Latest Reviews

Electronic MUSICIAN

MARCH 1987 A MIX PUBLICATION U.S. $2.50/CANADA $3.50

Jan Hammer

There's no place like home (studios)

Home Recording

Choosing and using your 4-track recorder

Save $$

Build your own synth stands

$2 acoustic pickup

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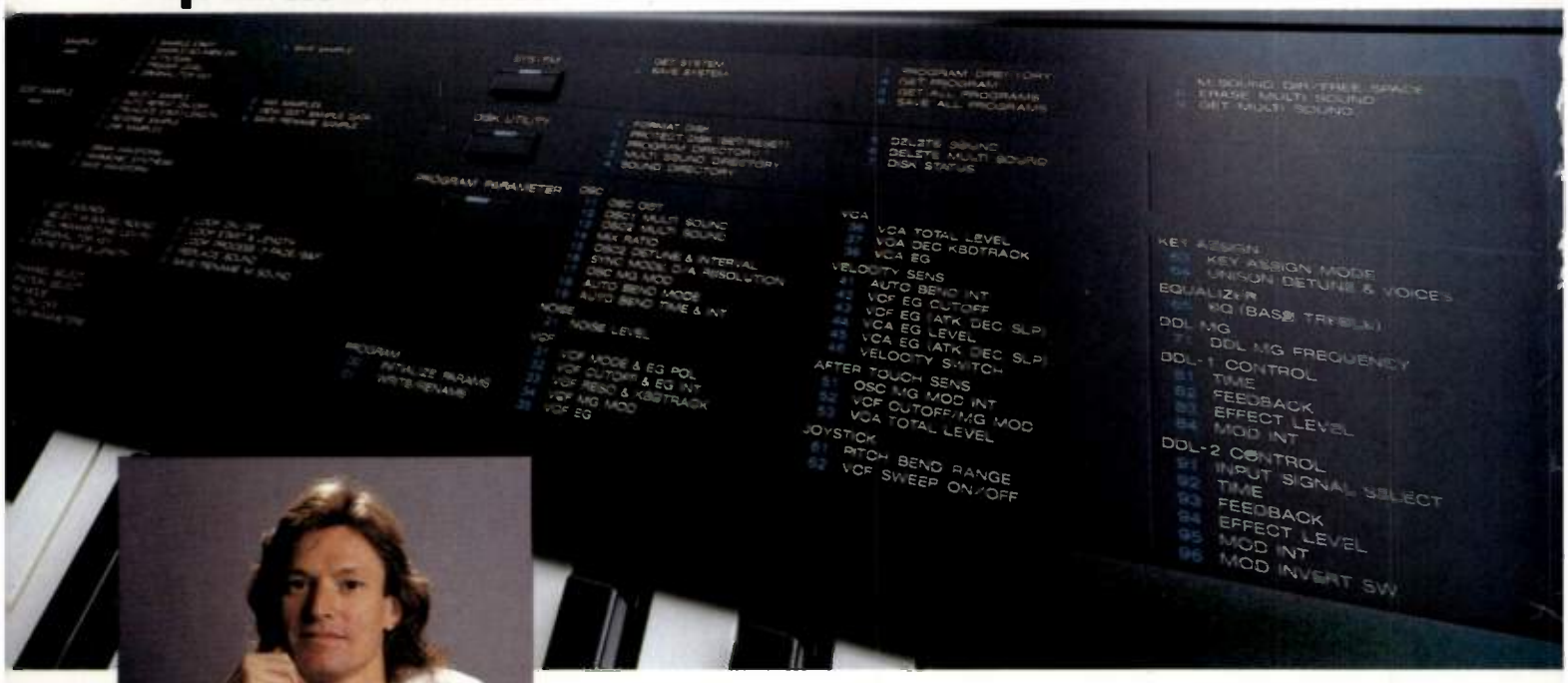
Why should a sampler and a synthesizer be combined?

Experimentation.



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

Steve Winwood
Multi-Instrumentalist, Vocalist, Composer

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

Exceptional Range The DSS-1's extraordinary potential for creating new sounds begins with three sound generation methods. Digital oscillators sample any sound with 12 bit resolution. Two sophisticated waveform creation methods — Harmonic Synthesis and Waveform Drawing — let you control the oscillators directly. Use each technique independently, or combine them in richly textured multisamples and wavetables. You edit samples and waveforms with powerful functions like Truncate, Mix, Link and Reverse, plus auto, back and forth or crossfade looping modes. Then apply a full set of synthesis parameters, including two-pole or four-pole filters and Korg's six-stage envelopes.

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

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

Expression The DSS-1's five octave keyboard is velocity- and pressure-sensitive, for precise touch control of Autobend, VCF, VCA, envelope rates and other parameters. Velocity Switch lets you play completely different sounds as you change your attack.

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

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

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

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SAMPLING IS ONLY THE BEGINNING

For a free catalog of Korg products, send your name and address, plus $1.00 for postage and handling, to: Korg USA, 89 Frost St., Westbury, NY 11590.

How do you put musical energy into drum programming?

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

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

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

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

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

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

Put your hands on the new DDD-1 Digital Dynamic Drums at your authorized Korg Sampling Products dealer. And discover how you can make drum programming a performing art.

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DDD-1

HOW TO BOUNCE TRACKS WITHOUT BOUNCING OFF THE WALLS.

The more tracks you record, the harder they can be to keep straight. And the more you'll appreciate the personal recorder that makes it easy to sound good.

The Tascam 246 Portastudio.

EVERYTHING'S UNDER CONTROL.

To begin with, the controls of the 246 practically explain themselves. When you want to assign any of its 6 channels to any of its 4 tracks, just push 1, 2, 3, or 4 on the channel strip.

That's it. The signal's routed. (And mixed, if you've decided to send other channels to that track.) No blind guesses about what's bouncing where. Or about levels, since the 246 has separate sets of meters for recording and mastering.

KEEP IT CLEANER.

The 246 cuts down on confusion. As well as hiss. In fact its built-in dbx gives you 10dB more broadband noise reduction than Dolby C.

And if you want to record Code or FSK, you can clear dbx out of Track 4 with the flip of a switch. What's more, you won't have to sacrifice Track 3 to guard against crosstalk, thanks to Tascam's advanced head design.

PUT MORE IN. GET MORE OUT.

Each channel of the 246 has line *and* mic inputs, complete with effects and EQ. Even Channels 5 and 6.

Which makes things much less frustrating when, for example, you're trying to mic a full drum set. Or use a multi-keyboard MIDI setup.

Everything else about the 246 makes recording easier, too. From a dual speed selector, to a transport control that lets you loop automatically and find any point on a cassette within seconds.

Visit a Tascam dealer today and test a Portastudio.

No matter what you assign it, the 246 will keep things simple. While keeping you calm, cool, and creative.

TASCAM

VOL. 3, NO. 3 MARCH 1987

Electronic MUSICIAN

A MIX PUBLICATION

DEPARTMENTS

COVER

With the proliferation of 4-track cassette recorders, more and more music will have its genesis in the musician's home, small studio or backstage dressing rooms. Multi-track recording has never been so affordable or accessible and in this month's issue we offer guidelines for becoming involved with this medium. Illustration by Dave Marrs.

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ARTICLES

Editor's Note

It's time to talk about a problem that's facing the electronic music industry—a problem that's causing outbreaks of fear and confusion among musicians, as well as torpedoing an occasional company here and there.

That problem is called not knowing how to count chickens.

We've all heard the expression "don't count your chickens before they hatch"—or have we? Based on the music and computer industries, I'd have to say no. More and more, companies are announcing products that don't hit the market until several months (or sometimes a year or more) later, and selling both software and instruments that are not yet finished (with the promise that "future updates" will make the things do what they were claimed to do in the first place).

Now I understand that this is a competitive world. A company wants to announce its latest wonder gadget to the world as soon as possible to start building momentum. Sometimes this tack gains a competitive advantage, since rumors about a new product can cause people to postpone a buying decision that involves an existing device.

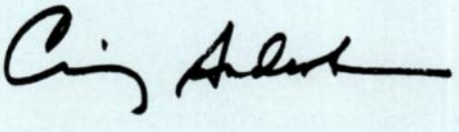
But the time between announcement and delivery is lengthening, and in the long run, this is not a good trend. Let's face it, electronic music gear represents a fairly decent investment; musicians are very cautious about what they do and do not buy. If they feel misled by promises of new goodies "just around the corner," that breeds resentment.

Many times announcing a product too soon can financially cripple a company, since anticipation of new products will keep consumers from buying the existing product line—bingo, no cash flow. Delivering products that aren't finished doesn't help people feel more comfortable about their investments either.

I don't necessarily feel the companies are "bad guys." Rather, everyone is caught in a vicious spiral. I've even seen a product reviewed at the same time I was writing the manual for that product, which was still a few software revisions away from being considered finished and ready to ship! Increasingly, product information (such as the typical press release) seems to have little to do with reality, and appears to be more a mixture of optimism, competitiveness, and a certain naivete about how long projects, especially software writing, *really* take.

I'm not saying we need a world without "vaporware"; it's exciting stuff, and much of it does come to pass. Announcing a product is also a good way to test the waters in a market where one serious miscalculation can finish off a company (where would Yamaha be if no one liked FM synthesis, or E-mu if no one liked sampled sounds?). But people are getting disillusioned when they buy a piece of software that's not finished, or doesn't do what it's claimed to do. The benefits of announcing vaporware have to be balanced with the long-term damage to a company's credibility if that vaporware doesn't turn into reality when promised.

There are many products in the world—cheese, wine, and so on—that requiring aging before they're ripe for market. Maybe software, and some electronic music products, should be treated the same way. Until then, let's at least learn how to count chickens.



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Add Digital Synthesis to your sampler!

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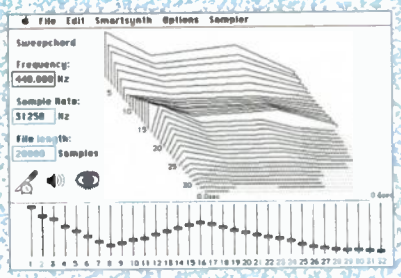
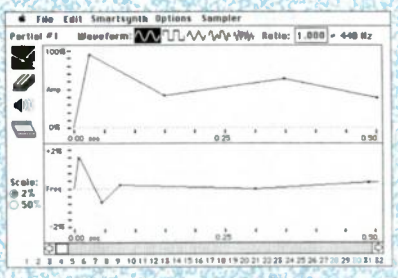
SOFTSYNTH™

Softsynth is a revolutionary new approach to digital synthesis: an advanced 32 oscillator, digital additive synthesizer with more features and versatility than other digital synths. Best of all, it's an easy to use software program that runs on your Macintosh™ computer!

How is this possible? Softsynth uses *software-based synthesis* to create sounds you design using graphic programming screens. After you specify a group of harmonics and envelopes, Softsynth creates a high quality digital sound that can be transferred to your sampler for playback.

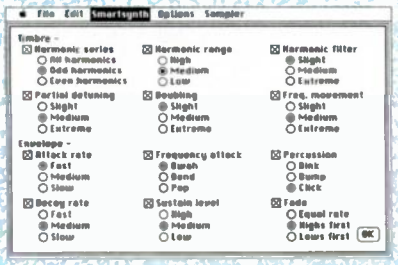




Additive synthesis is the most powerful and precise digital synthesis technique. Alas, hardware-based additive synthesizers are very expensive (usually over $10,000)! Softsynth offers an alternative—it is the first affordable, easy to use additive synth.

Softsynth provides precise control over all important synthesis parameters: *each* harmonic has a 40 (!) stage envelope, a 15 stage pitch envelope and a choice of five different wave shapes. Complete editing tools are provided that let you copy, paste and clear parameters between harmonics.

The unique *Smartsynth*™ function is even easier to use. You simply choose the characteristics of the sound you want to create, and Smartsynth will generate different variations of the sound each time you click the mouse!



Because Softsynth's sounds are software generated, they don't suffer from input sampling noise. Your Softsynth samples will sound "cleaner," and take advantage of the full playback frequency response and dynamic range of your sampler.

Add digital synthesis to your sampler—Softsynth provides the tools to create a wide range of exciting new sounds

Current version works with: Ensoniq Mirage™/Multisampler,™ Sequential Prophet 2000/2002,™ Akai S900™ and S612,™ Korg DSS-1,™ E-mu Systems Emax™ and Emulator II™ (Emulator II version requires *Sound Designer*.™)

For more information contact:

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(415) 494-8811

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Letters

Casio CZ-101/1000 Owners, Read This!

If you've had trouble finding the AD-5 9V 850 mA AC adapter for your CZ, you're not alone. We've presented various DIY surrogate-adapters in "CZ Mods" (August '86 *EM*) and "Service Clinic" (February '87), but it *would* be nice to be able to just go out and buy the thing!

Well, my local Radio Shack stocks a mega-hefty surplus 9.5V 1 Amp Commodore AC adapter—with the proper polarity and plug for the CZ—for $4.95! Eureka! (Note: the inside diameter of the Radio Shack adapter's plug is a little larger the Casio's, but it works just fine.)

The stock number is 277-1026 (don't bother looking in the '87 catalog; it's not in there). The package tag is titled "AC-TO-DC ADAPTER" and marked "SPECIAL PURCHASE." The store manager suggested that the item would remain available for the catalog year, but I couldn't get that in writing, so run—do not walk—(driving is okay) to your nearest Radio Shack and get one, or two, or three...

Alan Gary Campbell
Chattanooga, TN

Analog vs. Digital—Again

I just read an article from the L.A. *Times* entitled "The Case Against the Compact Disc" by Fred Kaplan. In it there is a discussion of the inadequacies of digital recording. The biggest problem, according to the article, is the sampling rate of a mere 44,100 times per second. Mr. Kaplan feels this is not enough to capture the complexities of music. Some of the other problems touched upon are the rounding off of musical signals to fit the constraints of the machine; the digital quantization; and the filters required to deal with the 44.1 kHz sampling rate.

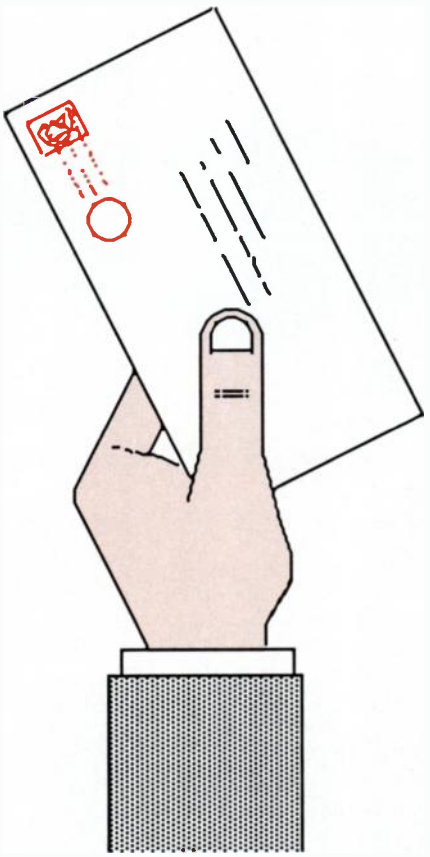
All of these things, according to Kaplan, result in a recording that distorts especially upper midrange and treble sounds. Violins will sound screechy, flutes will sound tinny, etc.

Because I am getting ready to invest some money in recording equipment, and because I was leaning towards a PCM unit, this article disturbed me, to say the least. I would welcome an opinion from EM on digital versus analog recording.

Douglas R. Thompson
Hyattsville, MD

Douglas—There are almost as many opinions on that subject as there are people, but since you asked for an opinion from EM, *here goes.*

I think most people agree that the ultimate analog reproduction systems sound better than digital. But "ultimate" is not always a real world concept. The main problem with analog occurs when copying, because each copy is degraded compared to the original. Also, analog material is more subject to deterioration. No matter how



fanatical you are about cleaning records, after a record is played enough times, dust and other contaminants will cause pops and ticks. A CD player that costs $150 will play a record hundreds of times with superb fidelity; try that with a $150 turntable/cartridge combo.

Digital does sound "different," and many people associate these differences with the high end. But analog has its problems too—hiss, for starters. One important point is that digital recording is still in its infancy. The latest generation of high-end CD players do sound considerably smoother than earlier models. Some people consider the sampling rate inadequate, others don't. I tend to lean towards the former opinion, but haven't really made up my mind yet.

There has been excellent music made on analog and digital machines. Just as guitarists debate whether a Les Paul or Strat is better, and recording engineers argue over tube vs. transistor limiters, people will debate analog vs. digital sound. Listen to what digital can give you in your price range, then listen to what analog can do in that same price range. Consider whether you will be doing a lot of dubbing and copying (which favors digital) or are primarily concerned with cost (which favors analog). The more closely you define your needs, and the more research you do, the easier it will be to make an informed buying decision.

Farewell

Syntech Corporation is calling it quits. After nearly a year of litigation, suits, and legal fees, the music software company is closing its doors. For questions concerning support, please contact the following:

Chroma Convertor: Chroma Cult, 4378 Ave. Prado, Thousand Oaks, CA 91360. *IBM 48 Track PC:* Robert Keller, 357 E. 15th St., Eugene, OR; tel. 503/485-3481. *Music Printer* and *Music Editor:* Quiet Lion Software, 7335 Craner Ave., Sun Valley, CA 91352; tel. 818/764-1461.

All other product support is offered by mail: Syntech Corp., 5699 Kanan Rd., Ste. 276, Agoura, CA 91301.

Kiki Ebsen
Syntech

Back to School

I would like your readers to know about the Audio Recording and Music Synthesis programs at California State University Dominguez Hills (tel. 213/516-3543). Our facility, in the South Bay region of the greater Los Angeles area, includes 24-, 8-, and 4-track mastering studios. Advanced students are allowed hands-on unsupervised studio time to produce their own projects. We offer two degrees, a major in Audio Recording and Electronic Music Synthesis, and a degree in Electronic Music Synthesis.

I'd also like to mention that I very much enjoy EM and recommend to students that they buy a subscription to your journal.

David W. Bradfield
Assistant Professor of Music
C.S.U.D.H.

Don't Clone Around

(In the January issue, Robert Rich cautioned that buying "generic" IBM PC clones might cause incompatibility problems, and to always try software before you buy. The following letter echoes his sentiments and adds some even stronger cautions—Ed.)

Regarding your article on "clones," I am currently using an IBM PC, Roland MPS software, DX5, RX11, TX216 (four modules), SPX90, and ARP 2600 with MIDI conversion. As I own both an IBM PC and a Turbo PC from PCs Limited in Texas, I can tell you first hand that there may be significant problems in making a clone the basis for a MIDI sequencing system. When I initially connected my MPU-401 to the clone PC, the software did not recognize any of the 640K of RAM in the machine. It booted up with no problems; however, with no recognizable memory, the software accomplished nothing more than providing a nice image on my monitor. Connected to my IBM PC, the system works flawlessly. The generic is now dedicated to being a word processor.

Though I have a distinct and separate use for each of the two machines, your readers may not be so fortunate should they succumb

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to the economic temptation of saving several hundred dollars by buying a generic 8088-based machine, to find only that their hardware investment now is nothing more than an exotic paperweight. Try it before you buy it.

Keep up the good work. By the way, I would like to see some articles on software for the DX5.

Daniel M. Colopy
Akron, OH

Watch Your Language

As one who trains people in the use of computers I'd like to take exception to Doug Lofstrom's freewheeling use of the term "format(ting)" in his piece (Dec. '86 EM), especially as he refers to "format(ting) several disks with frequently used applications." I'm not familiar with the software he names and the programmer may define "format" in the user's guide; if so, Mr. Lofstrom should have pointed out the distinction between formatting a blank disk and "formatting" a disk with applications or other data. The difference may seem trite to one who uses computers routinely, but to a beginner it is another obstacle in the path to understanding these particular instruments of torture. I'm not asking you to edit to the lowest common denominator, but I feel that consistency is vital for those who are just starting out.

On the whole, I enjoy your magazine a lot and I'll stay with you.

Keith Olsson
Arcadia, CA

Keith—Point well taken. It would be more correct to say that after you format *a* blank *disk, you* create *a* system *disk with particular applications. Anyone object to this phrasing to describe these operations?*

Get Your MIDI Retrofits . . .

The October '86 *Operation Help* asked about MIDI retrofits for the Prophet 5. Hi-Tech Musical Services offers a MIDI retrofit for the Prophet 5 (Rev 2), as well as for the OB-X, OB-XA, OB-SX, LinnDrum, Minimoog, Hammond B-3 and bass pedals, in addition to a variety of custom modifications and system setups. Call 213/822-1983, and be patient and persistent. Hi-Tech is a small company and we must split our time between the laboratory and the phone.

Tim Myer
Hi-Tech Musical Services
2800 S. Washington Blvd.
Marina del Rey, CA 90292

The Case of the Reluctant Subscriber

I have just reluctantly renewed my subscription. That's right, reluctantly. When *Polyphony* became EM, my initial reaction was just two words: Slick and Vapid. In the past year, maybe five articles in two or three issues have been of interest to me. Apparently, the beginnings of EM are lost in the mists of antiquity (all of ten years ago). Specifically, hobbyists and part-time musicians who build most of their equipment. Anything by Thomas Henry is always welcome. The homemade MIDI for the C-64 was also interesting. Several construction projects were silly or stupid. But I call your attention to the second word in the magazine's name—MUSICIAN. A whole issue of video? No thank you. I can appreciate the work of video artists, but many of us consider music videos a blight.

After spending $1,500+ on one's dream synthesizer, who has the money for an IBM, Macintosh, Amiga, or even an ST? (A lot of people absolutely hate, Hate, HATE IBM). To me, EM is rapidly becoming to Electronic Music what *Family Computing* is to computing—useless!

Maybe this tirade represents my dislike of the current state of music. When I see someone like Phillip Glass receiving acclaim and being interviewed I wonder if everyone else is nuts or just me. Phillip Glass? The auto-arpeggiator on my old Casio is more interesting than his "music." If EM doesn't get any better in the next year, I will surely cancel my subscription.

Richard Curcio
Brooklyn, NY

Richard—Although we don't get many letters like yours, I appreciate your straightforwardness and am glad to have an opportunity to address the issues you raise.

Ten or more years ago, about the only way to be an electronic musician was to build your own gear. Synthesizers were outrageously expensive, and the market was too small to support the kind of diversity of products we now enjoy. Polyphony *helped the "little guy" by educating musicians—many of whom had little electronic experience—about the world of musical electronics. People wanted to work with musical electronics, and learn about their gear, yet not spend a whole lot of money in the process;* Polyphony *served those enthusiasts.*

Nowadays, people still have the same needs—but the means to answer those needs have changed, so EM *has changed too. For example, it is often more expensive to build than to buy. Ten years ago a decent-sized PAiA synthesizer kit cost $500. For that same amount of money, you can now buy a CZ-101 multi-timbral synth with far greater tuning stability and less noise than the synth kit, a Commodore-64 computer, disk drive, and second-hand MIDI interface. Or, you could buy an Atari 520 ST with monitor and have $100 left over. Times have changed; electronics manufacturers are increasingly unwilling to sell parts in small quantities, the "radio rows" in every major city that used to sell every component under the sun are no more, ham radio operators (who helped trigger the electronic revolution) are declining in numbers, and very few linear ICs of any significance to electronic musicians have been introduced by companies (other than semi-custom houses) in the last few years.*

EM is still very much concerned about the "little guy," so we run articles on the C-64, Atari ST, CZ-101, FB-01, etc., publish free programs people can enter, run "Operation Help" and the User Group Listings, and include circuits and mods for those who are handy with a soldering iron. We like Thomas Henry too; but he is now very involved as a university professor, and doesn't have the time to contribute as much as he once did. However, to concentrate on circuits alone distracts from the art of music. Building your own gear is a means, not an end. What characterizes the "electronic musician" is the ability to take all the tools at one's disposal—computers, tape, do-it-yourself projects, store-bought equipment, video, audio, whatever—and use this rich palette as a means for self-expression. Regarding video, the marriage of visuals and music is not new; consider opera, musicals, or for that matter, Disney's Fantasia. *If you don't like the videos you're being force-fed on TV, then be glad that our video issue was so well-received—because we showed* EM *readers, creative people who think for themselves, what they needed to do to make their own videos. I feel the way to get better videos is to put knowledge in the hands of creative people. Hopefully they'll take care of the rest.*

Regarding computers, $299 for a 520 ST is not unreasonable. Save up $10 a week for less than eight months, and it's yours. In fact, in eight months it will probably cost less anyway, or you'll be able to get one second hand. And regardless of how you feel about IBM, a lot of hobbyists have access to an IBM PC because of the businesses they work for, and can hitch a musical "free ride" on these machines. We want to serve these people too.

Also remember that Polyphony *was a special-interest magazine with a very small circulation.* EM *covers a broader range of subjects, and appeals to a much wider group of people. We don't expect every article to appeal to every person, but we do try to pretty much take care of everybody's desires during the course of a year. If those five articles you enjoyed saved you time or money, or inspired you to create some new art or technology, then we have provided something you wouldn't have had otherwise—and we hope that alone would encourage you to continue reading the magazine.*

Perhaps your distress is not really with EM, *but with a world that might be changing faster than you would like. We report on that world. Times change, music changes, people change—it's always easier to remain with the familiar than try to strike out in new directions. We've been exploring the world of musical electronics for over ten years; don't stop now just because we've reached strange and unfamiliar territory. Hey—exploring is never as much fun if you already know where you're going.*

The World's 'Next Generation' Music Studio...

Desktop Multi-Media Production.

Nowhere has technology moved so fast as in todays music studios. Two years ago MIDI was just being established as an industry standard and the number of music software manufacturers could be counted on one hand. Over the same period music video has gone from experimental to an established art. Computers, video and music have joined to make musicians multi-media technology artists.

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Mimetics' SoundScape PRO MIDI Studio's unique modular design provides the power and flexibility necessary to connect and synchronize the various programs with internal and external music synthesis, SMPTE, video tape and processing systems. It, by itself, is the state-of-the-art music system. Combined with Amiga's video power, SoundScape gives you a completely new dimension in music and video production environments.

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CORPORATION

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The Professional Software Source.

FOSTEX

Start Up.

Consider price, performance, back-up, and you'll agree: there's no better way to begin multitrack recording.

Here's the latest in a whole series of Personal Multitrack products from the people who created the phrase as well.

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Plus, Fostex makes all the Necessarys™ and accessories you need to get the job done.

So if you're ready to start, this one's all ready to go.

X-15 Series II

Upstart.

The brash new Fostex 260 flat out challenges multitrack cassette/mixers costing anywhere from $400 to $600 more.

So we can't help asking why the top of *their* line should make you dig to the bottom of *your* wallet, when you could have all this:

- ☐ 6-inputs. Synth players and MIDI users will especially appreciate the extra line inputs.
- ☐ 4-track recording. 3-3/4 ips with advanced noise reduction, the best the format offers.
- ☐ Independent stereo buss, dedicated stereo tape mix (cue or send), extra stereo line inputs, 2 independent send controls and convenient patch points — more routing flexibility than any unit on the market today.
- ☐ 2-band parametric EQ. ± 15 dB from 80Hz to 10,000 Hz, continuously variable.
- ☐ Auto stop with memory.
- ☐ Switchable meters can read either the 4-track recorder or the stereo mixer.
- ☐ True rolling punch-ins: rehearse with the recorded track and the input signal; when you punch-in, the monitor switches automatically to input. Optional remote foot control.

In short, the brash new Fostex 260 is everything the top of the line should be, except expensive.

Fostex 260

*Actual retail prices are determined by individual Fostex Dealers.

 15431 Blackburn Ave., Norwalk, CA 90650 (213) 921-1112

The Real Thing

I'm fascinated by the sound of a crowbar hitting a concrete floor inside a fairly reverberant room. In my attempts to recreate that sound in my home studio, I'm starting to believe that all the inexpensive digital reverbs around today really only grope at trying to recreate the natural reverberation of various environments. I've been using an SPX-90; what affordable digital reverbs will do a significantly better job, or am I doing something wrong? I could swing a PCM70 if I thought that would change my world.

Another sound I'm fond of is that of tapping the bottom of a throw-away aluminum pie tin with my finger. I've never been able to sample that sound to my satisfaction. Isn't it true that with sounds rich in high frequencies, sampling (even at 42 kHz) is only a rough approximation of the sound and that my pie tin with its rich, high timbre will never sound nice coming from my Prophet 2000? I've tried drastic EQ while sampling. What can I do?

Robert Bolman
San Francisco, CA

Robert—The SPX-90 is a great machine, but it is designed to do many things well rather than one thing superbly. A dedicated reverb, such as the units made by Alesis, ART, Ibanez, Lexicon, Roland, Ursa Major, Yamaha, etc. may give better performance, but remember that any electronic reverb is indeed an approximation of the real thing, not the real thing itself. In fact, one of the major criterion for selecting a reverb is how "natural" it sounds. Also remember that these reverbs have many alterable parameters. While this gives great flexibility, it also means that you will go through a lot of "dud" settings on the way to finding that ultimate reverb sound. Regarding the PCM70, it's a fantastic device. It also has a number of special functions (resonant chords etc.) that are very useful in the studio, although some studios use dedicated reverbs for reverb sounds and the PCM70 more for effects and ambience.

Re sampling: the optimum sampling rate is always a source of controversy. Until you get into at least 16-bit sampling (the Prophet 2000 is 12 bit), there will always be a difference between the source sound and the sample (and you may notice a difference with 16-bit units as well, although the difference will be less pronounced). Sampling rate is not all that counts; the type of A/D and D/A converters used, as well as the number of bits, greatly influence the quality of sound. The bad news is that 16-bit samplers are currently rather expensive, but prices will surely come down in the years ahead.

Error Log:

In the spirit of "credit where credit is due," we'd like to acknowledge Pro Media's gracious assistance in providing many of the signal processors used in January's cover shot. Thanks! EM

ACCESSORIES

▶**DSP-16** ($2,495): TMS32020-based, single-slot plug-in digital audio processor (digital delay, loop editor, waveform synth, storage scope, etc.) for IBM PC. 16-bit resolution, 5 to 50 kHz sample rate.
Ariel Corporation
110 Greene St., Suite 404
New York, NY 10012
212/925-4155

▶**Voice Master** ($89.95) for C-64/128, Atari 800/800XL/65XE/130XE, Apple II family: Digitized speech record/playback, speech editing, word recognition, music editor.
Covox
675-D Conger St.
Eugene, OR 97402
503/342-1271 for demo and info.

▶**IM-2203 Line Voltage Monitor** ($49.95, kit): three-digit LED display reads line voltage; LED lights when voltage drops below preset level. **SK-211 AC Monitor** ($39.95, kit) indicates line voltage in 5-Volt steps from 95-130 volts; also with low voltage and spike detection indicators. **SK-201 Telephone and Modem Surge Protector** ($14.95, kit) safeguards telecommunications equipment from high-voltage transients on telephone line.
Heathkit
Benton Harbor, MI 49022
800/253-0570

COMPONENTS

▶**LC-403 gain control IC** with adjustable attack, release, threshold.
Linear Technology Inc.
PO Box 489, Station A
Burlington, Ontario
Canada L7R 3Y3
416/632-2996

ELECTRONIC GUITAR

▶**Stepp DG1** electronic guitar ($6,995): Programmable guitar interface with sound generators located in guitar stand, fret-scanned (maximum 1 ms delay), MIDI implementation.
Group Centre Innovations
23917 Craftsman Rd.
Calabasas, CA 91302
818/884-2653

MICROPHONE

▶**SM89 Condenser Shotgun Microphone** ($900; optional shock mount $90) for location film and TV production, theater sound, etc.
Shure Brothers, Customer Services Dept.
222 Hartrey Ave.
Evanston, IL 60202
312/866-2553

PUBLICATIONS

▶**Music Software Catalog** ($2) describes software products from a variety of leading manufacturers.
Scherzando Music
PO Box 3438
Milford, CT 06460
203/783-8758

▶**Catalog 861** (free) describes products for microcomputer protection (line conditioners, spike filters, uninterruptible power supplies, etc.).
Electronic Specialists
171 S. Main St.
Natick, MA 01760
800/225-4876

Group Centre Innovations
23917 Craftsman Rd.
Calabasas, CA 91302
818/884-2653

▶**ProBass 1000** single-rack space bass preamp ($249.50): Nine-band graphic EQ, dual effects loops, crossover, headphone jack, ¼-inch and balanced XLR outputs.
Peavey
711 A Street
Meridian, MS 39301
601/483-5365

▶**CN3201 Crossover** ($399.95): Two separate three-way channels for stereo bi-amping (or five-way mono crossover), separate jacks and phase inverters for each section.
Ross Systems
PO Box 2344
Fort Worth, TX 76113
817/336-5114

▶**MDX-60 Keyboard Mixer** ($499): 6 in/stereo out, 1 × 4 MIDI Thru, pre and post EQ, expandable to 12 in with extra MDX-60.

Alesis Microverb

SIGNAL PROCESSORS

▶**MQ-1** MIDI stereo equalizer ($599.95; optional MC-1 program select foot controller $199.95). 99 programs, 14 bands/channel.
ADA
7303D Edgewater Dr.
Oakland, CA 94621
415/632-1323

▶**Microverb** digital reverberator ($249): 16-bit PCM, 16 programs, 90 dB dynamic range.
Alesis
PO Box 3908
Los Angeles, CA 90078
213/467-8000

▶**SPM8:2** eight-channel programmable MIDI Mixer (under $1000): Stores 64 combinations of level, EQ, panning, and effect send settings; access via MIDI.
Aria Music
1201 John Reed Ct.
City of Industry, CA 91745
818/968-8581

SOFTWARE

▶Ensoniq **ESQ-1 ROM cartridges** (80 voice, $59.95; 160 voice, $116.95).
Valhala Music
PO Box 20157
Ferndale, MI 48220
313/548-9360

▶**Glasstracks** ($69.95): 8-track sequencer for Apple IIe/II+ and C-64/128. **RX Librarian** ($99.95) for C-64/128: 150 editable pattern library for RX11/21. **MacFace** ($239.95) for Macintosh: 2 Ins, 6 Outs/Thrus. **DX-Design** ($259.95): Supports DX-TX7/216/816 and IBM PC/XT/AT. Two-bank Librarian/programmer.

Sonus
21430 Strathern, Suite H
Canoga Park, CA 91304
818/702-0992

▶**Metatrak** ($99) for Atari ST: 32-track MIDI sequencer, 70,000 notes (1040ST), track editing, step record. $10 demo package available.
Midisoft
PO Box 1000
Bellevue, WA 98009
206/827-0750

▶**Sound Designer** software ($495) for Korg DSS-1 or Akai S900 and Mac 512K/Plus. Compatible with other Sound Designer versions and any Mac interface.
Digidesign
920 Commercial
Palo Alto, CA 94303
415/494-8811

▶**Conversion Plus** ($99) utility program for IBM PC transfers Sequencer Plus songfiles to Personal Composer (and vice-versa).
Voyetra Technologies
426 Mt. Pleasant Ave.
Mamaroneck, NY 10543
914/698-3377

▶**48-Track PC II Sequencer** ($259), formerly Syntech's 48-Track PC for IBM, is now available from the author, Robert Keller. With new SMPTE and sync tools. Requires 256K, two disk drives. MPU-401 compatible.
Robert Keller
357 E. 15th
Eugene, OR 97401
503/485-3481

SYNTHESIZERS

▶Expansion options for **K250**: Brass Block D (nine ROM sounds; $1,695), Superam I (2 Meg, doubles sample memory, $1,995), Superam II (4 Meg, quadruples sample memory for 40 seconds at 50 kHz, $2,995), and Version 4 software upgrade ($395; stock in new machines).
Kurzweil
411 Waverly Oaks Rd.
Waltham, MA 02154
212/354-2100

▶**EX20 MIDI Organ** expander module: With presets, special effects, rotating speaker simulation, cartridge memory. Prices range from $1,090 (four-note kit) to $3,690 (20-note plus reverb, assembled). Available with EX20: **MIDI 2000** MIDI converter for existing organs. Prices range from $440 (four-octave, kit) to $590 (five-octave, assembled).
Wersi
Box 5318
Lancaster, PA 17601
800/233-3865 (PA: 717/299-4327)

▶**DPX-1 Digital Sample Player** ($1,995) plays back E-II, Mirage, Prophet 2000 disks. Samples convertible to MIDI Universal Dump Standard for downloading to compatible devices.
Oberheim/ECC
11650 West Olympic Blvd.
Los Angeles, CA 90064
213/479-4948

OTHER NEWS

▶**Syntara** ($4,795; $5,150 with rhinestones) MIDI accordian with PCM drum sounds, auto-accompaniment, bass.
Syncordian
117 Cedar Lane
Englewood, NJ 07631
201/568-7943

▶**Contest**: International Horn Society, 1987 Composition Contest for French Horn and Synthesizer. Winner receives $1,000, performance at next International Horn Workshop. Deadline 11/10/87.
Jeffrey Agrell, Contest Director
Gibraltarstr. 1
CH-6003 Lucerne
Switzerland

▶Phillips of the Netherlands recently submitted a proposal to Japanese manufacturers regarding adding a video feature to existing audio CD technology. A CD-video disc would allow about 20 minutes of digital sound and five minutes of digital sound plus video. Since CD video would require a different disc speed (1.25 meters/sec for audio CDs and 11.5 meters/sec for video) a special player would be required. According to our sources, there was concern on the part of the Japanese that another standard would confuse the market and also harm the progress of LaserVision products. Phillips is reportedly approaching four American companies, and may have prototypes ready for the Summer Consumer Electronics Show in Chicago.

CALENDAR OF EVENTS

▶Workshop: "Using Technology in Music Education and Performance" by Don Muro. Columbia University, 3/21, 3/28, and 4/11. Session I: Synthesizer overview (entry-level). II: MIDI. III: Synthesizer pedagogy. Tel. 212/678-3283. EM

Released and Reviewed

BY ROBERT CARLBERG

Send records, tapes, CDs, and music videos for review to Robert Carlberg, PO Box 16211, Seattle, WA 98116. And hey, tell 'em you saw it in EM*!*

Garry Hughes, *Sacred Cities* (Audion 102). Larry Fast's Audion label should pick up a lot of respect with this release. Hughes is a British keyboardist with a talent for percussion, using Emulator, Mirage and a Bel BD80 digital delay to sample and arrange oil drums, kitchen utensils and a sledge hammered automobile into attractive, innovative rhythm lines. Lightweight DX7, OB-8 and Quadra hold it together musically.

Spencer Brewer/Nancy Rumbel/Eric Tingstad, *Emerald* (Narada 61011). *Emerald* is a co-operative project, half the tunes written, produced and performed by keyboardist Brewer, mixed and programmed by our own editor, Craig Anderton. The other half are by guitarist Tingstad and oboe/English horn/ocarina-player Rumbel. Rumbel and Tingstad guest on Brewer's cuts (along with a cellist, flutist and harper), but synthesizer and piano on their tracks is handled by David Lanz (got that?). Together they make *Emerald* a fine example of the New Acoustic Music—uh, plus synthesizer.

Paul D. Lehrman, *The Celtic Macintosh* (cassette). Irish traditional and folk melodies performed through the use of an Apple Macintosh computer and Southworth's Total Music software. Unlike Christopher Light's similar effort (reviewed 6/86), Lehrman uses the Mac to drive external synthesizers, including DX7, CZ-101, TR-707 and a borrowed Kurzweil K250, imitating some very acoustic flutes and fiddles along with the digital synthesis. He also makes use of a Lexicon to give it some air; in all creating a very pleasant oxymoron of traditional acoustic folk on modern technology. $10 postpaid from LehrWare, 31 Maple Avenue Suite 1, Cambridge, MA 02139.

Don Harriss, *Elevations* (NuMotion 1001; cassette). Harriss was the keyboardist for the Pat Travers Band until recently, and he says rather than wait for "The Big Deal" on his solo album he's just putting it out on his own money. It should establish him as a marketable commodity, being full of delicious digital DX patches arranged in gentle, fully-orchestrated suites in the Private Music style. Here's your chance to catch a rising star. Don Harriss Productions, 910 Celia Way, Palo Alto, CA 94303.

Robert Carlberg finds the assignment of reviewing music an invigorating challenge. "Music is essentially a right-brain, creative endeavor while describing it is a left-brain, analytical task. The enforced coordination of one's hemispheres is enough to give you dyslexia," he reports.

Jeff Johnson, *Harbinger* (Jefson 0686). This Jeff Johnson is a bass player who favors a bright percussive tone on his Fender Precision. Synth, drums and sax complete the jazz ensemble. Mixed direct to 2-track digital, which (thanks to PCMs and VCRs) puts state-of-the-art within reach of independents. $10 postpaid from 6655 La Jolla Blvd. Suit 15, La Jolla, CA 92037.

Jeff Johnson, *Icons* (Ark 5474); ***Fallen Splendor*** (Ark 5475). This Jeff Johnson is a singer/songwriter/synthesist who expands Contemporary Christian Music to the limits of technology (Emulator, digital drums, studio tricks, etc.) Only a few of his songs feature subtly religious lyrics, the rest being either instrumentals or about human-scale problems, so you can easily view Johnson as a CCM artist who also does progressive rock—or a PR artist who occasionally does CCM. He too uses a PCM and VCR, so his CCM is PDG (pretty darn good). PO Box 230073, Tigard, OR 97223.

Pekka Pohjula, *Everyman* (Breakthru 2). Soundtrack music to a Finnish TV special of the same name, full of ponderous minor-chord themes on synthesizers. An electric guitar, drums and a chamber choir also make guest appearances. The music alternates between severe underproduction (solo synthesizer) and severe overproduction (chorus and all the rest), so perhaps the missing visuals tie it all together. Breakthru is a new importer of Scandinavian progressive rock, also releasing albums by Stefan Nilsson, Thomas Almqvist, Janne Schafer, Jean Pierre Llabador and Triangulus (with Bjorn J:son Lindh). 2 Lincoln Square, New York, NY 10023.

William Goldstein, *Oceanscape* (CBS 42226). Soundtrack music to the NBC miniseries "OceanQuest" using T8 and DX7 slaved to a PC through Roland's MPS software. Musically, the short vignettes probably make more sense tied to the visuals. By themselves they're moody without being essentially tuneful.

David Borden & the New Mother Mallard Band, *Anatidae* (Cuneiform 4). David Borden had a synthesizer trio in the early '70s named Mother Mallard's Portable Masterpiece Company who put out two records on his Earthquack label. His music was and still is composed of fast 16th-note patterns with a slow-evolving development superimposed over them, not unlike Steve Reich. The new MMB consists of four syntheisists (doubling on pianos), sax, guitar and drums for a fuller, and more Reichian, sound.

Present, *Le Poison Qui Rend Fou* (Cuneiform 3). Present is a quintet from Beligium made up of an electric guitarist, bassist, synth/pianist, drummer and female vocalist. They apparently take their inspiration from the Henry Cow/Art Bears/Work school of jagged jazz-rock played very fast without compromise on starkly grating instruments. The ensemble is as tight as a shark's sphincter and almost as imposing. Cuneiform is Steven Feigenbaum, PO Box 6517, Wheaton, MD 20906.

Solaris, *Marsbeli Kronikak* (Start 17819). Keyboard-heavy instrumental progressive rock, based on Ray Bradbury's *The Martian Chronicles*, from a Hungarian quintet of keyboards, guitar, flute, bass and drums. The interplay of textures between the airy flute and the "Marshall overload" guitar recalls early PFM or King Crimson, and their smooth-flowing music contains lots of angular leads and time changes.

5uu's, *Bel Marduk & Tiamat* (U:r 01). The five you you's are Jon Beck, Randy Coleman, Greg Conway, David Kerman and Curt Wilson playing, not too respectively, bass, percussion, guitar, synthesizers and voice. The concept here (first introduced on the California Outside Music Association sampler 1/86) is noise-music, along the lines of This Heat or Throbbing Gristle, mixed in with equal parts of very competent jazz-rock a la Henry Cow or National Health. They know what they're doing no doubt about it. Trouble is, do we? Available through Rotary Totem, address below.

Motor Totemist Guild, *Contact With Veils* (Rotary Totem 005). Another mysterious predator in the underground waters of the lower left state. Sax, cello and bass guitar with synth, trumpet and percussion played by three talented but mentally suspect individuals named James Grigsby, Lynn Johnston and Becky Heninger. How to describe the music? "In a forest where there is no heartwood the caster oil plant rules."—Burmese proverb. Rotary Totem Records, 3613½ West 4th St., Los Angeles, CA 90020.

David Gilden, *Ancestral Voice* (cassette); ***Reed Maidenberg, Poppies*** (cassette). Hopefully these two artists won't mind being lumped together, since we've got a lot of material to get through. Both tapes feature gorgeous digital syntheisis mixed in with mature recordings by the artists. Both also feature exotic guest instruments (kora and kalimba on Gilden, pan flute and ocarina on Maidenberg). Neither is a simple "New Age" dismissal, since each is tuneful and fully composed (as opposed to improvised). Gilden's is a little more advanced compositionally, but Maidenberg gets the nod on packaging with a unique wrap-around cover. Why shortchange yourself? Get both. $10 each: from Gilden at 165 Prospect Park West, Brooklyn NY 11215; from Maidenberg at RhythMythology Productions, PO Box 5704, Santa Rosa, CA 95402.

While you were playing, we were listening.

Introducing the ne

You said you wanted a DX7 with more voice memory. And function memory. We heard you. You also wanted a split and dual tone system. And much more extensive MIDI implementation. We heard you. Micro-tuning and a larger backlit LCD? We heard that, too.

We also did some listening on our own and came up with improvements like random pitch shift, assignable controllers and after-touch for real-time parameter changes, digital pan, two-channel design for dual and split play modes as well as true stereo output, and two models, one with a built-in 3.5" floppy disk drive, one without. And greatly improved fidelity.

If that's not enough on the new DX7IIFD (and minus the disk drive, the new DX7IID) to get you out of this ad and into the store to do some listening of your own, read on. There's more.

One of the most important considerations in making a new DX7 was making it compatible with the current one. So even though there are a lot of new things going on with the DX7II, there are still six operators waiting to hear the sound of your voice. You don't have to tear things down and start over. Just build on what you already have and know.

Compatible as it is with the original, the II has taken on a whole new personality. Dual and split play modes give you the power and sound of two DX7s. Any two

xt generation DX7.

voices can be combined and played as one in the dual mode. Combining similar voices with slightly different timbres can greatly enhance vibrance and realism as well as adding thickness to the sound. Combining completely different voices can make for some very interesting and novel effects. Split mode, of course, lets you assign different voices to the right and left sides of the keyboard.

The dual FM tone generators in the II give true stereo output. This allows you to expand the sound field. It also opens up some exciting new digital pan possibilities. The parameters for this new pan feature let you determine the position of the voices in the stereo field according to velocity, LFO and key number. There is also a pan envelope for reshaping the dynamics to create even more special effects.

More memory was an important consideration in the new DX7II. So we doubled the on-board single voices to 64.

But perhaps more important, we added 32 internal performance memories to the II. These memories store voice position data with function (or what we now call performance) parameter data including modulation, pan, aftertouch, foot controllers and continuous sliders as well as dual, split and single play modes.

We've also greatly expanded the new DX7II's data storage capacity. In two ways.

First, with the new RAM4 cartridges. One of these babies will store the DX7II's total memory including 64 voices and 32 performance combinations, or 63 micro-tunings. Both the DX7IIFD and DX7IID also come with a ROM cartridge containing 128 pre-programmed voices, 64 performance combinations, 11 micro-tunings and fractional scaling data.

But the really big news in expanded storage capacity is the DX7IIFD's built-in 3.5" disk drive. One 3.5" disk equals the storage capacity of 40 RAM4 cartridges. So you can have a massive voice, performance, micro-tuning and fractional scaling library ready for virtually instant use and access. And a MIDI data recorder for recording and storing external MIDI equipment information.

Speaking of MIDI, the new DX7IIs have much more complete MIDI implementation than ever before for extensive system control capability. Much more than we have room to talk about here.

And speaking of room, the new larger 40-character by 2-line backlit LCD and two alpha-numeric LEDs make operating and programming the II a lot easier. You get a full status display of current modes and names while playing and simultaneous display of all parameters while programming.

How about if you've ever wanted to explore quarter or eighth tone tunings instead of the usual half tone tuning? Play Bach in the tuning of his era? Or combine two voices with slightly different tunings for a natural detune effect across the keyboard? The II's new micro-tuning feature lets you do all that and more. There are 10 preset alternate tunings besides the standard. And two on-board memories let you create and store your own.

The II's all-new fractional level scaling function lets you precisely adjust the output level of each operator in three-key groups. This gives you unheard-of control over volume and/or timbre. So voices such as piano and woodwinds sound much more authentic.

Also adding to acoustic voice authenticity (as well as being able to create a thicker, fuller sound) is the new random pitch shift feature.

Heard enough? There's still more.

In the multiple LFO trigger mode, for instance, a totally independent LFO cycle can be started for each note to create incredibly realistic vibrato and tremolo or subtle voice thickening effects. The new Unison Poly mode combines four tone generators for each key so you can detune to achieve a fatter sound. Assignable controllers now include foot controllers and switches, continuous sliders and control wheels. The optional BC1 breath controller adds pitch and EG bias as well as amplitude modulation to the original pitch modulation. Aftertouch can also now control EG bias and pitch bend.

And both the DX7IIFD and DX7IID benefit from greatly improved fidelity. This is a result of an all new FM tone generator system which uses advanced high-speed digital circuitry to provide significant improvements in frequency response and dynamic range.

So FM is sounding better than ever. Especially when you hear the new DX7IIs' very reasonable prices. Just visit your Yamaha Digital Musical Instrument dealer. And listen.

Or if you'd prefer to do some more reading, write to Yamaha International Corporation, Digital Musical Instrument Division, P.O. Box 6600, Buena Park, CA 90622.

100
1887-1987
A Century of Quality

YAMAHA

Miles Davis, *Tutu* (Warner Bros. 25490-1). Miles's best album in a decade—maybe two. The songs are mostly the creations of Marcus Miller (bass, synthesizers & digital drums), with Miles wafting confidently overhead. Neither has ever sounded better.

Wally Badarou, *Echoes* (Island 90495-1). Imagine a talented studio musician, with an unconventional streak, being turned loose in a major studio with unlimited time on a Synclavier. Got that image? Okay, open your ears, it's here.

The Nits, *Omsk* (CBS 25364); ***Adieu, Sweet Bahnhof*** (CBS 25985); ***Henk*** (CBS 26870). The Nits have generated a lot of excitement as the successors to Dutch keyboardist Robert Jan Stips previous group, Supersister. Unfortunately none of that group's freewheeling bravado comes through. Vocalist Henk Hofstede's lyrics are obscure at best, his voice is tentative, and every song features him. Stips' synthesis and innovative percussion stands out—but only by comparison.

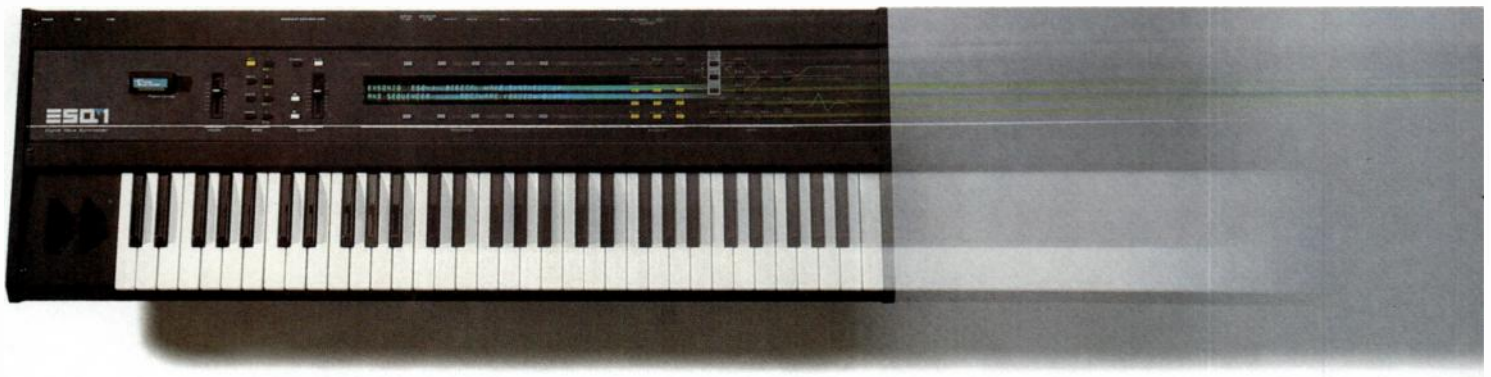
David Erskine, *Sierra Passage* (cassette). Pianist Erskine really works the keyboard, calling on nearly every note lurking there for his portrait of the mountains he loves. His impressive technique raises this tape miles above the pretty city-piano of Windham Hill, scaling the heights with rope and pitons and no safety net. This is athletic edge-of-endurance music for solo grand piano from someone who obviously loves challenges. Le Conte Hall, Berkeley, CA 94720.

Rainer Maria Rilke, *Inside the Temple of Listening* (cassette). Ludwig Fischer reads the poetry of Rilke (1875-1926), who influenced so many Beat poets after his death. Dan Portis-Cathers provides varied and charming backdrops on his Emulator, all but inaccessible behind Fischer's monotone reading, reverbed 'til he sounds like he's sitting at the bottom of a well. $12 from Tonearth Records, PO Box 348, Salem, OR 97308.

Arnold Mathes, *Infinite Room* (AM 19; cassette). More humus from the mind of Arnold Mathes. His experiments aren't unique or particularly polished, and I can't imagine sitting and listening to them over and over. Yet there's something, I don't know, touristy and listening to his musical wanderings for the first time, always somewhere different, always indicative without being definitive. He's a unique talent. $5 postpaid from 2750 Homecrest Ave., Brooklyn, NY 11235.

Editor's note: We would like to point out that the above are Robert Carlberg's opinions. *We don't expect everyone to agree with him—we don't always—and would also like to remind everyone that things in print are often just an individual's opinion and like everything else, subject to change and even error.* EM

0-120 in 3.6 seconds



If you're interested in a high-performance synth, it's time to test drive an Ensoniq ESQ-1 Digital Wave Synthesizer. It puts 120 sounds at your fingertips as fast as you can switch it on and plug in a cartridge. But that's only the beginning.

In addition to standard synthesizer waveforms, the ESQ-1 features complex multi-sampled waves for a total of 32 waveforms on board. Each of the ESQ-1's 8 voices uses 3 digital oscillators with the ability to assign a different waveform to each oscillator. That's thousands of distinct sonic possibilities.

The ESQ-1 is simple to program because it lets you see what's really going on inside. Its 80-character lighted display shows ten programs or parameters simultaneously. So you'll spend less time writing down numbers and more time laying down music.

A built-in 8-track polyphonic sequencer makes the ESQ-1 an ideal MIDI studio. Each track can play internal voices, external MIDI instruments, or a combination of both. And each track can be assigned a separate program and MIDI channel. Like any good studio, the ESQ-1 can auto-correct timing, auto-locate passages and balance individual tracks during mixdown.

You can build songs made up of 30 different sequences and store them internally, externally on tape or on 3.5" diskettes using the Mirage Sampling Keyboard or Multi-Sampler.

If controlling other MIDI instruments is on your list of priorities, the ESQ-1 puts you in the driver's seat. It supports poly, omni and mono modes along with Ensoniq's multi and overflow modes that extend the MIDI capability of the ESQ-1 far beyond ordinary synths. You won't ever have to leave the comfort of its 61-note weighted, velocity sensitive keyboard to play any MIDI instrument in your setup.

Comparable high performance digital waveform synthesizers and MIDI sequencers can easily exceed the legal limits of your cash on hand. But the good news is that the ESQ-1 comes from Ensoniq—at a sane price of just $1395. For a glimpse of technology that's earned the name "advanced", put an ESQ-1 through its paces at your authorized Ensoniq dealer today.

Synthesizer

8-voice polyphonic and polytimbral
32 synthesized and sampled waveforms
40 internal, 80 cartridge programs
80-character lighted display
Each voice features:
3 digital oscillators
3 multi-waveform LFO's
4-pole analog filters
15 routable modulation sources
4 complex envelope generators

Sequencer

8 polyphonic tracks
Auto-correct, auto-locate, step edit
Internal storage—2400 notes
Expandable to 10,000 notes

MIDI

Poly, omni, multi and mono modes
MIDI Overflow Mode for slaving units
8 simultaneous polyphonic channels
MIDI remote programming
MIDI guitar controller compatible

Although you should always fasten your seat belt when playing the ESQ-1, you don't have to wear a helmet or obey the 55mph speed limit. ESQ-1 and Mirage are trademarks of ENSONIQ Corp.

ensoniq®

ENSONIQ Corp, 263 Great Valley Parkway, Malvern, PA 19355 □ Canada: 6969 Trans Canada Hwy., Suite 123, St. Laurent, Que. H4T 1V8 □ ENSONIQ Europe, 65 Ave de Stalingrad, 1000 Brussels □ Japan: Sakata Shokai, Ltd., Minami Morimachi - Chu-O Building, 6-2 Higashi-Tenma, 2-Chome, Kita-Ku, Osaka, 530

Casio MT500 ($299) ★★★★

When I met Craig Anderton at the rehearsal for the TEC Awards at the November AES show, he asked to see the new Casio MT500 I'd been raving about. After 30 minutes or so of noodling with my new toy, Craig had to be physically separated from the unit by the roadies who wanted to get on with the soundcheck. At this point, he approached me about doing a review—I would be the first comedian to write for EM. I was flattered, but also apprehensive about my lack of technical knowledge. He assured me that his staff had been faking it for some time and none of the readers seemed to notice, so here it goes, Craig....

My work as a comedian (Ray also appeared as an obnoxious disk jockey in the film *Legend of Billie Jean*—Ed.) keeps me traveling to some wonderful places, as well as places where maybe they shouldn't be doing comedy shows. I find myself in these places anyway, and to protect myself, I try to be completely self-contained without carrying a lot of heavy stuff. I used to travel with a Fender Rhodes Suitcase 73 and Anvil cases—a piece of baggage roughly the size of a refrigerator. Load-in was usually accompanied by comments from the roadies like, "My back hurts. You'd better be funny."

I trimmed down to a Roland Keyboard Cube amp and a 4-octave Casio 405T with full-sized keys, but in July 1986 I had a chance encounter with some of the new Casio products at a Macy's in Sacramento (by day, all comedians transform into mall rats), and my life was changed.

It seems these folks at Casio are determined to make each successive keyboard smaller, cheaper, and more packed with goodies. After some soul-searching, I compromised my prejudice against mini-keyboards and went for the MT500. It does melodies, it does chords, it has little drum pads you can bop (or preset rhythms that drive the drum sounds), and even provides auto-accompaniment for those of us who like to replace entire orchestras with cheap plastic keyboards. The preset sounds won't make Oberheim Xpander owners regret their investment, but for something that you can carry under one arm and is legal in every state of the union, this is a happening little keyboard. Composers could, for example, get a reasonably good idea of what their creation is going to sound like, and having a rhythm section on call at the touch of a button just might get the creative juices flowing.

I think it's impossible to be totally happy with any new purchase, but overall I'm pretty pleased with this little guy. It took some doing, adjusting my hands to the mini-sized keys, but my only real disappointment is the lack of sustain capability. Although certain of the tones do have longer sustain times, they aren't always the tones I'd like to hold that long.

Everyone who hears my MT500 is amazed at the sound quality. The stereo sweep is appropriately cosmic and the organ tones compare favorably with any DX experience I've had. The sampled drums are frighteningly accurate, especially if you're easily frightened. The improved self-accompaniment section has over 12,000 combinations of kick, snare,. cymbals, claps and chords, and although it sounds a little cheesy for use during a live show, it's certainly more fun than a metronome for practicing. The AC/battery capability made it very convenient for my shows in England.

As we head toward the '90s, I see this miniaturization trend continuing. My next axe will be the Casio wristwatch MIDI-keyboard with sequencer, string section, and booking agent to take 10% off the top. All in all, my Casio MT500 has made my life a lot easier as I waltz through places like Charlie Chortles, Ha Ha a Go-Go, and the various airports of the world. —*Ray Hanna*

Casio
15 Gardner Rd.
Fairfield, NJ 07006
201/575-7400

First Take is just that—people's first impressions of some of the latest products. Ratings are provided by each reviewer according to the following standards:

★★★★★ *The cream of the crop—offers exceptional value or vision*
★★★★ *Very good product with few, if any, flaws*
★★★ *Solid, workmanlike product but not particularly exciting*
★★ *Below-average for its field; often flawed in some way*
★ *Has serious problems—try before you buy!*

We would like to remind you that these are opinions, not gospel, and as always, EM *is a communications medium and we welcome opposing viewpoints.*

360 Systems' MIDI Merge+ ($295) ★★★★★

The Merge+ is a single-space (1U) rack-mount MIDI merger/data filter, with some novel features, a classy look, and a solid feel. Power is supplied by an AC adapter (seemingly a fact of life with economical processors). MIDI connections include two MIDI Inputs with associated Thrus, and two Outputs that transmit identical data.

Merge+ will combine any MIDI data appearing at its two inputs, including system exclusive data. You can't select a given receive channel, or mute inputs or outputs—but there's only so much you can put in a box at this price!

Data filters allow pitch bend, modulation, aftertouch, program change, system real time, and system exclusive data to be selectively removed from the data stream, *and* a user-defined filter function lets you select up to eight additional controllers to be filtered. You simply press the "set" and "User Filter" buttons and engage the controllers (on your synth, etc.) that you want to filter. Merge+ even remembers the User Filter assignments when powered down. You can set up the regular filter *and* user-defined filters separately and independently for each input; and you can independently enable/disable the filters as a group, for either or both inputs.

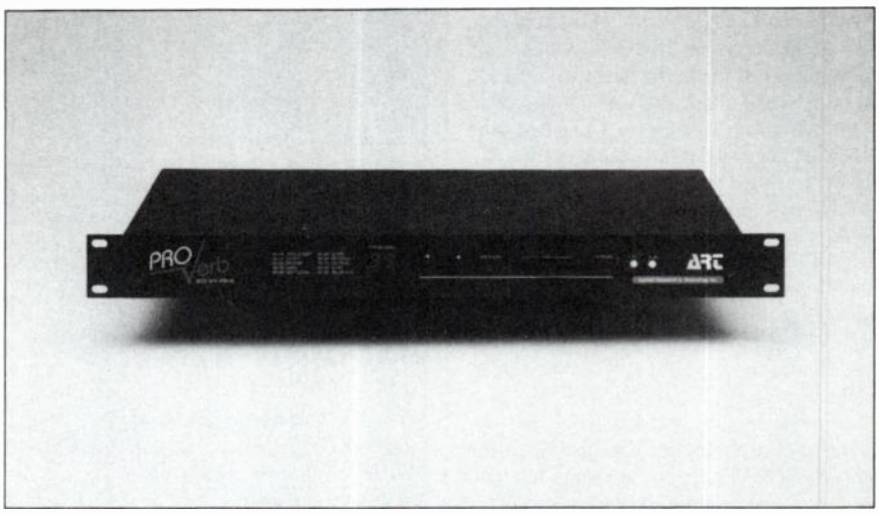
Merge+ also incorporates several additional processing features. Channel Bump adds "1" to the channel number of any incoming channel messages. For example: Note On/Off commands arriving on channel 4 would be re-transmitted by the Merge+ on channel 5; commands on channel 16 would "wrap-around" to channel 1. Transpose transposes Note On/Off data for either input by a selected interval. Channel Bump and Transpose can be independently enabled/disabled for each input. Also, Filter Enable and Transpose functions for each input may be controlled by MIDI program change numbers on channel 16.

An All Notes Off function (engaged from the front panel or by a remote footswitch) initially sends an All Notes Off command for each channel. If the panel switch or footswitch remains engaged, individual Note Off commands for every possible MIDI note on all 16 channels are sent. That's a lot of data to transmit, but, unfortunately, many synths don't recognize the brief All Notes Off command. (Still, Merge+ silenced randomly-voiced "stuck" chords on a Yamaha TX7 module in a just few seconds.)

To test Merge+, I invaded the studio and hooked up/merged various controllers and synths. (For one of my favorite effects I took a DX7 output, transposed it down an octave, filtered everything, merged nothing, and ran the Merge+ output back to the DX7 Input with factory patch 21 "Jazz Guitar" selected—instant Wes Montgomery.) The manual says "... Merge+ is extremely fast and smart enough not to allow either input to dominate." Well, it is fast: processing delay on the Merge+ was, at worst, tolerable, and at best, negligible. Of course, the real test of a merger is to try to overrun the input buffer by merging outrageous amounts of data. Try as I might, I couldn't provoke a MIDI crash, short of totally overloading one of the inputs with lots of system exclusive data.

Merge+ works. It's priced competitively with other mergers, but it's the only one that comes in a rack-mount package, and the features are great—it's more like a MIDI "tool kit." It lives up to what it promises, and deserves five stars. —*Alan Gary Campbell*

360 Systems
18730 Oxnard St.
Tarzana, CA 91356
818/342-3127



ART ProVerb

ART ProVerb ($395) ★★★★
ProVerb is a MIDI-controlled preset digital reverb unit that attacks the reverb price barrier with: 100 presets, including flange, chorus, and ping-pong effects; program-change mapping; and a rack-mount (1U) enclosure—for *$395*.

Like competing low-end reverbs, ProVerb does all this on a budget by utilizing a RISC (Reduced Instruction Set Computer) processor for the digital audio stuff, and a second micro (a Z80) for housekeeping functions. The front panel has the usual push-buttons/LED displays; connections include left and right line-level inputs and outputs, a 3-wire line cord (but no switch), and MIDI In.

ProVerb processes in what the manual refers to as "true stereo": the left and right inputs are mixed and fed to the reverb processor, which generates a synthesized *stereo* effect signal that is combined with the dry stereo input signals and fed to the outputs. Inputs and outputs logically cross-couple so that a single, mono input produces a stereo output; and using only a single output with stereo inputs produces a mono image, without phase cancellation of the effect.

ProVerb has 50 "normal" reverb presets, 10 gated, 10 reverse, 10 delay, 10 echo, and 10 chorus/flange presets. And how do they sound? To my ear—and this is a very subjective thing—there is some good stuff here. A number of the Tight Plate and Warm Room programs are excellent, and the Echo and Delay programs are surprisingly good. The chorus and flange effects are a real boon; there's even a Percussive Flange preset that makes just about anything sound like it's being played through a giant Tesla coil! But, to give you a little just makes you want more (like adjustable modulation rate), and, speaking of wanting more, not being able to adjust the pan rate on the Bouncing Ball program is just maddening! A triggered autopan function would be more useful (EPROM update, anyone?). Inevitably, a few of the programs didn't appeal to me; but, that's the rub with a preset machine: not all of the programs will please any one listener.

The sound of the ProVerb does have some of the limitations you might expect from a low-end processor. Its bandwidth is only 15kHz, though this is certainly adequate for its intended applications; and there is a minute amount of flutter on long reverb tails. Also, some bright keyboard sounds produce audible artifacts with the Chorus and Flange programs—especially on higher notes—but this effect is not noticeable with other signal sources.

MIDI-wise, ProVerb can set up program-change maps where a given MIDI program change number can call up any one of the ProVerb presets. Maps can be entered via the panel buttons, or you can simply call up the appropriate MIDI program number on a synth or controller and select the desired preset—a great feature. However, the ProVerb doesn't remember the map when powered down. A battery back-up retrofit kit is available as a service-center-installed option. (A call to ART's marketing department confirmed that this feature was omitted to keep the price down to the "magic" $395 figure.)

ProVerb offers a lot of bang for the buck; but, as with any processor, you'll want to give it a thorough test drive before you buy one. Watch out—the listening environment can affect the sound of some of the programs, especially those set to generate subtle stereo ambience simulations (try headphones). I'll give it four stars, and with battery backup, five. —*Alan Gary Campbell*

ART
215 Tremont St.
Rochester, NY 14608
716/436-2720

Fostex 4050 Applications Notes

Any musician who owns a MIDI system and is looking to expand with a multi-track tape set-up should take a close look at the exciting range of products Fostex has to offer. Designed with today's and tomorrow's musicians in mind, Fostex multi-track tape recorders and state-of-the-art peripherals like the 4050 Synchronizer/Autolocator provide you with powerful creative tools that are unsurpassed.

Truly a "breakthrough" product, the Fostex 4050 Synchronizer/Autolocator offers all the features found on autolocators used in professional recording studios and much, much more. It provides a veritable seamless link between the tape and your music. One of the obvious advantages of using an autolocator such as the 4050 with your multi-track tape deck is that it enables you to move around within a recorded piece of music using world-standard SMPTE time code to deliver pin-point accuracy to any point on the tape (with a resolution of minutes, seconds, and frames). Just select any point in the recording (up to ten positions can be stored in memory), using the unit to punch up the particular minute or second you wish to locate in a song. This saves a lot of the wear and tear resulting from repeated searches throughout the tape for a particular musical passage. It's easy to loop or repeat between any two points in your music. It's also possible to select pre-roll times up to ninety-nine seconds and to set zone limits (end-of-tape tags) to keep you from accidentally running the tape off the reel in fast wind modes.

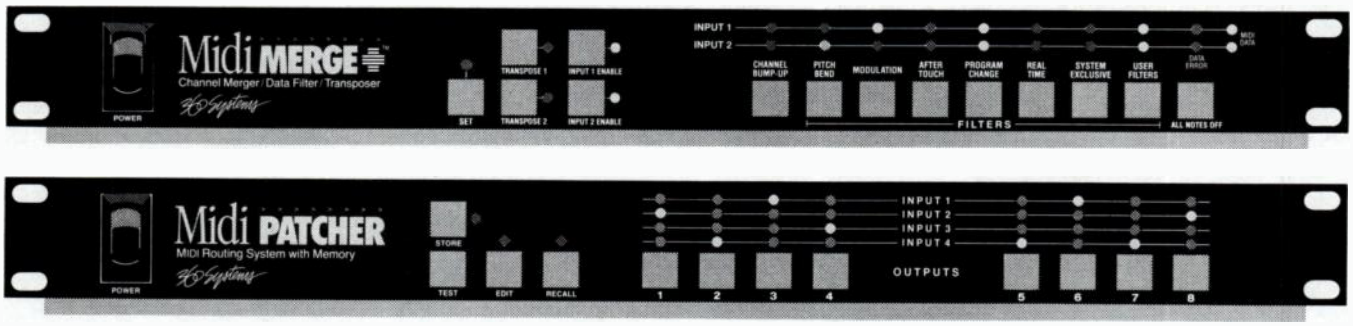
In addition (and even top professional autolocators don't offer this), the 4050 enables you to sync up all your MIDI devices directly to tape using SMPTE code as the master timing reference (instead of problematic drum sync pulses that aren't standardized). Simply record SMPTE code (a SMPTE generator is built right into the 4050) on one track of your multi-track tape–that's all the signal you'll need for complete control! This even enables you to use the unit's autolocator functions to locate discrete points in a MIDI sequence. In other words, the unique MIDI features of the 4050 allow you to autolocate in a sequence by specifying the exact measure, bar, and beat you wish to reach by sending out a MIDI Song Position Pointer message to each instrument in your MIDI system. Real-time sequenced playback of your MIDI instruments will kick in at whatever bar you select and all your MIDI instruments will be in perfect sync with the tape.

In addition to providing a metronome with a built-in speaker (that can be turned off), the 4050 gives you the capability to quantize the tempo of a piece of music. For example, let's say you've written a jingle that is thirty seconds long, but your client says it should really be only twenty-six seconds long. The 4050 can be used to alter the timing of the MIDI clocks in your sequencing set-up so the jingle will fit the required length. And the pitch won't change because it's being sequenced through MIDI. The 4050 also provides a memory for MIDI data so this information can be stored in the 4050 unit itself rather than in the sequencer. There's also MIDI dump to and from tape, so you can even store all autolocate points for a song on a spare track of your multi-track tape. And because the 4050 is software based, modifying or updating the unit is easily accomplished by replacing the socketed EPROMS.

With the power of MIDI and SMPTE combined in a single unit like the 4050, the doors are wide open for MIDI musicians who want to apply their skills to film and video sound-track work and music post-production. Besides providing musicians with an exceptionally effective way to express themselves, a MIDI recording system can provide you with a lucrative means of earning a livelihood with your MIDI instruments, and all the while doing what you enjoy most–playing music!

I N T R O D U C I N G

PROFESSIONAL OUTBOARD EQUIPMENT FOR THE MIDI MUSICIAN



Midi MERGE™

The difference between *most* recording studios and a hit factory is often the outboard equipment. Introducing outboard equipment for the Midi studio: Midi Merge Plus. The many features in this rack-mount unit greatly extend the creative possibilities in music production.

Now it's easy to accompany a sequencer, mix a keyboard performance with drum machine timing information, or transpose to another key. And each of the two inputs can be programmed differently, with Midi control over key functions. Midi Merge Plus fixes channel conflicts with its "bump up" feature, and stuck notes with an "all notes off" button and footswitch jack.

Next time a performance is great but pitch bend, modulation, or after touch isn't, one of our buttons can remove the problem. Load up to eight of your own personal Midi controllers into our intelligent User Filter, and punch it in any time you need it. LEDs show the status of *every* control feature on Midi Merge Plus; and for convenience, the entire machine setup is stored when power goes off.

Professional performance, and great looks. It's the producer's edge.

$295.

Midi PATCHER

4 in, 8 out Midi routing system *with memory*

Now every important link in your Midi system can be remembered, recalled, changed and instantly compared to others. Midi Patcher does more than just organize your wiring—it displays every connection on its front panel with a complete LED Matrix. And it's the only patcher that's usable on stage, when you *have* to know what's connected at a glance.

Patches change instantly—through Midi on Channel 16, or with the front panel buttons. And stored scenes never get lost thanks to new E²ROM memory that doesn't even need batteries. With 360 Systems' Midi Patcher, the complexity of large systems becomes completely manageable under intelligent micro-computer control. Discover the exciting *special* things you can do with a Midi system when it can be instantly and automatically re-arranged. Rack mounted, professional quality Midi Patcher—at high-tech keyboard stores everywhere.

$295.

360 Systems

MADE IN U.S.A.

18730 Oxnard Street ■ Tarzana, California 91356

No matter what your reason for getting into home recording—cutting demos, educating yourself, having fun with a better hobby than watching TV, preparing yourself for a career in the studio, or whatever—here is some useful advice on making your studio equal to the task.

Trackology:
The Art and Science of the 4-Track Cassette Studio

BY CRAIG O'DONNELL

I laugh when I see so many 4-track cassette machines on the market today. In 1969-70, I learned recording on a ¼-inch, quarter-track stereo Sony TC-252D with "Sound-on-Sound"—the budget way to layer sounds back in those days. I cut dozens of tracks of varying sophistication with my pal Davey Jones (now of Austin, Texas, *not* the Monkees). Some are worth remembering, but the tapes are *so* hissy it's tough to hear the tunes. Nope, no noise reduction. Ah, foolish, wasted youth.

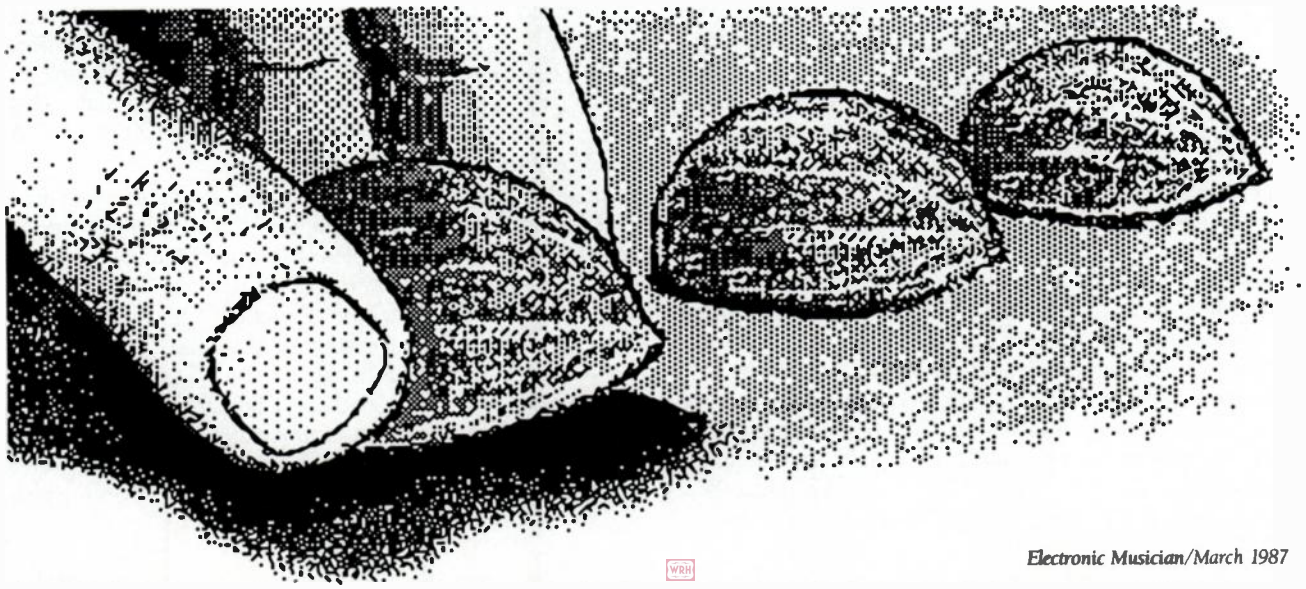
I "graduated" to a Scully half-inch, 4-track in a college electronic music studio—and even there we added a couple of the famous TEAC 4-track machines in the mid-'70s. I learned a lot of audio engineering by constantly screwing things up, even on a "professional" Scully. Nope, still no noise reduction.

As no-nonsense New York guitarist Bob Quine said in a recent issue of *Mix*, "It's the *music* that counts." Hear, hear! I'm so impressed overall by the performance of today's 4-track cassette decks that I can't see why every musician doesn't own one—or two.

I understand and appreciate the pros' feelings, though. Use the best tools, and you get closer to insuring the best results. For what it costs to operate in this manner, only truly random errors should be allowed and results must be consistent. After all, pros are like airline pilots: they'd rather fly a Boeing 757 than a Piper Cub. (Unless it's *their* Cub—then you should hear 'em go on about their beloved, "highly modified" handmade ten-year-old Squonkus seven-bus console . . .)

Now, both planes get you from Chicago to Los Angeles. And your microMTR (short for micro multi-track recorder) can cut an acceptable record album. *Your* record album. Go ahead—impress them by bringing your dinky 4-track into their big control room for mixing a pretty nice tape. Just learn your machine well and the quality will come.

I learned on my low-cost gear, and it didn't cost me an arm and a leg. And that's what's wonderful about microMTRs at home. So when professional engineers



Brand & Model	List Price	Tracks in Record Simultaneously	AC/DC	Motors	Punch	Counter
Vesta Fire MR-30	$ 299.50	2 in Stereo, One in 4tk	DC-AC, AC Xfmr Inc.	1	MAN	M
Fostex X-15-11	450.00	1 Odd, 1 Even	DC-AC, AC Xfmr Extra $	1	FS	M
Vesta Fire MR-10	459.50	1 Odd, 1 Even	DC-AC, AC Xfmr Inc.	1	FS	M
Yamaha MT1X	565.00	Up to 4	AC-DC, Inc. AC Xfmr	1	FS	M
Tascam PortaOne	595.00	1 Odd, 1 Even	DC-AC, AC Xfmr Extra $	1	FS	M
ROSS 4x4 Series 2	599.95	Up to 4	AC-DC, Inc. AC Xfmr	1	FS	M
Fostex 160	695.00	Up to 4	AC	1	FS	M
AMR MCR-4	699.50	Up to 4	AC	3	FS	LED Time/Ctr
Tascam PortaTwo	895.00	Up to 4	AC-DC, Inc. AC Xfmr	1	FS	M
Aria Pro R-504	899.00	Up to 4	AC	1	—	M
Tascam 234 Syncaset	949.00	Up to 4	AC	3	AUTO	FL
Fostex 260	995.00	Up to 4	AC	2	FS	LCD
AMR System II	1,139.50	Up to 4	AC	3	FS	LED Time/Ctr
AMR System I	1,398.50	Up to 4	AC	3	FS	LED Time
Tascam 246 Portastudio	1,495.00	Up to 4	AC	3	FS	FL Time/Ctr
AudioTechnica RMX64	1,695.00	Up to 4	AC	3	FS	LED Time
Akai MG614	1,799.95	Up to 4 plus 1 Sync	AC	3	—	LED Time & Memory

Cassette Matrix (Part 1)

assert that only Ampexes, Studers, and MCIs are "real," I can only laugh.

So Which Is The Trackological Device For You?

The accompanying Matrix compares 17 4-track cassette decks, representing a wide range of features and prices from which to choose. The Fostex X15 (now replaced by the X15 Series 2) is the prototypical battery-powered portable, while the TASCAM PortaStudio (no longer made—its successors are the 244 and 246) is the archtypical "demo-blaster."

In Tim Tully's matrix on digital samplers (EM, Dec. '86), he discussed the meanings and functions of various sampling terms. Rather than doing that here (we all know basic tape recorder features, anyway; if not, check out the dated but still highly useful book *Home Recording for Musicians*; available from Mix Bookshelf, 2608 Ninth St., Berkeley, CA 94710—send for free catalog), I'd rather talk about how to fit your microMTR into a complete functional system—mics to monitors to cue.

This Matrix groups the machines to allow the best price-class comparison. It will help you locate machines with specific features you may need, or help fit your budget to what's available. It will also illustrate the different classes of machines. For example, some, like the Fostex X15, can act as the nucleus of a good recording system but need certain add-ons. Others are more fully featured "studios-in-a-box."

Nothing beats hearing the decks yourself, with material you know well. Many of these machines are operating at the limits of low-cost audio technology and are complicated to design and manufacture cheaply. Also, because the specs are not standardized and simple—they tend to be written in consumer audio-ese—a by-the-numbers spread can only help you zero in on a group of likely decks, not do your thinking for you. The inevitable design tradeoffs necessitate listening and operating these babies yourself to find your level of comfort with a given machine's tradeoffs. Or, if you can buy a micromachine on a credit card with a return plan, do so. Check it out thoroughly in its working environment if you are unsure how much you'll enjoy using a particular machine.

Tully's sampler matrix revealed that samplers are a get-what-you-pay-for proposition, and the same goes here. Of course, you may be in line for a great deal from someone on your second-choice deck and only you can decide if the discount makes the purchase worth it.

Basics: Cleanliness and Care

The Matrix gives a fair idea how various models compare on features and price. Quite frankly, I wish I'd had the privilege to *subjectively* audition each machine for a day; sometimes little quirks make a big difference, and that's where your user evaluation is crucial.

And while pros assume they can handle these little beasts as well as you, don't be fooled: the microMTR is harder to operate well than a giant professional machine. Experience and care should make your tapes sound very nearly as nice as those recorded as studio demos. To get this quality, create a convenient system around whichever unit you buy. A few hints for better results follow.

✓ Attention to basics improves the per-

***Craig O'Donnell**, musical electronics and computer author for many publications, is technical editor for* Option *magazine, and a member of the group* Scientific Americans. *This spring he will complete his MBA and instead of only crunching numbers on his beloved Mac he will have the time to run some music software. However, his high tech computer toys still do not diminish his love of surf music, cheap drum machines, and analog synthesizers.*

Automation & Useful Tricks	Sequencer Sync	Speed, IPS S=1⅞ D=3¾	NR	S/N no NR	S/N best NR
none	-	S	B	NG	60
none	-	S ± 15%	B	n/a	60
none	-	S ± 15%	D	NG	85
ZS	Rec on Ch 1	S ± 10%	D	NG	85
ZS	-	S ± 15%	D	57	85
ZS	-	S ± 15%	C	NG	75
ZS	Rec on Ch 4	D ± 15%	C	NG	70
ZS, Play from Zero	-	S ± 12%	B,C	55	68
ZS	Rec on Ch 4	S ± 15%	D	NG	85
none	-	D ± 15%	"B"	NG	NG
Stop @ Cue, ZS, Rew to Top of Tape, Loop Play, Auto Tape Mon	-	D ± 12%	D	54	95
ZS, Stop @ Cue, Auto Tape Mon	-	D ± 15%	C	NG	70
ZS	-	S ± 12%	B,C	55	68
ZS	-	S ± 12%	B,C	55	68
Apparently same as the Syncaset	Rec on Ch 4	S & D ± 12%	D	NG	85(S)/90(D)
ZS	-	S & D ± 15%	B,C	NG	68
Autolocate, Repeat, Punch, Rehearse, ZS, & Much Much More	Rec on 4 w/NR off	S & D ± 10%	D-1	60	90

formance of any of these microMTRs. One basic, of course, is *cleaning*. Keep the heads and tape path cleaned and demagnetized. Cleaning heads before each take isn't necessary (I hear the group Yes used to do that, but you know how rumors are); still, cleaning heads before every session, and every three or four hours during a session, pays off.

✓ Use good tape from a major manufacturer or a reputable bulk tape house. Make sure the cassette mechanism (pressure pads, e.g.) is sound. This makes as much or more difference as the tape type. The engineering tradeoffs to get signal onto tiny tracks mean these decks sound best with Type II (high bias) C-60 (or shorter) tape unless otherwise specified—so use it. Poor quality tape has dropouts, and sheds too much oxide. If you *must* go with low-grade tape (that rough rhythm mix you made four years ago that you'd love to add overdubs to—one of the wonderful things about microMTRs!), re-record it on the microMTR from a clean consumer deck, tweak with EQ and/or limiting to optimize the transfer, and work from a fresh master.

✓ Tom Lubin of Fostex suggests the following nifty procedure: run your new tape through in Fast Forward, then Rewind while depressing the play or cue button. Wayward oxide is "scrubbed off" the tape by head contact. Then reclean the heads. We can hear the gasps of dismay out there now—most audio engineers will tell you that running tape in a fast mode while the heads are engaged will wear the heads right out. Lubin, who knows his product, feels no problem exists considering that this is done only once per tape. We leave it up to you, our talented readership, to judge for yourselves.

"The (micro multi-track recorder) is harder to operate well than a giant professional machine"

He says this will result in noticeably greater highs, because the highs sit in the outer layers of oxide. Once the tape has run through once or twice, "all ashore that's going ashore" has happened for the flecks of loose material. He also suggests EQ'ing sources a little bright during recording, and using less bass on low sounds.

✓ Keep the heads aligned, the bias and EQ adjustments tweaked, and the noise reduction and speed calibrated. These are procedures that often require special test tapes and tools, so visit an authorized service center or a local audio tech with a reputation for good work.

People in the real time cassette-copy business often say that most home decks do not come out of the box with anywhere near perfect calibration. Quality microMTRs are pretty solid, but a little tweaking works wonders here, too. It is worth the extra negotiation to get your dealer's service tech to recheck the initial setup for free, or for a discounted fee, when you buy your deck.

Cables and Adapters

Nothing is more frustrating than being unable to connect everything up without hassle when needed. Buy decent, low-capacitance cables for all major permanent cable runs. Such cables are made by Fostex, Tascam, and others, and are worth the bucks. Low-cap cables mean crisper, livelier sound—more top end. We need all the help we can get.

✓ The local Radio Shack is an excellent

Brand & Model	Frequency Response ±3 dB unless noted	Wow & Flutter	THD Distortion @ 1k, O VU	Separation dB	Fast Wind SEC/C60
Vesta Fire MR-30	40 - 10k	.15% JIS Wtd	3%	NG	100
Fostex X-15-11	40 - 12.5k @ -10 VU	.1% Peak Wtd IEC	1.50%	40	NG
Vesta Fire MR-10	40 - 12.5k	.12% JIS Wtd	1%	55	100
Yamaha MT1X	40 - 12.5k	0.05%	1% O VU @ 315	55	100
Tascam PortaOne	40 - 12.5k	.05% NAB	1%	55	100
ROSS 4x4 Series 2	40 - 15k @ -10	.05% WRMS	1%	55	NG
Fostex 160	40 - 14k @ 0	±0.1% Peak Wtd	2%	40	NG
AMR MCR-4	40 - 14k	.04% NAB	1%, O VU @ 315 Hz	50	100
Tascam PortaTwo	40 - 12.5k	.05% NAB	1%	55	100
Aria Pro R-504	50 - 13k +2/-3 @ 0	NG	NG	NG	80
Tascam 234 Syncaset	40 - 14k	.04% NAB	1%	70	85
Fostex 260	40 - 18k (+.66, -0) @ 0	±0.1% Peak Wtd	2%	65	100
AMR System II	40 - 14k	.04% NAB	1%, O VU @ 315 Hz	50	100
AMR System I	40 - 14k	.04% NAB	1%, O VU @ 315 Hz	50	100
Tascam 246 Portastudio	40 - 12.5 (S); -14(D)	.05% NAB	1%, O VU @ 315 Hz	70	85
AudioTechnica RMX64	40 - 15k	.04% JIS-A	1.50%	60	80
Akai MG614	30 - 20k (S); 40 - 13k (D)	.04% Peak Wtd	1%	70	90

Cassette Matrix (Part 2)

source for ¼-inch-to-RCA adapters, female-to-female adapters, and so on. After years of experience, my advice is to buy the integrally molded cables for the most commonly used adapters. Don't try making special adapters from five or six of the little metal-barrel ones connected together. One or another is going to be intermittent and it will drive you crazy, pronto. When one *does* get weird, chuck it in the trash immediately and replace it. It's not worth the time and aggravation to fix it.

✓ Buy lots of *long* RCA-to-RCA cables in the stereo and four-wire varieties. Add to that a number of (1) RCA female-to-female barrel connectors and (2) RCA female-to-¼-inch-male barrel connectors. This gives you a versatile way to create adapters to get from the two most common connector types you'll encounter—RCA and ¼-inch guitar "phone" males and females.

Figure out how many you need, and then double the number. You may feel silly spending $60 on wires, but it's worth it. You'll be happy you did.

Better Signal To Noise: Add-Ons

Now that we've got everything connected up, let's figure out how to make it sound good.

✓ Judicious compression of source sounds is one trick which makes all microMTRs sound better. Numerous compressors are on the market: the new "Performer Series" units from dbx seem to be an excellent price-performance choice. If possible, use miniprocessors (like the Scholz "Rockman") on instruments, even voice, to let you slap higher levels onto the tape. Fostex makes the tiny MX-50 battery powered mixer with compressor for the ultimate in portability.

✓ Use a "soft" microphone, that is, one that shaves transients off the sound without sacrificing clarity. Shure's SM57 and SM58 dynamic microphones are the classics, but any quality dynamic will do it. This has to do with the way a dynamic transducer works. In addition the dynamic will give your limiter more meat to chew on.

✓ When recording stereo ambient tracks, throw Radio Shack's $40 PZMs into the fray. Since PZMs are virtually immune to frequency response irregularities due to reflected sounds, you automatically eliminate a troublesome sonic problem. If extended flat response is very important, spend your money on the real Crown PZMs.

✓ It's clear that the decks with dbx NR are quietest. This is an engineering tradeoff that was made for real reasons by the designers (it's not that they're stupid and forgot to include it). Make sure that your dbx levels are calibrated by a trustworthy tech with the proper tapes and tools, because out-of-calibration dbx is mucho trashier than out-of-cal Dolby.

If your deck does not have dbx, see if you can locate a pair of old dbx-118 home audiophile "linear companders" on the used market. These funky stereo boxes were marketed in the '70s to go with four-channel "quad" open-reel decks. They are ideal in our tiny studio. They create a straight compressed (while recording), then expanded (when playing back) noise reduction. There's no messing with frequency response at all.

This will also greatly improve the sound of Dolby-NR decks because it shoves the motor noise and grumble down on playback. I've tried it. You may be in for a little bit of "breathing" (i.e. the background noise occasionally becomes audible during louder passages and peaks) but that beats motor noise. Depending on how you're monitoring the compressed (dbxed) signal, your internal-mixer cue mix might sound odd (squished). This is no big problem. Ah life—full of compromise.

✓ You can sometimes use the standalone, consumer-type dbx or the new half-rack dbx NR as an add-on. To de-

Monitor Headphones	Monitor Mix	Monitor In NomΩ, Max In
1 Jack, 100 mW, 8Ω, LP	Source in Rec, Tape in PB	NG
1 Jack, 100 mW, 8-40Ω, LP	4:2 to Phones and Stereo Out	Internal from Tape or Input
1 Jack, 100 mW, 8Ω, LP	Remix/Pgm Switch	Internal from Tape or Input
1 Jack, 100 mW, 8-40Ω, LP	4:2 to Phones and Stereo Out	Internal from Tape or Input
1 Jack, 100 mW, 8Ω, LP	Mono 4:1 Tape Cue; 4:2 Remix	Internal from Tape or Input
1 Jack, 60 mW, 8-200Ω, LP	Pushbutton Track Monitor	Internal from Tape or Input
1 Jack, 100 mW, 8-40Ω, LP	4:2 to Phones and Stereo Out	Stereo Mix or Aux Mix
1 Jack, 100 mW, 8Ω, LP	Switch: Stereo or 1,3/2,4	none
1 Jack, 100 mW, 8Ω, LP	Mono 4:1 Tape Cue; 4:2 Remix	Int: Tape, Input, Effect Bus
2 Jacks, 50 mV into 38Ω, LP	4:2, LP, PP, Chnl Solo, LP	Source Select by Pushbuttons
2 Jacks, 100 mW, 8Ω, LP	Mono/Stereo 4:2 Cue	Internal from Tape or Input
1 Jack, 100 mW, 8-40Ω, LP	4:2, each Chnl LP, PP	Internal from Tape or Input
1 Jack, 300 mW, 8-300Ω, LP	4:2, Level Fader	From Tape Only
1 Jack, 500 mW, 8-300Ω, LP	4:2, LP, PP, Patch Points	From Tape or Patch: 10kΩ, +24
2 Jacks, 100 mW, 8Ω, LP	Mono/Stereo 4:2 Cue; Pgm (Stereo Bus)	Monitor Bus
2 Jacks Front, 2 Rear, 1.2 W @ 8Ω (2W @ 2Ω), LP	No; use the submasters	N/A
1 Jack, 100 mV, 8Ω, LP	LP; Select Master, Track, Sub A-B, Rcv 1&2	Switch Matrix

Brand & Model	Monitor Out NomΩ, Max Out (dBV)	Mixer Channels	Other In	Mic In #
Vesta Fire MR-30	to HP, Master Line out	1 in; 4 out	-	1Q
Fostex X-15-11	10k, -20	4	-	2Q
Vesta Fire MR-10	to HP, Master Line out	6	-	2Q
Yamaha MT1X	1k, -10	4	2 Aux Ret	4Q
Tascam PortaOne	Phones Only	4	-	4Q
ROSS 4x4 Series 2	Thru Phones or Master	4	-	4Q
Fostex 160	10k, -10 Nom, +6 Max	4	Bus In L/R	2Q
AMR MCR-4	none	none	-	none
Tascam PortaTwo	Tape Cue to Phones, Cue Out ¼-inch Jack	6	-	6Q
Aria Pro R-504	20k, -20 Nom	no mixer	4 Mic, 4 Line	4Q
Tascam 234 Syncaset	Monitor to Phones, Stereo RCA Jacks	4 (Mic, line on each)	-	4Q
Fostex 260	MonMix & Mon Out: 10k, -10 Nom, +12 Max	4	Line in 5-6	4Q
AMR System II	1kΩ, +9.5	4	-	4Q
AMR System I	100Ω, +18	6	-	6X
Tascam 246 Portastudio	Monitor to Phones, Stereo RCA Jacks	6	-	6Q
AudioTechnica RMX64	See Submasters	6	-	6X Bal
Akai MG614	100Ω, -10 Nom	6	-	2X Bal

Cassette Matrix (Part 3)

scribe how to do this, though, is beyond the scope of this article. Discuss this option with a knowledgeable dealer or sound engineer.

✓ For the simplest way to scrub the scruff from a Dolby B-only recording (or from a noisy guitar amp, for that matter), look into single-ended noise reduction units from any of a variety of manufacturers—Rocktron is one. Operating only during playback, single ended NRs filter hiss from the tracks. They are also useful, eventually, for special effects such as filter-faded reverb in the house-sized studio you'll build someday.

Reference Monitoring

A good set of reference speakers are im-

Brand & Model	Equalization Mid	Lo *shelving @ 100 unless noted*	Other Channel Features
Vesta Fire MR-30	± 10 @ 3k, PB only	±10, PB only	1 Input: TR, LF, LED Meter
Fostex X-15-11	none	±12	LF
Vesta Fire MR-10	□note: on Input 1,2 only□	±10	Input 1 & 2: TR, LF
Yamaha MT1X	none	±10	TR, PP, LF, LED Bar
Tascam PortaOne	none	±10	TR, PP, LF
ROSS 4x4 Series 2	none	±12	TR,PP,LP
Fostex 160	none	±15 @ 150 Hz	PP (Mix-Direct sw), LF
AMR MCR-4	none	none	N/A
Tascam PortaTwo	none	±10	TR, PP, LF
Aria Pro R-504	none	none	LP
Tascam 234 Syncaset	none	none	LP, Cue LP & PP
Fostex 260	none	PD±15, 80 - 1.2k	TR, MU, PP (Mix-Trk Sw)
AMR System II	none	±15 @ 50 Hz	GA, PP, CC, LF
AMR System I	PD 200 to 5k	±15 @ 50Hz	GA, MU, PP, CC, LF
Tascam 246 Portastudio	none	PD±12,62 - 1.5k	TR, PP, CC, LF
AudioTechnica RMX64	□Rec ± 13.5 db, PB ± 7.5 db□	PD(or) Shelve, 60-1.5k	TR, PP, CC, SOLO, LF
Akai MG614	none	PD±15, 40 to 1.5k	TR, CC, PP, LF

Cassette Matrix (Part 4)

Line In Ω	Level	#	Ω	Level	Line Inputs comments	Equalization High *shelving @ 10k unless noted*
100k	-10N	2R	10k	-10N	"Band"=normal deck; "Multi-Track"=4tk Mode	±10, PB only
10k	-50N	2R	20k	-20N		±12
10k	-10N	4R	10k	-10N	Stereo Aux, Stereo Phono Inputs	±10
10	-50N	4Q	10k	-10N		±10
10k	-50N	4Q	10k	-2M		±10
100k	-3M	MIC	MIC	MIC	same as Mic	±12
40k	-35M	4R	10k	+20M		±15
none	none	4Q	50k	+18M		none
50k	-50N	6Q	50k	-10N		±10
1k	-55N	4Q	47k	-20N		none
100k	-10N	4R	22k	+15M		none
50k	+12M	2R	20k	+20M		±15dB, 700 - 10k
50k	0M	4Q	15k	0M		±15
10k	+11M	6Q	50k	+21M		±15
10k	-60N	6Q	10k	-10N		PD±12, 1k - 8k
4k	-	6Q	33k	+18DBM	Mixer is fully balanced, Meters Cal to OVU=+4 DBM	PD (or) Shelve, 600-10k
1k	-16M	6Q	100k	+15M		PD±15 @ 800 - 10k

possible to live without. Many records are actually mixed to reference monitors, because they give a good approximation of the sound of a typical home stereo.

If you already have an amplifier, the small two-way metal-box speakers typified by the Radio Shack Minimus-7 or the Numark MS-100A are inexpensive and hard to beat. JBL has recently introduced a similar speaker called the Control-1 and Akai markets a comparable micro monitor.

At the next dollar plateau I personally like the excellent and punchy Toa ME280 three-ways. Numark's DMS 20 two-way "digital monitors" are an inexpensive and accurate alternative. I understand they are in short supply at the old bargain

Channel Input Selector	Channel other comments	Aux Send #, NomΩ, Max Level	Aux Return #, NomΩ, Max Level
St. Cass./4-Tk	PB:LF Ch 1-4; Stereo or ind. chnl. rec. Sw	none	none
Mic/Line/Remix	n/a	none	none
	Line In 1-4 with PP, LP or Tape 1-4 for Remix	none	1 Stereo, 10k, -10, LP, Balance
Input/Off/Tape		1 Mono: 10k, -10N	1 Stereo, 2 Faders, 10k, -10N
Mic-Line/Off/Tape	n/a	Use Tape Cue thru Phone Out	Use a Mixer Channel
Line/Mic/Tape 1-4	Ready/Punch-In button above level pot	none	none
Input/Track	Post Fader Aux Pot w/Source-Pre Fader Tape Sw	1 Mono: 5k Min, +6, No LP	Stereo Bus In: 20k, +6 Max
N/A	n/a	none	none
Mic-Line/Off/Tape	Effect Pot, Post Fader and EQ	Use Tape Cue	Use a Mixer Channel
Mic/Line/Tape	Patch Points on each Input. Inputs always active.	none	none
Line and Mic/Inst	Both inputs always active for mixing.	none	none
Input/Track	Post Fader Aux Pots (2)	2 Mono: 5k Min, +12, No LP	Stereo Bus In: 20k, +15 Max
Mic-Line/Tape	Tape Out (direct out); Aux Send Pot	1 Mono: 1k, +9.5, No LP	1 Stereo: 47k, 0, Level Fader
Mic-Line/Off/Tape	Aux Send Pot; 1-2/3-4/L-R chnl. Assign Sw	1 Mono: 1k, +18, LP	1 Stereo: 10k, +24, LP, PP, Assign
Mic-Line/Off/Remix	Post Fader Effect 1; Post Fader Effect 2 w/Sw	none	Four Pgm Bus Return Inputs
Line/Mic/Tape	2 Sends can be Pre/Post, Channel Assign to Subs 1-4	2 Mono Pre or Post, LP	2 Mono, LP, PP, Sub Assign, Solo
Mic-Line/Off/Tape	EQ Sw; Bus A-B Assign; 2 FX Sends	none	1 Stereo, 22k, -10 Nom

Brand & Model	EFF Send #, NomΩ, Max Level	EFF Return #, NomΩ, Max Level	Patch Points	Stereo Outputs NomΩ N (Nom); M (Max)
Vesta Fire MR-30	none	none	none	10kΩ, -10N
Fostex X-15-11	use Monitor	none	none	See Mon Out
Vesta Fire MR-10	none	4 Aux Line In, 10k, -10, LP, PP	none	1kΩ, -10N
Yamaha MT1X	none	none	none	see Mon
Tascam PortaOne	none	none	none	1k, -10N
ROSS 4x4 Series 2	none	none	none	1k, +10M
Fostex 160	none	none	4	5k Min, +6M
AMR MCR-4	n/a	n/a	none	n/a
Tascam PortaTwo	1 Mono: 100Ω, -10 Nom, LP	1 Mono/St., 10k, -10 Nom, LP	2	100Ω, -10N
Aria Pro R-504	none	none	4	n/a
Tascam 234 Syncaset	none	Use Line or Mic/Inst Inputs	none	none
Fostex 260	Can Use Stereo Monmix	Return thru Bus In or Line In	none	5k Min, +12M
AMR System II	none	none	none	470Ω, +9.5M
AMR System I	none	none	6	100Ω, +18M
Tascam 246 Portastudio	2 Mono: 100Ω, -10 Nom, LP	Use Pgm Bus Inputs	6	100Ω, -10N
AudioTechnica RMX64	none	none	6	none-use Subs
Akai MG614	2, 100Ω, -10Nom	2 Mono, 22k, -10Nom, PP	6	2 Sets, 100Ω, -10N

Cassette Matrix (Part 5)

price (before the rising yen scuttled the value of the dollar) so look fast in the nearest dance gear emporium.

There is another method for the ultra-hip: go buy a moderately priced blaster with a couple 4-inch or 6-inch speakers, tone control, volume, and Line/Aux inputs. Connect this to your mixer outputs as the reference monitor system. Adjust the volume and tone with a favorite cassette playing, or while tuned to your favorite FM station.

With the blaster set up this way, you can compare the sound of your mixes to the sound of your favorite artists and engineers as they work out in the Real World. This may sound a little unorthodox, but it works quite well. It's an invaluable learning tool, too, if you're still struggling with how to layer the sounds in the overall mix.

All decks on our matrix need outboard EQ. My absolute favorite for this purpose is the budget-priced single-rackspace Korg KME-56, which I have seen sold for well under $275 in stores. The KME-56 has four mono five-band graphic EQ circuits and a dual-gang stereo seven-band graphic.

Front-panel push buttons select which EQ is in and which is out; rear-panel selectors set any individual section to operate at either -30 or -10 dBV. The KME-56 is perfect for patching or just slapping in-line with a drum machine's output as the track is recorded. Twelve dB boost and a similar amount of cut are plenty to work with. You'll hear sounds you never thought you could get from that tired old gear. Break out your adapters, though: the Korg has ¼-inch ins and outs.

Finally, one wonderwidget that deserves a place in the rockers' hall of fame: the Fostex 2050 Line Mixer. This versatile unit combines two stereo Aux inputs (-30) with eight stereo line (-10) inputs. Each input has Level and Pan. There are no mic preamps or tone controls, just buffer amps. The Line inputs have doubled RCA females so that you have a built in "Y" connector. Insert the 2050 between the tape deck and the mixer and *voila*, instant cue! There is a Master volume, Cue and Remix mode switch, plenty of extra stereo outputs, and a respectably hefty headphone amp with its own little volume knob. With the less expensive microMTRs this is a must-get. You'll find your way much quicker with an extra stereo bus (which of course can be an effects bus during mixdown) and extra gain in the chain. I have seen these selling used for as little as $60 each; store prices are changing, again, due to the yen's rise.

Many more accessories are useful for the home studio: Alesis and ART make some neat little under-$400 reverbs, and although it's a pain to splice cassettes, a cassette splicing block will come in handy at some point. Ultimately, though, the most useful piece of gear is your own educated ears—and probably the best way to give your ears that education is by trial-and-error with your microMTR-based studio. Choose carefully, keep your tape path clean, and I'll listen for your tunes on the radio.

A Caveat, Two Orphans, and The Ugly Duckling

Inevitably, by the time this hits print there will be additions to the 17 cassette decks listed here. Ross and Fostex both say that new models will be shown at the January NAMM show in Anaheim, which is only weeks away as I write. So buyer, beware. EM is not delivering the final word on four-track cassette units. Use the empty spaces at the bottom to list new microMTRs that are as yet merely a gleam in a marketer's eye.

The Aria R-504 is discontinued as of January 1987, according to their marketing spokesperson. However, it is available from dealers, and if it suits your needs,

Submasters & Widgets	Track Outputs imp, nom (dBV), max (dBV)	Meters #	Meter Type
Single input, but Mix and EQ on Playback	none	1	Peak LED
none	10k, -10N	2	Peak LED
4 Line, Stereo Aux/Phone mix to 1/2	1k, -10N, NG	4	VU
none	1k, -10N	4 on Chnls	Peak LED
PP assigns any Input Chnl to Any Tape Tk	1k, -10N	4	VU
none	1k, ON, NG	4	VU
none	10k, -10N, +6M	4	Peak LED
n/a	1k, -10N, +6M	4	Peak Hold LED
PP Assigns Inputs to Tks; Ins 5-6 direct to Tape	150Ω, -10N, NG	4	VU
n/a	20k, -20N	4	VU
Automatic Tape Mon Switching for Overdubs	100Ω, -10N, +15M	4/2	VU w/Peak LED/VU (Pgm/Eff)
Can route stereo remix to record channels	10k, -10N, +12M	4	Peak LED
None, but Stereo 7 Band EQ on L&R Outs	n/a	2	Peak LED
Sort Of: ½, ¾, L/R using Pan & Assign	n/a	2	Peak LED
PP and Buttons Assign Inputs to Tracks	150Ω, -10N, NG	4	VU w/Peak LED
4, w/Solo, 1&2 have ¼" & RCA, 3&4 have ¼" and XLRm	4 direct tape outputs	4+1	4VU, 1 Peak LED
Automated A-B Subs; Track Assign by Button	100Ω, -10N	4	Peak LED

Brand & Model	Metering comments	Frequency Response and THD of Mixer Section
Vesta Fire MR-30		(see legend on page 38)
Fostex X-15-11		"
Vesta Fire MR-10		"
Yamaha MT1X		"
Tascam PortaOne		"
ROSS 4x4 Series 2		"
Fostex 160		"
AMR MCR-4		"
Tascam PortaTwo	Switch for Tracks or L/R/Cue/Effect	"
Aria Pro R-504		"
Tascam 234 Syncaset	Switch for Cue or Tape	"
Fostex 260		"
AMR System II		"
AMR System I		"
Tascam 246 Portastudio	Switch for Pgm or Trk	"
AudioTechnica RMX64	Each Meter w/Chnl/Sub Sw; Solo Peak LED Meter, -20 to +6	"
Akai MG614		"

Cassette Matrix (Part 6)

try to negotiate a deal. By the way, as it was explained to me, the "proprietary" NR is a version of Dolby B which, for legal reasons, cannot be listed as such in the literature. It is supposedly compatible, and always engaged.

Tascam said the venerable 244 Portastudio *might* be found in stores although it has been replaced by the 246. From my experience with the 244—which I did not much like—the 246 looks like a major improvement. But again, if price is a constraint, see if you can negotiate a deal on the discontinued 244 or find a good used one. Later, when you are an accomplished micro-four-track engineer you can trade up to a sophisticated machine.

The "ugly duckling" which I did not list happens to be a Toa product, the MCX-106. This is a big square box with a mixer on the left and a stereo cassette deck on the right. Find this used, as it too has been discontinued. It's a cassette player-recorder with a PA/monitor/recording mixer, a power amplifier, a patch bay, reverb, and graphic EQ built in—sort of a speakerless, hyperpower blaster. While it is outside the scope of our matrix, for someone who performs with tape backing, it makes a compact economical alternate to the Syncaset, the Aria 504, or the MCR-4 (all of which are rack-mountable), and as such it deserves mention. I had the opportunity to mess with the MCX-106 at trade shows, and it is a solid unit as befits a Toa product. I suspect it never sold well in the U.S. because we're used to modular PA systems, and the 106 was neither fish nor fowl, not recorder nor PA mixer, just an ugly duckling. If you see one, by all means give it a listen.

LEGEND

Here's what the categories and abbreviations across the matrix mean. Levels are in dBV unless noted, impedances in ohms.

✓ BRAND & MODEL, LIST PRICE: I hope these are self-explanatory.

✓ TRACKS IN RECORD: some recorders allow only two tracks to be recorded, simultaneously while some allow one, two, three, or all four. The Akai MG 614 crams a sync track onto the cassette as well.

✓ AC/DC: Primary power is first. Units with external AC adaptor are noted. DC units, of course, are portable.

✓ PUNCH: Punch-In is essential if you are to complete songs as both engineer and player. Footswitch ("FS") punch is standard across the industry.

✓ COUNTER: "M"=mechanical, "FL"= fluorescent; LED; LCD. "Time" refers to running time on the tape. "Ctr" is the usual 000-999 counter.

✓ AUTOMATION & USEFUL TRICKS: "ZS"= Zero Stop (for example, when rewinding to the beginning of a tune) is virtually standard. Generally the expensive machines have much more sophisticated controls.

✓ SEQUENCER SYNC: ideally, sync is recorded without NR. Most microMTRs don't allow turning the NR off on just one track, but some have a special input and/or a special switch so that NR is "Off" on one track only. This track is used to record FSK sync from a FSK-to-MIDI converter. Then you sync your four-track to your MIDI sequencer set-up. Convenience feature.

✓ SPEED, IPS: Double (D) speed is preferred for serious mastering, while Standard (S) speed is preferred if you're playing consumer cassette tapes as well.

✓ NR: B= Dolby B. C= Dolby C. D-1= dbx pro. D= dbx consumer. *All* are mutually incompatible.

✓ S/N: where's the noise floor without/with NR engaged?

✓ FREQUENCY RESPONSE: Some manufacturers rate their machines at -10 VU, which results in a more forgiving number.

✓ WOW & FLUTTER: Machines fall into the "about .1%" or the "about .05%" class. There are many ways to measure W&F, so this is an approximation only.

✓ DISTORTION: THD of the *recorder* even if the model has a mixer, too. This

Unique Feature #1	Unique Feature #2	Unique Feature #3
CB-30 Case w/Batt Pak*		
Video Users' Manual (free)	The Original	
Phono Inputs	Up to 8 Inputs Active	
Sync Track Capability	Battery Pack*	Attache Style Case*
Channel Mutes!	Very easy on your Batteries	
Also inc. Case and Batteries		
Patch Points	Sync Input/Output	
Rack Ears*	Bracket Mount to Mixer*	"Overdubber" FS*
Channel Mutes!	Very easy on your Batteries	
Rack Mount (3 Spaces)	Discontinued 1/87, but Available	
Remote Transport Cntls*	Rack Mount Unit	Inst & Line Inputs mix
Mutes on Channels!	Memory Play betw 2 points	LCD Counter
Rack Ears*	Bracket Mount to MCR 4*	External Power Supply
Rack Ears*	Bracket Mount to MCR 4*	Mutes on Channels!
Channel Mutes!	Remote Transport Cntls*	Ch 5-6 have Line Inputs
48V Phantom Power	Stereo-Only @ Slow, 4 Track @ Double	Meters Calibrated to +4 dBm, Mixer is Balanced Pro unit
Sophisticated Automation	Pushbutton Patch System	Padded Armrest

figure varies with level recorded onto the tape. An approximation.

✓ SEPARATION: how much lower than the signal of the monitored Track "n," are the signals from adjacent tracks? "40" isn't very good, while "70" is.

✓ FAST WIND: end-to-end shuttle on a C-60.

✓ HEADPHONES: number of built-in jacks, power of the built-in amplifier, nominal impedance in ohms, "LP"=Level Pot. Most of these headphone amps are wimpy, so find some *very* efficient headphones (Sony has good ones) or an extension cable to feed a separate headphone amp.

✓ MONITOR MIX: what provision is there for listening to the tape while overdubbing? Some have a mixer, others have switches, others have a cue bus plus a Remix bus—there's no standard.

✓ MONITOR IN: what feeds the monitor (tape cue) bus?

✓ MONITOR OUT: some have a separate monitor output for listening through speakers. Some use a stereo output for both remix and monitor. You get monitor through the phones, of course.

✓ MIXER CHANNELS: number of channels on the mixer part of the unit. The X15 is different as there are only two inputs but there is a four-channel monitor mix which is used for remix, too. It's a pretty shaky mixer; get an outboard unit.

Brand & Model	Unique Feature #4	Size, Max Weight S, M, L; LBS
Vesta Fire MR-30		S; 3.9
Fostex X-15-11		S; 6.4
Vesta Fire MR-10		S; 4.5
Yamaha MT1X		S; 5.5
Tascam PortaOne		S; 7.7
ROSS 4x4 Series 2		M; 7
Fostex 160		M; 7.7
AMR MCR-4	Made in USA	M; 16.5
Tascam PortaTwo		M; 8.8
Aria Pro R-504		M; 18
Tascam 234 Syncaset	Simple Mixer for Snd-on-Snd	M; 21.6
Fostex 260		
AMR System II	Made in USA	M; 13.6 / L; 9
AMR System I	Made in USA	L; 16
Tascam 246 Portastudio		M; 22.7
AudioTechnica RMX64	No Stereo Monitor Bus	L; NG
Akai MG614		L; 40

Cassette Matrix (Part 7)

✓ OTHER: some units have additional inputs.

✓ MIC IN: simultaneous mic inputs; nominal input impedance; level. High input impedances work with pretty much any mic or instrument input. On many, the Mic and Line inputs are the same jacks and a Trim control adjusts levels. Those at 4k or less should be used with low-impedance mics only. "N"= nominal input level, while "M"= maximum input level before clipping. "Q"=¼-inch, "X" =XLR.

✓ LINE IN: "R"=RCA, "Q"=¼-inch, etc.

✓ EQUALIZATION: "PD"=Peak/Dip, often referred to as "Parametric" EQ. In other cases EQ is shelving. HF at 10k Hz is standard, which is not surprising considering most decks don't record much above 14k anyway. Use it to add top when tracking, then subtract the top when remixing. Old timey "NR," folks.

✓ OTHER CHANNEL FEATURES: how complete are the mixer channels? "TR"= Trim Pot, "LF"=Level Fader, "PP"=Pan Pot, "LP"=Level Pot, "MU"=Mute, "GA"=Gain, "CC"=Channel Clip LED, "SOLO"=Solo Button.

✓ CHANNEL INPUT SELECTOR: the switch on each channel allows you to choose from prepatched inputs.

✓ AUX SEND, EFF SEND: if there are sends for mixdown, here are the vital statistics.

✓ AUX RETURN, EFF RETURN: same thing; the distinctions are somewhat arbitrary depending on what the manufacturer has called the controls. Workarounds are noted, like "Use Monitor." When there are direct outs, or a stereo mix bus, the headphone mix and its output can be pressed into service as a supplementary bus.

✓ PATCH: patch points are probably the most useful items to have on a microMTR. They substitute well for Aux and Eff buses.

✓ STEREO OUTPUTS: main stereo outputs' specs.

✓ SUBMASTERS & WIDGETS: notes on other features of the mixer section. These may seem cryptic (they are), and are meant chiefly as a guide. Manufacturers do pretty much as they see fit here, so check out the interesting machines firsthand.

✓ TRACK OUTPUTS: direct outs from the tape head electronics, used to connect the microMTR to another mixer for track bouncing or mixing.

✓ METERS: number of meters.

✓ METER TYPE: generally, peak meters are preferred because for sounds with a lot of high frequency content, they will give a more accurate indication of level-to-tape. Excess HF will cause the most grief with tape saturation or a "spitting" sound. Sounds with lots of lows often can be recorded "in the red" without significant audible distortion. With all but the two or three most expensive, meters are more a guide than anything else. Use your ears (and those decent monitor speakers).

From what I can glean, the 0 VU tape reference calibration is 160 nW/meter for most of these decks. When the meters are used for input/output, most are set to -10 dBV, the "semipro" standard.

✓ FREQUENCY RESPONSE: of the mixer section. They're all about the same, which is a consequence of IC electronics more than anything else.

✓ THD: of the mixer section. Many manufacturers don't supply this, but the best was .003% and the worst .05%. Not terribly meaningful, only included to help illustrate that you're really buying (1) mixer *features* and (2) the tape transport.

✓ UNIQUE FEATURE 1-4: anything that seems interesting.

✓ SIZE, MAX WEIGHT: given *with batteries* where possible.

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216/686-2600

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15431 Blackburn Ave., Norwalk, CA 90650
213/921-1112

Ross Electronics International Music Co.
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The Latest Page in Audio History.

1877: The microphone is invented.

Developed by Alexander Graham Bell, Thomas Edison and Emile Berliner, it was patterned after the human ear itself. The first of many attempts to capture sound as we really hear it—a goal that took more than a century to realize.

1896: The first synthesizer.

Thaddeus Cahill's Telharmonium weighed 200 tons! A touch-sensitive keyboard drove a complex labyrinth of motors, pulleys and alternators.

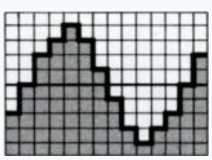
1924: The dynamic loudspeaker.

The design first developed by Chester W. Rice and Edward W. Kellog has changed very little over the years. But today's broad frequency bands and increasingly complex audio signals are challenging the loudspeaker like it's never been challenged before.

1925: The vacuum tube amplifier.

The collective work of Edison, John Flemming and Lee DeForest. Transistors later came to replace tubes, but audiophiles have never been entirely satisfied with what they heard.

1958: The advent of digital.



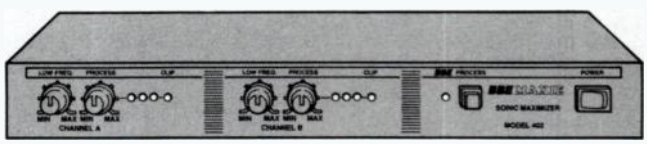
Working at Bell Telephone Laboratories, Max Matthews developed a computer program for creating and storing audio waveforms as digital data. Today, digital technology is widely available to musicians and consumers through innovations like user sampling devices and CD players. To hear the sound, however, it's still necessary to translate it back into the analog domain. And that's where problems develop.

1978: The BBE breakthrough.

When you put a power amp and a loudspeaker together, something has always been lost in the interface. That's where phase and amplitude distortion develop, due to "miscommunication" between amp and speaker. And that's why amplified sound has never had the dimension, depth and realism that the human ear can hear all around it in nature. That is until Bob Crooks made an important discovery—BBE. BBE is the vital "missing link" between amplifier and speaker. It analyzes the action of both—automatically and on a continual basis. It applies the phase and amplitude correction that's needed to make the sound come through the way you and nature intended it. The difference is easy to hear. Improved low-end definition and punch. Cleaner high-end transients. Better mid-range presence. *In short, unprecedented clarity.*

1984: BBE on stage.

Major P.A. companies like Stanal Sound and Best Audio made BBE part of their touring systems. And when the entertainment industry



gathers for such events as the Grammies and the Academy Awards, BBE is there, making sure the sound is as special as the occasion itself.

1985: BBE in the studio.

Award winning producer Steve Levine joined forces with the Beach Boys and teamed them up with BBE for an all-digital recording session for CBS/Caribou. *"BBE is to digital what equalizers were to analog,"* said Levine. *"I can't imagine ever recording without BBE again."*

1986: BBE today.

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From "Akihabara" to "X-Days," Japan is a fascinating land that blends ancient traditions with high technology. Here's a first-hand look at the latest products from Yamaha, and a brief glimpse of the country that spawned them.

Report from Japan

BY CRAIG ANDERTON

"Turning Japanese, I think I'm turning Japanese, I really think so...." —the Vapors

Look around your studio. Chances are you'll find a Japanese influence—it might be a cassette, synthesizer, tape recorder, VCR, video camera, headphones, or any one of a number of high-tech toys. Japanese culture, whether expressed by high technology or the sushi bar down the street, is making its mark in the U.S.; but did you ever stop to think about the country that spawned this technology? I often have, which is why I was thrilled when Yamaha invited me to visit Japan to check out some of their new products (we'll get to that later) as well as get a feel for Japan in general, and Yamaha in particular.

Where to start? How about Tokyo, and X-Days—something quite different from any type of trade show I've experienced in the U.S.

X-DAYS

Part of Yamaha's modus operandi is educating the public about music, since they figure the more people want to play music, the more likely it is that they will buy Yamaha gear. X-Days is part of this concept: for no admission fee the public gets a chance to play with, and see demos of, the latest Yamaha gear. About 30,000 people attended the Tokyo show (another was held in Osaka a week later), of which about 40% were public school students, 35% amateur musicians over 20, 5% professional musicians, and the remainder being the general public, press, and so on.

So much for figures. When you look into the faces of the kids, what you see is the dream of being on stage, and probably, a certain identification with what is indeed homegrown technology. But perhaps there's more. My perception of Japanese society is that there is a strong homogeneity and tendency (if not desire) towards conformity; rock and roll and new musical technology offer an exciting, yet socially safe, way to assert one's individuality.

Part of the X-Days formula includes concerts that draw a young and predominantly female crowd. In this country, I'm sure a bunch of MBAs would be more than quick to point out to Yamaha that these girls don't buy musical instruments; but Yamaha considers catering to this market as sowing seeds for the future. To say that American companies look only at the bottom line while the Japanese go for the longer haul is a cliche, but a cliche I saw borne out during my travels in Japan.

Another part of X-Days involves demos conducted in a manner that would benefit NAMM and AES shows. I saw Dave Weckl, the drummer in Chick Corea's band, give a particularly impressive demo where video monitors (some of which were located well away from the main stage) displayed the action. Because of these monitors, everybody could see the demo, regardless of their physical proximity to the stage.

X-Days was when I had my first glimpse of the DX7 Mark II, RX5, and TX81Z, but I was also intrigued by a packaged system called X-Art (known as the Studio 100 system in the U.S.). This is an apartment-sized music center (drum machine, synthesizer, sequencer, and powered monitors), mounted on a self-contained stand and clearly intended for the "potential musician" market. This is a brand new marketing experiment, and no one knows whether this approach will get more people into music—but the concept looks promising.

THE AKIHABARA

After X-Days it was time to check out the Akihabara, an electronic musician's dream come true. This is the electronics section of Tokyo, and you can buy everything from a single resistor, to one of the 40 billion (well, okay, maybe only 35 billion) different types of portable cassette players, to a professional quality video setup. Dominic Milano (*Keyboard*'s editor and traveling companion for the trip to Japan) and I spent several hours there and had a blast. Although neither one of us spoke Japanese, we could pretty much figure out what was going on with the various pieces of gear. Dominic is a Compact Discoholic (and I'm getting that way), so we spent a lot of time at the various CD shops. But it was at the consumer electronic stores that we encountered some of the most interesting phenomena.

First, LaserVision discs are very big in Japan. This is in keeping with the Japanese "hi-res" society; despite being

After completing mixdown and consulting work for several album projects, ***Craig Anderton*** *is putting the finishing touches on* Eden, *a collaboration album with pianist Spencer Brewer.*

A worker inspects one of the first RX5 drum machines off the assembly line.

stuck with the NTSC protocol, their TVs looked—well, sharper. Beta is still a popular format over there due to its superior picture quality (as quality seems of major importance to the Japanese). In fact, the new Beta pro machine with editing was being advertised regularly on Japanese television, just like any other "consumer" item. Even the loudspeakers at train stations that blast out advertisements and announcements were clean and crisp. Japan is a neat society—litter and graffiti were virtually nonexistent, even in the big cities—and that seems to carry over to the quality of electronic gear as well.

Second, Dominic and I found these great little $500-$600 video processors, sort of like a Fairlight CVI Jr. I've never seen anything like this in the U.S. but I sure hope to soon. With these units you could adjust colors in just about any way possible, do wipes, dissolves, fades, titling, or create interesting geometric patterns. One even had this curious little box attached, and Dominic surmised that it was some kind of scanner. He pulled out a photo, we pushed some buttons, and presto—there was the photo transferred to the TV screen, and it took only a few seconds. We re-painted some of the colors, and then figured out how to superimpose the stock TV signal in the blank parts. Wild! With one of these and a decent personal computer, you could take over the budget video world.

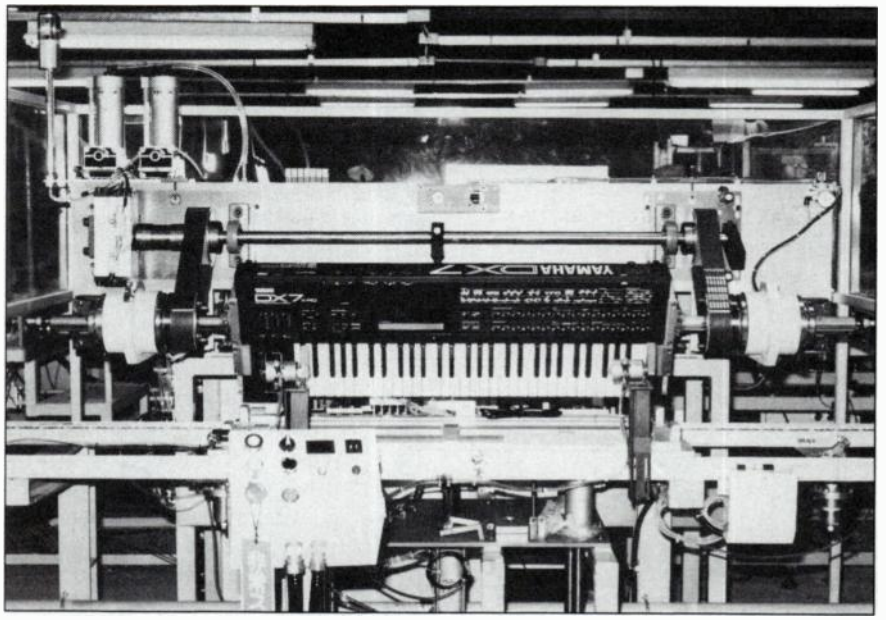
Third, there was a ton of computer stuff. Apparently NEC (a large Japanese company) dominates the industry over there, thus creating a de facto standard for software. Some sources estimate the market share for NEC and compatibles at 60 to 70%, and as a result, some good music software is available for these machines. However, many homes have MSX computers, and it was estimated that more than half of the computers used for music applications are MSX types. (Curiously, like LaserVision, MSX computers have had virtually no impact in the U.S.) Rounding out the personal computer scene are a bunch of dedicated game machines that play the usual Intersteller Adventurer/Destroyer type games.

HAMAMATSU

After Tokyo, it was time to go to a "small" city (*only* 1.4 million people). Hamamatsu is home to not only Yamaha but Kawai, Korg, Roland, and other Japanese musical instrument manufacturers. Here we had a chance to visit some of Yamaha's musical instrument factories and talk with Mr. Karl Hirano, part of the engineering team that developed the original DX7 as well as the new DX. We also had a chance to meet Mr. Nobuto Tojima, head of Yamaha "Light Music" products worldwide. Light Music (LM) is what Yamaha calls products like the X-series stuff (electric guitars, drums, pro audio) as opposed to trumpets, pianos, home keyboards, and so on.

I never realized how large Yamaha is. They started producing their first instrument—a reed organ—in 1887 (their hundredth birthday will be in October). They did 350 billion yen (about $2.18 billion at current exchange rates) in business last year, of which about 55% was from musical instruments. But Yamaha also makes LSI circuits, consumer audio gear, skis, furniture, motorcycles (of course)—and even runs a series of resorts around Japan that serve as both vacation centers and as test sites for their products.

I was particularly eager to see Yamaha's piano, brass, and LM product factories because of the interest in this country concerning Japan's high level of pro-



A robot flips over a DX7IIFD prior to final checkout.

ductivity. I imagined hundreds of people frantically running around, slapping products together.

The reality, though, was very different. The assembly lines had robots doing whatever tasks could be done by robots; the people took their time and were very deliberate. When a worker picked up part of a DX7 and put it on the line for assembly, he or she would first look it over carefully, sight down the piece for straightness, maybe wipe off a smudge, check for any burrs or other problems, and generally make sure that all was perfect before proceeding. There was clearly much care taken in the work being done.

> **"When the robots went by, they played simple tunes to warn people to look out"**

There was a large readout or monitor above each assembly line for the various products showing the production target for the day, how many had been made so far, and whether the line was ahead of or behind schedule. Although most of the time the lines were on schedule, there was no change in attitude for those lines that were behind—no one ran around saying "speed it up."

There were a couple of other nice touches. Several robots carried parts or assemblies along little tracks; when the robots went by, they played simple tunes to warn people to look out. It was difficult to tell the managers from the workers, as they wore the same clothes and were physically in the same general area. At one point I saw a group of people sitting down at a large table in a separate room. The room, though, had clear walls so even these people weren't isolated from the factory processes. I thought they might have been software engineers, but when I asked, I was told they were the quality control and efficiency people, and their job was to work on new ways to streamline and improve the manufacturing process.

I would be reluctant to draw any sweeping conclusions on the state of Ja-

panese industry based on one day's experience. But the same kind of care that I saw throughout Japan—the same attention to quality and detail—was very evident in the production of musical instruments. I was also surprised at how few people were required to assemble something like a DX (although the job of circuit board manufacturing, parts stuffing, tooling, and fabrication was handled elsewhere). Interestingly, the experience reminded me of my visit to Peavey Electronics in Mississippi, which is also highly automated and seems to have motivated workers.

While at Hamamatsu, I also visited one of Yamaha's Pulse Music Centers. This is a not a store, but a place where customers can get hands-on experience with Yamaha gear, or go for lessons after the sale. Classes are held for keyboard technique and also for how to use electronic music studios, including the art of recording. Incidentally, this was a very classy operation in a beautiful suite overlooking Hamamatsu, with sufficient facilities to present lectures and handle numbers of students on both an individualized and class basis. I was really quite impressed with how much Yamaha works to get their message across to the public that music is fun, and of course, they also try to get across in their message that it's even more fun if you play Yamaha gear.

Dominic and I then got a chance to talk with Mr. Harry Suzuki and Mr. Karl Hirano, LM division engineers. Mr. Hirano was very generous in telling us anything we wanted to know about the DX. As we wanted to know a bit about the philosophy behind the new DX, our questions started there.

The Debut Of The DX Mark II

Apparently there were three major design directives for the new DX7. First and foremost, it had to retain complete voice and cartridge downward compatibility with the older DX7. Second, it needed to provide at least some features that were missing from existing synthesizers. Third, it had to serve as a good master MIDI keyboard in its own right. Another design goal was to incorporate some of the features that had been used in other Yamaha gear or competing synthesizers, but not in the DX.

The first requirement was addressed by retaining the same algorithm/operator architecture as the DX7. However, the internal processing now uses 16 instead of 12 bits, which dramatically cleans up the quality and clarity of sound. Another goal was to store more data on cartridges yet retain compatibility. The new RAM 4 cartridge stores 64 voices and 32 performance data parameters (the same storage as the instrument itself), but old cartridges can be used with a simple adapter.

I had always wondered what induced Yamaha to add microtonal capabilities to the new DX. It all started with a conversation between Mr. Hirano and American composer Max Matthews, who asked why the DX didn't include microtonal capabilities. Yamaha realized that microtonal hardware had not been well-accepted, even though it had been made available in some other instuments (Synclavier, Prophet-5, Yamaha GS instruments) but went ahead and included this feature anyway, since they figured microtonality would give "new vistas" to musicians. The DX7 II has 11 preset tunings (including eighth-tone, quarter-tone, mean, just, and several other tunings) and two-user programmable scales. However, additional custom scales can be stored in a separate RAM 4 cartridge (scales are not stored in the same cartridge as voices) if desired. The general procedure for memory management is to load in scales from a "scales" cartridge, remove the cartridge, plug in the voice cartridge, then load in your voices. The 14-bit tuning resolution gives 1.17 cent resolution. (Note: Fractional scaling parameters, discussed later, are stored in a manner similar to alternate scales.)

> **"I had always wondered what induced Yamaha to add microtonal capabilities to the new DX, and got to find out"**

Another new feature, at least for the DX7, is dual and split modes. The split is a true split and does not require elaborate scaling rituals. Each split, as well as each layer in dual mode, can be accessed by its own MIDI channel for "duo-timbral" MIDI operation. Like the DX7, the new DX has

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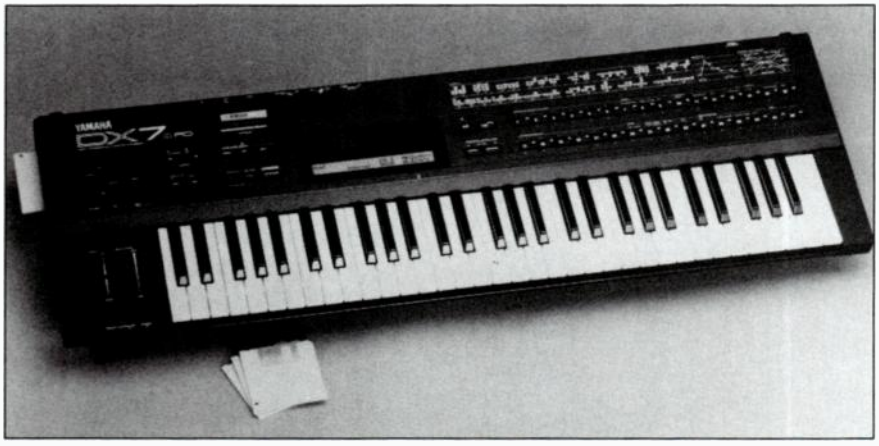

Yamaha DX7IIFD FM digital synthesizer with floppy disk drive

16 voices, so you can play with eight-note polyphony in dual mode. There are also two unison modes. *Unison mono* layers four notes on one key and you can activate only one key at a time, while *unison poly* layers four notes on four keys. This provides four-voice polyphony with a very thick sound, further enhanced by the addition of a random detuning option (to "spread" the voices a little bit for a fatter sound), and by multiple LFOs (one for each voice). While the LFO delay and phase parameters can be different for each voice, the speed is the same for all LFOs. These new features thicken the sound to resemble what you would expect from a good analog synthesizer.

A more radical new feature is panning. Panning can be triggered by envelope, velocity, aftertouch, note number, pedal, etc. In dual or split mode, each split or layer has its own output, and panning creates a crossfade between the two (for example, as one split fades out, the other fades in). As with the microtonal capabilities, I hope more companies start including dynamic panning (not just panning caused by voice assignment algorithms) in their instruments.

Fractional scaling is another whole new kind of animal. The traditional DX scaling parameters are still available, but now you can create a scaling where the curve changes every three notes. And these can be radical changes, I might add that Yamaha consultant Gary Leuenberger demonstrated a patch at X-Days that alternated between French horn and trumpet every three keys. This can also be used to create "stretch" tunings (talk about a realistic piano sound!).

The new DX also has some new expressive capabilities. There are two continuous slide pot controllers (called CS1 and CS2) that can be assigned to any parameter in edit mode and subsequently accessed in play mode. When the Mark II is acting as a master keyboard, these can also be assigned to any of the MIDI continuous controller numbers and send real time parameter change data over MIDI.

> **"The idea was to allow the musician to set up all the MIDI instruments of a large setup quickly and easily from a single DX"**

One useful application is to crossfade between patch sounds. Along with the existing aftertouch and velocity capabilities, these options allow for quite a degree of expressiveness.

Another useful master controller function is the ability to map program changes over the MIDI output. For example, punching up program 50 on the DX could be mapped to any of the MIDI program numbers for calling up patches on other expander modules or, perhaps more importantly, signal processors. (Yes, you can now use a MIDIVerb with a DX7 and access *all* the programs.)

One convenience feature I was particularly glad to see was the backlit LCD (all right!) but Yamaha has gone one step further by including seven-segment LEDs to show the program number. Not only can you see what program you've selected on a dark stage, you don't need 20/20 eyesight to do so.

Perhaps the most significant feature is the inclusion of a 3.5-inch floppy disk drive. Using MS-DOS formatted disks, the drive can hold 1 Meg of data (unformatted). This can be voice data, or if you're using the DX as a master keyboard for a large MIDI system, you can also store all kinds of MIDI and System Exlusive data. According to Mr. Hirano, the idea here was to allow the musician to set up all the MIDI instruments of a large setup quickly and easily from a single DX. The inclusion of the drive means that you'll have to be a little more careful about transporting the DX, but the DX series has had an excellent reliability record overall and this shouldn't be a serious problem. For those who are superstitious about disk drives, another model is available that is identical except that it lacks a drive.

Officially, the two new DX7 models are designated the DX7 IID (D for dual) and DX7 IIFD (FD as in floppy drive). As of this writing, prices have not yet been set but I assume that the IIFD will cost somewhat more than a standard DX—I'd guess somewhere in the $2,400 range, but that is only a guess.

By the way, the DX Mark II models will come with a ROM cartridge that contains 128 voice data programs and 64 performance data programs—nice. I've also been told by Yamaha that they expect to work fairly closely with software developers to insure that existing software products will work with the new DX products. That's good news for all of us with voice editing programs who don't want to go out and buy entirely new versions—hopefully upgrades will be available.

The TX81Z

While the DX7 Mark II is getting most of the attention, Yamaha had some other

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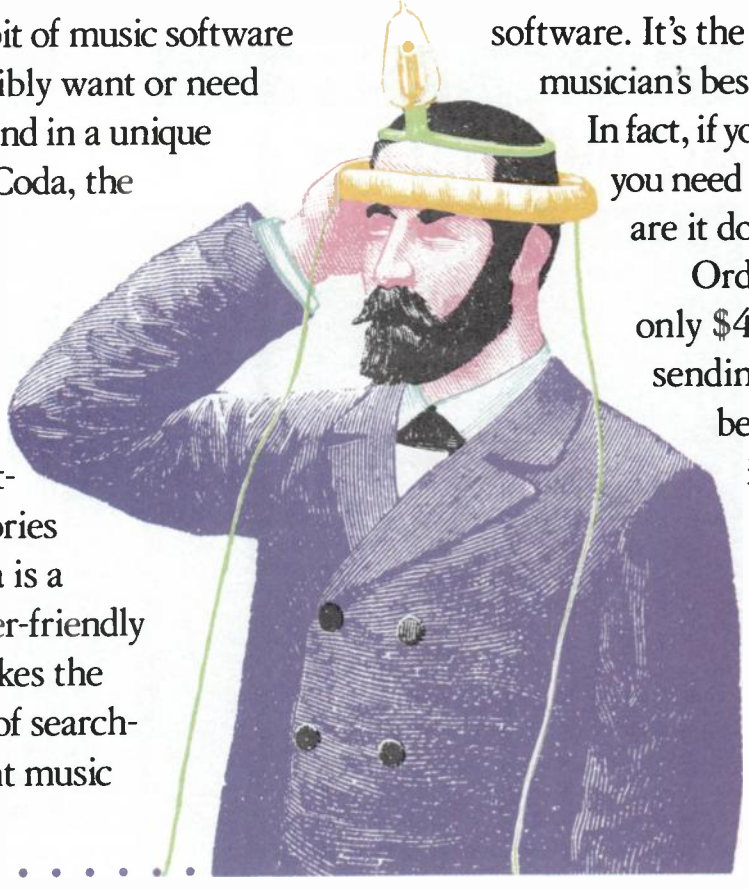

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new products of potentially equal significance. The TX81Z is similar to the FB-01 (four-operator, eight-voice, multi-timbral), but includes some very useful new features. There are 24 performance memories that store MIDI setups, 128 factory preset voices, and 32 user-programmable memory slots. Although voice data is compatible with the DX21/27/100, the internal bit architecture has been bumped up to 12 bits, thus giving it the same sound quality as the old DX7. The front panel allows for full programming and editing, and—get this—you can do FM synthesis using eight different operator waveforms, so you're no longer limited to sine waves. There's also a simulated reverb effect that lengthens the decay by slowing down the envelope generator release rates when the operator level falls below a certain point.

Like the new DX7, the TX81Z provides 11 preset and two user-programmable alternate tuning scales, panning, and the ability to play four notes in response to a single MIDI note-on command. Another special effect, Transposed Delay, lets one note trigger a delayed, transposed note with variable delay time, transposition, number of repetitions, and velocity. All TX81Z memory slots can be mapped to any of the 128 available MIDI program change numbers, which makes life much easier when using a master controller. Finally, there's a rear panel cassette interface which we can use as we await the emergence of librarian software. The price will probably be around $500.

Other Products

I saw some other products of note at X-Days, but didn't have time to get too many more details at Hamamatsu. For starters, Yamaha has a piano with MIDI Out (not surprising) and MIDI In (very surprising). The MDF1, a MIDI data filer, seems similar in purpose to the disk drive in the new DX but is a stand-alone unit that stores up to 19 files (60K) of MIDI bulk data on a Quick Disk. For guitarists (and others), the MFC1 MIDI controlled footswitch allows for the sending of program change commands over MIDI via foot control.

But one device was totally unexpected: the RX5 drum machine, which I also saw briefly at Hamamatsu. As the product is very new, details weren't easy to come by. What I do know is that there are 64 total voices with individual tuning, level, and full sample editing. Not only pitch, but a five-parameter-with-gate envelope can be modified and stored as voice data. There's also a cool "reverse" button that can program in a reversed drum sound. Any voice can be mapped to any of the unit's drum play buttons. The buttons are not velocity-sensitive, but the RX5 will receive MIDI data with velocity and this can be recorded as part of the pattern (unlike many other drum machines, where if you send in MIDI data, the drum machine is relegated to being used as a "dumb" peripheral). Increased velocity also lengthens the envelope to more closely simulate an acoustic instrument. In addition to programmable levels, there are 12 individual faders and outputs (different voices are assigned to different outputs). There are also multi-pitch and multi-level settings for individual drums, just like E-mu's SP-12, where one drum can be spread over several play buttons, with each button exhibiting a different tuning or level. Or, drum sounds can be set up to be played over the full length of a MIDI keyboard. Drum patterns and voice parameters are saved in the RAM 4 cartridge—the same cartridge used with the new DX7s.

Finally, the RX5 will sync to MIDI and FSK and accepts song pointer. Overall memory capacity is 100 patterns, 20 songs, and three chains of songs (although I'm sure that like most drum machines, if you program patterns with any significant degree of complexity you will run out of memory before you run out of song or pattern space). The RX5 looks very promising; we will be doing an in-depth review in a later issue of EM.

Moving On...

Much more could be said about my experiences in Japan: the temples of Kyoto, the *excellent* seafood and cuisine, the tightly structured and consumer-oriented nature of the society, the smiles of both appreciation and amusement when I tried to speak Japanese, the acute interest in Western culture, and most of all, the friendliness and genuine warmth of the people...but I think it's time to wrap things up.

I would have liked to have stayed a while longer, as I felt very comfortable in Japan. In fact, I wouldn't mind at all if some of the Japanese attitudes rubbed off on our culture. Hopefully as East continues to meet West, each society will learn from the best characteristics of the other. EM

It's every musician's dream: To be successful and, best of all, work in the comfort of your own home. Jan Hammer lives that dream, but it took a lot of hard work to get there—and it takes a lot of hard work to stay there.

Jan Hammer's Electronic Cottage

BY CRAIG ANDERTON

Jan Hammer has long had a reputation as a musician's musician, but it took his landmark soundtrack work for Miami Vice *to bring widespread recognition of his intriguing blend of rock attitudes and jazz finesse. From his days in the original Mahavishnu Orchestra, when he processed his electric piano through a ring modulator, to his current experimentations with sampling, video scoring, MIDI, and SMPTE, Jan (pronounced Yahn) is not afraid to learn about and become fluent in new technology. But he believes adamantly that technology must retain its human touch and always place musical value above technological dazzle.*

If you've thought of Jan as simply "the guy who makes his keyboard sound like a Les Paul through a stack of Marshalls," you're in for a pleasant surprise. This is a musician with a wide range of interests and styles who retains a natural sense of curiosity and remains unspoiled—but feels vindicated—by his success. Right now Jan is sitting on top of the world: he's had a number one single, a lucrative TV gig, and turns down more offers than most people accept in a lifetime.

Yes, it sure is amazing what can happen once you set up a home studio . . .

EM: *Is your home studio more to you than just a place to do pre-production?*

JH: Yes, everything is done here, right to the final mix.

EM: *When did you first get into home recording?*

JH: It has been an evolving thing. A studio always starts out very small, and before you even put your foot in the door it begins to grow (laughs). Originally, it was going to be an extension of what I had in my living room in New York, based on a Sony 4-track I used for audio sketches. Then I thought, if only I had a large space where I could record a band, and drums. So my partner, Gene Perla, and I started looking for a large house in a remote location. We had to get an hour away from the city (New York) to get enough isolation. By the time we started the move, the studio was no longer going to be four but eight tracks. The first album done at home was with (jazz drummer) Elvin Jones (*On the Mountain*) . . . we had sawdust on the floor, wires running all over the place, totally homemade. After things got more permanent, I started doing my album, *The First Seven Days*.

EM: *Did you have to do soundproofing, or run separate electrical lines?*

JH: The separate electricity came later when we started getting pops from the refrigerator and stuff like that, but we tried to do soundproofing from the beginning. With a wooden structure there's only so much you can do, and we knew it would be silly to build a shell inside, to

PHOTO: GEORGE PETERSEN

At the recent Audio Engineering Society Convention in Los Angeles, Jan Hammer explained his post-production scoring techniques used on Miami Vice.

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totally "float" the structure. So all we really did was put a lot of fiberglass insulation in the wall, treat the surfaces with non-reflective material, and suspend a ceiling and fill it with rockwool. That was the best thing we did, because the music hardly travels upstairs. As far as low notes go, though, they vibrate the whole house. It's a wooden house; there's no way you can stop that.

EM: *Do you work with any assistants? Or do you do everything yourself—engineer, produce, compose, play, mix?*

JH: Everything.

through a door to get to my keyboards. I want to tear down a wall, but my schedule's so hectic I haven't had a chance to do that.

EM: *How do you keep current on technical subjects such as SMPTE, MIDI, synchronization, and all that?*

JH: Sheer necessity! MIDI was simple; SMPTE I had to learn because I realized I couldn't score movies or television just by watching a VHS cassette and running wild and trying to count seconds. I wouldn't be as good or fluid in the studio if I hadn't found SMPTE fairly early on in my career. That enabled me to create music independently from the scene I was working on. If I had to use traditional methods, by the time I would figure out the beats per minute and individual hits for specific moments, I would probably lose my inspiration for the music itself. With SMPTE I can really play things wild, and then conform them later to the visuals by sliding the music's timing against specific scenes via SMPTE. I can find a particular spot in the music that really feels great with a particular scene or shot, and then synchronize it from the middle point forward and backward. In the old way, you could work from the start point only.

EM: *How does your recently-acquired Fairlight Series III fit into your video/audio production?*

JH: It's phenomenal. I'm just totally blown away by it. I was sold on the Fairlight initially with the old Series IIX because of the combination of sampling and different modes of sequencing, which are so well-suited to a musician-like approach. Even though the instrument still looks a bit foreboding—it seems like you can only get to it through the alpha-numeric keyboard—that's not exactly the case. There's so much real time interaction, and it's so well thought-out, that once you

"I actually had to buy a Commodore-64 because I discovered this program that Dr. T makes, the Algorithmic Composer. I'm totally sold on it, I'm crazy about it, I use it all the time"

EM: *Do you ever miss interacting with people?*

JH: Yes, I do, sure. . . but not enough to actually go and seek out someone (laughs). I miss it only occasionally, and more in terms of musical interaction. As far as working with an engineer or producer or someone like that, I find it *more* difficult to work with them. The way I work is very instinctive and experimental; I try lots of different things. It's like "throw it up against the wall and see what sticks," and much of it sounds very mundane. I could not do that very freely with someone just sitting here doing a job, like watching the meters. I would feel that I was being judged, with the direct result being that I wouldn't really let go.

EM: *Is there anything you miss about big studios?*

JH: I could definitely use a bigger control room. The studio here was conceived in the old style large-room-for-playing, small-room-for-mixing-and-monitoring. Now, though, it has turned into one large keyboard environment; I've long since taken out the window so there's no longer any isolation between the two rooms. But I still have all my musical instruments and keyboards on the other side of the window, so I have to work in a sort of "split" mode and walk from the console

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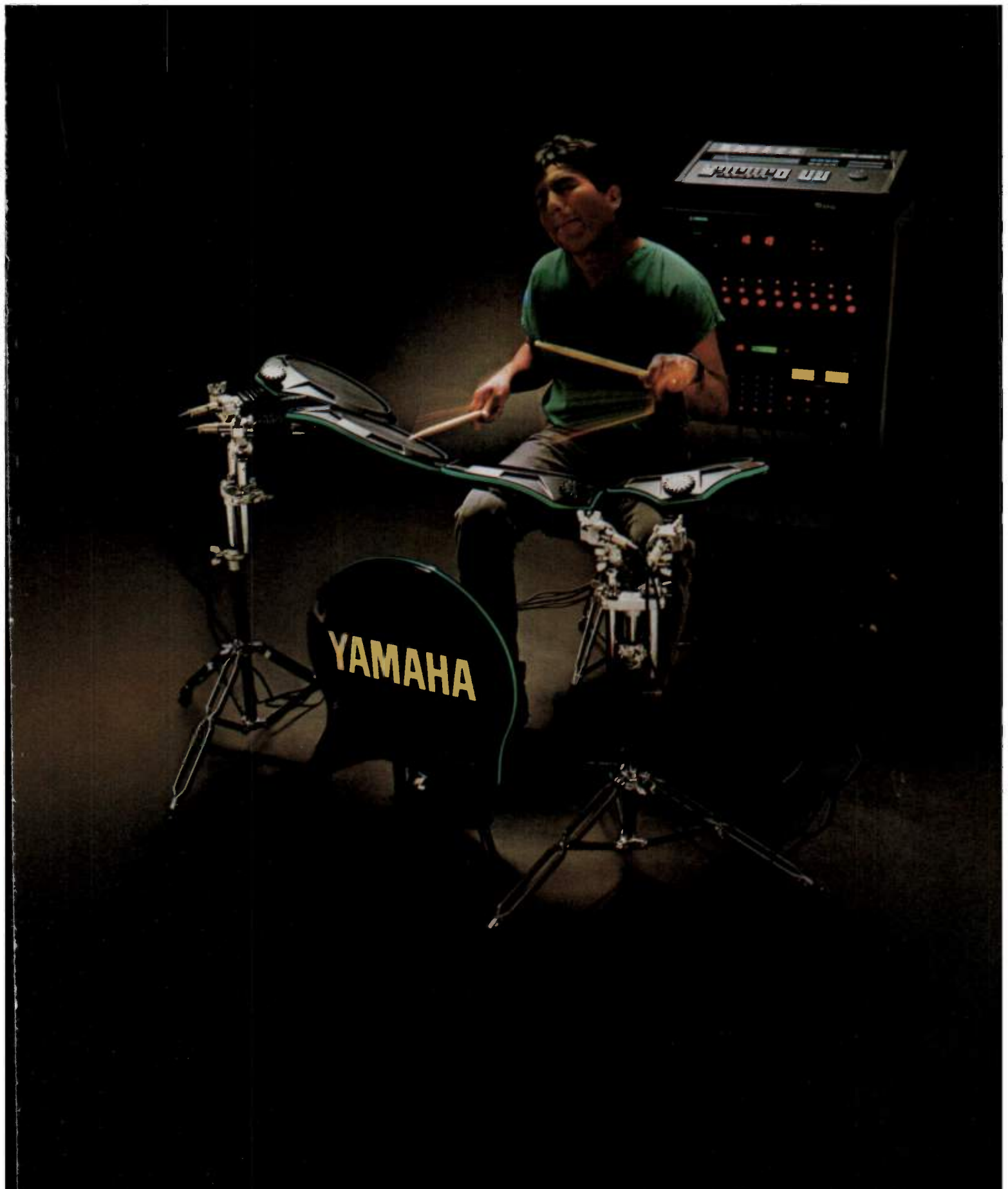

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EM: *So you'd say it has good human engineering?*

JH: Yes, that's the bottom line for me.

EM: *Does the sequencer form the basis of your compositions?*

JH: Compositions happen differently every time. Lot of times I've started from a rhythmic nucleus...a typical drum machine approach, using my own drum sounds in the Fairlight, but still the approach where you create an interesting drum beat and go from there. Or it could be a percussion section, samples of real exotic instruments, and creating Cuban, or Haitian, or Asian rhythms...with those patterns, you have a continuum on which you can float.

EM: *Considering how much you have to create, how do you avoid writer's block?*

JH: (Laughs) It's not always easy. It sounds very flippant to say you prevent writer's block by not worrying about it, even when you feel it's actually there. You just have to accept it's there and move along. Basically, I think it comes down to not trying to force things.

It's also good to keep ahead of yourself in the sense that any time there's an idea that strikes you, even though it may be totally unrelated to the project you're working on, it's worth taking the time to record the idea or store it in a sequencer for later use. It's not a waste of time, especially if you're having trouble as is, because you are still spending your time productively. Why beat your head against the wall and try to work on the project at hand when you can work on something that will be useful down the road?

EM: *Do you find that working at home makes creating a lot easier?*

JH: Absolutely. That is the only way I could dream of finishing everything on time, week in and week out. It's another thing when you work on an album and you have a year to make it. Here within the space of five months I have to finish 22 episodes. It doesn't leave you any time to second-guess yourself or anything like that...

EM: *Or commute to a studio...*

JH: Forget it! No way. If I lived in the city, walking across the street every day would be hard enough.

EM: *Do you find it hard to leave the studio behind and just relax when your work is done?*

JH: I can forget about the studio, but not the music, and I don't think that's something that can be cured...not that it's a disease in the first place. It may be a blessing as some people see it, and I'm certainly not upset with having this problem.

EM: *Do you ever get a hot idea at 3 a.m. and run into the studio?*

JH: Yes, but I haven't done it much lately because I'm so tired. The kids (Hammer has two children) get up at 5:30 and claim it's day, even though it's still pitch black outside. You have to flow with the punches, so most of my work these days is done during regular "banker's hours."

EM: *Do you have other ways to increase efficiency?*

JH: There are remotes everywhere at strategic locations. Automation helps too. Along with synchronization, the type of automation I've started using for over a year—the Sound Workshop Disk Mix—is so fantastic. I've worked on just about every console, and have found this the most straightforward and thorough way to automate mixdown. Everyone who's thinking about automation should give this system a look.

EM: *That leads us into the obligatory boring question: What equipment do you have in your studio?*

JH: I'm still working with good old analog, an Otari MTR-90 (24-track) about which, again, I have nothing but good things to say...especially in this world of synchronization. And the way it handles tape, because there's no pinch roller or anything. The mixer is a Sound Workshop

Jan Hammer Selected Discography

Nemperor Records:
Like Children, 1974 (solo)
The First Seven Days, 1975 (solo)
Oh Yeah, 1976 (Jan Hammer Group)
Melodies, 1977 (Jan Hammer Group)

Elektra/Asylum:
Black Sheep, 1978 (Hammer)
Hammer, 1979 (Hammer)

Columbia:
Inner Mounting Flame, 1971 (with Mahavishnu Orchestra)
Birds of Fire, 1972 (with Mahavishnu Orchestra)
Between Nothingness and Eternity, 1973 (with Mahavishnu Orchestra)
Love, Devotion, Surrender, 1973 (with Santana & McLaughlin)
Elegant Gypsy, 1977 (with Al Di Meola)
Splendido Hotel, 1980 (with Al Di Meola)
Untold Passion, 1981 (Neal Schon & Jan Hammer)
Electric Rendezvous, 1982 (with Al Di Meola)
Here to Stay, 1983 (Neal Schon & Jan Hammer)
She's the Boss, 1985 (with Mick Jagger)

Epic:
Wired, 1976 (with Jeff Beck)
Jeff Beck/Jan Hammer Group Live, 1977 (with Jeff Beck)
There and Back, 1980 (with Jeff Beck)
Flash, 1985 (with Jeff Beck)

A&M:
A Night in Heaven, 1983 (original motion picture soundtrack)

MCA:
Miami Vice, 1985 (original television soundtrack)

Series 34 with the Disk Mix package I mentioned that runs on an IBM computer. As far as outboard gear, I use different digital reverbs, the wonderful Ibanez SDR-1000 that I do endorse—I'm not compelled to mention it, but I will—other than that, the Fairlight. To call it a musical instrument is to do it an injustice. It does so many things. I did a raunchy piece of rock and roll a couple of weeks ago, and sampled a 55-second "guitar-like" solo, reversed it, and play different sections of the solo backwards from the keys. That's just one little thing the Fairlight can do for you. You could use it on records to fly in stereo sub-mixes of background vocals or whatever—record a verse, mix the whole thing in stereo, and fly it in.

EM: *Do you still play the DX7?*

JH: Oh, absolutely. I'm sure everyone into electronic keyboards realizes that sampling, and sampled sounds—as great as they are—by themselves don't lend themselves so well to live playing. They are not as interactive as, let's say, a really good FM synthesis sound model would be... all the way down to the way the harmonics behave. I play the DX7 a whole lot.

EM: *Do you play any analog synths?*

JH: I play the Memorymoog, but I have only one and since they're getting very cheap, I'm going to have to stock up. I think that's about the best-sounding analog machine for my money. I also have the Oberheim Xpander, Jupiter-8—the old one with the random arpeggiator, one of my favorite toys. I don't understand why we don't have more MIDI arpeggiators. For sequencers, on the IBM I have Roger Powell's Texture, which is quite incredible.

EM: *You use that as well as the Fairlight?*

JH: For certain things, they really complement each other and with MIDI it's so straightforward to play things across to each other (i.e. transfer tracks from one sequencer to another). So if you like one mode of editing better than another, you can always switch sequencers as needed.

Going from the completely sublime, which the Fairlight is, to the ridiculous, I actually had to buy a Commodore-64 because I discovered this program that Dr. T makes, the "Algorithmic Composer." I'm totally sold on it, I'm crazy about it, I use it all the time. I'm able to get so much out of it that I don't think they even realize what it does. When people talk about it, they think it's more like a glorified toy. Well, not for me! I think it's an incredible tool. Especially if you can play what it generates into a sequencer like the Fairlight, and then edit it. It does some counterpoint things that are so off the wall, and you just clean them up.

EM: *Do you have any other favorite programs like that?*

> **"Sampled sounds are not as interactive as, let's say, a really good FM synthesis sound model would be... all the way down to the way the harmonics behave"**

JH: I'm waiting. Really, I'm looking for... well, for lack of a better description, you know the auto-play functions on all the toy synthesizers? Sort of one-chord play. That's silly. Now, if you could add a random factor to it, and balance the random and the degree of control... those elements are still missing from current sequencers. We're ready for that. You talk to software people, right?

EM: *Yes.*

JH: Let's convince them to do an interactive arpeggiator. Like a new generation of the Jupiter-8, with modes that would, you know, let you map things around.

EM: *Is interaction what you see as most lacking in current software and sequencers?*

JH: Yes, absolutely. It's nonexistent. I don't want to always have to figure out things ahead of time; I want to be able to play, and have the thing play back at me.

EM: *And come up with its own ideas?*

JH: Yes. And do it all in real time so there would be a merge of your keyboard, and the sequencer. It's really something that has been totally forgotten, and it could be expanded on tremendously.

EM: *Speaking of ideas that could be expanded on, are you going to edit down what you've done for* Miami Vice *into an instrumental album?*

JH: I hope that I can do something like that, perhaps in late spring of '87. Obviously, everybody's worried about it conflicting with the "official" *Miami Vice* album. The first one was such a smash, and now the second one is out. But I think there is definite interest in just the instrumental music—basically, my input to the show.

EM: *Do you think record companies don't have a handle on how to sell instrumental music?*

JH: Absolutely. (Laughs) So what else is new? And I think there's a reason for it—songs are such a mass media concept. The impact of instrumentals is totally underestimated by the marketing forces and the accountants. It's unfortunate. But every now and then something sneaks through; I was lucky that my thing snuck through. You don't know how much happiness that has brought me, how much satisfaction. Actually getting a number one single... it's fantastic! I feel justified, in other words, I got my satisfaction for all those years of being invalidated by everybody. Especially after I spent years trying to play rock and write songs, pop songs, and being told that I'm supposed to be a jazz-rock whiz. Which I was, but I'm no longer interested in it. Everybody just went on and ignored whatever I wanted to do. So here I am.

EM: *I suppose that's part of being typecast. Are you worried about the same type of thing happening with* Miami Vice*—that people will think that all you can do is score cop shows?*

JH: No, because look at what I do. It's rock, it has pop, jazz... it's contemporary instrumental music.

EM: *Since you have pretty eclectic tastes, what are your favorite albums?*

JH: That's really difficult to answer. Albums, as albums, really disappeared about 15 years ago. The only person who comes close in my mind, especially making *albums* the way I like them, is Prince.

EM: *Which of your albums do you like best?*

JH: Mine? (Laughs) Yeah, that's hard. (Pause) There was an album I did with Neal Schon (Journey's guitarist), called *Here to Stay* and it's a lot of really good rock and roll and good songs. I don't know whose fault it was, but everybody dropped the ball on that one so the record died. But there are too many good songs on it to let it go. That one is very close to my heart, really a rock and roll/pop album.

EM: *Are you going to continue with* Miami Vice?

JH: This is my last season. I said that last year too, but this year I mean it. There are too many good things that I'm passing by.

EM: *Like movie soundtracks?*

JH: Yes, movies, features, theatrical events . . . I want to expand, and I miss playing live. I had a chance to go out once this year with Jeff Beck. Neither of us had played live in three years, so we got together and did a tour of Japan in June. That was great, it was really a ball. I'd like to do some more of that.

EM: *Do you find playing live helps with composition?*

JH: It helps with everything, it helps with your well-being. For the type of musician that I am, you need that type of periodic recharge. The degree of fun that's involved totally outweighs all the hassles that go with live playing, especially if you've been spoiled by having state-of-the-art equipment in the studio and everything sounds so great, then you go on-stage and it doesn't sound so good . . . but the fun you get out of that is just immeasurable.

I wish I had more time, because Jeff really wanted me to produce his new album. But you know, the way he works it's probably going to be five years from now, so I still might get a chance to do it.

EM: *What do you think is going to be happening five years from now?*

JH: I'm wondering. I'm really intrigued with what's going to happen now that I have little kids. For instance, for Christmas my three-and-a-half year old daughter is getting a Casio SK-1, right? She can sample, do synthesis, she has PCM sounds in there that are great—I would have killed for them two years ago! And I'll probably borrow the instrument and sample some of the sounds into the Fairlight . . .

EM: *Make sure she gets to use it too . . .*

JH: Right! But really, I'm wondering what's going to happen to the new generation? That will start showing up in five years, kids who were brought up with all this stuff being around. There has been a quantum leap, and only a few people have assimilated all this new gear. First it was people who could afford it, but now prices are coming down to where things are ridiculously cheap. Once the new wave of kids take it for granted, I wonder where they're going to take it. I'm really excited about that . . . and I'm going to be listening! EM

Electronic music behind the Iron Curtain? While the conditions under which the music is made are not exactly ideal, some musicians manage to persevere.

Electronic Music Behind the Iron Curtain

BY ARCHIE PATTERSON

One of the greatest problems faced by the 20th century world population is a lack of knowledge. In spite of satellite links, mass media coverage and electronic journalism, most of us remain functionally illiterate in regards to the life and culture of most other countries. This is most certainly the case when it comes to the Eastern Bloc or socialist countries.

The times are changing, however. One of the main areas that reflects this process of change is music—a universal language if there ever was one. Rock spread through the cultural underground in the 1960s to all corners of the globe. Now in the '80s we have the synthesizer revolution changing all aspects of music; musicians in virtually every country can employ new technology in some way as they work out ways to expand their means of expression.

Their search, however, is undertaken within the context of a quite different situation than that of their fellow musicians in the Western countries. Before going on to chronicle the works of some of the main Eastern European artists, a bit of background on the working conditions there would be enlightening.

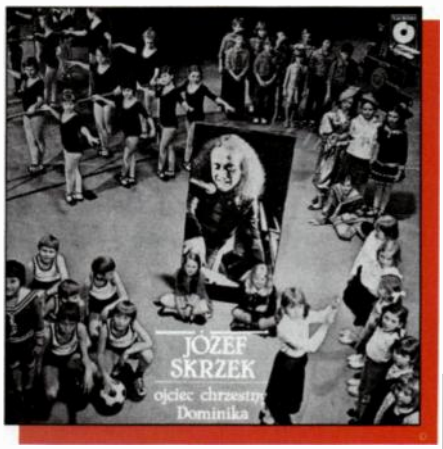
In most cases, the making of music in Eastern countries is primarily a hobby. You work a day job, save your money and buy some equipment (sound familiar?). What's available is either very expensive Western gear (via the black market for the most part), or expensive, nationally manufactured equipment sold through legitimate music stores. The situation is a bit different in Yugoslavia, which is a bit looser in terms of allowing free currency exchange, and Hungary, because of its open trade relationship with Austria that dates back to earlier times. In these countries you can obtain good equipment more easily, though it is still very expensive. The general working of the music "business" is somewhat more free as well, yet still under state control.

> **"There are several artists in the Eastern Bloc who are producing adventurous electronic music within the context of state-financed cultural programs and record companies"**

After gathering equipment, the next step is to practice and develop a repertoire to present at the twice-yearly auditions that are necessary to obtain a license. The major criteria for getting a license is two-fold—politically correct ideology with party membership being helpful, and musically, an emphasis is placed on the knowledge of music theory, ability to read music, and original composition. The imitating of Western pop groups is not acceptable. If you fail to pass the audition, you can try again or decide to be a non-professional; in the latter case the chance to play live or record is very limited. If you do play live it's in a small club or bar and you cannot receive any payment. As for independent record releases, for the most part they don't exist. In a few cases like the Plastic People and DG 307 in Czechoslovakia, groups are banned and arrested for their "anti-social" music/attitudes. In other words, there's little room for you to "do your own thing."

On the other hand, after obtaining a license a musician may have the opportunity to perform occasionally in small clubs or bars for a modest fee. Additionally, they can work to be able to record for the state record labels. Recording artists are subsidized and allowed to record free of charge, with no real pressure to be commercial for the most part. Record labels, pressing, distribution and promotion (on a very small scale) are controlled by the government, and exportation between East Bloc countries is well developed. Sales to the West, however, while possible, are done under relatively restrictive conditions and on a small scale. Over the years, some of the major, more established artists have developed the ability to make good money playing larger concerts and selling significant amounts of records. The "superstars" in Eastern

Archie Patterson is the editor and publisher of Eurock, *an underground magazine devoted to promoting and distributing progressive music from around the world ($8 for four issues; available from P.O. Box 13718, Portland, OR 97213). In addition, he lectures on "Music of the '60s" in the Portland Oregon Community Schools.*



Europe can sell anywhere from 50,000 to 100,000 records. Most groups, however, sell far less. A few Western records are licensed and released, but not very often and nothing that's considered politically controversial.

As this background indicates, unlike some of their Western counterparts, the life of Eastern bloc musicians isn't glamorous or easy. Some Western artists who have visited and played there have, however, had very positive experiences. Audiences react quite strongly; to some extent being a "fan" is a highly personal matter, and on the whole, music is taken more seriously. They aren't drowning in a flood of groups/records, thus the whole process of hype and mass marketing is nonexistent. Basically music is looked upon as part of an overall cultural program in the socialist countries, as opposed to being just another product to be sold in the capitalist marketplace. Ultimately, perhaps this different ethic in some ways allows for greater musical freedom and creativity in spite of the rigid structure of state control.

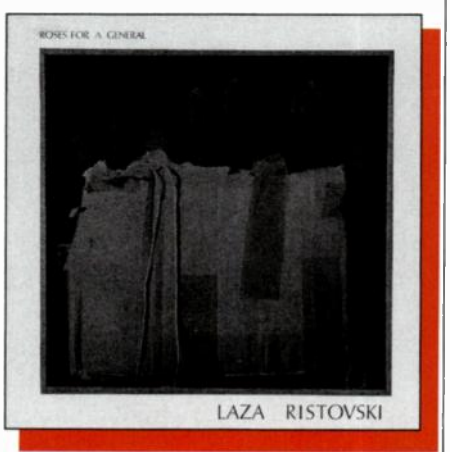
Today, in fact, there are several artists in the Eastern Bloc who are producing adventurous electronic music within the context of state-financed cultural programs and record companies. In most cases, their means are modest and technical capabilities relatively low, but as is the case with good musicians universally, they strive to fuse imagination with the physical creative process as they go off in search of the lost chord.

The following survey of socialist synthesizer music hopefully will serve as a small bit of musical detente. It should also give evidence that in spite of any differences, music does serve as a prime source of creativity and cultural communication throughout the world.

POLAND

The godfather of Polish electronic music is undoubtedly Czelaw Niemen, a Russian emigre who began in the late '60s by recording a series of adventurous pop records. Early on, his keyboard work began to assume epic proportions. *Enigmatic* was the beginning of a series of records that also incorporated synthesizer usage into his sound. With the release of three albums outside of Poland (*Strange Is This World, Ode To Venus,* and *Mourner's Rhapsody*), he gained some international recognition—especially when the latter was released in the U.S.

Niemen's musical climax came with his *Katharsis* album, which combined pulsing sequential patterns, rich melody lines, and his dramatic vocal phrasings to achieve a compelling effect. As conflict between the workers' Solidarity union



and the Polish government grew more intense, Niemen left the country for the U.S. and was last heard from playing benefits in Los Angeles during the height of the crises in support of the Solidarity cause.

Jozef Skrzek is a major artist still active in Poland today. He began his musical activities as the bassist for the trio who backed up Niemen during his middle period works. After five albums with him, the trio split off to become SBB (Search, Breakup & Build), the major group in the history of Polish progressive music and creator of a high-powered symphonic rock sound. The group's career spanned nine records characterized by adventurous stylistic fusions of classical, jazz, and rock instrumental music. Parallel to the group works and continuing after their breakup in 1982, Skrzek did some solo recordings whose easily intermingling sounds range from moody, impressionistic soundscapes to delicate, classical inspired melodies.

CZECHOSLOVAKIA

Marian Varga has been the leading keyboard/synthesizer music artist throughout the history of Czechoslovakian contemporary music. In the late '60s, he founded the legendary Collegium Musicum group, which featured a blending of classical and rock. Varga was greatly enamoured of the idea of merging classical themes and the spirit of rock music, and on their second album entitled *Konvergencie*, he created a masterful variation on the Rimsky/Korsakov opus "Scheherazade," which still stands today as one of the most interesting fusions of old and new music.

Varga continued working with the group through the '70s before finally deciding to concentrate on solo efforts in the '80s. His latest album, released in 1984 and titled *The Same Days Again*, was recorded primarily on grand piano and a variety of Roland synthesizers and contained one of the most impressive major works of his career, "The Anti-War Requiem," which reportedly caused some problems with government authorities.

YUGOSLAVIA

In some ways Yugoslavia is the most liberalized of the East Bloc countries; this is certainly the case with respect to their social structure in general, and music scene in particular. Two artists who are the main practitioners of electronic music are Laza Ristovski and Miha Kralj.

Laza Ristovski has produced three albums to date which make extensive use of Oberheim equipment and minimoog. All three are characterized by pulsing rhythmic motion and layered melodies rooted firmly in the German tradition. A major difference in Ristovski's works, however, is that everything is kept simple, instead of cosmological. An American comparison might be Michael Garrison's early works, with the addition perhaps of an injection of gothic East European angst into Ristovski's sound. In any case, it is catchy without being overly commercial, yet has an experimental edge to it that keeps it from being redundant.

Miha Kralj, on the other hand, adopts a more cosmic approach as the titles of his two albums imply: *Andromeda* (in my opinion, the more interesting of the two) and *Odyssey*. Of all the electronic musi-

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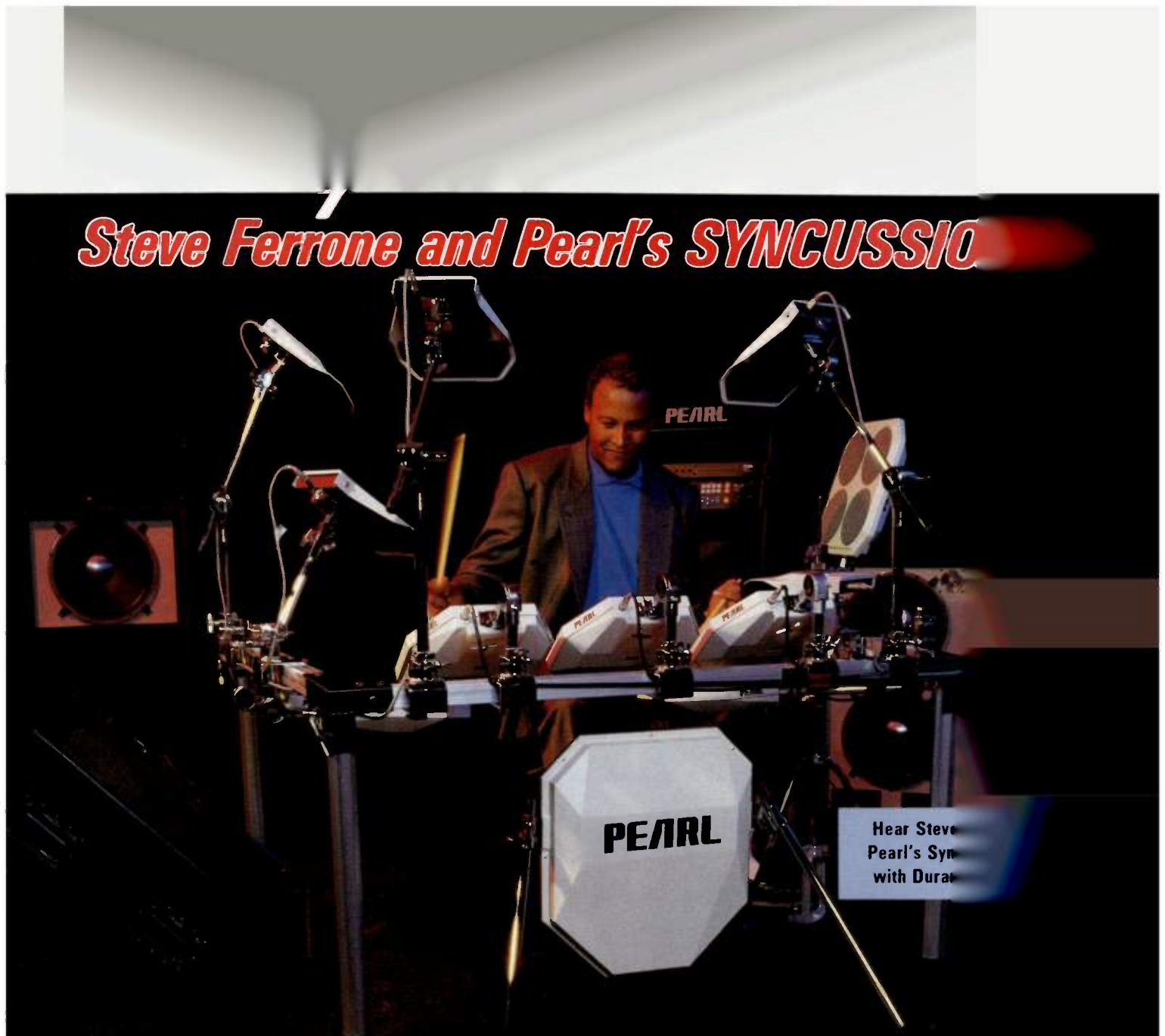

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cians mentioned thus far, Kralj has the largest arsenal of equipment at his disposal, as the credits list 16 various keyboards and synthesizers.

HUNGARY

The Hungarian socialist model is the most economically democratic of all the Warsaw pact countries. In fact, the most popular rock group, Omega, has even become extremely wealthy and set up their own private studio and production services to help other musicians with recording. Omega was/is the unquestionable musical kingpin of Hungarian progressive rock music. Their brand of keyboard-dominated rock laced with heavy guitar was especially popular during the mid '70s.

In the early '80s, group activity was cut back as the various members took time to concentrate on solo projects which involved electronic music. Keyboardist Laszlo Benko has been the most active, producing several records as well as releasing two albums of his own synthesizer compositions: *Lexikon I* and *Lexikon II*. Unlike many of the other Eastern

Bloc artists, he has the money to afford state-of-the-art equipment, and both albums feature top Roland, Korg, Yamaha, and ARP gear. As a result, the sound is sophisticated and this quality, along with Benko's keyboard/compositional talents, makes for a set of diverse, high quality tracks. Elaborate melodies and complex rhythmic arrangements intertwine to produce a very musical effort.

Other notable Hungarian releases are *Synthesizer Transcriptions* by Mihaly Tamas (Omega bassist), which features electronic interpretations of famous classical works (a la Tomita). P.R. Computer is a new synthetic trio whose debut album was produced by Omega vocalist Kobor Janos. It features Sinclair ZX81 and Spectrum and was composed with the aid of an IBM PC. Musically it can be described as adventurous synth-pop. Lastly, there's *Electromantic* by Gaboor Pressor, the keyboardist from Hungary's other internationally known rock group, Locomotiv GT. Of all the records out of Hungary, it has gotten the most exposure via a release in England as well. Reviewers even compared it to Vangelis in some cases, as it was given a relatively big push in terms of the electronic music record's usual low profile. Pressor's album does have some nice moments; however, comparisons with the Greek master of soundtracks don't hold up.

EAST GERMANY

Since the original synthesizer revolution began in Berlin with the likes of Edgar Froese, Klaus Schulze, and Konrad Schnitzler, you might think some of that energy would have drifted over the Wall. It wasn't until over ten years later, however, that the first electronic music production came out; Reinhard Lakomy's *The Secret Life* was released in 1981.

Lakomy previously was the keyboardist for a top East German jazz group. After the group split up, he took a couple years off from music and seems to have picked up new inspiration from Klaus Schulze, as evidenced on the three albums he has done in the last four years. *The Secret Life*, *The Dream of Asgaard*, and *Times* are perhaps the prime examples of synthesizer music to come out of the Socialist countries so far. The music is richly melodic and filled with powerful, surging rhythms that drift off effortlessly into floating soundscapes. Digital purists might not appreciate his analog sound, but Lakomy definitely is carrying on the spirit of the early days.

Although working conditions may be tough, all the artists mentioned above have managed, to some degree or another, to create their art. Perhaps auditioning for the state license isn't that different from doing a showcase gig for the head of A&R. In any event, as communications between countries increase, we probably can expect to see even more interest in electronic music from behind the Iron Curtain. EM

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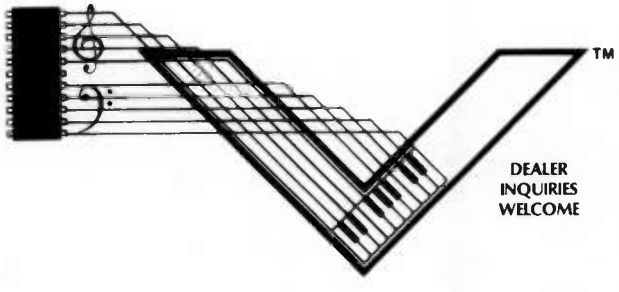

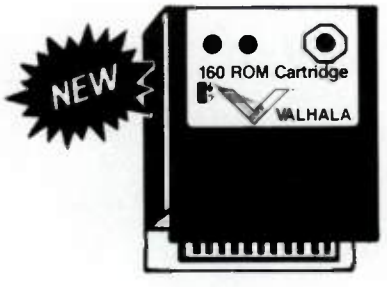

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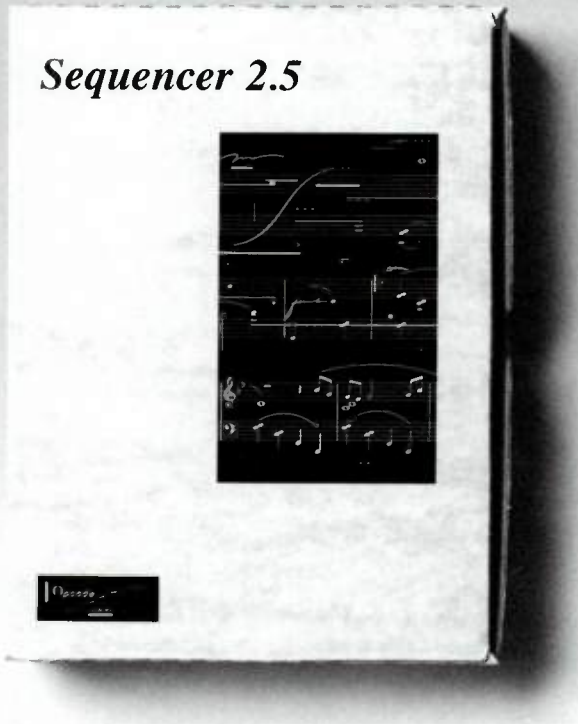

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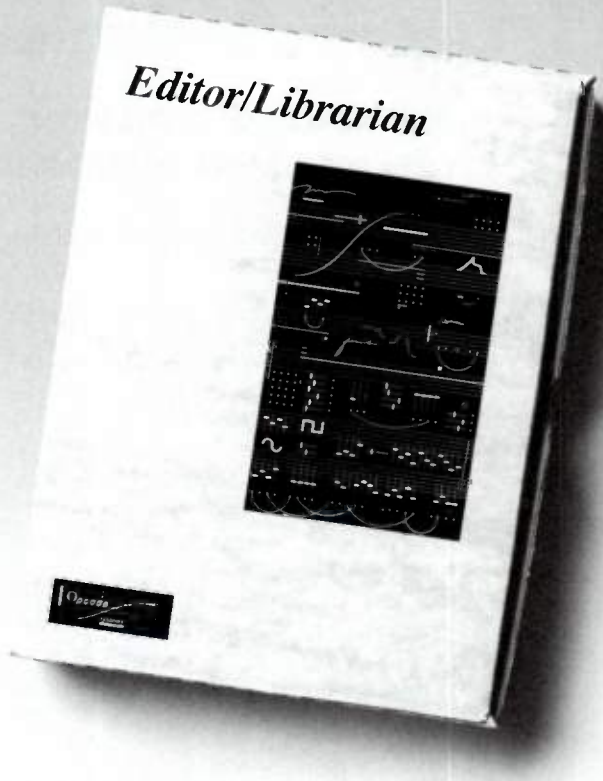

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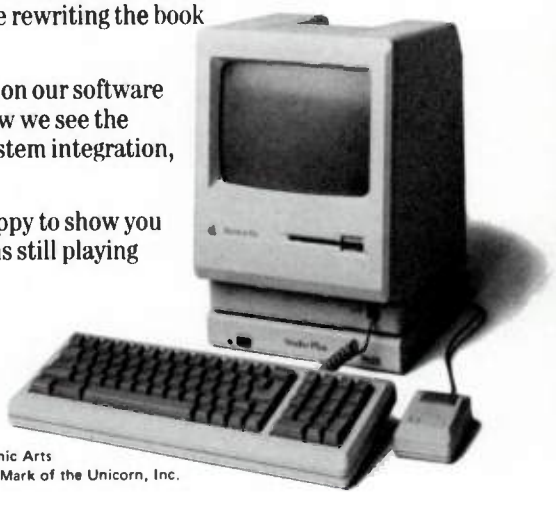

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BY JAMES CHANDLER JR.

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Standard microphones capture the essence of acoustic instruments better than contact or magnetic pickups, but one must resort to pickups when miked acoustic instruments are drowned out by other instruments. The central mechanism in a contact pickup is a piezo crystal that converts vibration into electrical energy. Piezo elements are found in many electronic components, from radio crystals to phono cartridges.

While casting about for a cheap piezo to use on acoustic instruments, I found that the element in certain piezo buzzers makes a fine contact pickup. Two Radio Shack buzzers do nicely, the one-dollar #273-069 and the dollar-fifty #273-064. Both units have similar sound. The only advantage the #273-064 has is its smaller diameter, which may make it easier to mount in some situations.

Surprisingly, these pickups work quite well on piano, acoustic guitar, and acoustic bass. Even cellos and other acoustic instruments have been successfully "picked up." Contact pickups unfortunately cannot replace drum mics for accurate percussion sound, but the Two Buck Pickup makes an excellent remote trigger for electronic drum sets and similar triggerable devices. Those who want further details on drum pickup applications should read my article, "Drum Pickups" (December '85 *Modern Drummer* magazine, 870 Pompton Ave, Cedar Grove, NJ 07009; write for back issue information and tell them you saw it in EM).

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

"These pickups could not be simpler to build and install"

BUILDING THE PICKUP

These pickups could not be simpler to build and install. To convert either of the above buzzers into a pickup, cut away the plastic shell and remove the metal disk inside. Your pickup will be complete once you have attached shielded cable and an output connector to this disk. Pickups will need about 12 inches of shielded wire, depending on how you mount them. Small-diameter wire is preferable, since lighter wire is less likely to weigh down the pickup and pull it off the instrument or to be torn from the pickup itself. The average musician should be able to salvage enough cable for many

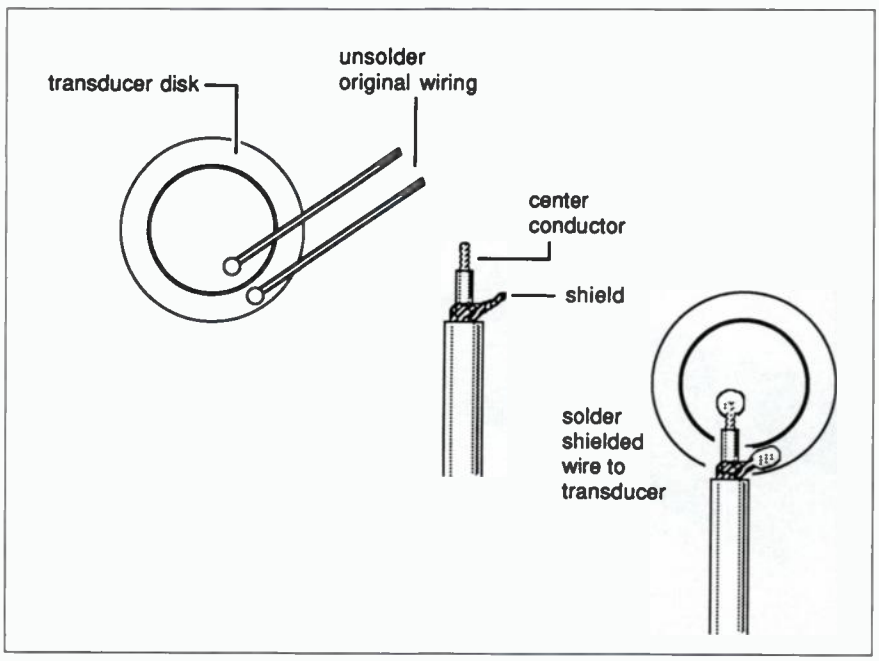

Fig. 1 *Constructing the pickup*

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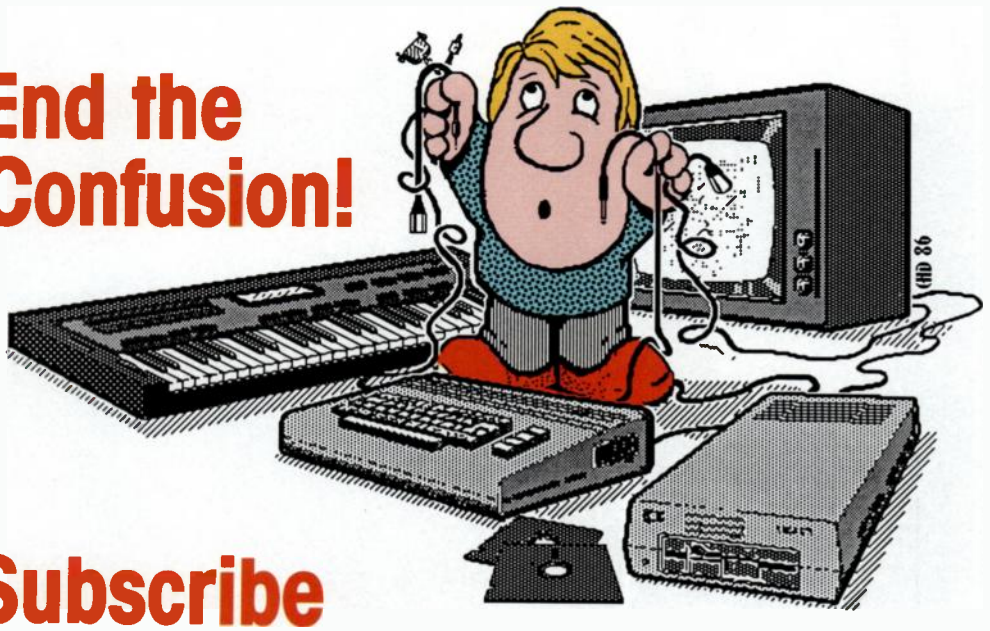

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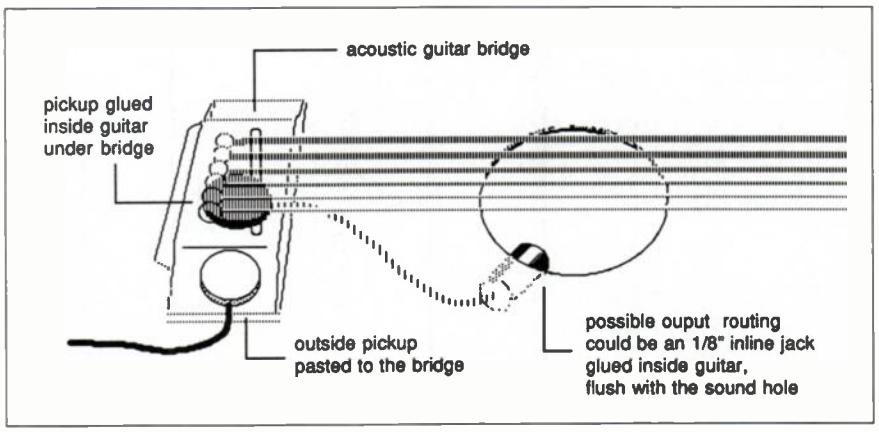

Fig. 2 *Acoustic guitar mounting*

pickups from the standard inventory of bad patch cords. **Fig. 1** illustrates the construction details.

The model 273-069 buzzer has two wires and the model 273-064 has three wires. Only use the red and black wires and snip off the offending third wire. Though you can solder these tiny wires to your cable, it is better to go to the trouble of removing the wires and soldering shielded cable directly to the disk. This makes it less likely that the pickup and cable will decide to part company at some inopportune moment.

While trying not to incinerate the pickup, remove the original wires with your soldering iron and pliers, then add just a little more solder to the pads where the red and black wires were connected. Dress an end of your cable so ¼-inch of shield extends perpendicular to the cable, and about ⅜-inch of center conductor is exposed, with ⅛-inch of the center conductor stripped. Tin the exposed ends. Heat the blob of solder on the pickup where the red wire was connected and set the center conductor in place, holding the connection still until the solder joint cools. Follow the same procedure to attach the shield where the black wire was.

Provide electrical insulation and strain relief by coating the connections with silicone rubber. Cosmetically concerned musicians may want to paint their pickups. Spray paint works fine, especially if applied before the silicone rubber sets.

The Two Buck Pickup has a typical output level of 100 millivolts or higher, and the output impedance is low enough to drive most unbalanced amplifier inputs without buffering. If the piezo disk is cut carefully (my technique is to cut very fast with sharp tin snips or scissors), smaller pie-shaped or strip pickups can be made. These tiny pieces have much the same sound as the mother disk, and

"Rather than worrying about pre-amping this pickup, you may actually have to worry about overdriving some amplifier inputs"

are good, cheap parts for experimenting with novel pickup ideas, such as three-axis pickups.

An inductive pickup, such as a magnetic guitar pickup, will lose highs when loaded down by a low impedance input. Piezos are capacitative pickups and will lose bass when loaded down. If a pickup seems excessively bright in an application, you may be able to equalize it by placing a capacitor in parallel with the pickup. A good value to start with would be 20 nF (0.02 μF). Increasing the capacitor will reduce the treble, and vice-versa.

Feedback

Pickups used with acoustic instruments are less prone to feedback than microphones, but at high volumes one must still take some common-sense feedback precautions such as keeping your distance from loudspeakers. Other feedback prevention techniques, such as notch filters, frequency shifters, and the like, can also be used.

Acoustic Guitar Installation

Since these pickups are rather large, you won't have to worry about esoteric mounting methods. Good results usually require mounting either on the bridge outside the guitar or under the bridge inside the guitar. From my experience, the sound quality obtained from either location is equivalent.

A "paste and dangle" outside mount-

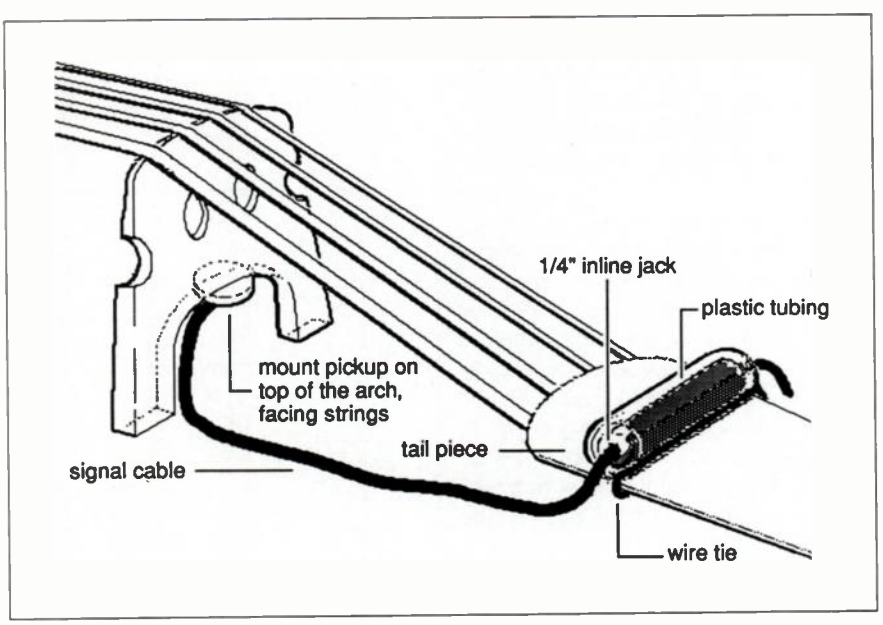

Fig. 3 *Acoustic bass pickup*

ing method is the easiest and most common one in use. Use some kind of sticky putty to paste the pickup to a flat part of the bridge. Window putty sold in auto supply stores makes a good pickup adhesive, as does Radio Shack connector sealant tape (part no. #278-1645), or roofing sealer tape (actually a long roll of putty) sold in hardware stores. These hold quite well on finished surfaces such as a bridge, but eventually release on the unfinished surfaces inside a guitar. Silicone rubber sealant makes a good permanent adhesive for internal mounting. Make sure the pickup does not obstruct the string peg holes in the bridge.

In any case, spread a thin, even coat of either over the whole pickup surface, then firmly press it into place.

Connect an ⅛-inch inline jack (such as the Radio Shack #274-333) to the pickup cable, and route the patch cord to the amp between the strap and guitar, allowing everything in between to dangle. This method provides minimal risk to the guitar, but a bit more to the pickups themselves. Considering the price of the pickup, though, as long as you have a spare you needn't worry much.

Routing the cable out of the guitar is the biggest problem in a permanent internal installation. The simplest homebrew method is to drill a hole in the skirt of the guitar and drop a ¼-inch jack in place. Some acoustic guitars with factory-installed pickups are configured like this. The guitar technicians I know strongly advise against drilling holes in the body; it is easy to split the wood while drilling, and they claim that any unauthorized air hole could ruin the sound of the guitar. I don't put much stock in the theory that one little hole in the skirt would ruin a guitar's sound, but I would nonetheless be reluctant to drill on a vintage Martin or Bluebird.

I did one installation where I pasted an ⅛-inch jack inside the guitar with a blob of epoxy putty. Some brands of epoxy putty will harden in only a few minutes, so you can hold a part in place by hand until the putty sets. The jack was facing up and mounted flush with the bottom of the sound hole. No change was made to the appearance or sound of the guitar, but one could plug in (with a right angle plug) at the bottom edge of the sound hole (**Fig. 2**).

Jack-strap buttons are the best way to route the signal out of a guitar. Drilling is also necessary for mounting jack-strap buttons, but at least you have a pilot hole when the original strap button is removed.

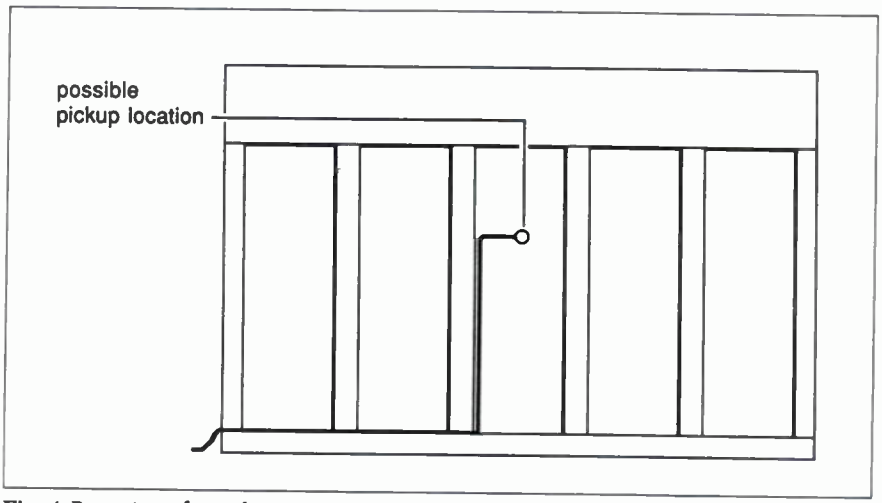

Fig. 4 *Rear view of upright piano*

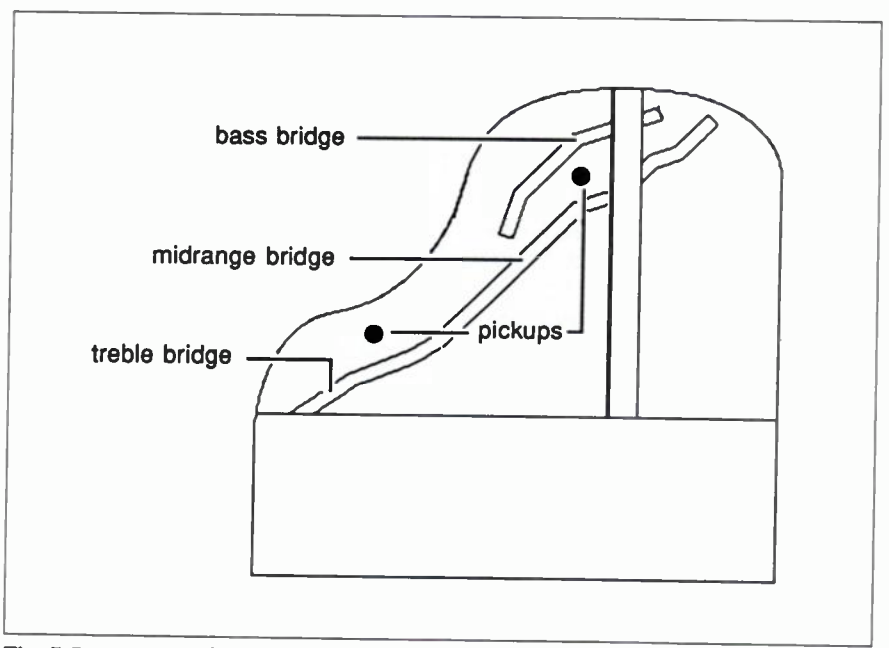

Fig. 5 *Bottom view of short grand piano*

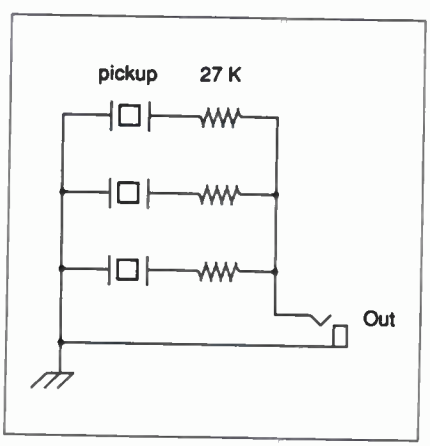

Fig. 6 *Mixed pickups*

Stand-Up Bass and Other Stringed Instruments

The Two Buck Pickup performs nicely on stand-up bass. Here, the best tone and volume seems to come from mounting parallel to the strings on the inside arch of the bridge (**Fig. 3**). Nylon wire ties are perfect to hold the pickup jack on the tail-piece. However, wire ties are easy to install, hold forever, and are easily removed without marring the instrument.

The pickup should work successfully

on cello, mandolin, hammer dulcimer, etc. Try mounting techniques similar to bridge mounting on guitar or string bass.

Piano Installation

Hot spots and unpleasant resonances are the main drawbacks to using contact pickups on a piano. These acoustic anomalies make good mics preferable to pickups if the situation allows. One pickup placed near the center of the sound board will frequently give acceptable results with upright pianos (**Fig. 4**), but I've not seen any grands that were flattered by such a simple installation. Some of this "grand" frustration may be because one expects a better sound from a better piano, and can't necessarily get it with contact pickups.

Maximizing the sound quality from a particular piano will normally require some experimentation with pickup placement. Before delving into the actual details of installing pickups, you might want to refer to the sidebar on how a piano makes sound so that you can make a better-educated guess concerning proper piano pickup placement.

Simple Piano Installation

For pickup adhesive, see the recommendations listed under guitar mounting. Spread a thin, even coat of adhesive over the whole pickup surface, then firmly press it into place.

Self-adhesive nylon wire clips (Radio Shack #278-1639) make excellent strain reliefs for routing wire around a piano. Hot spots are best avoided by putting pickups between the reinforcing ribs on the sound board. The ribs are the best place to mount the nylon wire clips, however. For the simplest installation, just paste a pickup on the sound board and route the cable through a couple of nylon wire clips to a convenient exit point on the piano (**Fig. 4**).

For slicker installations, put two ¼-inch jacks in an aluminum mini-box and wire them in parallel. Attach the box under one side of the keyboard or wherever, and plug the pickup into one of the jacks. The other jack is used for a patch cord to the sound system. This scheme allows the piano to be moved without having to worry about dangling wires. The mini-box can be mounted to the piano with wood screws, double-sided foam tape, or velcro.

More Elaborate Piano Installations

Grands benefit from multiple pickups. Two pickups mounted as shown in **Fig. 5** has been successful in some grands, but remember that every piano is different. One pickup is placed between the bass and midrange bridges, and the other is placed to sense the treble bridge. You may also try an additional pickup on the

How the Piano Makes Sound

The sound board is the large piece of wood that extends behind the strings of an upright piano and under the strings of a grand. Pickups are most easily attached to the sound board of an upright from behind the piano, and from underneath a grand. This also keeps most wiring out of sight.

The sound board amplifies the piano strings. Without a sound board, no piano would be much louder than an un-amplified Yamaha electric grand. A piano string makes contact with the piano body at three locations (discounting hammers and dampers). On both ends the string attaches to the iron frame; the strings make contact with the sound board via the bridge, which is a piece of wood wedged between the strings and the sound board a few inches away from the hitch pins. There are usually three individual bridges to accommodate the bass, mid and treble strings.

The bridge is the main conductor of sound energy from the string to the sound board, and subsequently, into the air. By viewing the bridge from inside the piano, one can find the corresponding locations on the back of the sound board. When viewing the back, a row of screws usually trace the location of the bridges.

If you place a pickup directly behind a bridge, the strings nearest the pickup will sound much louder than the rest of the keyboard (hot spot). If you move the pickup away from the bridge toward the center of the sound board, hot spots diminish and the sound becomes more bassy. By moving toward the edge of the sound board, hot spots diminish and the sound becomes brighter as the output level is attenuated.

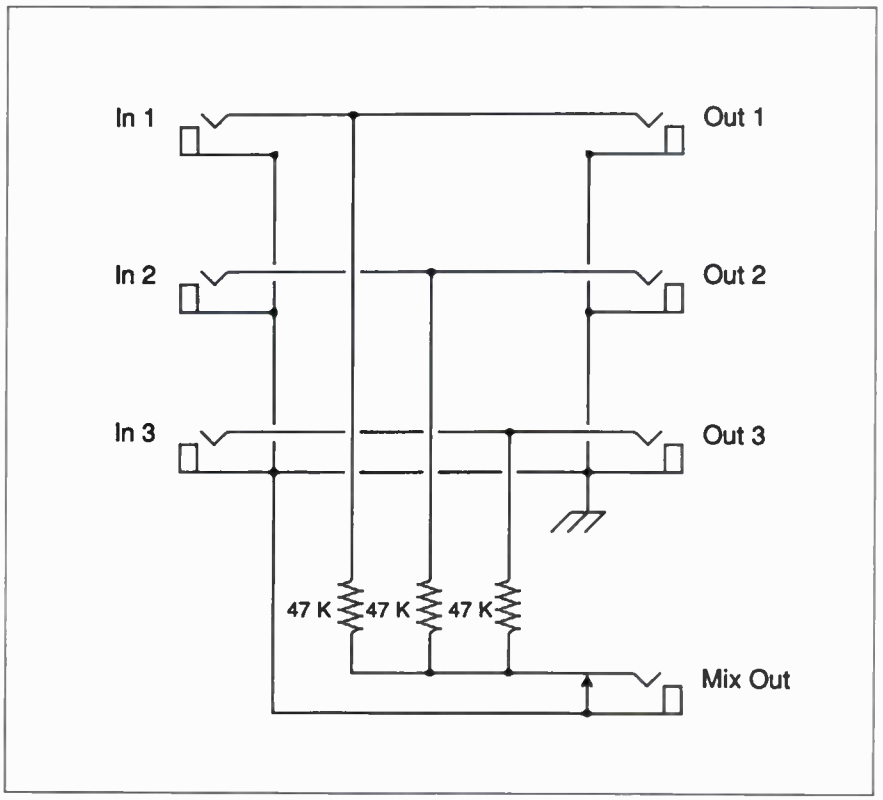

Fig. 7 *Passive mixer*

steel frame of the piano. Pickups can be passively mixed with 27k resistors, or use a separate PA channel for each pickup.

Fig. 6 shows a simple pickup mixer box. This box can accommodate three pickups and gives either separate pickup outputs or a passively mixed mono output.

Traveling Pickup Kit

If you do casual gigs playing "house" pianos, you may want to carry a pickup kit along with you. A convenient pickup kit to carry might include: several assembled pickups, the mixing box shown in Fig. 7, double-sided foam tape (Radio Shack #64-2343), connector sealant tape (Radio Shack #278-1645), and universal cable clips (Radio Shack #278-1639).

The pickups are so cheap it might be more convenient for you to leave them in a piano rather than bothering to remove them. In fact, the hustlers among you may even be able to charge club owners for installing a high-class pickup system in their pianos.

Getting Creative In The Studio

These pickups are also useful for a variety of recording situations, usually as "supplements" to existing mics. Sometimes attaching one of these two-buck wonders to an electric guitar will pick up some of the string and finger noises usually lost through the pickup, and when mixed in with the standard pickups, gives a more "natural" sound. Basses tend to gain more "snap" when you attach a contact mic to the body (I've had good results on some sessions by attaching a contact mic to the headstock, and in others by mounting it in some of the free space underneath the pickguard—Ed.). For the sampling nuts in the audience, attaching one of these pickups to metal garbage bins, steel girders, suspension bridge cables, and other sound sources will allow you to record some of these sounds onto tape, and then into your sampler. Those who work in video can also use contact mics to obtain sound effects without having to worry so much about interference caused by other sound sources leaking into the mic.

Conclusions

Sometimes good things come in small packages. Sometimes good things come in *cheap* packages, and you can't get much cheaper than a two buck pickup. Go ahead and build one of these things; you never know when it will come in handy! EM

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Tired of packing up your synthesizer every time Mom wants to serve dinner? Here's a project that'll "stand" you in great stead.

Build Your Own Synth Stands

BY JIM KERKHOFF

After months of dreaming and stashing your pennies, you've just spent it all—your life savings—on a brand new synthesizer. But right away you realize you can't keep setting up on the kitchen table—you need a *stand* for your synthesizer.

When I faced that problem, I decided that *building* a stand was the answer. Wood seemed acceptable, but I knew that would probably look pretty cheesy unless I spent a lot of time in construction and finishing. Then a friend came up with the idea of using PVC pipe, the kind used in plumbing. Perfectly ludicrous, I thought. The stuff has to be impossible to work with, certainly worse than wood. And what about the cost? "No," my friend assured me confidently, "It'll be easy and inexpensive. Trust me."

A trip to the local building supply store soon dispelled my misgivings. The stuff is positively cheap! It comes in designer colors—white and beige—and all you do is glue it together. Nothing could be simpler.

Well, almost. Here's a blow-by-blow account.

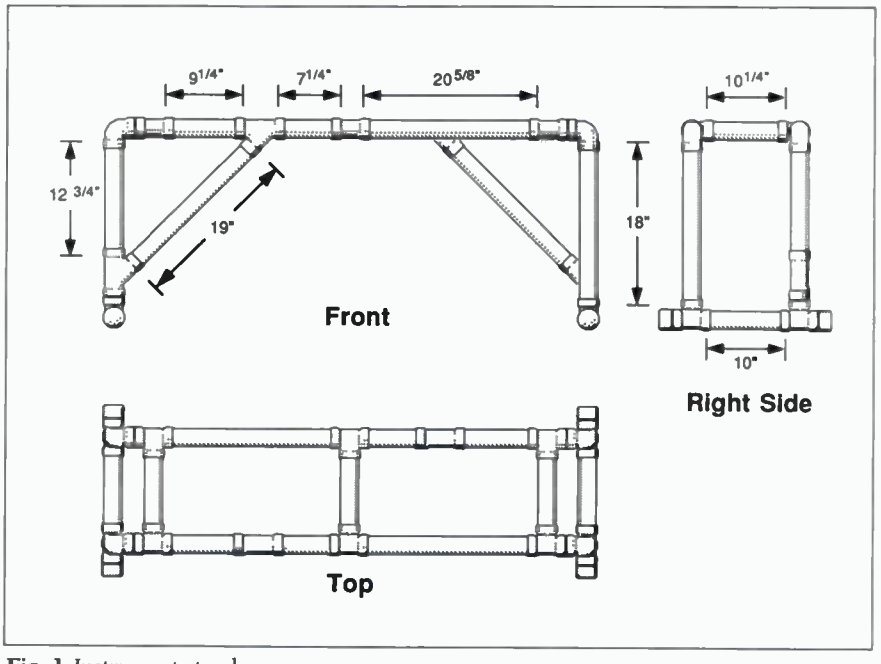
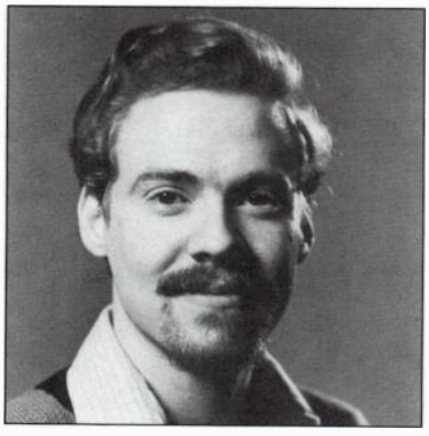


Fig. 1 *Instrument stand*

Jim Kerkhoff poses as a mild-mannered broadcast engineer to earn his daily bread, and switches to his dynamic composer/programmer/writer persona the rest of the time. He holds a Master of Music degree from the University of Texas and hopes that one of his vocation/avocations will assert itself someday so he can find out what he is going to be when he grows up.



PLAN YOUR STAND

First, plan your stand. I wanted a unit 24 inches high, 58 inches wide, and about 15 inches deep. I designed my stand from only those general measurements. As you can see from **Fig. 1**, the stand I made consists of short lengths of 1½-inch diameter pipe joined by an assortment of standard pipe connectors. I used 90° elbows, "T" and "Y" connectors, and end caps for the legs.

Be careful when deciding how long to make pipe sections that go between connectors. The pipe overlaps each connector collar about ¾-inch and you have to allow for this. Unfortunately, the length of the overlap is different in each connector. The way to deal with this problem is to measure the depth of the collar on each type of connector. (The collar is the part of the connector that the pipe fits into.) To determine how long to cut the pipe, subtract the collar depths from the overall length of the connector(s) and subtract this figure from the desired length of the structure (See **Fig. 2**). For example, I wanted my stand to be 24 inches high. I subtracted the collar depth of the elbow connector from the overall length of one of its sides, and the collar depth of the "T" connector from *its* overall length. I then subtracted the two resulting

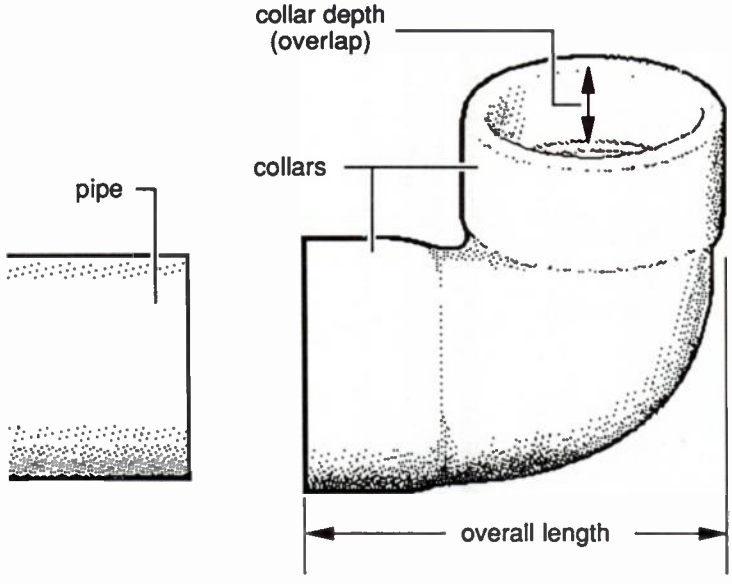


Fig. 2 *PVC elbow/pipe assembly*

numbers from 24 inches and I knew that I needed an 18-inch length of pipe to complete the right front leg (See **Fig. 1**). The diagonal brace is also a little tricky. I used 45° "Y" connectors to attach this pipe, and a little Pythagorean Theorem went a long way toward figuring out the required lengths.

Once the plan was on paper, it was time to draw up a bill of materials. PVC tubing comes in various diameters from ½-inch to 8-inch, and lengths of up to ten feet. I used 1½-inch diameter tubing because it seemed to be about the best trade-off between strength and manageability. **Fig. 3** shows the materials I used to build a stand for a KX88.

In addition to the pipe and connectors, I needed some PVC primer and multi-purpose plastic pipe cement. The primer attacks the smooth surface of the pipe so the cement will adhere well. The cement is very much like the airplane glue you might have used as a kid to assemble model kits.

Caution! Note that both these products are extremely flammable and should be used away from open flames, in a well ventilated area. Likewise, one should avoid inhaling the vapor of either the primer or the glue.

PARTS LIST

Quantity	Description
2	10-foot lengths of 1½-inch diameter PVC pipe
1	2-foot (or more) length of 1½-inch diameter PVC
10	"T" connectors, 1½-inch diameter
4	45° "Y" connectors, 1½-inch diameter
4	90° elbows, 1½-inch diameter
4	End caps, 1½-inch diameter
1	¼ pint PVC primer
1	¼ pint multi-purpose plastic pipe cement

TOOLS

1	Mitre box
1	Hacksaw
1	Package of 10-32 hacksaw blades
1	Tape measure
1	File or rough sandpaper

Fig. 3

TOOLS

Aside from the basic materials, I also needed a few tools. A tape measure is indispensable, and to cut the tubing, I used a hacksaw with a 32-teeth/inch blade and a mitre box. A file or some rough sandpaper helps smooth the cut edges. The tubing cuts easily, so power tools are not necessary. For the stand I built, all the materials cost under $30 and the tools, which can always be used for future projects, only added about $12 to that cost—a much more economical route than retail.

STAND BY YOUR PLAN

Construction is more time-consuming than difficult. It took the "All Thumbs Crew" (me) about eight hours to complete the project, including planning, parts, purchase, cutting, fitting and gluing. I probably could have done it in less time, but I ended up cutting many of the pieces more than once due to a perceptual acuity problem (I didn't measure correctly). **Fig. 4** is a cutting guide for a project the size of mine. **Fig. 1** should indicate clearly where each pipe goes. The 1½-inch lengths of pipe are used to join connectors directly together.

Now, remembering to smooth the edges first, put the stand together without any glue. Check for proper tubing lengths at this point and you'll avoid a lot of grief later on.

Finally, glue it all together. This requires a certain amount of quickness and agility, and you might even want to enlist the aid of a helper for this step. The glue sets up rather quickly and unless you are fast, you may end up with a connector alignment problem. I've pulled apart glued sections up to ten minutes after gluing, but it was very difficult and might be impossible under some circumstan-

TUBING LENGTHS

Quantity	Length
2	20⅝-inch
2	19-inch
2	18-inch
2	12¾-inch
3	10¼-inch
2	10-inch
2	9¼-inch
2	7¼-inch
10	1½-inch

Fig. 4

ces. Start by treating the tubing ends and the interior walls of the connector collars (**Fig. 2**) with primer—a thin liquid that dries very quickly. Then, one by one, apply glue to both the end of the tubing and to the connector, press them together and hold each connection together for awhile so the two pieces don't "ooze" apart. Don't use so much glue that it drips out of the joint, but use enough to form a nice "bead" all the way around the connection.

The finished product is very light-

> **"It took the "All Thumbs Crew" (me) about eight hours to complete the project"**

weight and surprisingly strong. I suppose it can be painted, but I left mine *au naturel* and it looks just fine. While I built a keyboard stand, there's no reason you can't build almost any piece of studio furniture. Keyboard stands with multiple levels, speaker stands and shelving units all seem to be good possibilities.

The studio is complete at last. I can feel the tunes just dripping off my fingers, and surely nothing stands between me and greatness. Then again, there is that nifty reverb unit I saw, and it certainly wouldn't hurt to have some sort of sampling keyboard. Hmm-m-m, with all the money I saved by not buying a commercial stand, I wonder if I have enough to buy...? EM

More fun for analog fans: make a simple LFO, combine it with the noise source and lag processor from Part 1, and you'll end up with more modulation capabilities for your synthesis system.

Mini-Controller, Part 2

BY THOMAS HENRY

Rev up your soldering iron, it's time to finish the Mini-Controller!

In Part 1 (October '86 EM; back issues are available for $3.50 each from the publisher), we examined two subcircuits of the Mini-Controller (MC): the noise source and the lag processor. This time, we'll concentrate on the low frequency oscillator (LFO), and then see how to blend all of these functions together to make one complete module. (The MC also includes a trigger extractor; this was treated in an earlier installment and is employed in the MC without change.) So let's dive in and see how to make it all work.

CLOSE ENCOUNTERS: THE LFO STORY

LFOs, which generate periodic, typically sub-audio waveforms, are handy for zillions of applications. The most common application is to plug it into the CV input of an oscillator to add vibrato, or the CV input of a VCA to add tremolo—but a good LFO can do much more. An LFO also makes a dandy external clock to control analog sequencers and drum boxes, as well as a way to add "animation" to voltage-controlled delay lines or pulse width modulated waveforms. An LFO is a simple circuit, but that doesn't mean it's not essential—in fact, its simplicity means you might as well make two! And of course, we want our LFO to be easy-to-use, yet versatile.

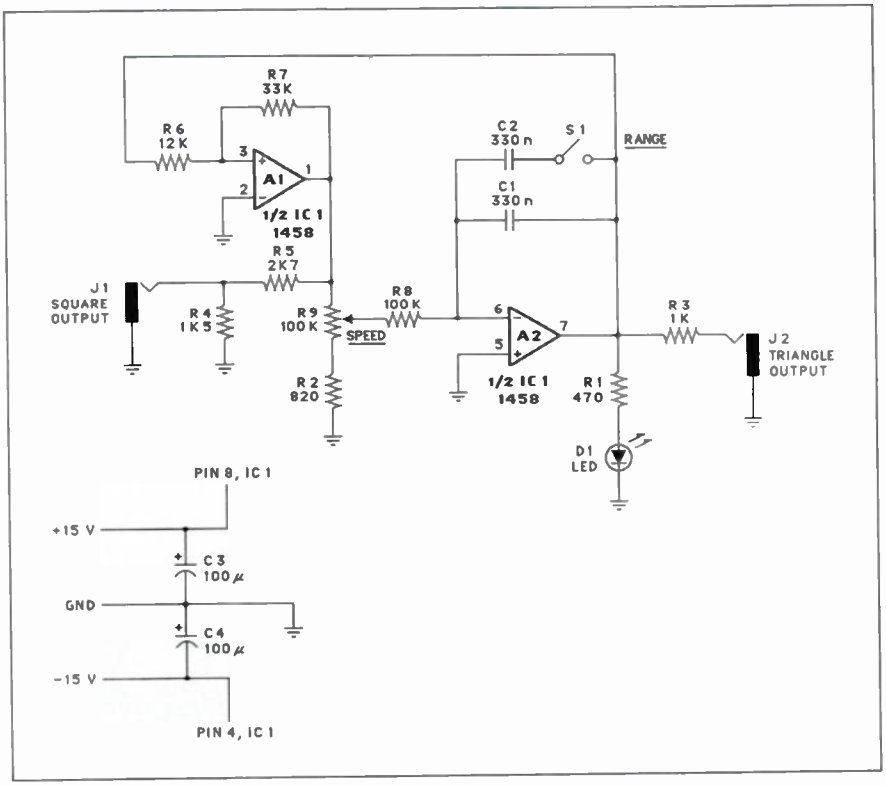


Fig. 1 *Mini-controller; the LFO. Designer: Thomas Henry*

Many of you will recognize the circuit in **Fig. 1** as the old reliable "Schmitt trigger/integrator" function generator. For dependability it's hard to beat. (This circuit has been around for years and is discussed in many books and magazines, but perhaps the definitive explanation of its inner working can be found in Bernie Hutchins' classic "Simple Triangle-Square Oscillator," which appeared in *Electronotes* Application Note No. 67, December 18, 1977.) Let's look at some of the device's basic features.

The LFO provides two simultaneous outputs, a square wave and a triangle wave. In keeping with the design philosophy of this series, both outputs feature 10V peak-to-peak (p-p) signal swings, and have 1k output impedances. Let's see how this is accomplished. Op amp A1 (one half of the 1458 dual package) is configured as a Schmitt trigger. Its output will swing from about -14V to about +14V. This signal is tapped and attenuated by voltage divider R4-R5. The divider has been arranged so that the resulting square wave is 10V p-p in amplitude, and also presents an output impedance of about 1k. The signal then goes to jack J1.

Thomas Henry contributes to several magazines in addition to EM. *He played guitar professionally for ten years to put himself through school. Currently he is an assistant professor of Computer Science at Mankato State University in Minnesota. Aside from computers and electronics, Thomas has a passion for Victorian literature, Sherlock Holmes, and the works of Oscar Wilde.*

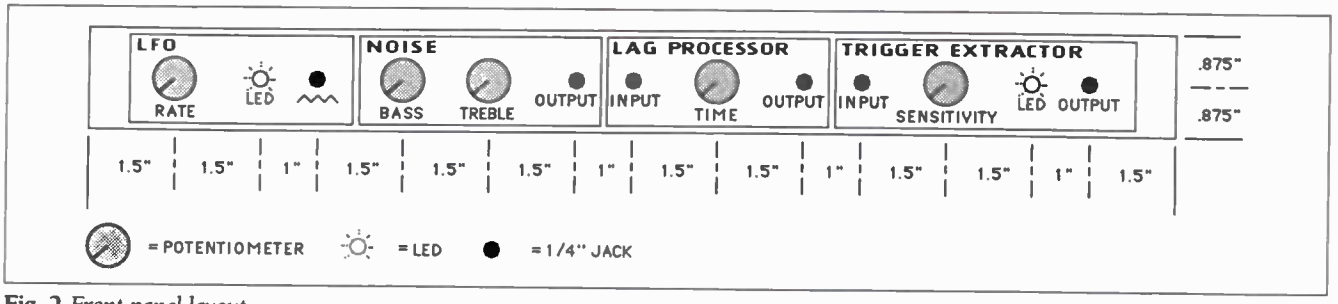


Fig. 2 *Front panel layout*

Resistors R6 and R7 set the triangle wave's amplitude. Again, these have been chosen to generate our standard 10V p-p level. In the case of the triangle wave, however, R3 determines the output impedance, which is 1k. The resulting signal feeds jack J2.

To give some visual indication of the LFO rate, the triangle wave also goes through R1 to a red light emitting diode (LED). This LED will then throb in time to the oscillation of the circuit. Besides being fun to watch, this LED really does help in the rapid adjustment of the controls for some specific effect.

Two controls affect the circuit's rate of oscillation. Switch S1 engages or disengages capacitor C2 from the integrator portion of the LFO. Closing the switch decreases the range by a factor of two. Opening the switch causes more rapid oscillation rates.

Potentiometer R9 adjusts the rate in a continuous fashion, within the basic range set by switch S1 mentioned above. Resistor R2 at the bottom leg of the pot prevents the circuit from "stalling" at the low end of the frequency range; this insures that the LFO will in fact oscillate at all settings of the rate pot. With the resistor and capacitor values specified in Fig. 1, the circuit will cover a range from about one cycle every five seconds on up to about 30 cycles per second. This should cover most of your LFO needs.

In wrapping up this description of the LFO, notice capacitors C3 and C4. These capacitors connect directly to the 1458 power supply pins and must not be left out! They are needed to decouple the power supply thoroughly, so the LFO doesn't interact with any other nearby circuits (like the noise source). Solder these caps directly to the pins of the 1458 dual op amp's socket. Regarding the power supply, use a well-regulated, bipolar 15V supply. Chances are your synth system already provides these voltages, but

Parts List

Resistors (¼W, 5%)

R1	470
R2	820
R3	1k
R4	1k5
R5	2k7
R6	12k
R7	33k
R8	100k
R9	100k pot

Capacitors (25 working Volts minimum, 10%)

C1, C2	330n (polystyrene or mylar recommended)
C3, C4	100µ electrolytic

Semiconductors

IC1	1458 or equiv. dual compensated op amp
D1	LED

Mechanical parts

J1, J2	¼-inch phone jack
S1	SPST switch (see text)
Misc.	Front panel, hardware, wire, solder, etc.

if not, a future edition of *Practical Circuitry* will describe how to build a "universal" bipolar supply.

Building The Mini-Controller

I built my version on perfboard, using flea clips and a wirewrap tool. With this method, the circuit board went together in about three hours. There is nothing sacred about wirewrapping, however, so feel free to use any standard method of construction.

Fabricating an attractive front panel takes a little planning. **Fig. 2** shows the layout I used on a standard 1¾-inch by 19-inch rack panel. Notice that space was a little tight, so I eliminated the square wave output of the LFO, a reasonable compromise, and mounted a push-push switch on the LFO rate pot to serve S1's function; I can push the knob to double or halve the range, or dial the pot to adjust the specific rate. (I got this neat pot from Star-Tronics, PO Box 683, McMinnville, OR 97128. Star-Tronics has all sorts of excellent parts suitable for music purposes, at surplus prices, so be sure to get on their mailing list.)

I am very pleased with this module—while each of its functions are simple, the unit as a whole is a real workhorse. Nearly every patch I come up with on my analog sequencer box uses one or more devices from this module. To put it another way, without the MC, my sequencer would sound rather dull and flat. The various nuances and subtleties that are possible with the MC go a long way in making the music generated by a sequencer sound less mechanical.

But don't think that the MC is only good for sequencing. In fact, it makes a fine addition to any analog synthesis system. And best of all, it won't steal very much valuable panel space from you. Finally, if you're just getting into building your own equipment, I think you'll find the MC a good place to begin. It's easy to build, doesn't need any tweaking, and is apt to work for you right off the bat. It's simple and useful enough to give you the confidence to build more exotic equipment. So, come on, what are you waiting for? Try a little Do-It-Yourself this weekend! EM

One of Radio Shack's best-selling computers is starting to learn MIDI.

CoCo and the Sequencer: Radio Shack/Syntrax

BY CHUCK McQUILLAN JR.

Radio Shack's TRS-80 Color Computer (now called the Tandy Color Computer, or simply, "CoCo") has been on the market since 1980. A large amount of CoCo software is available, including an excellent version of the arcade game, "Zaxxon," various business programs, more games, and even a MacPaint-like graphics program. Until recently, there were no MIDI products available; now there are at least three different MIDI systems for the CoCo. One of these is an unusual sequencer from Intercomp Sound called "Syntrax 2.00."

BUT FIRST, THE HARDWARE

The CoCo, despite its cutesy nickname, is not a "toy" computer. Tandy didn't help matters by using an inexpensive "chiclet" style keyboard in the original design, but the new CoCo comes in a smaller case and has a much better, though still not "full travel," keyboard. I resorted to installing my own keyboard, purchased from a third-party company. But, underneath that plastic Radio Shack shell lurks a Motorola 6809 microprocessor, the premier 8-bit CPU. (The 68000 microprocessor, used in the Macintosh, Amiga, and Atari 520ST, is a 16/32 bit descendant of the 6809.) Its highly refined instruction set means fast operation, which is very important for MIDI work. A 64K CoCo retails for around $160 (without TV), and while Tandy markets a $300 single disk drive (with your second drive going for $180), compatible drives are available in the $200 range. Remember also that Tandy regularly marks down prices throughout the year, and a new CoCo was recently introduced (see sidebar).

Intercomp Sound's MIDI interface, called the Color MIDI Connection (CMC), is similar in function and construction to other devices on the market, such as Pass-

Product Summary

Products: Syntrax 1.00 and 2.00
Type: MIDI sequencers and MIDI interface
Price: Syntrax 1.00, $75; 2.00, $125; Color MIDI Connection interface ($98).
Hardware requirements: Tandy Color Computer with 64K ($160) and one to four disk drives ($200 to $300 each); Color MIDI Connection interface.
Sequencer architecture: Pattern/song with alphanumeric entry only.
Note capacity: 30,000 notes
Track capacity: 16 tracks
Manufacturer: Intercomp Sound, 129 Loyalist Ave., Rochester, NY 14624; tel. 716/247-8056.

Chuck McQuillan, Jr. (Dr. Q) is a self-proclaimed Psycho-Acoustician from Davison, Michigan (John Sinclair's hometown). Dr. Q is also a college dropout who works for the Federal Government and has no time for live performance anymore, but still craves the admiration of millions, or at least a couple of girls in Modesto. He has experimented with analog synthesizers since 1975, and MIDI for as long as anybody else has.

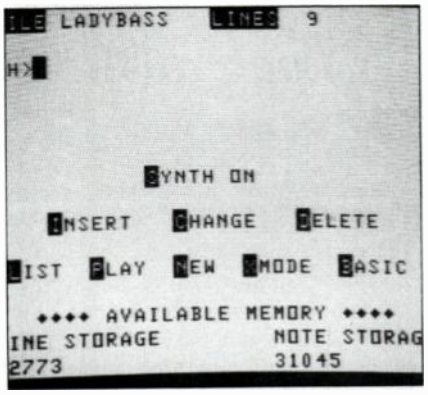
port's MIDI Interface. CMC is contained in the same small plastic cartridge as Tandy's "Program Paks" and plugs into the cartridge slot. The CMC has top-mounted MIDI In and Out jacks (of course), but also two extra MIDI Outs on four-inch pigtails coming from the cartridge end. For really big studio setups, Intercomp Sound suggests the addition of three six-way MIDI Thru boxes to allow *18* synths/drum machines to be controlled with no data distortion. However, the MIDI Outs are not separately addressable by MIDI channel number (i.e., the signal is identical at all three outputs). The CMC has a ribbon cable going to the disk drive, which is helpful since the CMC plugs into the game port where the disk drive normally goes. While overall this makes makes for a messy jumble of ribbon cables, when you consider all the other MIDI and audio cables running all over your bench already, one more doesn't really matter.

THE SOFTWARE

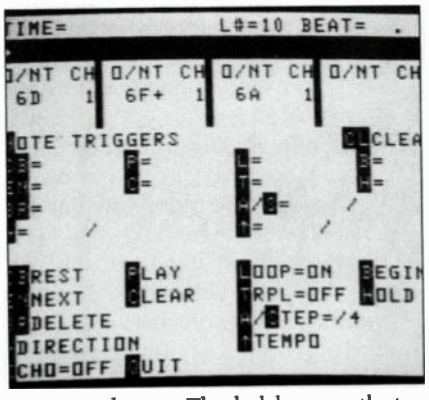
Syntrax 2.00 is a MIDI sequencer by Intercomp Sound. As it stands now, Syntrax is more like a drum machine than a tape recorder simulation, and though some functions may appear cumbersome compared to other programs, like every sequencer program, Syntrax takes its own approach to composing music on a computer. If you don't have a definite idea of the music (i.e., a written score), or if you employ improvisation as a form of composition, this program is not for you. But if you are a stickler for details, Syntrax will fill the bill. Syntrax 2.00 (and the earlier Syntrax 1.00) requires 64K memory and one to four disk drives. It is a 16-track sequencer with 30,000 note memory. Each track can record 8-voice polyphony and contain any kind of MIDI data, such as velocity, pitch bend, program change, and note on/off, providing a maximum resolution of 1/384th note. These tracks are created in the so-called "channel" (track) mode. Incidentally, while the MIDI standard clock rate is 24 beats per quarter note (bpqn), Syntrax's *internal* clock rate is 96 bpqn. It can send/receive at 24, 48, or 96 bpqn.

The uniqueness of Syntrax lies in the way that music data is entered and displayed. Phrases and measures are entered from a QWERTY keyboard, line-by-line in an alphanumeric code. For example:

1 & e/8:d:c:d:e:e:e/4
2 d/8:d:d/4:e/8:g:g/4



Main menu. The "CH" prompt indicates channel mode. Line storage is for source files, note storage for object files.



Line record menu. The dark bar near the top displays memory used on a bar graph. "BEAT" shows beat # to the left of the point, clock # to the right.

Punch this in and you will recognize the first two bars of Thomas Edison's fave, "Mary Had a Little Lamb."

IS THIS WHAT THEY CALL PROGRAM MUSIC?

This method of coding music is very weird to me, but it allows for tight control of my music. In fact it demands it. Program or MIDI channel changes can be inserted in the middle of a measure, and phrases can be repeated with a single line. Repeats can be nested up to four levels, thus mimicking the FOR...TO ...NEXT construct in BASIC. After each line is entered, it is immediately assembled (translated) into MIDI code and stored in memory. Saving the "channel" file to disk actually saves two files: the alphanumeric codes (the source file) and the assembled MIDI codes (the object file). Thus, channel files can be chained to create a long piece out of smaller sections. Sections of a channel file can be

A Look at the Color Computer 3

The CoCo may be a pretty good machine, but it has always had limitations. The unit only includes an RF output suitable for use with a television, set to channel 3 or 4. Third-parties responded by offering install-it yourself devices that provide the composite signal for use with standard computer monitors. Alternative (and usually incompatible) disk operating systems (DOS) make up for the few bugs and inconveniences of Radio Shack DOS. For 80 column applications, several 80 column cards are available, as are ways to overcome the single expansion slot, non-standard serial port, and "plinky" keyboard. Only problem is, once you've thrown the requisite amount of money at these problem, you realize that you could have bought a PC clone with all this junk built-in for less.

My standard argument against most high-end computers is that a "Symphony" type program (all-in-one word processor, spreadsheet, telecommunications, and database) available for the CoCo will do anything that regular, anti-establishment type humans would want to do with such an application, and it only costs $150 (Yuppie's First Rule of Software Marketing: if you can afford a Macintosh, you can afford the software for it). At any rate, considering all the CoCo's hardware deficiencies, some of the third-party programmers out there are to be applauded for some of the truly outstanding, low-cost products made available over the last two years. Unfortunately, many of the best hackers have lately given up on the CoCo and started working with the new Ataris, Amiga, etc., and blame Tandy for continuing to treat the CoCo as a toy.

I hope they haven't tuned out completely, because Tandy has finally released an upgraded CoCo, and it is said to be totally compatible with all previous CoCo hardware and software. The CoCo3 comes in the standard CoCo2 case, with 128K memory expandable to 512K, 80 column text display built-in, and a whopping 640 × 192 pixel hi-res graphic display that displays four out of a possible 64 colors. This compares to the CoCo2's maximum 256 × 192 two-color display. Intermediate modes of resolution allow up to 16 colors on one screen. To accommodate the higher resolution, an analog RGB output has been added, as well as the long-awaited composite video out. To accommodate the RGB out, a new monitor, the CM-8, is available separately. The Motorola 6809 is still used, but it runs at 2 MHz, twice the old speed.

On the software side, OS-9 from Microware is said to be *the* operating system for the CoCo3. Indeed, OS-9 allows for multi-tasking/multi-user options, with up to seven different programs running at the same time, each one displayed in its own window. It can also have pull-down menus, just like GEM for the Atari ST systems. The multi-tasking environment of OS-9 would be ideal for MIDI since it would allow you to have sequencer, voicing, and librarian functions available at all times. OS-9 also happens to be the operating system used by the Fairlight CMI, and is being used in the new interactive compact disk technology (CD-I).

Tandy has done very well in addressing the problems of the old CoCo. They have also attempted to retain complete compatibility with their old peripherals and software. The CoCo3 lists at $220 with 128K; all peripherals (disk drive, monitor, etc.) are extra. So, being as objective as a CoCo nut can be, a CoCo with nearly the power of an Atari 520ST can indeed be had for $220, but only if you have already invested in a CoCo system. By the time new users buy all the peripherals that are needed, they might as well have bought an Atari 520. As for me, I still stand by my CoCo!

Also note that there is a monthly magazine devoted to the Color Computer called *The Rainbow*. For more information, write:

The Rainbow
The Falsoft Building
P.O. Box 385
Prospect, KY 40059

copied to another disk file and called from another channel file, eliminating the need to re-type a pattern or motif. And since the music is in the form of a simple text file, songs can be transferred over phone lines or posted on an electronic bulletin board system.

If all this looks suspiciously like an assembler for a high-level language like FORTRAN or PASCAL, it is. Syntrax is, in fact, a MIDI assembler. While compilers, whether computer code or music data, do separate the user from real time interaction with the computer, working with Syntrax for a while reminded me that, after all, the flow of music and the flow of a computer program are quite similar.

Version 2.00 includes a "Synth On/Off" feature in the main menu. With this switch on, Insert and Change functions switch to the "line record" mode and Syntrax activates step-time MIDI programming. As you play your MIDI keyboard (connected to the computer of course), the menu displays note names, octave numbers and MIDI channel. Echo On/Off turns the CMC into a MIDI thru box, another of my favorite features.

In line record mode, the computer records all MIDI note on/off info in step-time. QWERTY keys increment and decrement note duration during input, insert rests, program triplet values and so forth. The screen displays all options during input. The "Note Triggers" option assigns unused keys on the MIDI keyboard (usually at the high end) to the corresponding computer command keys. These keys, consequently, cannot be used for note input. An option to save a note trigger setup to the boot disk would enhance this feature.

Future upgrades will supposedly add real time MIDI recording as well as automatic punch-in/out, keyboard split points and, best of all, access to 512K memory.

Compiled/saved channels (tracks) can be combined for simultaneous play in the "system mode," also called the "global track." A line can contain a tempo marker that can be defined down to the MIDI clock to create very subtle tempo changes. Markers remain in effect until the next tempo marker in the file. The repeat procedure in channel mode also works in system mode to control exact patterns of tempo changes.

While system (song) mode plays back the composition, you can display up to four tracks simultaneously, mute tracks, and choose between internal or external sync. Start, stop and continue are controlled from the CoCo's keyboard in internal sync, from a drum machine in external sync, or from a sync track on tape (this requires a separate sync unit). Tempo (32 to 252 bpm) may be controlled from the computer's keyboard in real time. A View mode allows for fast forwarding through a sequence while muting the MIDI output. Once the desired point in the sequence is reached, you may switch the View mode off and continue playing. There is, however, no ability to "rewind."

Syntrax Errors

The step-time recording function is new with version 2.00. After a sequence is step-entered, Syntrax converts the received data into the 1.00 format. So, as version 1.00 is a MIDI assembler, version 2.00 is a MIDI disassembler. When a sequence is "de-compiled," further editing is done in line edit mode where lines are edited using the left/right arrow keys to wind/rewind the sequence. Since I

prefer the older method, this brings up a problem: only note on/off and MIDI channel data are recognized in step-time programming. Velocity, program, and any type of controller data must be entered from line edit mode. If a line with these codes is edited from line record mode, the codes are lost forever.

Syntrax was designed to accommodate new features and retain compatibility with files compiled on the older version. Now, system files compiled under version 1.00 must be recompiled under version 2.00 to be compatible (channel files do not need recompiling). A utility to automate this step would be nice, but the advantages of version 2.00 make this inconvenience worth it anyway.

On *my* wish list: a line copy function that could copy and vary a sequence, the ability to jump to a specific beat number and commence playing, graphic note display for each channel, and some kind of system for handling disk files. Since each channel and the system file requires two files on the disk, during an edit a song using all 16 tracks would require 34 files! This is somewhat offset by Syntrax's efficient data compression scheme and the fact that Syntrax requires you to put your music together in pieces. I have ten minute files that hardly make a dent in the memory.

On The Horizon

The manual says Syntrax will eventually recognize velocity and program changes in step-time mode, send/receive the enigmatic song position pointer, and record a channel file in real time while recorded channel files play. Here's hoping.

Frank Cutolo, head of Intercomp Sound and co-author of Syntrax, provides very good user support and offers Syntrax 2.00 to version 1.00 owners for the $50 price difference. He'll supply the above mentioned features as they are developed, at no expense. Syntrax 1.00 costs $75 and Syntrax 2.00, $125. The Color MIDI Connection sells for $98.

Synlib, a voice patch librarian and editing system with Mac-like pull-down menus and icons, is under development. The complete Syntrax/Synlib MIDI system promises to overshadow other low-cost setups. MIDI and the CoCo are complements that have been searching for each other for a long time; I salute Intercomp Sound for being the first on the market with a useable system, and I look forward to future offerings. EM

The secret to tapping the hidden power in a MIDI system often lies in the system exclusive commands, so here's how to embed sysex commands in a sequencer and make them work for you.

Fun With System Exclusives

BY JIM JOHNSON

The great acceptance of MIDI, especially as compared to such interfaces as the RS232, to a large degree is due to the *system exclusive* type of message. Available for sending any message the creative software developer might devise, system exclusive messages are the basis for some of the most welcome MIDI innovations—software-based sequencers, patch editors and librarians.

In addition to data dump and edit functions, most synthesizer makers equip their instruments with sysex commands that perform other functions (some not available from the instrument's front panel), and more and more products now utilize these commands. Dr. T's Keyboard Controlled Sequencer, Mark of the Unicorn's Performer, the Yamaha KX88 and KX76 master keyboards, the Axxess Unlimited MIDI Mapper, Roland's MC-500, and many other devices all take advantage of the power of the system exclusive message. Still, system exclusive is an area few musicians explore. Most are doubtless put off by having to deal with numbers and MIDI implementation documents, but there are a lot of neat things that can be done with the right hardware and a little knowledge. In a minute we'll talk about some of the problems solved, and effects produced, with the sysex commands we've unearthed on a few popular synthesizers. First, though, here's how to dig these commands out of your synth.

To discover your synthesizer's sysex commands if they're not documented in the manual, try requesting that information from the manufacturer or from the International MIDI Association. However, it can take anywhere from a week to forever to receive this information, and it is often poorly translated and/or incomplete. A way around these problems is to decode the sysex data yourself by using a Commodore 64 and the MIDI data analysis program, MIDIPRINT (August '86 EM; back issues available for $3.50). Connect your synthesizer to the C-64, load MIDIPRINT, and invoke a sysex function (e.g. patch dump). The codes used in the following applications were determined using a combination of these methods. The examples are given in the format used by Dr. T's sequencer, but the same values are used in any instrument, even though some may require data to be entered in hex.

THE OBERHEIM XPANDER

The Xpander has a very complete "normal" MIDI implementation, and its system exclusive capabilities are just as extensive. The Xpander/Matrix-12 MIDI Specification, available from Oberheim, lists 13 different commands including page selection, page editing, and modulation editing. Unfortunately, the documentation lacks some critical information, such as what values are used to select which pages, so you'll need MIDIPRINT or some equivalent program to fill in the gaps.

Even on a machine as powerful as the Xpander, there are idiosyncracies that could use a fix. Sysex commands offer a lot of useful tricks in these areas. For example, when changing patches, the machine sometimes "burps" because its envelopes haven't completed their cycles. To prevent this from happening while controlling the Xpander from a sequencer, send a Tune Page Select command just before each offending patch change, and all envelopes will be reset to zero. The listing below shows the data you would

Xpander Select Tune Page Command

SEQUENCE 1 TUNE PAGE 1 REPEATS

MSR-ST	EVNT	TIME	CH	TYP	NOTE	Comments
1-2	1	1		*	240	Sysex Start
1-2	2	0		*	16	Oberheim ID
1-2	3	0		*	02	Xpander ID
1-2	4	0		*	11	Command byte: Page Select
1-2	5	0		*	1	Page Number (Tune Page)
1-2	6	0		*	0	Subpage Number (none)
1-2	7	0		*	247	End of Sysex

*In between writing, programming, performing with his band girl:bike:dog, and writing software for Dr. T, **Jim Johnson** occasionally finds time to eat and sleep. His original musical goal was to become a renowned Dixieland trumpet player; he modified his aspirations when his high school bought a Paia modular synthesizer.*

Xpander Select Voices 1 & 6 Command

SEQUENCE 2 EDIT 1&6 1 REPEATS

MSR-ST	EVNT	TIME	CH	TYP	NOTE	Comments
1-2	1	1		*	240	Sysex Start
1-2	2	0		*	16	Oberheim ID
1-2	3	0		*	02	Xpander ID
1-2	4	0		*	14	Command byte: Prog. Mode
1-2	5	0		*	4	Data: 7 LSB's
1-2	6	0		*	1	Data: MSB
1-2	7	0		*	247	End of Sysex

enter into Dr. T's sequencer to accomplish this.

Another problem with the Xpander is the amount of time required to change from one multipatch to another. I've never measured it, but it's long enough to let a significant glitch occur if you change multipatches while running any kind of continuous sequencer line. If you only want to change a few voices within the multipatch, you can reduce this glitch by selecting the voices you want changed with a Programmer Mode Switch command, then sending the patch change as shown in the listing above. This has the same effect as pushing any of the Single Patch Edit buttons simultaneously (in this case the first and last, for voices 1 and 6). The eight bits in the two data bytes correspond to the eight program mode switches, with the LSB selecting Single Patch Mode, and the MSB selecting Edit Voice 6. Note that this command must be reversed before another multipatch can be selected.

Enter any of the instrument's editing pages similarly, and the Edit Page command can be used to alter the displayed parameters. While I can see no good reason to edit the single patches from a sequencer, some of the master pages such as the MIDI Enable page are good candidates for sequencer control. Between songs in a live performance, for instance, you could change the assignment of Pedal 2 from the mod wheel to the pedal input, depending on which appendage will be available at the time.

One other unusual sysex command available on the Xpander is the Display Control command. It allows printing messages (such as SET MINIMOOG FC TO ZERO) on the Xpander's fluorescent displays at appropriate points in a show.

Sequential Sixtrak

One nice thing about Sequential's manuals is that the entire MIDI implementation spec, including the system exclusive documentation, is listed in the owner's manual. The most interesting commands available for this instrument are the Set Double Mode, Enable Local Control, and Disable Local Control commands. Set Double Mode sets the instrument's basic MIDI channel, enables reception of all MIDI data, and selects mode 4 (omni off/mono). This command was intended to set the instrument up as a slave to another Six-Trak, but there are other applications as well. In a large system, few musicians will use the Six-Trak as a primary instrument, but by changing the basic channel at different points in a song (or set), it can be used as a sort of "utility doubler"—thicken the DX7 horns at one point, add bottom to a CZ-101 bass at another, etc.

The Six-Trak's system exclusive local control commands differ from the standard in that they affect only one voice at a time. By combining the Disable Local Control command with the Set Double Mode command, it is possible to assign some of the Six-Trak's voices to an external sequencer and others to the keyboard, with each voice having a separate patch. The listing below shows a Dr. T sequence that assigns the first five voices to play patch 10 from the keyboard, and voice 6 to play patch 25 from MIDI only. Note that the appropriate Enable Local Control commands must be sent at the end of the song to return the instrument to normal operation.

Yamaha RX11 and DX7

The system exclusive implementation for the Yamaha RX11 drum machine is both simple and extremely powerful. There is only one command of interest: the Set Parameter command. This command can change just about every setting on the instrument, including instrument select (i.e., which of the eight snares will be assigned to the two snare keys), instrument level, accent level, pan, MIDI key assignment, MIDI channel assignment for each of the 16 drum keys, and total vol-

SCI Six-Trak Disable Voice 6 Local Control Command

SEQUENCE 3 SEQ CH 6 1 REPEATS

MSR-ST	EVNT	TIME	CH	TYP	NOTE	Comments
1-2	1	1		*	240	Sysex Start
1-2	2	0		*	1	Sequential ID
1-2	3	0		*	123	Select Channel
1-2	4	0		*	0	(Basic Channel)-1
1-2	5	0		*	247	End of Sysex
1-3	6	1		*	240	Sysex Start
1-3	7	0		*	1	Sequential ID
1-3	8	0		*	125	Disable Local Voice
1-3	9	0		*	6	Voice Number
1-3	10	0		*	247	End of Sysex
1-4	11	1	1	PG	10	Patch 10, Voice 1
1-4	12	0	2	PG	10	Patch 10, Voice 2
1-4	13	0	3	PG	10	Patch 10, Voice 3
1-4	14	0	4	PG	10	Patch 10, Voice 4
1-4	15	0	5	PG	10	Patch 10, Voice 5
1-4	16	0	6	PG	25	Patch 25, Voice 6

ume. The example below assigns snare 1 to the Medium snare sound and shows the syntax for this command.

Note that the command's third byte contains a channel number. This is not the same as the MIDI channel number, but is what Yamaha calls a system exclusive channel number which is set using the RX11's MIDI OUT key. Apparently this is intended for systems with more than one RX11, so that data dumps will only be received by the correct instrument. When using a single drum machine, it doesn't matter what sysex channel is used, as long as the machine is set to whatever channel is used in the command. Unfortunately, the system exclusive information for the RX11 is published in the instrument's repair manual, and the complete list of parameters is too long to include here. So if you want to be able to do programmable mixes on your RX11, order the repair manual from Yamaha or find a service technician to make a copy. Deciphering the translated spec can be a real headache, but if you have ever built Japanese plastic models, you'll have a significant head start.

The DX7 sysex implementation allows remote editing of the function parameters, as well as voice editing. There may also be other functions, but since I got the following data via MIDIPRINT, I am not sure what other commands are supported. Yamaha sells a separate DX7 MIDI implementation guide that presumably gives complete descriptions of the system exclusive commands.

The next listing shows the syntax of the Set Function Parameter command, as well as the values to plug in for the various functions. Note that the third byte contains a channel number, much the same as the RX11, but in this case the value is the same as the MIDI channel on which the DX is set to receive note data. This command could be used in a sequence to change the functions of the different performance controllers as different patches are selected. A similar command changes such voice parameters as operator frequency and feedback, but since changing these parameters remotely causes sustained voices to cut off it is not terribly useful for real time patch changes. The TX modules do not have this problem, however, so this command might be worth investigating if you want, for example, to use one of the KX88's data sliders to control an operator's frequency.

DX7 Set Function Parameter Command

SEQUENCE 5 DX7 FUNC 1 REPEATS

MSR-ST	EVNT	TIME	CH	TYP	NOTE	Comments
1-2	1	1		*	240	Sysex Start
1-2	2	0		*	67	Yamaha ID
1-2	3	0		*	16	MIDI channel+15
1-2	4	0		*	8	Parameter group (?)
1-2	5	0		*	64	Parameter number
1-2	6	0		*	1	Data
1-2	7	0		*	247	End of Sysex

Function	Parameter Number	Comments
Mono/Poly	64	
Pitch Bend Range	65	
Pitch Bend Step	66	
Portamento	67	
Gliss	68	
Time	69	
Wheel Range	70	The Destination parameters associated with each controller use three bits to indicate routings: Bit 1 = Pitch On/Off Bit 2 = Amp On/Off Bit 3 = Bias On/Off
Wheel Destination	71	
Pedal Range	72	
Pedal Destination	73	
Breath Range	74	
Breath Destination	75	
Aftertouch Range	76	
Aftertouch Destination	77	

RX11 Set Parameter Command

SEQUENCE 4 MED SN1 1 REPEATS

MSR-ST	EVNT	TIME	CH	TYP	NOTE	Comments
1-2	1	1		*	240	Sysex Start
1-2	2	0		*	67	Yamaha ID
1-2	3	0		*	31	Sysex Channel+15
1-2	4	0		*	3	Parameter group
1-2	5	0		*	116	Parameter number
1-2	6	0		*	1	Data: Medium Snare
1-2	7	0		*	247	End of Sysex

Conclusion

This list of possibilities for system exclusive codes is by no means exhaustive; the potential applications are directly related to the capabilities of your particular instruments. If your keyboard or sequencer has the ability to transmit system exclusives, call or write the manufacturers of all your MIDI equipment to find out what hidden features you might be able to tap. If you have a software sequencer that doesn't have this capability, write the manufacturer and ask them to add it to future versions. This is the type of thing that programmers often overlook unless someone specifically requests it. Whatever it takes, once you've taken control of your synthesizers with system exclusives, you'll wonder how you got along without them. And, if anyone wants to know why you want all that esoteric information, say "System exclusives—they're not just for data dumps anymore!" EM

MIDI mergers can do a lot more than just add a couple of MIDI signals together—so let's find out how these little wonder boxes can make life with a MIDI system simpler and more efficient.

MIDI Mergers: Theory, Practice, Applications

BY DOUG KRAUL

MIDI Headache #1: As you listen to the mixdown of your last song, something's not right—it lacks the spontaneous feel that can only come from two musicians playing together. Yet your superdeluxe, state-of-the-art sequencer—like most sequencers—has only one MIDI In. Sure, you can store each part separately, but that makes it impossible for two musicians to interact and challenge each other. What can you do?

MIDI Headache #2: Then there's that drum part you slaved over for hours. You're about to record a keyboard bass line along with it into a sequencer, but rather than play along with the sterile click of a metronome, you want to play along with the drums. Since you want the sequencer to sync to the drums, you plug the drum's MIDI Out to the sequencer's MIDI In to send it timing data and... oops! There's no sequencer input left in which you can plug your keyboard. Well let's see, we can transfer the drum part into the sequencer, although maybe some of those tuning changes won't be recorded in the sequencer, and then send the sequencer track out to the drums, while recording the bass into a separate track ...all this requires some re-patching too...

Doug Kraul is president of Harmony Systems, which manufactures and markets the SynHance family of MIDI/synthesizer enhancement products. He has been a long-time enthusiast and practitioner of electronic music, has a MIDI-based home recording studio, and invites readers to contact him on the PAN network under the name HARMONY.

MIDI Headache #3: And what about developing patches for that expander module? As you work there with your favorite voice editing program and computer, and come up with a great patch, you send the interface's MIDI Out to the expander's MIDI In to upload the patch from computer to expander. Now unplug the cord from the interface, and plug in your keyboard to try the patch...hmm, it could use some changes. Unplug the keyboard, plug in the interface, send the new patch, plug in the keyboard...there *must* be an easier way than all this re-patching.

A switchbox would get rid of Headache #3, but a MIDI "Y" cable could solve all three problems and more. The bad news is that just wiring up three MIDI plugs in parallel will not do the job. The good news is that there *are* MIDI "Y" cables—they're called MIDI Mergers. But there is much more to MIDI merging than meets the eye.

WHAT IS A MIDI MERGER?

MIDI Messages are sent in a serial format (see "The Serial Nature of MIDI" in the July '86 EM), i.e. a series of grouped characters. The serial nature of a MIDI message must be preserved and the characters of a group kept together, otherwise the message will be garbled. A MIDI Merger's main duty is to separate the information from each input into messages, and then combine them into one output. Using a simple "Y" cable won't work because it doesn't know which are the individual bits of each character, or have the means to separate incoming information into messages. In general terms, then, a MIDI Merger:

- ✓ Takes two or more MIDI inputs
- ✓ Breaks the MIDI information in each up into MIDI messages
- ✓ And finally, recombines the messages from each input into a single output.

Nothing is as easy as it sounds, though, and MIDI Mergers are no exception. Let's discuss a hypothetical, two-input, one-output merger.

THE OLD IN, IN, OUT

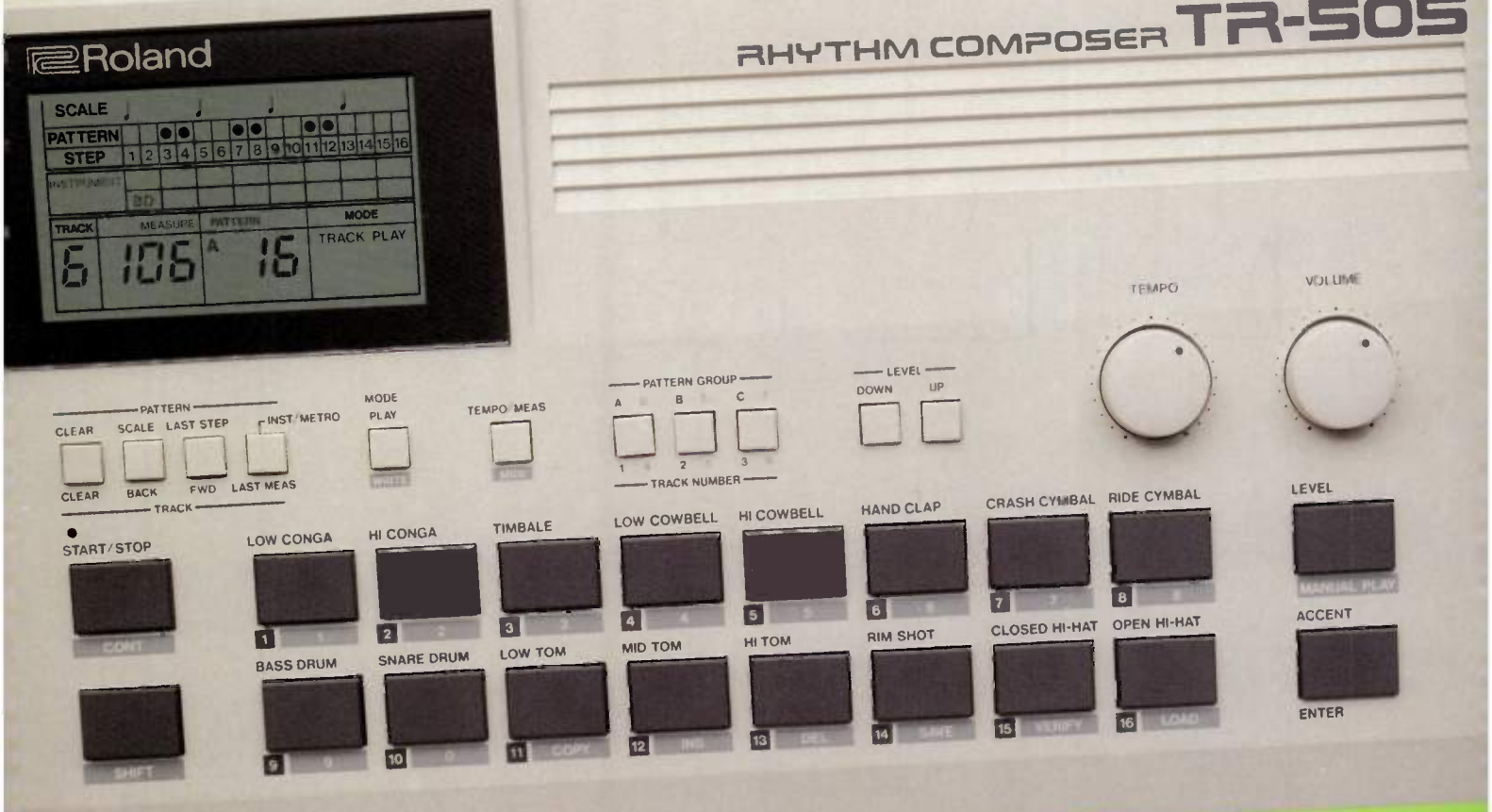
When MIDI information is sent on one or both of the merger's inputs—but not simultaneously—the merger examines the incoming MIDI data, breaks it into messages and then resends the messages to the output. This process continues for as long as there are MIDI messages. Surprisingly, mergers operate this way most of the time, since truly simultaneous input is rare. An important point is that this must happen as quickly as possible to avoid creating delays in the MIDI data stream.

When simultaneous data appears at *both* inputs, two "scanners" (implemented in software) go to work. For each input, one scanner independently breaks the MIDI data into MIDI messages and checks to see if the other is resending. If the other is resending, the requesting scanner waits to send its message until the other is finished. This alternate sending process sounds simple, but in fact it is a challenge to make the merger operate smoothly and reliably.

THE BUFFER

When a scanner receives a message while the other is resending, it puts the data in a buffer that holds messages in the order received and releases them in their turn.

TR-505



LIGHT HEAVYWEIGHT

Weighing in at only 950 grams (that's 2 lbs. 2 oz. to us), Roland's spunky new TR-505 Rhythm Composer sports a winning combination of traditional drum-kit and Latin Percussion instruments. But don't let its small size and modest price fool you—the TR-505 boasts heavy-weight digital PCM samples of kick, snare, toms, handclaps, high hats, cymbals, timbales, congas and cowbells—16 voices in all to give your rhythm tracks, rehearsals or live performances a punchy professional drum sound and feel. Behind all this brawn is a sophisticated computer brain with more than enough smarts and memory to make this drum machine your ally in the fight against boring drum programming. Program 48 of your own drum patterns (in real-time or step-time) or take advantage of 48 useful preprogrammed patterns—either way you're off and drumming right away. The large LCD display helps you keep track of every beat and performance parameter. But that's not all, our new champ still has a few moves you haven't seen. The TR-505 is a thoroughly modern MIDI instrument loaded with MIDI features and controls including an ability to respond to dynamic drum parts. Battery or AC powered, the versatile TR-505 scores an easy Technical Knock-Out over the competition. But don't say we didn't warn you—this little powerhouse will knock your socks off!

Roland

RolandCorp US, 7200 Dominion Circle, Los Angeles, CA 90040 (213) 685 5141.

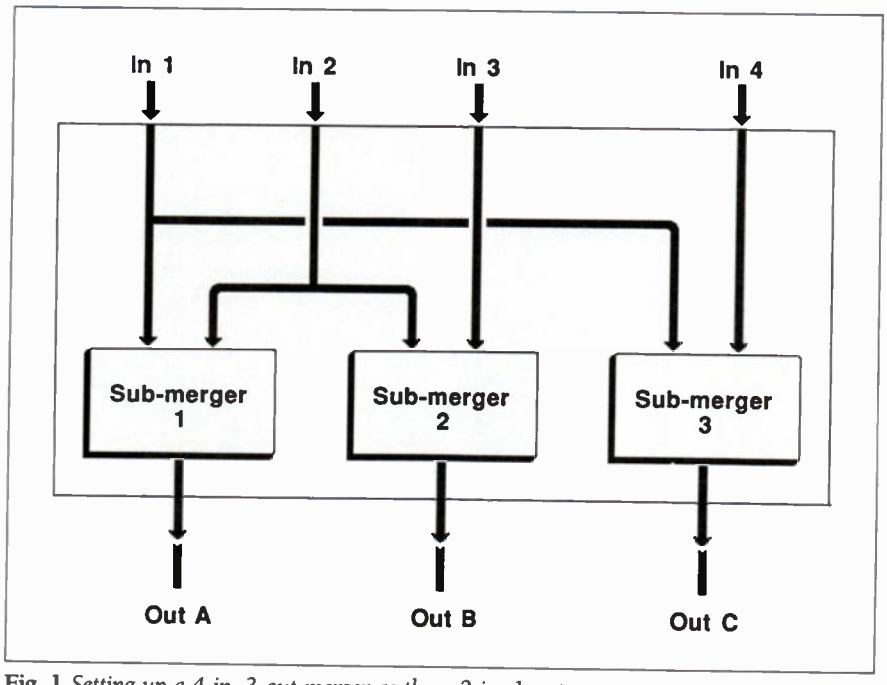


Fig. 1 *Setting up a 4-in, 3-out merger as three 2-in, 1-out mergers*

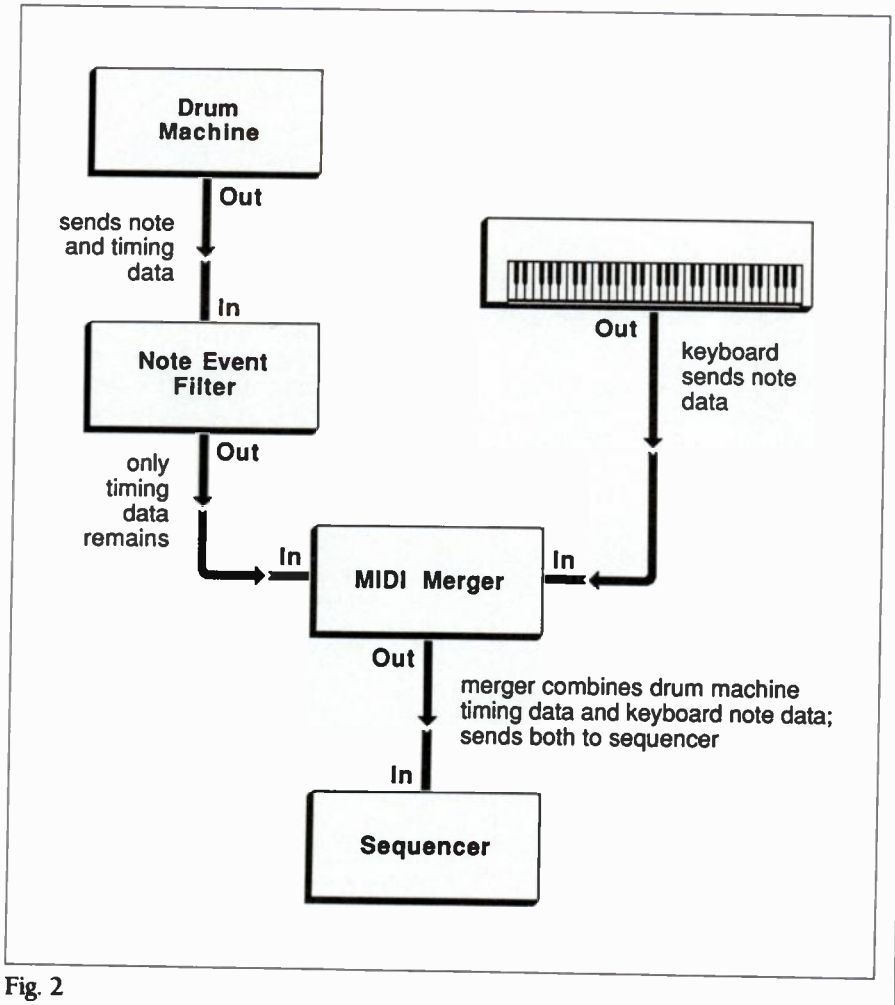


Fig. 2

Buffers vary in size; too much data will cause a "buffer overflow" and lose data. Since Murphy's law says all lost MIDI data will be note-off commands (thus causing "stuck" notes), the synths will drone forever, or at least until they are reset. Larger buffers help somewhat, though at a certain point increased size yields minimal improvement from a practical standpoint.

The other issue is how scanners decide when to send a message. One way is to wait until an entire message is received before resending it. This way, one scanner does not "hog" the output while waiting for the rest of a message that may never come. This approach works, but the typical MIDI message takes about one millisecond to send, and that long a wait introduces a delay into the MIDI stream that eventually becomes audible, particularly if a number of mergers are chained together. A better approach is to resend the message as it is received, without tying up the output in the case of an unfinished or broken message. This design uses a message timer to detect broken messages so the scanner can take appropriate action. Either method works, but the latter yields a shorter delay.

Typical MIDI Merger Features

MIDI Mergers, like many products, come with a variety of features that fall into three categories: operationally essential; convenience; and non-merger features that may have other uses in a MIDI system. Let's talk about merger features in general, and what they mean to a user.

The first option to be considered is the *number of inputs and outputs.* Regarding inputs, regardless of the depth of your wallet, there are real-world restrictions to how many can be used. On the average, the maximum amount of MIDI data that a merger can process is limited to the maximum rate at which MIDI information is sent. Practically, this means that as you increase the number of simultaneous inputs, the complexity of the music at each input must be reduced. If you are putting two keyboard players through your merger, and both players use aftertouch, modulation wheel and pitch bend, chances are that your merger will handle no more than these two inputs. On the other hand, if you use a merger on stage to let you move freely among a fixed keyboard, remote keyboard, guitar controller and your exotic motion-to-MIDI interface, you'll never use more than one controller at a time and will

therefore experience no problems. So, be sure that you know your application before you buy more inputs than you need.

Another issue surrounding the number of inputs is the merger's ability to process the MIDI data. This can become a problem, for example, when one merger is asked to act as a number of independent mergers.

Consider what happens when you set up a four-input, three-output merger so output A mixes inputs 1 and 2, output

"Using a merger to add keyboard echo to a librarian has exciting possibilities for live performance"

B combines inputs 2 and 3, and output C mixes 1 and 4 (**Fig. 1**). You start playing, are careful about the maximum MIDI rate, yet you still get buffer overflows and lost note-offs.

The problem is that, while still playing MIDI by the rules, your multiple inputs may add up to exceed the merger's processing ability. Unfortunately, manufacturers do not publish their mergers' capacity. If you have a demanding application requiring more than two inputs, test before you buy. Remember, the number of inputs can always be expanded by chaining mergers together. Usually this is not the most economical way of getting additional inputs, but it will work, and you will also be safe in the knowledge that the limitation on capacity will be MIDI, not the merger.

The *number and implementation of outputs* is another option. Outputs should be fully and independently switchable to accept any or all inputs. An output is like the bus on an audio mixing board; so a two-input, two-output merger should allow either output to resend combinations of either input. Such a device can sometimes act like two two-to-one mergers.

Some mergers offer *multiple connectors* for each output. This means that the merged MIDI stream at an output is available at more than one physical jack and

the merger can control more than one MIDI device without resorting to using a separate MIDI thru box. Be careful to understand the distinction between the number of outputs and the number of connectors per output.

A related feature is the *input selector switch*. On a basic, two-input, one-output merger this switch selects whether one or the other or both inputs are routed to the output. Of course with more inputs and more outputs the feature is even more desirable, since it allows a merger to provide some of the functions of a MIDI switch box.

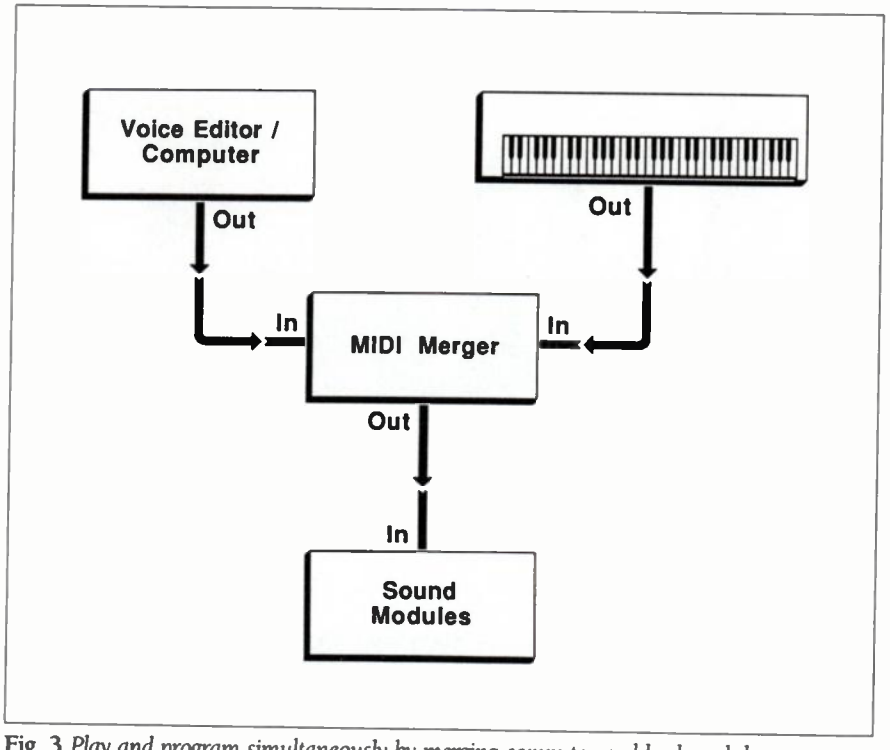


Fig. 3 *Play and program simultaneously by merging computer and keyboard data*

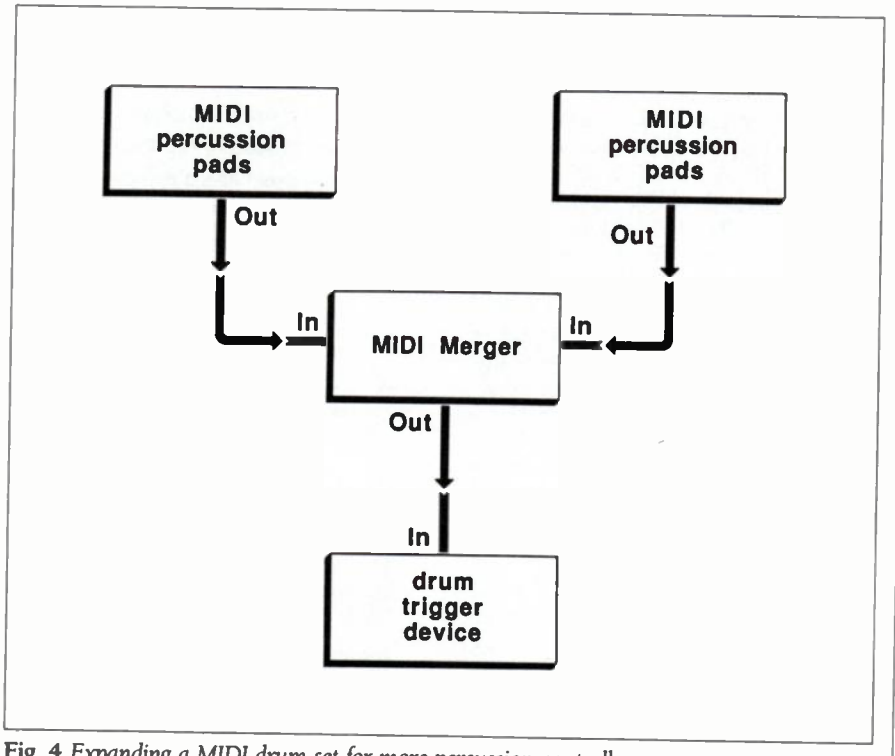


Fig. 4 *Expanding a MIDI drum set for more percussion controllers*

Switching is implemented in many different ways, so try before you buy to make sure you get what you want. If you plan to switch often, the switching should be conveniently located. Some mergers offer a way to control the switching remotely via MIDI commands. This feature is useful in a MIDI system where the set-up is under sequencer or computer control.

There are three ways to handle the effect of switching while MIDI data is being sent. The least desirable method allows switching anytime, even between or in the middle of a MIDI character. This approach leads to MIDI data errors. A second approach only allows switching between MIDI messages. This "glitchless" switching is controlled by the merger without user intervention and prevents data errors. A third method assumes that switching only occurs at the beginning or end of a performance, and so initializes the rest of the MIDI set-up whenever you switch. This method prevents switching before note-off commands are sent, but prevents the switch function from being part of the performance.

FILTERING

As we discussed above, it is possible to send more information to the merger than MIDI can handle at the output. To avoid this, some mergers can filter aftertouch, pitch bend and continuous controller data out of the data stream. Of course, the need for filtering only becomes apparent after clogging happens. This is all right in the studio, where you can always do another take, but live performance is another matter. Further, the filtered data is not always superfluous, and will be needed in many cases. Filtering the modulation wheel, for example, may also prevent you from using the MIDI volume control.

To overcome this, some mergers do "dynamic filtering," where the merger decides when and what to filter. The merger does this by determining whether the data about to clog the output is pitch bend, aftertouch or continuous controller data, and if so, filtering every other message. This relieves the clog without altering the result appreciably, and the performer still has the benefit of using knobs and wheels.

External filters with selectable filtering, which have certain practical applications in merger-based MIDI set-ups, are

available if your merger doesn't have one on-board. To sync a sequencer to a drum machine, for instance, without sending note data, requires a "note event" filter between the drum machine and the merger. Merging the filtered drum box with a keyboard allows the drums to fire the sequencer while the musician records MIDI data from the keyboard (**Fig. 2**). Clearly, for a filter to be truly useful, it must be settable separately on each input. A global elimination of note commands would have been as useful as disconnecting the keyboard.

> **"Be sure that you know your application before you buy more inputs than you need"**

Your own set-up and techniques should determine whether you buy a unit with built-in user filtering or take the external route.

The Box Itself

Mergers can be table-top units, rack mountable, or adaptable to both placements. If you are unsure about your future mounting requirements, then this type of package may be the best to purchase.

But What Do I Do With It?

You perform live in a quartet, but as keyboard player you're a little tired of all the attention being focused on the lead singer and guitar player while you slave away with your glorious chops unnoticed behind your stack of MIDI gear. You decide to invest in a remote keyboard controller, like a Roland Axis, Yamaha KX5, Casio AZ1, Lynx, etc. You quickly realize that you will need to share your mountain of MIDI synth gear between your fixed keyboard and your remote keyboard. The simplest approach is to use a MIDI switch box that lets you switch between the remote keyboard and the stationary one. However, you had better remember to switch at the appropriate times, or you'll be out front with no sound coming from your keyboard! A much safer method is to use a two-input merger, since you can concentrate on your music instead of remembering when to flick the switch and also, you could play both keyboards at the same time if required.

In The Studio

Remember MIDI Headache #3? **Fig. 3** shows a set-up that lets you play your keyboard into the synth, or load patches from a voice editor via system exclusive commands without switching or repatching. Note that if you're using a synth with on-board sound generators, the same set-up applies if you turn off local control at the keyboard (assuming this option is available) and route the MIDI merger output to the synthesizer MIDI In.

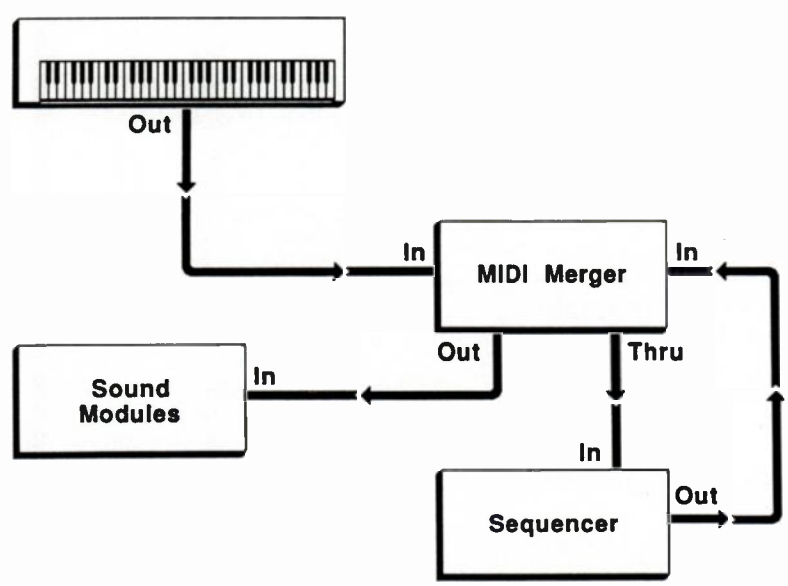
To play two stacked keyboard controllers, like an organ, merge your controllers, and take the output to the rest of your set-up. If the trigger device on a drum kit only supports eight pads or mics, and you really need to expand your percussive palette, merge two eight-trigger controllers with a two-input merger (**Fig. 4**). If a lead singer wants to play a remote keyboard controller hooked into the keyboard player's MIDI stack, a two-in merger solves the problem. Hook the remote into one input, and the keyboardist's controller into the other. Set the MIDI channel on the remote to play a module the keyboardist isn't using, and both players can share the MIDI gear without the keyboardist losing the use of the synth module that the lead singer only uses occasionally.

If your sequencer syncs to tape via its single MIDI In and you want to create sequences synched to some already-recorded tape tracks, merge the sync unit and the keyboard into the sequencer.

Hello...ello...ello...llo...lo...o...

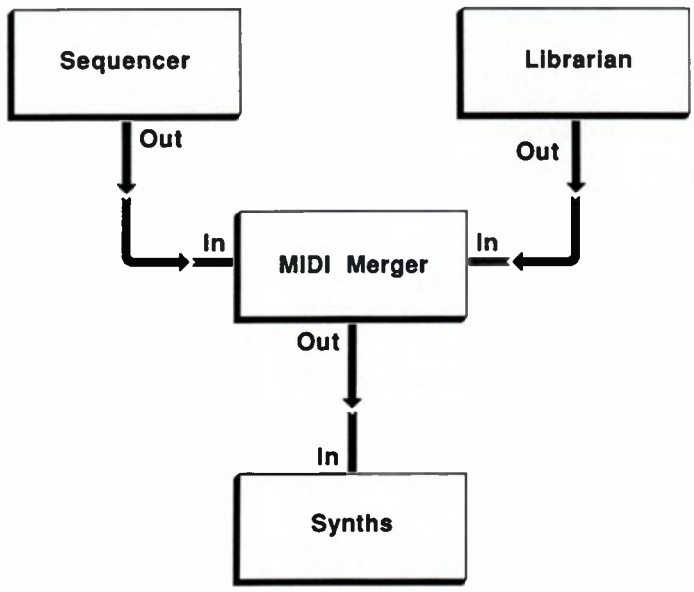
If your sequencer does not support a "Keyboard Echo" capability, use a merger with a MIDI Thru port. Referring to **Fig. 5**, hook your keyboard's MIDI output into one of the merger inputs and the MIDI Thru output into the sequencer's MIDI In, then connect the sequencer output into the other merger input. Finally, connect the output of the merger to your sound module(s). What you play will not only go into the sequencer but also to the sound modules and synths. Incidentally, this set-up is also perfect for playing live on top of prerecorded sequenced material for a small MIDI set-up.

Even if your sequencer supports a keyboard echo, you may find the above set-up both convenient and more accurate. Keyboard echo on sequencers, especially computer-based, requires you to have the computer or sequencer turned on just to play the keyboard. This can be a drag, especially if someone else wants



Keyboard note data feeds the sequencer and sound modules; the sequencer can also play back through the sound modules

Fig. 5



Send patch changes, from the librarian, to change synth sounds as the sequence is playing

Fig. 6

to use the computer to play Interstellar Commando. Additionally, such set-ups have a difficult time delivering the keyboard's and the sequencer's data to the output in a timely fashion. A merger can solve this too.

Keyboard echo is not only useful for sequencing, but if software patch librarians and editors neglect to implement keyboard echo, or if you have a keyboardless MIDI sound module, or like playing any and all of your keyboard synths from one central keyboard, then you need a keyboard echo capability for your patch editors, waveform editors, and librarians to audition your sounds. If you did not get one with the software, then a merger can add this important feature.

The addition of a keyboard echo to a librarian has exciting possibilities for live performance. Have the librarian and keyboard merged into the rest of the MIDI set-up at all times. Now you can use the librarian to change patches *while you play!* Think of the possibilities for subtle (or maybe not so subtle) patch changes during a performance. Live!

LIBRARIAN

Here's a use for that old stand-alone sequencer that you replaced with the nifty new computer-based sequencer/patch librarian. Hook the librarian and stand-alone sequencer each to the inputs of a merger, and the merger output to your synths (**Fig. 6**). Play a song you're orchestrating on the sequencer, with looping on if available. Invoke the librarian for the synth playing the part you wish to orchestrate. Send a patch out, listen to one sound, try another, and another. Until you try this you won't believe how much easier it is to get the right sound for a part. If you're really brave, replace the librarian with a patch editor and tweak the patch during playback. This can be fun during live performances too.

Here's one final tip. Connect the output of a MIDI controller to both inputs of a two-input merger. Connect the output to a MIDI synth, and when you play any note, the synth will sound two voices in unison about one millisecond apart to produce a subjectively thicker sound.

CONCLUSIONS

MIDI mergers, as we've seen, provide many useful functions. As MIDI set-ups increase in complexity, we can expect to see additional useful applications for these devices. In any event, the MIDI merger is useful to have around if for no other reason than as a "problem-solver." Chances are if you have one, you'll use it—and maybe discover some interesting new applications in the process. EM

Knowing a few simple techniques can make your DX7 easier to set up, and use, in live performance . . . take it from one who knows.

The Performing DX7

BY LOWELL LEVINGER

Ah, the venerable DX7. It blew everybody's socks off when it hit the market in '83 at a mere two grand. Even with the new DX7 Mark II now available, there are still zillions of keyboard players who play, buy, sell, program, and trade DX7s. As someone who has been playing the DX7 almost since its introduction, I've collected a bunch of tips on how to set up this popular instrument for simple, efficient live use . . . and here they are.

FUNCTION SETTINGS

The FUNCTION (Performance) settings are accessed by the only *tan* button of the synth. Being global parameters, the DX's entire memory is affected by these settings (the TX216/816 and TX7, on the other hand, remember FUNCTION parameters for each patch), so changing patches won't change your performance settings.

Most single DX setups have only two pedals, one for sustain or portamento, and one for volume or foot controller; sustain and volume are most often chosen. Since players generally don't use a breath controller, we are left with two modulation sources, the Mod Wheel and Aftertouch.

MODULATION

I like to set the Mod Wheel RANGE to 99 and set its EQ BIAS to ON. This way the wheel will bring in "Stuff" that I've programmed into the voice to respond to the mod wheel. ("Stuff" is a term I learned from Gary Leuenberger, who programs voices for the DX professionally, to describe voice components such as pad noise, spit noise, tube distortion, fret buzz and the like.) Or it can bring in a whole different part of a sound (see the patch in **Fig. 1**, "Interlude"; **Fig. 3** shows the function parameters for this patch as well as the patch in **Fig. 2**). You can also substitute the Mod Wheel for the breath controller or foot pedal for patches that are programmed to respond only to them (see "Softstrings," **Fig. 2**). When you're checking out a ream of new patches to find the good ones, set the Mod Wheel as above and introduce modulation into each new voice so that you won't miss any hidden features.

AFTERTOUCH

The right Aftertouch RANGE setting depends on your playing techniques (I set it for about 41 with the PITCH set ON). Since the lower the RANGE value, the harder you have to press to get an effect, a light touch needs a higher setting and a heavy touch can require as low a setting as 09 - 17.

Many sounds are programmed to include vibrato; using Aftertouch to introduce this can add expressiveness to your playing without having to move a hand from the keyboard over to the Mod Wheel.

```
   A ***IntrludeLL***  ALG.# 6 FDBK= 5
O                                      R V
P R1 R2 R3 R4 L1 L2 L3 L4 OL FTUNE     S S
1 82 26 28 43 99 89  0  0 99  2. 0+2  3 6
2 83 72 26 17 99 82  0  0 99 10. 0+0  2 4
3 81 19  4 36 99 89  0  0 99  0.50+2  4 2
4 75 59  5 33 99 80  0  0 99  1.50-6  3 4
5 80 26 29 42 99 87  0  0 99  2. 0-5  2 6
6 78 75 28 38 99 82  0  0 99 10. 0+6  3 2

P  9  9 44 99 50 50 50 50  OSC SYNC:ON

L  WAVE S-DN  O MOD    LEVEL SCALING
F SPEED 30    P SNS  LEFT    BP   RIGHT
O DELAY  7    1  0  -LIN  0 C 7 -EXP  0
    PMD  0    2  0  -LIN  0 F 3 -LIN 18
    AMD 80    3  3  -LIN  0 C 7 -EXP  0
   SYNC ON    4  3  -LIN  0 A-1 -LIN  3
    PMS  2    5  0  -LIN  0 C 7 -EXP  0
MIDDLE C=C 3  6  0  -LIN  0 A-1 -LIN  5
```

Fig. 1 *Patch A, "Interlude"*

Lowell Levinger, a/k/a **Banana**, *is best-known for his work with the Youngbloods in the '60s and early '70s, and as accompanist for Mimi Farina. He started the Raccoon School of Recording Engineering, one of the first, in the early '70s; he also co-authored the JXPRESS Editor/Librarian for the Roland JX-8P synthesizer, and is recognized as an accomplished programmer for the DX7.*

```
   B ***Sofstrings***  ALG.# 2 FDBK= 7
O                                                    R V
P R1 R2 R3 R4 L1 L2 L3 L4 OL FTUNE                   S S
1 35 11 11 31 99 97 86  0 99 1*905-7                 4 2
2 35  7  9 35 99 97 86  0 76  2.  2-3                4 0
3 35  7  9 35 99 97 86  0 99  2.  0+3                4 2
4 71 30  0 33 99 98 90  0 72  2.  0-5                3 0
5 99 49 55 34 99 95 92  0 68  8.  0+0                2 0
6 99 42 50 59 99 99 99  0 72  2.  0-4                0 0

P 87 94  0 99 47 51 50 50  OSC SYNC:ON

L  WAVE SINE  0 MOD     LEVEL SCALING
F SPEED 35    P SNS  LEFT    BP   RIGHT
0 DELAY  0    1  3  -EXP  0 C 7 -EXP  0
    PMD 18    2  1  -EXP  0 C 7 -EXP  0
    AMD  0    3  3  -EXP  0 C 7 -EXP  0
   SYNC OFF   4  1  +LIN  4 G 3 -LIN 13
    PMS  1    5  1  +LIN  4 B 2 -LIN 44
MIDDLE C=C 1  6  1  -EXP  0 F#2 -LIN 62
```

Fig. 2 *Patch B, "Sofstrings"*

```
FUNCTION SET # 0

MONO:   OFF

PITCH BEND RANGE:  2
           STEP:   0

PORTAMENTO  MODE: ON
           GLISS: OFF
            TIME: 50


CONTROL    RANGE  PITCH  AMPL  EG BIAS

WHEEL       99     OFF    OFF   ON
FOOT         0     OFF    OFF   OFF
BREATH       0     OFF    OFF   OFF
AFTCH       41     ON     OFF   OFF
```

Fig. 3 *Function settings for the two patches*

Pitch Bend

Setting the Pitch Bend RANGE to two semitones facilitates the most common kinds of bends—half-step and whole-step. Set STEP at 0 so the bend works smoothly. To get a totally variable pitch bend, set the FINGERED PORTAMENTO MODE (Mono Mode only) with PORTAMENT TIME at about 50 so you can hear what's happening. Now with the PORTAMENTO MODE set to SUS-KEY P SUSTAIN and no pedal plugged into the Portamento jack . . . everything sounds weird! We need to plug something into the Porta-

mento port, and since we're using our only on/off pedal for sustain, it's not available. To remedy this situation, short out a standard ¼-inch jack by connecting the hot and ground terminals, and plug this into the Portamento port Now the synth will work normally until you switch from POLY to MONO mode and go into the nothing-but-fun FINGERED PORTA mode.

"Hitting your new 'Cat Jugglers from Betelgeuse' sound by accident during a romantic ballad is not likely to endear you to the lead singer"

Being in MONO mode, the DX will only play one note at a time. Release one note before hitting the next, and they play normally. But hold a note down and play another, and the pitch slides to the new note. *Voila*, variable pitch bend. Bend up and down and back up again without releasing the note, or play whole passages totally legato if your patch has enough sustain built into it. You won't have to press FUNCTION before switching into MONO; just leave FUNCTION set to the POLY/MONO parameter and press INTERNAL. As long as you don't access another FUNCTION, every time you press the YES button or slide the Data Entry Slider all the way up, the DX will go into MONO and FINGERED PORTAMENTO. Pressing NO returns the DX to POLY mode with no portamento.

Internal Memory Management

In addition to the 32 Internal Memory storage spaces, stock DX7s come with one RAM cartridge capable of storing 32 voices. This isn't really enough storage space for players who like to program their own sounds or who like to choose from a lot of custom sounds. Personal computers and good software have made it easy to store thousands of voices and

—page 106

Much more than just a review—here are some extremely useful tips to help you get the most out of this popular program.

Sonus Super Sequencer for the C-64 and 128

BY STEVEN SMITH

Super Sequencer is an updated and greatly improved version of the software that won "Product of the Year" award from *MIDI Marketer* magazine in 1985. The program's authors, Tim Ryan and Marshall Otwell, have done an outstanding job of putting extreme power in a sequencer without adding stiffness in operation. First we'll cover the program's basic features for those who aren't familiar with this software, then we'll get into a variety of tips and applications that will help you get the most out of this surprisingly sophisticated program.

Product Summary

Product: Sonus Super Sequencer
Type: Sequencer Software
Price: $225 (C-64 version); $275 (C-128 version)
Hardware Requirements: Commodore 64 or 128 computer; Passport/Yamaha, Sequential Circuits (C-64 or 242), Sonus/Syntech MIDI interface
Sequence architecture: 16 sequences of up to eight tracks; sequences arranged in up to four songs with up to 24 steps
Manufacturer: Sonus Corp., 21430 Strathern Suite H, Canoga Park, CA 91304; tel. 818/702-0992

FUNDAMENTALS

Super Sequencer supports Passport/Yamaha, Sequential Circuits (C-64 or 242), and SONUS/Syntech interfaces. The program's architecture consists of a possible 16 sequences, each containing up to eight tracks. These sequences can then be arranged in up to four songs, each of which can contain 24 steps. The four songs can additionally be grouped as a "set" which can be saved or loaded from disk with a single command. You can record and play back in real time or step mode with both live punch-in and *programmable* punch mode to help salvage those near perfect "Gee, I'd hate to lose this one!" tracks.

The program logically groups most commands into "menus"; the menu commands are shown at the bottom of your screen in four "reverse field" displays which correspond to the four function keys on the Commodore 64 and 128 computers. Each menu can have as many as 16 commands since the SHIFT and CTRL keys are also used with the four function keys, thus giving four possible options—unshifted function keys, shifted function keys, control with function keys, and shift plus control with function keys. The reverse field displays respond immediately to the various options, thus allowing a rapid scan of the various options—just hit CTRL, for example, and the screen will display the commands initiated by hitting the four function keys when CTRL is pressed.

Fig. 1 shows the Main Screen display. The upper left-hand section shows all 16 sequences with any names you have assigned to each sequence. Across the top we have a remaining memory and sequencer clock status display. The upper right-hand section displays the status of several "hidden commands" (more on these later). Center screen shows the "transport" display, active sequence and track display, tempo and meter settings, and counters for current sequence position and end of sequence location. All tracks (identified by a three-letter name) are displayed near the bottom, along with MIDI channel number and velocity offset factor (if these have been assigned; we'll cover velocity offset in greater detail under applications). As mentioned above, the very bottom of the screen shows the currently active commands available for the four function keys. In the sequence and track display, the currently active sequence and track (respectively) are highlighted in bright yellow so you don't get lost.

MORE ABOUT MENUS

Sonus has grouped their commands into seven menus according to function. The seven groups are: 1) Main Menu, 2) Edit Sequences, 3) Edit Tracks, 4) Edit Songs, 5) System Exclusive, 6) Track Modification and 7) Disk Commands.

The Main menu is like a home base that lets you access any other menu instantly. Some commands are duplicated (or modified) in more than one menu to help reduce the movement in and out of menus. For example, you can enter the Disk menu from the Song menu but the commands are modified to only allow the manipulation of Song files (which is desirable in performance situations).

TAKE ONE

After I connect all my audio lines, MIDI cables, get my channel assignments straight, prime my drum machines and bow toward Mecca three times, I think I'm ready to put this program to work. A

Steven Smith received his BM degree from Jacksonville University in 1983. His major was music composition with emphasis in electronic music. He is currently part of the EM faculty at J.U. and also part-time keyboard salesman at the American Music Store. He is co-founder of Songsters music services in Jacksonville, FL, and performs in the band ForeRunner locally.

counter keeps track of where you are in the song by bar, beat, and clock pulse; when you first enter record, the counter counts like mad—but never moves past the first beat until after you play the first note. You can bypass this feature if you wish, yet I like the fact that it gives me plenty of time to check the displays, confirm the tempo, etc. If you lay down a track, don't like it, and want to record again, a prompt asks if you want to record over the previous data. In fact, any time you enter a command that might erase something, Super Sequencer asks "are you sure?" in one way or another. I personally *love* safety prompts; although they slow me down, they've saved me from accidentally erasing hours of work.

"Some commands are duplicated (or modified) in more than one menu to help reduce the movement in and out of menus"

Once a track is recorded, its end can be set if you go past the desired end point. The track can also be bounced, quantized (I quantize the bounced version for safety's sake in case I don't like the quantization), muted, or erased.

After recording the first track you can turn a countdown On or Off. When On, the screen shows a numeric countdown, accompanied by a metronome click. Although you can record or play back from anywhere within the sequence, the countdown works only if recording from the very beginning.

When recording drums, I often use three or more tracks. Once they're complete, the bounce function can be used to bounce multiple tracks down into one track, thus providing a merge function.

You can also boost or cut all the velocity values of a track by a factor of +7 through -7 (good for "MIDI automated mixing") and assign a MIDI channel number to a track. The good news is if you merge a track (or tracks) with either velocity and/or channel assignments, the program processes the data into the tracks independently and then performs the merge.

Tricks and Tips

There are three track shift functions. The first lets you move a track backwards or forwards in time by up to ±96 clock pulses. The other two, Shift Track Left and Shift Track Right, can shift a track left or right as far as you want and can also erase data. Why would you want to erase data? Suppose you have an eight bar sequence and accidentally play the wrong chord just before the sequence ends. Sure you could punch it, but it can be faster to just shift the track right so that the incorrect chord is shifted out of the eight bar sequence, then shift the track left back into its original position...presto chango, the chord is gone.

Track shifting can also provide echo by copying one track to another, track shifting (delaying) the second track, and lowering the velocity scaling of the second track (the velocity scaling only works, of course, with synthesizers that support velocity). Copying to more tracks can provide even more echoes, although this technique works best with voices that have fast attacks and fairly quick decays since each echo uses a synth voice, and lots of echoes therefore use up lots of voices. Since you can also transpose tracks (limited only by your keyboard's range, and you could always transpose more than once to circumvent that), the echo could move upwards in octaves, create chords, and do other track tricks.

Program Change and Auto-Punch

If you call the program (sound/voice) up during the pre-record countdown, the sequencer will store the program number on the first beat of the track. This is a real time saver if you remember to use it. If you don't remember, no problem—Super Sequencer provides Auto-Punch for this and many other needs. Auto-Punch is a programmable punch-in mode that works in either real time or step-mode recording. One of the most common uses of Auto-Punch is to erase an occasional bad note out of a track. Three parameters must be set for Auto-Punch: Cue (where playback starts), In (where new material replaces old material), and Out (where to stop recording new material).

When using Auto-Punch to correct wrong notes, the best approach is to enter step-mode playback and walk through a

Fig. 1 *Super Sequencer 128 Main Screen Display*

track to find out exactly where the sour note starts and ends (write down the counter settings on a piece of paper). One good aspect of this program is that you can use one of three methods to move the clock in step mode—single clock pulses, full beat, or programmable (quarter note through 1/32nd note triplet).

But, you ask, how can Auto-Punch record a program number recorded at the beginning of a track *without* recording over the first note?

Here's where we use the track time shift command that doesn't erase data. Auto Correct your track (after making a safety copy). Time shift right by one clock pulse. Set the Auto-Punch mode In on the first pulse and Out on the second. Enter step-mode record and the sequencer waits for you on the first clock pulse. Call up your program on your synth, then advance the clock one pulse. You're now out of record (thanks to Auto-Punch) and your program number is neatly placed at the beginning of your track without damaging anything you've recorded. If you can Auto-Correct again, everything will shift back into place without erasing the work we just did.

Large Scale Structure

In Song mode, each song has 24 "slots" into which any of the sequences can be placed. All 24 positions are displayed simultaneously so it's very easy to keep track of your song's structure. All the normal song commands are available—Insert, Delete, Name Song, etc., with some very nice extras. You can place from two to nine repeats at any step in the song. You can independently transpose any step. Another feature, Auto-Mute, lets you choose a track mute layout for each step of the song. For example, suppose we have a chorus section that's 16 bars long, and the first eight bars are identical to the second eight bars except for the horn riffs. We can use the same sequence for both halves and place the different horn riffs on different tracks. During playback, we mute one track for the first song step, and mute the other track during the second song step. Simple.

For a more extreme use, suppose Verses A and B were 16 bars long each but totally different. We could merge all the tracks of Verse A's sequence down to just two tracks (say, 1 and 2). Then we would merge all of Verse B's sequence down to two other tracks (3 and 4). We could then append the two sequences, track shift Verse B so that its two tracks occur simultaneously with Verse A, and use the Set End command to remove the empty part of Verse B. Now we can use the same sequence to play back Verse A or B simply by muting the two tracks we don't want to hear. This can be very useful if you start to run out of sequences. While in the Song screen, whichever sequence you are working on is highlighted in bright yellow and the track display (still at the bottom) shows which tracks are muted and which are not. You can mute or unmute from this screen.

Track Mods, Hidden Commands and System Exclusive

The Track Modification Menu lets you selectively remove different MIDI "controller" data (Program Changes, Pitch Wheel, Modulation Wheel, After Touch, Sustain Pedal or Volume data) from any individual track.

Sonus also includes several little goodies called "hidden commands," which means they are commands that are not activated by the function keys. You can set the sequencer clock to output tape sync, output drum sync, follow tape sync, follow drum sync, or follow incoming MIDI clock data. You can enter Play Through mode which allows you to play your controller keyboard (or synth) using any MIDI channel you assign (this even operates in playback or record mode). There is also a hidden command that converts Modulation Wheel data into MIDI volume data. A common trick is to record your basic track and then on a second track (assigned to the same MIDI channel) add program changes, pitch bend, foot controller or whatever. You can work on one controller at a time until you get what you like, merge the two tracks together, then move on to the next controller. With the Play Through and the Mod Wheel/MIDI Volume features turned on simultaneously, you can hear how the volume of the track reacts to the Mod Wheel track as you record it. Live MIDI Volume mixing! There are, however, two points to remember—start wth the Mod Wheel all the way up, and play a dummy note at the beginning of recording a "controller" track to make sure it records. You can easily punch out the extraneous note later.

And for the "coup de grace," there's a built-in MIDI System Exclusive librarian. It comes complete with MIDI Receive; MIDI Transmit; and Disk Save, Load, and Delete commands. I have been waiting for this a long time—finally I have a back-up of my drum machine's info via MIDI, living on the same disk as my other sequence data, and the process is at least 20 times faster than cassette.

Loose Ends

Tempos range from 44 to 240 BPM and can be changed by increments of one BPM. You have an audio and visual metro-

nome with an option to squelch the audio. In the back of the manual, there are appendices that list the hidden commands and the corresponding keys that activate them. Also, there is a list of clock pulses that are matched up with different note values—very helpful in the step record mode. I haven't even mentioned the sequencer Time Shift commands; these work similarly to the Track Shift command and are useful in creating measures of rest in the beginning of sequences, cutting off bad measures, etc. All the Time Shift commands are new to me.

"The Time Shift commands...seem to offer a lot of new possibilities that have yet to be fully realized"

They seem to offer a lot of new possibilities that have yet to be fully realized. As with any computer work, always remember to save your work to disk in stages. This will allow you to go back and rework anything you decide to change. Also, it can save lots of work from being lost by just one brief power failure.

CONCLUSION

Of course, no program has *everything*—for example, you can't just grab one note from a chord and alter its velocity, as you can with programs written for computers costing ten times as much as a C-64. But this program isn't missing much. On the whole it gives me the tools to do what I need to do with a minimum of fuss. Often in computer programs for music you find yourself wishing the programmer had more of an idea of what musicians are trying to do, and how we are trying to go about composing music. Here I felt just the opposite. The clarity and detail of displays, high flexibility and ease of use, unique and useful options, safety prompts everywhere—even a well-written manual!—make it seem as though Sonus has really expended the effort to make this a *musician's* program. I highly recommend Super Sequencer as exceptional MIDI software for your C-64 or 128 computer. EM

Do you have a performer's identity crisis? Don't despair—the convertible DK70 synth/controller lets you sit behind the stack or strut your stuff.

Siel DK70 MIDI Synthesizer

BY ALAN GARY CAMPBELL

The DK70 is an eight-voice polyphonic MIDI synthesizer that features an onboard stereo chorus and internal two-track sequencer. An optional "Stage Set," including an add-on performance controller arm, converts the DK70 to a strap-on synth/controller. Power is supplied by a hefty AC adapter (included) or eight C-cell batteries.

The DK70 is housed in a 2¼ × 29 × 11 inch (6 × 74 × 28 cm) all-plastic case. This minimizes the instrument's weight and bulk, which is great for strap-on use, but take care when handling the unit—the case could be damaged if dropped on a hard surface. The case design (steel-gray with vivid, colored accents) is very attractive. Even the "black" keys are a matching shade of grey. The multi-lingual owner's manual is adequate in general but, oddly, makes no mention of a number of performance functions and controls.

Programs and parameters are accessed by the familiar function buttons, increment/decrement switches, numeric keypad, and LED display. A "battery saver" circuit blanks the display after 15 seconds. All parameters are programmable except the performance functions, sequencer functions, and the Master Tune and Volume controls. The rear panel provides: stereo line outputs; a stereo headphone output; power switch; AC adapter input; clock input; multi-function pedal (footswitch) input; MIDI In, Out, and Thru jacks; and a multi-pin socket to connect the Stage Set.

The keyboard has a very light, four-octave (C to C), unweighted action. The keytops are of approximately normal width, but are somewhat stubby. The keyboard is not velocity-sensing, but the MIDI Output does transmit a programmable, constant velocity value with each Note-On command. This lets you determine how hard the DK70 will drive external MIDI synths that receive velocity, and is especially handy with synths like the Yamaha DX/TX series that produce an "overdriven" sound in response to the upper range of MIDI velocity values. The DK70 also has a Chord Hold function and a Solo (monophonic) mode.

The DK70's panel-mounted performance controls include a spring-loaded pitch-bend wheel (bend range is not adjustable), and a modulation-control switch marked "Depth." Curiously, the pitch-bend wheel is recessed too far below the panel: the performer's thumb or finger, riding in the notch on the wheel, impacts the panel before reaching the upper or lower limit of the bend range. This makes precise, intervallic bends at the range extremes difficult if not impossible.

The DK70 is a *hybrid* synth. DCOs and DCAs, with digitally-produced envelopes and LFOs, are processed through an analog VCF (Voltage Controlled Filter) and Chorus. Each "voice" consists of a DCO, DCA, and EG, but there is only a *single* VCF to process the combined output of all eight voices; this is perhaps the most limiting feature of the instrument.

The DCOs offer sawtooth or square waves, but not both simultaneously. The sawtooth may be transposed to 16', 8' and 4' octave settings. The square wave has 16', 8', 4', and 2' settings that *are* available simultaneously; and the relative level of each octave is separately programmable, thus providing a limited source of complex staircase waveforms. In this respect and many others, the DK70 is *very* similar to the Korg Poly 800 series, with which the DK70 obviously was designed to compete.

The DK70 envelopes are six-segment Attack/Decay/Break-Point/Slope/Sustain/Release types. This design is fairly easy to program, yet provides many common envelope shapes including the standard ADSR and even double-envelope "horn blips." The VCF is a standard four-pole resonant lowpass filter. VCF parameters include Cutoff, Resonance, Keyboard Tracking (0, ½, or Full), Envelope Amount, and Trigger Mode; this last parameter determines whether the VCF EG responds in single- or multi-trigger fashion. The filter does not oscillate at maximum

Product Summary

Product: Siel DK70 Convertible Keyboard
Type: MIDI synthesizer and/or remote (or strap-on) keyboard controller
List price: $595
Sound Production: 8-voice polyphonic, hybrid voices (DCOs, DCAs, and EGs for each voice; single analog VCF for all voices)
Keyboard: Four-octave (C to C), unweighted action, no velocity (module responds to velocity when played over MIDI by a velocity-sensitive master keyboard)
Memory: 40 internal presets, 10 internal user-programmable memory locations; cartridge slot for 50 additional ROM presets or 50 additional user programs in RAM
Other features: Chorus, six-segment envelopes, 2-track 200 note sequencer, double mode, bolt-on control arm
Distributor: On-Site Music, 3000 Marcus Avenue, Suite 2W7, Lake Success, NY 11042; tel. 516/775-5510

Alan Gary Campbell is the owner of Musitech,™ a consulting firm specializing in electronic music product design.

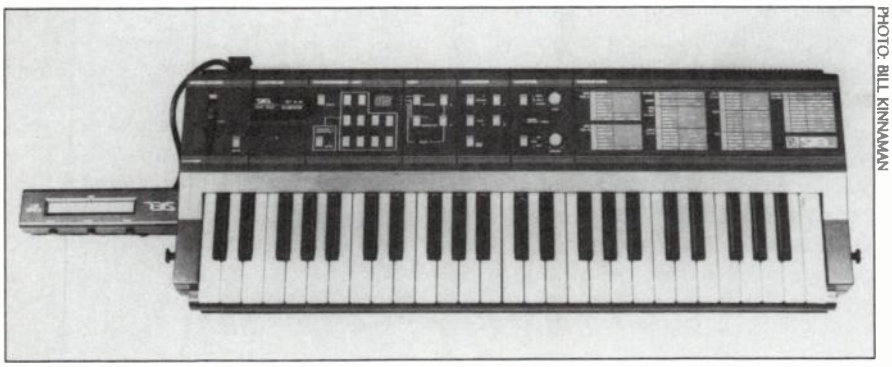


PHOTO: BILL KINNAMAN

resonance. A digital noise generator provides pseudo-pink noise that may be routed to the VCF, or to a separate DCA controlled by the VCF EG.

Two separate LFOs provide modulation effects for the DCOs and VCF; at the high end the DCO LFO is fast enough to create some "raspy" FM. Each LFO provides programmable initial/final levels and modulation delay times. The LFOs may be triggered automatically, or controlled from the Modulation Depth button. There is no pulse-width modulation; any DCO timbral animation must come from the onboard chorus, which can be enabled/disabled, but has no rate or depth adjustments. The chorus outputs use phase inversion to simulate stereo. If these outputs are inadvertently combined in mono, the effect will cancel out.

The DK70 does have a *Double* mode that allows you to combine two DCOs, each with its own DCA and associated EG. This increases the potential complexity of sounds, but reduces the number of available voices to four. In Double mode, each DCO has the same waveform; however, DCO2's frequency can be detuned over a wide range and each DCO can have its Sustain Pedal functions separately enabled/disabled.

The DK70 contains 40 internal presets and 10 internal user-programmable memory locations, each with programmable volume. It retains the user programs whether or not batteries are installed, and includes a software write-protect function. A cartridge slot provides 50 additional ROM presets or 50 additional user programs in RAM. Unfortunately, the internal presets are *very* weak, but the ROM cartridge presets are better—so much so that purchase of the ROM cartridge seems mandatory. As might be expected, the best sounds use Double Mode.

The sequencer stores up to 200 notes which can be allocated as needed between two seqences. If your sequencing desires are grandiose, this won't be enough; but it's adequate for bass lines and comps (simple, repeating chord patterns). An LED and audible metronome (which can be disabled) indicate record/play tempos. A sequence begins recording when either the Start/Stop button or the remote footswitch is pressed; no "count off" is provided. Each sequence can be recorded, looped, or played back—independently or in parallel. No editing or auto-correct features are implemented, so sequences must be re-recorded to fix mistakes. The sequencer can sync to an internal clock, or to or from either MIDI or pulse-based clocks. The sequencer can be programmed to control the internal tone generators or to send MIDI Note On/Off commands—but not both at once.

The unit always transmits MIDI data on Channel 1. Programmable MIDI functions include: Omni On/Off mode, MIDI Receive Channel (1-16), Velocity Transmit Value, and Velocity Receive (On/Off). When the DK70 is played by velocity-sensing controllers, Velocity Receive allows the the unit's DCAs and VCF to respond to MIDI velocity data. This provides a considerable enhancement of the DK70's sound, though the instrument's note range under MIDI control is only five octaves. The MIDI functions are global parameters, but the unit does remember the most recent settings when powered down. There is also a non-programmable front panel button that allows the DK70 to select internal programs, or send/receive program changes via MIDI, or both.

A multi-function footswitch input (Siel refers to this as a "pedal" input) uses a stereo jack to access two footswitches; one provides the Sustain Pedal function, and the other can be programmed to

control Octave Transpose, Program Up, Sequence Start/Stop, or MIDI Out On/Off functions. This is a really useful feature, which more manufacturers should implement; but it would be even more powerful if *both* footswitches had programmable functions.

The Stage Set accessory kit contains a bolt-on performance-control arm and a guitar-type shoulder strap. The performance controls consist of a ribbon controller (the panel-mounted pitch-bend wheel is disabled when the arm is plugged in) and three pushbuttons that engage the Modulation Depth, Sustain Pedal, and Filter Mode functions. The ribbon controller has a smooth plastic surface that responds well to a light touch. It's easy to get used to and has a really great feel. The ribbon controller range, like the wheel range, is not adjustable. For in-tune multi-instrument bends via MIDI, you'll have to adjust the bend range on each slave unit, which is somewhat of a nuisance.

The DK70 makes a surprisingly comfortable and well-balanced strap-on controller. However, it's almost impossible to use the AC adapter with the unit strapped on, and batteries add unwanted weight (*and* become depleted quickly). It would probably be best to have a service center modify the unit to receive phantom DC power over the MIDI or audio cables.

The DK70 is a mixed bag. It has some well thought-out features, especially its MIDI implementation and multi-function pedal, and it does include an onboard sequencer that can control external MIDI gear, and a stereo chorus. But the internal presets and pitch-bend wheel design need revision, and the DK70 faces some stiff price competition in the MIDI marketplace—especially when you consider the added cost of the ROM and RAM cartridges and Stage Set, items that many players are likely to consider to be necessary accessories. Still, if you're among the many DX, CZ, and sampler owners who would like to add a hybrid/analog expander to your setup, the DK70 might fit the bill, if its timbral capabilities are sufficient for your needs. It does offer many of the features of an expander, sequencer, and strap-on controller for not much more than the cost of a controller alone—not a bad deal, when you think about it.

—from page 99, DX7

performance banks on inexpensive disks. There are also RAM cartridges on the market that cost around $80 and will store 128 voices. Using the DX's Internal Memory spaces as storage vaults can adversely affect your performance on stage; it makes more sense to devote your Internal Memory solely to one given performance—even a single set—and think of Internal Memory as a patch "buffer" rather than as permanent storage.

Don't keep weird voices onboard that you don't plan to use on a gig; hitting your new "Cat Jugglers from Betelgeuse" sound by accident during a romantic ballad is not likely to endear you to the lead singer. Put the patches you *do* plan to use in a logical, easily accessible order for the show. It's convenient sometimes to have the same patch in more than one memory location. If you have trouble hitting the right button, put the same patch on adjacent buttons for a bigger target area. Some players divide the buttons into areas of solo patches: pads, keys, basses and so forth; others divide the areas into songs. You might even consider leaving blank patches (all output levels set to 00) to separate areas (songs) from one another. Each player and situation determines how internal memory should be managed but the point is, don't hoard it. Use it freely for performance and keep your precious library somewhere else. Before I got my first DX editing program for my Apple II, I filled many sheets of paper with blank patch sheets copied from the owner's manual. It takes a few minutes to write down all the parameters, but it's a reliable backup method and it's cheap.

"Don't hoard (internal memory) . . . use it freely for performance and keep your precious library somewhere else"

The DX is a versatile, good-sounding instrument; no wonder it has been so popular. With a little forethought, it can be easy—even painless—to use live, and I hope you find these tips helpful. EM

Advertiser Index

Sound Experience

Kawai's SOUND experience and excellence in building innovative electronic products has resulted in the creation of the K3 synthesizer system. The foundation of the system, the K3 Digital Wave Memory Synthesizer, is so advanced it has set higher standards of quality in the industry for affordably priced digital synthesizers. The advanced technology featured in the K3 provides an incredibly wide spectrum of useful voice programs created from a broad base of 32 digitally sampled waveforms. The K3's keyboard is carefully crafted to be the finest playing keyboard of any synthesizer and features both velocity and pressure response. 100 on board tone patches, "live" editing of patch parameters and full MIDI implementation give the K3 a true performance edge over the competition. Performance features on the K3 are designed to enhance — not hinder — your personal style. The user friendly programming system together with its programmable digital wave form makes creating and storing your sounds easier than ever before.

The K3 sound experience continues with the new K3M Module. The Kawai K3M is not a mere keyboard clone, but is specifically designed to enhance the performance of any Midi synthesizer. With the K3M you can add the crystal-clear sounds of Kawai's digital wavememory technology to your existing keyboard set-up. When Midi'd to the K3 (or any other synthesizer equipped with Midi Local Control) the K3M provides true Keyboard Split and Range assignment, and Midi Spillover (useful for 12-voice polyphonic performance on the K3). Like the K3, the K3M features 100 on board tone programs, full patch editing functions, 2 user programmable digital waveform settings, and 32 pre-sampled digital waveforms.

The K3 System

Now, for what most other manufacturers charge for a single keyboard, you can have a complete digital music system featuring both the K3 and the K3M! Also, Kawai has taken advantage of the open architecture of the K3 system by introducing a complete computer support system based on the Atari 130XE computer. Jointly developed with Hybrid Arts, the K3 Computer System includes a Librarian for organizing and storing hundreds of tone patches to disk, and a Wave Table Editor for creating and storing to disk hundreds of user programmed digital Waveforms and tone patches. The K3 computer system also features the Midi-Track III, a 16 track, 10,000 note Midi music sequencer.

Conclusions

Before you invest money in a digital synthesizer, take our SOUND advice ... check out the SOUND EXPERIENCE of the Kawai K3 and K3M Module.

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