing, only $75 each. Jack Deckard's full-featured **FB-01** editor for the **Amiga** only $90. Include $2.50 p/h. Write or call for details. **Triangle Audio,** PO Box 1108, Sterling, VA 22170, (703) 437-5162.

ESQ-1 owners! Cesium has 640 of the best sounds available with dozens of testimonials from delighted customers. Send $95 for the whole set arranged in categories, on data cassette or Mirage diskette. Individual volumes, 160 and 80 voice RAM and ROM cartridges are also available. Write to Cesium Sound, 1640 Walnut St. #C, Berkeley, CA 94709. (415) 548-6193.

D-50 sounds by Cesium! Time, effort, and experience combine to produce dramatic results! We have two volumes on ROM cards for $60 each, or $100 for both. RAM cards filled for $25 each. Add $2 shipping, CA residents add tax. Free listing available. Cesium Sound, 1640 Walnut St. #C, Berkeley, CA 94709 (415) 548-6193.

SQ-80 owners! Our entire, highly acclaimed (by our customers) 640 sound library has been adapted for use with th is new Ensoniq wonder, and are available for $95 for the complete set. Individual volumes by category, cartridges, and all new sounds utilizing the SQ-80's new features are also available. Write for info—get on our mailing list now! Cesium Sound, 1640 Walnut St. #C, Berkeley, CA 94709, (415) 548-6193.

WANTED TO BUY

Electro-Harmonix 16-second delay footswitch wanted, or schematic for same. 35 Caldwell St., Huntington Station, NY 11746, (516) 673-1063.

Software writers—wanted: playback MIDI software w/song menus. Can you customize? Let's talk—Jack—(214) 373-8388.

MISCELLANEOUS

9th Annual Music City Song Festival will begin soon. **Over $50,000 in cash and prizes!** Amateur song, professional song, vocal performance, lyric and lyric poem divisions—variety of musical categories. **Entry form** and entry fee are required to enter contest. Free educational magazine for all on mailing list—write/call for details today: MCSF, PO Box 17999-E, Nashville, TN 37217, (615) 834-0027.

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See page 127 for Classified Ad Coupon.

—from page 60, CD PRODUCTION

of your costs are one time: pre-mastering ($525), glass mastering ($1,000) and printing ($2,025). When you make reorders for your second 1,000 discs (and let's hope you do!), you will only be paying around $2.30 per disc (including packaging). At this point your profit margin will increase substantially!

I hope this article will help you avoid some of the pitfalls that can cost time and money. I wish you luck on your new venture of making compact discs.

Acknowledgements: The author would like to acknowledge the kind advice and support of Mr. Don Rose of Rykodisc and Mr. Larry Kraman of Newport Classic. EM

***Toby Mountain** has music degrees from Princeton (BA, 1972) and UC Berkeley (MA, 1978; PhD, 1981). In 1984, he founded Northeastern Digital Recording, the first digital editing facility in New England, and has edited and mastered over 350 CD projects for diverse artists such as Frank Zappa, Ritchie Havens, Arlo Guthrie, Devo, and the Kingston Trio.*

—from page 111, SERVICE CLINIC

state, passive, and electromechanical components.

Getting Started

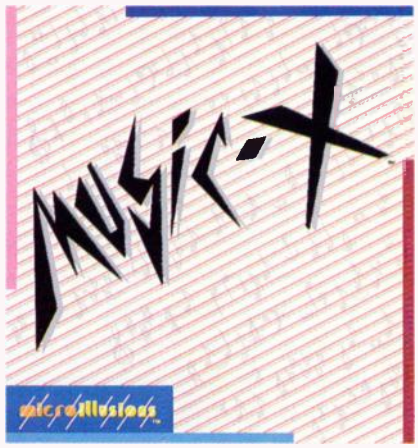
If you're new to all this, I'd suggest that you start with *Electronic Projects for Musicians*, *MIDI for Musicians* (both available from the Mix Bookshelf), *The Sounds of Music*, and Radio Shack's *Getting Started in Electronics*. Later, you might want to purchase the *Archer Semiconductor Reference Guide*, some of the *Mini Notebooks*, and the *Practical Guide for Concert Sound*. From there, you'll be better prepared to choose your own direction for further study. Also, I understand that Craig Anderton's newest book, which should be available soon, is called *The Electronic Musician's Dictionary*. We've long needed this type of book and hopefully it will fulfill the needs of those who need to look up terms in magazines such as EM.

EM

***Alan Gary Campbell** is owner of Musitech.™*

Advertiser Index

MUSIC-X™



MUSIC X SOFTWARE, *like a fine instrument is crafted from the heart. It is more than an excellent tool, it is also a work of art.*

COMMITMENT: *We have committed ourselves to pushing ahead state of the art in professional music software, enabling you to open new worlds of creativity at a cost, both in hardware and software, that is well within the budget of any serious musician.*

NO COMPROMISES *or shortcuts have been tolerated as we designed this product. The master clock is accurate to 1 millisecond with a resolution of 192 clocks per quarter note. Sequences and library data can be any length, limited only by available memory — if you want, you can dump a 100K or larger sample into a library entry!*

KEYBOARD MAPPING *features allow almost any function of the sequencer to be controlled from a MIDI keyboard, footpedal, or other MIDI device. This includes starting/stopping the sequencer, initiating sequences, and even changing the key map itself!*

REAL TIME: *The system supports real-time recording of systems exclusive data, as well as full graphic-oriented and event-oriented editing of sequences. You can even record while in edit mode and watch notes appear on your edit display as you play them!*

LIBRARIAN: *A configurable librarian is included with the program. You can teach the librarian how to communicate with any MIDI instrument which outputs system exclusive data.*

EDITING: *An impressive battery of editing features will be supported. In fact, new editing features are being added daily as we interact with our network of working, professional musicians whose input has greatly contributed to the quality of this program.*

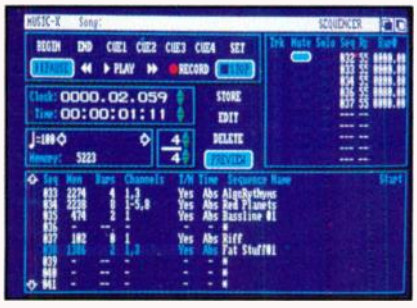
COMMITMENT: *Our commitment to music production does not stop here. A future product, Patch Editor Construction Kit, will allow you to create graphical patch editors for virtually any synthesizer you may own. Some technical knowledge will be required, but since patch editors, once created, can be traded between users, you should have no problem getting an editor for your needs.*

THE POWER: *Part of the power of Music-X comes from the computer it was created for: The Amiga, one of the most powerful and inexpensive personal computers available. At last you can run these many powerful applications in an environment that is a pleasure rather than a chore to use!*

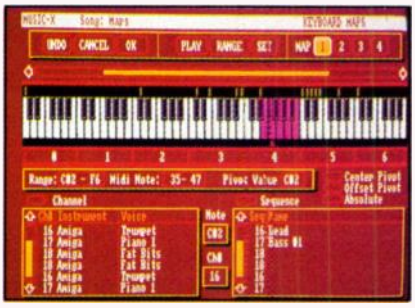
MICRO MIDI: *Although Music-X will work with any of the many MIDI interfaces for the Amiga, we offer our own MIDI interface which we feel is a cut above. It features six outputs (each output switchable as OUT, THRU or OFF), two switch-selectable inputs, a channel loading indicator, and an external clock output (sync/start stop) for synchronizing older, non-MIDI drum machines, and a serial pass-thru!*

MICRO SMPTE: *This complete SMPTE Reader will allow Music-X to synchronize with video or audio tape decks. It connects to the Amiga parallel interface and includes a pass-thru so as not to interfere with printer operation. Our Micro SMPTE is compatible with all Amiga models (A500/A1000/A2000).*

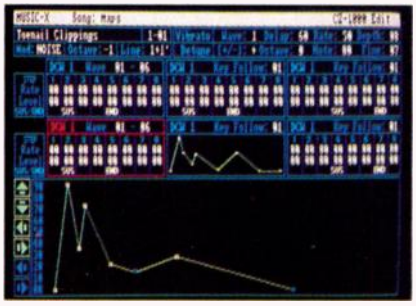
PHOTON VIDEO: *Photon Video is a complete, integrated video animation system. It includes facilities for both 2-D and 3-D animation, as well as automatic tape transport control and real time playback of rendered images. Our 3-D rendering module supports variable light sources, shadows, transparency, and reflections in a 3-D environment. Other modules include Cel Animator, Object Editor and Transport Controller with SMPTE support.*



SEQUENCER PAGE: *Tape transport-type controls allow manipulation of up to 250 sequences; each contain 16 MIDI channels worth of data.*



KEYMAP EDITOR PAGE: *Create keymaps by dragging the mouse over a selected area of the keyboard. The highlighted region can then be redefined in terms of real-time behavior.*



PATCH EDITOR: *A sample patch editor (CZ-1000) of the type that will be included with the product.*

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