Check out Roland's studio-in-a-box: The marvelous VS-880!

Electronic Musician

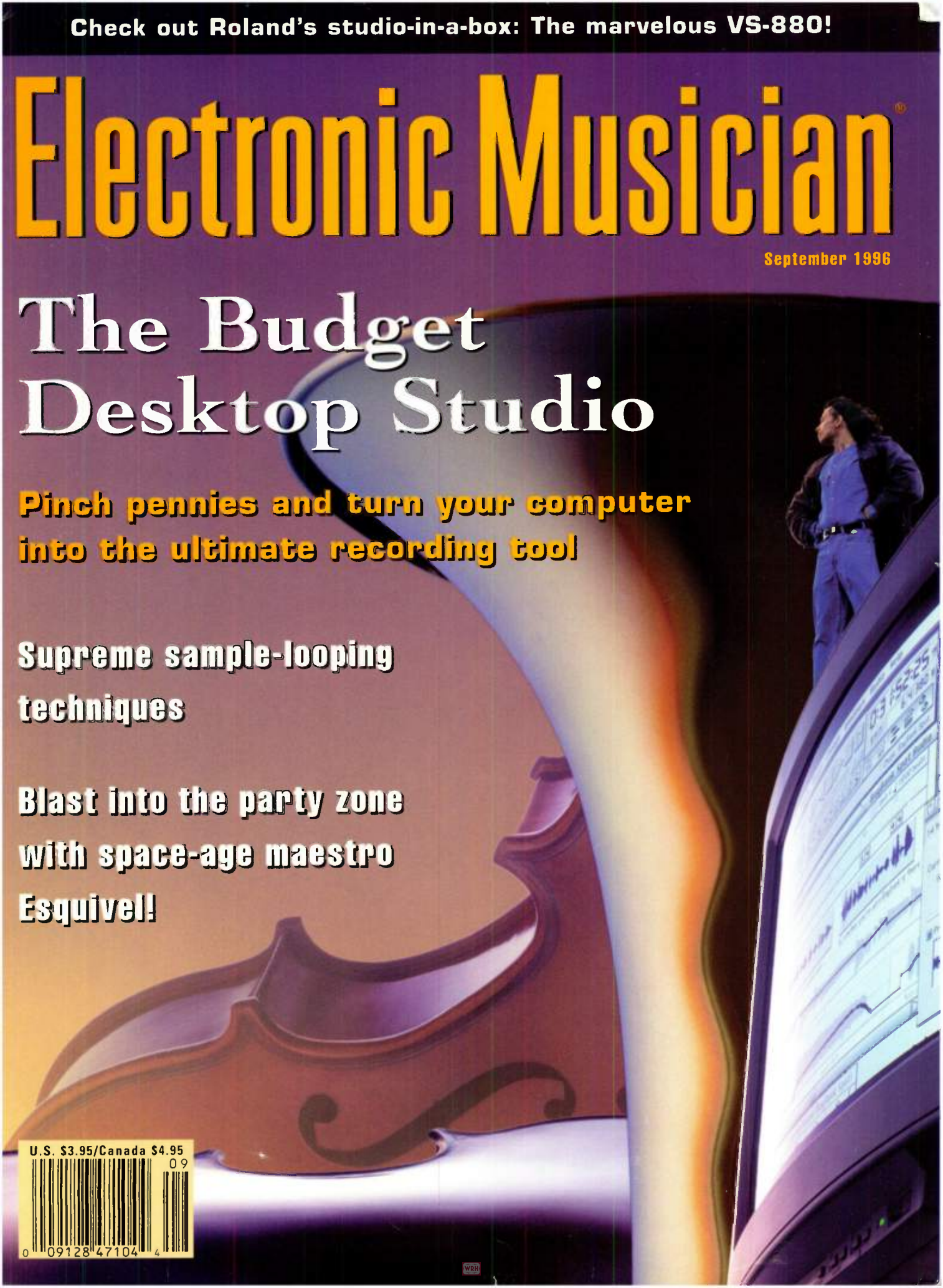
September 1996

The Budget Desktop Studio

Pinch pennies and turn your computer into the ultimate recording tool

Supreme sample-looping techniques

Blast into the party zone with space-age maestro Esquivel!



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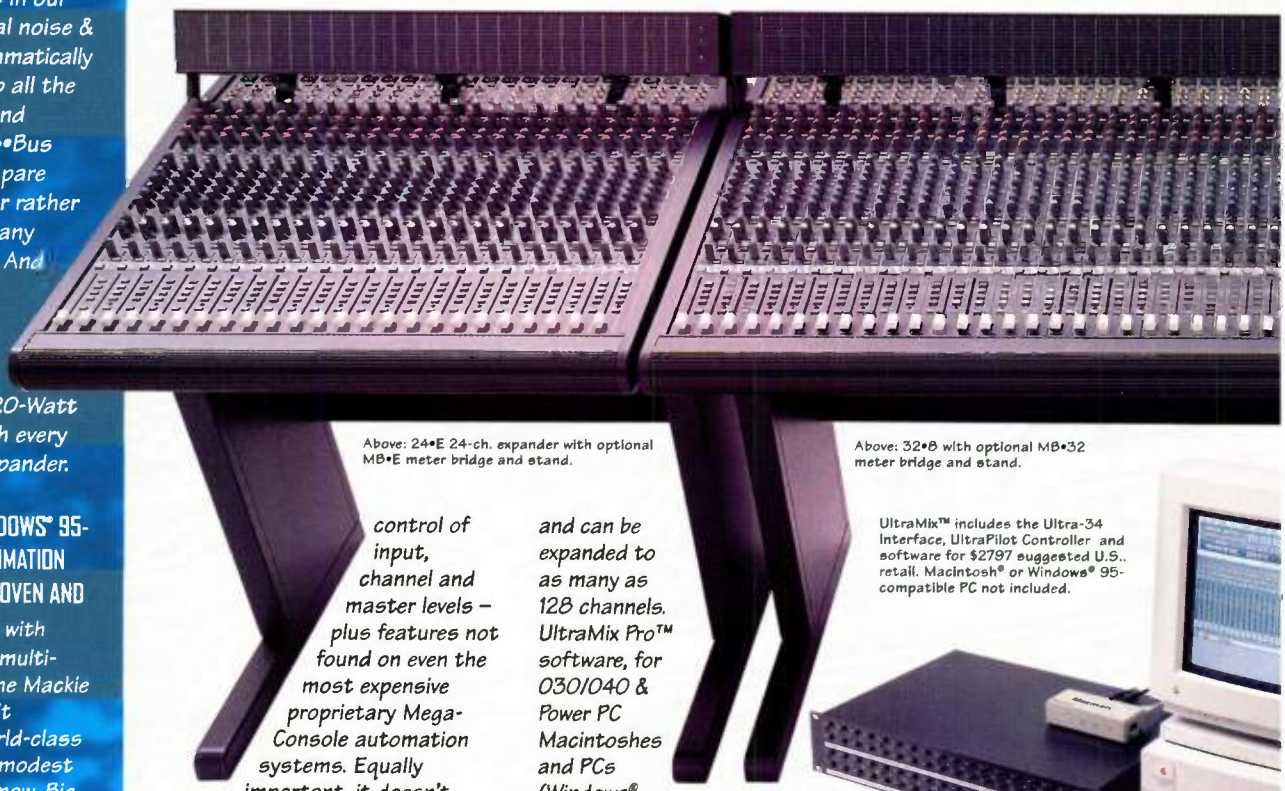
7 REASONS TO BUY OUR TO MIX MORE CREATIVELY,

1 VLZ CIRCUITRY FOR ULTRA-LOW NOISE AND CROSSTALK. *A fancy new name for the same old circuitry? Nope. VLZ (Very Low Impedance) is a Mackie innovation based on solid scientific principles. Through the careful deployment of high operating current and low resistor values at critical points in our consoles, thermal noise & crosstalk are dramatically reduced. Open up all the channels, subs and masters on an 8•Bus console and compare what you hear (or rather don't hear) with any Brand X console. And because VLZ circuitry needs loads of high current, we ship a humongous, 220-Watt power supply with every 8•Bus & 24•E expander.*

2 IT EXPANDS ALONG WITH YOUR NEEDS AND BUDGET. *You'd be surprised just how many 8•Bus console setups like the one below are currently in use. But you don't have to start out this way. Start out with a 24•8 or 32•8 and then grow your 8•Bus console 24 channels at a time with our 24•E add-on modules. 1, 2 or even 3 of 'em connect in minutes. They come with their own 220-watt power supply; optional meter bridges are available.*

3 IMPECCABLE MIC PREAMPS. *A console can have motorized dooflammers and an optional MIDI espresso attachment, but if the mic preamps aren't good, you don't have a fully-useful production board. Our discrete preamps with large-emitter-geometry transistors have won a critical acclaim for their exceptional headroom, low noise (–129.5dBm E.I.N.) & freedom from coloration. VLZ circuitry in the preamp section also reduces crosstalk.*

4 THIS CONSOLE JUST PLAIN SOUNDS GOOD. *Sure, you may be able to buy a Brand X console for less. But you end up with a console that sounds like…well…a Brand X console. Granted, we're getting into a pretty subjective area here…but we have tall mounds of 8•Bus warranty cards that rave about our consoles' "clarity," "sonic purity," "sweet sound," "transparency," "lack of coloration" and a lot of other superlatives we wish we'd thought of first.*



Above: 24•E 24-ch. expander with optional MB•E meter bridge and stand.

Above: 32•8 with optional MB•32 meter bridge and stand.

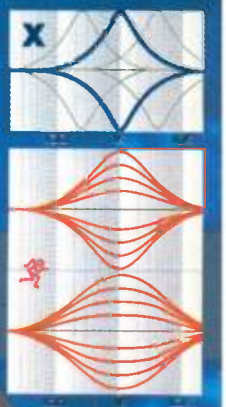
7 MAC® & WINDOWS® 95-BASED AUTOMATION THAT'S RELIABLE, PROVEN AND AFFORDABLE. *Along with affordable digital multi-track recorders, the Mackie 8•Bus has made it possible to do world-class productions on a modest budget. But until now, Big Studios have still had one remaining and unattainable creative "secret weapon"… computerized level automation. That's why we developed the UltraMix™ Universal Automation System. It gives you fully editable and recallable control of input, channel and master levels – plus features not found on even the most expensive proprietary Mega-Console automation systems. Equally important, it doesn't degrade sound quality, introduce zipper noise or cause audible "stepping." UltraMix is currently being used to mix network television music themes and on several major album projects – by seasoned engineers who grew up on Big Automation Systems. Their verdict is that UltraMix is a serious automation solution – stable, reliable and frankly easier to use than more expensive systems. The basic system controls 34 channels and can be expanded to as many as 128 channels. UltraMix Pro™ software, for 030/040 & Power PC Macintoshes and PCs (Windows® 95 required), includes a wealth of features like editable fader curves, built-in level display, up to eight subgroups, SMPTE time code display, event editor with pop-up faders, optional control of outboard effects devices, and the ability to play Standard MIDI files from within the program.*

UltraMix™ includes the Ultra-34 Interface, UltraPilot Controller and software for $2797 suggested U.S.. retail. Macintosh® or Windows® 95-compatible PC not included.

8-BUS CONSOLE... AND 2 TIPS ON HOW EFFICIENTLY AND, WELL, MORE FUNLY.*

5 **PROFESSIONALS REALLY USE THEM.** *The members of Boyz II Men could have afforded any console they wanted for their studio's second room. They chose an 80-input 8•Bus setup with 102 channels of UltraMix™ automation. In the studios of artists as diverse as k.d. lang†, Yes, Queensryche, Aerosmith, Lee Roy Parnell, Bryan Adams, Carlos Santana, Whitney Houston, Eric Clapton & U2, our consoles really are used to make great music.*

6 **WIDE MID RANGE EQ.** *Whether you're tracking or mixing, equalization is one of your most important creative tools. Mackie's 8•Bus consoles feature extremely-wide-bandwidth peaking EQ that can be used to achieve effects that simply aren't possible with narrower EQ. Most Brand X midrange EQs have a fixed bandwidth of about 2 octaves (blue graph at right). You can sweep it up & down the frequency spectrum, but the "sharpness" of the EQ curve is always the same. This kind of EQ is good for some purposes... but if you've worked with it before, you know it's too drastic and localized for gentle changes in overall tonal coloration.*



The 8•Bus' true parametric Hi Mid lets you spread the bandwidth out to as much as 3 octaves (red curves above). That extra octave of "width" gives you a whole new creative palette.

Above: 24•E 24-ch. expander with optional MB•E meter bridge and stand.

Above: The SideCar, matching 8•Bus equipment rack.

8 **WHAT ULTRAMIX AUTOMATION CAN DO FOR YOU:**

- *Hone a complicated mix one track at a time with every fader move recorded*
- *Clone your best fader moves and use them in other places in the mix*
- *Automute unused sections of your tape tracks or noisy MIDI sound modules*
- *Via automated mute or fader cuts, make a composite mix ("comp track") from the best moments of several tracks of the same vocal or instrument*
- *Save mixes for recall and editing at any time (great for mixes with music beds or "donuts")*
- *Make six voice-over versions of a jingle mix – and then easily make the inevitable nitpicky client changes three days later*
- *Step up to big-league automation without breaking the bank!*

9 **LEGENDARY RELIABILITY.** *One of those factors you probably don't think much about – until your console goes down in the middle of a critical late-night session. Built with pride in Woodinville, WA USA, Mackie 8•Bus consoles have an enviable three-year track record for enduring continuous, round-the-clock use and abuse.*

* Poetic license applied for.

† Mention in this ad denotes usage only, as reported to Mackie Designs, and is in no way intended to constitute official endorsement by the artists or groups listed.

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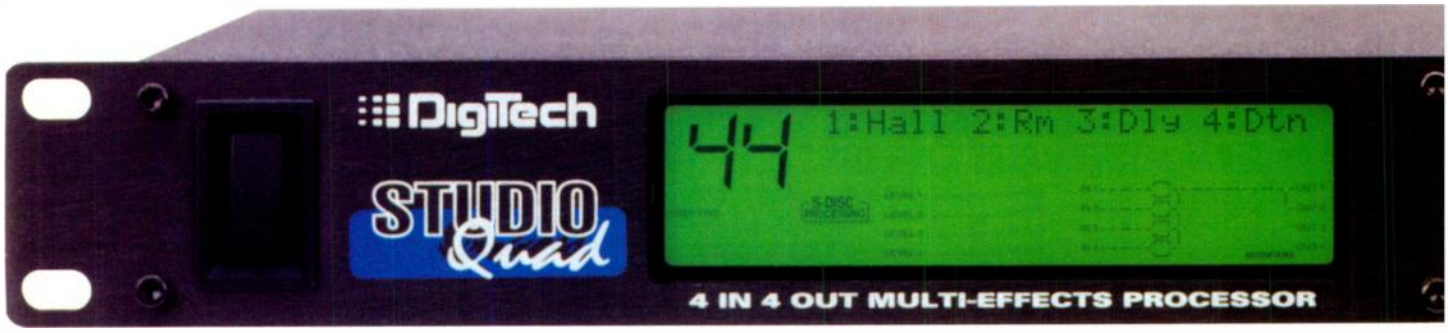
STUDIO Quad GET 4 PROCESSORS



4 COMPLETELY INDEPENDENT INPUTS

4 COMPLETELY INDEPENDENT OUTPUTS

4 COMPLETELY INDEPENDENT EFFECTS

*Buying one Studio Quad is like buying 4 independent processors. Inside the Studio Quad is a multi-effects processor that is multi-talented and while most of us can't do more than one thing at a time, the Studio Quad can do 4. Why did we put the power of 4 multi-effects processors into one unit? So you, too, would be able to do more than one thing at a time.

The Studio Quad features 4 completely independent inputs and outputs that give you the power of four independent mono processors or two true stereo processors. Imagine the power to process two true stereo sources simultaneously without sacrificing control. But true stereo is only the beginning. Imagine having 4 independent reverbs for vocals, guitar, keyboards, and drums, where each reverb can be optimized specif-

STUDIO Twin SIMPLE. POWERFUL. AFFORDABLE.

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ically to achieve the best audio performance for each application. And imagine a processor that gives you the power to create any combination of effects, in any order. And then multiply by four.

Check out the Studio Quad. With its ingenious user interface, large custom display, and potent S-DISC® technology at its heart, the Studio Quad is capable of not just replacing, but thoroughly eliminating the need for multiple, expensive, single-purpose processing units. You work hard for your money. DigiTech makes sure you get the most for it.

and multi-tap Delays, Chorus, Flanger, Detune,and Tremolo. **POWERFUL** Multi effects combinations like Mod+Delay, Mod+Reverb, or Delay+Reverb are also available. You can even process 2 independent mono sources through 2 separate effects. We also included a Noise Gate with an adjustable threshold, MIDI program change control, and an internal power supply. All these features packed into a single **AFFORDABLE** rackspace. Check out the DigiTech Studio Twin at you dealer today. Start sounding great tomorrow.

DigiTech

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I N S I

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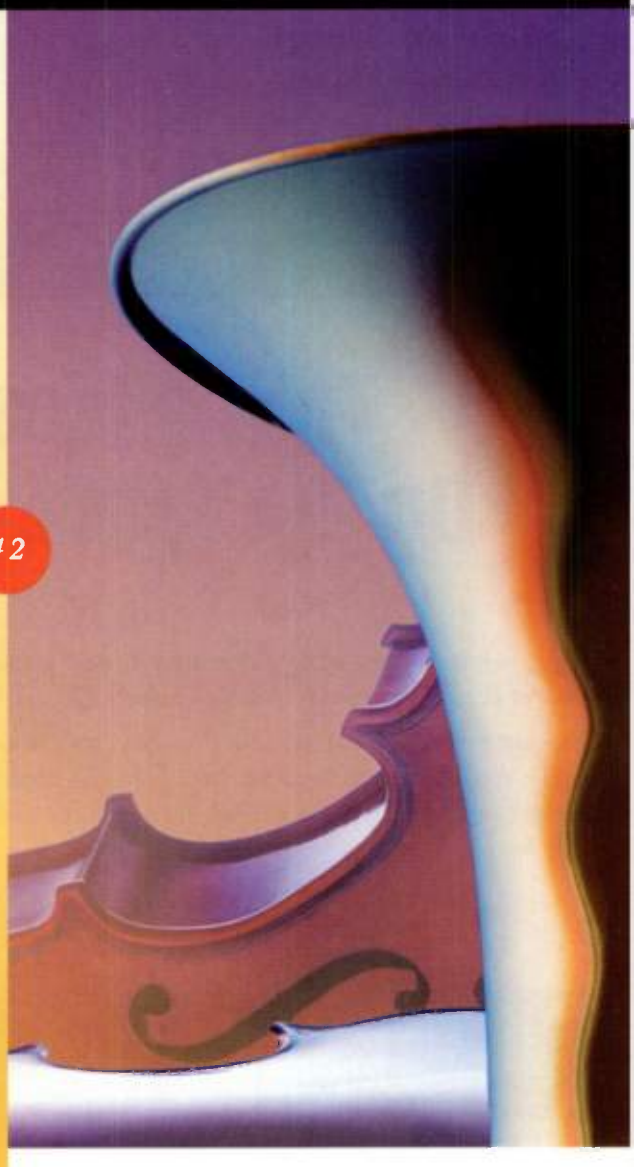

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ten! years of hot tracks & hip gear
SEPTEMBER 1996 VOL. 12, NO. 9

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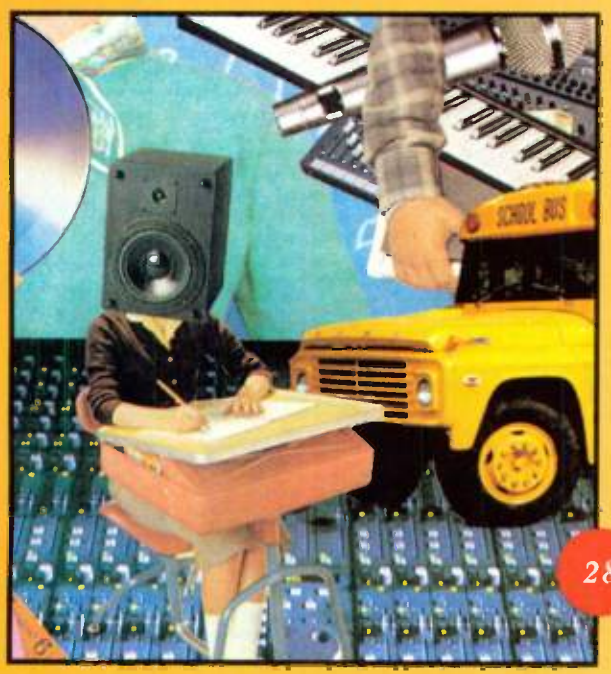

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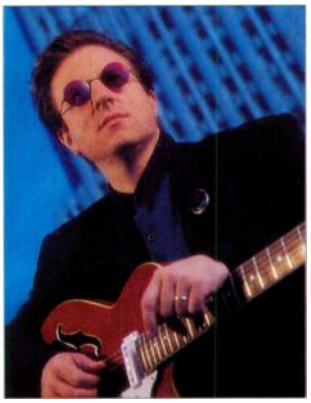
Cover: Photography by David Bishop.

Special thanks to Mark of the Unicorn and Dmitry Panich.

Diversification

There's more than one way to make beautiful music.



ROBERT PERRY

It seems that our excitable senior editor, Steve Oppenheimer, has moved **EM** out of the magazine business and into book publishing. His cover story, "The Budget Desktop Studio" on p. 42 (cowritten with Zack Price) is probably the largest single feature we have ever committed to print. Slap that sucker into a fine leather binding and you'll have yourself a library-quality reference work on assembling an affordable music production system. Anytime you have a couple of weeks free, I encourage you to read it! But, all kidding aside, I think this month's cover story is possibly the most comprehensive report on the desktop recording medium currently available. I salute Steve and Zack for helping **EM** continue to be "the source" for essential music production information.

But I'm also kind of peeved at them. Their voluminous account made me think about my own relationship with the modern music world. Now I have to cop to the fact that I am not yet a member of the desktop revolution. There are no PCs partying at Tiki Town, the project studio that I share with noted producer Scott Mathews. I haven't broken bread with a MIDI sequence in ages, and the only time I see a MIDI controller in the joint is when I hire Steve O. to sweeten a track with some of his exquisite mellotron samples.

Surprised? Well, it has always been erroneous to assume, just because I'm editor in chief of **EM**, that I use computers to make music. Likewise, it is a sadly uninformed assumption that **EM** is solely about making music with computers. Music production is a diverse field that encompasses a vast universe of methods and technologies, and **EM** is devoted to covering the big picture. Our job is to help you produce better music using the tools with which you're most comfortable. It doesn't matter whether you play guitar, drums, keyboards, or even accordion or whether you record on a cassette ministudio, a desktop system, or an MDM. Everyone on our staff has a specific field of expertise in this endeavor and, as a group, I like to think we are one mighty "database" of knowledge and experience. In the ensuing months, we'll be enlarging our scope even more so that no matter what you do, or how you do it, we'll have the informational goodies to help you achieve success. Believe it!

But let's stop blathering about music production and talk about something even *more* important: baby making! I'm so very happy to announce that my workout buddy and **EM** Southwestern Advertising Manager, Dave Reik, and his wife, Jenny, have produced a (literally) bouncing baby boy named Christopher. The kid already has all of the manic energy of his daddy and is definitely exhibiting a guitarist's mentality. Heaven help his poor mom!

In addition, Jennifer Seidel, our stellar editorial assistant, gave birth to a little angel named Kate just minutes before press time. (Leave it to her to make a tight deadline so she could get her birth announcement in this issue!) Ever the conscientious editor, Jennifer was composing a memo regarding our *Digital Piano Buyer's Guide*, detailing various tasks that still needed to be done, *as she was going into labor!* I'm sure her husband, Kevin, must have loved that stunt. Our staff had quite a laugh over the memo's final sentence: "Oh, God! My water broke. Here we go..."

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4 Outputs

How often have you had a great inspiration that somehow got lost on its way to the sequencer? Meet the MR-61 and MR-76, two new keyboards designed for the songwriter in all of us.

Capture your inspiration here.

The Idea Pad™ records everything you play, all the time. Noodle around a bit. Try out a few ideas. Yeah, that last one was a keeper! Don't worry, your inspiration has already been captured.

Here's your drummer,

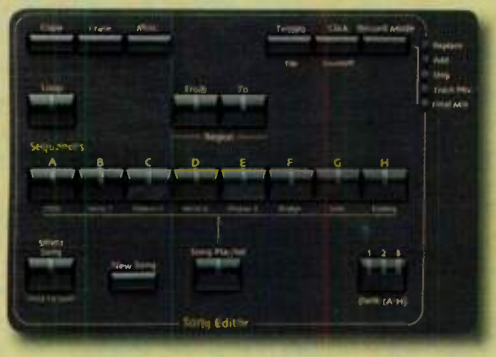
complete with 8 variations and 8 fills. Load in new rhythms from disk, creatively exploring how the patterns can change by trying different drum kits.

Use the Drum Machine on your live gigs, or to jam with to find your next inspiration. When you use it together with the Idea Pad, all of your Drum Machine activity is captured as well!

Send your ideas on to the 16-track sequencer to develop them further.

Arrange it here.

The Song Editor gives you a natural, easy-to-use interface for arranging your sequences into songs. Make a playlist by choosing the order of your sections. Trying a new arrangement is as easy as A, B, C, (or A, C, C, B, D, or A, D, C, B, E, ...).

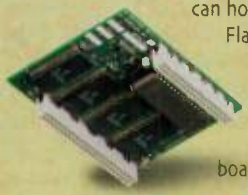


Mix it here.

The FX / Mixdown strip gives you direct access to each of the effects sections – reverb, chorus, and any of the 40 insert effects. Plus control over panning, volume, solo, and muting – use it just like a mixing board.

Here are your expansion options.

The MR Series have 3 expansion slots, which can hold either wave expansion or Flash memory for loading samples. Expand your wave ROM with up to 24 MB per board, or add 4 MB of sample memory per board, in any combination you need.



We wanted these great new concepts to be easy to use, so we put all the right controls on the front panel. Arranged in sensible groups so you don't waste time searching through complex menus.

Of course there's more – like support for Standard MIDI Files and General MIDI, a powerful voice and effects architecture (the same as our MR-Rack), performance features, fast sound editing, 64-note polyphony, a DOS-compatible disk format, and our SoundFinder™ interface, to name just a few.

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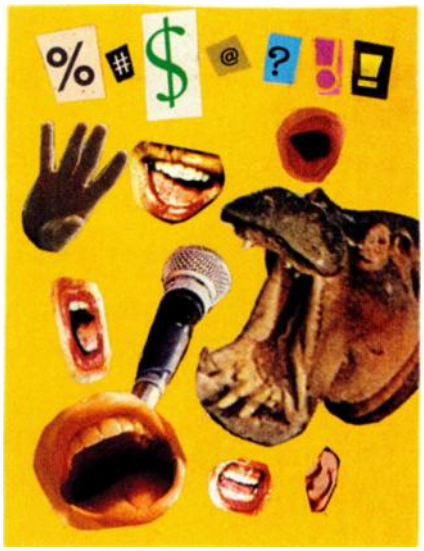

SIDECHAIN BLUES

After reading your article "Recording Musician: Working on the Sidechain Gang" (July 1996), I have a question about connecting an equalizer to the sidechain of my compressor. Can I use the equalizer from the spare channel on my board, or do I need to buy something such as a graphic EQ for de-essing?

Bill Ebner
Lisle, IL

Bill—If you have a direct output from the channel, you can patch the console EQ into the sidechain of a compressor. But how well it will work is another story. Unless your board has parametric EQ, you'll have a hard time specifying the particular frequencies you want to address, especially if de-essing is your goal. If taming sibilance is your primary goal, you may be better off buying a dedicated de-esser rather than an outboard equalizer. The de-esser will be easier to use, and it may even cost less.—Brian K.

PATCH IT UP

This is in response to the July letter from mbwonder ("Ma, Can I Have a Raise?"). I agree with Steve O's ideas about digging in and making your own patches, but here are a few more words from my own experience.

You might want to consider learning the basics of analog synthesis. It may not be practical for you, but if you can get your hands on one of those pre-MIDI monsters with all those knobs, it will help you greatly. They also sound cool. If you live near a big city, there might be a local studio that has lots of them, and they may be willing to teach you to play them.

I spend a lot of time creating patches, but it's really, *really* time consuming to make good ones. Sometimes it's not so bad to go back to those patches you think are terrible and try to use them in different ways. For example, use a generic trumpet patch as a bass line or use a bass patch in the upper register for a melodic theme. I would guess that you're probably sequencing or recording. You can think of "creating patches" within your sequences. For example, sequence a line, and then copy it to different tracks with different sounds. The layered unison sound is magical! And it gets even fatter if you pan the sounds to opposite sides and detune them a little. Let me know what you think.

mylzt1@aol.com

4-LETTER ERROR

I was very pleasantly surprised when reading the July issue of **EM** to find not only the excellent article "The Windows Studio" (which was the most technically sound and detailed article I have seen to date in any publication) but also a recommendation of my Web site, "Synth Zone," both in "Letters" ("Ma, Can I Have a Raise?") and in your article outlining music resources on the Internet ("Desktop Musician: Postcards from the Web").

However, I have a correction to the URL of my Roland page that was printed as http://www.rain.org/~nigelsp/roland.html. The document has only an "htm" rather than an "html" extension due to the fact that my pages are created on a PC with a maximum of 3-letter file extensions. I have temporarily duplicated my page so that the misprinted URL will work for the time being, but I'd advise visitors to amend that link to the correct one.

Thanks again for all your support. I think that you do a great job with your coverage. I know only too well what a diverse area music technology covers and that it's not an easy job to maintain that coverage—but you manage to do it. My stack of **EM**s has quite a bit of space before it finally meets the ceiling of my living room, so I hope **EM** is around for many years to come.

Nigel Spencer
Synth Zone
nigelsp@rain.org

BELLS WILL RING

Thanks for an awesome issue (June 1996)! I managed to find something of interest in just about every article. I especially enjoyed the one on the bell tower that's programmed via Visual Basic ("A Day in the Life: Ring My Bell"). It's fun to see how some people are using MIDI to do things other than put out vanity pressings of their music. It inspired me to give Visual Basic programming a try. Also, your coverage of CD-R in "Burn, Baby, Burn!" was far more comprehensive than any I've seen in other magazines.

junkbin@aol.com

AUDIO META EVENTS

Looking over "Square One: Genesis of a Standard" (June 1996), I learned that the meta events from SMFs can include Audio events that represent audio data from a digital audio sequencer. But I was told by Mark of the Unicorn, Opcode, and Digidesign that I could not import my audio edits to and from the various digital MIDI sequencing platforms. Is this true? I am currently an owner of Opcode's *Studio Vision Pro,* and I am thinking about getting MOTU's *Digital Performer,* but I hate the idea of having to change over to another audio/MIDI platform and not being able to import my *Studio Vision Pro* audio edits. Is it really possible to import digital audio edits from these platforms to each other by using meta events?

Alex Untermyer
auntermyer@kraft.com

(continued on p. 153)

MICHELE ALANIZ

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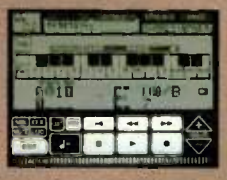
Realtime faders give you control of volume, panning, reverb and chorus levels for all 8 tracks.

Intro, fills, verse, chorus, ending—the Style Track lets you lay out your song visually.



27 different chord types to choose from in any key with any bass note—even a different chord on every beat.

With step editing you can go deep. Change the velocity and duration of one note, move it a few clock pulses ahead, or insert individual events.

When you're ready to get back to less comfortable surroundings, the PMA-5 has a built-in computer interface. And, because it's MIDI compatible you can play or record into the PMA-5 from a MIDI controller. You can even exchange Standard MIDI File data with your computer for freedom you never had before.

When traveling with a band won't work, the PMA-5 will. Since the PMA-5 is battery powered, you can have a band at your side anytime or anywhere. Choose from up to 20 songs, select bass and drum parts, transpose to any key at will, choose a preset style or create your own. It even has a built-in start/stop jack.

Try the PMA-5 at your nearest Roland dealer. Or, better yet, try it someplace more inspiring.

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WHAT'S NEW

By the EM staff

▲ PRECISION AUDIOTRONICS PEARLS

You can't hear me because you have a banana in your ear? Try a more subtle approach. Precision Audiotronics' Pearls ($499) earphone monitors use subminiature transducers to keep the product small. They also use vinyl earmold shells in an attempt to provide a better seal than is possible with conventional Lucite earmolds. The vinyl comes in thirteen standard colors. (The visible faceplate of the monitor is either beige or brown.) Pearls are custom molded, so users must have an audiologist take an impression of their ears.

The monitors have a single port at the ear canal. Their frequency response is rated at 20 Hz to 16 kHz (±4 dB), and they attenuate outside sound by 25 dB. A proprietary response-smoothing system produces a frequency curve that mimics the frequency response of the open ear. The cord ends in a 3.5 mm gold-plated stereo plug, and a ¼-inch adapter plug comes with each set. Precision Audiotronics; tel. (800) 711-7317; fax (407) 831-0909; e-mail audiotronics@precisionweb.com; Web http://precisionweb.com.

Circle #401 on Reader Service Card

▲ DBX MODEL 262

Ever since dbx began shipping its Project 1 series a few years ago, the company has introduced a steady flow of inexpensive but quality signal processors. The Project 1 Model 262 compressor/limiter continues in this tradition, offering dbx's famed VCA-based dynamics processing at a bargain price ($199.95). All inputs and outputs are differentially balanced and use ¼-inch, TRS connectors.

The dual-channel 262 offers both hard-knee compression and dbx's classic OverEasy soft-knee compression. You have control over threshold, ratio, and output gain, and the two channels can be linked for stereo operation. The unit's potentiometers click to detented positions. Each channel has an 8-LED gain-reduction meter. LEDs also indicate positive or negative OverEasy compression and the bypass status for each channel. Harman/dbx Professional Products; tel. (801) 566-7660; fax (801) 566-7662; e-mail customer@dbxpro.com; Web http://www.dbxpro.com.

Circle #402 on Reader Service Card

▼ TASCAM DA-38

When it comes to 8-track modular digital multitrack tape recorders, two machines have long dominated the market: TASCAM's DA-88 and Alesis' ADAT. The DA-88's extra features and higher price led to more DA-88s ending up in professional and post-production facilities and a preponderance of ADATs in home studios. But TASCAM's new DA-38 ($3,499) is designed specifically for home and project studios.

The DA-38 utilizes the same Hi-8 mm tape format used by the DA-88, and tapes are interchangeable between the two machines. Multiple DA-38s and DA-88s can be interconnected with either unit acting as master.

A digital track-copy function allows the user to assemble composite tracks from definable sections of other tracks. An electronic patch bay lets you direct signals from any input to any track or combination of tracks. Other features include track advance and delay, a built-in test-tone oscillator referenced to A-440, auto punch-in/out, and a shuttle wheel.

Front-panel controls include two locate points and a Shift key with color-coded functions. The rear panel has eight analog RCA inputs, eight analog RCA outputs, TASCAM Digital Interface (TDIF) digital I/O, and +4 dBm balanced, 25-pin D-sub analog I/O connectors. MIDI Machine Control is available with the optional MMC-38 ($449).

The DA-38 utilizes 18-bit Delta-Sigma A/D converters with 64× oversampling and 20-bit Delta-Sigma D/A converters with 8× oversampling. S/N ratio is rated at better than 92 dB and THD at less than 0.008%. TASCAM; tel. (213) 726-0303; fax (213) 727-7656; faxback (800) 827-2268.

Circle #403 on Reader Service Card

It's not polyphonic polyphonic.

It has only 37 keys.

NO sequencer? **NO** drums? **NO** piano?

Yet, it's oddly compelling. A little scary. Wild.

But even with mondo chops like yours, you're skeptical about the idea of monophonic, one-handed soloing.

Until you *play* it.

And you **[listen]**...

And you realize you're going to need your other hand to

pick your jaw up off the floor.

And all of a sudden, you sense that *your music* isn't about

88 weighted keys.

Or PCM ROM.

Or polyphony.

Or bells.

Or whistles.

Your music is about *you.*

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Prophecy
SOLO SYNTHESIZER

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SUDDENLY THERE'S AN EXPLOSION IN YOUR HEAD.

You see colors, hear sounds. Something has inexplicably touched you. *Congratulations. You have just been inspired.*

So now what do you do? *Bring it to life.* On paper, on screen, on a scale never before imagined.

With words, with movement, with a heart-stopping new power like never before. *You don't know where it came from. Or where it's going.* But you know how it will get there.

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Inspiration happens. In David Carson's case, inspiration happens a lot. Fortunately for David, what he sees on his screen is never very far from what he sees in his mind. Power Macintosh® computers help him explore just about anything he can imagine. His groundbreaking design work for *Surfer* and *Ray Gun* magazines – as well as for clients like AT&T, Nike and Pepsi – confirms it. But the Power Mac® is also flexible enough to change when David's ideas do. So he can take his concepts and easily reexpress them in new mediums – from film to the Internet. It's the kind of freedom that allows him to push not only the limits of his computer, but the limits of his creativity. Authoring web sites. Manipulating graphics. Altering video. It's never been easier for David to create the work he's known for: the kind that never existed before.

To find out more about our cross-media authoring solutions, visit us at www.masters.media.apple.com or call 800-305-8374 for information via fax.

▲ RANE MOJO MC 22

Rane has their Mojo working, and it just might work on you. The Mojo Series is Rane's new line of affordable, 1U rack-mount products. Leading the pack is the Mojo Squeeze MC 22 ($299), a dual-channel compressor featuring reduced-noise circuitry and an automatic downward expander with a fixed 2:1 ratio and -55 dB threshold.

The unit also features stereo link, bypass, and program-dependent attack time. The compressor ratio is adjustable from 1:1 to 10:1 and threshold from -40 to +20. Each channel offers balanced XLR I/O, balanced ¼-inch inputs, and unbalanced ¼-inch outputs. S/N ratio is rated at 88 dB and THD at 0.02%.

Next up is the Mojo Filter MQ 302 ($399), a stereo ⅓-octave graphic equalizer. A single set of sliders controls the 30 EQ bands for both channels, so you can't set the two channels differently. The unit has balanced XLR and unbalanced ¼-inch connectors for each channel, and it boasts 80 dB of channel separation, a 115 dB dynamic range, and 0.009% THD. The S/N ratio is rated at 76 dB with all sliders at maximum boost and 96 dB at unity gain.

The Mojo Cans Amp MH 4 ($299) is a 4-channel stereo headphone amplifier that promises to drive most phones to 120 dB SPL. It features front-panel headphone jacks, balanced ¼-inch stereo master inputs, a global stereo/mono switch, and independent overload indicators.

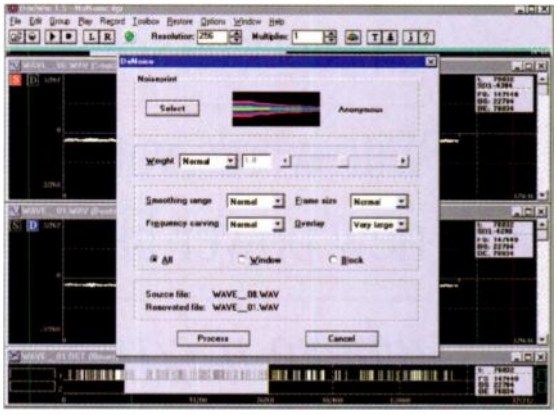
Completing the Mojo Series are two stereo crossovers, the Mojo Divider MX 22 2-way crossover ($299) and the MX 23 3-way crossover ($399). Both units feature balanced XLR connectors, LED meters, 24 dB/octave Linkwitz-Riley filters, an additional mono subwoofer output, and an internal power supply. Rane Corporation; tel. (206) 355-6000; fax (206) 347-7757; e-mail sales@rane.com; Web http://www.rane.com.

Circle #404 on Reader Service Card

▶ TRACER DART PRO

Until recently, software-based noise-reduction was an expensive item available only on Macintoshes. One of the first affordable Windows-based solutions to this problem was Tracer Technologies' *DART* software (reviewed in the January 1996 **EM**). Now Tracer has introduced *DART Pro* ($399). According to Tracer, the new program is three times more powerful than the original program. Current *DART* users can upgrade to *DART Pro* for $49.

The original program (which is still available and now lists for $99) was designed to eliminate clicks, pops, and surface noise from WAV files. To this, *DART Pro* adds DENoise, DEHiss, a spectrum analyzer, and a Wave Manager.



DENoise is designed to remove any constant audio disturbance, such as the sound of an air conditioner in the background or surface noise from an old LP. To get rid of this garbage, you just highlight the area you want to clean up, take a noise print, and let *DART Pro* do the rest. As its name indicates, DEHiss is a software hiss whacker aimed at eliminating tape hiss and similar irritants.

The Wave Manager lets you compile a playlist of your salvaged material. This allows you to record the cleaned-up tracks, in the desired order, to a new DAT tape or other medium. Tracer Technologies; tel. (717) 843-5833; fax (717) 843-2264; e-mail info@tracertek.com; Web http://www.tracertek.com.

Circle #405 on Reader Service Card

▼ DIGITECH STUDIO 400

The trend in multi-effects processors is toward greater user-configurability and more inputs and outputs. DigiTech's latest offering, the Studio 400 ($869.95), has both. The unit can provide up to eight effects at once, in any order or combination, utilizing four independent XLR and ¼-inch balanced inputs and outputs. An optional software card, S400 DIO ($279.95), offers AES/EBU and S/PDIF digital I/O.

Powered by two DigiTech S-DISC II processors, the Studio 400 offers 191 presets drawn from a large bank of reverbs, delays, choruses, and flangers and includes intelligent pitch shifting, autopan, rotary-speaker simulation, compression, EQ, detuning, and more. Presets can be modified and saved to 100 user locations.

Complete real-time control of up to eight parameters per preset is possible via MIDI or the processor's dynamic and LFO settings. The 2U rack-mount unit's front panel features a data wheel and large LCD display. The Studio 400 has an internal power supply, so you don't have to suffer with a wall wart.

The Studio 400 samples at 44.1 kHz. A/D converters are 18-bit Delta-Sigma with 128× oversampling, and D/A converters are 20-bit with 64× oversampling. S/N ratio is rated at greater than 96 dB and THD at 0.03%. DigiTech; tel. (801) 566-8800; fax (801) 566-7005; Web http://www.digitech.com.

Circle #406 on Reader Service Card

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FEATURES:

- 8 tk. simultaneous disk recording
- Non-destructive editing
- Multiple TAKE function
- Expand to 128 tracks
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You Could Always Hear What AKAI Did For Your Music . . .

In 1992 we introduced low cost disk recording with our 4-track DR4d. Thousands of DR4d's have found their way into broadcast facilities, recording studios, post production houses, and project studios. Combining our experience with input from thousands of end users, we created the DR8 and DR16. Whether you're just starting out with your first 8-track, upgrading your current tape-based MDM, or even if you're planning on a double-whammy, 128-track, multi-interfaced, graphically-based, post production facility, the new DR Series from Akai will serve your needs and grow with you in the future. It's an important fact to consider when someone tries to sell you a "budget" digital recorder that never really meets your needs. Check out these features and you'll "see" what we're talking about.

Record/Edit The new DR Series utilize our latest 24-bit internal processing technology enabling simultaneous 8-track recording with the transparent digital audio quality that has become an Akai trademark

Three dedicated LSI's (Large Scale Integrated circuit) for recording, mixing, and optional EQ provide real-time performance and stability of operation that computer based units simply cannot provide.

Real-time random-access editing features like copy, insert,copy + insert, move, move + insert, erase, delete, slip, and sliptrack inspire creative efforts that are simply unthinkable with tape based recorders. The TAKE function allows you to record up to five separate takes of a critical solo, or enables you to compare separate effects treatments of a singular passage. The jog and shuttle wheels make finding precise edit points a breeze, while the familiar tape-machine style transport controls and autolocator make operating the DR Series recorders like working with an old friend.

DR8 - $3495.00 Sugg. Retail Price
8 Track Disk Recorder

MORE FEATURES:

- 18 bit ADC • 64X oversampling
- 20 bit DAC • 8X oversampling
- 24 bit internal processing
- 16 channel digital mixer
- Dynamic MIDI mix automation
- Built-in mic preamps
- 2AUX sends
- 109 point autolocator
- AES/EBU and S/PDIF digital I/O
- 50 pin SCSI port

DR16 - $4995.00 Sugg. Retail Price
16 Track Disk Recorder

EVEN MORE FEATURES:

- Balanced 1/4" TRS in/out
- Switchable +4/-10dB line levels
- 8 in 8 out + stereo master (DR8)
- 8 in 16 out + stereo master (DR16)

Media The DR8 can be equipped with an optional internal 1 GB SCSI drive, while the DR16 is available with an optional 2 GB internal SCSI drive. The DR Series recorders are both equipped with a standard 50 pin SCSI port alowing a combination of up to seven SCSI drives with disk overflow recording capability. Lists of compatible drives are available from Akai product information.

Data backup is achieved through standard audio DAT or Exabyte.

At the time of this writing, the Iomega Company is preparing to go into production with their new 1 GB "JAZ" drive, a removable media SCSI drive which will greatly enhance the capabilities of our new DR Series recorders. Stay tuned for more info in our upcoming ads. Better yet, test drive a new DR Series recorder today at your local Akai dealer.

Now You Can See It.

OPTIONS:

- SuperView™ SVGA card - $699
- ADAT interface - $299
- MIDI interface - $299
- S.M.P.T.E. read/gen - $379
- RS422 video sync - $299
- BiPhase film sync - $299
- 2nd SCSI port - $299
- MT8 MIX controller - $799
- 8 channel 3 band parametric EQ - $550
- 16 channel 3 band parametric EQ - $699

Mixing Some of our competitors' disk recorders use a portion of their recording LSI to provide mix capability. While this saves money, it can also produce audio artifacts like "zipper" noise when adjusting such critical functions like EQ, pan, and fader level. On top of that, many disk recorders won't even let you make real-time adjustments during mix down, eliminating a critical part of the creative recording process. The heart of the DR mixer is a 16-channel, 24 bit custom LSI designed to provide real-time dynamic digital mix capability. Built-in 99 scene snap-shot automation for all functions and dynamic automation via external MIDI sequencers, combined with 8 or 16 channel 3-band parametric EQ option, ensures that the only limit in the DR Series mixer is your imagination. With its built-in 16 channel mixer, the DR8 becomes the perfect compliment to any 8-track recorder you might currently own. It can mix down its 8 tracks of internal digital audio with an additional 8 inputs from a sampler, tape machine, or a live performance, all in the digital domain. The MT8 mix controller provides a 16 track console format for dynamic remote control of all mix and EQ parameters.

(Monitor/Keyboard/Iomega Drive and Batteries not included.)

SuperView™ We sort of went into a frenzy packing new features into our DR8 and DR16. When we stepped back to take a look at what we'd done, we realized we crammed a whole roomful of equipment into a single 5U box. In order to help keep track of everything that's going on inside our "studio in a box", we developed the SuperView™ SVGA monitor board. SuperView™ mounts internally in the DR8 or DR16 and provides envelope and track information for up to 16 tracks of audio, as well as region highlighting for record, playback, and edit. SuperView™ is further enhanced by 16 track level meters with indicators for left/right master out and aux 1/2 out. The time indicator will read in the same format as the DR front panel. SuperView™ requires no external computer, simply plug your SVGA compatible monitor into a SuperView™ equipped DR Series recorder and you're ready to go. SuperView™ enables real-time video representation of audio status; no waiting for screen re-draws. What you hear is what you see.

ELECTRONIC MUSICIAN 1996 EDITORS' CHOICE

Keyboard Interface To increase the power of SuperView™ even further, we added an ASCII keyboard input to the SuperView™ card, allowing a standard ASCII keyboard to operate as a control interface for SuperView™ equipped DR Series recorders. Function keys will provide the ability to zoom in on a single track, as well as zoom in/out timewise for precise edit capability. All tracks and locate points can be named, allowing you to manipulate and track large amounts of data in a very simple manner. A unique interface has been developed to allow track arming, transport control, and edit functions directly from the keyboard, providing enhanced productivity through an intuitive human interface design.

AKAI DIGITAL

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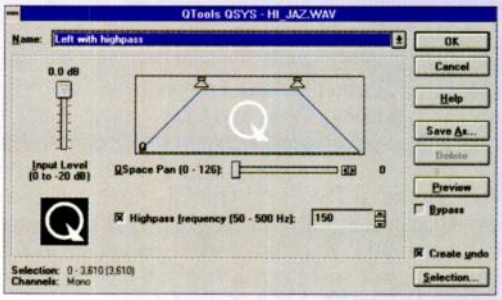
REV UP! ▲ ▲ ▲ ▲

▶ SONIC FOUNDRY/WAVES/QSOUND

Sound Forge 3.0, Sonic Foundry's killer sound editor for Windows, has been issued several new weapons in the form of DSP plug-ins. To begin with, Sonic Foundry has released its Batch Converter plug-in ($199), which lets you batch-convert hundreds or even thousands of audio files between any of the countless formats *Sound Forge* supports. (Examples include AIFF, AU, RAW, VOC, VOX, and WAV.)

But that's just the beginning of the plug-in's batch-processing capabilities. The Batch Converter also batch-resamples files, with support for any rate between 2 and 60 kHz; converts 16-bit to 8-bit files, with intelligent dithering; changes mono files to stereo or vice versa; applies dynamics processing; normalizes; equalizes; and slices and dices. Sonic Foundry doesn't claim it can batch-walk your dogs, but I wouldn't bet against it.

Two third-party developers also announced new *Sound Forge* plug-ins. Waves has now ported its *L1-Ultramaximizer* ($595), which had been available only for the Mac. *L1* includes a look-ahead peak limiter, level maximizer, and requantizer in one package. According to Waves, this results in a 16-bit signal that has the perceived quality of a 19-bit signal, which represents an 18 dB improvement in dynamic range. *L1* incorporates Waves' IDR dithering/noise-shaping technology to reduce nonlinear quantization when converting from higher bit resolutions to lower resolutions. Two types of dithering and three noise-shaping curves are supplied. Waves; tel. (423) 689-5395; fax (423) 688-4260; e-mail waves@waves.com; Web http://www.waves.com.



Also newly available for *Sound Forge* is QSound's *QTools/SF* ($195), which is a suite of three plug-in tools. Two of these tools, *QSYS* and *QXpander*, incorporate QSound's spatial-enhancement technology. Using *QSYS/SF*, you can place a mono sound anywhere along a 180° arc in front of the listener. With *QXpander/SF*, you can process existing stereo files to widen the image beyond the normal stereo soundstage. *QSRC/SF* provides high-definition sample-rate conversion for any file. QSound Labs; tel. (403) 291-2492; fax (403) 250-1521; e-mail info@qsound.com; Web http://www.qsound.ca.

Information on all three plug-ins is available from Sonic Foundry; tel. (800) 577-6642 or (608) 256-3133; fax (608) 256-7300; e-mail sales@sfoundry.com; Web http://www.sfoundry.com.

Circle #407 on Reader Service Card

▼ FOSTEX D-80

If you're in the market for an 8-track modular hard-disk recorder but you don't need built-in effects and mixing capabilities, Fostex's D-80 ($2,195) may be just the ticket. The 3U rack-mount device can record and play back 16-bit audio at 44.1 kHz on eight tracks simultaneously using 18-bit, 64× oversampling Delta-Sigma A/D and D/A converters.

You can cascade up to three D-80s and Fostex DMT-8s to provide up to 24-track recording. All analog inputs and outputs are on RCA jacks, and the unit offers optical S/PDIF digital I/O and MIDI In, Out, and Thru connectors.

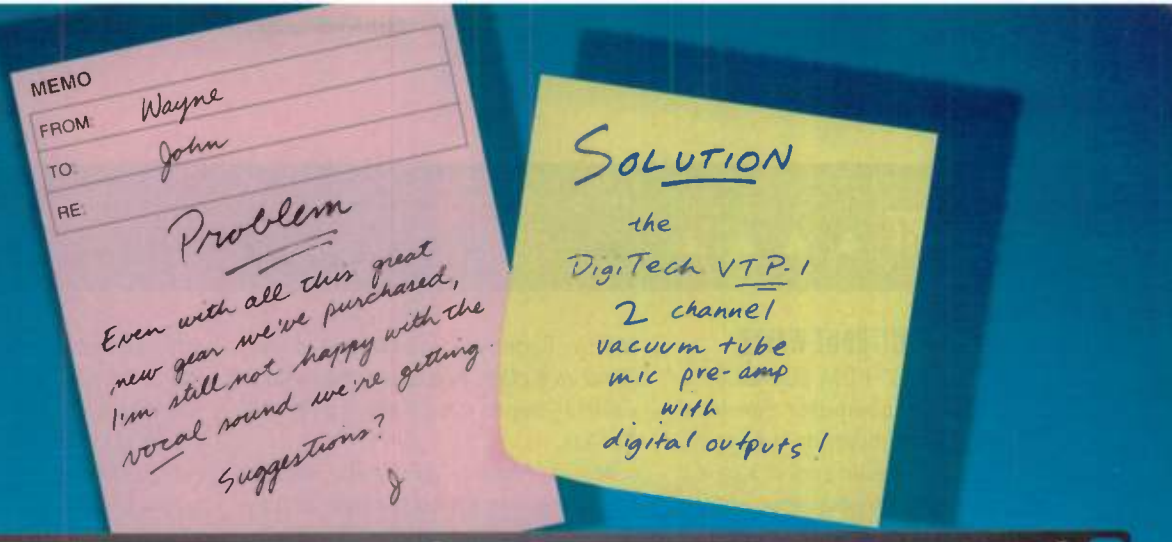
The D-80's removable, 3.5-inch, 850 MB IDE hard drive stores up to eighteen minutes of uncompressed digital audio. An optional plug-in 1.7 GB hard drive stores 40 minutes of uncompressed audio. The hard drive can be partitioned into five Virtual Reels, each with a different tempo map and time signature. Any or all Virtual Reels can be archived to audio DAT via S/PDIF at four times real time. There is, however, no SCSI port, so you can't chain multiple drives.

As with the Fostex R-8 analog 8-track recorder, the D-80's entire front panel can be removed to serve as a full-function remote control. The unit offers tape recorder–style transport keys, extensive locate functions, auto-punch, nondestructive editing (copy, move, paste, and erase), undo and redo, a jog/shuttle wheel, and a fluorescent display.

The D-80 is fully MMC-compliant. Timing information can be displayed as Absolute Time, MIDI Time Code, or bar:beat:clock. The MTC is subframe accurate, and you can program an offset of up to six hours between ABS and MTC. The unit also supports MIDI device-ID numbering.

Frequency response is rated at 20 Hz to 20 kHz and dynamic range at >92 dB. Prices and ship dates for the optional 1.7 GB hard drive, extension cables, optical cables, and hard-disk cartridge case were not announced at press time. Fostex Corporation of America; tel. (310) 921-1112; fax (310) 802-1964; e-mail info@fostex.com; Web http://www.fostex.com.

Circle #408 on Reader Service Card



The VTP-1 Story

We had been upgrading our studio but there was still something missing. You told us that some tracks just sounded too clinical, too brittle, especially the vocals. With all the new technologies available, none of us seem to capture the warmth that can still be heard in 25 year-old classic recordings.

So, we took a fresh look at equipment designs behind those classic recordings, added what we've learned since then and came up with the VTP-1.

Designed for tracking, mixing and mastering, the VTP-1 meets the challenge of today's studios. Two discrete, metered channels of vacuum tube preamplification and 4-band semi-parametric EQ allow for dual mic recording, as well as individual instrument processing and tone shaping. 18-bit digital converters and AES/EBU and S/PDIF output formats mean that you can use the VTP-1 to interface directly to your multitrack digital recorder, or for mastering from analog to DAT.

The VTP-1, another vocal solution from Digitech.

Available at your dealer now.

DigiTech

H A Harman International Company

VTP-1

2 CHANNEL VACUUM TUBE MIC PRE-AMPLIFIER WITH DIGITAL OUTPUTS

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GET SMART ▲ ▲ ▲ ▲

GROVE SCHOOL WITHOUT WALLS

Although a CD-ROM course on a multimedia computer can be a great way to integrate the visual, aural, and textual elements of a music education, there are other approaches. *See It—Hear It/Hear It—Play It,* part 1, video series is a 12-chapter course, developed at the new Dick Grove School Without Walls, that uses books, videos, and cassettes.

Each chapter includes a textbook, assignment book, answer book, 90- to 120-minute video lesson with Dick Grove, and audio cassette. The course assumes a basic understanding of musical notation. Its goal is to teach students to identify and visualize the elements of music that they hear or imagine.

The early chapters focus on scales, triads, and intervals. The lessons progress through rhythm theory and notation, introduction to chord voicings, diatonic 4-part harmony, modes, and blues and pentatonic scales. The final three chapters teach chord families: I chords, IIm7 chords, and V7 chords with major 9th, 11th, and 13th. (Part 2 of the series is still being developed; it will consist of eight more chapters that continue the instruction in chord families.)

See It—Hear It/Hear It—Play It, part 1, can be ordered in one package for $648, or you can choose to receive one chapter per month at $60 per chapter. There is also a one-time course-registration fee of $10. Dick Grove School Without Walls; tel. (800) 994-7683; fax (702) 269-8265; e-mail dgsww@aol.com.

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VOYAGER

Your kid may love chewing on her plastic saxophone and scrawling with the mouse on your computer, but let's face it: she won't get far with your graphic wave editor. Voyager's *Making Music* CD-ROM ($39.95), created by primordial electronic musician Morton Subotnick, is designed to give children a place to express their musical imagination even if they can't read the box.

Making Music's Melody and Rhythm Maker section allows the user to play with pitch and rhythm and to hear how these elements sound separately and together. The Building Blocks section teaches structure and repetition by letting the user alter six simple tunes. In the Mix'n'Match section, you can select and combine melodies, rhythms, and instrumentations. The games section integrates kids' compositions with surprising pictures.

The Mac version runs on any 25 MHz 68030 or faster machine with a color display and System 7 or later. The PC version requires an 80486DX/66 or better CPU, Windows 3.1 or 95, a 16-bit sound card, and a 640 × 480, 256-color display. Both versions require 8 MB of RAM, a double-speed CD-ROM drive, and external speakers or headphones. Voyager; tel. (800) 446-2001 or (212) 431-5199; fax (212) 431-5799; Web http://www.voyagerco.com.

Circle #410 on Reader Service Card

▼ VOYETRA

The advantages of computer-based, interactive keyboard instruction are obvious. Still, those who remember walking around a piano for the first time and plunking its keys might fear that the learning process is getting a bit far from its roots. Voyetra has attempted to remedy this situation with the release of the new *Discovering Keyboards* CD-ROM ($79.95), which includes lessons on the history and technology of keyboards along with lessons on theory and technique, instructional games, and a MIDI song library.

The program's Keyboard Tour module uses graphics, video clips, and MIDI and digital audio examples to present the history of keyboard instruments, from early spinets and virginals up to organs, pianos, and synthesizers. The Understanding MIDI and Synthesis module explores the technology behind synthesizers and computer-generated music. This module includes a glossary of MIDI- and synthesis-related terms.

The Keyboard Lessons module uses a series of video clips and exercises to introduce basic music notation, theory, and playing technique in three beginning levels, each broken into five chapters with up to nine lessons per chapter. (Advanced lessons are planned for release in early fall.) The program tracks progress for each lesson and analyzes and gives feedback on the user's MIDI keyboard performances. A performance mode provides accompaniment.

Discovering Keyboards' Songbook module is a library of MIDI songs that users can print as sheet music or play with a choice of instrument sound, tempo, volume, and display options such as note names and finger numbers. The program also includes a Game Room with instructional games.

Discovering Keyboards requires an 80486DX/66 or faster PC with 8 MB of RAM, Windows 3.1 or Windows 95, 6 MB hard-disk space, 256-color display, 2× or faster CD-ROM drive, 16-bit sound card, a MIDI keyboard, and a MIDI interface. Voyetra Technologies; tel. (800) 233-9377 or (914) 966-0600; fax (914) 966-1102; e-mail info@voyetra.com; Web http://www.voyetra.com. ❦

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PRO FILE

Ping-Pong Wizardry

Enna Deer bounces tracks DAT to DAT.

By Brian Knave

Sometimes you want something so badly you just go for it. Such was the genesis of *Shedding Skin,* a hauntingly beautiful collection of songs by Enna Deer that was recorded by bouncing tracks back and forth between two DAT decks. "Originally, I was going to record direct-to-DAT," explains Deer, "but after two or three songs, I realized how much I wanted to add harmony vocals and other instruments. Unfortunately, we didn't have access to a multitrack recorder. That's when we came up with the idea of using a second DAT machine."

This rather primitive use of modern gear raised a few eyebrows. "I can't tell you how often I heard 'You can't do that. It won't work.' But what people don't realize," says Deer, "is that Les Paul was working the same way when he conceived the multitrack machine. The only problem was, with analog tape, each bounce added more hiss. Fortunately, digital bouncing is much quieter."

Deer recorded on a Sony DTC 700 consumer-model DAT deck and a borrowed Denon DTR-80P portable deck. She was assisted by oboeist and former Windham Hill recording artist Russel Walder. Together, the two recorded all the tracks in Deer's warehouse loft in less than two weeks.

Because tracks couldn't be individually processed after they were bounced, the effects were recorded to tape. Deer and Walder generally used chorusing on the guitars and reverbs on vocals and wind instruments. On a few songs, the cumulative effects compromised clarity, but overall they resulted in lush mixes reminiscent of those on Jon Hassell recordings. "Some songs were bounced seven or eight times," says Deer, "so we learned not to add too much reverb. But if I did this again, I would use even fewer effects."

Ranging from dreamy ballads to mystical folk rockers, the eleven songs on *Shedding Skin* are characterized by hooky melodies, cryptic but compelling lyrics, and Deer's enchanting voice. Some songs employ sparse instrumentation with only guitar and vocals whereas others, such as "Shedding Skin" and "The Lonely River," use oboe, wood flutes, hand drums, and various sequenced pads and percussion. The sequences were done on an Alesis MMT-8 using sounds from a Korg M1. Vocals and percussion were recorded with a Shure BG5.0 condenser mic, and flutes and oboe were recorded with an AKG D 12E. Other equipment included DigiTech DSP-256XL, DHP-55, and TSR-24 effects processors and a DOD 1642 16-channel mixer.

Because Deer didn't have access to dynamics processors during recording, the mastering process proved critical for balancing the sound of the final product. "Mastering made a big difference," says Deer. "The engineer was sensitive to the music and did a great job of compressing and smoothing out the sound. This wasn't the best way to make a CD, but it was the only way I could make it happen at the time. The important thing is staying true to your vision. You have to be pleased with the sound every step of the way."

For more information, contact Spiral Canyon Productions, PO Box 7501, Berkeley, CA 94707; tel. (510) 526-2562.

If you have a CD you recorded in your home studio, we'd love to consider it for "Pro/File." Send your CD and background information to Pro/File Editor, Electronic Musician, *6400 Hollis St., #12, Emeryville, CA 94608.*

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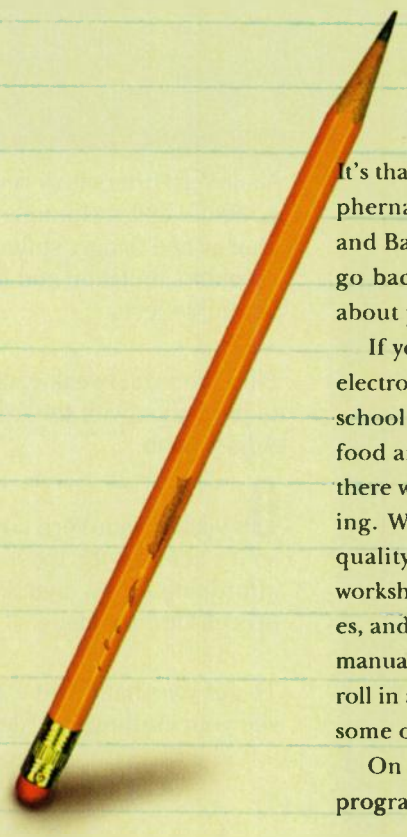
ALESIS

Study this sampling of music-education programs that run anywhere from one day to one year.

Back 2 SCHOOL



By Jennifer Conrad Seidel

It's that time of year. The stores are filled with "back to school" paraphernalia: Pee Chee folders, Hootie and the Blowfish lunch boxes, and Barney backpacks. Perhaps all of this has given you the itch to go back to school and brush up on your geography. No? What about polishing your mixing skills or songwriting abilities?

If you've never considered attending a recording school or an electronic-music seminar, maybe it's because you've always imagined school as a form of incarceration that includes the horrors of dorm food and Scantron "bubble" tests. Or maybe you didn't know that there were classes on things like tape alignment and tapeless recording. Well, we're in the information age now, and you can get a quality education in your choice of "dense" packages: weekend workshops, university-extension classes, intensive month-long courses, and year-long programs. Learned all you can from your owner's manuals and old-fashioned trial and error but you can't afford to enroll in a 2- or 4-year degree program? It may be time you looked into some of these low-commitment educational opportunities.

On the next few pages, you'll find a sampling of the short-term programs available for musicians, composers, and recordists.

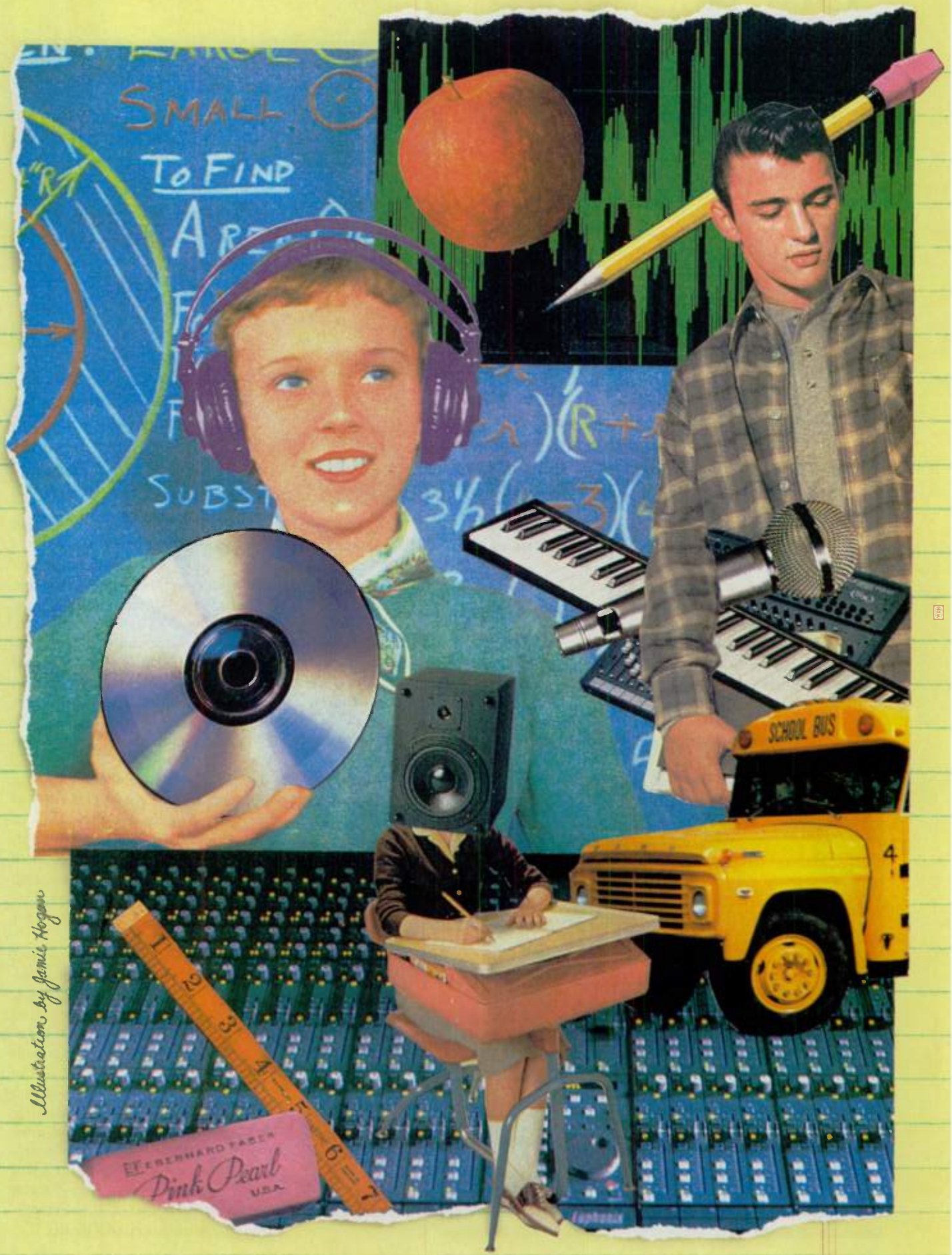


Illustration by Jamie Hogan

Back 2 SCHOOL

You can get vocational training for almost any type of studio job, or you can study other aspects of the music business, such as artist management, promotion, or film scoring. And you can do it in a variety of settings and time frames. We aren't endorsing any programs by profiling them here; nor are we trying to discourage you from considering other programs by not including them. Our goal is to provide you with a few examples of programs (organized by their durations) that might be of interest.

The main control room in this studio at Full Sail features a Neve VR60 console, two 24-track Otari MTR-100s, three 8-track TASCAM DA-88s, and a Meyer 2000-watt monitoring system.

SHORT-TERM COMMITMENT

The easiest thing to fit into your schedule (and usually your budget) is a one-day or weekend workshop or seminar. This is not a second-rate option: in fact, such a workshop offers access to the faculty and facilities at universities and music schools without your having to enroll in a degree program. Some workshops are more than just lectures. They include hands-on time in studios and at workstations with the latest gear and software.

For example, the Music Technology Division at the Berklee College of Music in Boston, Massachusetts, offers an annual summer workshop to the general public. In 1996, its 3-day workshop focused on music production. The classes ranged from "Desktop Digital Audio" to "Project/Home Studio Design and Setup" to "Multimedia Applications Overview." (The cost for the 20-hour music-production workshop was $350.) The 1995 workshop addressed making and selling your own CD; in 1994, the workshop concentrated on the many aspects of sampling, including hands-on sampling techniques and related legal issues.

This 16-track recording and mixing studio is one of six studios at the Recording Workshop in Chillicothe, Ohio. The school has a Pro School affiliation with Digidesign.

The Department of Technology in Music and Related Arts (TIMARA) at Oberlin College's Conservatory of Music (Oberlin, Ohio) hosted its tenth annual Workshop in Electronic and Computer Music in July. This workshop comprised two week-long classes. Tuition for week one was $460; tuition for weeks one and two was $870.

The first week's classes introduced students to various synths (from a classic Moog to the Kurzweil K2000), synthesis methods, elementary recording techniques, and some entry-level Mac software. The second week, which built on the information presented in the first week, focused on effects processing and advanced Mac software, starting with voice-editing programs and moving on to MOTU's *Performer*, Opcode's *Vision*, Coda's *Finale*, and Opcode's MAX programming language. Each week concluded with a concert performed by workshop participants.

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1995 NOMINEE

ELECTRONIC MUSICIAN 1996 EDITORS' CHOICE

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workstation, Pro Tools III, with mountains of record tracks, I/O, and real-time effects and mixing. Each step of the way, you'll learn and grow with Pro Tools software, share work between systems, and take an upgrade path that lets you build on the value of your investment. Audio professionals now have more choices and flexibility than ever before. And getting started couldn't be easier. To learn more about the clearest path to the best in digital audio, call **1-800-333-2137x261**.

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Back 2 SCHOOL

Musicians who are interested in multimedia would benefit from seminars like those offered by the continuing-education department at the University of Massachusetts, Lowell. Although these seminars do not cover audio for multimedia, they address other topics like multimedia basics ($75, one day) and using Macromedia's *Director* software ($325, three days).

EXTEND YOURSELF

Do you have an appetite for more than just a weekend workshop? You should check out the extended-learning programs offered by many colleges and universities. These extension programs are often designed for working adults who want to better their professional skills or get training in a new discipline. Students can take individual classes or work toward a certificate of completion by taking a full curriculum. (Because the programs allow students to choose their own electives, the actual cost to complete a certificate program is approximate.)

Several West Coast universities offer music-related extension courses. The Department of Entertainment Studies and Performing Arts at UCLA Extension offers certificate programs in the following areas: the music business ($5,500), songwriting ($2,900), recording engineering ($6,000), and film scoring ($3,300). You can take classes like "Tour Management for the Music Industry" ($325), "The Digital Musician: Tools for Making Music in the MIDI Era" (with **EM** Technical Editor Scott Wilkinson, $295), "Microphone Techniques for Professional Recording" ($125), and "Producing Professional Demos" ($335). Classes are usually held on weeknights and can run from six to twelve weeks. UCLA Extension is, of course, unrivaled in its proximity to and connections with Hollywood, as evidenced by its impressive pool of instructors.

If you're up the coast in the Bay Area, you might want to look into the Music/Recording Industry Certificate Program at San Francisco State University's College of Extended Learning. Required courses include "Legal Aspects of the Music/Recording Industry," and electives include "History and Aesthetics of Popular Music Record Production." (**EM** contributors Michael Aczon and Scott Mathews are among the program's instructors.) You can take individual classes or work toward the certificate ($3,280).

Farther north, in the latest trend-setting city, the Extension program at the University of Washington, Seattle, offers the Certificate Program in Sound Production. Designed by an advisory board made up of Seattle-based music-industry professionals and University of Washington faculty, the 8-month certificate program includes four courses ($1,756). Unlike the certificate programs offered at UCLA and SFSU, this program does not allow students to enroll in individual courses: all students must apply to and complete the entire certificate program.

SOMEWHERE IN THE MIDDLE

If you are able to take an intensive course for several weeks and you're interested in recording, you should look at the many recording schools across the country. The programs vary in curriculum, length, and cost, so you'll want

YOUR HOMEWORK ASSIGNMENT

Here's contact information for the schools mentioned in this article. This is only a small sample of the programs available; it is not a comprehensive listing. You can find out about other schools by scanning **EM** classifieds, searching the World Wide Web, looking through reference books in your local library, and asking others for recommendations. You may also want to order Mix Bookshelf's *Audio and Music Education Guide* (tel. 800/233-9604 or 908/417-9575; fax 908/225-1562).

Audio Institute of America
tel. and fax (415) 931-4160
Berklee College of Music
tel. (617) 266-1400, ext. 408; fax (617) 536-2257; e-mail akunst@it.berklee.edu
Full Sail Real World Education
tel. (800) 226-7625 or (407) 679-6333; fax (407) 678-0070;
e-mail admiss@fullsail.com; Web http://www.fullsail.com
Conservatory of Recording Arts and Sciences
tel. (800) 562-6383 or (602) 858-9400; fax (602) 829-1332
Oberlin College Conservatory of Music
tel. (216) 775-8044; e-mail anna_hoffmann@qmgate.cc.oberlin.edu;
Web http://talbert3.con.oberlin.edu
Omega Studios' School of Applied Recording Arts and Sciences
tel. (800) 93-OMEGA or (301) 230-9100; fax (301) 230-9103;
Web http://www.omegastudios.com/school/index.htm
The Recording Institute of Detroit
tel. (800) 683-1743 or (810) 779-1388; fax (810) 772-4320;
The Recording Workshop
tel. (800) 848-9900 or (614) 663-2544; fax (614) 663-2427;
e-mail workshop@bright.net; Web http://www.bright.net/~workshop
San Francisco State University College of Extended Learning
tel. (415) 338-1533; fax (415) 585-7345; e-mail maryp@sfsu.edu;
Web http://www.cel.sfsu.edu
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Recording Magazine

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Guitar Player Magazine

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MIX Magazine

"All of the mixes we played gained extra sparkle and clarity when processed with the BBE 462."
Keyboard Magazine

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Back 2 SCHOOL

to investigate as many as possible before choosing one. Most recording schools require that you enroll for an entire session, but a few may allow you to take individual courses.

Founded 25 years ago, the Recording Workshop in Chillicothe, Ohio (near Columbus), currently offers four programs, each of which is presented seven times a year. The Recording Engineering and Music Production Program, which is five weeks long ($1,990, 200 hours), is the school's main program. During 125 studio hours and 75 lecture hours, students learn about recording, mixing, editing, studio maintenance, sound for radio and video, and MIDI.

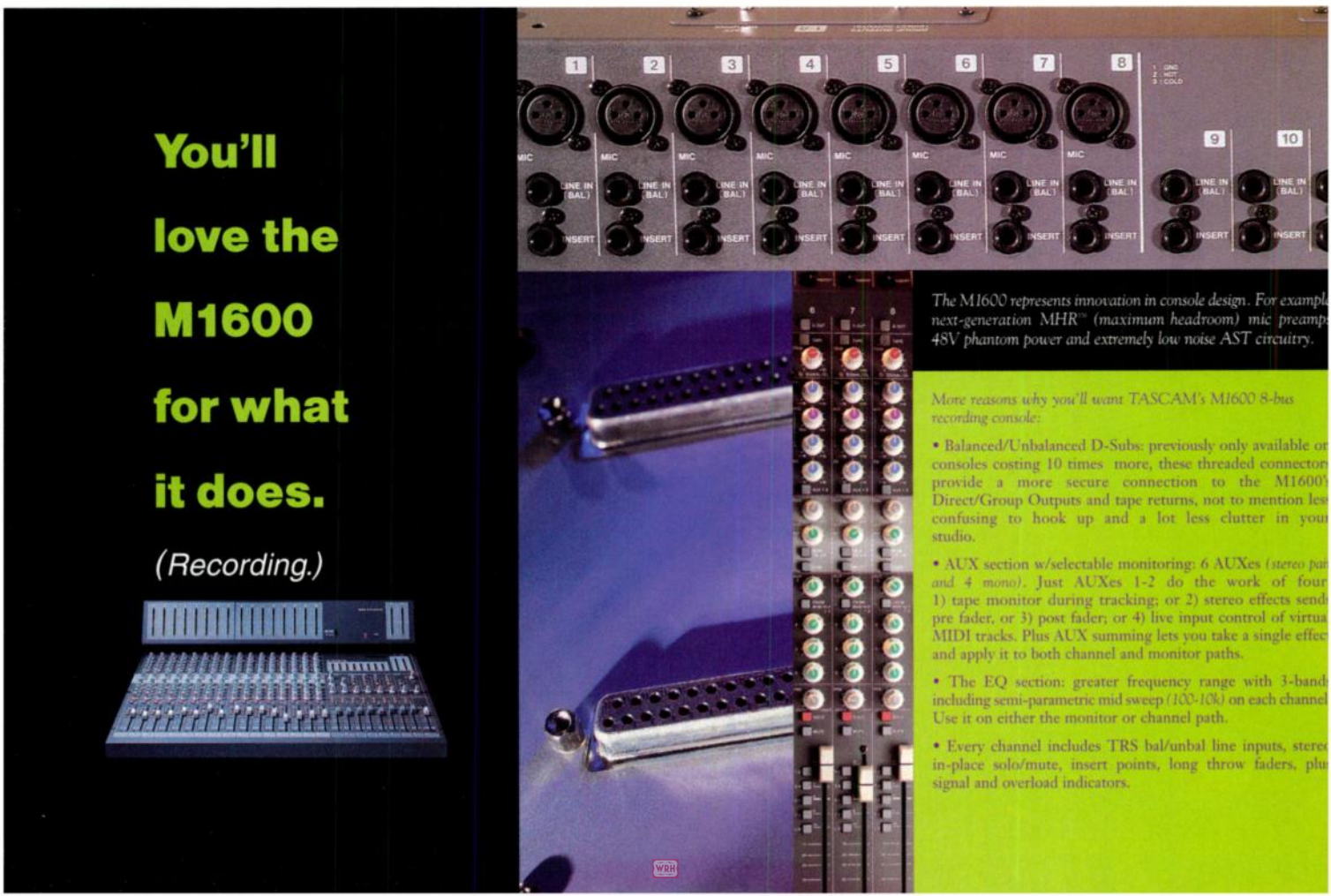
The other three programs each run for one week. The Studio Maintenance and Troubleshooting Program ($395, 40 hours) and the Advanced Recording Engineering and Music Production Program ($595, 60 hours) are intended to develop more fully some of the techniques learned in the main program. The newest offering at the Recording Workshop, the NewTech Production Program ($595, 36 hours), centers on Digidesign's Pro Tools and Sound Tools systems. (The Recording Workshop has a Pro School affiliation with Digidesign.)

Tempe, Arizona, is the home of the Conservatory of Recording Arts and Sciences. Its main focus is multitrack music production. The conservatory offers a diploma program with 600 hours over 22 weeks ($6,065), including a 7-week (280-hour) internship. Five courses plus the internship make up the Master Recording Program: "Audio Recording and Production" ($3,600, 200 hours), "Music Business" ($520, 24 hours), "MIDI/Computer/Electronic Music Recording" ($1,040, 60 hours), "Sound Reinforcement" ($620, 24 hours), and "Troubleshooting" ($285, 12 hours). Seventeen sessions are scheduled to begin during the 1996 calendar year. It is possible to take individual courses without having to complete the entire diploma program.

The Recording Institute of Detroit's Audio Techniques Program ($3,649) provides 376 hours of instruction in 39 weeks. The program is flexible: classes are offered during weekday afternoons and evenings and on weekends, and it's possible to complete the program in evening and weekend classes or just weekend classes. Courses start every month, and students can take individual classes if they wish. The Audio Techniques program is made up of the following classes: "Recording Techniques I" ($799), "Applied Music Theory" ($799), "Recording Techniques II" ($2,149), and an internship ($199). The institute also offers classes—"Applied Music Theory I" (aka "Music as a Second Language," $679) and various study courses (some of which are based on study techniques developed by L. Ron Hubbard)—in addition to those offered in the main program.

THERE'S MORE

Several programs, both part-time and full-time, span about one full year. The



most famous of these is at Full Sail Real World Education (previously known as Full Sail Center for the Recording Arts) in Winter Park, Florida, near Orlando. Full Sail offers three 1-year associate-degree programs in film and video production ($20,850, 1,519 hours), digital media ($24,600, 1,743 hours), and recording arts ($20,650, 1,519 hours). The campus has eighteen studios, featuring everything from individual mixing stations to an 18,000-square-foot building that is used for developing concert-sound techniques and music videos.

Omega Studios' School of Applied Recording Arts and Sciences in Rockville, Maryland, is located at Omega Recording Studios, a 4-studio facility. Classes are held weekday mornings and evenings. Omega Studios' School offers programs in Recording Engineering and Studio Techniques ($4,950, 185 hours), Electronic Music Synthesizers and MIDI ($2,044, 87 hours), Sound Reinforcement for Live Performance ($2,474, 113 hours), Audio Production Techniques for Advertising ($2,474, 117 hours), and

SELF-EDUCATED

Do-it-yourself educational opportunities are all around you. If you live near a college or university, find out about the lectures and concerts sponsored by its music department. Subscribe to magazines and journals that don't just entertain, but teach. Exercise your Internet-surfing muscles by looking for research papers, newsgroups, chat rooms, and pages set up by electronic-music study centers.

You can start by looking at these Web pages, which have dozens of links to research centers and music departments at colleges and universities around the world.

CERL Sound Group, University of Illinois, Urbana
Web http://datura.cerl.uiuc.edu/schools/courses.html
Department of Music, Durham University
Web http://capella.dur.ac.uk/doug/res_site.html
Department of Music, Leeds University
Web http://www.leeds.ac.uk/music/Menu/mus_depts.html
Eda Kuhn Loeb Music Library, Harvard University
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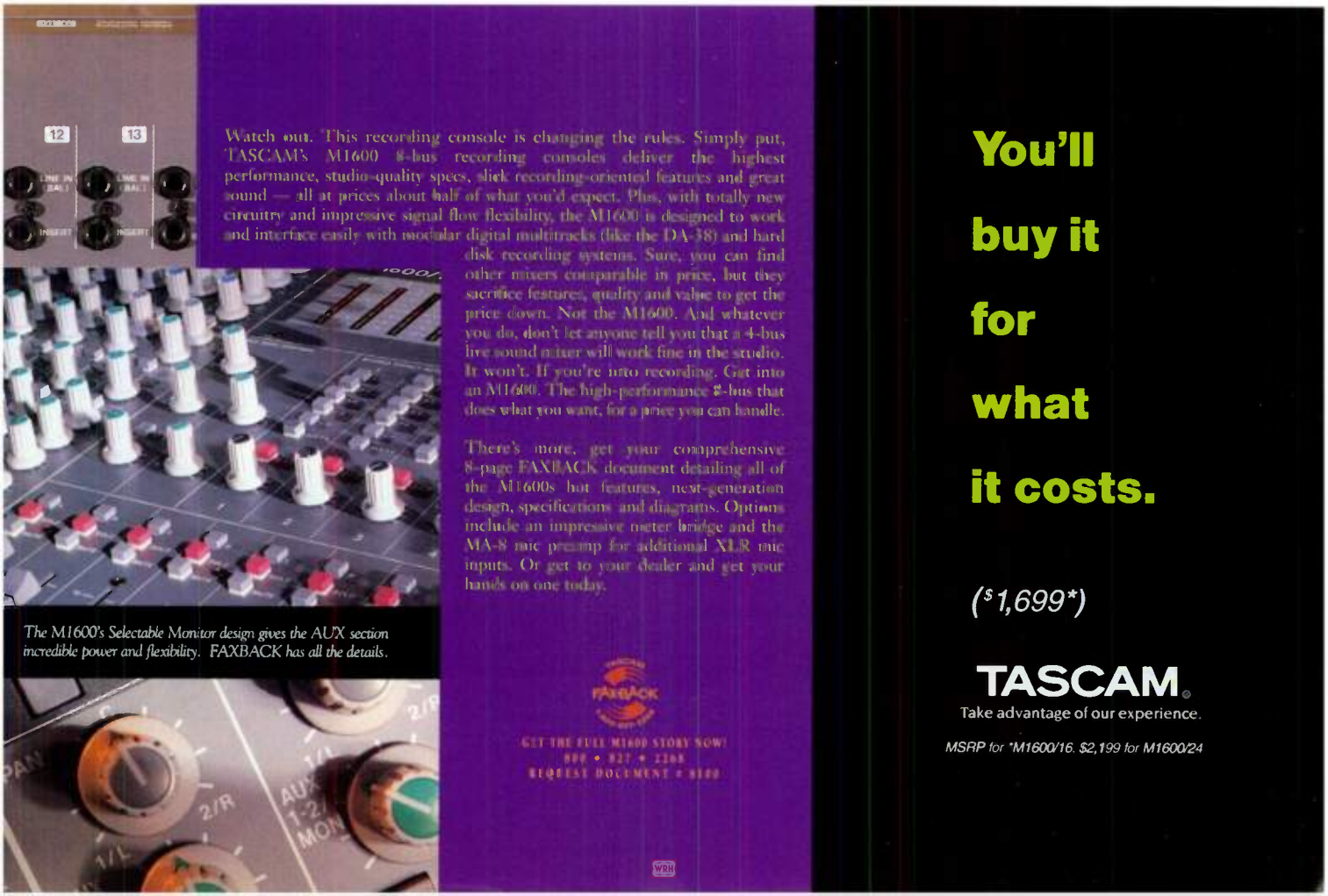
Sibelius Academy
Web http://www.siba.fi/Kulttuuripalvelut/institutes.html
Technology in Music and Related Arts Department, Oberlin College
Web http://talbert3.con.oberlin.edu/emusic/links.htm



Back 2 SCHOOL

Essentials of Music Business and Artist Management ($1,204, 52 hours). It takes about twelve months to finish the programs with evening classes; taking day classes allows you to finish in approximately six months.

If none of the options described so far fits into your schedule, you may want to contact the Audio Institute of America, which offers a correspondence course in recording engineering. The program covers the basics: MIDI, recording sessions and equipment, mixing, making and releasing your own recording, and starting your own personal or project studio. The materials, including a 500-page manual and twelve cassette lessons, cost $388. You can examine the materials under AIA's 10-day no-risk trial period and return them for a full refund if you aren't satisfied.

MAKE A MATCH

We've already separated the programs by their lengths. Now, how do you narrow down your choices even further? Here are a few important questions to ask yourself and the schools.

Is the program strong in the areas you want to study? There may be some flexibility in the required courses, but you won't learn everything you want to know about music theory in a sound-reinforcement program. And even though many classes have similar titles, for instance, "Studio Maintenance," the actual content of each class may differ from program to program. Don't assume, for example, that all studio-maintenance classes will include computer-maintenance basics. Conversely, don't assume that a program won't address multimedia just because none of the classes have the word *multimedia* in their titles. It may be understood that multimedia will be incorporated into several classes.

What is the learning environment? How much time will you spend in a studio or at a workstation? Almost all of the programs strive to give their students as much time as possible in a real-world, hands-on learning environment. In some programs, such as the Recording Workshop, you get to learn in a state-of-the-art multitrack studio that is used only for instruction. Other programs, such as those offered by SFSU and Omega Studios' School, give students access to commercial studios with paying customers. Each setting has its advantages: instruction-only facilities are available to students at any time because the school isn't trying to accommodate paying customers, whereas a commercial-studio environment will provide on-the-job training instead of role-playing scenarios.

Is the environment appropriate to the class work? Some instruction may take place in a classroom instead of an actual studio. This is not necessarily bad. It may be more appropriate to learn about algorithms in a classroom than in a multitrack studio. And, obviously, nonrecording classes on topics such as tour management aren't appropriate for an in-studio setting.

What equipment will you be using? Schools typically list the equipment

For Musicians

Who Bought

The Other

Digital Multitrack

SORRY!

they have at their facilities in their promotional literature. If you are mainly interested in doing more with the equipment you have in your home studio, you'll want to find a program that uses the equipment you have. However, if you're hoping to find a job in a studio after you complete the program, you'll probably want to work on several different, popular pieces of gear.

How many people will be sharing the facilities with you? A class of five students may sound great, but if you all have to share one workstation, your actual hands-on time will be limited. You may be better off in a class of twenty that's held in a facility with ten workstations.

Can you take individual classes, or is the curriculum fixed? Do you want to sit through a year of artist-management classes just to get that one miking-techniques class? You may only be able to afford one course at a time, but some schools require that you complete the entire program within a specified time frame. The UCLA Extension program allows students to take most classes in any order they like; however,

Can't spare a few years to get a degree? Take advantage of schools like the Berklee College of Music (shown here) by attending workshops or taking individual classes.

Back 2 SCHOOL

the Extension program at the University of Washington, Seattle, offers classes that build upon each other, so you'll need to take them in order. (If you miss one, you'll have to wait until it's offered again before you can continue with the program.)

Does the school offer an internship or job placement with a professional studio during or after the program? For some students, landing a job is the main reason they're going to school. If this is the case, an expensive program that guarantees job placement may be a better choice than an inexpensive program that provides only a referral service (often just a huge list of studios and their phone numbers).

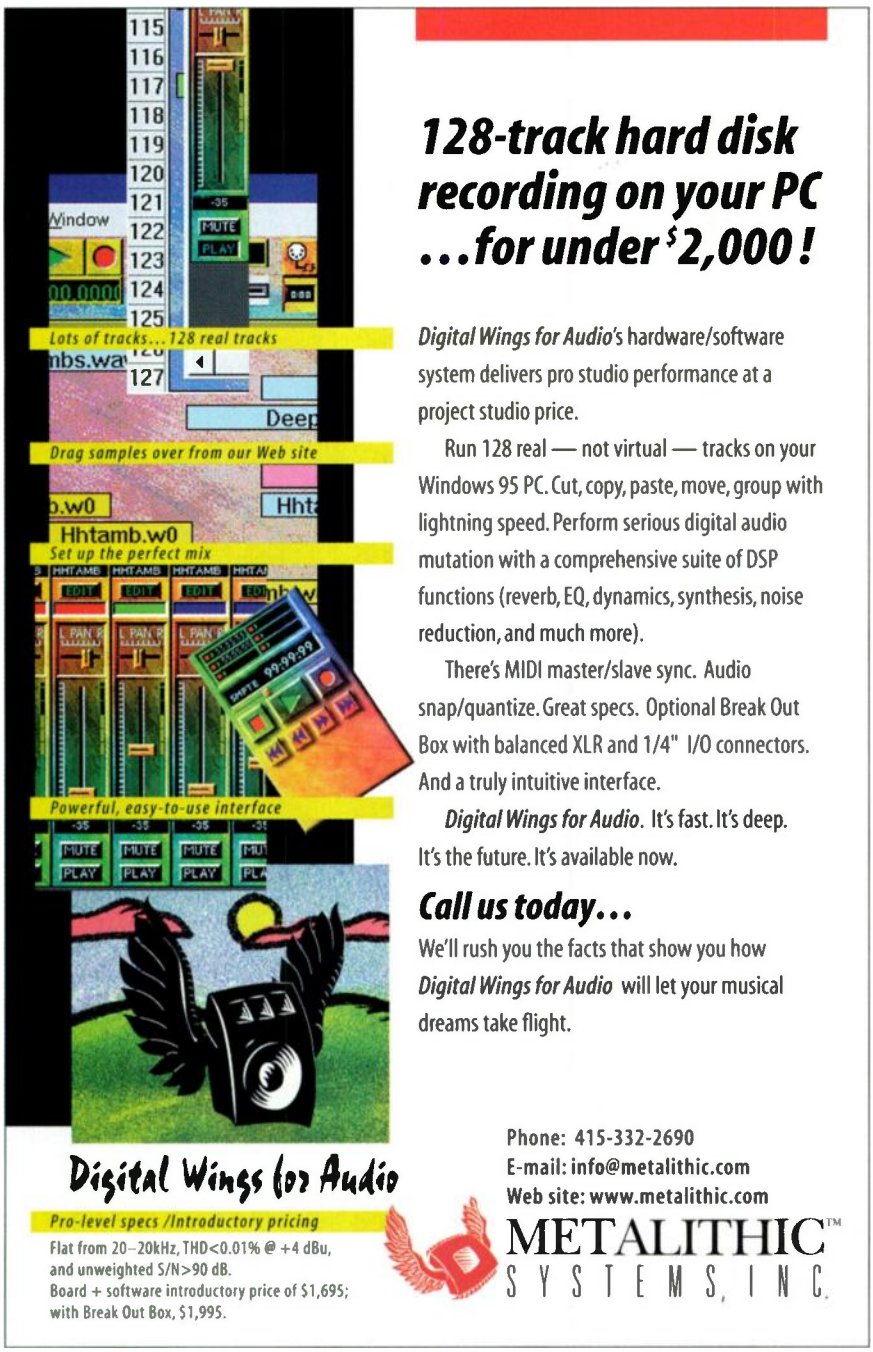
Job placement may be irrelevant if your goal is to improve your recording chops so that, as a musician, you can better articulate what you want when you go into a commercial studio.

An internship may or may not be part of the official program. The Recording Institute of Detroit places students who graduate from its Advanced Recording Course with a 2.0 or higher gpa in a supervised 100-hour internship. After completion of the internship and its assignments and exams, the student receives a certificate of completion. Students in the institute's Master Recording Program at the Conservatory of Recording Arts and Sciences must complete a 280-hour internship in order to graduate from the program. The conservatory guarantees that it will place a student in an internship, and it tries to do so at one of the student's top five choices, whether local, national, or international.

How is your progress assessed? One program may offer written tests whereas another will have students complete a final project, such as a scored video commercial. Your attendance may also figure strongly into your grade, which may not be a big deal if you're in a residential program but may be important to consider if your classes are held downtown on weeknights.

Who teaches the classes? Most of the programs state that their instructors have experience in the music industry, but you'll want more specifics. Are they currently employed in the industry, or have they retired? A professional engineer who is just teaching on the side will know a lot about current equipment and recording trends, but his or her length of experience may be short. You may prefer to study with someone who has twenty years of experience, even if that experience was in the 1970s and 1980s. It really depends on why you're taking the course: Do you want to find a job that requires you to be trained on all the latest equipment? Or do you just want to learn better mixing techniques for the 10-year-old mixer you have at home?

Good credentials do not guarantee that an instructor is a good teacher. His or her production credits won't be of much help in a *Finale* class. And just because someone has *done* something well doesn't mean that he or she can *teach* others how to do it well. Talking to people who have taken classes through the program you're considering may reveal that the person with the shortest vita is really the best instructor.



How much is this going to cost? The costs given in this article are for tuition only. Textbooks, materials, registration fees, and even sales tax can be added to these costs. You may also need to factor in room and board for out-of-town programs, whether they are three days or three months long.

Don't hesitate to ask the admissions personnel about your financial-aid options. You may qualify for government assistance, or the school may have scholarships for which you can apply.

SO MANY PROGRAMS...

You no longer have the excuse of not pursuing education because you don't want to spend several years in a degree program. Somewhere out there is an opportunity for you to gain new or stronger skills in every area of making music without having to put your life

cal and theoretical knowledge, both of which are crucial in any aspect of the music industry. For example, you'll need technical knowledge to explain what's wrong with a recording, and you'll need some theory to communicate what's wrong with a song to the musicians.

By going back to school, for a day or for a year, you can develop your untapped potential. If you invest some time in a class, you'll be surprised at what you'll reap the next time you play your instrument, enter the studio, or use your sequencer. With so many inexpensive, low-commitment, high-quality programs to choose from, the only way you can go wrong is to not choose any of them.

The most recent classroom experience **EM** *Editorial Assistant* **Jennifer Conrad Seidel** *has had is her Lamaze class.*

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92dB
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Digital Mixer
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Turn your computer into an affordable one-stop

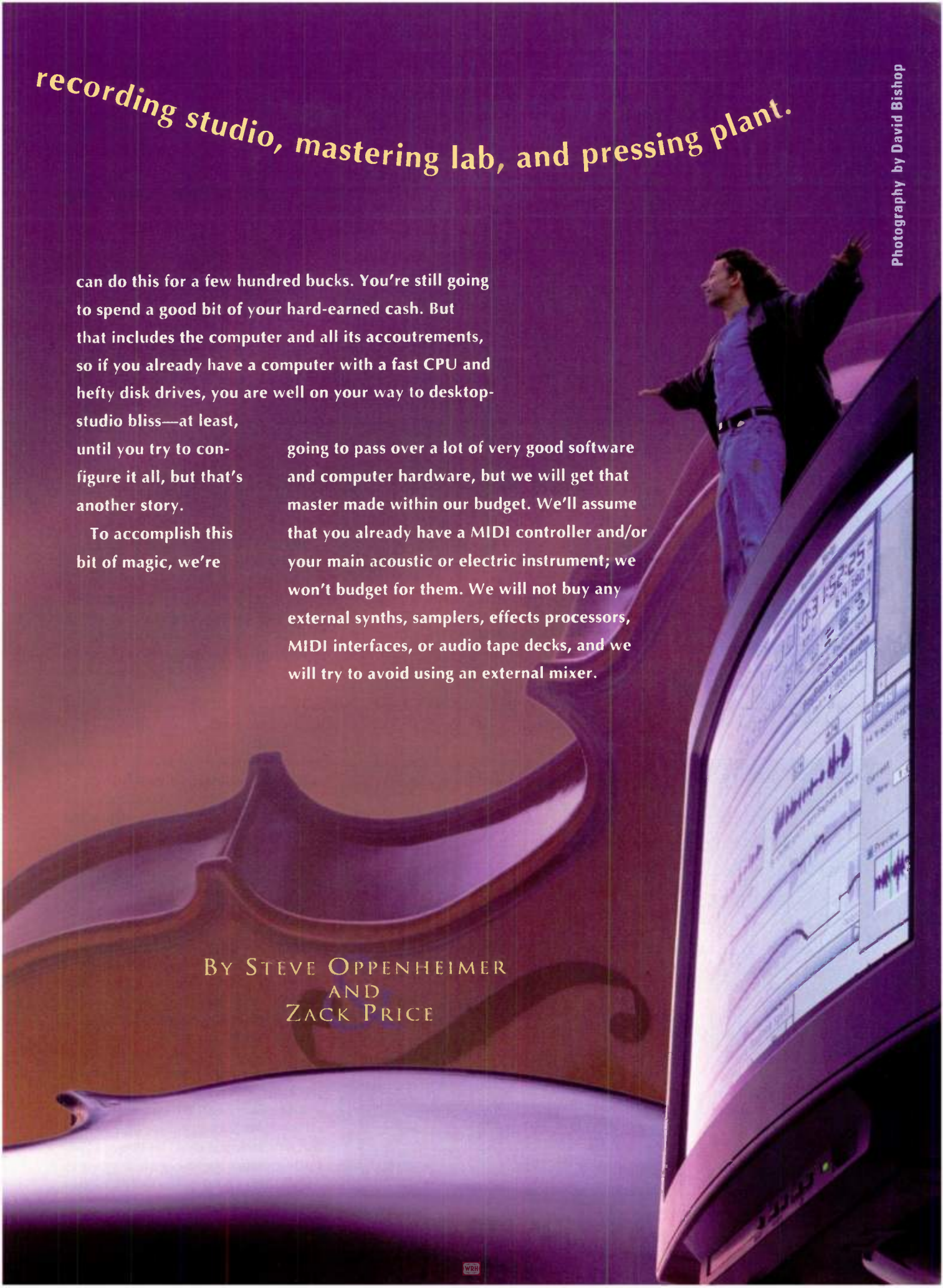
The BUDGET DESKTOP STUDIO

Even in the days when Commodore 64 computers and multitrack cassette decks ruled the home studio, the pundits predicted that "someday soon" computers would record and play audio tracks and that the personal computer would become an entire studio in a box. Looking at our little C64s, we found that hard to believe. But today it is indeed possible to record entire projects, apply effects, edit and assemble the masters, and even burn finished CDs using little else than your computer, a few connected peripherals, and the right software.

Don't believe it? Well, at first we were skeptical, too. But by delving into the dark depths of our computer musician's toolkit, we have delivered the goods for you. Or at least, we have made a good stab at it.

What's more, it can be done on a reasonable budget. Now, don't get too whipped up and start thinking you

recording studio, mastering lab, and pressing plant.



Photography by David Bishop

By Steve Oppenheimer and Zack Price

can do this for a few hundred bucks. You're still going to spend a good bit of your hard-earned cash. But that includes the computer and all its accoutrements, so if you already have a computer with a fast CPU and hefty disk drives, you are well on your way to desktop-studio bliss—at least, until you try to configure it all, but that's another story.

To accomplish this bit of magic, we're going to pass over a lot of very good software and computer hardware, but we will get that master made within our budget. We'll assume that you already have a MIDI controller and/or your main acoustic or electric instrument; we won't budget for them. We will not buy any external synths, samplers, effects processors, MIDI interfaces, or audio tape decks, and we will try to avoid using an external mixer.

THE BUDGET DESKTOP STUDIO

The only remaining outside devices other than computer peripherals will be a monitor system, a microphone, and perhaps a preamp. (And you might not even need the mic and preamp if you are just doing sequenced instrumental tracks.) We're not going to discuss these items in detail because the issues involved are the same in the budget desktop studio as in any other home studio. Because we're going to cover a lot of ground in this one article, we can't evaluate each product; in fact, we can't even mention every product you might use in a desktop studio. But most of these products have been evaluated in these pages or are in the process of being reviewed, and we've included sidebars and tables to point you to in-depth coverage.

THE WINDOWS CPU

Naturally, the heart of the desktop project studio is a computer with a fast enough CPU and hard drives to be able to do effective multitrack hard-disk recording and MIDI sequencing. In addition, the computer needs enough system RAM and video RAM to smoothly process MIDI and digital audio playback with all the attendant onscreen graphics.

The hardware considerations for hard-disk recording on Windows systems were covered in "The Windows Studio" (in the July 1996 **EM**), so we'll just note that for Windows-based systems, a 66 MHz 80486DX2 with 16 MB of RAM and at least 1 MB of video RAM is minimally required. To get the most out of the combined digital audio and MIDI technology, though, we recommend getting at least a Pentium 90.

Plug-in architectures can be used for a lot more than effects processing.

THE MAC CPU

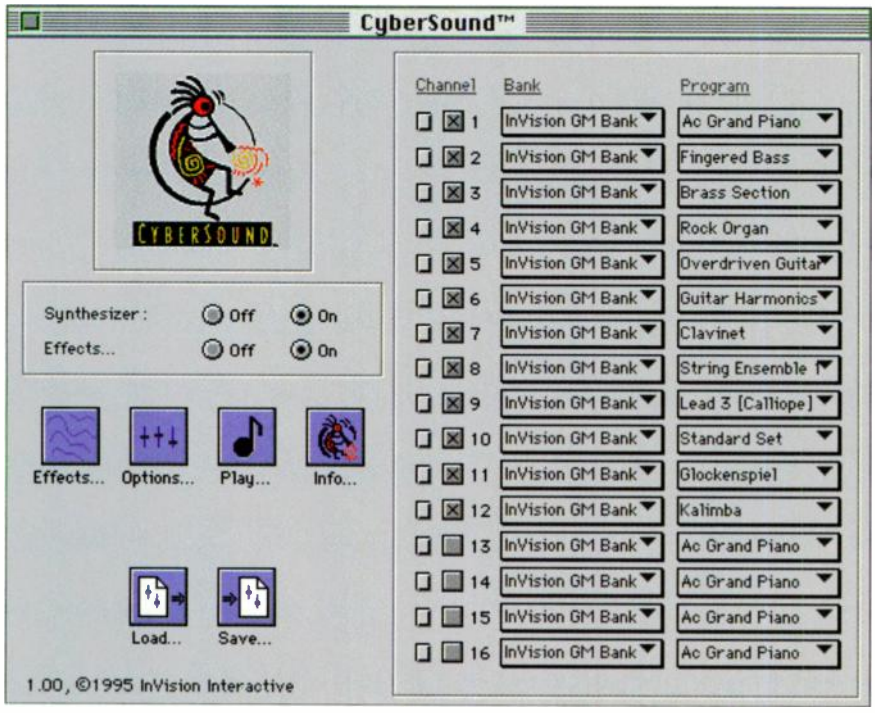
It has been some time since **EM** has discussed which Macs are best for music, so we'll go into a bit more detail than we did for the Windows machines. (If you have already settled on a CPU, just skip this section.) Here are a few simple guidelines.

You have a need for speed. If you are buying a new Mac, the Power Mac is the way to go, not only because of its superior CPU and drive-access speed, but also because it can use Sound Manager to record and edit 16-bit digital audio without a sound card or external digital audio converters (assuming your software supports this feature). If you choose a Power Mac, you must have Level 2 cache. Note that we didn't say "should."

If possible, go for a PowerPC 604-based Power Mac because the 604 is much faster than the 601. Prices are down and CPU clock speeds are up, so these machines are practical choices for the average musician. It's wise to get a machine with a CPU that is upgradeable via a daughtercard so you won't have to buy new hardware to take advantage of upcoming CPU improvements. Avoid 7200s and Performas; they're not bad machines, but they were designed for light office and general home applications, and they lack the extra speed and expansion capabilities required for serious desktop audio and multimedia studios.

Of the older Macs, the practical minimum is the Quadra 650, which is the 68040-generation descendent of the beloved IIci. The 840AV (but not the slower 660AV) also is a good machine, especially if your music software supports its ability to record 16-bit digital audio via its onboard DSP chip and Apple's Sound Manager system extension. If you already have a Quadra 650 or 840AV, you can certainly keep it in service. However, these computers are outdated, and they won't run some of the latest and greatest software. We don't recommend you buy a used 680X0 Mac at this point, even at a good price.

Clones are cool. We haven't evaluated the UMAX and DayStar Mac clones, but we can attest that the Power Computing clones are every bit as good as Apple Macs and often are a better value. Of course, by the time you read this, Apple will have released some



InVision Interactive *CyberSound VS*

FOLIO SX

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THE FACTS (& no Bull)

At Soundcraft, designing the mixing consoles people actually want has been a serious business for over 22 years. We've listened to our customers – from budding musicians to world-renowned artists and sound companies – and we've built their wish-lists into our mixers. We don't hype our new features and we don't go in for gimmicks. When you listen to SX you'll realize we listened to you.

NO HYPE NO GIMMICKS NO BULL.

FOLIO SX is a powerful, multipurpose mixer with DAT quality sound, housed in a freestanding frame with carry handle.

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- **20 inputs** (including 4 stereo channels) as standard, enough for most live and recording situations
- **12 mono inputs with UltraMic™ preamps** giving 60dB of gain range and +22dBu of headroom, allowing any mic or line device to be plugged in.
- **Two sub-buses** allow you to record groups of instruments to multitrack, send them to additional speakers, or sub-group to mix. SX also has a dedicated Mono Out.
- **8 Direct Outs switchable pre/post fader,** equally useful when recording in the studio or at a gig.
- **100mm faders** throughout
- **Real British 3-band EQ with swept mid**
- **18dB/Octave High Pass Filter** effectively reduces low end muddiness.
- **3 Auxiliary Sends:** 2 can be pre- or post-fader.
- **Custom-designed consistent controls** give an even spread of control around their sweeps.
- **Surface-mount technology**
- **Rack mount option**

SX's Direct Outs on the first 8 inputs are front panel switchable pre-fader for live track laying, or post-fader so you can "massage" recording levels in the studio.

MONO INPUTS

UltraMic™ padless preamp gives 60dB of gain range with 22dBu of headroom

Insert point for effects

Direct Out on channels 1 – 8

100Hz steep slope High Pass Filter

3-Band "British" EQ with swept mid

3 Auxiliaries configurable
2 x Pre/1 x Post or
1 x Pre/2 x Post

Channel "ON" switch

MIX/SUB routing switch

Full 100mm fader

PFL

STEREO INPUTS

13, 14, 17 & 18: simple phono inputs with Level and MIX/SUB routing

15, 16, 19 & 20: Balanced jack inputs with Gain, 2 band EQ, Aux levels, Channel "ON", MIX/SUB routing, 100mm fader and PFL

APPLICATIONS

LIVE SOUND
Bands, small venues, conferences, schools, places of worship

STUDIO RECORDING
Digital and analogue multitrack (4 & 8 track), small or home studios, pre-production, video post production

SUBMIXING

LOCATION SOUND

TYPICAL SPECIFICATIONS

Mic EIN	-129dBu
Crosstalk (1kHz):	
Channel Mute	<95dB
Fader Cutoff	<90dB
Frequency Response (20Hz to 30kHz)	<1dB
THD	<0.006%

SURFACE MOUNT TECHNOLOGY BREAKS THE FEATURES/PRICE BARRIER

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new, low-cost models that may provide competitive alternatives.

NuBus is history; think PCI. All the 604-based machines come with PCI (rather than NuBus) slots, which is a big plus. The PCI bus delivers much greater throughput than NuBus, which translates into superior performance for data-intensive applications such as digital audio and digital video. In addition, because the PCI bus is available on many Windows PCs as well as Macs, PCI cards often are less expensive than NuBus equivalents. Besides, NuBus is fading away quickly, so if you want to buy expansion cards in years to come, you'll have to go with PCI.

Buy more RAM. Many computer consultants will tell you that you need 8 MB of RAM for a 680X0 Mac and 16 MB of RAM for a Power Mac. That may be fine for many business and home-entertainment applications, but it isn't enough memory for a serious desktop studio. We recommend you start with no less than 32 MB for a Power Mac or Windows 95 PC and 16 MB for a 680X0 Mac or Windows 3.1 PC. Laying out more cash may hurt now, but you'll thank us later.

Don't overextend the OS. A lean system runs faster and cleaner with fewer potential extension conflicts. On a Power Mac, use the minimum number of non-native extensions, as these have to run in 680X0 emulation, which slows things down. Also, it is imperative that you turn off virtual memory and that you do not use RAM-expansion software (e.g., Connectix *RAM Doubler*). Many timing-dependent applications (such as music-production programs) cannot function properly with anything other than real RAM. On the other hand, Connectix *Speed Doubler* for the Power Mac includes a Speed Access extension that accelerates disk access. Although not necessary, this native-code extension is worth using.

Buy a large monitor, but don't hock the farm. A 15-inch monitor gets mighty crowded when you start editing multiple tracks. A 21-inch monitor is great, but these beasts cost twice as much as 17-inch monitors. A 17-inch monitor seems a happy medium for those who can't afford a big screen.

DRIVING THE POINT HOME

It's fine to store your MIDI files and synth patches on your main internal drive, but it's best to record digital audio to a dedicated, fast, high-capacity hard drive. (It doesn't have to be an AV drive.) For Windows machines, you can use either ATA-2 or SCSI-2 drives, as discussed in "The Windows Studio."

All desktop Macintoshes use SCSI, but this bus comes in several flavors. The stock Mac external SCSI bus is fine for most purposes, but SCSI-2 is faster and is therefore highly recommended. Some Macs have an external SCSI bus and an internal SCSI-2 bus. In this case, it's best to use an internal SCSI-2 drive to record digital audio. However, you can add an external SCSI-2 bus via a NuBus or PCI card such as FWB's SCSI Jackhammer.

Fast removable media are very good for music as they let you record your project to a cartridge that can be stored just like a DAT tape or cassette. Removables also are an excellent way to store sound libraries. One possibility is the Iomega Jaz drive, which can record up to 1 GB per cartridge. By the time you read this, SyQuest will have released a competing product, the SyJet, which should do the job as well as the Jaz. If you only need two to four tracks of audio, you can probably use SyQuest's 270 MB removable drive.

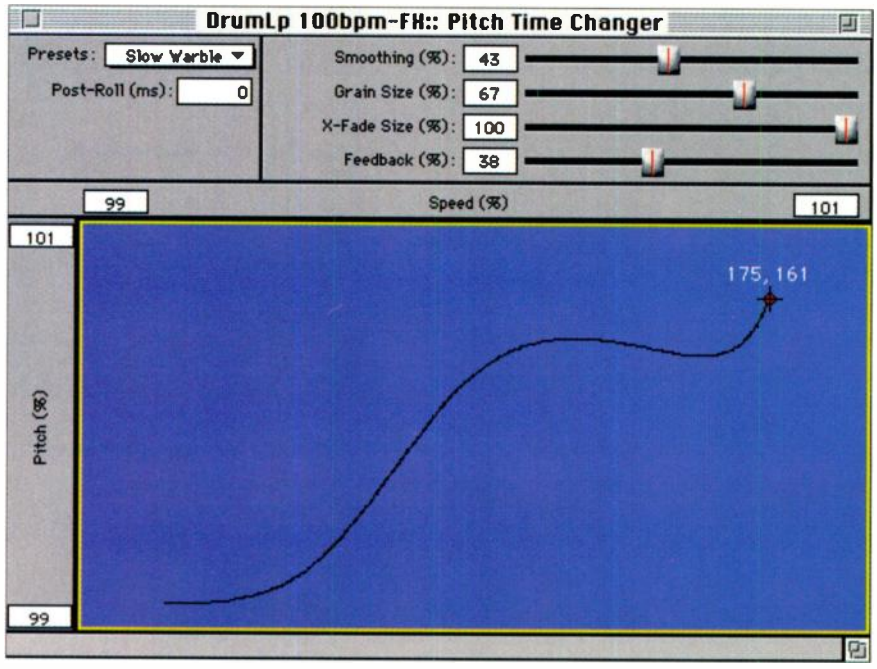
WINDOWS AUDIO CARDS

PC-compatibles don't have built-in audio inputs and outputs, so you must add a sound card to record and play back audio. Most multimedia computer packages are sold with sound cards that support this feature. Furthermore, these cards usually offer an onboard synth and a built-in MIDI interface.

Make sure your PC sound card offers full-duplex operation; that is, it must be able to simultaneously record and play back. A few low-end Windows-based sound cards don't have this capability, but they are becoming less common. If you have this kind of card, it may be more practical to get a second card with full-duplex capability for digital audio recording and playback. You still can use the first card as a synth/MIDI interface and/or a second stereo audio bus.

Some cards that support simultaneous record and playback don't monitor the recording through the audio outputs. To monitor the active track with these cards, you need an external mixer. We set out to do our whole project with just the computer and peripherals, but we may decide to cheat on that.

When recording digital audio tracks with a single sound card or one set of



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HAVE YOU HEARD THE NEWS ABOUT CAKEWALK PRO AUDIO?

"The results and underlying technology are astounding"

—Recording

"The unchallenged reign of the Mac in the pro audio world may be ending."

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"Awesome! Cakewalk Pro Audio takes top honors for its excellent all-around feature set and easy learning curve."

—New Media

"Cakewalk (Pro Audio)'s groove facilities are some of its most impressive features"

—Future Music

"Cakewalk Pro Audio...un produit fabuleux pour les musiciens"

—PC Loisirs (PC Leisure, France)

"A very good choice for professionals who work on a deadline and demand top performance"

—Electronic Musician

"Excellent—and user friendly—results."

—Musician

"A very powerful sequencer of MIDI data and audio that now makes hard disk recording a cakewalk"

—EQ

"The #1-Selling Music Software"

—Music and Sound Retailer, April 1996

THE WORD IS OUT.

Cakewalk Pro Audio™ is now the leading MIDI and digital audio workstation for Windows PCs. Cakewalk Pro Audio provides you with a unique balance of power, stability, and ease-of-use, letting you concentrate on *creating music*. (It's a quality you won't find in music software that is merely "ported" from the Mac platform.)

THIS NEWS JUST IN.

Cakewalk Pro Audio 5.0 is now available. It includes both a native Windows 95 version and a Windows 3.1 version on a single CD-ROM. Plus 40 new instrument definitions, improved editing functions, new MIDI+audio song files, on-screen Cakewalk tutorials, JAMMER® Hit Session™ accompaniment software, support for the Digidesign Audiomedia III™ card and Soundscape SSHDR1™ hard disk recorder, and more.

And, oh yes— ***still*** no copy protection. Unlike some software manufacturers, we don't treat our customers like suspected criminals.

SO SPREAD THE NEWS.

If you need integrated MIDI and digital audio recording, rock-solid SMPTE synchronization, and high-quality notation, then ask for the industry leader— Cakewalk Pro Audio.

Did we mention affordability? Cakewalk Pro Audio is only $399. (Deluxe edition $479; includes Musician's Toolbox CD-ROM.) For the name of a Cakewalk dealer near you, call 800-234-1171, or fax 617-924-6657.

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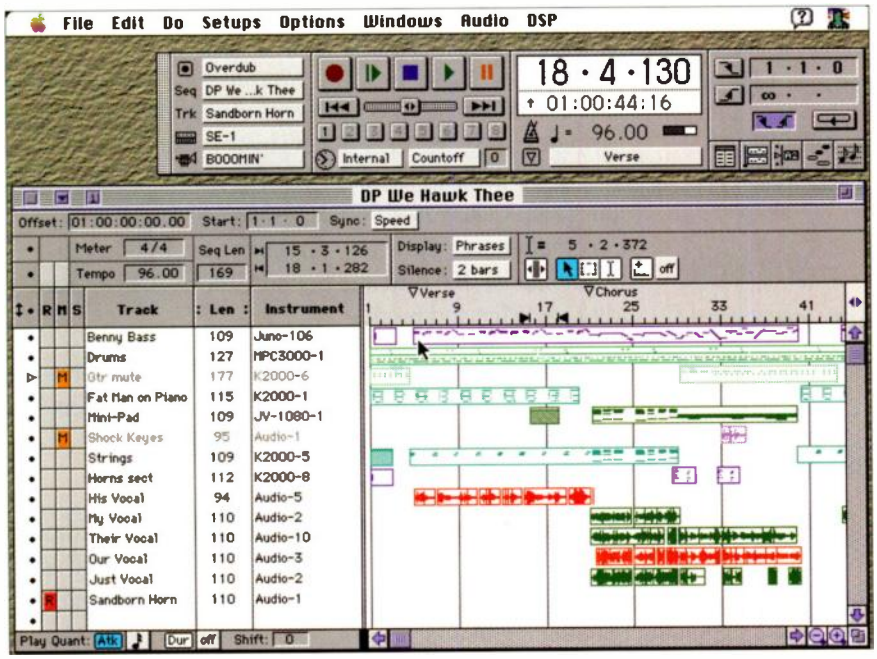
THE BUDGET DESKTOP STUDIO

outputs, you should be aware of another important factor. Although you're engaged in multitrack recording on your system, the active and recorded tracks get summed together into the stereo outputs. If you don't adjust the input and output levels at the program's source, digital distortion can occur and ruin your take. Some programs help you avoid this problem by automatically decreasing each playback track's base output level, usually by 6 dB.

For more on PC sound cards, we refer you again to our "The Windows Studio" feature in the July 1996 issue. In addition, please see the review of the Digidesign Audiomedia III card on p. 131 of this issue. We'll encounter this card again on the Mac side of the sound-card world.



Opcode *Studio Vision Pro*

PROPRIETARY AUDIO CARDS

Most of the discussion so far applies to standard Windows sound cards and a few specialty audio cards (e.g., DAL's CardD and Digidesign's Audiomedia III). These cards can be used by any audio program that supports standard Windows sound-card drivers.

Another approach combines a dedicated audio card and proprietary software. Two new systems of this type have garnered attention recently: CreamWare's tripleDAT and Metalithic Systems' Digital Wings for Audio. TripleDAT has been around for a while in Europe and is already shipping in the U.S.; Digital Wings should be available by the time you read this.

Digital Wings for Audio is currently a closed system, meaning that it won't work with third-party software. The tripleDAT software is proprietary, but the hardware comes with Windows drivers for audio and MIDI so it can be used with third-party software. Both products offer a lot of processing power. Because they include both hardware and software and offer effects processing, they are more affordable than they initially appear when you compare them to a regular sound card. **EM** discussed both of these systems in "NAMM's Greatest Hits" in the May 1996 issue (see the sidebar "Related EM Articles").

CreamWare's tripleDAT is a 4-in, 4-out system with simultaneous digital and analog I/O. As with most such systems, the number of virtual tracks depends on your CPU and hard drive, but a fair estimate would be between eight and 24 tracks. You will need a Pentium 90 or better with 16 MB of RAM for this. You get waveform-editing features and a host of real-time effects, including 4-band parametric EQ, reverb/room simulator, delay, dynamics processing, and a spectrum analyzer. Keep in mind that these effects work in real time, which is not true of some plug-ins. By the time you read this, Red Book CD-writing will be included.

Digital Wings uses an innovative processing technology that is said to provide up to 128 tracks of audio. The system offers three stereo inputs (six channels) and one stereo output. To top it off, the system is bundled with *Way Cool Edit*, a new commercial version of David Johnston's popular *Cool Edit* shareware wave editor. Here's the downside: like the Power Mac's I/O, Digital Wings' inputs and outputs are on ⅛-inch minijacks. (Sigh!) But for another $300, you can get a breakout box with S/PDIF digital I/O and balanced ¼-inch and XLR analog outputs. The specs are good, and the system can use any IDE or SCSI drive.

SOUND MANAGER AUDIO

Many older Macs lacked audio inputs but supported 8-bit audio recording via Macromedia's now-discontinued MacRecorder, which connected to the serial port. Non-AV Quadras have a mic/line input and line output, but again this only provides 8-bit audio. If you have a non-AV Quadra, you'll still need an audio card to do 16-bit audio recording and playback. As mentioned earlier, the Quadra 840AV has onboard DSP chips that allow 16-bit recording and playback, though the quality of the audio converters is not as good as you'll get with a Digidesign card or professional DAT deck.

All Power Macs that meet our guidelines offer 16-bit stereo audio input and output on ⅛-inch TRS minijacks. However, using a Power Mac and Sound Manager to record and play back audio has its drawbacks and limitations. For one thing, Mark of the Unicorn's *Digital Performer* digital audio sequencer doesn't support Sound Manager; if you're a fan of this program, you will still need a Digidesign card.

In addition, tightly synchronized multitrack playback of Sound Manager–based audio can sometimes be a bit dicey—sometimes the tracks drift out of phase relative to each other—and

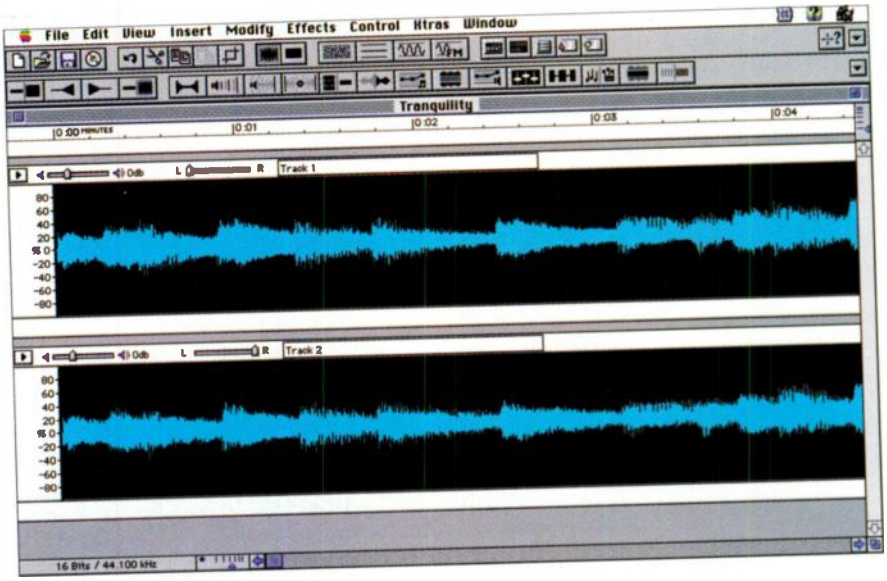
Software Applications

Manufacturer	Product	Type	Platform	Price	"What's New"	Review
AnTares	*Infinity*	sample looping	Mac	$325	7/93	11/93
Apple Computer	QuickTime	system extension with software synth	Mac	free	n/a	n/a
BIAS	*Peak*	audio editor	Mac	$499	5/96 ("NAMM's Greatest Hits")	n/a
Cakewalk Music Software	*Cakewalk Pro Audio*	digital audio sequencer	Win	$399	12/95	4/96
Digidesign	*Pro Tools*	multitrack recorder	Mac	$795	8/96	4/92, 10/93
Digidesign	*Session*	multitrack recorder	Mac/Win	$199	6/95, 12/95	4/96
Digidesign	*Turbosynth SC*	synthesis	Mac	$349	8/88, 9/88, 10/88, 10/89	11/88, 1/94
Emagic	*Logic Audio*	digital audio sequencer	Mac/Win	$799/$599	7/94, 4/95	5/95
Emagic	*SoundDiver*	universal patch editor/librarian	Mac/Win 95	$249	8/94	7/95
Innovative Quality Software	*SAW Plus*	multitrack audio recorder	Win	$999	5/93, 5/96 ("NAMM's Greatest Hits")	12/93
InVision Interactive	*CyberSound VS*	software synth	Mac	$249	3/96	n/a
IRCAM	*SVP/AudioSculpt*	phase vocoding, time correction, pitch scaling, cross synthesis, complex filtering	Mac	1,600 French francs (approx. $300)	n/a	5/95 *(SVP)*
Macromedia	*Deck II/Sound Edit 16*	multitrack recorder/ audio editor	Mac	$499 bundle ($399 ea.)	11/93, 12/94, 4/95 *(Deck II)*	10/92 *(Sound Edit Pro)*, 3/94 *(Deck II)*, 8/96 *(Sound Edit 16)*
MOTU	*Digital Performer*	digital audio sequencer	Mac	$895	3/91	5/88, 3/90, 9/93
MOTU	*Unisyn*	universal patch editor/librarian	Mac/Win	$295	12/92, 11/95	1/94, 3/96
Opcode	*Digitrax*	multitrack recorder	Mac	$199	3/94	10/94
Opcode	*Galaxy Plus Editors*	universal patch editor/librarian	Mac	$399 (upgrade from *Galaxy*, $150)	5/91, 11/91	5/92
Opcode	*MAX*	MIDI processor	Mac	$495	7/92	n/a
Opcode	*Studio Vision Pro*	digital audio sequencer	Mac	$995	1/91, 7/92, 12/93, 7/94, 12/94	2/91, 4/96
Opcode	*Vision*	sequencer	Mac/Win	$495/$299	4/89, 5/89, 7/90, 7/92, 2/94, 1/96	8/89, 5/94
Seer Systems	*Reality*	software synth	Win	tba	5/96 ("NAMM's Greatest Hits")	n/a
SEK'D	*Samplitude Studio*	multitrack recorder	Win	$398	6/95	3/96
Sonic Foundry	*Sound Forge*	audio editor	Win	$495	12/93, 10/95	2/94, 4/95
Sound Quest	*MIDI Quest*	patch editor/librarian	Mac/Win	$249	5/90, 12/93	9/90, 12/94
Steinberg	*Cubase*	sequencer	Mac/Win	$349	6/90, 6/91	1/90, 2/91
Steinberg	*Cubase Audio*	digital audio sequencer	Mac/Win	$799	12/95, 5/96 ("NAMM's Greatest Hits")	12/92, 1/95
Steinberg	*Cubase Score*	sequencer	Mac/Win	$549	12/95	7/93
Steinberg	*TimeBandit*	time correction	Mac	$399	10/94	6/95
Steinberg	*WaveLab*	audio editor	Win 95/NT	$399	12/95, 5/96 ("NAMM's Greatest Hits")	9/96
Terzoid Software	*NoiZe*	universal patch editor/librarian	Win	$99 (base)	3/96	n/a
Tracer	*DART/DART Pro*	noise reduction	Win	$99/$399	9/95 *(DART)*, 9/96 *(DART Pro)*	1/96 *(DART)*
Voyetra	*Digital Orchestrator Plus*	digital audio sequencer	Win	$159	2/96	n/a
Wildcat Canyon	*Autoscore*	pitch-to-MIDI converter	Mac/Win	$150	9/94, 5/96 ("NAMM's Greatest Hits")	2/95

THE BUDGET DESKTOP STUDIO

no stock Mac (including the Power Mac) has digital I/O or multichannel I/O. Fortunately, Korg has announced the SoundLink 1212 I/O PCI digital I/O card for Power Macs, which wasn't shipping at press time. Its twelve I/O channels are configured as two channels of analog I/O on ¼-inch TRS connectors, one ADAT optical interface, and a stereo S/PDIF on a mini-DIN connector. The mini-DIN attaches to breakout cable that supplies RCAs and a BNC word-clock input.

Some folks aren't enthusiastic about the quality of the Power Mac's I/O connectors and audio converters. But they're not unusable by any means. They are good enough for producing demos, and you might find them suitable for producing a home-release CD.



Macromedia *SoundEdit 16*

Best of all, a fast PowerPC-based PowerBook can become an extremely mobile workstation.

MAC AUDIO CARDS

Nevertheless, in order for you to get the best audio features and quality, you still need an audio card or external hardware such as the Yamaha CBX-D5 or CBX-D3 (discussed shortly). And when it comes to audio cards for the Macintosh, Digidesign is the only practical game in town.

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variety of pro-quality cards, all of which have digital I/O, good converters, dedicated SCSI ports for routing data to disk, and onboard DSP chips that do the main number crunching. The onboard SCSI chain and DSP free the CPU to more gracefully deal with other critical tasks, such as handling the recording program's user interface and MIDI features.

The only Digidesign cards that fit our tight budget are the Audiomedia II for NuBus Macs and the Audiomedia III for PCI Macs and PCs. The Audiomedia series has long been the standard for the budget Mac studio, and the latest version shows every sign of continuing in that tradition. Audiomedia III has two analog inputs, two analog mix outputs, and S/PDIF digital I/O.

A lot more power is available with the higher-priced cards, though the next step up from Audiomedia III for the Mac is a big one. Pro Tools Project PCI gives you a professional-quality 8-track system with *Pro Tools* software. (*Pro Tools* software also works with Audiomedia cards.) The I/O box is a separate purchase, though; the bottom of the line is Digidesign's 882 I/O, which offers eight balanced ¼-inch inputs, eight balanced ¼-inch outputs, and stereo S/PDIF I/O. Obviously, this isn't part of a low-budget desktop studio, but if you need an 8-in, 8-out Mac system, it's a great choice.

OUTSIDE LOOKING IN

If you have a PC or Mac and don't want to go with an audio card—maybe you're out of slots or have a Windows laptop computer that lacks slots—you can still record digital audio using external hardware that acts as a computer peripheral.

For example, the Yamaha CBX-D5 and CBX-D3 clearly are computer peripherals for digital audio recording. They are reviewed in this issue (p. 147), so we'll just give a general overview here. These devices provide digital-to-analog and A-to-D conversion and have onboard DSP for processing digital audio and recording to disk via SCSI. Major pluses for the tabletop CBX-D5 are its onboard stereo effects, digital EQ, and digital I/O. The D5 also has balanced analog I/O.

At first, you might look askance at the CBX-D5's price tag. But because the unit offers extensive onboard signal processing and high-quality I/O, it's a good value. The 1U rack-mount CBX-D3 lacks the D5's effects, EQ, and digital inputs, but it has S/PDIF digital outputs. It is more affordable than the D5, but it offers far fewer features. In addition, the CBX-D3 has unbalanced, -20 dBm outputs whereas the D5's balanced outputs are at +4 dBm, so the D3's audio quality is not quite as good.

Software support for the CBX is limited, especially on the Windows platform, where only *Cubase Audio* can use it. (*Logic Audio* for Windows support for the CBX is expected sometime this fall.) On the Macintosh, you can only use the CBX with *Logic Audio* or *Studio Vision Pro*.

The Soundscape Digital Technology SSHDR1 is evolving from its original incarnation as a dedicated DAW to a complete MIDI/audio production environment. With the new version 1.18 software, the SSHDR1 adds a proprietary plug-in architecture, a time-correction module, and CD-R mastering software. (Unfortunately, the CD-R package only supports the Marantz 610 and 620, Apex CDR2000, and Studer

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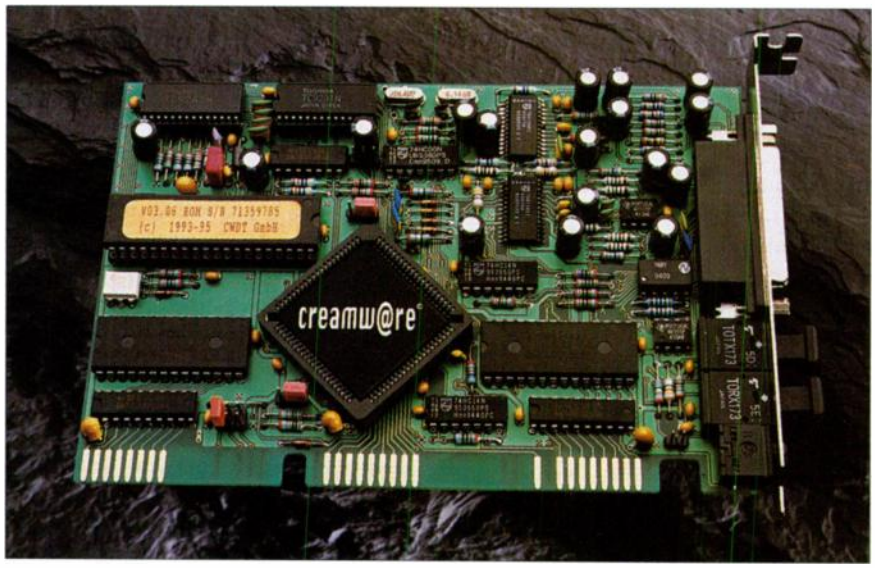
CD recorders.) The first DSP plug-in is *Reverb* from Wave Mechanics (not to be confused with Waves).

In addition, *Cakewalk Pro Audio* 5.0 now supports the SSHDR1, which gives the Soundscape platform a complete digital audio sequencer with its own plug-in architecture and the ability to integrate with digital audio editors such as *Sound Forge*. Until recently, we would have included the Soundscape system in the dedicated-DAW category, but with the addition of *Cakewalk Pro Audio* support and a plug-in architecture, the SSHDR1 has become a much more flexible tool.



CreamWare tripleDAT

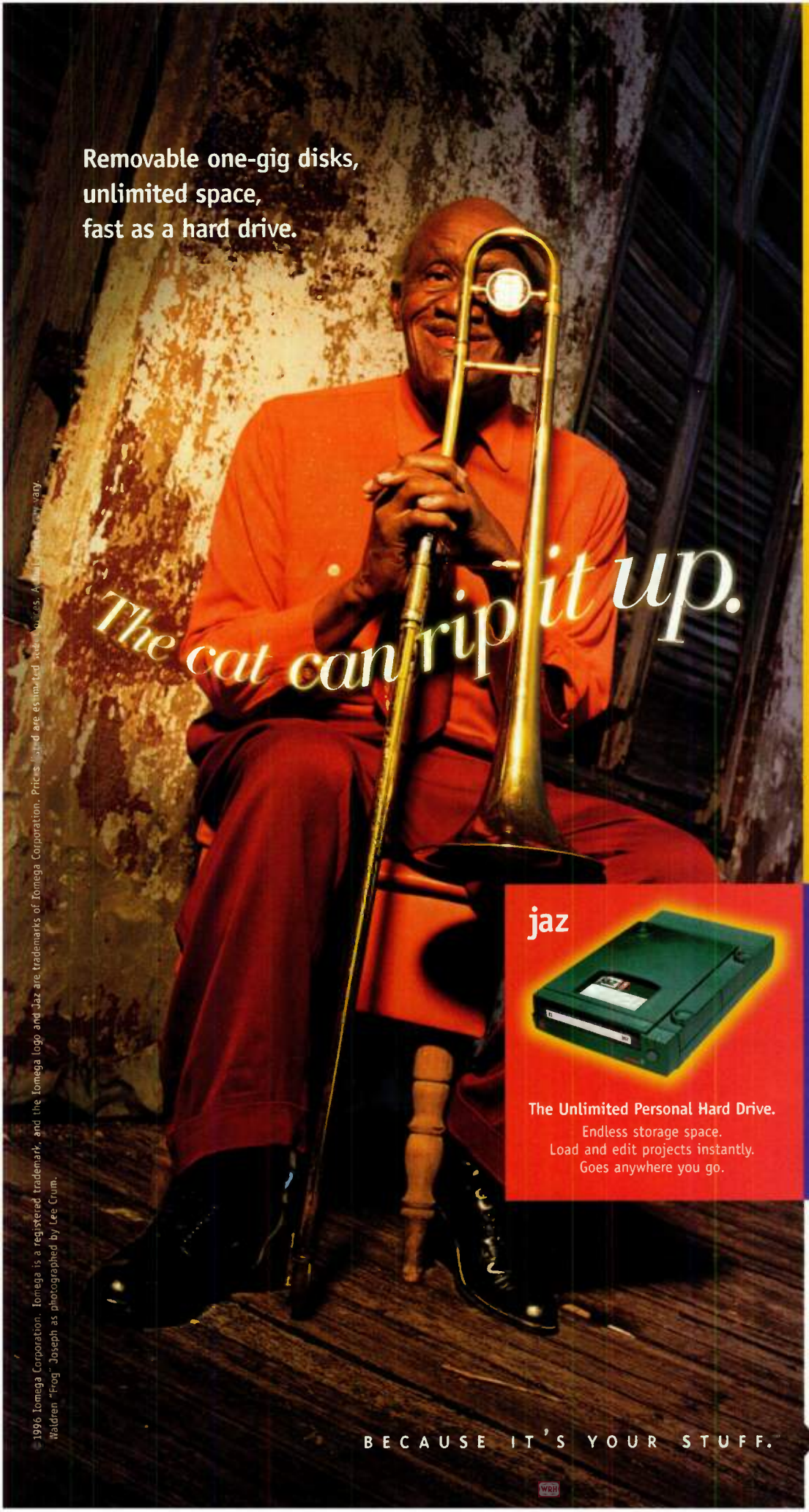
NEAR RELATIVES

Many dedicated digital audio workstations (DAWs) act as computer peripherals to varying extents. Some are clearly computer-related, supplying the recording and processing horsepower and using the PC or Mac simply as a front end. Examples include the Spectral Prisma Music System and MTU MicroSound. (These systems have been reviewed in **EM** and discussed in various features; see the sidebar "Related EM Articles.") Unfortunately, these quality products would blow a modest beer budget, but if you can afford them, check them out.

Although modular hard-disk recorders such as the E-mu Darwin, Akai DR8, Fostex D-80, Roland DM-800 and VS-880, and Vestax HDR-8 can't really be counted as computer peripherals, some of them are about to enter a gray area similar to that occupied by the Soundscape SSHDR1 DAW. Several manufacturers are working on adding computer front ends that will turn modular HDRs into more full-featured (and more flexible) equivalents of the Yamaha CBX-D5. For now, we'll leave these products out of our desktop studio, but you can keep them in mind for the future.

PC SYNTH CARDS

In the past, most PC sound cards sold with multimedia systems were infamous for the poor quality of their FM-based synth sounds. In many cases, the quality of the digital audio that streamed forth from them was nothing to get excited over, either. Moreover, some cards couldn't perform all functions simultaneously, such as recording digital audio while the synthesizer was playing. And although sound cards are supposed to be 16-part multitimbral, some of the original ones played back eight synth sounds and four percussion sounds at a time on MIDI channels 11 through 16. Other cards played more



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Waldren "Frog" Joseph as photographed by Lee Crum.

sounds, but only on the first ten MIDI channels.

Fortunately, these problems have been addressed in recent-vintage PC sound cards. Good cards are relatively inexpensive today, so don't waste your time with such garbage. If you have this type of card, just get rid of it.

Many multimedia systems still come bundled with FM-based sound cards, but there has been a notable increase in the number of systems sold with sample-based wavetable synth sound cards. Even so, as we'll see later, you may not want to rely on using just one sound card for handling MIDI and digital audio data.

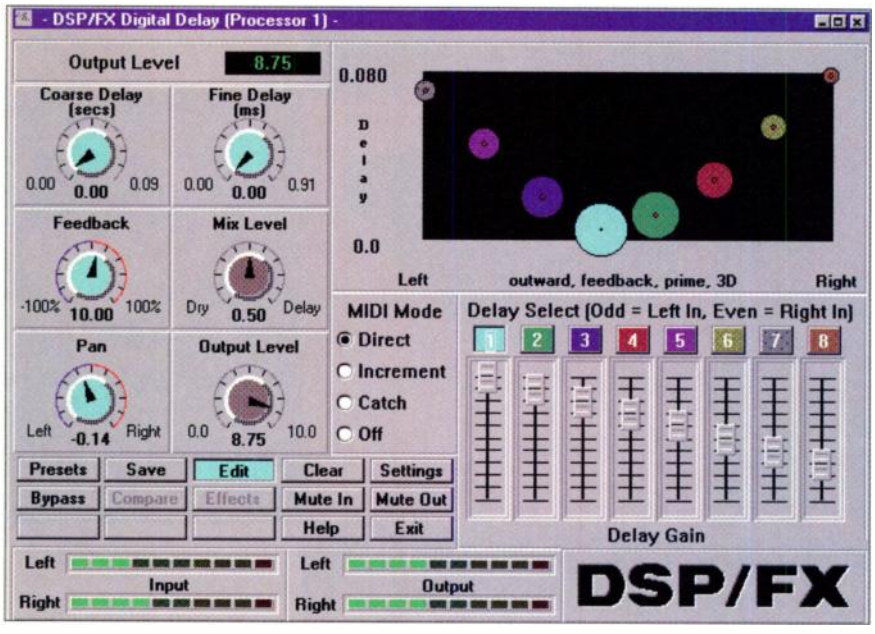
Turtle Beach Systems raised the standard of quality for PC-compatible sound cards by putting a Proteus 1/XR on their MultiSound (aka MultiSound Classic) card. It featured 16-part multitimbral playback on all sixteen MIDI channels. Since then, the quality and features of synths on sound cards have steadily improved. Several sound cards offer wavetable sounds in ROM as well as software for editing synth sounds and digital audio data. Furthermore, most cards have 24-voice polyphony and 16-part multitimbral operation.

Also, many FM synth-based, Sound Blaster–compatible cards have a 26-pin connector for adding wavetable-based daughterboards from well-known synthesizer manufacturers. For example, Roland makes the SCD-10DB and SCD-15DB Sound Canvas daughterboard as well as the SCC-1 Sound Canvas synth card. Creative Labs, the company that makes Sound Blaster cards and owns E-mu, markets the Wave Blaster daughterboard, which uses the Proteus/1 sound set. Ensoniq, producer of the Soundscape Elite sound card, also makes the Soundscape DB daughterboard. Likewise, Yamaha manufactures the WaveForce SW60XG sound card and DB50XG daughterboard, which feature the same XG synth engine as the MU50 sound module.

Instead of FM or wavetable ROM, some cards use RAM-based samples. Some systems use the host computer's RAM, in which case a set amount of computer RAM (512 KB to 2 MB) has to be reserved to load and play the "sound fonts." Nowadays, cards that use sampling capability do so more efficiently by using sample RAM on the card. For example, the new Gravis Ultrasound Plug 'n' Play Pro contains 1 MB of wavetable ROM and 512 KB of sample RAM that is expandable to 8 MB using 30-pin SIMMs. Sound Blaster's AWE32 PnP has an E-mu 8000 wavetable synthesis engine and 512 KB of sample RAM that can be expanded to 28 MB using 30-pin SIMMs. It uses E-mu's SoundFont patch format for loading samples and performance data.

A lean operating system runs faster and cleaner, with fewer potential extension conflicts.

Turtle Beach's MultiSound Pinnacle and Tropez Plus have wavetable synthesizers, but the Pinnacle uses Kurzweil MASS synth chips whereas the Tropez Plus uses the ICS synth. (ICS is Turtle Beach's parent company.) The Pinnacle also differs from the Tropez Plus in that it has 48 MB of sample RAM capacity using 72-pin SIMMs whereas the Tropez Plus has a 12 MB RAM capacity using 30-pin SIMMs. Furthermore, the Pinnacle has a daughterboard option for adding S/PDIF digital I/O. Both, however, use the Sample-Stor format for loading and playing sampled sounds.



Power Technology DSP/FX

MAC SYNTH CARDS

The Macintosh world has not embraced synth sound cards to the extent that PCs have because Macs have always had internal sound capabilities. One of the first sound cards available for the Mac was the Digidesign MacProteus, which was an E-mu Proteus/1 synth on a NuBus card. But in those days, many popular Macs didn't have card slots, and besides, a regular Proteus module offered more portability for less money. So the MacProteus flopped.

Far more successful was Digidesign's SampleCell NuBus card and its stereo successor, SampleCell II. SampleCell II is a 32-voice polyphonic, 32-part multitimbral, 16-bit, RAM-based (up to 32 MB) sample player. It has four stereo (TRS) ¼-inch main outputs, each with its own converters, for a total of eight

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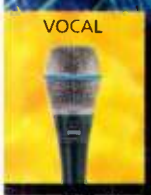

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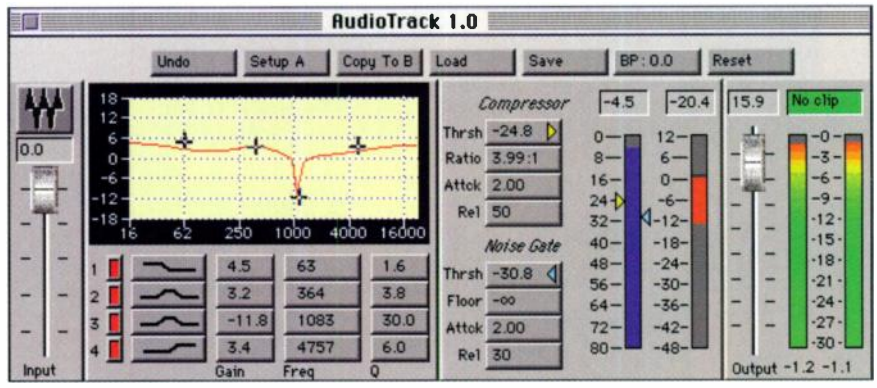
mono audio streams. Fortunately, it has just been released for PCI.

SampleCell II's powerful matrix modulation offers more than twenty controller paths and delivers considerable synthesis power. In addition to the *SampleCell Editor* front-end software, the card comes with *Sound Designer II SC* sample-editing software, so you can mangle, reshape, and loop sounds to your heart's content. (The card also works well with Digidesign's *Turbosynth SC* synthesis software, which is described shortly.) You can't record with SampleCell, but it can import and export AIFF and Sound Designer I/II files, and our desktop studio can record those file types already.

At least one company offers the Kurzweil MASS synth chip set on a Mac card. Morningstar Solutions' MacWaveMaker is a 7-inch NuBus card with a stereo pair of RCA audio outputs and MIDI In and Out ports. The card gives you 357 instrument sounds and more than 400 drum sounds (more than 2,000 waveforms compressed into 6 MB of ROM). The sounds are organized into four sound banks (including a GM bank) and fourteen drum sets. MacWaveMaker also has an effects processor with 48 algorithms that provide reverb, chorus, EQ, and delay.



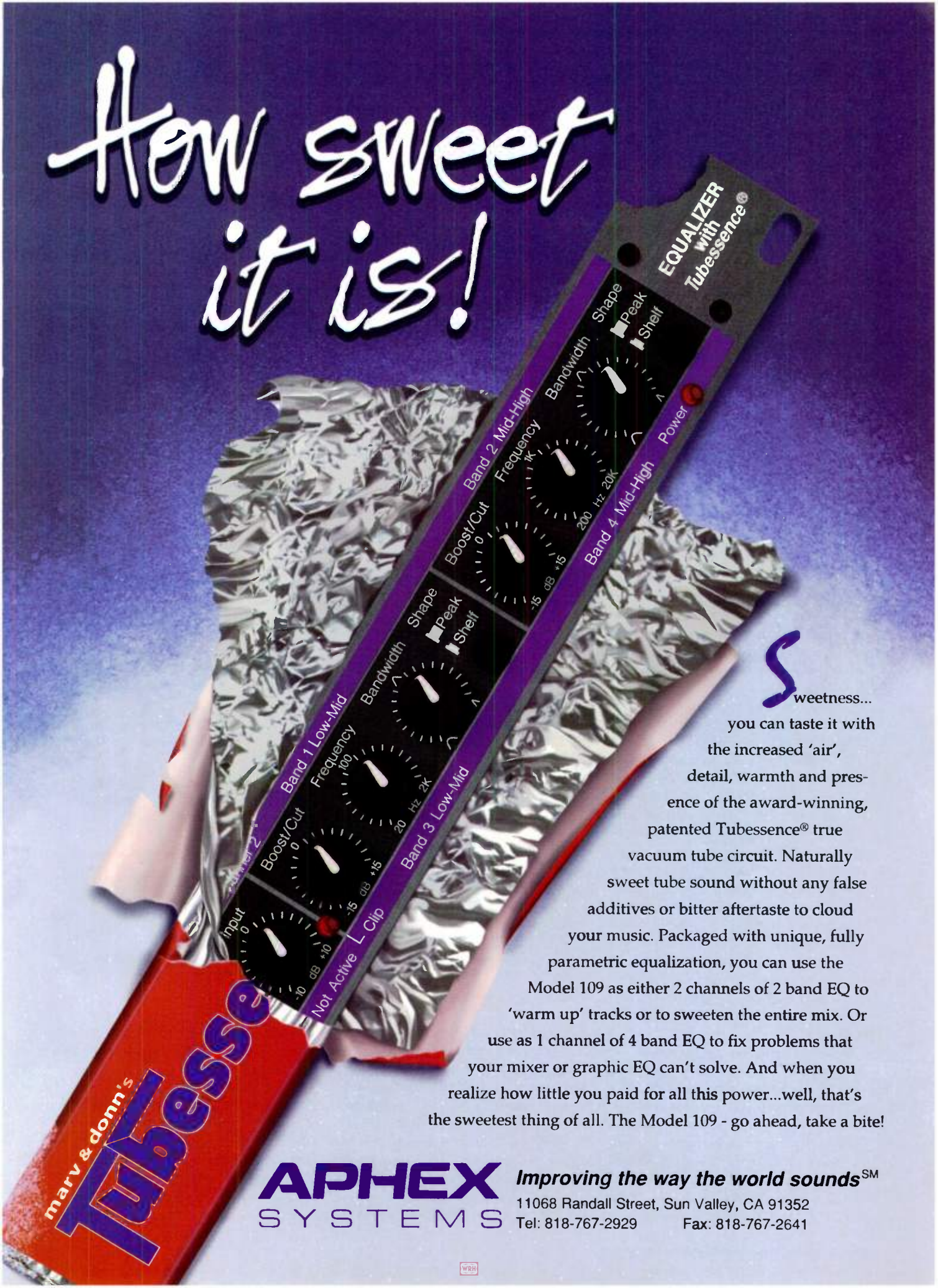
Waves *AudioTrack*

Another approach is the AVM Summit, a cross-platform product that puts the MASS sound set on a daughterboard mounted in a black box. Primarily designed for use with PC sound cards, it has DB-15 connectors that interface with a PC via the joystick port. It connects to a Mac via MIDI or the Summit's onboard serial-port interface.

SOFTWARE SYNTHS

Several manufacturers offer software synths, which are primarily intended

How sweet it is!



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for game players, those who aren't satisfied with using a synth card, or those who want to do audio work on a laptop computer. **EM** discussed software synths for the PC and Mac in the feature story "Flash in the RAM" (see the October 1995 issue). A few things have changed since then, but not much, so we'll just give you a quick update.

One thing to keep in mind with almost all of these systems is that they put a heavy load on your CPU. If you're running a digital audio sequencer and effects programs at the same time, your CPU could easily hit a virtual wall. Sometimes you can adjust how much CPU time the software synth requires, but that costs polyphony and sometimes reduces the synth's response time. Therefore, given the current state of this technology, a software synth might not be ideal for a desktop studio that has to handle many other tasks. But if you are primarily creating synth-based music and you don't need a lot of digital audio power, it might prove a good investment.

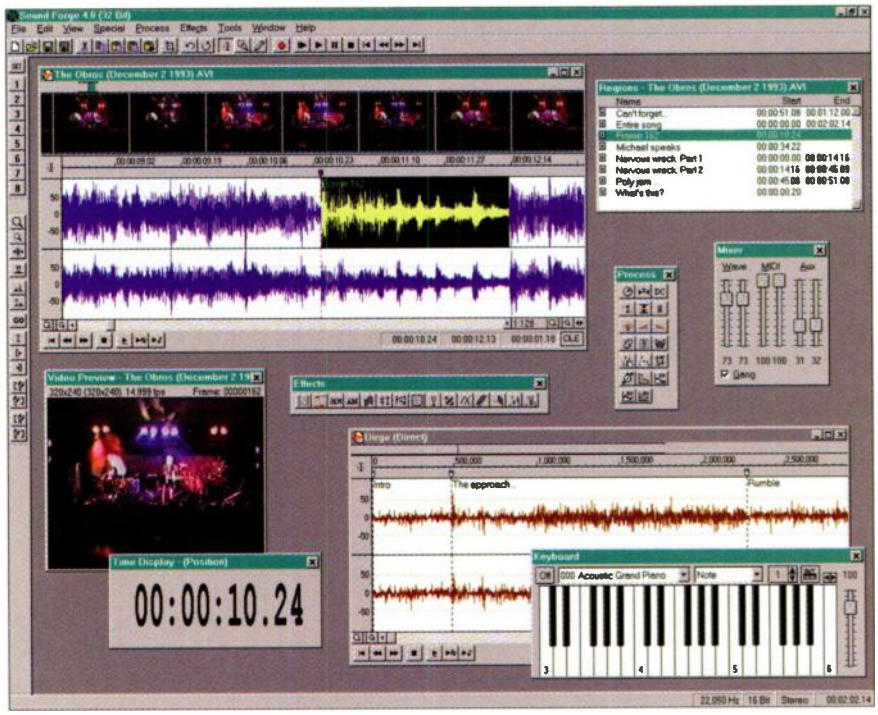
Several software synths have been introduced for the PC, but not much has changed since we last discussed them in the October 1995 issue, with one exception. Seer Systems announced that it will take the synthesis system we described last year another step. The new GM-compliant version, called *Reality*, will offer 16-part multitimbral operation and up to 64-voice polyphony on a fast Pentium. The synth engine will use a combination of samples and waveguide/physical modeling synthesis. If Seer delivers as promised, you'll have significant sound-editing capabilities.

Mac users who have QuickTime 2.0 or later already have a limited onboard synthesizer known as QuickTime Musical Instruments. The version of QuickTime Musical Instruments that comes with QuickTime 2.1 includes a handful of sounds from the Roland GM sound set (up to 43 16-bit sounds on a fast Power Mac). The v. 2.1 sounds are decent though nothing to write home about. However, the new QuickTime 2.5, which should be available by the time you read this, will have a full Sound Canvas GM set (128 16-bit, 44 kHz sounds) and a revised synthesis architecture that will let you add your own or third-party sounds and remap a few MIDI controllers. We'll bring you the details in an upcoming article.

InVision Interactive's *CyberSound VS* delivers excellent synth sounds. That should come as no surprise if you remember that InVision began life as a sound-design company. The software synth comes with 512 16-bit sounds, which fill from 6 to 50 MB of disk space. Polyphony varies according to CPU power, maxing out at 128 voices on a fast Power Mac. (The program runs in native PPC code.) The sounds can't be edited except for a few Roland GS-type parameters for the chorus and reverb effects. MIDI control is pretty limited, too. In addition, there seems to be a short delay between when you play a key on a MIDI controller and when you hear the sound. (According to InVision, this delay has been eliminated in v. 1.01.) But the sounds are killer.

Digidesign's *Turbosynth SC* offers a different approach to synthesis on the Mac. *Turbosynth* has a long history that harkens back to the days before Digidesign made hardware, when the program played back via the 8-bit Mac sound chip. (The original *Turbosynth* was reviewed in the November 1988 issue, and **EM** published an applications article called "Turbosynth Tips" in August 1989. *Turbosynth SC* was reviewed in January 1994.)

The program provides a variety of analog-style synth modules that you connect with virtual patch cords to create a sound. You can start with samples and/or sophisticated oscillators, put them through various filters and amplifiers, analyze their spectra, modulate them, mix them, add effects, and generally muck about. Then you can save the results as a *Turbosynth* patch or as SDII or AIFF sound files. If you have SampleCell, you can use Apple Events to automatically load the new *Turbosynth* patch into SampleCell as a new multisampled instrument. This program is a must-have for those who want to create gonzo original sounds on the Mac without using external samplers and synths.



Sonic Foundry *Sound Forge*

DIGITAL AUDIO SEQUENCERS

Sequencing and audio recording are the core technologies for our desktop studio. For many people, the most elegant and cost-effective solution is to use an integrated digital audio sequencing program. Not only are these

BASS

THE BUDGET DESKTOP STUDIO

programs capable of sequencing and hard-disk recording in the same environment, but they also offer solid editing capabilities for MIDI and digital audio data, albeit different programs offer differing degrees of editing power. Both the Mac and Windows platforms have a wide selection of integrated production programs. Most have been reviewed in **EM**, and reviews are in the works for the others.

At the moment, the primary integrated digital audio sequencers for Windows are Steinberg's *Cubase* family, Cakewalk Music Software's *Cakewalk Pro Audio*, Emagic's *Logic Audio*, Musicator A/S' *Musicator Audio*, and Voyetra's *Digital Orchestrator Plus*. All variations of Steinberg's *Cubase* for Windows support audio using a Windows sound card, but *Cubase Audio* also supports the Digidesign Session 8 and Audiomedia III cards and the Yamaha CBX-D5 and D3.

Some digital audio sequencers, especially the Windows programs (such as *Musicator Audio*, *Digital Orchestrator Plus*, and *Logic Audio* for Windows), lack plug-in architectures, which limits your ability to integrate effects processing. (However, *Logic Audio* for Mac supports SDII and TDM plug-ins.) You can get around this with a separate audio-editing program or stand-alone effects-processing software, as we'll see. Nevertheless, the lack of a plug-in architecture limits your options and reduces the degree to which you can integrate the parts of your system.

The Steinberg and Emagic programs also are available on the Mac, where they are joined by Opcode's *Vision* and *Studio Vision Pro* and Mark of the Unicorn's *Digital Performer*. All of the programs except *Digital Performer* 1.7 support Sound Manager–based audio on the Power Mac. *Digital Performer* 1.7 requires a Digidesign card, though as mentioned earlier, you can use the Yamaha CBX-D5/D3 with version 1.41y.

In addition, some of these programs are bundled with handy companion applications. For example, *Cubase Audio* 3.0 for Mac comes bundled with *Time Bandit* 2.0, Steinberg's amazing time-stretching and pitch-shifting software. *Vision* and *Studio Vision Pro* are bundled with Opcode's *Galaxy* universal MIDI-device librarian.

Until the advent of integrated digital audio sequencers, dedicated sequencers were the most important programs in the electronic musician's arsenal. However, many of the top sequencers—including *Cakewalk*, *Cubase*, *Performer*, and *Vision*—now have digital audio versions and can be upgraded to their audio versions, so you can save money at the start and then wait to pay the difference when you're ready to go full speed ahead.

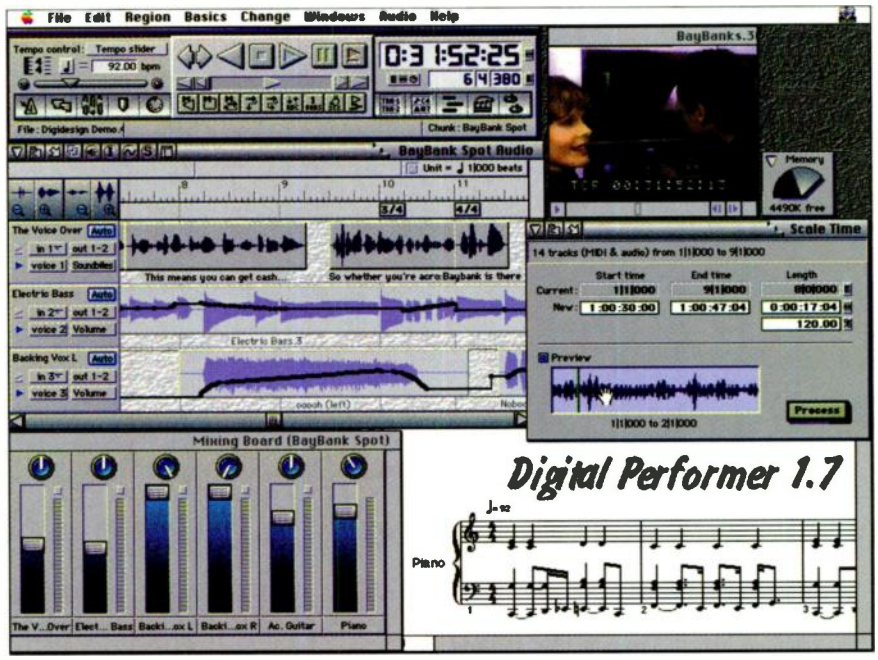
However, increasing numbers of pro sequencers now offer audio-recording capabilities in their base versions. For example, all members of the *Cubase* 3.0 family for Mac now incorporate Steinberg's Virtual Studio Technology (VST), which means they support Sound Manager audio on the Power Mac and have an automated audio mixer with panning, EQ, and effects (which currently include chorus, reverb, and delay), all of which operate in real time. *Vision* for Mac also supports native Sound Manager audio on the Power Mac and has all the editing features of *Studio Vision Pro*. All versions of *Cakewalk* also have been upgraded to support digital audio.

The biggest factor that separates the Mac sequencers from their official "audio" versions is that the basic sequencers don't support audio cards and DSP plug-ins. (*Cubase VST* is an exception in that it has a plug-in architecture, but it doesn't support audio cards.) The biggest differences between *Cakewalk Pro Audio* and the lower-priced versions are the number of tracks and the *Pro Audio* version's support for higher-end hardware, such as Soundscape's SSHDR1 and Digidesign's Audiomedia III and Session 8. (CBX-D5/D3 support is in the works.)

AUDIO RECORDER/EDITORS

Some recordists prefer to run separate sequencing and digital audio applications, either in a multitasking environment or on separate computers that are synched together. This method of operation has several advantages on the digital audio side.

For instance, you sometimes can get more audio tracks or find more specialized editing features with a dedicated multitrack audio program than with an integrated program. (The number of tracks you get still depends on the system's capabilities and what programs and system software are running in the background.) Sometimes you can get all the basic features you need for less money, too. Examples of dedicated multitrack digital audio programs



Mark of the Unicorn *Digital Performer*

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include Innovative Quality Software's *SAW Plus* (Windows), SEK'D's *Samplitude Studio* (Windows), Macromedia's *Deck II* (Mac), Opcode's *Digitrax* (Mac), and Digidesign's *Session* (Windows and Mac) and *Pro Tools* (Mac).

You often can combine an integrated program with one or more separate applications. For instance, you could record basic audio tracks in a program such as *Deck II,* in which you have lots of tracks to play with. However, this program doesn't offer in-depth waveform editing. After deciding which tracks are keepers or doing a submix, you can save the recording in a standard format and then open the file in an audio editor or digital audio sequencer. Macromedia offers the cost-effective *SoundEdit 16/Deck II* Mac bundle for exactly this purpose.

In addition, a stand-alone digital audio editor, such as Sonic Foundry's *Sound Forge* (Windows), BIAS' *Peak* (Mac), Steinberg's *WaveLab* (Windows 95/Windows NT), or Macromedia's *SoundEdit 16* (Mac), often provides more powerful sound-editing capabilities than an integrated digital audio sequencer. These programs mostly deal with stereo sound, so they are not a substitute for a multitrack recorder.

Many audio editors and multitrack recording programs have onboard effects and plug-in architectures that allow you to add features, including effects that run in a separate window within the host program. The lack of a plug-in architecture could inhibit your ability to create a complete studio in the computer. Therefore, consider carefully whether you can afford to pay a bit more for software that lets you use plug-ins.

One variation on the combination of a digital audio sequencer and dedicated audio editor is provided by *Cakewalk Pro Audio* 5.0. This digital audio sequencer integrates with more powerful third-party audio editors such as Sonic Foundry's *Sound Forge* by exporting an audio region for editing and then seamlessly reimporting the edited audio. This is doubly cool because *Sound Forge* has its own plug-in DSP architecture and *Cakewalk Pro Audio* doesn't have one quite yet.

EFFECTS PROCESSING

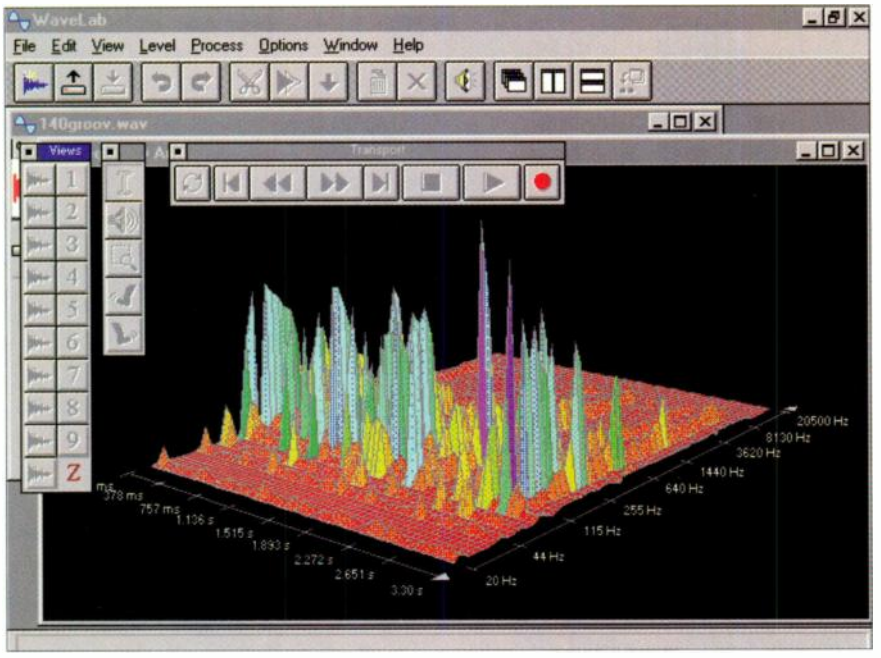
The desktop studio would not be a practical reality without extensive effects-processing capabilities. We want to do it all: delay, reverb, EQ, modulation effects, dynamic processing, and even noise reduction. As we'll see, not only can we do it all, we have choices in every category.

In general, effects processing chews up a lot of computing power, so it often takes place offline (i.e., the audio is not playing during processing). In some systems, you can process the audio in real time during playback but not during recording. However, if you have a powerful enough computer (such as a Pentium 90 or better or a fast Power Mac), you can do a surprising amount of real-time processing.

Desktop effects processing can be accomplished in several ways. Some audio-editing programs and digital audio sequencers have built-in effects. For example, Steinberg's *WaveLab* audio editor offers gain normalizing, time correction, pitch shifting, chorusing, and parametric EQ. Although its built-in effects operate offline, *WaveLab*'s new plug-in architecture will operate in real time. In many cases (e.g., IQS' *SAW Plus*), these effects are of limited usefulness, but they probably are enough to get you started.

Programs with plug-in architectures are limited only by the extent of their third-party support. Some plug-ins are also available as stand-alone applications, and of course, some effects-processing programs are only offered as stand-alone applications.

Finally, a few systems use dedicated hardware rather than, or in addition to, standard audio cards. As with some of the audio-recording hardware/software packages, this gives them the processing power to apply effects in real time so you can instantly hear what you're doing. In general, custom hardware solutions are more expensive than software-based effects that use standard audio cards. We'll deal with these systems first because examining them will help us put the all-software approach in perspective.



Steinberg *WaveLab*

EFFECTS CARDS

At least one dedicated effects-processing system for Windows uses custom hardware. Power Technology's DSP/FX includes an ISA-bus card with a 32-bit floating-point CPU that is dedicated to handling the DSP computation. The host PC runs the proprietary software front end. This allows the user to create pro-quality reverb, delay, chorus, flanging, and pitch shifting in real time. (More effects algorithms are promised.) Everything can be automated via

DSP Plug-Ins

Manufacturer	Product	Type	Architecture	Price	"What's New"	Review
AnTares	*MDT*	dynamics processor	TDM/SDII	$599/$499	3/94	9/94
AnTares	*SST*	tunes Digidesign system to match monitor system and room	TDM/SDII	$699	12/95	n/a
AnTares	*Voice Processor*	de-esser, compressor, expander/gate, EQ, delay	TDM/SDII	$499/$399	11/94	n/a
Apogee	*MasterTools*	UV22 Super CD Encoding bit reduction	TDM	$795	n/a	n/a
Arboretum	*Hyperprism*	filtering, reverb, modulation, pitch shifting, delay, stereo manipulation	TDM/SDII/ stand-alone (Power Mac)	$1,195/ $595/$295	11/93	8/94
Crystal River Engineering	*Protron*	3-D spatialization	TDM	$995	2/95	n/a
Digidesign	*D-Verb*	reverb	TDM	$495	n/a	n/a
Digidesign	*DINR*	noise reduction	TDM/SDII	$995	12/95	n/a
Digidesign	*DPP-1*	pitch processor	TDM	$495	n/a	n/a
Focusrite	*d2*	parametric EQ	TDM	$995	n/a	n/a
INA	*GRM Tools*	23-band EQ, filtering, time stretching, harmony processing, noise gate, Doppler, filtering, delay, pitch shifting	TDM/ stand-alone	$499/$799	n/a	n/a
InVision Interactive	*CyberSound FX*	reverb, EQ, delay, flanger, phaser, chorus, compressor, tremolo, normalizer, pitch shifter, echo, wah-wah	Premiere/ SoundEdit 16	$129	10/95	6/96
QSound Labs	*QSYS/TDM*	soundstage enhancer	TDM	$995	n/a	n/a
QSound Labs	*QTools/SF (QXpander, QSys, QSRC)*	soundstage enhancer, sample-rate conversion	Sound Forge	$195	n/a	n/a
QSound Labs	*QX/TDM, QX/SDII*	soundstage enhancer	TDM/SDII	$295	n/a	n/a
Steinberg	*DeClicker*	noise reduction	TDM	$995	n/a	n/a
Steinberg	*Virtual FX Rack*	chorus, autopan, plate reverb, spatial enhancer, signal merger	TDM	$399	n/a	n/a
T.C. Electronic	*TC Tools*	reverb, chorus	TDM	$995	12/95	n/a
Waves	*AudioTrack*	4-band parametric EQ, compressor/expander, gate	TDM/SDII/ Premiere	$300	2/96	n/a
Waves	*C1*	compressor/gate	TDM/SDII/ Premiere	$850/$650/$650	n/a	n/a
Waves	*L1*	peak limiter, level maximizer, requantizer	TDM/SDII/ Premiere/ Sound Forge	$800/$600/ $600/$600	n/a	n/a
Waves	*Q10*	parametric EQ	TDM/SDII/ Premiere	$600/$400/ $400	12/93, 12/94	6/94
Waves	*Q2*	parametric EQ	Premiere	$99	n/a	n/a
Waves	*S1*	stereo imager	TDM/SDII/ Premiere	$650/$450/ $450	n/a	n/a
Waves	*TrueVerb*	reverb	TDM	$800	7/96	n/a
Waves	*WaveShell*	shell for Waves plug-ins	TDM/SDII/ Premiere	$100	n/a	n/a

MIDI so you can record dynamic effects changes in a sequencer.

The software displays the wet sound's position in the stereo soundstage via a graphic window. For example, you can see and change the stereo placement of eight taps in a dynamic 8-tap delay, group and manipulate them as desired, view and change the regeneration value for each tap, and watch their positions and values change in real time as the audio plays. The stock system has analog I/O with 16-bit converters, but a digital interface is available on a daughterboard card for $299 that provides AES/EBU and S/PDIF digital I/O.

On the Mac, two real-time hardware/software systems are worth mentioning briefly for those who are willing and able to go with them. The Mac system that best compares to DSP/FX for Windows is Lexicon's NuVerb, which creates elaborate time-based (reverb, delay, and modulation) effects. NuVerb includes a NuBus card and software with an excellent graphical interface that gives you incredibly detailed control over its effects. It works with TDM but doesn't require it. As for audio quality, well, it's a pro product from Lexicon. Need we say more?

The best known hardware/software combination is Digidesign's TDM system for Macintosh, which uses the company's DSP Farm card in conjunction with a Pro Tools system. If you want a full-blown desktop studio and don't mind shelling out big bucks for the latest and greatest, Pro Tools III (which includes TDM) is what you need. Pro Tools III is expandable and delivers excellent audio quality on both digital and multichannel analog I/O. The TDM system provides complete real-time effects-processing and mixing capabilities, including the ability to route audio to and from DSP plug-ins within the computer. Although a Windows version hasn't been formally announced, it would seem inevitable.

Because TDM systems are expensive for our budget studio, we won't discuss TDM-only plug-ins here. That leaves out plug-ins from Steinberg, Apogee, Crystal River, and Focusrite, for example. However, we have listed them in the table "DSP Plug-Ins."

PLUG-IN ARCHITECTURES

Plug-ins are hot not only in audio but throughout the software world. (For example, many World Wide Web browsers, graphics programs, and desktop publishing programs have plug-in architectures.) In the audio world, several near-standard DSP plug-in architectures have emerged along with several proprietary architectures.

We've already mentioned Digidesign's TDM plug-in architecture. However, Digidesign also offers two more affordable offline (non-real-time) plug-in architectures. The older and better-known architecture is incorporated into *Sound Designer II* 2.5 or later and has been adopted by many third-party audio-recording software developers, which means you can run SDII plug-ins within their host programs. For instance, Opcode, Emagic, MOTU, and Steinberg offer SDII plug-in support in their digital audio sequencers.

Digidesign's AudioSuite architecture is so new that we haven't had our hands on it yet. (It will run on a Power Mac.) The first program to support it will be *Pro Tools* 4.0 (Mac), which should be available by later this year. Digidesign has stated that AudioSuite will be an open architecture, and several third-party developers have already announced that they will release plug-ins for it.

Version 3.0 or later of Adobe's *Premiere* multimedia-authoring program also offers a plug-in architecture, which is rapidly being adopted by some of the same third-party developers that support SDII and TDM plug-ins. The main audio programs that support the Premiere architecture other than *Premiere* itself are Macromedia's *Deck II* 2.5 multitrack recorder and BIAS' new *Peak* audio editor. The Premiere plug-in architecture is generally considered less powerful and flexible than the SDII architecture, which isn't a big surprise considering that *Premiere* was not primarily designed for audio production. On the other hand, the plug-ins tend to be less expensive.

Innovative Quality Software *SAW Plus*

Macromedia's *SoundEdit 16*, Steinberg's *WaveLab*, IQS' *SAW Plus*, and Sonic Foundry's *Sound Forge* have their own plug-in architectures, though third-party support is just beginning to appear. As of press time, *WaveLab*'s architecture was so new that even Steinberg's plug-ins weren't shipping, and no major plug-in developer had announced products for *SAW Plus*. The most widely supported architectures (SDII and TDM) are Mac-only for now, but this obviously will change soon.

In our book, though, this abundance

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of mutually incompatible plug-in architectures is not a good thing. We would like to see one top-quality, standardized architecture for Mac and PC that everybody supports. That way, you could buy, say, a reverb plug-in and use it with every audio program.

EFFECTS SOFTWARE

Israeli developer Waves is one of the top manufacturers of DSP plug-ins, supporting the Premiere (Mac only), SDII, TDM, and Sound Forge plug-in architectures. Waves even has a unique software shell, called *WaveShell*, that allows multiple Waves plug-ins to be used simultaneously as if they were a single plug-in. You buy a shell for a specific plug-in architecture, and all your Waves plug-ins run within the shell. *WaveShell* for Premiere uses Sound Manager audio on a Power Mac. There's even a version called *WaveShell-RT* that lets you run Waves plug-ins in real time on a Power Mac and Digidesign card as if the plug-ins were a single, stand-alone application. In addition, Waves plug-ins use DSP resources very efficiently.

Among Waves' most popular plug-ins is *Q10*, which provides up to 10-band parametric EQ. *Premiere* users can also use *Q10*'s 2-band sibling, *Q2*, which will even run on a 68000-based Mac. Waves' *L1-Ultramaximizer* includes a look-ahead peak limiter, level maximizer, and requantizer in one package. Basically, it's a brickwall compressor/limiter for CD and multimedia mastering that lets you strictly define the dynamic range of a mix and hear what the mix sounds like in different file formats and at different resolutions up to 20 bits.

C1 is a frequency-selective dynamics processor with phase compensation. It includes spectral enhancement, noise reduction, and more. *S1* enhances and alters the sound's stereo image in some fancy ways. For instance, it allows you to lower the level of the sounds on one side of the stage and raise the sounds on the other side without affecting the position of sounds in the center.

Earlier this year, Waves released *AudioTrack*, which combines a 4-band parametric EQ, compressor/expander, and gate, all controlled in a single window. This program runs in native Power Mac code and can use Sound Manager or a Digidesign audio card.

As of this writing, all but two Waves plug-ins are available for the TDM, Sound Designer II, and Premiere plug-in architectures. *Q2* is only available for Premiere, and the *TrueVerb* reverb plug-in is TDM-only. Waves also has entered the Windows plug-in scene with its release of *L1* for the Sound Forge architecture as well as for the three Mac architectures.

AnTares Systems (formerly Jupiter Systems) is another major source of DSP plug-ins and stand-alone software. These programs feature easy-to-use graphical interfaces and do far more than we can describe here, but we'll try to give you the general idea.

Of particular interest for our desktop studio is the *Voice Processor*, a one-stop, real-time signal-processing shop for vocals and other audio parts. It

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combines a de-esser, full-featured compressor with downward-expanding gate, parametric EQ, and multitap delay. You can use the tools separately or in any combination. The program requires a Digidesign audio card.

The *Voice Processor*'s de-esser and compressor use the same algorithms as another useful AnTares plug-in, *Multiband Dynamics Tool. MDT* lets you separately process up to five different frequency bands so you can create dynamic EQ, de-essers, compressor/limiters, expanders, and so on. The customized dynamics processors can operate without the pumping and breathing artifacts commonly found in hardware compressors because during multiband processing, the relationship of each spectral band to the master gain curve is controllable.

Perhaps the most interesting real-time effects processor for the Mac is Arboretum Systems' *Hyperprism*, which lets you simultaneously vary two parameters of an effects algorithm by drawing curves onscreen. The shape and rate of your mouse moves are recorded, and you can store not only the processed audio but the processing curves themselves, which can be applied to live audio or an AIFF or SDII file. The program includes reverb, dynamic filters, amplitude modulation, pitch shifting, ring modulation, and several strange and wonderful algorithms. You can even make multiple passes, stacking algorithms.

Several versions of *Hyperprism* are available. *Hyperprism-68K* is a stand-alone application, and *Hyperprism-TDM* is a TDM plug-in. Both of them require a Digidesign card. A new version, *Hyperprism-PPC*, runs as a stand-alone Power Mac application and uses Sound Manager audio. For the moment, at least, *Hyperprism-PPC* lacks a few features found in the other versions, most notably MIDI control. However, it is easier to use, and it is a heck of a lot less expensive than the other versions.

Another interesting set of plug-ins is InVision's bargain-priced *CyberSound FX* for Premiere and SoundEdit 16. The

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Voyetra tel. (914) 966-0600 or (800) 233-9377; fax (914) 966-1102; e-mail info@voyetra.com; Web http://www.voyetra.com

Waves tel. (423) 689-5395; fax (423) 688-4260; e-mail waves@waves.com; Web http://www.waves.com

Wildcat Canyon Software tel. (800) 336-0982 or (510) 527-5155; fax (510) 527-8425; e-mail autoscore@wildcat.com; Web http://www.wildcat.com

Yamaha Corporation of America tel. (714) 522-9011; fax (714) 739-2680; e-mail info@yamaha.com; Web http://www.yamaha.com

program includes fifteen effects modules, including three types of reverb, three types of EQ, 2-tap and multitap delay, flanger, phaser, chorus, compressor, tremolo, normalizer, and pitch shifter. You also get free echo and wah-wah modules when you register. The processing is destructive, but there's one level of undo. The audio quality varies, but the price is so low that buying *CyberSound FX* is a no-brainer for *SoundEdit 16, Deck II* and *Premiere* owners.

QSound Labs is best known for its soundstage expansion products. *QTools/SF* is a suite of three plug-in tools *(QSYS, QXpander,* and *QSRC)* for Sound Forge. Using *QSYS,* you can place mono sounds anywhere outside the normal stereo domain to surround the listener. *QXpander* is used for processing existing stereo files to widen the image beyond ordinary stereo. *QSRC* provides sample-rate conversion. *QSYS* and *QX* (the equivalent of *QXpander*) are also available as Mac SDII and TDM plug-ins.

IRCAM is a French music-research institute that is best known in academic circles. Mac-based MIDI maniacs know it mostly because Opcode's *MAX* was initially developed there. But IRCAM has edged into the commercial software field. One of its first offerings was *Super Vocoder du Phase (SVP).* Now there's a new version with a graphic interface called *AudioSculpt.* This program for the sonically adventurous provides phase vocoding (not the same as channel vocoding), which lets you manipulate the amplitude and phase spectra independently. You can analyze and resynthesize a digital audio file and do time correction, pitch scaling, cross synthesis, and many types of filtering. *AudioSculpt, SVP,* and several other programs are offered via subscription to the IRCAM Users Group, which allows you to license IRCAM's programs. The total to join the group and license *AudioSculpt* comes to 1,600 francs, or about $300.

NOISE REDUCTION

Even if your budget desktop studio produces relatively clean audio, some noise is almost inevitable. If you capture audio from outside sources such as old films, tapes, and records (paying for the rights, of course), you'll certainly want to take out a lot of garbage.

Not long ago, if you wanted to run real honest-to-goodness noise-reduction software, you had to have a Macintosh and a very large bank account.

Audio and Synth Hardware

Manufacturer	Product	Type	Platform	Price	"What's New"	Review
AVM Technology	Summit	synth box	Mac/Win	$389	n/a	8/95*
CreamWare	tripleDAT	ISA card–based DAW	Win	$1,798	5/96 ("NAMM's Greatest Hits")	n/a
Digidesign	Audiomedia II	NuBus audio card	Mac	$1,295	8/92	12/92
Digidesign	Audiomedia III	PCI audio card	Mac/Win	$795	6/95, 12/95	9/96
Digidesign	Pro Tools III PCI	PCI card–based DAW	Mac	$7,995**	8/96	n/a
Digidesign	Pro Tools Project PCI	PCI card–based DAW	Mac	$2,495**	10/90, 6/93	4/91, 12/93
Digidesign	SampleCell II	NuBus sample-playback card***	Mac	$1,995 (no RAM)	2/93, 4/93, 3/94	9/93
Digidesign	Session 8	ISA sound card	Win	$1,995**	8/96	4/92, 10/93
Korg	SoundLink 1212 I/O	PCI card–based digital I/O	Mac	$1,250	12/91	n/a
Lexicon	NuVerb	NuBus card–based effects processor	Mac	$1,795	n/a	11/94
Metalithic Systems	Digital Wings for Audio	ISA card–based DAW	Win 95	$1,698	5/96 ("NAMM's Greatest Hits")	n/a
Morning Star Solutions	MacWaveMaker	NuBus synth card	Mac	$369	n/a	8/95
Power Technology	DSP F/X	ISA card–based effects processor	Win	$1,295	2/96	n/a
Turtle Beach	MultiSound Pinnacle	ISA sound card	Win	$449	8/91, 4/94	8/92, 10/94
Turtle Beach	Tropez Plus	ISA sound card	Win	$249	n/a	n/a
Yamaha	CBX-D5/D3	audio recorder/processor	Mac/Win	$1,995/$995	6/92, 4/93 (D5), 4/95 (D3)	9/96

* Sidebar to Morning Star MacWaveMaker review

** Core System only; requires Digidesign I/O box (882 I/O $995; 888 I/O $2,995)

*** PCI version expected this fall

ALESIS

The Advantage is the POWER

The Power To Perform

The Alesis **QS7™ 64 Voice 76 Key Expandable Synthesizer** is a powerful instrument designed for exciting, dynamic live keyboard performances. You'll appreciate its 76-note semi-weighted keyboard with velocity, release velocity and aftertouch. Its four assignable control sliders, pitch and mod wheels, and two assignable pedal inputs (plus sustain pedal), give you expressive control over every nuance of your music. And its advanced Modulation Matrix lets you assign almost any controller to any target parameter, making the QS7 a powerhouse on any stage.

The Power To Create

In your studio, the QS7 becomes a complete MIDI production system. Create fat chords and thick layers with its true 64 voice polyphony. Utilize its massive sound library with thousands of unique, realistic programs and multitimbral mixes. Add four discrete multieffects with built-in reverb, delay, chorus, lezlie, overdrive and more.

Sequence directly into your Mac® or PC with the QS7's high-speed serial interface, or record direct to ADAT® with its innovative Optical Digital Output. Expand your sound arsenal to up to 32MB at once with two PCMCIA card slots. And take advantage of sequencing, sample transfer, synth editing and much more with the QS7's free CD-ROM.

A keyboard with this much power should cost megabucks, but the QS7's advanced performance and creative tools are incredibly affordable. The power of the QS7 is at your fingertips... experience it at your Alesis Dealer today.

QS7™

64 VOICE EXPANDABLE MASTER SYNTHESIZER

Alesis Corporation 3630 Holdrege Avenue Los Angeles CA 90016 310-841-2272 alecorp@alesis1.usa.com

For more information about the QS7, visit your Authorized Alesis Dealer or call 310-841-2272.

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ALESIS

THE BUDGET DESKTOP STUDIO

Sonic Solutions' extremely high-end hardware/software system was the only game in town for years. Then Digidesign started the audio plug-in craze with *DINR* for SDII and TDM. *DINR* works well on constant noise such as hum, but it's not designed to eliminate clicks and pops, and it's costly for our modest budget. The only other noise-reduction option for the Macintosh is Waves' *C1*.

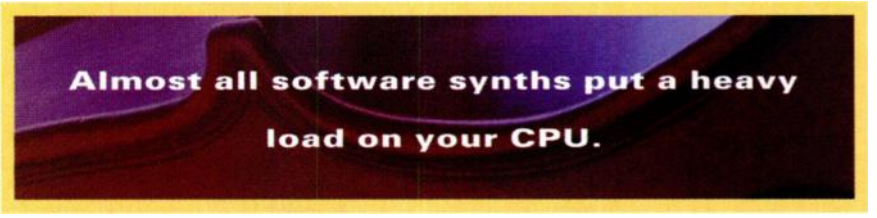
My, how the worm has turned! Now Windows users have either Tracer's *DART Pro* noise-reduction software or Sonic Foundry's *Sound Forge* and *Noise Reduction* plug-in.

EXPANDING THE SOFTWARE

For the purposes of creating a reasonable desktop studio on a budget, we have focused on bread-and-butter programs. But these don't necessarily cover all the bases. For example, we haven't discussed notation software—and we won't this time because it's a huge story on its own.

Similarly, the world of MIDI device editor/librarians is a topic unto itself. You might not even need to buy one of these programs if you are using a sound card or software synth that comes with editing software. But if you expand your desktop studio to include a keyboard synth or sound module, an editor/librarian allows you to hide your synths and control them from the computer.

There are numerous single-product editors and at least four "universal" ed/lib programs, but the degree to which the latter are truly universal varies. For example, Opcode's *Galaxy Plus Editors* editor/librarian for the Mac has a programming language for creating custom editor modules, but it doesn't ship with nearly as many preprogrammed modules for common MIDI devices as do Sound Quest's *MIDI Quest* (Win/Mac) and Mark of the Unicorn's *Unisyn* (Win/Mac). Emagic's *SoundDiver* (Mac/Win 95) and Terzoid's *NoiZe* (Win) are other players in this market, though they are relative latecomers and have a much smaller market share.



In addition, the plug-in architectures we described earlier can be used for a lot more than effects processing. Intelligent Devices' *AD-1 Pro Audio Analyzer* can run as a TDM plug-in or as a stand-alone application and gives you a wide variety of level meters and analysis tools. AnTares Systems' *Spectral Shaping Tool (SST)* plug-in for TDM or SDII lets you tune a Digidesign system to match your speaker system and listening environment.

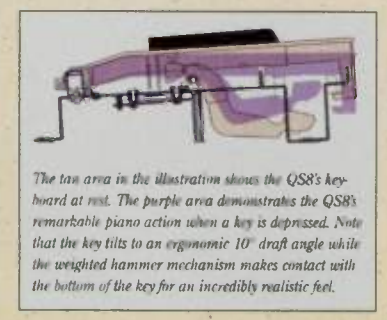
Also from AnTares is *Infinity*, the company's very first major product, which is the ultimate sample-looping tool. It reads and writes AIFF and SDII files and is a great product for lots of sampling applications, but if you use a SampleCell card in your desktop studio, *Infinity* is a must have.

Almost from the moment MIDI was introduced, people wanted to generate MIDI note data just by singing into a sequencer. With Wildcat Canyon's *Autoscore* (Mac/Win), you sing or play a single-note line into the computer's audio jack, and the program converts the audio pitches to MIDI note data, complete with Velocity values. *Autoscore* does not operate in real time, though it's close; there is a short lag between audio input and MIDI conversion. It's fine for sequencing and notation but not for live performance. Alternatively, Emagic's *Logic Audio* can read a single-note audio line from a digital audio file and generate the appropriate MIDI data. Version 3.0 of Opcode's *Studio*

ALESIS

The Difference is The Feel

You don't buy an 88-key keyboard because of a spec sheet, feature list, or any number of bells and whistles. 88-key keyboards are for serious players. Players who require an instrument that feels as good as it sounds, with expressiveness that will be reflected in every brilliant performance. So, when you go to your Alesis Dealer to play the new **QS8™ 64 Voice 88 Key Expandable Master Synthesizer,** the first thing you'll notice is its full-sized, weighted, hammer-action keyboard...perhaps the most piano-realistic ever implemented in a synthesizer.



The tan area in the illustration shows the QS8's keyboard at rest. The purple area demonstrates the QS8's remarkable piano action when a key is depressed. Note that the key tilts to an ergonomic 10° draft angle while the weighted hammer mechanism makes contact with the bottom of the key for an incredibly realistic feel.

The QS8 also contains an extremely powerful synth engine. With 64 voices of polyphony, thousands of authentic acoustic sounds (including our acclaimed Stereo Grand Piano), dynamic synth textures, and built-in Alesis four-bus effects, you get everything you need for a complete MIDI composition system. We even include a CD-ROM with all the creative software you could want—sequencers, editor/librarians, sample editors and more. Two PCMCIA card slots add the ability to expand your sound library to 32 MB, or even to store your own samples for instant recall. Use its ADAT™ Optical Digital Output for direct digital recording and its high-speed serial computer interface to make QS8 the center of your MIDI production and recording studio.

With its realistic feel and advanced synth features, you might be surprised to learn that the QS8 is the most affordable fully weighted 88-note synthesizer available. Get your hands on a QS8 at your Alesis dealer today.

QS8™

64 VOICE 88 KEY EXPANDABLE MASTER SYNTHESIZER

Alesis Corporation 3630 Holdrege Avenue Los Angeles CA 90016 310-841-2272 alecorp@alesis1.usa.com

For more information about the QS8, visit your Authorized Alesis Dealer or call 310-841-2272.

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ALESIS

RE1000

Electro-Voice®

True Condenser Studio Microphone

The Electro-Voice RE1000 is a monumental breakthrough in studio condenser microphone performance and value. Its sound quality and performance rivals many of the world's finest microphones, regardless of price. One listening test will reveal that this serious audio tool belongs in your studio.

Electro-Voice®

Electro-Voice, Inc. a MARK IV company
600 Cecil St. Buchanan, MI 49107
800/234-6831 616/695-6831
In Canada: 613/382-2141

Vision Pro takes this even further: it converts single-note audio lines to MIDI and single-note MIDI lines to audio. These aren't real-time processes, however.

With all these different products and formats, a file-format converter could prove handy. In addition, there is an assortment of sample-rate converters, batch processors, and MIDI processors (such as Opcode's *MAX*). And don't overlook shareware programs. **EM** described two shareware effects programs (Tom Erbe/Frog Peak Music's *SoundHack* and Bill Gardner's *Reverb*) for the Mac in the March 1994 feature "Virtual Effects." A variety of PC shareware was covered in "Share and Share Alike" (June 1994 **EM**). And there's much more where that came from; **EM** will evaluate several shareware programs for the Mac and PC in an upcoming feature story.

EXPANDING THE HARDWARE

If you need more synth voices or different sounds than your sound card provides and you don't want to dedicate the CPU power to a software synth, you may have to go outside the computer and add a sound module, preferably with a built-in MIDI interface for Mac and Windows computers. Yes, this means departing from our all-computer studio. But it's an option worth considering. Don't forget the keyboard versions of these instruments; you're going to want a controller of some sort.

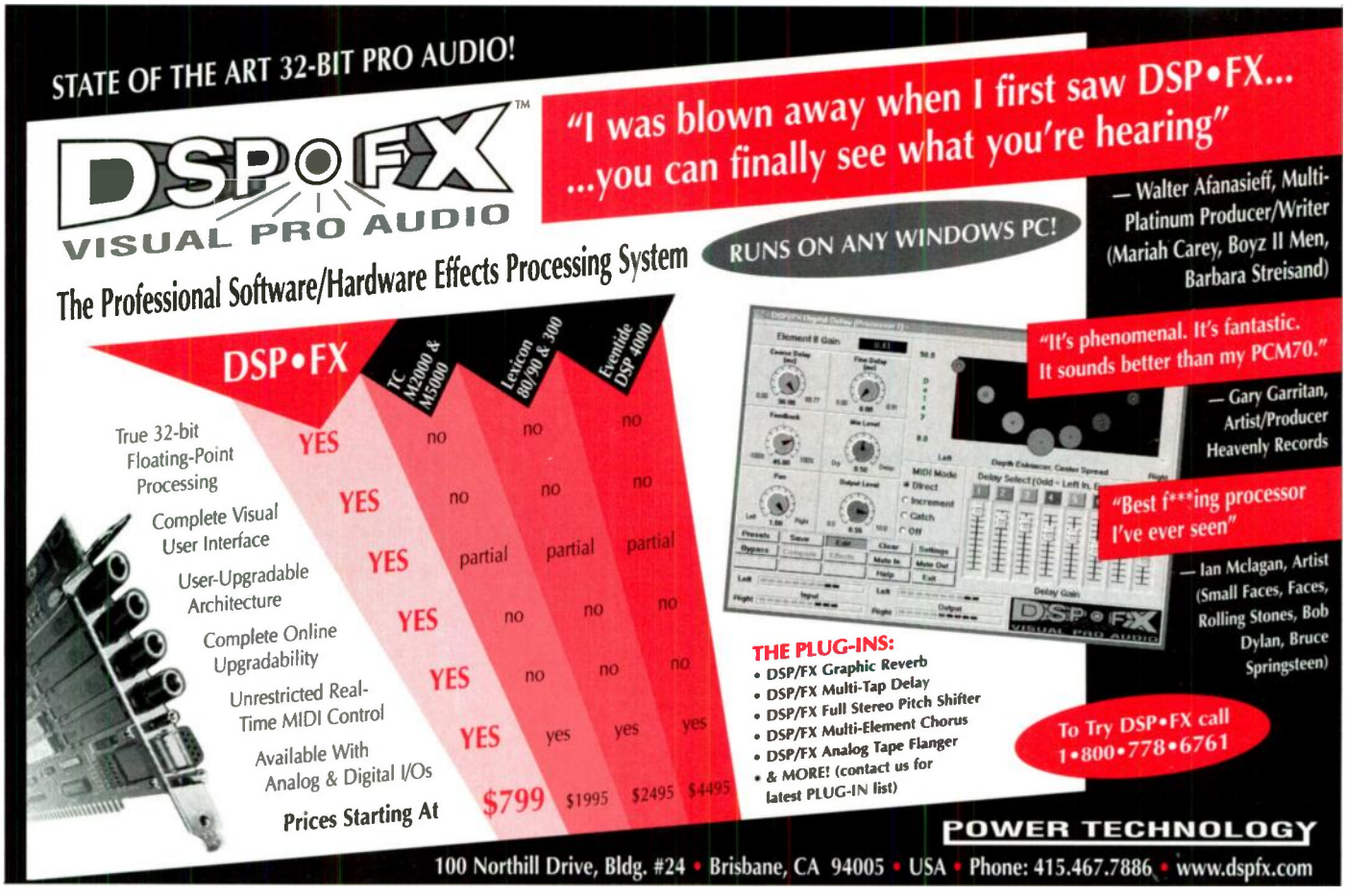
Of course, when you add a sound module or keyboard synth, you have one more reason to add a small external mixer. You can use any small, clean mixer that gives you a mic preamp, lets you mix the synth card and external sound sources, and routes the audio to the monitors and 2-track recorder (e.g., an audio card, CD-R, or DAT). And you'll need a monitor system unless you can tell what you've recorded by listening to hard-disk and fan noises.

MIX MASTERS

The ultimate goal of all this desktop technology is to produce a finished, original DAT or CD master for commercial replication or to make limited-run CDs right from the computer using a CD-R drive.

Before doing that, you need to mix all the tracks down to stereo and make sure that the stereo mix is in a standardized digital audio file format. The biggest stumbling block in this process is converting MIDI tracks to digital audio tracks. If we use an external mixer, this will be a simple, familiar process.

However, if you're still determined to do it all on the computer, there are at least two reasonable ways to accomplish this feat. The first method is to route the synth card's or sound module's outputs to the digital audio card's inputs and record them as two more digital audio tracks in your program. Obviously, this method doesn't work if your synth and digital audio tracks come from a single PC sound card. (But then, you may be the kind of person who actually likes the combined



Yamaha 02R Receives Too Many Awards. Currently Under investigation for Foul Play!

In an announcement that may shake the industry, Harley Rubinesky announced at a press conference held at the offices of the US Department of Unfair Practices and Wishful Thinking, that the Yamaha 02R Digital mixing Console was under investigation. He continued, "In it's young life, the 02R has received every conceivable award available to such a product." What was most disturbing, however, stated Rubinesky, was the fact the Yamaha 02R had received awards such as Post Magazine's prestigious "Producer's Choice Award" in the audio mixer category, where it's competition included mixers costing more than $200,000.00. This is especially suspect when you consider that the Yamaha 02R retails for less than $10,000.00 as a complete system. Rubinesky continued with a long list of awards garnered by the 02R, including...EQ Magazine's Best In Show award, '95 AES Show and The Radio World Cool Stuff Award, NAB '96. Not only is the price discrepancy so wide between the 02R and it's nearest competition, continued Rubinesky, taken on it's own the 02R delivers too much value to be credible. For example, the Yamaha 02R has 40 power-packed inputs which include 4-band parametric eq, 8 aux sends, and its own limiter/compressor/gate. 02R automation can remember every setting and movement of all of this stuff on all 40 inputs and bus outputs so you can instantly recall and recreate your mix in fine detail. As a digital console, 02R can be digitally connected with the new breed of digital multitrack tape and non-linear recorders for astonishing sonic transparency.

In a related story, the Yamaha ProMix 01, having received AV Video's Platinum Award for outstanding technological achievement in the audio hardware category, the Mix Foundation's Tech Award for technical excellence in the small mixer category and Electronic Musician's Editor's Choice Award, has also been singled out for investigation by the same government agency. Agency Director, Melinda Rubinesky, no relation, stated that there seemed to be a disturbing pattern of unrealistically high value for low cost in a number of Yamaha's products. "This fact strengthens our case" stated the Director.

02R

When asked for comment, Yamaha explained that they were studying or considering the idea of making their products less competitive.

Haunted Mansion Scam Exposed!

"We were taken for a ride by this crook and her "music playing ghosts" spit out a betrayed patron of Madame Wiley's haunted jazz house. Wiley had been charging $40 admission since last month when her house allegedly became spooked by the spirits of jazz greats. They had been performing twice nightly.

Paranormal experts, intrigued by the regular visitations, quickly unearthed Wiley's nefarious scheme. "We found these two tone generators," reported Captain J. Muir, lead investigator, holding up a Yamaha P50m piano tone generator and VL70m virtual acoustic tone generator.

VL70M

P50m

Mrs. Eunice P. Wiley, convicted felon and frustrated musician, had been performing the piano parts using a Yamaha P50m piano tone generator. With the P50m's 12MB of waveROM condensed into 6MB, 40 types of effects and 3-band EQ controlled by front panel sliders, it was easy for her to accomplish any piano or electric piano sound. After studying the jazz greats in prison, she was accomplished at their techniques.

For the sax and horn parts, Wiley ingeniously chose the Yamaha VL70m. She blew into a Yamaha breath controller as she played a keyboard, triggering computer models of the wind instruments—not samples. "That was what had all the patrons fooled. She was playing an expressive melodic lead instrument with uncanny acoustic properties." explained Muir.

The otherworldly sounds patrons heard as the spirits supposedly arrived from the netherworld was also one of the VL70m's 256 voices, not a gaping hole torn in the spiritual continuum. "Wiley picked up the P50m for only $499.95 and VL70m for just $799.95, yet she raked in some mondo bucks. She's a devious criminal mind and a pretty fair musician," commented Muir.

NUCLEAR ACCIDENT SHRINKS PROJECT STUDIO TO SIZE OF TOASTER

In a dramatic accident that has profound implications for the music industry, a nuclear "incident" decimated a project studio and shrunk its entire collection of recorders, sequencers and tone generators—worth millions of dollars—into a size slightly larger than a pair of Pop-Tarts. Fortunately, no one was hurt since the incident occurred at 10:00 am.

"It's a miracle, really," said Shizzy Rock, the studio owner. "All the equipment still works fine, it's just all really small. Now that's helpful, 'cause I'm going to have to move around until I find a new place to live."

In his insurance report, Shizzy listed the following equipment involved in the carnage: an XG tone generator with 480 voices and three effects blocks; an 110,000 note sequencer with battery backup and 1/480 quarter note resolution; 3,800 ready-made musical phrases (and thousands of his own) used for professional composition and a large screen TV.

"I thought I was really screwed. I mean, I create everything in my project studio; from composition to production. But now I can take it all with me."

After the detonation, Yamaha engineers rushed to ground zero to record the affects of the blast. They were then able to duplicate the effects of the nuclear nightmare and package the newly configured studio as the QY700 music production studio in a box. "Funny how a disaster of biblical proportions can actually turn out for the best," Shizzy declared.

QY700

FLESH EATING PETUNIA LIKES NEW RBX

While devastating a small urban community in Des Moines, the large carnivorous flower stopped for a brief moment outside a local music store. "I just had to check out one of the new RBX basses." "After reading the reviews I couldn't believe that those boy's over at Yamaha could deliver so much bass for so little cash!" The flower was last seen...

FOR MORE INFORMATION
ABOUT ANY OF THE PRODUCTS SHOWN IN THIS ISSUE
PLEASE Call (800) 291-4214 ext.801
or visit us at www.yamaha.com.

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ALIENS GIVE BIRTH TO SYNTHESIZERS

I was in the field and I saw 'em clear as day," said Rubinsk E. Presley, a farmer in Topeka, Kansas. "They was doing something kind of wild and out came this keyboard thingee. And then another. And another..."

Scientists who examined the keyboards determined them to be synthesizers. "This is quite peculiar," reported Jay Piccirillo, keyboardologist. "This synth species, we've named it CS1x, shows all the trappings of the old fashioned synths yet with an important mix of new technology. Obviously, these aliens have emerged from a time warp. There's no other plausible explanation."

CS1x

Pressed to explain the dichotomy, Piccirillo elaborated, "There are six realtime sound control knobs that allow the user to program sounds on the fly—NO menus. Just like it was back in the 70s. On the other hand, this species is obviously very versatile; it has a performance mode for powerful layers and splits. After dissecting it, we concluded it was born with 256 user and preset performances plus 480 XG voices and 11 drum kits. And it has a TO-HOST connector for connecting to computers. That says a lot about it's home planet.

"One more thing. It has an Arpegiator. But instead of just making sounds go up and down, they go all different ways. We're still studying this unique feature. We think it must come from the Andromeda galaxy."

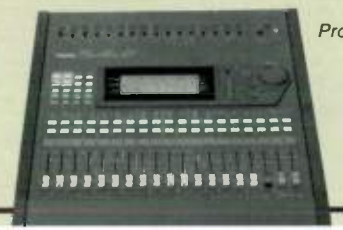
The CS1xs have shown remarkable virility,"They just kept comin' and comin' and comin'..." said Presley. Yamaha, which has cared for the CS1xs since their discovery, has no choice but to start selling them to the public at an incredible price. "They're just $799.95 suggested retail," commented a Yamaha spokesman. "And aside from making great music, they make great pets."

MAN SUES INTL MFR: FALSE ADVERTISING!

Harvey Rubinesky, of Climax, Ga. filed suit with a large professional audio manufacturer for false advertising. He contends that the Yamaha Promix 01 was advertised as a "smart" mixer, but, in reality, it can't answer even the simplest question! For example, the Promix 01 does not even know the capital of New Jersey, stated Harvey! Rubinesky freely admitted that one might be "smart" and not know the capital of New Jersey. However, continued Harvey, how about an opinion? When I ask the Promix for its favorite color it just sits there!

Yamaha, when ask to comment, pointed out the Promix was extremely smart when compared to other mixers. It is Yamaha's position that no audio mixer knows state's capitals or can offer an opinion of any kind. Where the Promix is really smart is in the area of MEMORY - this mixer remembers every setting of all 18 input channels. This means at the touch of a button you can store and instantly recall the position of faders, mutes, aux sends, pan pots, eq, at any time, to allow you to return precisely to a previous mix. When connected to a MIDI sequencer or data recorder, real--time moves (such as actual movement of faders, pan, eq and aux send controls) can also be stored and replayed with precision. With 20 bit A/D converters, 3-band true parametric eq on every channel, and 3 internal compressor/limiter/gates, sonically the ProMix 01 is a giant - and has performed impeccably on top film scoring sessions, classical recordings, in high-end professional sound reinforcement and broadcast applications. As a digital mixer, the ProMix can connect directly to digital recorders like RDAT and other devices, keeping signals in the digital realm. At a suggested price of $2,199 the ProMix 01 competes with the finest mixers, replaces a ton of outboard gear and allows you to get back to your favorite settings in a snap.

Rubinesky was asked for comment after hearing Yamaha's response. Harvey maintained that having a good memory did not necessarily make one smart. When we asked Rubinesky what the capital of New Jersey was, he said he couldn't remember.



Promix 01

NATIONAL

The Inquisitioner

Nobody Expects The Inquisitioner. Vol.6 Issue 1142

CONSUMER ADVOCATE WARNS, "DON'T BUY YAMAHA RM800!"

"I went to the local dealer to buy one and was shocked by what I found!"

Getting a free pair Yamaha NS10M Studio speakers with the purchase of a Yamaha RM800-16 or RM800-24 (free with the possible exception of the postage to return the coupon claiming the above–we know he'll read this.), was more than well known consumer advocate, Ralph Rubinesky could take. Ralph warned that consumers should be careful in considering the purchase of the Yamaha RM800 Mixing Console. Ralph admits he is suspicious by nature and that Yamaha's latest offering has got him spooked. "I have learned over the years, commented Rubinesky, that if something seems too good to be true, it probably is."

Ralph explained, " I decided to start taping my nationally syndicated show at home. This required that I purchase a lot of gear, including a mixing console. Being a consumer advocate, I read all the reviews on various mixers and found the Yamaha RM800 to be just the value and performance I needed. In fact, it was almost too good to be true:

"Sound... is exceptional (particularly the low noise and sensitive EQ) for a board in this class." "Inexpensive, great sound, very versatile" says EQ Magazine.

"As the first eight bus recording mixer to come in under $2,000...it offers the home studio market more features per dollar than any other mixer in its class." states Electronic Musician.

"I went to the local dealer to buy one and was shocked by what I found! "I was offered the RM800 at a great price. I said I'd take it. But the salesman insisted that I fill out a coupon to receive a pair of Yamaha NS10s, the world standard for recording monitors—a $478.00 value—free of charge! This was after I had already agreed to buy the mixer. The salesman said that all I had to do was fill out a coupon and send it to Yamaha and they would ship the NS10s directly to me!"

Ralph seemed clearly shaken. "Then, to put the final nail in the coffin, they offered to finance the deal, for six months, same as cash!"

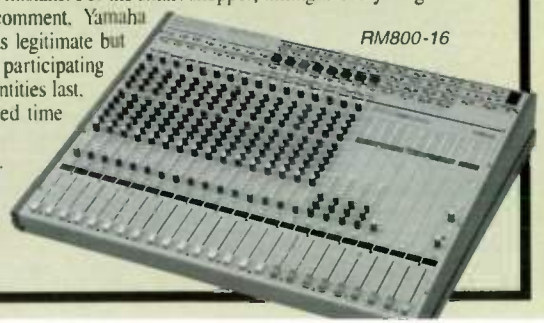
When asked if he bought the Yamaha RM800, Ralph said ...

"Yes! What, are you crazy? I wanted to buy before they changed their minds, ran out, or discovered their mistake. For the smart shopper, timing is everything!"

When asked to comment, Yamaha stated that the deal was legitimate but that it was available at participating dealers only, while quantities last, and that it was a limited time offer.

"See," said Ralph.

(call 1-800-291-4214 ext. 801 for your closest participating dealer)



RM800-16

sound of feedback and digital distortion.) Still, it may be the best approach.

Even if your synth and digital audio tracks come from different sound sources, there is the additional problem of slight time shifts that may occur due to the lag between the time the sequencer triggers the MIDI data and the moment the digital audio recorder records it. However, offsetting the existing tracks' start times with the newly recorded tracks should take care of that problem.

Another potential pitfall can occur when your computer is already playing the maximum number of audio tracks. You either have to mute some digital audio tracks or do a premix before recording the stereo MIDI tracks to digital audio. Keep in mind that if you mute tracks first, you may still have to premix some digital audio tracks afterward. At minimum, you'll need to shut off different combinations of tracks to set mix levels before digitally mixing all tracks to stereo.

The only other way to mix digital audio and MIDI tracks into a stereo audio file is to mix all tracks to an external DAT deck's analog or digital inputs (assuming your audio card has digital I/O). Don't forget to record the mix at 44.1 kHz sampling rate because that's the sample rate that will be required for your final CD. Of course, if you want to mix to DAT and then master to CD-R, you still have to digitally record the stereo DAT mix back into the computer.

DAT mixdown is convenient, but you face the added expense of a DAT recorder that doesn't force you to use SCMS copy protection, and you need a sound card or external device (e.g., CBX-D5) with digital I/O. If you prefer to master to DAT rather than CD-R, you'll need a DAT deck anyway. However, we're going to try to keep our external gear to a reasonable minimum, so we're not going to include an audio DAT machine in our budget.

EM recently discussed CD-R technology and evaluated some of the leading software and hardware in "Burn, Baby, Burn!" (June 1996 issue), so we won't get into detail on that here. Based on that article, we'll budget $2,000 for a 4-speed CD recorder and CD-R software that support disc-at-once recording. You might be able to find better prices, but we want to budget enough to get good stuff. After all, the CD-R is the final link in the recording chain.

BACKUP

No matter which mixdown method you choose, there is one important task you should always perform first: back up all your session data. You can use your CD-R to archive the files in their original formats so that you can easily import them into your system again. Another option is to copy the data (audio and MIDI) to a removable hard drive or large-capacity tape drive such as data DAT.

Data safety aside, there is another important reason you should back up your session data in its native formats. If you use a fixed hard drive, you may have to erase some files to make room for the stereo mixes of all your songs. Naturally, you want to be able to recover the original tracks and all their settings in case you realize afterward that the stereo mix should be redone. This is another argument for using a large-capacity removable drive (or two), which eliminates the need to erase anything.

POINT, CLICK, AND SHIP

Desktop project studios are now an affordable reality, although we have learned that it may be practical to make a few compromises, such as adding a small external mixer and possibly a sound module. Even after adding a monitor system, controller, and microphone, you have a powerful studio that is far smaller than what's available with conventional approaches.

However, the desktop music studio doesn't stop after the finished master is burned. Your computer can become your personal graphics department, generating flyers and cover graphics. It can also be your accounting department, contact and promotions manager, and shipping clerk. Come to think of it, your computer is not just a desktop studio in a box. It's the whole darn record label!

EM *Senior Editor* **Steve Oppenheimer** *promises to stop writing articles the length of Tolstoy's* War and Peace. **Zack Price** *owns and operates Tin Ear Productions, a digital audio editing service that is located in the Chicago area.*

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"Advanced Logic"	Emagic *Logic Audio* master class	June 1996
"All for One"	digital audio sequencer face-off (Mac)	April 1994
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PRODUCTION VALUES

SPACE AGE Pioneer

He is the hippest of the hepcats, the patron saint of the cocktail nation, and one of the most twisted arrangers ever to wield pencil and staff paper. He is Juan Garcia Esquivel, the pasha of space-age bachelor pad music—the mellow, mostly instrumental soundtrack for the current renaissance of martinis, lounges, and tiki parties.

Although Esquivel's stylistic genre is unabashed mood music, his records are far from lame snoozefests—they are just too weird. The mad maestro replaced song lyrics with "zu-zus," "rah-rahs," and other exotic syllables, experimented with early electronic devices such as the theremin and ondioline, and was so obsessive about stereo separation that he split an orchestra into two different recording studios.

Even more astounding, however, is that in the days before synthesis made sound layering a musician's birthright, Esquivel used conventional instrumentation to produce exquisitely unusual sounds. But as strange as Esquivel's alien soundscapes must have appeared to record buyers in the late 1950s, the maestro had been working toward the extraordinary from a very early age.

BY MICHAEL MOLENDA

Juan Garcia Esquivel's Martian party music was *really* ahead of its time.

Digital Imaging by Linda Gough

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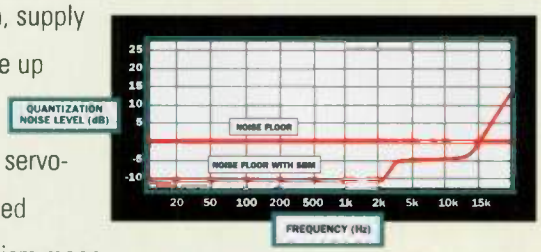

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SONY

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Born in 1918, Esquivel signed on for his first professional gig at fourteen and was conducting, composing, and arranging for his own 22-piece orchestra by the time he was eighteen. The musical prodigy's radio broadcasts and concerts soon made him one of the most popular band leaders in his native Mexico. In 1958, a visionary executive at RCA brought Esquivel to Hollywood to help the label exploit the wonders of its Sonorama stereo technology. Although the RCA executive may not have known what he was in for—Esquivel's commitment to perfection made him an unrepentant budget buster—the maestro's sojourn in America was incredibly successful.

The maestro of space-age mood music, Juan Garcia Esquivel, pictured here in his heyday.

The futuristic arranger earned three consecutive Grammy nominations (1958–60) in both the Orchestral and Engineering categories, arranged and conducted for other artists, such as the Ames Brothers, and composed numerous television soundtracks and short mood pieces. Those underscores are still used to this day, adding a touch of the bizarre to popular TV fodder, such as *House of Style, Miami Vice, Columbo, Baywatch,* and *Murder, She Wrote.* In addition, his arrangement of the song "Sentimental Journey" was used in one of television's classic comedy skits: the madcap office-furniture ballet "choreographed" by Ernie Kovacs.

In 1962, Esquivel took a 5-year break from recording to perform in a smash nightclub act, "The Sights and Sounds of Esquivel." Not surprisingly, the production was ahead of its time, using undulating lighting that predated the hippies' psychedelic light shows.

Recently, Esquivel has fallen—literally—on tough times. In July 1993, the maestro fell and broke his hip, leaving him bedridden for months. (The fall also aggravated an old spinal injury, and corrective surgery was too risky an option.) Then, the day before I spoke with him in January 1996, he slipped out of his lounge chair and fractured his wrist. The consummate hipster's polite, stately demeanor was such that I didn't realize he was medicated and in pain until—30 minutes into the interview—he requested we reschedule our conversation. A week later, Esquivel was again happily detailing past sessions, slinging anecdotes, and discussing the future. Despite his infirmities and advanced age, the man refuses to retire. At 78 years old, he is working on arrangements for an album he plans to record in the U.S. later this year.

It's all so easy now, isn't it? Today's electronic musician is literally handed an enormous palette of sounds.

Oh yes, with the synthesizer I believe you can produce almost anything. If I had them many years ago, I wouldn't have needed to work so hard to make the sounds I had in my head. But I think that people using synths now should be more selective. Too many musicians rely on presets rather than making their own sounds.

You managed to produce some pretty far-out sounds *without* the benefit of synthesis. How did you develop such otherworldly tones?

It was a very long and tedious job. Obviously, I didn't have the electronic equipment we have now, so I had to produce these different sounds purely with instrumental arrangements. I was trying to achieve with conventional instruments these strange sounds that I had in my mind.

"The most difficult part of arranging is self-editing."

For example, I would ask a tenor saxophonist to play a melody, and then I'd have the viola play the same melody simultaneously. I was layering sounds. Of course, in this instance, the sound of the sax would overpower the viola, and that was not the sound I wanted. So I would ask the sax player to tone it down. When the saxophonist played softer, the tone would match with the viola better, and the combined sound would be closer to the idea I had. I was always experimenting. Once, I asked a trumpet player to play a solo using a mute. It wasn't quite the sound I wanted, so I asked him to put his hand over the bell and move it around. I was starting from scratch, you see, so it was a lot of work to realize my ideas. However, it was also very rewarding because I could see and hear, right there in the studio, all my theories about sound brought to life.

So you actually did all these experiments in the studio while you were recording your albums?

Oh, no. Before I made a recording, I would have everything written out. This is why I insisted on so many rehearsals. It was during these rehearsals that I experimented with sound, and I always needed more time. I would rehearse ten or twelve hours a day with a big orchestra. These sessions were just for me to take notes and see what combinations of instruments produced the sounds I wanted. When something was right, I would keep careful notes on how the sounds were combined. I found that out of ten experiments,

maybe two or three would be good. Every day, I'd start experimenting with new ideas. I rehearsed for close to four years to find the proper unisons and to determine what worked well and what didn't.

As strange as your arrangements must have sounded to musicians at that time, was it difficult gaining their trust and support throughout these experiments?

When I started, I was very young, and I often wondered why musicians older than myself would tolerate my ideas. I was very grateful to the musicians I worked with because whenever I asked them to do something, they never refused or asked for explanations. They just did it. And most of the time, I wasn't right. If an idea didn't work, I'd write "NG" in my notes, which meant "no good." I'm very much in debt to all the musicians who put up with my ideas and helped me discover these new sounds. Thanks to them, I was 85 percent confident that my arrangements were right by the time I went into the studio.

Your arrangements were not limited to notes written on paper, however; you were also very involved in the recording process.

Yes. I was always very conscious of the mics I had to use to get the sounds I wanted. I knew all the model names and qualifications of the mics. I experimented with different mic positions and which mics produced the best sound when recording strings, piano, horns, or whatever. I also insisted on putting separate mics on each instrument.

Luckily, I was able to practice in a radio station that had very fine equipment. In addition, my brother, Sergio, was the chief engineer, and he introduced me to all the microphones. I'd tell him that I couldn't get the sound I wanted, and he'd figure out what I needed.

For example, I once wanted a violin solo to play against a background of five saxophones. Of course, the saxophones overpowered the sound of the violin. Sergio advised me to put thick drapes in back of the saxophones and to put the violinist in front of a mirror. We actually built a wall of mirrors in the studio. Sergio was right—the reflections off the mirror amplified the violin and the curtains dampened the sound of the saxes. All I had to do was move the musicians and mics around to find the right balance of sounds. You see, to get what was in my head on record, it was very important that I could arrange the instruments *and* the sounds.

Cabaret Mañana **spans many of the high points of the lounge master's oeuvre.**

I assume that this concern with audio quality inspired your infamous use of two different studios to ensure complete stereo separation on your Sonorama records?

Acoustic separation was extremely important to me. At that time, we didn't have multitrack recorders. We recorded directly onto ¼-inch stereo tape and I had to be very careful that the sound didn't leak from one channel to the other. When I wanted something to appear in the right speaker, I wanted it *only* in the right speaker. I didn't want to hear even slight ghost images of it in the left speaker.

So, yes, to record *Latin-esque* in 1962, I asked RCA to book two studios that were one block apart. I put half of the orchestra in one studio and half in the other. I conducted in studio one and Stanley Wilson conducted in studio two, and we coordinated our efforts over closed-circuit television. All of the musicians had to wear earphones so that we could keep everybody in sync by using a click track. Some people might have thought that I went too far, but I was very happy with the separation.

In addition to strange sounds and stereo gymnastics, another element that personalizes your arrangements is the use of vocalists singing nonsense words and phrases. How did you come up with that idea?

I didn't want my work to be limited by a certain language. If I were doing a Latin tune, I wouldn't want to use the

MARTIAN COCKTAILS

The recent compilations from Bar/None and RCA are wonderful introductions to Esquivel's space-age symphonettes. However, if you want the full experience, seek out the original RCA albums. Here is a selected discography of the maestro's musical madness.

Other Worlds, Other Sounds ..... (RCA, 1958)
Strings Aflame ..... (RCA, 1959)
Exploring New Sounds in Stereo ..... (RCA, 1959)
Infinity in Sound ..... (RCA, 1960)
Latin-esque ..... (RCA, 1962)
The Genius of Esquivel ..... (RCA, 1967)
Space-Age Bachelor Pad Music ..... (Bar/None, 1994)
Music from a Sparkling Planet ..... (Bar/None, 1995)
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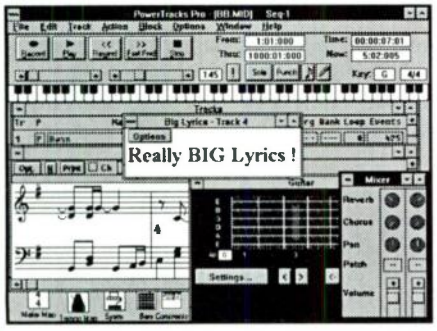

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WAVE FILE SUPPORT: Record and Play WAVE (audio) files inside the program (to 48kHz). Record an audio track of your singing or guitar playing along to a MIDI Sequence – all stored on disk!

PROGRAMMABLE: Programmers can extend the features of PowerTracks using the language of their choice (C, Basic, Delphi) using .DLL files. Customize PowerTracks to your needs, or purchase third-party add-ons for your synthesizer/sound card.

NEWEST FEATURES: We've added over 20 new features to Version 3.5 – Karaoke-style lyrics window • Notation scroll-ahead • Intelligent accidentals • Extended patch support • Rapid resume • Scoring enhancements • over 20 new features in all (existing customers upgrade for $15)

DELUXE WINDOWS INTERFACE: Multiple Windows – Staff Roll, Event List, Tracks, Bars, Meter, Tempo, Piano keyboard, Guitar fretboard.

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Requirements: PowerTracks for Windows - Windows 3.1/Windows 95, IBM Compatible AT, 386 or higher, 2 mb RAM, Supports any device compatible with Windows 3.1 or 95 including Roland MPU401, Music Quest MQX interfaces, Key Electronics MIDIATOR, SoundBlaster, AdLib, TurtleBeach, etc. PowerTracks for DOS - DOS 3.3 or higher, 640K, XT/286/386 or better. MIDI interface (Roland MPU401, Music Quest MQX series, SoundBlaster MIDI and FM sounds,

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New features in Version 3.5... Enhanced Notation Window • Karaoke lyrics window • Notation scroll ahead • Notation clean mod • Music alignment to click track • Force all files to PPQ option • Improved hand splitting • Intelligent enharmonics

In the past, PowerTracks has offered powerful features such as music notation, wave file support, lyrics, chord symbols and score printout. Now we've added even more! PowerTracks 3.5 ha a big "Karaoke Style" window to display lyrics up to "full-screen". The notation is greatly enhanced with support for finer resolutions such as 32nd notes. You can also now align a rubato piece to a click track. We've improved the intelligent piano hand splitting routines. The enharmonics are intelligently chosen based on the chord symbols, and more – Read on for more detail

Big Lyrics window lets you view song lyrics in the font of your choice in a full-screen window. Select your own font style, size, and color. Great for singing along with the music!

Notation Scrolling Ahead. If you're sight-reading the music off of the screen, you'll be pleased to note that the music can now scroll ahead. This is how we normally read sheet music! You can set the notation to scroll 1 or 2 bars ahead of the music *without* interfering with your view of the current notation. A great feature for sight-reading practice.

Rapid Resume. PTW can now automatically save the window positions of all opened windows and restores them the next time the program is used. You can optionally store and recall setups with a ".WS" file. Have PTW start out with your favorite setup every time you run the program by simply saving a file called FAVORITE.WS to your PT directory.

Save Your Patches. The enhanced patch select dialog now lets you select the patch list from within the dialog. PowerTracks 3.5 will remember the patch list used for each track and will save the name of the patch list used for each track to a ".SEQ" file. A "must have" for people who own multiple sound modules.

SysEx Input Buffer Size setting is now adjustable within the Options | MIDI. In dialog to help the people who normally have SysEx-input problems. The Buffer Amount can also be set.

Notation Enhancements:

- supports finer resolutions which allows you to enter notes such as 32nd and 64th notes
- "bars per line" markers which allows you to adjust the bars per line on a screen by screen basis
- "hard rests" which will be in effect even if you have minimize rests set to false, as well as the option to make notes invisible.
- a special mode for autodetection of finer resolution and/or multiple chords. PowerTracks can now "clean up" the kinds of notes & chords that can otherwise look like a bunched up mess
- the Chord Note Separation and Chord Total Separation settings are now fully adjustable
- "Clean Mode" which automatically "cleans up" grace notes and any unwanted glitch notes from the notation. Glitch Velocity and Glitch Duration settings are fully adjustable.
- transpose setting will now transpose the key signature *and* the chords.
- improved Guitar Tablature draws the note and fingering exactly like your favorite magazine.
- improved Lyrics editing makes it possible to cut and paste using the Windows clipboard.

Align Music To Click Track command will align the music you've entered or recorded to a click track. This is very useful for songs that were recorded rubato or without using a metronom

Improved hand splitting. Instead of arbitrarily splitting the keyboard into two parts, PowerTracks can make intelligent hand-splitting decisions which results in a highly accurate depiction o how the song should be actually played on the piano. These parts are also put on separate MIDI channels so that you can play or edit them individually.

Intelligent accidentals (enharmonics). sharps(#) and flats(b) are now context sensitive to the key *and* the chord its in. For example, if you are in the key of Eb and the chord is a D7, a F note will show up as an F#, and not a Gb. This means that the notation accidentals will automatically show up correctly.

Convert loaded files to specific PPQ. Regardless of what PPQ a song was recorded in, you can work with it at the PPQ that is most familiar to you. For example, set this to 480 and all files will be set to 480, regardless of their original PPQ.

Forced Channels. channels that you normally use for different instruments (e.g. Bass on Channel 2) can be embedded in a midi file in addition to .SEQ files.

New Tips of the day. We have added some new tips of the day to keep you informed of the new features of version 3.5.

Hot Keys. Common procedures such as "Select all" and "Run DLL" can be performed with a single keystroke.

Other Enhancements such as a new setting to prevent PowerTracks from sending an "All Notes Off" command when synched to MIDI or SMPTE. This is important if you're using a lighting controller or other device that has a tendency to 'misbehave' when receiving an All Notes Off command.

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Spanish words. Same if I were arranging a French or English song—I would just strip the lyrics and have the vocalists sing syllables. For example, in my arrangement of "It Had to Be You," the vocal melody is sung "rah-rah-rah-rah-ree." One of the assistant producers objected to that; he thought that reducing the lyric to vowel sounds was too far out.

Occasionally, I'd use just a line or two. For "Night and Day," I kept the chorus lyric. In some of my compositions, I'd throw in a word like "groovy" just to spice things up, but these words would be easily understood in any country.

In my arrangements, I use voices as part of the orchestra to complement the instruments. The voice is a very dynamic instrument, and it can surprise you. When I did "The Sights and Sounds of Esquivel" stage show, for example, I used four women of different nationalities. This was to get a combination of different types and styles of singing. One woman was Japanese, one was Italian, one was Greek, and one was French. However, the real surprise was that the women would get jealous of each other and try to outdo each other singing. That made for some very exciting times—and some very exciting performances!

So, besides keeping the singers from killing each other, what are some other skills of a good arranger?

Well, assuming that you're working with fine musicians who are able to go wherever you want to send them, a good arranger should be able to create wonderful sounds by writing easy parts. Don't overpower the musicians with your knowledge. It's ridiculous to write difficult parts just to show the musicians how good you are. The musicians should feel comfortable playing the parts so that they can sound good playing them.

For example, I'd often use the very upper or lower registers of the instruments, so I'd be careful not to tire the musicians with parts that were also extremely difficult to play.

For me, the most difficult part of arranging is self-editing. It's painful when I fall in love with a certain passage I've written but it just doesn't serve the purpose of the piece. Then I must take my pencil and erase it. That hurts. You see, when an arranger starts working on a piece, he or she is usually full of ideas and wanting to put *everything* on paper. But, ultimately, a good arranger will only use the ideas that enhance the music.

I was tickled to hear that you are planning to record an album of all new arrangements.

Thank you. I'm writing arrangements here in Mexico while I recuperate. I really want to excite people with these new ideas of mine, so I'm arranging some well-known works such as Mendelssohn's "Wedding March" and Ravel's *Bolero*. I'm treating these pieces with respect, of course, but I also want people to be aware of my arrangements. I plan to record in the U.S. because I'm more familiar with American studios. Now that synths are available, I will not need as many musicians as I used to, but I still want to use voices. I hope that I can find some very good singers.

"Stereo separation was *extremely* important to me."

I'm curious about what you must think of current artists.

I think the youth nowadays are very brave and audacious—they have plenty of guts. Some of the things I hear are very good. I like Peter Gabriel and Whitney Houston, and Tina Turner is wonderful. But, with all due respect, some of today's music is very boring; it's just the same thing over and over. Usually, after I listen to modern music for about two or three hours, I have to switch and put on some Mancini. He was a genius and a tremendous musician. I hope that people are still listening to him.

EM *Editor in Chief* **Michael Molenda** *fancies himself a Bronze Age bachelor.*

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BY JIM MILLER

In the Loop

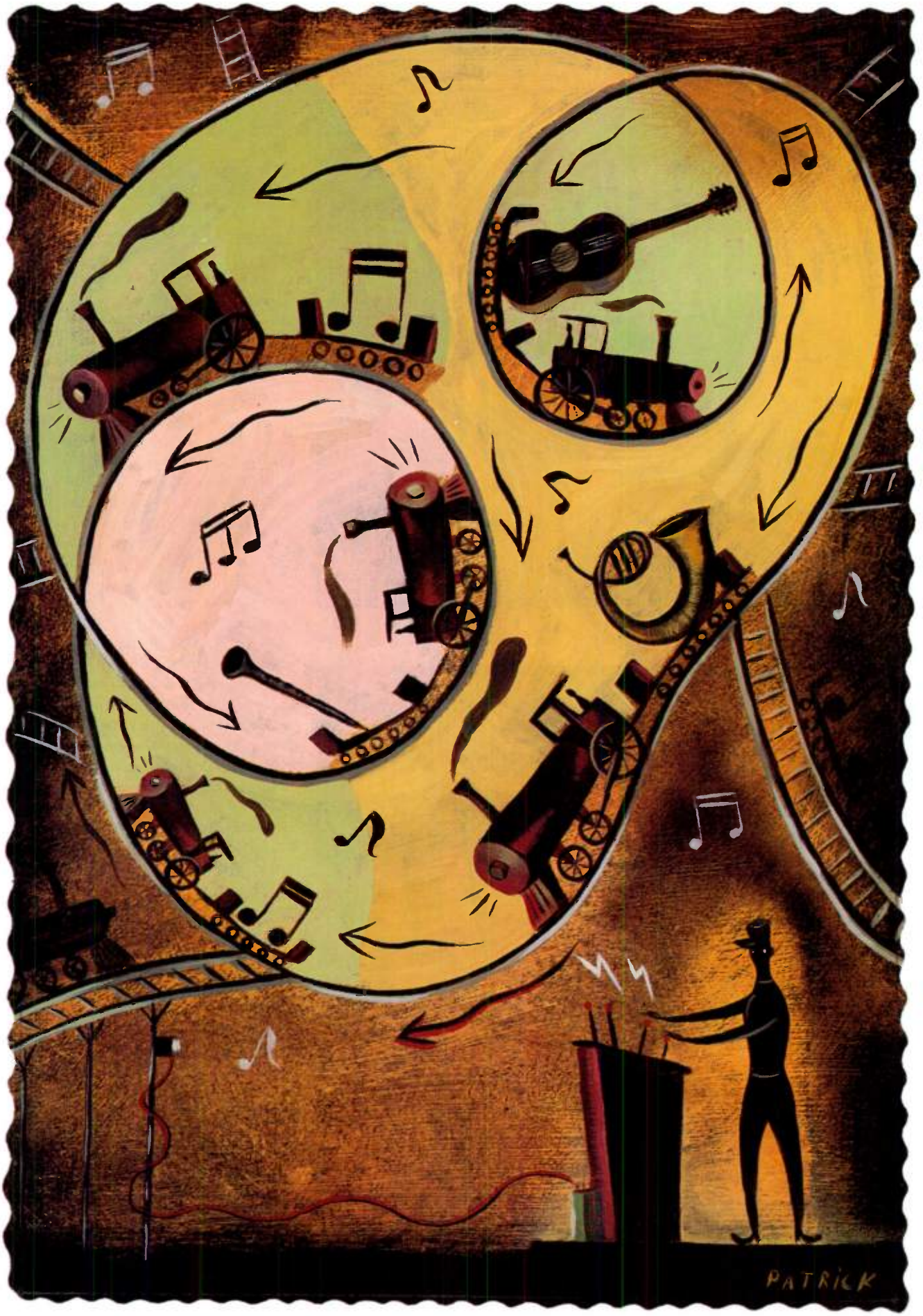
Don't let the fine art of sample editing throw you for a loop.

COMMERCIAL SAMPLE LIBRARIES can be a huge asset to sampler owners as they provide a wide variety of high-quality, professionally produced sounds. The samples in CD-ROM libraries are ready-to-use, which is very convenient, but sometimes the sounds you want are only available on audio CD or you crave something special that isn't in a CD library. In either case, you have to sample and loop the sounds yourself.

Why loop your samples? Well, recording a very long, high-resolution sample devours countless megabytes of sample RAM. But most pitched sounds are reasonably repetitive, so you can just play the attack and enough of the sustain portion to allow the sound to develop timbrally. Then you loop the sustain portion so that it repeats from start point to end point (or the other way around) as long as you hold a key. When you release the key, the loop plays to its end and releases. Now you have a sample of modest size that will sustain like a much larger sample. Obviously, to accomplish this feat, you need to learn the art of sample looping.

Illustration by Patrick Corrigan

In an ideal world, digital samples would loop themselves perfectly. We might as well expect global peace to break out and world hunger to end. But given that we live in an imperfect world, let's consider the easiest and most effective ways to loop your killer sounds.


PATRICK

LOOPS 101

Your first consideration is choosing between short and long loops. Most solo instruments—including brass, winds, and strings—quickly evolve into fairly static waveforms; that is, their waveforms contain little, if any, harmonic motion. As a result, these types of instruments are good candidates for short loops or even single-cycle loops. Complex synth timbres, pipe organs with multiple stops, and brass, wind, and string ensembles require longer loops because their harmonic structures are constantly evolving and you need to give them time to develop.

In addition to choosing the length of your loops, you also need to be aware of that great gift to mankind, the crossfade loop. In a forward crossfade loop, which is by far the most common type, the beginning of the loop fades in as the end fades out. Normally, the two fades should have the same duration and exactly opposite fade curves. That allows you to get a smooth transition every time the loop repeats.

Some samplers, including the Ensoniq EPS/ASR series and Akai S series, offer other types of loops, such as backward and backward/forward. A backward loop plays from the end point to the start point, and a backward/forward loop plays from start to end and then back to start. For the majority of musical uses, the forward-only loop is the most common choice, so that is where we'll focus our attention.

Aside from differences in playback direction (backward, forward, or some combination of the two), there are two distinctive types of crossfade loop: linear and equal power. In a linear crossfade, the sound's amplitude changes in direct 1:1 proportion to the change in time—a *linear* relationship. Therefore, halfway between the loop start and loop end, the amplitude is half of its peak value. Linear crossfades work best with short loops, as in the case of our solo instruments.

The main problem with long linear crossfade loops is that all frequencies in

the sound change phase during the crossfade, which causes spectral cancellation and reinforcement that is heard as a sonic bump. One solution to this is to analyze the spectral content of the loop area and redistribute the energy equally over the length of the crossfade. Most modern samplers and many sample-editing programs do this for you. Equal-power crossfades work best with longer loops, which are preferable for fat, complex, ensemble sounds. Of course, there are exceptions to every rule, and we'll discuss these as we go along.

SOLO INSTRUMENTS

Let's jump right in and loop a solo brass sound. Assume you have a beautifully recorded trumpet sample (see **Fig. 1**). There are two good ways to loop this sound, both of which use short loops with linear crossfades.

First let's examine a method for looping a 2- or 3-second sample. Imagine that our trumpet player has hit a note somewhere in the middle of his range. If the player is very good, there should be little pitch fluctuation from start to end. There is a bit more harmonic content in the initial, attack portion of almost any instrument sound as this is where the instrument is "coaxed" into producing a note. By the end of our sample, there should be almost no harmonic motion or pitch variation because the instrument will have settled into the note. That is where we will place our short loop.

It is a rare sample that can be perfectly looped, in tune, on a single cycle. Usually it is more effective to take anywhere from two to ten cycles (sometimes even more) for your loop because our linear crossfade can blend these cycles together to create a more seamless loop (see **Fig. 2**).

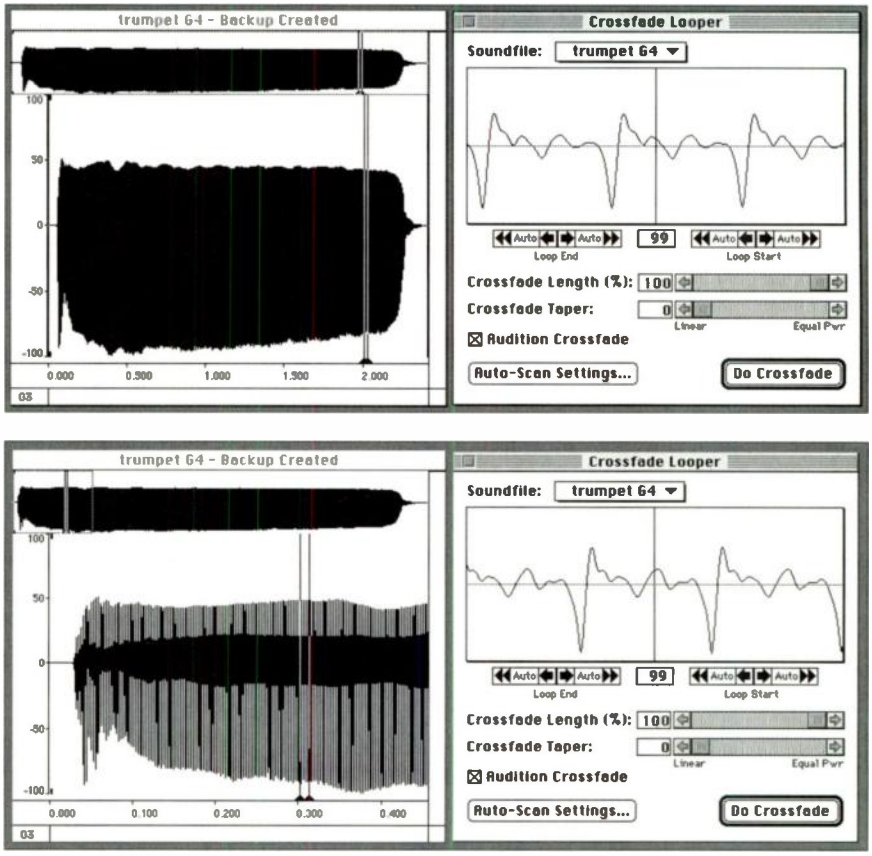


FIG. 2: I've looped this trumpet sample two different ways using AnTares' *Infinity* looping software. First I tried a short crossfade loop near the tail of the sample, around the 2-second point (top). Then I tried putting my loop 0.3 seconds into the sound (bottom). Note that there is not much difference between the waveforms in the two crossfade boxes.

The second method of creating these loops is more practical if your sampler has relatively little RAM or you are trying to get a lot of different samples into a machine. Almost every acoustic instrument varies in pitch at the beginning of a note, usually going a bit sharp before settling into the correct pitch. This second method places the loop points very close to the start of the sustain portion of our sample, just after the attack portion, as soon as the initial pitch fluctuation stabilizes.

In this case, we will try to get a loop that is so close to the start of the sound's sustain portion that the ear will not notice any harmonic motion (as would occur naturally to some degree in any acoustic instrument) and therefore will not perceive the loop. Because we're placing a short loop so close to the beginning of our sample (about 0.3 seconds into the sample), we will likely end up with a brighter sound than we would get with the first method. We can easily compensate for this by creating a filter envelope on the sampler that will close down just a bit over the next few seconds to more closely approximate the sound of a real trumpet. Of course, if you're looking for a really bright trumpet sound (or sax, oboe, etc.), you can leave the filter wide open.

Unfortunately, this technique of placing the loop very close to the start of the sample does not produce acceptable results on certain types of sounds, such as guitars, harpsichords, and other plucked instruments (at least, not without a lot of work). In these cases, it is almost mandatory that you loop your sound about three or four seconds into the sample, though higher notes will probably stabilize more rapidly and may require only about a second or two. Every sound is different.

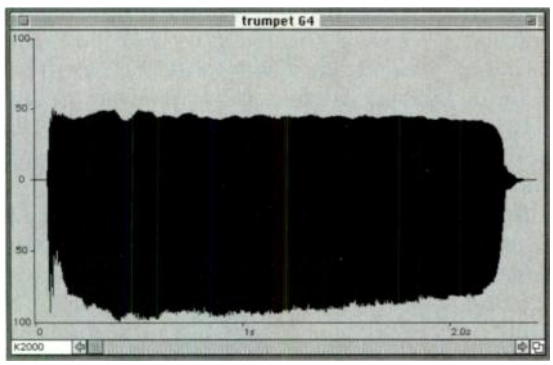


FIG. 1: We'll start with this raw, unlooped trumpet waveform, displayed in Passport's *Alchemy* sample-editing software. It's just over two seconds long.

For instance, I usually loop a Stratocaster guitar sound in a different spot than I would a Les Paul sample. A triple-course (three sets of strings) harpsichord requires a longer sample than a single-course harpsichord.

There is no formula for determining how much crossfading a given sample requires. For example, some trumpets may need very little whereas others may need close to 100 percent. Experience and experimentation are the best teachers.

WHAT ABOUT THE PIANO?

The modern acoustic grand piano is a special case when it comes to looping. I have found it to be the most difficult sound to loop perfectly because the piano's strings are usually fairly long (up to nine feet at the lowest notes on some grands), so it takes longer for these strings to settle into a fairly static timbre. In addition, most pianos have more than one string per note above the lowest octave, and these strings never vibrate at exactly the same frequency, so a fair amount of harmonic motion will happen over the first three to five seconds. In the upper octaves, however, the sound may stabilize in a second or so.

If you're lucky enough to have 8 MB or more of RAM, you will save yourself a lot of aggravation by using long samples and allowing each note to settle down until it becomes static. Many a professional sound designer has collapsed from anxiety after hearing these frightening words: "That grand piano has to fit into 256 KB." Most of those people have moved on to other pursuits and are now tackling far easier tasks, such as juggling chain saws, saving the rain forests, or writing articles for *Electronic Musician*.

If you absolutely must cram that piano into a small amount of RAM, you have to accept the fact that your loops won't be perfect—that is to say, undetectable. But unless you're going to play individual notes in highly exposed solo piano parts, don't panic. It is almost impossible for even trained pros to pick out reasonably good loops when the samples are played in an ensemble setting.

You could record your samples with compression, which would allow you to do a longer (about 2- or 3-second) equal-power crossfade loop. But to my ear, compression robs a sound of its natural dynamics, though you may be able to compensate for this by building an amplitude envelope to put the punch back in at the start of the sample. It depends on your personal taste. No amount of advice will substitute for just getting in there and wrestling for a day or two with that nearly unloopable piano sound.

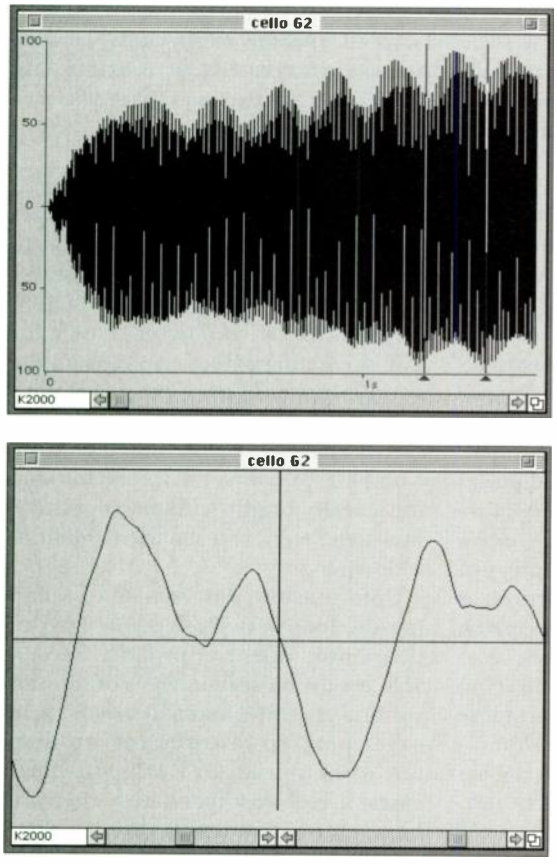


FIG. 3: It's easy to spot the vibrato points in this solo cello sample (top). Using Passport's *Alchemy*, we can get a close-up view of our cello loop (bottom).

SAMPLES WITH VIBRATO

Some people love sounds that have been sampled with vibrato; others abhor them. Again, it's a matter of taste. I find most solo strings (and some wind instruments) unacceptable without natural player vibrato. No LFO is capable of the complex pitch, phase, and harmonic motion that occurs when a player's fingers or lips are creating the vibrato effect.

If you are fortunate enough to have an instrument with a ribbon controller, such as the Kurzweil K2500 or the Korg Trinity, you can play your samples with real finger vibrato. This feature provides a more expressive performance than could be achieved with an LFO or sampled vibrato. But because relatively few musicians can afford these instruments, we're back to sampled vibrato or an LFO.

Fortunately, sounds sampled with vibrato are almost a breeze to loop. Just pick a vibrato cycle anywhere in the sound; the second or third cycle usually works best and is the most consistent. Applying a small amount—say, 5 to 10 percent—of equal-power crossfade will clean up the start and end points nicely, eliminating tiny clicks or pops. Go easy; too much equal-power crossfade will smear the sample.

Picking out a vibrato cycle can be easy if you have a way to see the waveform (see **Fig. 3**). Even if you don't have a graphic display or looping software, you can usually hear each cycle by playing the note down an octave. You can loop most samples with vibrato in the first 1 to 1.5 seconds.

Sounds with a lot of breathiness (e.g., flutes or breathy saxophones) should be sampled with vibrato as the harmonic content of human breath noise is almost impossible to loop. You don't believe me? Try sampling yourself just making a white noise–like, breathy sound, like a long "pfffffffft." Try to be as consistent as you can in your overall tone and pitch. Now try looping it. Go ahead, I'll wait. Are you pulling your hair out yet? I rest my case.

If you have breathy samples recorded without vibrato, I suggest you just bite the bullet and re-record them with vibrato. If you absolutely must loop them, your best course of action is to get your hands on specialized looping software such as AnTares Systems' *Infinity* for the Mac. You can also try a 3- or 4-second, equal-power crossfade

loop, but you probably won't be happy with the results. It will inevitably sound bumpy and display unacceptable phase shifts and other sonic artifacts.

As a last resort, you can create a subtle vibrato-like effect by looping the sample with a fairly short, equal-power loop about a second into the sound. Use your ear to pick out what you feel is a realistic vibrato rate for that note. After looping all your samples, apply a fairly deep LFO vibrato effect to these sounds. This should produce a usable set of samples for playing over accompaniment.

Another obvious time to use longer, equal-power crossfade loops is when sampling a Hammond organ with a Leslie speaker system. Treat the rotating speaker as you would a vibrato cycle, and it should be easy to loop.

LOOPING COMPLEX SOUNDS

Now that we've conquered solo instruments (except for pipe organs), we'll move on to ensembles. Sampling technology has come a long way since I began looping string-section samples on a Prophet 2000. With the advent of computer-based sound-editing programs and sophisticated crossfade looping on most modern samplers, creating ensemble sounds is no longer as scary as it once was. I often use the equal-power crossfade function on my Kurzweil K2000 for looping ensemble sounds.

With most of the current crop of samplers and sample-editing software, you get some sort of graphic representation of the overall waveform. Obviously, the bigger the display, the easier it is to pick the right start and end points for the loop. In **Figure 4**, we have placed loop points in the appropriate places in a string-ensemble sample, giving us a 2-second loop. Both the start and end points are at the top of amplitude peaks, but you could place them anywhere as long as they are both at the same place in the cycle. Don't place the start point on a rising waveform and the end point on a falling waveform; this generally produces an unusable loop.

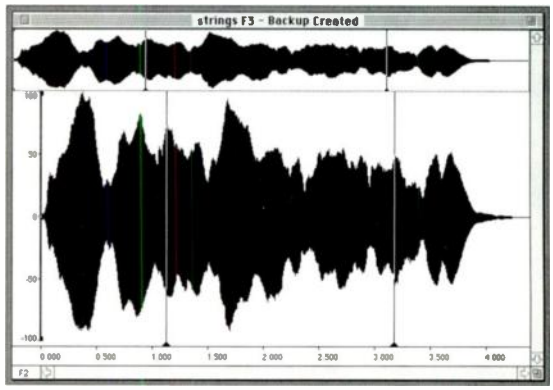


FIG. 4: I've placed loop points at the appropriate spots in this string-section sample. Although I decided to place the start and end points at the sample's amplitude peaks, I could have placed them anywhere as long as both points were at the same place in the cycle.

You should make sure that you place your loop start point about a second or so into the sound, after all of the instruments have settled into a relatively stable pitch and tone. It takes only a little practice to pick out likely crossfade points. Pretty soon it should

become easy to pinpoint the best spots for your loops.

Now that you've chosen your loop points, try processing the sample with a fairly high amount of equal-power crossfading (see **Fig. 5**). If your sampler doesn't allow you to undo a crossfade, be sure to make a safety copy of the original sample.

If you're fortunate enough to have a sampler with a very good crossfade algorithm, you may find the end result quite acceptable, with minimal audible *recycling* (the sound of the loop repeating, sometimes resulting in an audible throbbing or pulsing). If this first attempt produces a particularly bumpy-sounding loop, try placing your loop points at the low spots (troughs) in the waveform's graphic representation, or try a longer loop or a shorter loop. Much of this is guesswork rather than science.

If your looped ensemble sounds pretty good, save the looped sample. Then undo the crossfade and try it again with other loop points or with more or less crossfade processing, and compare the results. In most cases, the best sample will be readily apparent.

Very dense ensemble sounds almost always have some degree of audible recycling. With a good crossfade, this recycling is minimized, but you can still hear it if you listen carefully. This problem is virtually unavoidable but will likely be unnoticed when three or four notes are played at the same time. In the majority of cases, 3- to 5-second loops produce the best results, and 2-second loops seem pretty bumpy. However, I have occasionally obtained good results with short loops, particularly when the players were able to produce a consistent, homogeneous sound.

Pipe organs with more than one stop out (say, a 4' flute stop mixed with an 8' brass stop and a 16' bass-pedal tone) need to be treated like an ensemble because the pipes are never exactly in tune with each other. This requires—yes, you guessed it—a long, equal-power crossfade loop. However, samples of pipe organs played with only one stop out (e.g., a 4' reed stop) sometimes loop well when treated as solo instruments (i.e., with a short, linear crossfade loop) as long as there is not too much "air" in the sound.

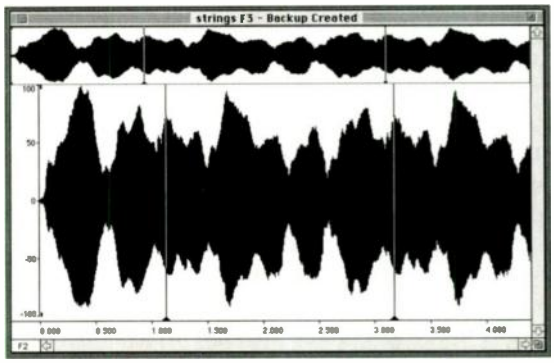


FIG. 5: Note how uniform the loop points became after I applied a 2-second crossfade loop to this string sound. The results sounded very good indeed.

Another candidate for long, equal-power crossfades is an electric guitar with heavy effects such as fuzz, phasing, and chorusing. If you have the RAM, it's better to let the sound die naturally (say over five or six seconds), and then loop it as a short, linear crossfade. Nobody will hear the loop at that point. However, with a heavy-metal guitar sample with lots of compression, the sound may not decay quickly enough to slap on a short loop. In this case a long, equal-power crossfade loop is mandatory. Depending upon the sophistication of your sampler's crossfade function and the timbre you're trying to loop, you might also try a long, linear crossfade and compare the results.

Most solo instruments are good candidates for short loops.

A FINAL WORD

Every periodic sound can be looped. But will the results be musically acceptable? In the vast majority of cases, when used along with other instrumentation, good loops are invisible. Yet we still seem doggedly determined to have absolutely flawless loops. Certain reviewers (in other magazines, of course) have criticized sample collections whose sounds were sonically excellent but whose loops were somewhat less so. Those who would give a sample the "thumbs down" based upon a loop point that is noticeable only when played naked (i.e., no filtering, reverb, or other processing, just one note held down) are missing the point. In the real world, nobody plays just one note with an unprocessed sample; it's the final sound that counts.

Having said that, I will admit that our standards are much higher now than they were ten years ago. A sound that was perfectly acceptable—even killer—when played on an Ensoniq Mirage in its heyday would be considered dog-meat today.

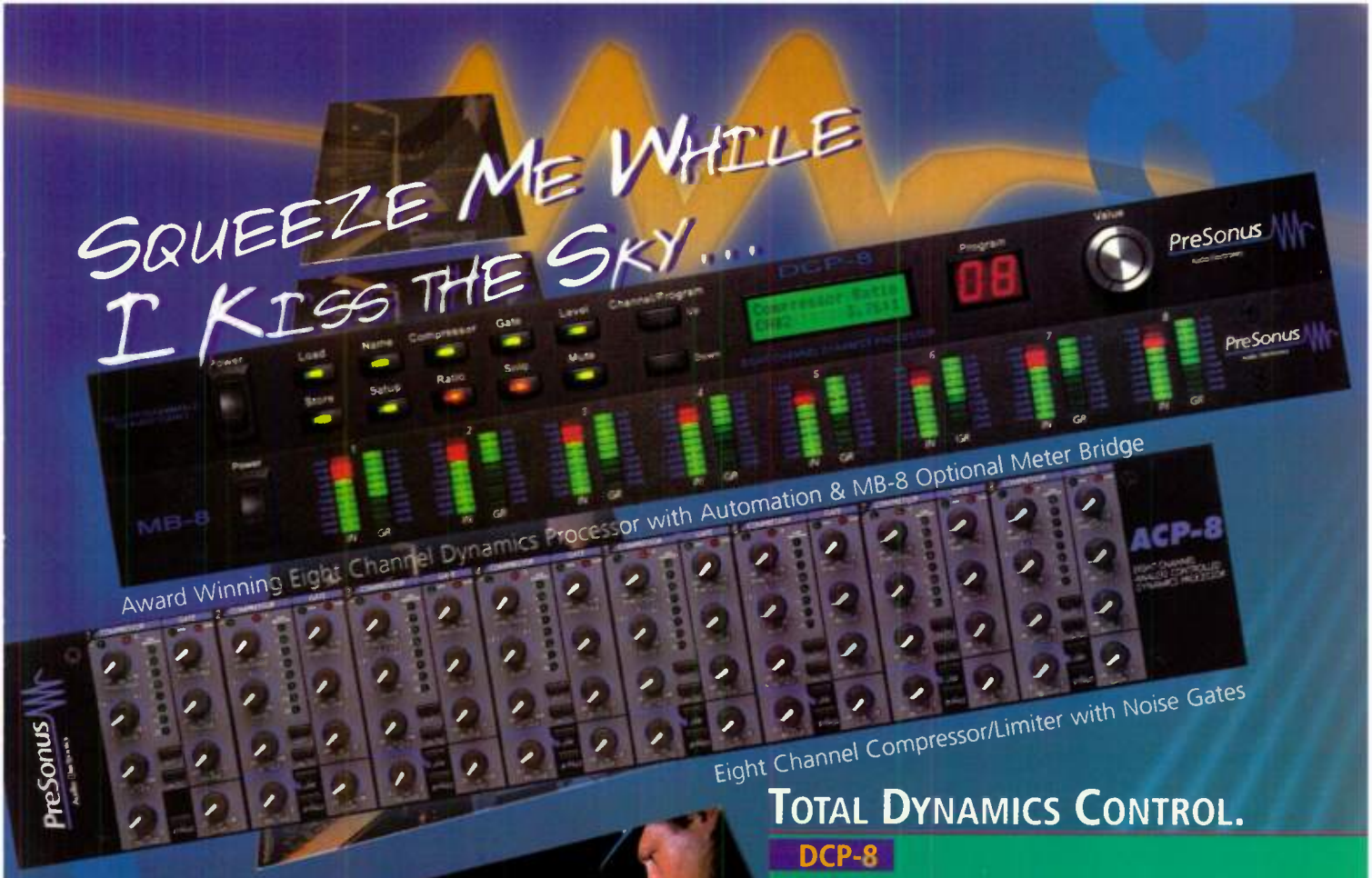
It takes a great deal of patience, skill, and artistry—not to mention more than a bit of luck—to create a great loop. Don't become discouraged if your initial attempts yield unsatisfactory results. As you become more familiar with various sounds, you will be able to create better loops with a lot less hassle. The truth is, after more than ten years of sampling, I still occasionally encounter samples that refuse to yield to my arsenal of looping techniques. Fortunately, these recalcitrant samples are few and far between, and it's not likely you'll be running into many of them.

Once you have mastered the process, you'll hear every sound differently. A car honking will have you picking out appropriate loop points. That electric guitar being played at your next gig will cause you to consider the possibility that it could be looped with just a short, linear crossfade.

As technology evolves, it will become easier and easier to get great looped samples from our samplers or audio-editing software. Still, there will always be some artistry involved, so the techniques you learn now will be useful well into the next century.

Jim Miller *is a frequent contributor to* **EM**. *His samples have appeared in many sound libraries and ROM-based instruments, including those from Sweetwater Sound, Alesis, Roland, InVision Interactive, and Peavey.*

SQUEEZE ME WHILE I KISS THE SKY...



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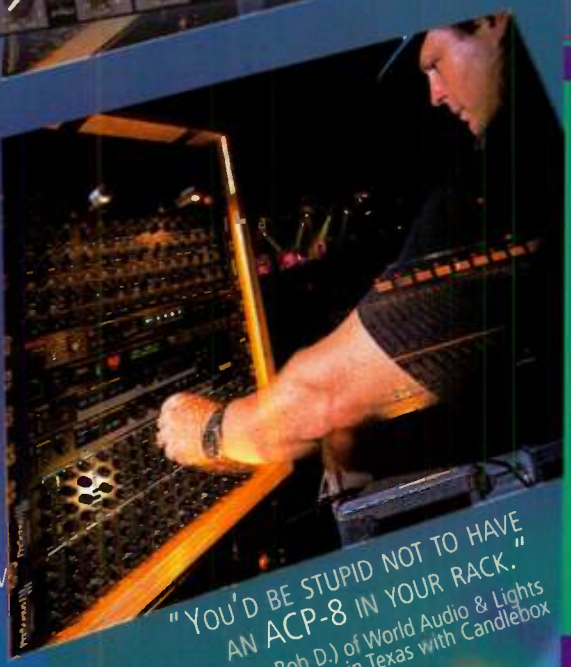

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Control Is Everything

Machine Control demonstrates the power and flexibility of MIDI.

By Scott Wilkinson

MIDI is an important cornerstone of electronic music. It lets musicians integrate and control synthesizers, samplers, computers, effects, and mixers in a coordinated system. And it doesn't stop there; the designers of MIDI knew they couldn't predict all potential applications at the outset, so they included the ability to add new types of messages as applications arose—a feature that renders MIDI virtually immune from complete obsolescence.

FIG. 1: The JLCooper CuePoint provides a universal MMC controller for many transport-based devices, including most digital multitrack tape decks.

Among the sets of messages that have been added to the MIDI spec since its initial publication is MIDI Machine Control (MMC). These messages are used to control transport-based devices, such as audiotape recorders (ATRs), videotape recorders (VTRs), and hard-disk recorders (HDRs). MMC also incorporates MIDI Time Code (MTC) to synchronize these devices with sequencers and other time-based MIDI products. (Watch out. This part of MIDI is real alphabet soup.)

MMC uses Universal System Exclusive (SysEx) format to represent its messages. As you might already know, SysEx is the part of MIDI normally used to represent product-specific information, such as synthesis parameters. However, it can also be used to represent new types of messages intended for many different devices, just as the basic MIDI messages can. To this end, the MIDI Manufacturers Association (MMA) established a standard format for two types of Universal SysEx messages: Real Time and Non Real Time.

With MMC, Real Time SysEx is used because the controlled devices operate in real time. Aside from the Universal SysEx overhead bytes, no MMC message can be more than 48 bytes long. If more than 48 bytes are required, multiple messages must be sent; this is called *segmentation*. If the messages are short, more than one can be sent in a single SysEx packet.

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"music hit me early on,...

Lee Ritenour – Los Angeles 1996

when I was five I was stretching rubber bands across brooms and making sounds. My father was my first real inspiration. I watched him create wonderful music on piano and came to understand that you could just compose your own songs.

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IN CONTROL

Typically, there is one master device, called the *controller*, and one or more *controlled devices* in an MMC system. (The spec doesn't forbid using multiple controllers, but this isn't recommended.) The controller is usually a computer running MMC software, but it could be a dedicated device, such as the JLCooper CuePoint (see **Fig. 1**), BB[3] MMC Transport Controller, or control software for the company's MCS Media Control Station and CS-1 and CS-10[2] Control Stations.

The controller issues commands, such as Play, Stop, and Fast Forward, to one or more controlled devices, which perform the requested action. They might send a response message back to the controller, as well. If there are two or more controlled devices in the system, their responses should be merged, preferably within the controller, using multiple MIDI In ports. You could use an external merger, which should work most of the time. However, this type of system could choke if the MIDI bandwidth is maxed out, so be careful.

The connection between the controller and a controlled device can be configured as either an open or closed loop (see **Fig. 2**). In an open loop, the controller's MIDI Out is connected to the controlled device's MIDI In, but not the other way around. In a closed loop, the controlled device's MIDI Out is connected to the controller's MIDI In, which lets it send responses back to the controller.

A closed-loop connection is also important for *handshaking* between devices. For example, each device stores received messages in a memory buffer until it can perform the requested action. If the buffer becomes full before the action is complete, the device sends a Wait command to the sender, which stops the transmission until it receives a Resume command. All MMC devices should expect a closed loop by default. If the controller doesn't receive the expected response from a controlled device, it should automatically switch to open-loop status.

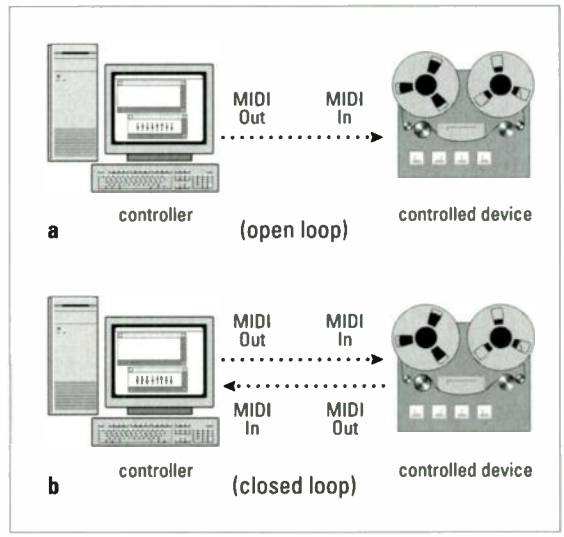
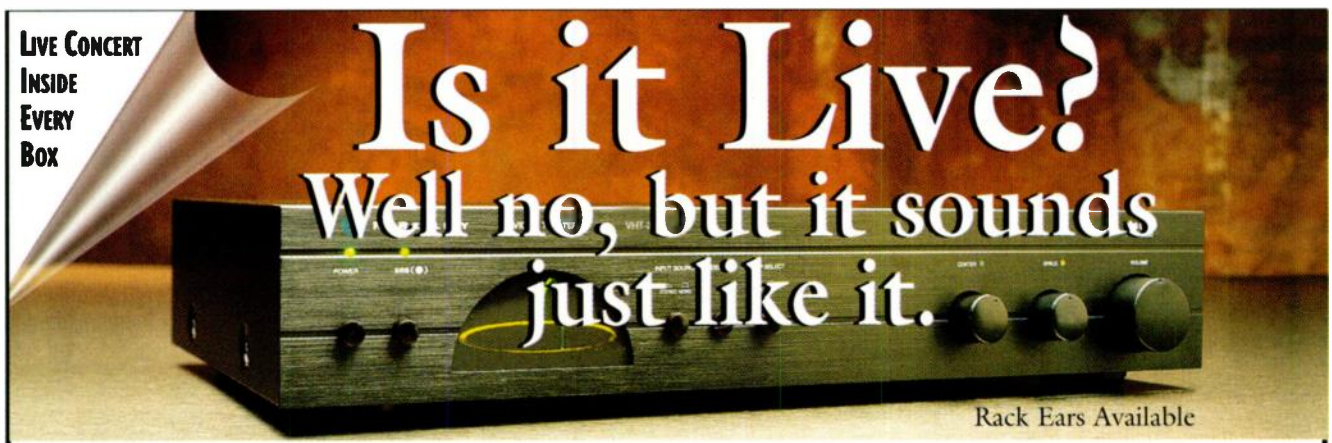


FIG. 2: In an open-loop configuration (a), the MIDI Out from the controller is connected to the MIDI In of the controlled device, but not vice versa. A closed-loop configuration (b) lets the controlled device send responses back to the controller.



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COMMANDING PRESENCE

As mentioned earlier, commands are sent from the controller to one or more controlled devices. Each device is assigned a unique ID number that identifies the device for which a command is intended and from which a command or response is sent. Devices can also be assigned a group ID number, which lets the controller send one command to all devices with a common group ID. In addition, the controller can send a message to all devices in the system by using a special "all call" ID number.

There are several types of MMC commands; perhaps the most common of which are the *control* commands, which directly affect the operation of a controlled device's transport. Most control commands are also known as Motion Control States (MCS). Currently defined MCS commands include Play, Stop, Pause, Fast Forward, Rewind, Search, Shuttle, Step, and Eject.

The purpose of many of these commands is self-evident, but a few are not. For example, Search tells the device to move in the specified direction at the specified speed while producing audio or picture for monitoring, and Shuttle does the same thing without audible or visual monitoring. Step tells the transport to move a specified distance forward or backward with monitoring.

Additional MCS commands include Deferred Play, Variable Play, and Deferred Variable Play. The Deferred versions are used when the controlled device is in the process of locating to a specified point, after which the device drops into Play mode. The Variable versions let you specify the speed and direction of the transport as it plays.

▼

The controller is usually a computer running MMC software.

Another type of control command is known as a Motion Control Process (MCP). This type of command causes the controlled device to implement its own commands to achieve the desired result. For example, the Locate MCP command moves the transport to a specified time-code value, which involves several MCS commands.

The remaining control commands relate to the record function in a controlled device. These commands include Record Strobe (i.e., engage record mode for the enabled tracks), Variable Record Strobe, Record Exit, and Record Pause.

A number of commands determine the flow of information from one device to another. These I/O commands include Read, Write, and Update, which apply to information within a controlled device (more in a moment). Communications commands include the aforementioned Wait and Resume, which can be sent by any device in the system, and Group, which assigns a Group ID to a device.

Finally, two commands provide some automated activity. The Event command tells a controlled device to execute any specified MMC command at a specified time-code value. The Procedure command defines a sequence of commands and tells the controlled device to execute that sequence.

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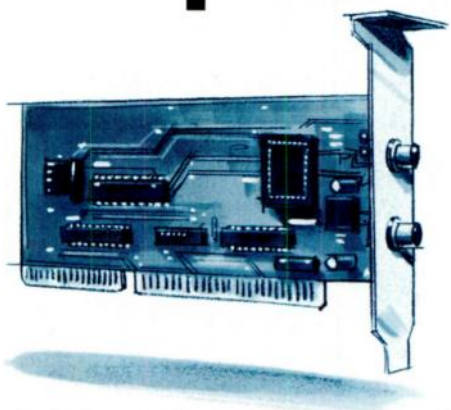

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IT'S ABOUT TIME

Obviously, synchronization is an important issue when controlling transport-based devices. MMC incorporates two types of time code: standard MIDI Time Code and a "short form" time code. Standard MTC uses five bytes for each message to represent hours, minutes, seconds, frames, and subframes (1/100 of a frame). The subframes can be replaced by *status* information, such as whether the incoming time code is "real" or is simply timing information from a tape deck's tachometer pulses during a fast wind.

Short-form time code sends an initial value in hours, minutes, seconds, frames, and subframes, but thereafter sends only frames and subframes, which uses only two bytes per message. (Hours, minutes, and seconds are sent only when they change.) This conserves bandwidth in the MIDI datastream.

There are a number of commands that relate specifically to time code. For example, the sync commands include Assign System Master, which specifies the system's time-code source, and the Chase command, which is an MCP command that tells the controlled device to locate its transport to the current time-code value and lock to it.

FIELDS OF INFO

Most of the responses from a controlled device consist of data found in the device's memory. This data is stored in memory locations called Information Fields. For example, the type of SMPTE time code (i.e., frame rate and drop/nondrop status) used by a device is stored in an Information Field called Selected Time Code. The controller accesses the data in any Information Field with a Read command. This command returns data that reflects the current condition of the device, not necessarily the data that was most recently written to the Information Field by the controller.

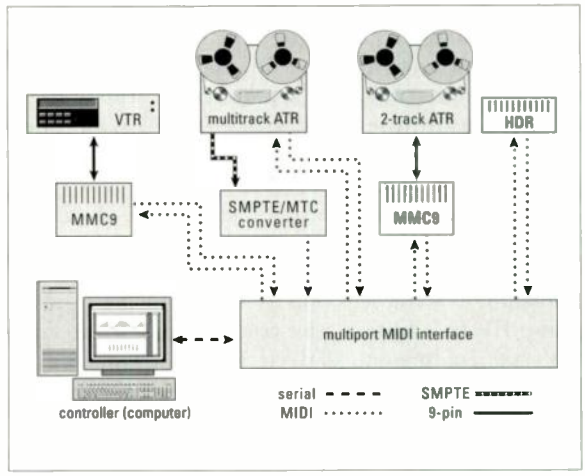
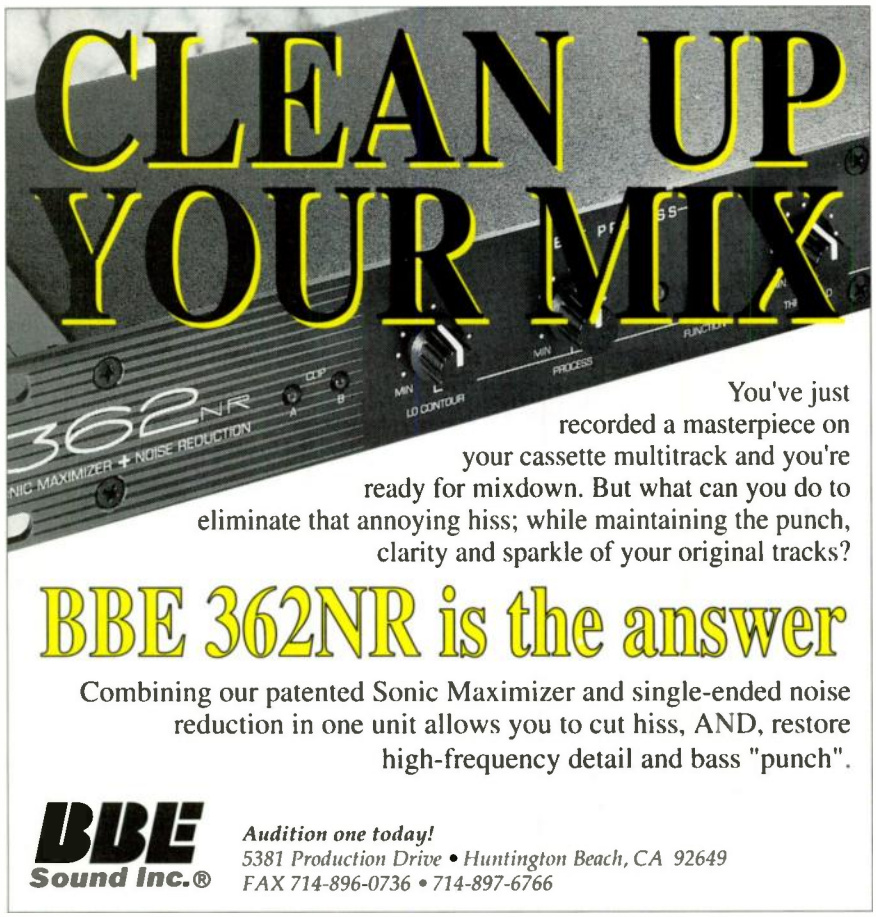


FIG. 3: In an MMC system, some devices may need an MMC-to-9-pin converter, such as the JLCooper MMC9. If none of the devices generates time code internally, you may need to stripe SMPTE on the multitrack ATR and use it as the master sync source via the SMPTE-to-MTC converter.

Data in an Information Field is updated with a Write or Update command. For example, each track in a device is record-enabled by writing to its Track Record Ready Information Field. This Information Field is used in conjunction with another section of the device's memory called the Track Bitmap. The tracks within a device are identified as active or inactive in the Track Bitmap, which consists of one bit for each track. Only an active track can be record-enabled. A Track Bitmap can support up to 317 tracks before message segmentation is required.

Responses and Information Fields are organized into several categories, just as the commands are. The control responses include those that reflect the state of the transport, such as Stop Mode, Fast Mode, Play Speed Reference, Fixed Speed, and Step Length (which is used by the Step command). The record/playback control responses include Record Mode, Record Status, Track Record Status, Track Record Ready, and Track Mute.

In addition, a number of Information Fields are related to monitoring. For example, Global Monitor determines whether the input signal for all active tracks is monitored. This monitor signal can be synchronous with any new material being recorded, but in the case of audiotape recorders, the quality of the monitor signal is not very high because the same head used for recording is then used for playback. The monitor signal can also be placed



in Repro mode, which uses separate heads for playback, so the sound quality is better. However, a Repro monitor signal will not be in sync with new material being recorded.

Time-code synchronization Information Fields include Chase Mode and Selected Master Code. If you specify an offset (a starting time-code value other than 00:00:00:00.00), two Information Fields let the system compare the Requested Offset with the Actual Offset. If the device strays from the incoming time code, this is recorded in the Lock Deviation field. An MTC Input field is constantly updated with the most recent MTC value.

There are a number of commands that perform mathematical calculations on time-code values. These commands include Add, Subtract, Move, and Drop Frame Adjust. The results of these calculations are then stored in up to eight General Purpose (GP) registers within each controlled device. The GP registers are also used to store locate points. This makes it easy to identify important sections of the recording and to move to them.

APPLICATIONS

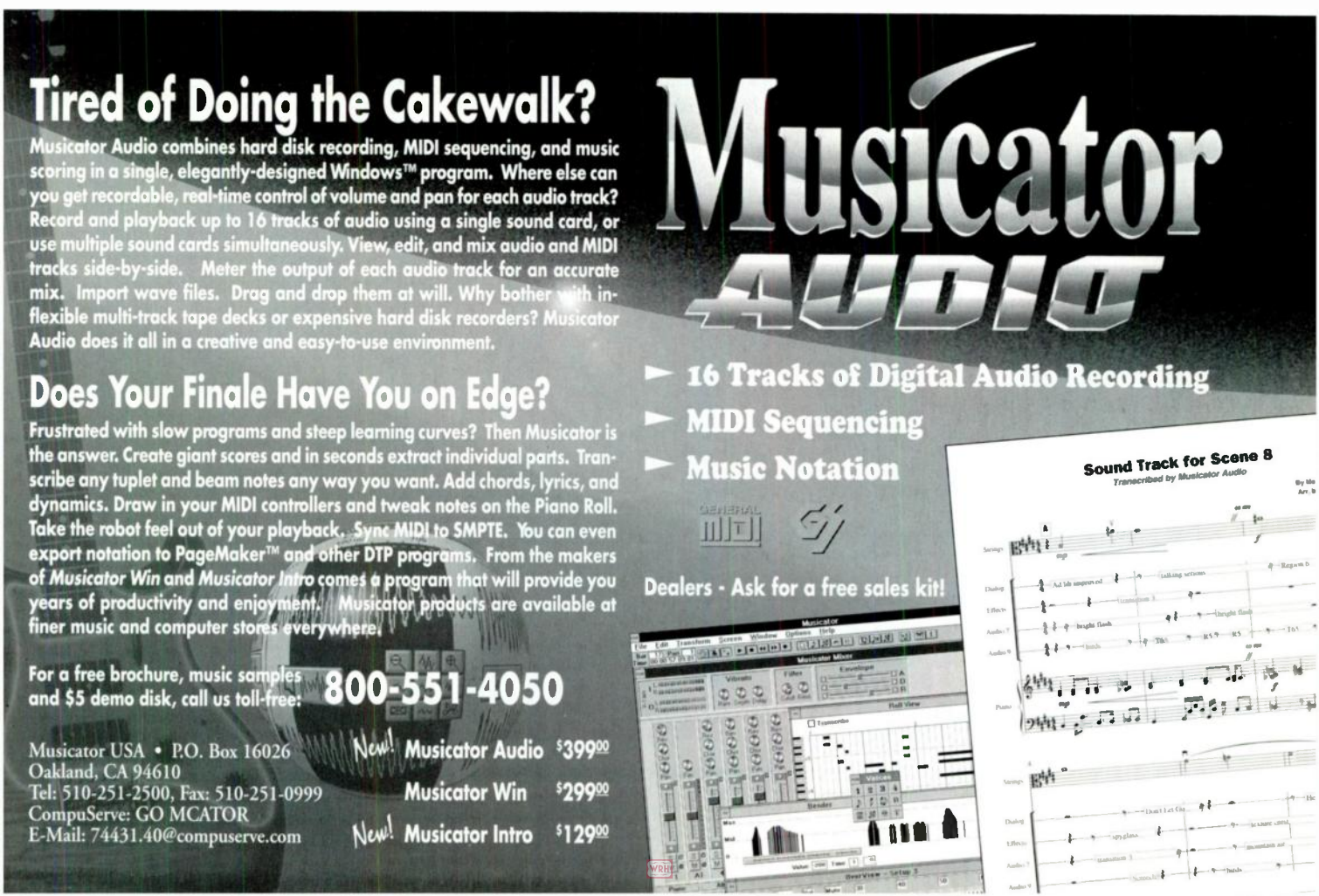
As mentioned earlier, MMC is used to integrate several types of equipment in the studio. Typically, a computer running sequencer and/or hard-disk recording software is the controller in an MMC system that includes a multitrack ATR (such as an Alesis ADAT or TASCAM DA-88/38), 2-track ATR (such as a DAT), stand-alone HDR, and/or VTR. If you start the computer at a particular measure, the controlled devices locate to the corresponding time-code value and play along. You can also arm and disarm tracks at will and automate punching in and out.

Ideally, you want bidirectional MIDI communication between the controller and each controlled device to accommodate commands, responses, and handshaking (see **Fig. 3**). However, most VTRs don't include MIDI ports; instead, professional models are controlled through another standard, bidirectional interface called Sony 9-pin. In addition, DAT decks don't typically include a MIDI interface, but a few (such as some from Fostex) include a Sony 9-pin interface. For these devices, you need an MMC-to-9-pin converter, such as the JLCooper MMC9.

If one of the devices in the system generates MTC (such as the sequencer software or HDR), it can be used as the master source of time code. If not, you may need to stripe SMPTE time code on one track of the multitrack ATR and use a SMPTE-to-MTC converter to synchronize the sequencer and other devices to the multitrack (see **Fig. 3**). Modular digital multitracks such as an ADATs or DA-88/38s can be equipped with a sync option that reads and generates SMPTE and MTC. Both units also require a hardware option to utilize MMC.

MIDI Machine Control demonstrates the power and flexibility of MIDI by allowing musicians to control more equipment with a single, consistent scheme. No matter what types of devices you prefer to use in your studio, they can probably be controlled via MIDI, which makes life a whole lot easier for recordists everywhere.

EM *Technical Editor* **Scott Wilkinson** *loves to watch machines respond to his commands.*



DESKTOP MUSICIAN

Don't Be a Crash Dummy

Avoid system crashes by practicing routine disk maintenance.

By Zack Price

Experienced computer musicians know that regular hard-disk maintenance is extremely important. This is especially true for hard-disk recording, in which smooth recording and playback of digital audio data depends on properly maintained hard drives. Failure to perform regular disk maintenance leads to a significant degradation in computer performance over time. Worse yet, poor disk maintenance dramatically increases the chance of a system crash that could result in a loss of valuable data.

Like all hard-disk drives, the Seagate Medalist Pro 2.5 GB drive requires regular maintenance to operate at peak efficiency.

Unfortunately, too many computer musicians fail to put this knowledge into consistent practice. This is amazing to me, considering that routine hard-disk maintenance is easy. Furthermore, the tools you need to perform disk maintenance are inexpensive and readily available. For instance, both MS-DOS 6.22 and Windows 95 include Defragmenter and Scan Disk, two of the most commonly used disk-maintenance utilities.

The Macintosh doesn't include similar disk utilities in its operating system, but there are plenty of third-party disk utility programs for the Mac (and for Windows, too). Their average cost is about $120, which is a small price to pay for staying out of system-crash hell.

FRAGGED

System crashes can occur for a variety of reasons (electrical spikes, computer viruses, hacked programs, etc.), but the most common problem affecting hard-drive and system performance is *disk fragmentation*. Surprisingly, this problem stems from the ordinary, everyday use of your computer. To understand how fragmentation occurs and why it affects system performance, you need to know how computers store data on a disk.

All hard disks consist of one or more physical platters coated with magnetic

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Photo shows the internal version, the RO-1420C

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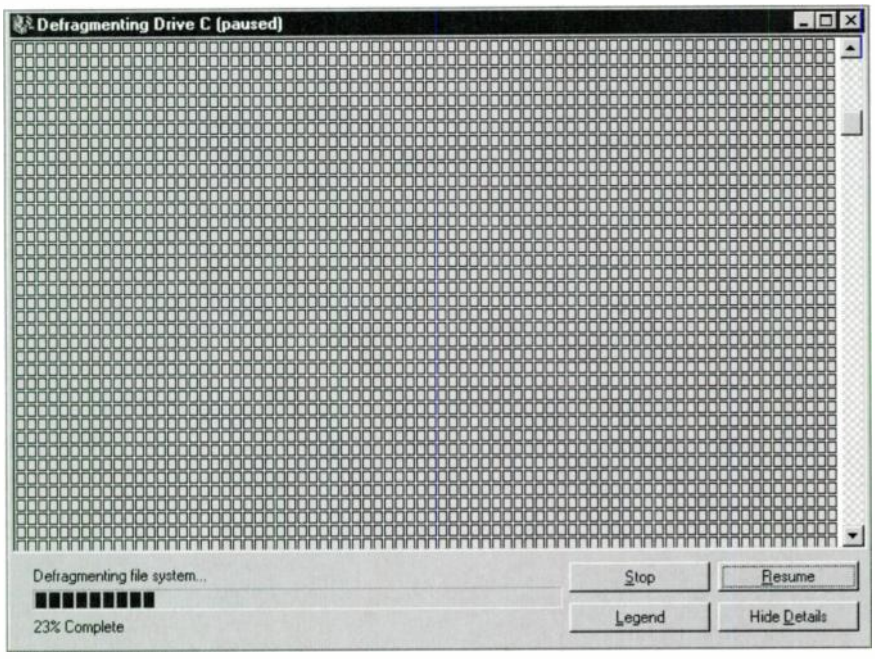

FIG. 1: This is a section of a defragmented hard drive. Ideally, all drive data is arranged in contiguous blocks, as shown here.

material on both sides. Each surface is divided into concentric circles, called *tracks,* by the manufacturer. The tracks are further divided into smaller sections, called *sectors* or *blocks,* by your computer's operating system as part of the formatting process. (These terms are not precisely synonymous, but their differences are not important for this discussion.)

Most desktop operating systems divide the tracks into a fixed number of blocks, each of which is a fixed size. For example, the Macintosh OS can divide a hard disk into as many as 65,536 blocks. The size of each block, sometimes called the *cluster size,* is determined by the capacity of the disk; on a 1 GB Mac disk, the cluster size is about 16 KB. Windows NT keeps the cluster size down to only 4 KB on disks of up to 8 GB capacity.

Ideally, the system stores data in contiguous blocks on the disk (see **Fig. 1**). This minimizes disk-head movement so that files can be read from and written to the drive more efficiently. Whenever new data is written, the system stores the data in the next available block at the end of all existing data.

The data on the drive changes over time as files are added, deleted, and updated. Because new data is stored after any existing data (or, as a last resort, placed in whatever empty blocks may have been left by deleted files), the added or altered data may not be placed in a block next to its original file. In fact, it may be written to a block that is quite distant from the original file data.

Over time, data becomes spread out among several discontiguous locations on the drive. Deleted files also compound the problem by leaving gaps between occupied blocks (see **Fig. 2**). The combination of these two processes forces the disk heads to move around more to access data, slowing access time and reducing drive performance.

As the degree of fragmentation increases, so does the likelihood and extent of noticeable delays. And because file data is dispersed over disparate areas of the drive, it becomes more difficult to recover any lost data after a crash.

OPTIMIZED FOR PERFORMANCE

To correct this problem, use a *defragmenter* or *optimizer* program regularly. (All types of disk utilities mentioned here are packaged with operating systems or are available as part of commercial disk-utility packages, such as Symantec's *Norton Disk Utilities.*)

There are three basic options for optimizing drives. The fastest, simplest choice is to defragment files. This option rearranges individual files so they are not scattered around the disk. However, the blocks that contain these files are not rearranged into contiguous groups to optimize the space at the end of the disk. As a result, a defragmented drive may still have gaps between blocks, as shown in **Figure 2**. On the other hand, a file's data can be found in one location on the disk, which makes it easier to recover in the event of a crash.

The second option is to consolidate

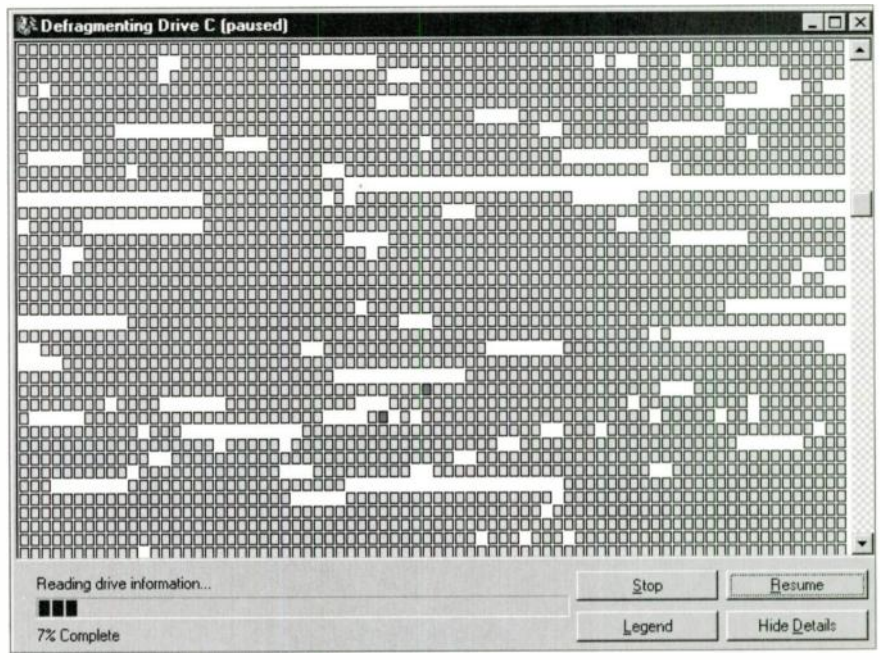

FIG. 2: This section of a drive is fragmented. The blank areas represent blocks that contain no data. These gaps were created when the data located in those blocks was changed or deleted.

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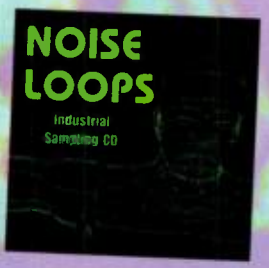

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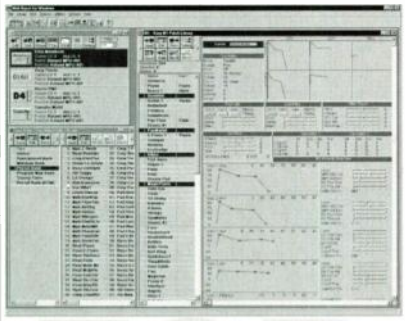

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free space. Although this method doesn't defragment the data, it maximizes the amount of contiguous free space remaining on the disk. Moving all the free space to the end of the disk lets you add new files without contributing to further fragmentation.

This particular option is useful for most hard-disk recordists because their programs simply refer to digital audio data using "virtual tracks" rather than physically moving the data. However, if a digital audio file is deleted, it can leave a large gap of unused blocks in the middle of the drive. The newly formed gap may not get refilled because the system looks for the next available space at the end of the data. Space consolidation closes that gap and makes more contiguous disk space available again for recording.

The third option is full optimization, which takes longer but keeps your system running in top shape when performed on a regular basis. Not only are files defragmented, but all files are rearranged into contiguous blocks (see **Fig. 3**). In addition, the software analyzes the usage of various files and puts frequently changed files in a different location from files that are not changed at all. This speeds up access to existing files and maximizes the speed at which new files can be written to disk. Moreover, block reorganization increases the amount of available disk space.

BOOBY TRAPS

Optimization differs on Macs and Windows machines. On Windows-based computers, not all files are moved during optimization: operating-system files, hidden files, and Windows swap files stay locked in their original positions on the drive, ensuring that the operating system is never tampered with during optimization. On Macs, however, OS files and hidden files can be moved during optimization because the process is launched from a drive other than the one being optimized.

Unfortunately, some older programs employ a copy-protection scheme that places a hidden file at a specific physical location on the drive. If this file is moved during optimization, the program will not run.

If you have programs that use this form of piracy control, you have to deinstall them before you optimize your hard drive. Otherwise, the programs won't work after optimization, and you'll have to reinstall them. Thankfully, this older type of copy-protection scheme is becoming less common. The current copy-protection scheme, called *disk authorization*, authorizes the entire volume and is not disabled by optimization.

In any case, you should follow some additional procedures before you optimize your drives. First, back up your drive's contents. Although it isn't likely to happen, rearranging file fragments and moving disk blocks can sometimes cause data loss. Also, make an emergency boot-and-recovery floppy disk. This disk should include the operating-system and disk-utility software. Not only is this disk extra protection, it

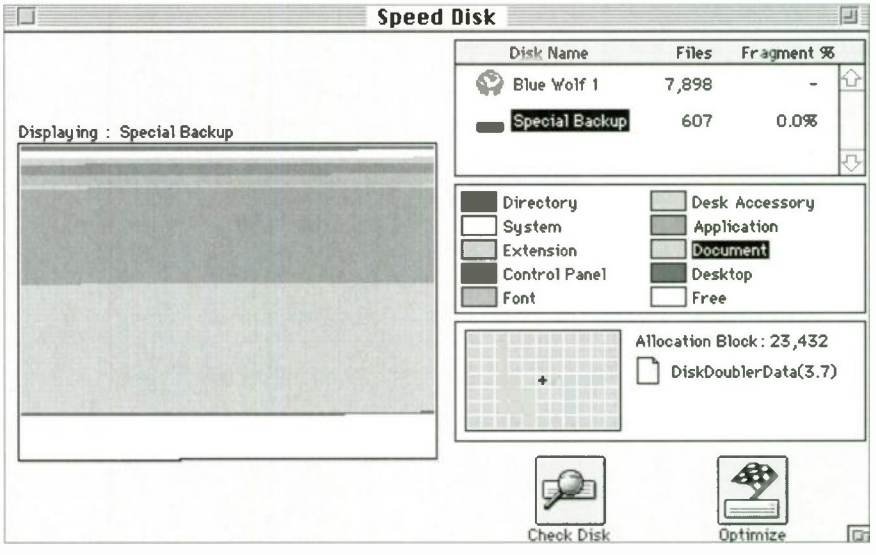

FIG. 3: The disk directory, operating-system files, applications, and data are efficiently organized after optimization.

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just may be your last chance to restore lost files, especially if you forgot to make a backup.

Use a disk-scanning program to check your drive for improperly named files and folders (e.g., a 9-letter DOS file name) and "orphaned" data that no longer relates to any existing files. The software should let you rename these files and examine their contents. If you have an older drive or suspect your drive may have some physical damage, instruct the program to check the integrity of the disk's physical surface, too. Any damaged blocks can then be identified and masked so the computer won't attempt to write data to them. However, if you seem to have damaged blocks every time you check the drive, you may need to replace it.

If you use an "undeleting" program that lets you restore accidentally deleted files, be sure to restore any erased files before beginning disk optimization. Once blocks are rearranged and the free space is cleared, there is no way to recover the deleted files.

There are other tools that increase hard-disk performance, but computer-based hard-disk recordists should avoid certain types of these programs. For example, disk-compression utilities conserve hard-drive space by compressing files in real time. These files are decompressed when accessed, again in real time. Unfortunately, this process slows down hard-disk performance because it requires valuable processing time that the computer needs to smoothly process digital audio data. Furthermore, attempting to compress digital audio data in real time can sometime make the files larger than they would normally be in an uncompressed state!

In addition, many disk-utility programs include various options for running in the background. For instance, some programs defragment drives if the drives are idle for a specified time. However, these features shouldn't be used if you are doing hard-disk recording. First, that additional program sits in the background taking up computer memory, which is anathema to the digital audio rule of running a lean and mean system for maximum performance. Second, the utility could start to defragment the idle boot drive while you're busily recording tracks to the digital audio disk. This could interfere with the hard-disk recording process.

ON SCHEDULE

Although there is no set timetable for performing routine disk maintenance, here are some basic guidelines that will help you draw up your own drive-maintenance schedule. You should start by making a full backup of your hard drive's contents. Then make incremental backups every time you use your computer.

Before installing a new program on your computer, fully optimize the drive so the program will be installed more efficiently. After installation, perform a full backup again, preferably on a different tape or disk than the first full backup. The older backup is your insurance against problems with the new backup and any troubles with the new program.

How often you should defragment your disk depends not only on how often you use your computer, but also on the type of data stored on disk. For instance, I use one computer almost every day for writing, business, and some sequencing work. However, it usually takes a month of daily use before the hard drive is even 10 percent fragmented, which is the point at which I fully optimize the disk.

On the other hand, the computer I use for the majority of my sequencing and digital audio work rarely needs defragmenting. Most of the hard-disk recording programs I use don't directly manipulate digital audio data but use pointers to play and manipulate the existing data on disk. By the time there may be a need to defragment the disk, the project is usually completed, backed up, and deleted from the hard drive.

However, some digital audio editing programs directly change the file data with every edit. In addition, some programs create partial or full backup copies of the original files before making any editing changes. If you use digital audio editing programs that work this way, you may need to defragment after every session. You may even have to defragment the drive during particularly heavy editing sessions to maintain peak performance.

Only you can determine how often you need to perform regular disk maintenance. Nonetheless, it's important that you set a regular disk-maintenance schedule and stick to it. It's the best way I know to avoid being a crash dummy. ❁

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RECORDING MUSICIAN

South American Session

Painting audio pictures of distant places requires ears and empathy.

By Brian Knave

Capturing the flavor of music from other countries is more than a matter of documenting the sound of indigenous instruments with a few microphones. For one thing, familiarizing yourself with a country's musical heritage can help you make informed decisions regarding mic selection and placement. In addition, some knowledge of the culture—its food, fabrics, art, etc.—can suggest creative signal-processing concepts when it's time to mix. Ideally, all elements of the final mix should work together to create an ethnic "signature" of the music and its country of origin, even if the tracks were recorded in your basement in North Carolina.

BRIAN KNAVE

Hector Salgado and Enrique Cruz lay down tracks for an Andean folk song. Two AKG C 460 condenser mics capture a stereo image of the pulo while a C 414 condenser, positioned to highlight breath attack, records a chromatic pan pipe.

I recently recorded two Chilean-born musicians who bring a contemporary edge to traditional Andean folk music. Enrique "Quique" Cruz, who has worked with Jackson Browne, Pete Seeger, Sting, and many others, is a master of Latin American pan pipes and wood flutes. He's also an accomplished string player, equally adept on guitar, cuatro, charango, and tiple. Hector Salgado also plays guitar and South American strings as well as percussion. During the early 1980s, Cruz and Salgado were members of the internationally acclaimed band Grupo Raíz, which made three LPs and toured the U.S., Canada, Europe, and Latin America.

For this current project, Cruz and Salgado's aim was to create a recording that evoked the soundscape of the Andes with an extended palette of colors and effects. To achieve this, they laid down multiple tracks of South American instruments—including some that aren't traditionally played together in an ensemble—and some synth pads.

I'll discuss some of the techniques used on this South American–music session to illustrate a workable approach for recording foreign or unusual instruments. Hopefully, this will inspire you to open your doors to some new and exciting sounds.

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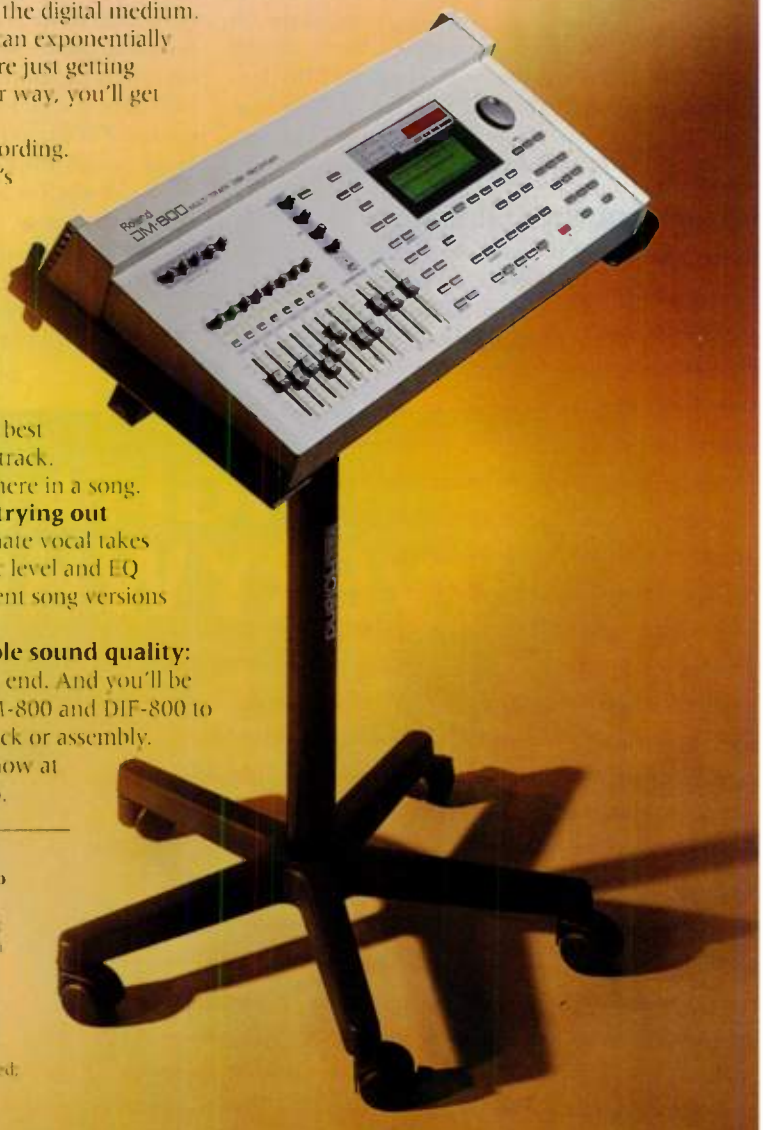

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SOUND AND SENSE

Even if you go cold turkey into a never-seen-that-before recording session, you should still be able to turn out good work, because no matter how exotic or bizarre an instrument is, it will almost certainly have *something* in common with other instruments you have recorded. Acoustic instruments, for example, generally fall into one of a handful of families: strings, reeds, woodwinds, horns, drums, percussion, and so on. In fact, you can get a good idea of how an instrument sounds—or at least how it produces its sound—just by studying it. I had never recorded pan pipes before, but because the pipes had no finger holes, it was obvious that the sound would come primarily from the tops and bottoms of the tubes.

The key thing, of course, is to listen. Begin by having the musicians play their instruments in different parts of the room. Instrument placement alone, especially in home and project studios, can have a dramatic effect on sound quality. For example, I recorded Cruz's kena (wood flute) next to a wooden door and shelves to liven up the sound with some early reflections. On the other hand, I favored the drier sound of a foamed-in corner when it came to recording the nylon-string guitar, the charango, and the pulo.

Also, when auditioning the instruments' placement in the room, make sure the musicians are playing selections from the song you're about to record as opposed to just jamming aimlessly. This is very important as the sound of an instrument can vary greatly based on the performance technique required by the song (for example, picked versus strummed). Finally, don't hesitate to get the *musicians'* opinions about where the instruments seem to sound best; after all, they should know how their instruments ought to sound.

HEY MIC, OVER HERE

After figuring out where the instrument sounds best in the room (and in relation to the other instruments if you're recording an ensemble), it's time to find the sweet spot for microphone placement. The sweet spot is the place where the mic hears the most natural tonal balance of an instrument. Because a single microphone is (generally) monophonic, I'll often listen for the best balance by covering one ear and moving around the sound source. This is also a good time to

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BRIAN KNAVE

FIG. 1: The variety of Andean wind instruments made from cane is impressive. Pictured here are a large, chromatic pan pipe (left), an antara and set of toyos (pan pipes in back), a mocxeño or bass flute (leaning against the drum), and a selection of wood flutes known as kenachos and kenas (in front). The drum is a wuánkara.

identify the source of any weird harmonics or unwelcome noises. Knowing where the "sour spots" are is very helpful in finding the sweet spot.

At this point, if you're familiar with the tonal characteristics of your microphones, you should be getting a good sense of which mic will best translate the sound you're hearing. Choosing the appropriate microphone is critical because it will minimize EQ tweaking at the mixer. In general, I try to use no console EQ while I'm recording acoustic instruments *unless* I'm going for a special effect.

Of course, the presence of a buzz or strident overtone is likely to affect both mic choice and equalization. On the song "Quiqueñita," for example, Salgado played a steady, rumbling beat on the wuánkara, a relatively small bass drum that produced a massive—and magical—low note. This particular wuánkara was more than a century old and consisted of llama skin stretched over a metal shell (see **Fig. 1**).

Unfortunately, accompanying the wonderful rumble was an obnoxious buzz. After locating the origin of the buzz (it came from a point where the head met the metal hoop on one side of the drum), we were able to reduce the buzz simply by playing and miking the drum from the opposite side. However, I was still forced to replace the condenser mic I wanted to use with a dynamic mic because the condenser reproduced too much of the overall drum sound. But with careful placement of the dynamic and a bit of high-mid EQ cut, we sufficiently banished the buzz.

STRING THING

My prior experience miking acoustic guitars, mandolins, mandolas, ukuleles, and even bazoukis proved good preparation for recording the South American stringed instruments (see **Fig. 2**). The 10-string charango, for example, sounded like a cross between a mandolin and a uke, so I had a good idea which mics might best capture its high, shimmering tones.

After a few quick comparisons, I ended up using an AKG C 460, a small-diaphragm, cardioid condenser mic. Cruz played the charango with a rapid, fluttering strum (similar to a mandolin roll but played with fingers instead of a pick) that required his hand to completely cover the sound hole and most of the top of the diminutive instrument. Therefore, I aimed the mic toward the bottom of the fretboard (the end nearest the sound hole) about two and a half feet back. This position highlighted the percussive attack of the strings and beautifully captured the charango's sweet sound.

BLOWIN' IN THE WINDS

Choosing the most suitable microphones for the flutes and pan pipes required a more lengthy process. Having miked plenty of silver flutes, I was aware of how difficult it can be to capture the best blend of air sound, instrument tone, and dynamic balance between notes. Fortunately, Cruz not only had a strong idea of the sound he was going for, but he was also an experienced recording artist who knew how to work a mic.

Still, it proved necessary to conduct a few test recordings before committing to one mic or another. I set up three mics (an AKG C 414, a C 460, and a D 112 "bass drum" mic) side by side, recorded each flute and pipe with one mic at a time on separate tracks, and then A/B/C'd the results. For the antara, the small Ecuadoran pipes, and the very long Bolivian sikus, we chose the C 414 because it best captured the sensuous breath sounds that characterize pan pipes. To further accentuate those sounds on the antara—which performed the main melody—I positioned the mic about a foot and a half above the top of the pipes, angled toward Cruz's mouth.

For the sikus, we wanted a haunting, distant sound that would suggest the far valleys and high peaks of the Andes, so I tried an experiment. With the C 414 in the cardioid polar pattern, I turned the mic around *backwards*, cranked up the mixer input gain, and had Cruz play toward the dead end of the mic. Ultimately, the sound captured by the mic had to bounce off the far wall first as well as off everything else in the room. The multiple reflections definitely delivered a taste of the high Andes!

To contrast the breathy sounds of the antara and resonant tone of the sikus, we selected the AKG D 112 dynamic microphone to record the kena. This large-diaphragm mic, designed for kick drum and other low-frequency sources, has slightly rolled-back highs and high-mids, which effectively removed the sound of the player's breath

BRIAN KNAVE

FIG. 2: Present-day Andean musicians use stringed instruments that hail from many South American countries. Shown from left to right are the pulo and charango (Bolivian), a Spanish nylon-string guitar, and the cuatro (Venezuelan).

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and fingering. The tone it captured from the wood flute was fat, round, and warm—markedly different from the brightly detailed image provided by the condensers. Because I was able to record three distinctly different-sounding wind tracks, it wasn't necessary to use any console EQ during the mix.

PERCUSSION WHACKS

Andean music is often played in the streets, where it quickly draws the attention and participation of, among others, children. In the communal spirit that typifies South American villages, the children frequently join in by playing small bells and other handheld percussive instruments.

We attempted to generate some of that festive spirit by laying down an impromptu bed of percussion using whatever was at hand. I set the C 414 to the omnidirectional pattern and positioned the mic in the middle of the room. We each grabbed a handful of instruments—bells, claves, shakers, maracas, etc.—and spread apart from one another. As the tape rolled, we added spontaneous percussion parts.

Cruz, who was stationed next to the door where I keep dozens of spare audio cables hanging from coat hooks, repeatedly brushed his hands through the cables, which set them swinging, scraping, and rattling against the door. He even opened and shut the door a few times. Most impressively, during the climactic solo section of "Quiqueñita," he moved near the mic and poured water back and forth between two tall glasses. This last effect, he explained, was to suggest the dramatic waterfalls of the Andes, which constitute a perpetual presence in the lives of many Andeans.

Treated with cavernous reverb and faded in and out of the mix, these rhythm tracks provided an undulating wash of sound that wove throughout the song like the patterns on a Bolivian vest. Meanwhile, the awesome low note of the wuánkara, compressed at a 10:1 ratio, rumbled beneath the mix like thunder in a far-off valley.

ES TODO

The recording process is demanding enough when you work with familiar sounds, so it can be all the more challenging when you don't even recognize the instruments you are recording. But in the end, no matter what the sound source, success is dependent on critical listening, recording chops, and common sense.

Of course, with good gear and sufficient vigilance, it's possible to make a great recording of *any* instrument, even something from the dark side of the moon. However, when recording a foreign instrument for the first time, it pays to research the country's music beforehand. This will give you a sense of the instrument's tonality and how it is typically blended into a finished mix. It helps to learn a bit about the culture, as well. A smattering of knowledge will aid your understanding of the people and therefore of their music. Then when it comes time to mix, you can go beyond simple knob turning and let your imagination guide you toward sounds that truly evoke a particular place and culture. *¡Buena suerte!*

Assistant Editor **Brian Knave** *enjoys playing abroad where* his *music is considered "ethnic."*

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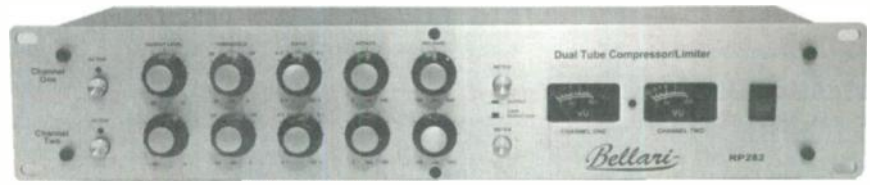

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Roland VS-880

By Erik Hawkins

A powerful, affordable digital multitrack studio in a single box.

Roland is well known for its hard-disk recorders. The DM-800 (which is still in production) and its predecessor, the DM-80, were among the first modular HDRs to be used in post-production houses and recording studios across the country. But the cost of the DM-800 is beyond the average home-studio owner's budget. So Roland introduced the VS-880, a hard-disk recorder for the masses.

Designed to meet the needs of project and home recording studios, the VS-880 is packed with an absolutely stunning array of features, including eight tracks, 64 virtual tracks, onboard EQ, a 14-channel mixer with automation, a removable storage medium, and optional internal effects. But that only scratches the surface. The longer you work with the VS-880, the more you appreciate it. And with a list price starting at $2,495, the VS-880 shatters previous notions of how much you have to pay to get a really cool HDR.

The VS-880 is a comprehensive digital studio workstation that handles recording, mixing, and mastering in one compact unit.

IN SMALL PACKAGES

The VS-880 is a compact, wedge-shaped, tabletop unit designed for the home recordist with limited space. There is no rack-mount kit for it, nor is one planned. A gently curved armrest is designed into the front of the unit along with an indentation that's perfect for holding a pencil. The unit's portability and switchable AC voltage levels (117, 230, or 240 VAC) make it ideal for musicians and recordists on the go.

The VS-880 is available in two different configurations: with a 540 MB internal hard disk or an internal, 1 GB removable Iomega Jaz drive. A maximum of 1 GB can be addressed at a time, and 200 songs can be stored per gigabyte. A SCSI port on the rear of the unit accommodates up to seven daisy-chained devices. Although there is not an overflow function to allow continuous recording across drives, switching between drives is a simple matter of choosing a SCSI ID number from the front-panel LCD screen. Operating system updates for the VS-880 are done via SCSI or MIDI System Exclusive dumps.

The single expansion slot, located on the underside of the unit, looks almost identical to the expansion slots on Roland's JV and XP synthesizers. The expansion boards are user-installable. Currently available is an effects board, the VS8F-1, which adds two simultaneous effects per channel.

I found the wealth of storage options extremely convenient. The internal Jaz drive makes storage a snap. You can

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simply save your project to a Jaz cartridge and file it. (Jaz cartridges cost about $99 each.) Audio DAT backup offers an inexpensive way of storing files. The time it takes to back up to DAT varies according to the level of audio quality you select for the project: at the most it's real time, and at the least, half time. Fortunately, a Verify function makes all saves worry free. And, of course, you can always back up to any storage device that supports SCSI (except data DAT).

INS AND OUTS

The VS-880 has two sets of analog inputs, each comprising four jacks, for a total of eight analog inputs. The first set, labeled Input A, uses ¼-inch TRS jacks that accept balanced or unbalanced plugs. The second set, Input B, uses RCA jacks. Input A takes precedence over Input B. For example, if you insert a cable into Input A jack 1 and another into Input B jack 1, the VS-880 will only recognize Input A. You can use both sets of inputs simultaneously, but no more than four input jacks are "visible" at one time, with Input A jacks always taking precedence. The machine can record on a maximum of four tracks per pass. Trim controls for each input, located on the unit's face, allow variable input levels from -50 to +4 dBm.

There are four analog outputs for the VS-880: the master L/R outputs and two aux sends, all on RCA jacks. With factory settings, all signals are output through the master L/R outputs and none through the aux sends. However, the internal signal-routing system allows any input to be bused to any track, either individually or in groups. Also, any track can be bused individually or in groups to the aux sends and master L/R output. These routing choices facilitate internal mixdowns (e.g., ping-ponging tracks and recording effects) and allow you to configure the unit to output signals from four separate tracks. This is important because the VS-880 does not have individual track outputs.

Other rear-panel jacks include a ¼-inch stereo headphone jack (which would have been more convenient on the face of the unit, where the headphone volume knob is located), a ¼-inch footswitch jack, digital input and output, and MIDI In and Out/Thru ports.

▼

In low-light situations, the display is pretty much useless.

The digital I/O is S/PDIF on RCA jacks. The digital input's left and right channels can also be freely routed internally, making it possible to assign them to nonadjacent tracks. The digital output, of course, carries the same stereo mix as the master L/R analog jacks.

DAC FIELD IN MOTION

The VS-880 offers multiple recording modes that vary in sound quality. In order of descending quality, they are Mastering, Multitrack 1, Multitrack 2, and Live. The lower the sound quality, the more recording time is available. Each song in the Roland VS-880 is assigned both a recording mode and a sample rate. A song's recording mode does not dictate the sample rate, nor does the sample rate dictate the recording mode. However, the two parameters are interrelated in that recording time is determined by both settings (see the table "Recording Modes").

The variety of recording modes is made possible by Roland's proprietary audio compression, R-DAC. First introduced in Roland's MS-1 sampler in the middle of last year, R-DAC is a form of real-time audio compression that yields more than four times the recording time per MB than normal, uncompressed digital audio. R-DAC sounds amazingly good. It is warm and round sounding, with an almost analog quality. I liked the Multitrack 1 setting best and used it the most. The Multitrack 2 and Live settings tended to roll off the extreme high and low ends, resulting in rather lackluster recordings. All the recording modes use R-DAC except Mastering, which uses no audio compression but yields only four tracks.

DATA ENTRY AND DISPLAY

Data entry is accomplished in a variety of ways. The primary way is via the large Time/Value rotary dial located in the VS-880's top right corner. This control allows you to dial up values in any window and is particularly handy when there are a bunch of selections to get through. It is indented for precision dialing and has a nicely sized dimple for your finger.

Just beneath the Time/Value dial are two Parameter buttons that allow you to scroll forward or backward through windows. They don't enter any data, though, so you can scroll freely without worrying about accidental data entry. Data is entered using two cursor buttons that double as Yes/No or Cancel/Enter buttons. Below and to the left of the cursor buttons is a group of ten Locator buttons (I'll cover these later) that functions as a numeric keypad when the Shift key is held down. Though not laid out in a standard 10-key configuration, the keypad nonetheless makes entering exact numbers and locations a breeze.

The display is an LCD screen that, believe it or not, is smaller than a business card (3½ by 1⅛ inches). It is divided into two basic sections. The left side displays a song's current marker, (a type of locate point that I'll explain later), measure/beat, sync status, current mixer snapshot, and remaining hard-disk time. In Play mode, the right half of the display shows meters for the eight tracks (switchable between pre- or post-fader), the aux sends, and the master L/R output. The meters are 16-segment peak-hold. The current time, switchable between absolute and relative, is shown at the top of the display (see Fig. 1).

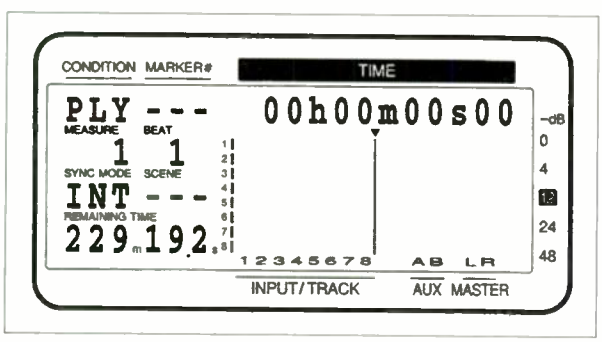

FIG 1: The display page in Play mode depicts the beat, sync mode, scene, remaining time, current time, and levels for eight tracks, two aux sends, and master L/R outputs. (Courtesy Roland Corp. US)

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The various Edit-mode pages show graphic representations of about every parameter you can think of, from EQ and track status to fader and pan settings. When you switch to any of the edit pages, the current-time indicator disappears, replaced by the parameter settings.

Considering how much information is packed into the VS-880's LCD screen, I don't understand why Roland decided to make it so small. I had to constantly squint at the display to determine which track meter was which. In low-light situations—say, a nightclub or dimly lit corner of a recording studio—the display is pretty much useless. Perhaps Roland should provide a complimentary magnifying glass and overhead light to accompany the VS-880.

FINDING THE TIME

Familiar tape recorder–style buttons, conveniently located at the bottom right of the unit, make up the transport controls. Return-to-zero is included along with Rewind, Fast-Forward, Stop, Play, and Record buttons, all of which feel solid. A single press of the Rewind or Fast-Forward button moves the current time by one second. Normal rewind and fast-forward speeds can be reached by holding down the buttons. Holding down the Shift key and pressing Rewind takes you to the earliest recorded sound in the song. Holding down the Shift key while you hit Fast-Forward will take you to the last recorded sound in the song.

The VS-880's Locator section features two types of locate points: regular locate points and markers. There are four locate-point buttons, which provide eight locate points. (Four of the locate points are accessed by holding down the Shift key.) Locate points are used for edit, auto-record in and out, and loop in and out points. Of course, they are also useful as general-purpose location tools.

Markers can be thought of as locate points without dedicated buttons. Each song can contain up to 999 markers. Markers are sequentially numbered, so placing a new one before one that already exists automatically renumbers all subsequent markers. You can move between markers with the Next/Previous buttons, or you can go directly to a marker by calling up its number. Although locate points are good for in-progress sections of a song, markers are good for outlining the song structure (e.g., verses, choruses, and bridges).

For hands-free operation, the VS-880 features auto punch/auto record and looped playback. These functions work simultaneously and are invaluable features when you are working alone, making it easier to concentrate on your performance rather than on the technical aspects of recording.

The footswitch jack mentioned earlier lets you connect any type of momentary footswitch to provide a variety of remote commands: Record in/out, Play/Stop, marker dropping, and movement between markers. The ¼-inch jack also accepts a General Purpose Interface (GPI) such as those found on video editors and title superimposers.

Dedicated Preview buttons—To, From, and Scrub—let you preview a song section to determine whether a locate point (not a marker) has been placed in the right spot. Pressing To causes the VS-880 to play from a user-determined preroll point up *to* the marker and then stop; press From, and the machine plays *from* the marker to a user-determined post-roll point and

VS-880 Specifications

Number of Tracks	8
Number of Virtual Tracks	64
Number of Inputs at Mixdown	14 (including external inputs)
Number of Outputs at Mixdown	4
A-D Conversion	18-bit, 256x oversampling
D-A Conversion	18-bit, 8x oversampling
Sampling Rates	48 kHz, 44.1 kHz, 32 kHz
Frequency Response (@ 48 kHz)	10 Hz–22.6 kHz (+0/-3 dB)
Total Harmonic Distortion	≥0.08% (1 kHz @ -10 dBm)
Crosstalk	≥82 dB (1 kHz)
Nominal Input Level (variable)	-50 to +4 dBm
Nominal Output Level	-10 dBm (aux sends and master out)
S/N Ratio (mixer)	96 dB
Dimensions	17.125 x 12.5 x 3.5 inches
Weight	8 lbs., 14 oz.

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then stops. Preview lengths can be set from one to ten seconds using the Time/Value dial. Pressing either To or From with the Scrub button activated (indicated by a dedicated light) causes the machine to play the specified area repeatedly.

MIXING IT UP

The VS-880's 14-channel mixer contains two basic modes: one for tracking and one for mixdown. In Tracking mode, inputs are bused directly to the tracks, bypassing the mixer. You can monitor EQ and effects in Tracking mode, but they are not recorded. In Mix mode, inputs are routed through the mixer before they reach the tracks, so any EQ and effects can be recorded. Both modes have faders, panning, parametric EQ, two internal effects, and a stereo aux send on every channel. Three bands of parametric EQ are available in Tracking mode, but only two are available in Mix mode.

Although Tracking mode only provides control over the eight internal tracks, Mix mode lets you control eight internal tracks and six external inputs. Inputs 1 through 4 are fully assignable. The L/R digital inputs are hard-wired to channels 5 and 6 in Tracking mode, but they are fully assignable in Mix mode. The eight internal tracks are logically assigned to channels 1 through 8. Because there are only eight physical channels on the mixer, a toggle feature allows you to switch control between the internal tracks and the external inputs.

Above each fader is an LED with an associated button. Hitting the button changes the channel status, which is indicated by one of four LED colors: orange for monitoring the source input, green for monitoring a track, red for Record Ready, and clear (or off) for mute. In Record Ready, the LED blinks red; during recording it remains lit (also red). The input monitor can be set to auto-monitor or source. Channel solo is available from the mute function while holding the Shift key.

Linked stereo pairs can be set up on adjacent channels (i.e., 1 and 2, 3 and 4, etc.), which makes stereo tracks or source sounds easy to work with. Once a linked pair has been set up, it is controlled by the odd-numbered channel.

▼

The effects board's sound quality is phenomenal.

The mixer can be fully automated via MIDI. You can control volume, panning, and EQ from a sequencer, with each mixer channel responding to a fixed MIDI channel. The controllers, which are identical for all mixer channels, are also fixed. For folks who want even more control, System Exclusive messages can control the two internal effects, including patch changes. A 14-page manual detailing this adventure into MIDI System Exclusive is available from Roland.

A MIDI-activity light (which also doubles as a disk-activity light) confirms that the unit is receiving MIDI messages (or accessing its disk). I managed to get both Opcode's *Studio Vision Pro* 3.0 and Mark of the Unicorn's *Performer* 5.0 to control the basic automation features, but I didn't have time to try the System Exclusive messages.

If you don't own a sequencer or are too lazy to set up the control templates for automation, you'll be glad the VS-880 offers an alternative in the form of snapshots, which Roland calls Scenes. Up to eight Scenes can be stored per song. A Scene consists of every setting (and I do mean *every* setting) on the mixer, from fader and pan positions to EQ and effects. The Scenes are extremely easy to use: just hit the Scene button, and the locate buttons become mixer snapshot buttons. Scenes are a great way of comparing different mixes, but you can't switch between Scenes during playback.

AN EFFECTING EXPERIENCE

The optional effects board's sound quality is phenomenal. This is one of the VS-880's best features; I highly recommend spending the extra money to get it. There are 100 preset patches and 100 user-definable patches. Patches include reverbs, delays, amp simulators, and a variety of preconfigured multi-effects that include chorusing, flanging, pitch shifting, EQ, compression, and de-essing.

Furthermore, there are plenty of parameters in every patch. Roland has included a host of guitar multi-effects derived from their COSM-based VG-8 guitar synthesizer. Guitar Amp Blues Overdrive is a particularly nice patch, and Vocal Multi-effect proved useful for volume smoothing.

Time compression/expansion is a DSP function that comes stock on the VS-880. It uses a fairly comprehensive algorithm that allows a selection's length to be changed from 75% to 125% of the original. As with many time compression/expansion algorithms, this process sounds best within a 5% to 6% range. Beyond that, results tend to sound grainy and synthetic.

Time compression/expansion can be executed with or without pitch change. Three quality levels are available: A, B, or C. A sounds the best, B is in-between, and C sounds the dirtiest. The amount of time change is calculated by specifying a new end point rather than a percentage. This is a much better way of finding an exact length.

A Vari-Pitch feature allows you to change the tuning of a song. As with

Recording Modes

This table shows the relationship between the VS-880's switchable sampling rates, recording times, and subsequent recording quality. For example, the Mastering mode at a 48 kHz sampling rate offers the best sound quality but the least amount of recording time (and only four tracks). On the other hand, recording in Live mode at a 32 kHz sampling rate gives you lower fidelity but nearly fifteen hours of recording time.

Recording Mode	48 kHz	44.1 kHz	32 kHz
Mastering	186 minutes	203 minutes	280 minutes
Multitrack 1	373 minutes	406 minutes	559 minutes
Multitrack 2	497 minutes	541 minutes	746 minutes
Live	596 minutes	649 minutes	894 minutes

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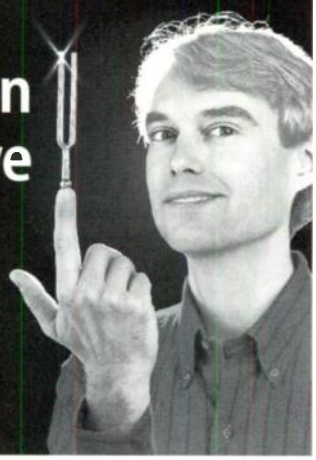


The TRUE STORY

by David L. Burge

IT ALL STARTED in ninth grade as a sort of teenage rivalry.

I would slave at the piano for five hours daily. Linda didn't practice anywhere near that amount. But somehow she always seemed to have an edge which made *her* the star performer of our school. It was frustrating.

What does she have that I don't? I would wonder.

Linda's best friend, Sheryl, sensed my growing competition. One day she bragged on and on about Linda, adding more fuel to my fire. "You could *never* be as good as *Linda*," she taunted me. "*Linda's* got *Perfect Pitch*."

"What's Perfect Pitch?" I asked.

Sheryl gloated over a few of Linda's uncanny musical abilities: how she could name any tone or chord—*just by ear*; how she could sing any pitch she wanted—*from mere memory*; and how she could even play songs after only *listening* to them on the radio!

My heart sank. *Her fantastic EAR is the key to her success* I thought. How could I ever hope to compete with her?

But later I doubted Sheryl's story. How could anyone *possibly* know F♯ or B♭ just by *listening?* An ear like that would give someone a mastery of the entire musical language!

It bothered me. Did Linda *really* have Perfect Pitch? I finally got up the nerve and asked Linda point-blank if the rumors were true.

"Yes," she nodded to me aloofly.

But Perfect Pitch was too good to believe. I rudely pressed, "*Can I test you sometime?*"

"OK," she replied cheerfully.

I couldn't wait...now I'd make her eat her words...

My plan was ingeniously simple:

I picked a moment when Linda least suspected it. Then I boldly challenged her to name tones for me—*by ear.*

I made sure she had not been playing any music. I made her stand so she could not see the piano keyboard. I made certain other classmates could not help her. I set everything up so I could expose Linda's Perfect Pitch claims as a ridiculous joke.

Nervously I plotted my testing strategy. Linda appeared serene.

With silent apprehension I selected a tone to play. (She'll *never* guess F♯!)

I had barely touched the key.

"F♯," she said.

I was astonished.

I quickly played another tone. She didn't even stop to think. *Instantly* she announced the correct pitch.

Frantically, I played more and more tones, here and there on the keyboard, but each time she would somehow know the pitch—without effort. She was SO amazing—she could identify tones as easily as *colors!*

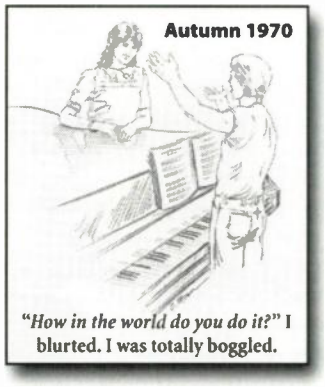
"Sing an E♭," I demanded, determined to mess her up.

With barely a pause she sang the proper pitch. I had her sing tone after tone. But as I checked her on the keyboard, I found that she sang each note perfectly on pitch.

I was totally boggled. "*How in the world do you do it?*" I blurted.

"I don't know," she sighed. And to my dismay, that was all I could get out of her!

The dazzle of Perfect Pitch hit me like a ton of bricks. My head was dizzy with disbelief. Yet from that moment on I knew *Perfect Pitch is real.*



"How in the world do you do it?" I blurted. I was totally boggled.

I couldn't figure it out...

"*How does she DO it?*" I kept asking myself. On the other hand, why doesn't *everyone* know musical tones by ear?

Then it dawned on me that *most musicians* can't tell C from C♯, or A major from F major—like artists who brush painting after painting without ever knowing green from turquoise. It all seemed so odd and contradictory. I found myself even more mystified than before.

Humiliated and puzzled, I went home to work on this problem. At age 14, this was a hard nut to crack.

You can be sure I tried it myself. I would sweet-talk my three brothers and two sisters into playing tones for me, then guess each pitch by ear. My many attempts were dismal failures.

So I tried playing the tones *over* and *over* in order to memorize them. I tried to feel the "highness" or "lowness" of each pitch. I tried day after day to learn and absorb those elusive tones. But nothing worked. I simply could *not* recognize the pitches by ear.

After weeks in vain, I finally gave up. Linda's gift was indeed extraordinary. But for me, it was out of reach.

Then it happened...

It was like a miracle. A twist of fate. Like finding the lost Holy Grail.

Once I had stopped *straining* my ear, I started to listen NATURALLY. Then the incredible secret to Perfect Pitch jumped right into my lap.

I began to notice faint "colors" within the tones. Not *visual* colors, but colors of *pitch*, colors of *sound*. They had always been there. But this was the first time I had ever "let go"—and *listened*—to discover these subtle differences within the musical tones.

Soon I too could recognize the tones by ear! It was simple. I could hear how F♯ sounds one way, while B♭ has a different pitch color sound—sort of like "listening" to red and blue!

The realization hit me: THIS IS PERFECT PITCH! This is how Bach, Beethoven and Mozart could mentally envision their masterpieces—and name tones, chords and keys all by ear—*by tuning in to these subtle "pitch colors" within the tones.*

It was almost childish—I felt sure that *anyone* could unlock their own Perfect Pitch by learning this simple secret of "color hearing."

Excited, I told my best friend Ann (a flutist) that *she* could have Perfect Pitch too. She *laughed* at me.

"You have to be *born* with Perfect Pitch," she asserted.

"You just don't understand how *easy* Perfect Pitch is," I explained.

I showed her how to listen. Timidly, she confessed that she too could hear the pitch colors. With this jump start, it wasn't long before Ann had *also* acquired Perfect Pitch! We became instant school celebrities. Classmates loved to test our abilities, leaving everyone awed and amazed by the power of our virtuoso ears.

Way back then I never would have dreamed that years later I would cause such a stir among college music professors. When I first explained my Perfect Pitch discovery, many of them *laughed* at me. You may have guessed it—they told me, "One must be *born* with Perfect Pitch." Yet once I revealed the simple *secret—and they heard for themselves*—you'd be surprised how fast they changed their tune!

As I continued my own music studies, my Perfect Pitch ear allowed me to progress far faster than I ever thought possible. I even *skipped over* two required college courses. Perfect Pitch made *everything* much easier—performing, composing, arranging, sight-reading, transposing, improvising—and it skyrocketed my *enjoyment* of music as well! I learned that music is definitely a HEARING art.

And as for Linda?

Oh yes—time eventually found me at the end of my senior year of high school, with my *final chance* to outdo Linda. Our local university sponsored a music festival each spring. I went all out for it. Guess what? I scored an A+ in the most advanced performance category. Linda only got an A.

Sweet victory was music to my ears—mine at last!

FOR 15 YEARS NOW, thousands of musicians and two university studies have proven my Perfect Pitch method. *Now I'd like to show YOU how to experience your own Perfect Pitch!*

I hope *you* won't laugh as you picture *yourself* with various Perfect Pitch skills—like naming tones and chords by ear with laser-like accuracy! I think you will be surprised at just how simple Perfect Pitch really is—*and how very valuable.*

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an analog recorder, changing the pitch on a digital recorder changes the speed of the material. But unlike an analog recorder, changing the pitch on a digital recorder is done by changing its sample rate during playback. For example, a 44.1 kHz recording can be slowed down to 24.06 kHz or sped up to 50.48 kHz. This works out to almost an octave below or one whole step above the original pitch.

Because changing the pitch also changes the tempo, I expected the VS-880 to stop sending out MIDI Clock after I had altered a tempo. Amazingly, the MIDI Clock output automatically matches the new tempo created by the pitch change. This means that virtual tracks are always locked to the VS-880's internal tracks regardless of pitch. So if you want to hear how a guitar riff would sound a half-step higher but you don't want to replay it, you can simply tune the recorder up.

It used to be that retuning a digital recorder caused all your virtual tracks to play at the wrong tempo—if they locked up at all. To make the maneuver successful, you had to recalculate the entire sequence's tempo to match the new speed. The VS-880, however, executes the entire procedure in an instant, no mathematicians or MIDI consultants required.

A VIRTUAL REALITY

Hard-disk recorders offer more than just instantaneous rewind and fast-forward. With some models, the random-access storage allows them to address multiple takes in a single track. These takes are commonly called "virtual tracks." The VS-880 can have up to eight virtual tracks hidden beneath the track you're actually listening to, for a total of 64 virtual tracks. At the push of a button, any virtual track can replace the current track for a completely different take. It's like having eight 8-track recorders locked together, each of which has tracks that are all completely interchangeable, except that you can only hear eight tracks at once. Still, with some creative cutting, pasting, and ping-ponging, virtually anything is possible.

Roland is notorious for having convoluted user interfaces, so I expected this powerful feature to be extremely difficult to use. Boy, was I surprised.

▼

You can undo back to last month.

The folks at Roland have created a straightforward, easy-to-use method of working with and moving between virtual tracks on a single track. Just hit the Virtual Track button, select the track you want to work on, and dial up the desired virtual track. It's as simple as that. And because the hard drive isn't accessed, no processing time is required, and the change between virtual tracks is immediate. The only disappointment is that switching between virtual tracks can't be done during play.

Virtual tracks can be moved across tracks as well as within a single track. This operation is a bit more complicated. However, each track is generally used for a different instrument, so virtual tracks are most often auditioned within a track anyway.

Another distinct advantage of random-access recording is the ability to undo the last take and return to a previous one. Most HDRs have at least a couple levels of undo. The VS-880 has 999 levels of undo *per song*. Furthermore, it retains these levels regardless of how many times the machine is turned on and off. This means you can—and I did—literally undo a song back to a version you had last month. That the VS-880 can do this with only a 540 MB hard disk amazes me. There's even a level of redo that allows you to undo your last undo.

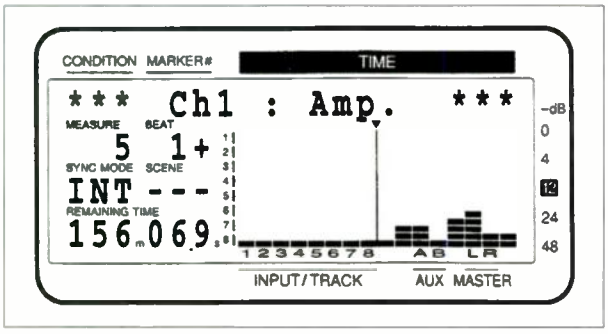

FIG 2: The VS-880's Waveform-Amplitude display allows you to accurately locate the beginning or end of a sound. Each vertical block represents amplitude. As you move the scrub wheel forward or backward, these blocks change to represent changes in amplitude over time. (Courtesy Roland Corp. US)

SCRUB-A-DUB EDIT

Taking full advantage of its computer-based core, the VS-880 offers a variety of editing functions: Copy, Move, Exchange, Insert, Cut, and Erase. Edits can be done on any virtual track that is currently selected (i.e., the one that you're hearing). Edit points can be entered via locate-point buttons, the numeric keypad, or the rotary dial. They can be measured in SMPTE time or as a bar and beat. Crossfade times can range from 10 to 50 milliseconds.

Erase, Cut, and Insert edits work pretty much as you'd expect. For example, by erasing a selected area, you create a silent space. Cutting a section erases it and removes the "space," as well, creating a butt splice between the in and out points. Insert lets you insert additional measures into a piece (without erasing anything) by moving over all existing material after the insert point.

Copy, Move, and Exchange edits can be performed on the same track or between tracks. In Copy or Move mode, all eight tracks can be edited at the same time. Start, End, To, and From points can all be adjusted. The To point dictates where your selection (the area between the Start and End points) will end up, and the From point lets any point within the selection be aligned with the To point. Normally, your Start and From points are the same. These four edit points make it possible to line up any part of a selection to any point in time, which means the VS-880 is capable of locking sound to picture (e.g., videos, commercials, movies, etc.) with pinpoint accuracy.

The Move edit lets you scoot any selection forward or backward in time; Exchange allows tracks to be swapped simultaneously. Imagine the Exchange function as the empty space in one of those puzzles that allows you only one space in which to move the pieces in order to complete the picture. This is an invaluable function for organizing tracks. Copy is self-explanatory, but it's noteworthy that a copied selection can be repeated up to 99 times. This is wonderful for looping (e.g., creating a drum loop throughout your entire song).

A great way to find precise edit points is with the scrub feature. Hitting the Scrub button turns the rotary dial into a scrub wheel and the LCD screen into a Waveform-Amplitude display (see **Fig. 2**). As you move the scrub wheel, each indentation represents a snippet of sound. This snippet is repeated until the wheel is moved to the next indentation, causing the next snippet to sound. Audible snippets can be as short as 25 milliseconds or as long as 100 milliseconds. However, you can cursor through and edit data in increments as small as 1/3000th of a second. The amplitude waveforms aren't as informative as real waveforms, but they're better than nothing. And they work pretty well for finding zero crossings.

MASTER AND SLAVE

When most HDRs are first released, synchronization tends to be a can of worms, and the VS-880 is no exception. The VS-880 syncs via MIDI, and that's it. There aren't any plans for future SMPTE options or synchronization cards for ADAT or DA-88.

The VS-880 can function as a master or slave. As a master, it generates MTC and MIDI Clock. It also has the ability to record MIDI Clock data from an external MIDI device onto a MIDI sync track without eating up an audio track. With MIDI Clock recorded on the VS-880, the external MIDI device that generated the clock can be slaved to the VS-880. Making the VS-880 the master instead of the slave usually results in a more stable lock than doing it the other way around. This method of synchronization is especially useful when a MIDI file containing tempo changes has been created prior to recording the live tracks.

As a slave, the VS-880 will sync to the standard frame rates: 30, 29.97, 25, 24, and 29.97 drop-frame. However, the VS-880 will slave to MTC only, not to MIDI Clock. So if you have a sequencer that only transmits MIDI Clock (e.g., *Performer*), you can't slave the VS-880. Of course, this "shortcoming" isn't unique to Roland, as MIDI Clock isn't a desirable way to lock to an HDR in the first place. For locking the unit's start time with that of an external sequencer or multitrack's start time, you can enter a SMPTE offset time of up to 24 hours.

The VS-880 is pretty picky about its MTC source. I was hoping to synchronize it to my ADAT for track transfers but had no luck locking it to the BRC. Out of ten attempts, I accomplished a phase-accurate lock only once. The other attempts resulted in ominous discrepancies that at times appeared to be off by as much as a frame. Of course, these discrepancies could be attribut-able to the ADAT and BRC, which use a motor-based sample clock that is hardly a time-code touchstone. A JLCooper PPS100 also yielded an erratic lock. Roland recommends that you use the Midiman Video Syncman as an MTC source, but due to time constraints I was unable to give it a try.

Apparently, though, the VS-880 likes its own MTC. You can purportedly slave an undefined number of VS-880s to a designated VS-880 master. (This is the recommended way to link multiple VS-880s together.) Roland claims to have locked four units together successfully with no audible MTC lag. As I had only one VS-880, I was unable to try this.

The VS-880 comes MMC-ready and can function either as master or slave in a closed-loop system. Using it as a slave, I managed to get the VS-880 to work

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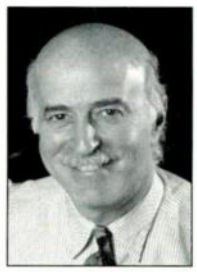
An open letter from Morris Ballen, Disc Makers Chairman



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with *Studio Vision Pro* 3.0 but had no luck with *Performer* 5.0. (Roland's representative, however, claims the company has had no problem slaving the VS-880 to *Performer* 5.0.)

Using the VS-880 as a master, I tried hooking it up to the BRC, but again, the two units didn't get along. At a

▼

Erase, Cut, and Insert edits work pretty much as you'd expect.

Roland product demonstration, I witnessed the VS-880 working beautifully with Roland's new XP-80 keyboard, both as master and slave. Unfortunately, I can't vouch for how tight the lock was, as I didn't actually have my hands on the units.

Another handy synchronization and timing feature the VS-880 offers is its metronome. The metronome source can be an internally generated click or a MIDI note message. The first downbeat of a bar can be assigned a different MIDI note than the others, for a total of two MIDI notes. You can also adjust each note's Velocity.

The metronome allows an artist to play against a click track alone and then lock up virtual tracks to the same click track later on. However, the click from every sequencer I tried (and I tried a bunch, from software sequencers to drum machines and onboard keyboard sequencers) was late when compared to the VS-880's internal click. Because each sequencer's click was identically late and didn't drift, I attributed the problem to MIDI delay in the VS-880. (Obviously, there is no MIDI delay on the internal click.) Of course, the way around this is to use the VS-880's MIDI-note click rather than its internal click.

PETTY COMPLAINTS

The VS-880 is a deep device, so it deserves a better manual than the sketchy volume that accompanies it. In particular, the manual's index could use a fact check and rewrite. For example, the entry for metronome directs the reader to page 20; however, there's no mention of metronomes on that page. In fact, the metronome sections are on pages 34 and 73. This is true of other index headings, as well—that is, if you're lucky enough to find the topic you're looking for in the first place. Turbostart, the VS-880's video start-up manual, is a bit more informative than the written manual but is by no means comprehensive.

Fortunately, Roland has contracted with an outside writer to produce a comprehensive, tutorial-based owner's manual for the VS-880 as well as an extensive owner's manual on video. The written manual is expected to be available in the fall of 1996.

Another gripe I have with the VS-880 is its typically Roland-esque, two-hands-minimum user interface. You know the routine: hold down the Shift key with one hand, press the button at the top right with the other, next turn the dial, and then spin around three times. Congratulations, you've done an edit! This type of user interface is annoying when you already have both hands on an instrument, especially when the problem could easily enough be remedied with more dedicated-function buttons and fewer multifunction ones with Shift-key submenus. Oh well, at least the virtual tracks are easy to use.

Another irritating problem I encountered was a bizarre ramp time between the source sound and the disk

Product Summary

PRODUCT:
VS-880 Digital Studio Workstation
PRICE:
$2,495 (with 540 MB internal HD)
$2,895 (with Iomega Jaz drive)
$395 (VS8F-1 Effect Expansion Board)
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EASE OF USE	● ● ●
AUDIO QUALITY	● ● ● ●
VALUE	● ● ● ● ◖

sound when punching in or out during recording. For example, a punch out, rather than switching you immediately from source to disk, results in a momentary signal lapse followed by a rapid fade into the disk. This occurs both in Manual Record and Auto Record modes. In Auto Record, it happens when punching in, too, only in reverse. This is a monitor problem, not a Record problem. The punches, although strange sounding, are correctly executed. Nevertheless, the net result is a punching system that doesn't work satisfactorily. It's a pain having to rewind in order to verify a punch you should have heard in real time. Hopefully, this problem will be corrected in a future OS upgrade.

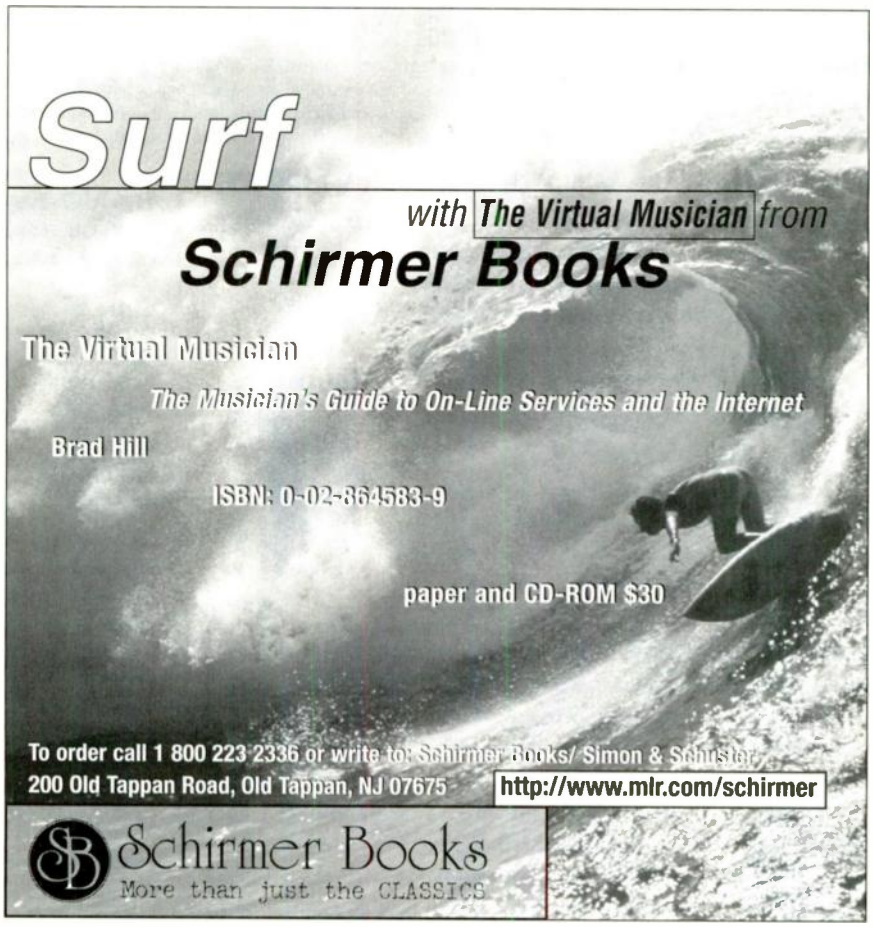
JOURNEY'S END

Roland's VS-880 is an extremely well thought out and feature-intensive machine. Despite its semiprofessional standing (no multiple outputs, only four inputs, limited synchronization, limited expansion, etc.), it's a winner in my book. Of course, it should be evaluated for what it is and the particular market it's aimed at. With those factors in mind, I can say without a doubt that the VS-880 is the best HDR in its price range today.

Thanks to its onboard effects, virtual tracks, removable storage medium, and compatibility with MIDI sequencers (not to mention its light weight and small footprint), I found the VS-880 to be one of the handiest composition tools I've used. The powerful features compensated for the semipro design so that I was able to just take the VS-880 for what it is: a remarkable, great-sounding digital studio in a single box.

My biggest wish is that it would somehow sprout a SMPTE port to make transfers between ADATS and other multitrack machines easier. But then again, with access to all these internal mixdown goodies plus high-quality sound, do I really need to transfer tracks to mix them? Maybe I should sell all my equipment, forgo major studios, and just hang out in the corner with the VS-880. I mean, you can do practically everything with this machine and just call it a wrap.

Erik Hawkins *often wonders whether he's crazy for doing all this music stuff. But as his dreams come true, the answer is clear: yes, the insanity is worthwhile.*



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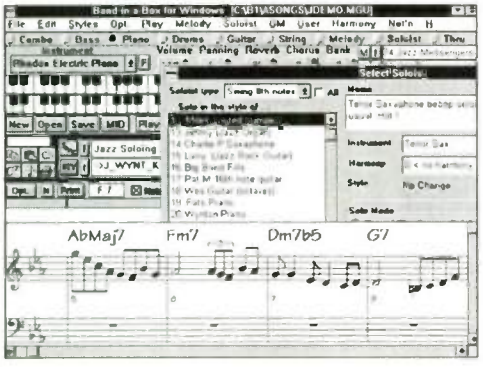

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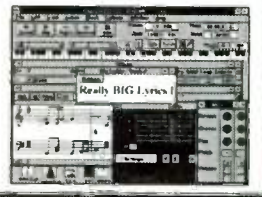

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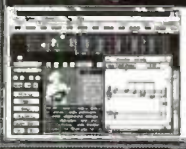

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SEPTEMBER 1996

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Digidesign Audiomedia III (Win)

By Dennis Miller

The next generation of midpriced audio cards.

After dominating the Macintosh desktop-audio world for many years, Digidesign attempted to move into the PC market three years back with Session 8. Though a good system, Session 8 was priced like a Mac product, and many cost-conscious PC users were slow to accept it. With the release of the Audiomedia III sound card, Digidesign has gone after midlevel Windows home recordists. The new card is also available for PCI-based Power Macs.

Audiomedia III provides a professional-quality option for the rather limited midlevel Windows audio market, which has been dominated by Digital Audio Labs' CardD system. With the support of several major sequencers and all Windows-compliant audio editors, the new Digidesign card instantly jumps to the top of the heap.

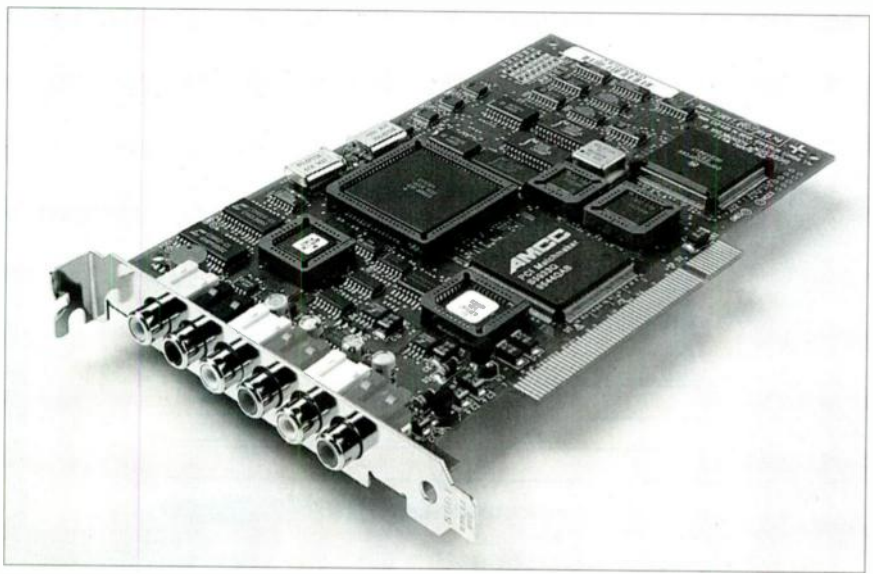
The Audiomedia III is a single-slot, 7-inch PCI card that provides analog and digital I/O at sample rates of 11.025, 22.05, 44.1, and 48 kHz. The optional *Session* 2.5 software is a revision of the version that comes with the Session 8 PC hard-disk recording system, although users of that system can upgrade to *Session* 2.5. Together, Audiomedia III and *Session* 2.5 offer four tracks of simultaneous recording and eight virtual playback tracks mixed down to four channels of output (using both the analog and digital outs). Eight bands of real-time parametric EQ are also available.

The Audiomedia III requires a 75 MHz or faster Pentium computer with 8 MB of RAM or more. It is compatible with the Plug and Play architecture—my Windows 95 computer identified it and loaded the correct driver on the first try. It works with Windows 3.1 or Windows 95 and can be used with fast, 200 MB or larger SCSI or EIDE hard drives.

ALL ABOARD!

Many computer-based digital audio systems depend on the speed and activity of the host CPU to determine the number of available playback tracks. If there are many other programs running at the same time, the number of tracks is often reduced. The Audiomedia III, however, always provides eight playback tracks because all processing is handled by an onboard Motorola 56002 DSP chip.

In addition, you get four channels of simultaneous playback and recording using a combination of the card's analog and digital ins and outs. You can also create an effects loop using the analog ins and outs while using the digital output as the main out, which is a handy option.



The Audiomedia III PCI card for the PC includes its own DSP, which allows up to eight simultaneous playback tracks regardless of the host CPU.

START YOUR SESSION

EM reviewed *Session* 2.0 software for the Mac in the April 1996 issue, so I won't repeat that information here. There are some important new features in the current PC version of *Session*, however, which I'll examine along with some of the custom options provided by other software manufacturers.

EQ allocation is somewhat different on the new Windows version, which provides eight bands of real-time EQ; four bands can be dynamically assigned per track. *Session* for the PC also supports 11 and 22 kHz sample rates and offers a DAT backup option. For editing, the PC software offers scrubbing capabilities and provides a Shuffle Mode option, in which contiguous audio regions placed in a track are automatically butted up against one another.

Session performed all its basic functions perfectly every time. I recorded dozens of samples from an audio sample CD using the digital ins, and I also remixed a large multitrack project that I had originally created on a Spectral Digital Studio system. I especially like the Digidesign system's sync options. Slaving my digital audio sequencer to *Session* through an internal "virtual MTC port" was simple. However, this option won't work if you have digital audio data in the sequence because the card can deal with audio data from only one program at a time.

I was surprised to find that when my sequencer was running on its own and I started a recording in *Session*, the sequencer tempo dropped to about half its previous speed! This problem didn't occur when I tried Sonic Foundry's *Sound Forge* and Innovative Quality Software's *SAW Plus* under the same circumstances. According to Digidesign, the current version of *Session* includes an older virtual device driver that is responsible for this problem. The company has a fix, which should be available on their Web site by the time this review is in print.

In addition, *Session* could be in better compliance with the standard Windows spec. For example, it lacks tileable windows and online help. I also wish more of its interface elements were customizable. For instance, the window at the left of the track screen that shows

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various track parameters should be removable so you can see more of your audio data (see **Fig. 1**).

SUPPORTING CAST

Using the Audiomedia III card with software other than *Session*, such as digital audio sequencers and audio editors, presents some interesting options. But before I elaborate, I should explain some basic concepts relating to the way these programs communicate with the card. In theory, there are three different ways that other programs can access the card: standard Windows WAV drivers, custom dynamic linked libraries (DLLs), and the Digidesign Audio Engine (DAE).

Windows drivers are included with the Audiomedia III and allow any Windows audio program to work with the card. *Sound Forge, SAW, Media Player,* and digital audio sequencers work fine with these drivers right out of the box. In effect, they turn the Audiomedia III into a standard, Windows-compliant sound card. However, 48 kHz operation may or may not be available, depending on the application. For example, *Sound Forge* supports 48 kHz, but *Cakewalk Pro Audio* does not.

Unfortunately, the Windows drivers provided by Digidesign are limited to half-duplex operation. In other words, you can't listen to existing tracks while recording, which effectively prevents overdubbing. I find it hard to understand this arbitrary limitation imposed by the company; other full-duplex sound cards include drivers that accommodate simultaneous recording and playback. You can overcome this problem by using the DLL or DAE options (discussed shortly).

In addition, using these drivers requires a tradeoff: when they're enabled, you're likely to get additional virtual track throughput in any multitrack audio program, but you lose the real-time equalization. And according to Digidesign, the timing is somewhat less accurate.

For example, using my Pentium 133 and *Cakewalk Pro Audio* 5.0, I got fourteen virtual tracks (44.1 kHz, 16-bit, mono) with the Windows drivers enabled, and only eight tracks without them. Representatives of Steinberg, makers of *Cubase Audio,* claim to have gotten up to sixteen virtual tracks, but I was unable to confirm this on my system.

When using *SAW Plus* with the Windows drivers, I got only eight mono tracks. However, this was probably due to the large track overhead *SAW Plus* sets aside, which allows it to perform a considerable amount of real-time processing. In no case did I detect any timing problems on my system, whether with audio alone or with audio and MIDI combined, but it's likely that slower systems could have some problems.

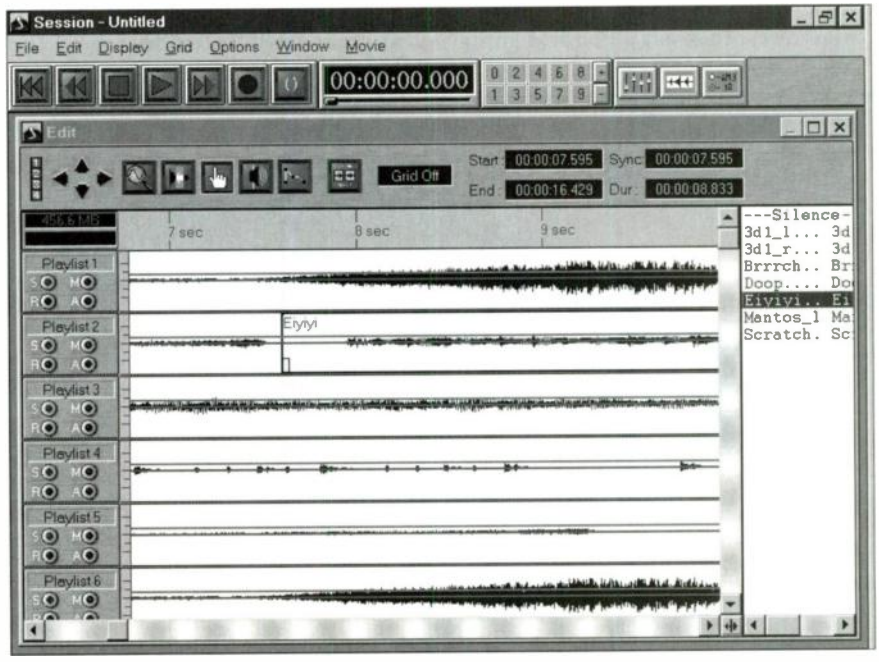

FIG. 1: *Session*'s main screen displays several tracks of audio and all relevant controls, but the controls on the left can't be hidden to reveal more of the waveforms.

The DLL option requires that third-party manufacturers write custom code to communicate directly with the Audiomedia III. At present, only *Cakewalk Pro Audio* 5.0 and *Cubase Audio XT* support this option. By adding a single line to *Cakewalk*'s INI file, you can tell the program to use the standard Windows drivers or the DLLs. *Cubase XT* requires you to reinstall the program to switch between the standard drivers and the DLL option. Other versions of *Cubase* that support digital audio, such as *Cubase* 3.0, can only use the standard drivers.

Once the custom DLLs are enabled, the card's real-time EQ features become available in both programs. For example, *Cakewalk* displays a screenful of controls for adjusting frequency, gain, attenuation, and equalizer type (high shelf, low shelf, wide band, or narrow band) while a WAV file plays back (see **Fig. 2**). One small nuisance is that you must start playback before opening the EQ screen; you can't access the record and play controls while the window is open.

In *Cubase XT*, you can access the EQ controls while performing any function. The EQ and audio controls appear as mixer maps directly from the Arrange screen. Both *Cakewalk* and *Cubase* provide only eight virtual tracks in this mode, a limit imposed by Digidesign to ensure stable and reliable performance on any PC. With either program, the EQ sounds great, and it's easy to manipulate.

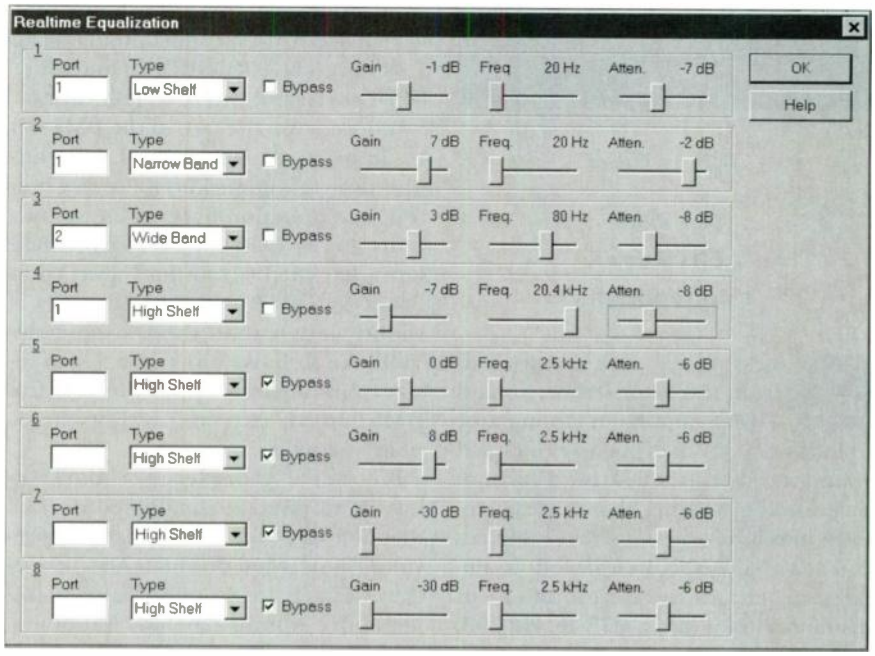

FIG. 2: The Audiomedia III EQ controls in *Cakewalk Pro Audio* 5.0 let you specify the type, frequency, gain, and attenuation of eight bands.

The final option for using the card is DAE, Digidesign's real-time audio operating system. DAE provides enhanced capabilities to both Digidesign and non-Digidesign software for working with Digidesign hardware. As of press time, this system is currently limited to Mac systems, but version 1.0 has been released for the PC and should be fully implemented by the time you read this.

Emagic claims that the PC version of *Logic Audio* is fully DAE compliant, and I expect other companies to jump on the bandwagon before long. Although the exact details of DAE's operation shouldn't concern the user, adding features such as plug-ins is much easier for manufacturers who choose to support it.

SOUND QUALITY

Testing the card with all the different software options gave me a chance to listen to many musical examples, and I found the Audiomedia III's sound quality to be very high. On many occasions, I connected the digital outs directly to a set of stand-alone 18-bit D/A converters that I often use. I also used the analog outs, in some cases combined with the digital outs. For the most part, the sound was clean and bright.

Percussion samples were crisp and clear, vocal material sounded full and rich, and some bells I synthesized using a sound-programming language called Csound were especially colorful. I did detect a slightly higher noise floor using the analog outs than I heard when using the outboard D/A converters. This is probably due to the fact that the card is housed inside the PC, which is not the ideal setup for digital audio. But this really wasn't a problem until I raised the mixer's faders well past the point at which I could comfortably listen to music.

Overall, the Audiomedia III card is an excellent solution for musicians who wish to enter the world of high-quality, multitrack digital audio editing. Combined with the *Session* software, it's a good value, and the ability to use it as a Windows sound card with your existing digital audio sequencer or multitrack software is a great bonus. You won't find anything of comparable quality in this price range except the CardD system. Audiomedia III is a welcome addition to the Windows audio world, and it will certainly become the card of choice for a great many users.

Dennis Miller *is a freelance composer living in the suburbs of Boston.*

Product Summary

PRODUCT:
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PRICE:
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FEATURES	●●●●●
DOCUMENTATION	●●●●◖
AUDIO QUALITY	●●●●◖
VALUE	●●●●◖

Alesis DM5

By Steve Wilkes

The drum hits keep on coming.

Assessing the evolutionary trail from the Linn Drum, Roland TR-808, and E-mu Drumulator to today's family of drum machines and sound modules is a task for a techno-paleontologist rather than a musician. Even musicians without science degrees can see that Alesis has played an important part in the development of drum machines with its HR-16, HR-16B, and SR-16.

Subsequently, the company helped push the drum module another step up the evolutionary chain with the D4, which incorporated the best sounds from the aforementioned Alesis drum machines and added trigger inputs. (All of these products have been reviewed in **EM**; see the sidebar "EM Covers Alesis Drum Products.") True, the D4 wasn't the top choice for those who wanted original sounds: as with the DM5, it offered little in the way of sound-programming parameters. But the addition of trigger inputs made the D4 into a superb brain for electronic drums as well as a versatile MIDI sound module.

It's obvious from the start that the DM5 is in the same tradition as the D4. You don't have to be an expert in music-technology prehistory to see that the new Alesis drum module simply represents another evolutionary step.

EVOLUTION, NOT REVOLUTION

As I said, the DM5 is an evolutionary advance over the D4, but it's not a revolutionary product. It has a lot in common with the D4 but does many things better. Like the D4, it has more than 500 Velocity-sensitive drum and percussion sounds; 16-note polyphony; four ¼-inch unbalanced audio outputs (main L/R and sub L/R); MIDI In and Out/Thru ports; and twelve trigger inputs.

Indeed, even the face of the DM5 will be familiar to D4 users. The headphone jack, volume knob, Preview button, and Function buttons on the two units are virtually identical. Each box has a backlit LCD and a Value knob (data wheel), but the DM5's LCD is slightly larger than the D4's and the Value knob looks more like a synthesizer alpha wheel. Like the D4, the DM5 has an external wall-wart AC power adapter.

But unlike its predecessor, the DM5 has 18-bit digital-to-analog converters that deliver better fidelity than any previous Alesis drum product. Also new to the Alesis drum-module line is a collection of sounds labeled "Random." With these sounds, the user can randomly trigger related samples, such as snare variations, for an authentic sound and feel during live performance.

The unit's design makes it easy to use, and it is made even more accessible by the excellent documentation. The manual is clear, concise, and well written, and it includes a MIDI implementation chart. Unfortunately, it does not include an index.

A REAL WORLD-BEATER

Alesis gives you 548 sounds in ROM, which are organized into eight groups called Voice Families. You get 95 kick drums, 117 snares, 71 tom-toms, 34 hi-hats, 36 cymbals, 114 assorted percussion sounds, 65 effects, and 16 sounds classified as Random. The last really blew me away; I'll discuss them a bit later. The collection includes a good variety of processed and dry snares, kicks, and toms.

The DM5 is world-beat friendly. Alesis has answered one of the top requests from D4 owners by supplying a huge array of ethnic-percussion sounds, which are found in the Percussion Voice Family. I particularly love the collection of shakers: "Bead Pot" and "Lo Shaker" knocked me out. I am the loving owner of two beautiful rainsticks, which I frequently use purely as shakers. When I triggered the DM5's "Shaken Rainstick," I couldn't believe my ears. The sample was so realistic I was momentarily taken aback; it sounded as good as my own rainsticks. The "Castanet" and "Castanet Rolls" are also fabulous. They will have you looking around your studio to see whether a real flamenco dancer is in the house.

Native American drumming is represented with three different drum samples, all good. You'll also enjoy the tablas, tavils, and clay drums. But the sweetest ethnic drumming experience has to be the talking drums. Try triggering these babies while using Pitch Bend; you'll have the time of your life imitating the talking drummers in Nigerian Ju-Ju bands.

The DM5 is also very contemporary, providing a generous assortment of techno, industrial, and hip-hop sounds. The kicks, snares, hi-hats, and other sounds associated with these styles are present in abundance. When I played the "Smoke" and "Aggressor" kick-drum sounds, I thought they belonged on the next Nine Inch Nails CD.

Special effects–conscious musicians will love the collection of guitar hits in the Effects Voice Family. If the D4 reflected a Steely Dan–like consciousness with its collection of great drum-set sounds, the DM5 reflects the much more diverse music world of 1996.

Varied as the DM5's sounds may be, I still wish Alesis had provided more orchestral sounds than just the three orchestral snare samples (including "Orchestral Roll") and the excellent orchestral crash cymbal. Timpani, tam-tam, triangle roll, cymbal swell (roll), concert bass drum, and glockenspiel would have been great additions. Alas, they are not to be found.

Considering this, an expansion-card slot would have been a great feature and would have kept the DM5 contemporary for years to come. Apparently the issue here was cost, which is

Alesis' DM5 drum module offers more than 500 tasty sounds, including plenty of ethnic percussion, and has twelve trigger inputs. Its Random Voices feature triggers realistic drum variations.

fair enough when you consider the unit's $449 list price.

DRUM SETS

The DM5's sounds can be assigned to any of the 21 user-programmable Drum Sets. A Drum Set contains 61 sounds from any of the Voice Families, which can be mapped to a 5-octave range. The Drum Sets can be stored internally and offloaded via SysEx.

Creating custom Drum Sets is quick and easy. I worked with a drumKAT as my controller, but the steps are the same with any MIDI controller. When you turn on the Note Chase function of the DM5 and trigger a note with the controller, the current sound assigned to that note appears on the DM5's LCD. Using the Value knob, you can then change that sound to any of the DM5's 548 sounds. By repeating this procedure, you can quickly create a custom kit. The machine has an edit buffer, which means you can undo all your changes and revert to the stored Drum Set.

As with the D4, you can't map sounds to notes beyond the 5-octave range. However, you can set that 5-octave range to be anywhere within the band of C-2 (root note) to G8 (highest note). The first kit I created was a world-percussion collection from the DM5's Percussion Voice Family that sounded so good I couldn't wait for a chance to use it.

The sound-editing features are limited to tuning, volume, panning, and output assignment. You can copy the parameters assigned to one MIDI note to another note, which makes editing faster. I wish this unit allowed more extensive editing of the sounds, though. Tuning sounds is an effective tool, but I would like to customize the filtering and envelopes, at least.

RANDOM VOICES

Triggering sounds from the Random Voice Family is a unique experience as these sounds seem tailor-made for real-time performance. When a Random sound is played, each attack triggers a sample from the same Voice Family. For example, when I played "Real Snare" from the pad on my acoustic snare drum, each strike triggered a different, but related, snare sample. I was blown away by the authenticity of the resulting sound. Each subsequent attack produced the same kind of extremely subtle differences (such as slight pitch variations) heard when one

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plays a real acoustic snare.

"Freak Snare" is the kind of high-pitched, ringing drum many hip-hop artists love. When you hear its sonic texture change subtly and convincingly with each attack, you know all rap artists on the block will be lining up to get their hands on this sound.

The samples rotate randomly through consecutive attacks. The Dynamic Articulation capability of the DM5, in which a sample's timbre is altered as a function of Velocity, works in conjunction with Random Voices to create one of the most realistic triggering experiences imaginable. The 16-sound Random Voice Family includes hi-hats, snares, shakers, hand drums, and effects. I wish there were more sounds in this group because none of the other sounds in the DM5 can be customized for Random performance.

TRIGGER INPUTS

The DM5 has twelve trigger inputs that let you play the internal sounds from standard electronic drums. In addition, the trigger inputs can generate MIDI note information, making it a great trigger-to-MIDI interface for use with other sound sources. The unit can simultaneously respond to trigger data and MIDI notes, so electronic trigger pads (or contact transducers on acoustic drums) can be used in conjunction with a MIDI controller or sequencer.

Five trigger parameters are provided. Velocity Curve sets the trigger sensitivity. The Crosstalk parameter helps suppress false triggering. Decay affects the time and threshold of the trigger-signal decay, which is especially helpful if you have to play quick, successive attacks on a specific trigger or are experiencing double triggering due to the long decay times of an acoustic-drum trigger source. The Noise parameter allows the user to adjust the noise floor on a trigger. Gain adjusts the trigger-signal input level.

I tested the DM5 using Kat fatKAT and hatKAT pedals and Concept One trigger pads on acoustic drums. Getting going is easy: within seconds I was plugged in and playing great drum sounds. The trigger inputs default to specific MIDI note numbers (trigger 1 = B♭1, trigger 2 = C1, and so on), so they trigger the sounds that are mapped to those notes on the current Drum Set. If you are set to, say, "Standard Set" (a set of generic drum sounds), you can play a full drum kit after plugging in with little or no remapping.

Even if you do have to remap the notes assigned to the trigger inputs, you'll find it a quick and easy process, much like creating Drum Sets. I found I had to adjust the gain upward on the snare trigger pad to get the dynamic response I wanted and lower the gain on the trigger pedals. But other than that, the trigger response generally felt good from the start.

A Footswitch mode allows you to set an optional footswitch to either step through the Drum Sets or act as a hi-hat pedal. The latter function is extremely cool. Used in conjunction with an open hi-hat sound assigned to trigger input 1, it can create realistic opening and closing hi-hat effects.

DRUM-SOUND REPLACEMENT

The DM5 can also be triggered from an audio source. This is especially handy if you are trying to fix a bad-sounding drum that is already recorded on tape. If the bad drum is on its own tape track, you can route the taped signal to one of the DM5's trigger inputs and replace it with the DM5 sound of your choice.

I tried this function using a DAT tape with a snare sample on the left channel and a kick-drum sample on the right channel. After plugging the DAT player's left and right audio outputs into two trigger inputs of the DM5, I was able to trigger a kick drum and snare from the DM5. The audio signal on the tape needed to be reasonably hot for this to work well. I was extremely impressed with how well the DM5's trigger interface matched the kick and snare sounds on tape. The DM5's internal snare even perfectly matched a flam on the taped snare.

I was so impressed by this trigger interface that I decided to try one more experiment. I set the DM5's Local Control to Off (disabling the internal sounds) and connected its MIDI Out port to the MIDI In port of my Roland D-50 keyboard. I once again cued up the DAT tape and called up a marimba patch on the D-50. I hit Play on the DAT player, and the D-50 marimba followed the taped kick and snare rhythm perfectly. Feeling a little like Butch Cassidy and the Sundance Kid as they admired their pursuers, I looked at the DM5 and thought, "This thing is good!"

GROUP MODES

The Group functions give you control over the way any sound responds to repeated attacks. There are four variations. In Multi mode, the sound goes through its full decay envelope after every attack. This is good for sounds with long sustain, such as cymbals. In Single mode, subsequent attacks of a given sample cut off the decaying sound. This is great for short, staccato sounds, and it worked well on the "Orchestral Cymbal," which is a handheld orchestral crash cymbal. (For a famous example of this sound, go out and rent Alfred Hitchcock's remake of *The Man Who Knew Too Much*, and watch the climactic scene that takes place in Albert Hall with Bernard Herrmann conducting the orchestra.) When this crash is done by real orchestral percussionists, each attack slightly chokes the previous attack's decay. Single mode helped simulate this nicely.

The last two modes are called Group 1 and 2. These allow any triggered sound to cut off the decay of any other sound assigned to the same Voice Family. This is especially useful for hi-hats: a closed hi-hat sample can cut off the decay of an open hi-hat sample.

MIDI IMPLEMENTATION

You can change Drum Sets at any time via MIDI Program Change even while

EM COVERS ALESIS DRUM PRODUCTS

Features

"Using the Alesis HR-16 As an Expander Module" ..... November 1988

Reviews

HR-16 drum machine ..... May 1988
HR-16B drum machine ..... November 1989
SR-16 drum machine ..... May 1991
D4 drum module ..... February 1992

the module is playing. Drum Sets are mapped to specific Program Change values using the unit's Program Change Table. The module can be set to respond to either Program Changes 0 to 127 or 1 to 128.

The unit responds to MIDI Volume and Velocity, but it ignores a Velocity value of zero, which some people like to use instead of sending a Note Off message to cut off a note. It also does not recognize Aftertouch, and the few Control Change messages it supports are mostly for data entry (CC 6) and increment/decrement (CC 96 and 97), not for modulating the sounds.

Pitch Bend is global and cannot be mapped to just one sound. Its range is preprogrammed for each sound and can sometimes extend beyond the amount of pitch variation you can set with the Tuning parameter. You have to send the Pitch Bend message before triggering a note or group of notes; notes that have already been triggered will not be affected.

The drum module recognizes All Notes Off, Reset All Controllers, and nonregistered Control Changes 98 and 99. The latter two can be assigned to any editable DM5 parameter; the CC value determines which parameter is affected, and the data-entry knob sets the parameter value.

Of course, the Alesis DM5 supports Local On and Off, which you would normally turn off when you're using an outside sequencer or playing an external sound source from the trigger inputs and switch on when you're using the trigger inputs to control the onboard sounds.

Product Summary

PRODUCT:
DM5
PRICE:
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MANUFACTURER:
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• DM5

For people who have been racking their brains for ingenious ways to get around polyphony limitations, the DM5 sports a MIDI Overflow mode. With this feature, when your drum parts exceed the DM5's polyphony, the leftover notes are routed to the module's MIDI Out/Thru port so they can be played by another sound source. This feature is common in synthesizers but is less so in drum modules.

Finally, the unit's memory can be backed up via System Exclusive. By the way, the D4 and DM5 use the same Trigger Setup data format, so you can save your D4 Setups via SysEx and load them into your DM5 or vice versa.

THE FANS VOTE

I had the opportunity to try out the DM5 in a live show using the Zendrum Z-2, an electronic percussion MIDI device that is played with the fingers. (The Z-2 was reviewed in the March 1996 **EM**.) I played a groove that used many of the DM5's hip-hop and techno samples, and the sounds were crisp and clear. They definitely caught the ears of the audience. I couldn't help but think that this module speaks the digital drum language of our day. Used musically, it communicates.

The dynamic response of the samples was great, and there were no uncomfortable moments. I play live electronic percussion in many different situations, and feeling comfortable with the gear in front of a large crowd is very important to me. The DM5 did not let me down.

CAN'T BE BEAT

Without a doubt, the DM5 is hard to beat. Alesis has been a tremendous help in the evolution of drum machines and modules by improving on a great product (the D4) and making its sequel truly contemporary. Despite my reservations about the lack of an expansion-card slot, too few orchestral samples, and limited editing capacity of the sounds, when all is considered, this is a formidable module for the price. I'd be surprised if any drum module on the market can top it for cost effectiveness. This is one of those rare products you don't ask how you can afford to have, but rather how you can afford *not* to have.

Steve Wilkes *is one half of the electronic percussion/voice duo, Fordham Wilkes. He wishes Santa Claus would bring him the products he writes about in* **EM**.

Steinberg WaveLab 1.0 (Win)

By Allan Metts

A slick digital audio editor for Windows 95.

Okay, I'll admit it: I was a die-hard IBM OS/2 user. When the rest of the world was using Microsoft Windows, I was telling my friends and neighbors to get a "real" operating system. We OS/2 users were certain that Bill Gates was going to lose the operating-system wars.

But alas, he didn't. And yes, I'm now running Windows 95 at home, at work, and in my studio. I even like it. And now that music software is starting to use the power of a true 32-bit, multitasking operating system, I'm ecstatic.

Among these products is Steinberg's *WaveLab*, a true 32-bit audio editor designed for use exclusively with Windows

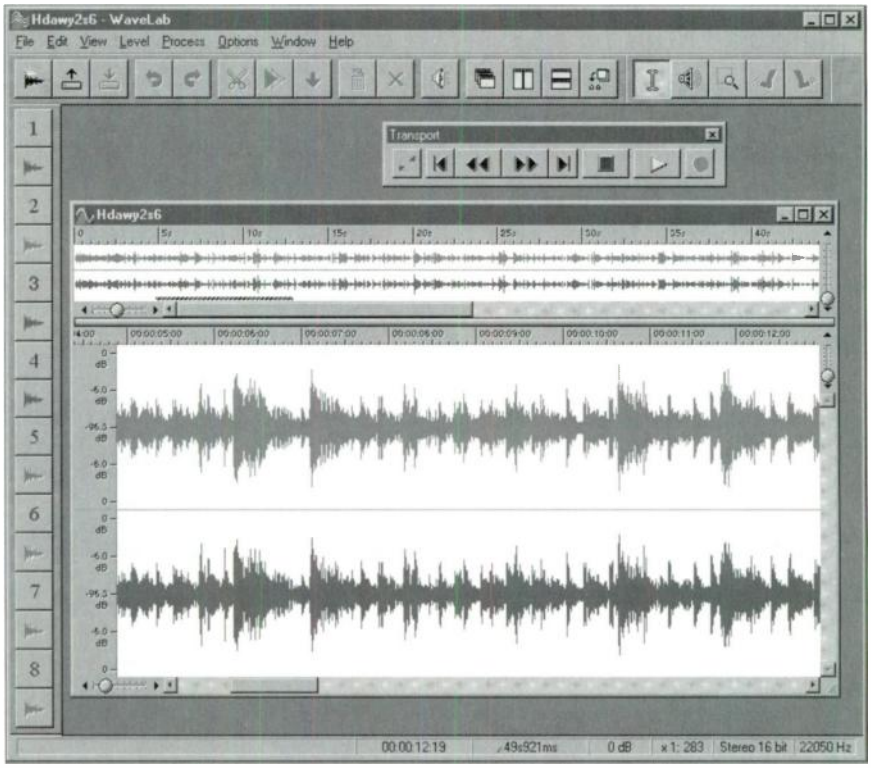

FIG. 1: *WaveLab*'s editing windows contain an overview and an editable Main view. Each view has independent zoom and scroll controls.

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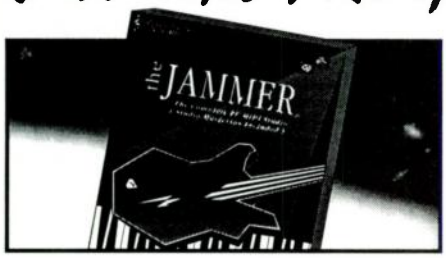

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• WAVELAB

95 and Windows NT. It can read, write, and edit both AIFF and WAV files (including WAV files compatible with Digidesign's Session 8, which users can edit in stereo), and it can use any 16-bit MPC-compliant sound card. *WaveLab* uses a CD-ROM copy-protection scheme that requires inserting the installation disk every so often at launch.

CATCH A WAVE

WaveLab can open multiple audio files at once, with each file appearing in its own editing window (see **Fig. 1**). I especially like the ability to drag and drop files on the program from *Windows Explorer* and the ability to open two monophonic files into one stereo editing window. According to Steinberg, you can open *WaveLab* directly from an audio track in *Cubase*, which is very convenient.

Each editing window includes one pane for manipulating the audio waveform—Steinberg calls this the Main view—and a second pane that provides an overview of the entire file. An indicator in the Overview pane identifies the portion of the file that appears in the Main view. Both panes provide their own sliders for horizontal and vertical zooming, and they can be resized and scrolled separately.

▼

I thought WaveLab's multitasking would let me go further.

Much of *WaveLab*'s functionality appears in specialized dialog boxes and pop-up menus that are opened by clicking the right mouse button. Consequently, the program's initial working environment is surprisingly simple. There are four toolbars that can be moved, resized, hidden, or "docked." One contains transport controls (Play, Record, Stop, Fast Forward, Move to Start, Move to End, and Looping on/off) for playing and recording audio files. Another duplicates many of the program's menu items. The Toolbox toolbar determines whether the cursor selects, plays, zooms, or moves audio data.

The final toolbar provides access to eight Snapshot locations. If you tend to

move back and forth between disparate locations in an audio file or you find yourself constantly changing zoom factors, Snapshots will save you some time. For each editing window, you can store the Main View's current zoom factor and scroll position in one of the Snapshot locations. You can return to that setting with one mouse click.

You can change the measurements of the time and level axes by right-clicking on them. Time can be represented as minutes and seconds, samples, SMPTE time code, bar:beat:tick (you specify a tempo and time signature in the program's preferences), or file size. In addition, "zero" time can be placed at any point in the file. The vertical (level) axis can be represented in decibels, a percentage of maximum, or a decimal number representing the sample levels. I wish all audio editors provided this level of flexibility. I found the bar:beat:tick setting was a lifesaver.

Typically, there are multiple ways to perform any operation in *WaveLab*. You can move around an audio file by moving the scroll bars, clicking in the Overview pane, using the GoTo menu, recalling a Snapshot, or clicking the current position in the status bar. There are also many different ways to initiate playback, zoom in or out, and reposition the Wave Cursor (current-location indicator).

I like *WaveLab*'s recording function. When you press Record, a dialog box appears, containing everything you need in one place. You can specify the sample rate, bit resolution, and stereo/mono/dual-mono status of the file you are about to record. This dialog also includes input-level meters with peak

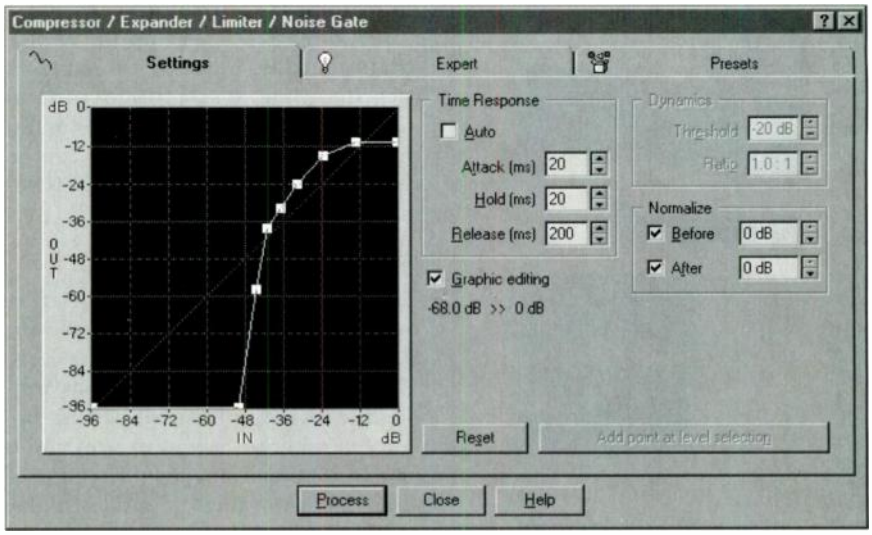

FIG. 2: *WaveLab*'s dynamics processor lets you draw your own compression, expansion, limiting, or gate functions. Notice the Presets tab, which contains settings for commonly used configurations.

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indicators. If your sound card has a mixer, one click brings up the appropriate controls. *WaveLab* also indicates recorded time, disk capacity in minutes and seconds, and the maximum peak for each channel (which can be reset at any time). I heard no glitches in any of my recordings.

IT SLICES, IT DICES

Once you open or record a WAV file, you will want to start tweaking it with *WaveLab*'s comprehensive editing tools. The program's multitasking environment lets you perform all editing operations without having to stop audio playback. I usually looped the section of audio I was working on and let it play continuously while I operated on it.

You can insert and name as many markers as you need in an audio file. The names appear in pop-up boxes when you hold the mouse over the marker. I usually placed my markers while editing a file, but you can also enter them with one keystroke while playback is in progress. The Wave Cursor can be placed at any marker by opening a marker summary, which also provides marker renaming and deleting functions.

There are many ways to select audio for editing, and all of the common mouse techniques are available. You can highlight portions of a file with the mouse or Shift-click to highlight a region between two points. Double-clicking in the waveform selects the region between the two markers on either side of the selected point, if they exist. If they don't, *WaveLab* selects the entire file. When you're working with stereo files, the mouse cursor changes appropriately to let you know whether you're about to highlight the left channel, right channel, or both.

WaveLab provides a couple of handy features that let you be a little imprecise when selecting regions with the mouse. Usually, you want to make splices at zero crossings to prevent audible glitches, so you can tell the program to snap your selections to the nearest zero crossing. You can even specify whether *WaveLab* should snap only to upward- or downward-sloping crossings. The program also offers a Magnetize Bounds feature that automatically snaps your selection to the nearest marker when you get close to one.

Once you've selected audio for editing, a host of tools let you move and copy it. For example, you can drag a selected region anywhere, even to other editing windows. In addition, you can hold down Alt or Shift to move the

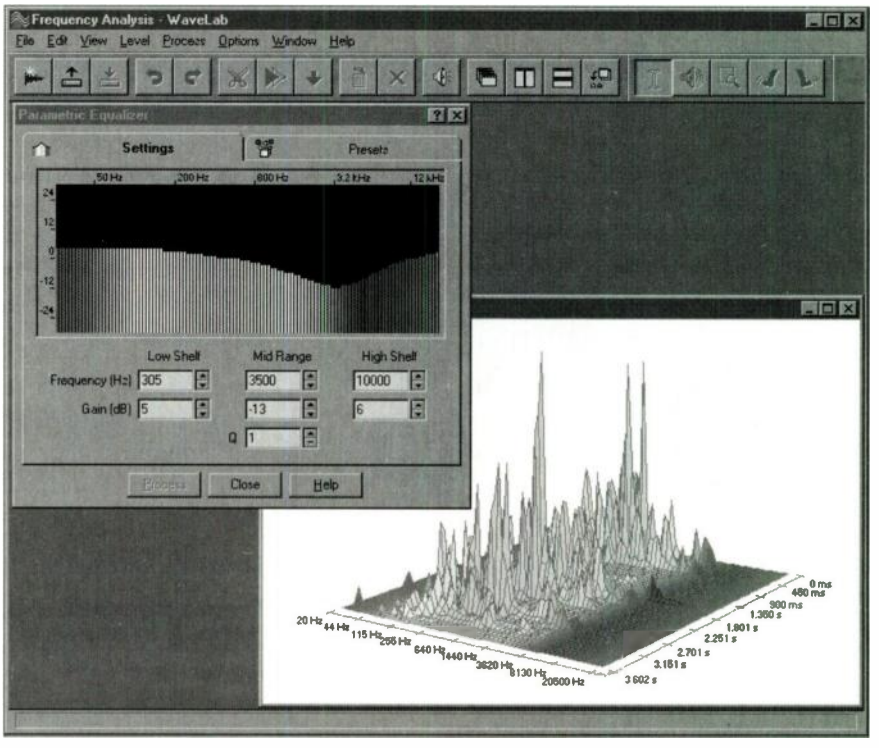

FIG. 3: The frequency-analysis graph and parametric EQ can be used in tandem to analyze and alter the harmonic content of your audio.

region without making a copy, and you can drag stereo selections to mono destinations (and vice versa). *WaveLab* makes intelligent decisions about how to handle different audio formats. If you drag audio to an empty place in the *WaveLab* workspace, a new editing window containing the selection opens. You can even drag audio to the Play button to hear it.

Cut, copy, and paste are available, and a pasted region can replace, insert

▼

My guitar part had really high green mountains.

into, or be mixed with the existing selection. The clipboard can be opened (and even changed!) in a separate editing window; unfortunately, however, the clipboard is incompatible with other Windows applications.

I did find one editing operation to be a bit cumbersome. It is impossible to drag a selection just a tiny bit forward or back in time; you must take the cursor completely outside the selection to release it in a new place. *WaveLab* provides Kicking (nudging) tools for this purpose, but they only move the selection one pixel per mouse click, which can represent different amounts of time, depending on the zoom level. I found myself clicking madly on the mouse when I wanted to move a selection back a few milliseconds. Dragging would be a lot easier.

WaveLab also offers several ways to delete portions of audio files. You can delete or silence a selection, remove everything but the selection, and insert silence. And if you mess something up, the program lets you undo as many steps as you need; the program creates temporary files as necessary. You can even specify the location of these temporary files and limit the number of undo levels if you have little disk space.

WAVE PROCESSING

WaveLab provides several processing tools. You can normalize amplitude levels, which sets the peak level to any value (up to 0 dB). You can also change the amplitude outright by ±12 dB. Other processors reverse a selection,

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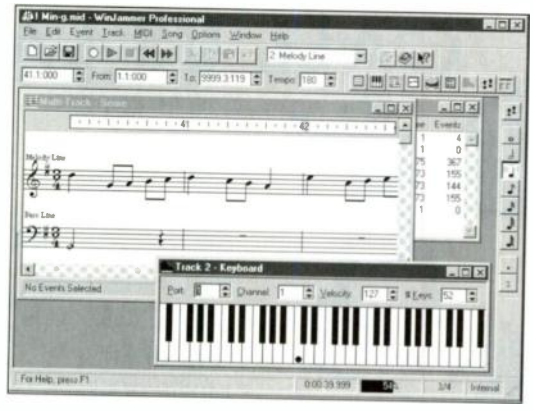

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eliminate any DC offset, invert the phase, and change the sample rate.

The program's dynamics processing is more advanced than simple gain changing. You can fade waves in or out and can crossfade between any two files. The program draws the fade curves on the waves as you change the settings. These curves give you a great picture of what you'll end up with before you actually run the processing.

WaveLab's compressor/expander/limiter/noise gate is easily my favorite processor (see **Fig. 2**). Using this tool, you can literally draw any relationship between input and output levels. In the graph, a 45-degree line represents no change between the input and output. Want a limiter? Flatten the line above a certain input level. How about a noise gate? Flatten the line at zero below a certain minimum threshold. Compressor? Make the diagonal line less steep above the desired threshold. You can create any combination of dynamics processors you want by using these techniques.

The program also includes pitch processing. You can alter pitch without changing duration and add multipart harmonies. The harmony processor lets you specify a pitch change and pan setting for each added voice, creating rich stereo harmonies. It can also create a

Product Summary

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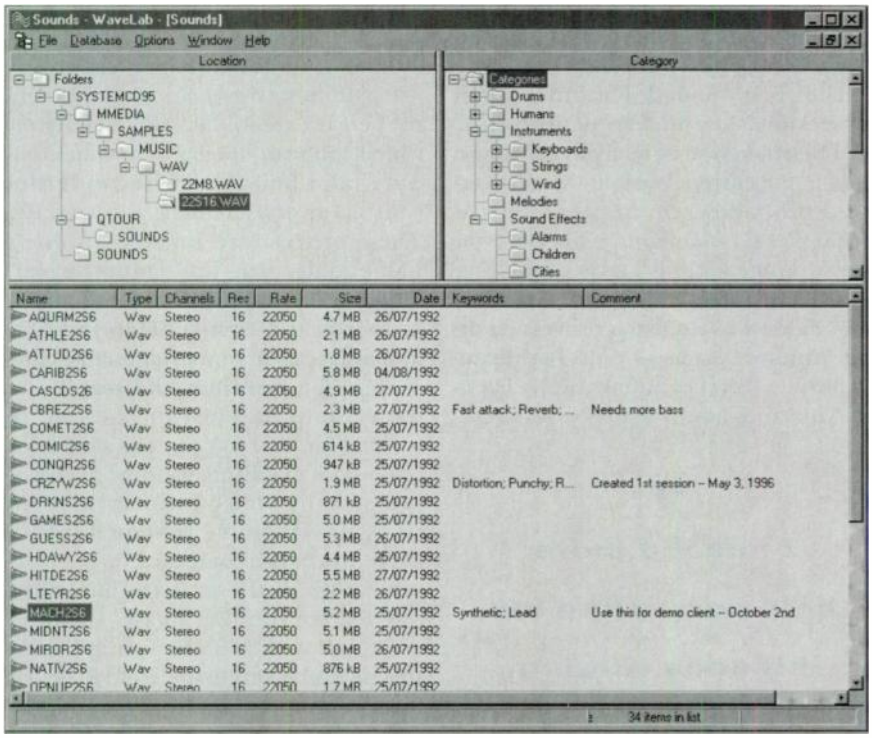

FIG. 4: *WaveLab*'s audio database can scan your entire system for WAV and AIFF files. Once created, the database provides an intuitive environment for finding, organizing, and auditioning your audio files.

stereo wave from a mono source.

The pitch processing works as advertised, but I needed a little more help correcting my hideous singing voice. Instead of simply altering a wave by cents and semitones, I wanted to tell the program "I meant to sing an A above middle C here. Please fix it and add some nice vibrato in the middle." Oh well, maybe I should just learn how to sing.

WaveLab also has a Hi-Fi Chorus that operates differently from a typical hardware chorus device. This chorus processor literally duplicates the source signal many times over; you decide how many replications are made. In addition, each copy varies a little in pitch and attack time; again, you decide how much. The end result is a natural-sounding chorus effect.

The program's Time Stretch function (which can compress, too) is quite flexible, letting you use samples, minutes, and seconds; SMPTE time; tempo; or a ratio to fit a region into a desired time. Again, those who work with MIDI sequences will appreciate the ability to use tempos, bars, and a time signature.

A built-in parametric equalizer works hand-in-hand with *WaveLab*'s 3-dimensional frequency graphing (see **Fig. 3**), thanks to the program's judicious use of color. You can plot any audio selection as a 3-D "landscape" with time, frequency, and amplitude appearing together. Each "mountain" in the landscape represents the amplitude of a particular frequency at one point in time.

The frequency analysis of my guitar part had really high green mountains. (Green represents midrange frequencies.) Using the EQ's frequency, gain, and Q controls, I created an EQ profile that notched out the green components and boosted the yellow and blue components a little. (Yellow and blue represent the low and high end, respectively.) The end result was a cleaner-sounding guitar part. A subsequent frequency analysis showed lower green peaks and higher peaks in the other frequencies.

WaveLab augments its processors with two wonderful features. First, all complex processors include a Presets tab. Clicking on this tab loads preconfigured settings for that processor. For example, instead of having to deal with the chorus' pitch, delay, dispersion, and intensity settings, you can simply call up the "Juicy Chorus" preset and start from there. I found presets to be a tremendous learning tool; I just wish there were more of them. Fortunately,

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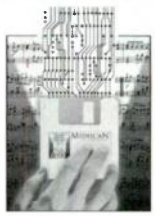

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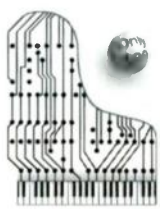

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you can add your own presets, a function that comes in handy if you always process certain sounds the same way.

The other wonderful feature is batch processing. Any number of processors can be applied to as many as 200 audio files in the current version; the next versions will allow you to process up to 1,000 files simultaneously. This lets you set up some serious audio crunching and leave for lunch. I had some fun and did some wild batch processing on my Windows system sounds. Fortunately for me, *WaveLab* automatically backs up your files before it processes them.

▼

I needed more help correcting my hideous singing voice.

Steinberg provides excellent explanations of the program's multitasking environment and processing dialogs in *WaveLab*'s manual. You can have several processors open on the screen at once, keep the audio playing, and dance between the dialogs to execute the various kinds of processing.

Although I applaud this streamlined working environment, I thought *WaveLab*'s multitasking would let me go even further. I was surprised to find I was locked out of all program operations once processing began. I thought the program's multitasking would let me start a lengthy processing operation and then open a new editing window or processor to keep working. No dice.

On the up side, *WaveLab* includes an open plug-in architecture called the Realtime Engine. Steinberg plans to release its *DeClicker* and *DeNoiser* plug-ins for *WaveLab* in the near future.

LABORATORY CONVENIENCES

WaveLab includes a couple of conveniences that help you keep track of all your audio files. For example, you can create a project file that contains all the files you need for a particular endeavor. Instead of locating all the files you used for that video spot last year, you can simply call up the project file and have immediate access to all the data. You can also create subgroups within a project, which lets you organize the files any way you like: by instrument, revision number, client, etc.

In addition, *WaveLab* includes a comprehensive audio database (see **Fig. 4**), which can scan the drives in your computer and build databases with files that meet any criteria you specify. These criteria can include the file's name, date, size, and audio format. Once in the database, you can attach keywords and comments to the files and assign them to user-definable categories. You can filter and search the database to find just the file you're looking for, and you can play the file or open it in an editing window. *WaveLab* prompts you for a particular CD-ROM or other removable volume if it isn't currently in the computer.

I like *WaveLab*'s database, but I need one feature it doesn't have. I tend to create many extra audio files as I work, so I need the ability to delete files that meet certain criteria from my computer. However, you can't delete files from a *WaveLab* database.

SURF'S UP

All in all, *WaveLab* is a very good package. The program is intuitive and graphically oriented, with a Windows 95 look and feel throughout. The user interface is highly customizable, and the program's manual and online help are thorough. There are many ways to activate the online help at every point in the program, and help is available in English, French, and German. The audio processing runs quickly and sounds great.

Everything that *WaveLab* does, it does well. But to be honest, I want a little more for $399. For example, *WaveLab* supports only two types of audio files. There are no delay, flanging, pitch bend, or vibrato effects. You can't output MIDI Time Code to sync up a sequencer, and you can't create playlists of audio regions. Finally, there is no sampler support.

Nevertheless, you should give *WaveLab* a look. The batch-processing and frequency-analysis features are impressive. And an intuitive, well-built program can often pay for itself with a shorter learning curve and reduced downtime. This may be just the program you've been waiting for.

Allan Metts *is an Atlanta-based musician, MIDI consultant, and systems designer.*

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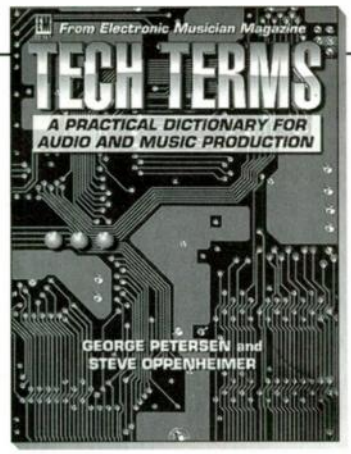

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Yamaha CBX-D5 (Win)

By Rob Rayle

An alternative to sound cards for computer-based recording.

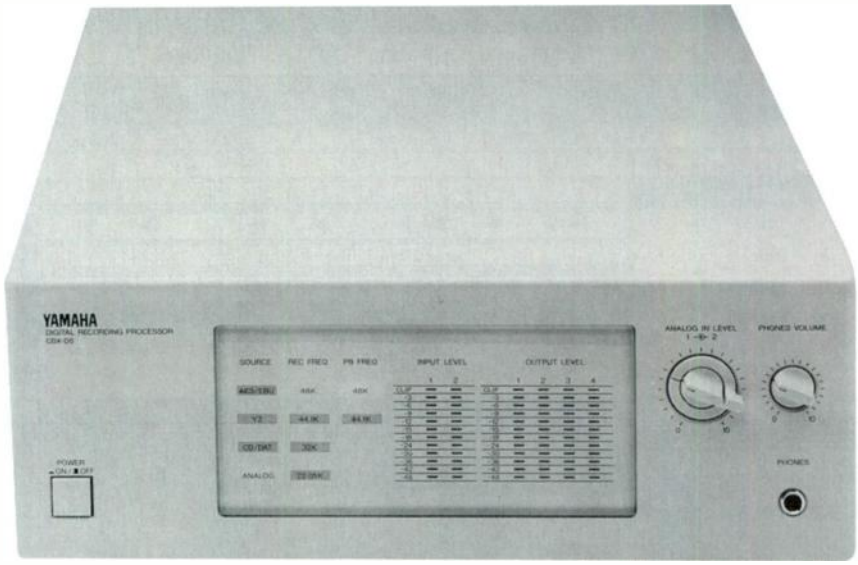
If you want to get into hard-disk recording, your first decision is whether to get a modular system such as the Akai DR8, E-mu Darwin, or Roland VS-880. But if you intend to edit your tracks in fine detail, and especially if you want complete integration between your audio and MIDI tracks, you need a computer-based system.

Most computer-based hard-disk recording systems revolve around sound cards, which can vary in sophistication from a basic, budget-minded Creative Labs Sound Blaster for the PC to a high-powered, high-priced Digidesign Pro Tools TDM system for the Mac. Computer-based systems that use external recording hardware, such as the Soundscape SSHDR1 for Windows (reviewed in the November 1994 **EM**), are noteworthy exceptions.

Yamaha took the road less traveled with its CBX-D5, a self-contained, tabletop unit that contains its own DSP chips and uses the computer only as a user interface. That means you don't need to use a blazingly fast computer to get top results. The CBX-D5 and its little sibling, the CBX-D3 (see the sidebar "Yamaha CBX-D3"), work with virtually any SCSI-equipped Mac, Atari, or Windows computer that can run the third-party recording software.

In creating these products, Yamaha focused on the hardware, a field in which the company is very experienced. Along with the data-format processors and A/D/A converters, the company integrated a pair of stereo effects processors and digital equalizers into the CBX-D5. Then, rather than try to compete with the established digital-audio software developers, Yamaha convinced several of these worthy companies (notably Steinberg and Mark of the Unicorn) to add CBX support to their digital-audio sequencers. This slowed the CBX-D5's initial acceptance, as we'll see, but the upshot is that the D5 and D3 now have operational software support on three major computer platforms.

Aside from the fact that the CBX-D5 is a tabletop unit and the CBX-D3 is a 1U rack-mount device, the most obvious differences between the two products are found in their feature sets. The D5 has digital inputs, multiple digital outputs, and balanced analog I/O, and it includes an internal digital mixer with EQ and effects; the CBX-D3 lacks these features. Both products record audio in Macintosh AIFF format and use the hard-disk format native to the host computer.



Yamaha's CBX-D5 provides hard-disk recording for the Mac, PC, and Atari and includes onboard digital EQ, two stereo effects processors, and on-the-fly sample-rate conversion.

SOFTWARE SUPPORT

Because the CBX-D5 is an external device, it can work with a Macintosh, Windows, or Atari computer. As of this writing, Windows software support for the CBX is limited to Steinberg's *Cubase Audio*, but this is expected to change by the time you read this, when Emagic's *Logic Audio* 2.5 for Windows should be shipping. Steinberg and Emagic also include CBX support in the Atari versions of their programs, which are still popular in Europe but are virtually dead in the United States and Canada.

On the Mac, you have two choices: *Logic Audio* 2.5 and Opcode's *Studio Vision Pro* 3.0. Mark of the Unicorn supported the D5 in *Digital Performer* 1.4 but dropped CBX support in subsequent versions.

The fact that Steinberg has long offered the only CBX support for Windows, coupled with MOTU's on-again, off-again Mac support, raises an unavoidable question: why did it take the CBX so long to establish its software support? When the product was first announced in 1992, Yamaha revealed agreements whereby Steinberg would have the exclusive right to support the CBX on the Atari and PC, and Mark of the Unicorn would offer the only Mac support for the first year after the product was released. These deals severely limited Yamaha's market, especially on the Mac, where *Studio Vision* was overwhelmingly dominant at the time.

Worse yet, the CBX's software drivers simply didn't work properly, especially on the Mac. The Mac problem was so bad that Yamaha temporarily pulled the product from the market. Around that time, MOTU dropped support for the CBX and decided to focus on supporting Digidesign hardware, which is standard equipment in higher-end, Mac-based studios. But now the CBX is back on the Mac.

I've been using the CBX-D5 with *Cubase Audio* for Windows for more than a year; I prepared this review using versions 1.5 and 1.6 (see **Fig. 1**). Steinberg recently renumbered all its *Cubase* products to version 3.0 in order to unify the line, so the company didn't release a version 2.0 for Windows. *Cubase Audio* 3.0 for Windows shipped just after I finished my research, so I didn't get to test it. But the CBX driver is unchanged, and I don't anticipate different results.

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SYSTEM REQUIREMENTS

If you're going to use a D5 with a Windows PC and you don't have built-in SCSI, you'll need a SCSI adapter for the computer; Yamaha recommends the Adaptec SCSI adapter. On the Mac, you can use the stock SCSI port.

Of course, you need a fast SCSI drive. Yamaha specifies a minimum 1 MB/second data-transfer rate. You might get away with less, but it will increase the likelihood and severity of timing glitches when using the system at or near its maximum capacity.

A MIDI interface may also be required, depending on the computer and software configuration. For a Windows PC running *Cubase Audio*, you should have a MIDI interface with a MIDI In and Out that can be dedicated to the CBX-D5. (This is not absolutely necessary, but it helps immensely.)

A serial port is provided on the CBX-D5, which is intended to connect directly to a Mac or PC without a MIDI interface. On the PC, it uses the same software drivers as Yamaha's MU-series sound modules. The serial interface works almost like a standard MIDI interface in that it passes MIDI to and from the CBX-D5. However, the unit cannot pass MIDI data through to other devices, so you must dedicate a serial port to this purpose.

HARDWARE OVERVIEW

The D5 offers four balanced XLR analog outputs and two balanced XLR analog inputs. On the digital I/O side, it includes one stereo pair of S/PDIF inputs and outputs, two stereo AES/EBU outputs (four channels), one stereo AES/EBU input, and Yamaha's proprietary Y2 stereo digital I/O. Although the AES/EBU, S/PDIF, and analog outputs are simultaneously available, the digital and analog inputs are not.

On the other hand, two CBX-D5s, two CBX-D3s, or one of each unit can be combined to create a 4-in, 8-out system. I have consistently achieved eight tracks with a D5/D3 combo, but I had to spend a month tweaking my system to accomplish this; you only get eight tracks under ideal conditions. In fact, Opcode (which supports the CBX with *Studio Vision Pro*) only promises four playback tracks with two units.

The unit records analog or digital sources at 48, 44.1, 32, or 22.05 kHz and plays back at either 44.1 or 48 kHz. The ADCs are 16-bit linear Delta-Sigma, and the DACs are 18-bit with 8× oversampling.

Six 12-segment LEDs monitor the two input levels and four output levels. A backlit display indicates the source being monitored and recorded, the input sample rate, and the output sample rate. A front-panel headphone jack is also provided.

SAMPLE-RATE CONVERSION

The CBX-D5's combination of flexible digital I/O and solid digital-effects processing makes it an excellent tool for

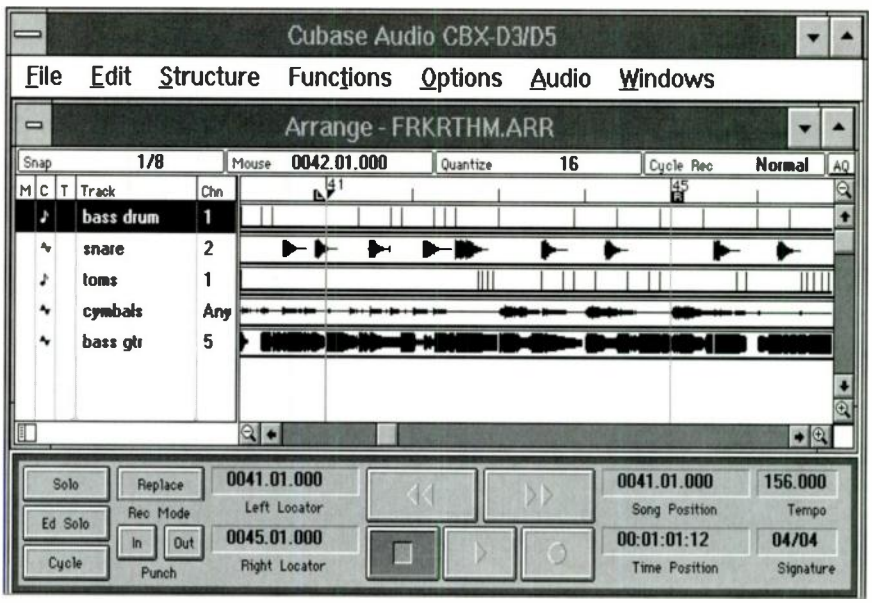

FIG. 1: On the Windows platform, the CBX-D5 is supported only by Steinberg's *Cubase Audio*, though this will change when Emagic's *Logic Audio* for Windows ships.

DAT mastering. It's easy to back up an audio DAT directly to disk or to use the CBX and hard disk as an intermediate stage for backing up to another DAT tape without using a second DAT deck.

It's also easy to rearrange the tracks, re-EQ the mix, and even add some highs using the Aural Exciter without leaving the digital domain. Best of all, you can tweak these things in real time while the music is playing.

The CBX-D5 and D3 can convert sample rates on the fly, which makes it quick and easy to convert DAT masters recorded at sample rates other than 44.1 kHz to the standard CD rate. I tested the D5's sample-rate conversion by taking some source material that was originally recorded at 44.1 kHz and converting it to 48 kHz, saving it as a new file, converting back to 44.1 kHz, and saving the results as another new file. The three versions were indistinguishable to my ears. I then used a high-end dbx RTA-1 signal analyzer to compare the three versions. According to the RTA-1, all versions were the same within ±2.5 dB across the audio spectrum. You can't do that with your average Windows sound card!

EQ AND EFFECTS

The CBX-D5 provides four bands of digital EQ per channel (sixteen bands total). Each filter band can be independently configured as fully parametric, low or high shelf, lowpass, highpass, bandpass, or band-reject (notch). The lowpass and highpass filters can have variable resonance, and the bandpass and band-reject filters have variable width.

Unfortunately, the software mixer that *Cubase Audio* provides for the CBX-D5 doesn't allow you to select the equalizer type; it provides only a default setup with two bands of parametric EQ, a low shelf, and a high shelf. However, after spending some time digging through manuals and tweaking the software, it's possible to modify the mixer to add the MIDI messages necessary for selecting the equalizer type.

The EQ uses the same processor and algorithms as the Yamaha DEQ5, and it sounds clean and transparent. EQ configurations and real-time changes can be saved and recalled from disk. However, changing the EQ configuration on the fly can cause some very nasty audible artifacts such as huge, likely-to-damage-your-speakers thumps

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and other interesting noises. You can sweep the EQ frequencies, change the amount of cut or boost, and modulate the bandwidth while the music is playing, but don't expect to be able to switch an active EQ band from lowpass to highpass in the middle of a mix.

The digital effects sound pretty good. The DSP algorithms are the same ones found in the SPX900 and SPX1000 with the addition of an Aural Exciter algorithm licensed from Aphex. There are two separate stereo effects processors that can be configured in parallel or in series or combined into a single multi-effects processor.

The stereo effects are routed to the same audio outputs as the tracks. If you're playing four mono signals simultaneously and you want to add a stereo effect to one of them, you must mix one side of the effects return with one of the dry mono tracks so the processed tracks can access two outputs. This isn't an issue when using the onboard mixer for submixing the internal tracks to stereo, but it can be annoying when you want to send all the tracks separately to an external mixer.

CRASHES AND LOST DATA

I found that the software driving the CBX system tends to have bugs, some of which cause crashes. Compared to a stand-alone hard-disk recorder or tape-based system, this system is flaky.

However, the *Cubase Audio*/CBX combination has become more stable in recent updates. With *Cubase Audio* 1.01, a system crash occurred about every half hour. But with version 1.5, I experienced system crashes about every three hours, and version 1.6 crashed only once every week or two, which is pretty darned stable.

It's hard to say how much of this is the fault of *Cubase Audio* and how much can be blamed on the CBX driver. Normally I would blame the application, but the CBX drivers have a checkered history. Either way, the end result is the same. Frequent saves become instinctive when using this system.

TIMING TESTS

Timing is always a concern when working with hard-disk systems. On a tape-based digital multitrack recorder (e.g., ADAT or DA-88), the individual tracks are striped on the tape, so they remain in sync unless you intentionally shift them. In most hard-disk systems, there's no physical property of the medium that keeps the tracks in sync. This allows you to freely shift individual tracks in time with respect to each other, but if the tracks shift when they're not supposed to, it can cause trouble.

To test this with my CBX-D5/D3 combo, I recorded a click track from *Cubase Audio* to all audio tracks and then cut and pasted the measures out of order so the computer would have to jump around to seek out and play them. In general, the tracks locked up closely but not perfectly; I could detect a slight flanging effect when multiple tracks were playing. Occasionally the tracks were way off, depending on the location in the song at which I started playing, but the time variations were very small for the most part. The timing was usually much more reliable when I started playback at the beginning of a bar or section than it was when I started anywhere in between.

Product Summary

PRODUCT:
CBX-D5
PRICE:
$1,995
SYSTEM REQUIREMENTS:
PC: 80386 or better with Windows 3.1 or later; Adaptec SCSI adapter; fast SCSI drive (1 MB/second throughput or better); MIDI interface
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This kind of timing inconsistency doesn't normally cause problems on separate mono tracks because the slippage is much less than normal human rhythmic variation. However, it is a problem when you have two tracks that form a stereo pair. In this case, the frequency content of the two tracks is largely identical, so even a slight time variation between the tracks can cause phase cancellation.

The CBX handles this by recording and playing back stereo files in which the data for the two tracks is interleaved (i.e., the file contains alternating samples for the left and right sides of the stereo track). This interleaving ensures that the two sides always play back together.

THE LAST WORD

The biggest challenge with the CBX-D5 is getting a proper configuration and smooth operation. This includes having the right drives, software, SCSI adapter, and so on (see the sidebar "Configuring a CBX System"). But when you finally get the CBX-D5 and software working together, you have a very cool system.

YAMAHA CBX-D3

The CBX-D3 is the D5's little sibling. It provides four unbalanced, analog line outputs; two unbalanced, analog line inputs; and a stereo S/PDIF digital output. The D3 has no digital inputs or onboard effects, which makes it far less attractive than the D5. It also lacks a digital mixer, though you do have individual volume control over each of its four playback tracks. Because there is no mixer, there is no way to pan an audio signal between two outputs; each track is completely discrete.

Although the D3 provides four separate outputs, it does not currently support multiple tracks per output. In contrast, depending on the software you use, you might be able to push six tracks or more through the two outputs of a standard PC sound card. (See "The Windows Studio" in the July 1996 **EM** for more information.) In addition, some higher end sound cards, such as Digidesign's Audiomedia III, even provide simultaneously available, independent analog and S/PDIF I/O.

The D3's unbalanced I/O can be problematic because the device tends to output disk chatter (the lovely sound of the electrical impulses generated by disk seeks and reads) due to differences in electrical potential between the D3 and the chassis grounds of mixers or other devices in the system. It might be possible to avoid this with careful attention to grounding, but the only way I have found to eliminate it is to use direct boxes to lift the grounds on all connected output and input lines. I found this to be rather irritating.

Furthermore, the output level of the D3 is quite low. Yamaha lists the nominal level as -20 dBm, which is 10 dB down from normal line level, and the D3 required more amplification than any of my other line-level devices. Yamaha doesn't publish the signal-to-noise ratio in their documentation, but I suspect it's fairly low. Most troublesome is an inherent low-level hum, which severely limits the unit's usable dynamic range. (Based on my tests, I estimate the D3 has about 50 dB of dynamic range, which beats most cassette decks but is inferior to other hard-disk systems.)

At $995, the CBX-D3 costs less than half the price of the D5, but it's a lot less than half the machine. If you want to add digital audio to your computer for the first time, I suggest you compare this unit with a few high-quality sound cards before making a decision. And if you decide you want a CBX-series device, I recommend you save up the extra money for the D5.

Yamaha's CBX-D3 has fewer features and costs half as much as the CBX-D5. Unfortunately, its sonic quality is markedly inferior.

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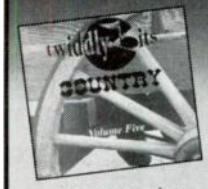

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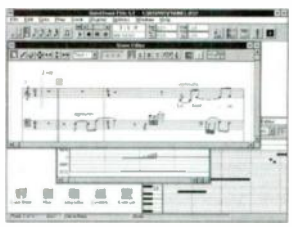

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CONFIGURING A CBX SYSTEM

One of the biggest disadvantages of a computer-based hard-disk recording system, as opposed to a stand-alone recorder, is that you have to play the role of system integrator. You must collect all the necessary hardware and software components (cables, drives, software drivers, etc.), make sure they're compatible, and hook them up correctly. The CBX-D5/D3 system is no exception.

Once you put all the hardware together and install all the software, your system *might* work. If it doesn't work the first time—and it sure didn't for me—don't expect a lot of help from the manufacturers. All of them told me that any problem I experienced was the fault of the other components, and in many cases only one of them was wrong!

If you use even one low-quality SCSI cable, the system behaves erratically. Of course, it won't reveal the nature of this problem; it will just act flaky, lose files, and crash without telling you why. You'll be stuck trying to figure out what's wrong by trial and error. Once SCSI cables are out of the package, there's no easy way to tell the difference between good ones and cheap ones. In addition, a cable that works fine in normal computer operations may be inadequate for hard-disk recording with the CBX.

Even if you have a fast, high-quality computer and hard drive and top-quality SCSI cables, configuring and troubleshooting the CBX system seems like a crap shoot. To get the CBX-D5 working under Windows 3.1 on my 60 MHz Pentium-based PC, I had to disable the BIOS on my SCSI card and use a software driver instead. In some systems, you might have to use the card's BIOS and not the software driver. You just have to experiment.

Don't think about getting this system unless you're comfortable with doing a lot of troubleshooting or can afford to pay someone else to put it together for you.

Chief among the coolness factors is the considerable advantage of built-in digital EQ and effects, which let you process sounds completely in the digital domain. Not only is this approach superior to running your precious audio through countless converters to and from external effects, but it also beats connecting to external effects with digital I/O because you don't have to match two potentially incompatible digital interfaces. (If you think all AES/EBU or S/PDIF interfaces are 100 percent compatible, think again.) And under automated control, the equalizer is much more flexible than what you get in the average external box, even if you can't really change EQ types on the fly.

On the analog I/O side, I liked the CBX-D5's converters a lot. They're clean, and they sound very good overall. The sample-rate conversion feature is excellent, as well.

As for the price—well, it isn't cheap. But in addition to the converters and recording DSP, you're paying for two kinds of digital I/O, built-in EQ, and two stereo effects processors, so the CBX-D5 is a good value.

If you don't need the editing power of a computer, you may be better off with a stand-alone, modular system, which is easier to use, more stable, and more portable. If you need the editing capability that a computer provides, a good sound card might do the job, but there are many factors to consider, which I've already outlined. Some of these factors differ a bit between the PC and Mac because, as of this writing, PC users don't have the alternative of Digidesign Pro Tools and TDM hardware at the high end, but they do have a variety of sound cards at the middle and low end.

If you don't care about the equalizer and effects and are content with 16-bit converters, the CBX-D5 may be overkill. A good sound card will do an acceptable job for a lot less money. But if you need it all, can afford the price of admission, and are willing to spend time troubleshooting in the early stages, the Yamaha CBX-D5 is a very good way to go.

Rob Rayle *is a San Francisco Bay Area audio-MIDIot.*

Alex—Audio meta events in SMFs offer the only practical way to import audio files from one digital audio sequencer to another. Unfortunately, this part of the SMF spec is not yet finalized, so it isn't available at the moment. Of course, most programs can save and import audio files in AIFF or Sound Designer II format, but these files don't include any timing information or MIDI data, which makes it difficult to synchronize the audio and MIDI in the target sequencer. Although the MIDI Manufacturers Association is working on Audio meta events, no one knows when they will be finalized and incorporated into the SMF spec. The wheels of MIDI progress grind very slowly, so I wouldn't hold my breath.—Scott W.

HARD-DISK INFO

I just got into the wonderful world of digital recording on my PC. I have a '486/33 with 8 MB of RAM, and I am running Windows 3.11 with a Turtle Beach Tahiti sound card. My question pertains to hard disks. In your *Cakewalk* 4.01 review (April 1996), you listed non-T-Cal drives or A/V drives as good candidates for hard-disk recording, but I haven't seen any disks with these attributes. I need something that is IDE in the 1.0–1.6 GB range. Could you list a few hard-disk models that would be appropriate for recording?

Damian Righi
Bethlehem, PA

Damian—To my knowledge, A/V drives are available for SCSI but not for IDE. However, you don't necessarily need an A/V drive. In our July 1996 cover feature, "The Windows Studio," author Zack Price explored in great detail this and many other aspects of assembling a Windows system for hard-disk recording. Price's discussion of hard drives ran almost 1,500 words long, and I don't feel I can accurately summarize it here. If you missed the issue, you can buy a copy from Mix Bookshelf: tel. (800) 233-9604 or (908) 417-9575; fax (908) 225-1562.—Steve O.

THE CABLE GUY

When transferring sound digitally between a DAT recorder and a digital computer I/O card, which type of cable is best: coaxial or optical? What are the advantages of each?

Tom Paciorkowski
tompaciorkowski@juno.com

Tom—The most common optical interface for digital audio (at least among DAT decks and computer I/O cards) is called Toslink. *According to Dave Lebolt, director of product strategy at Digidesign, you're theoretically better off with a Toslink connection, assuming the cables and connectors are pristine. This type of connection avoids the potential problems of waveform distortion, impedance, capacitance, induced noise, and electrical connections. However, there should be no audible difference between a pristine optical connection and high-quality coax cables and connectors designed for digital audio.*

In addition, Toslink cables and connectors are designed to be inexpensive. As a result, they have a reputation for being less than robust; if the cable is kinked or twisted, problems can occur. For example, all digital audio transfers include a series of regular clock pulses to maintain the audio data's sample rate as it is sent from one device to another. If these clock pulses deviate from their intended time increments, the result is called clock jitter.

According to Dave Clementson, senior design engineer at Digidesign, two factors determine the sonic properties of a digital transfer: data integrity and clock integrity. Data integrity refers to the accuracy with which the bits of the audio signal are copied; clock integrity refers to the accuracy with which the clock signal represents the original sample rate. Both coax and optical transfers affect the data and clock integrity, and it's difficult to measure these effects quantitatively.

Clementson maintains that clock jitter has no effect on the sound of the digital copy unless the clock signal is used to perform a conversion to or from the analog domain. The audible effect of clock jitter in this case is subjective, but many people describe it as a lack of spatial clarity and detail and a collapse of the stereo image. Fortunately, most systems use an external or self-generated clock to play the audio, so the clock signal in the transfer doesn't affect the overall quality of the copy.

However, Gary Hall, former **EM** *technical editor and current technical support representative for Sonic Solutions, points out that DAT stores the transferred clock signal with the audio data and uses it for playback in some cases. As a result, DAT could be more vulnerable to jitter problems than a digital audio workstation (such as a computer with a digital I/O card), which typically doesn't use incoming clock data for playback. Well-designed DAT machines can compensate by reclocking the output, but how do you know whether your deck is among them?*

There's only one way to know which cable—coax or optical—is better in your situation: try both types of cable and listen to the copies. Can you hear a difference? If not, it probably doesn't matter which type of interface you use.—Scott W.

THE SOFT AND LOUD OF IT

I've been recording, sequencing, and mixing my own compositions in my home studio for several years. The articles featured in each issue of **EM** have provided guidance along the way. However, as an untrained engineer, I am plagued by one recurrent obstacle: frequently mixes that are pleasing at one volume suffer from piercing, painful passages when played back at louder volumes. I am careful in the administration of EQ and compression, so what gives? Is there an ideal level one should monitor at when mixing?

Bobby Simons
ac30fan@aol.com

Bobby—There is no such thing as a single, "ideal" level for monitoring while mixing. You should choose a basic level that is comfortable yet loud enough to expose critical tonal elements. Periodically, you should also check your mix at extremely low levels (to ensure that all sounds are clear and articulate) and relatively loud volumes (to monitor satisfactory bass response and whether the mids and highs are too piercing). In addition, taking frequent "silence" breaks will diminish ear fatigue and keep your tweaking reflexes sharp. And don't forget to compare your mix to some favorite commercial CDs. Referencing your soundscape to a professional production will immediately reveal whether your effort is too shrill or bass heavy.

Just take your time, listen carefully, and don't get discouraged if you have to remix something ten times. All that matters is that the end result knocks your socks off and plants a mile-wide smile on your face. —Michael M.

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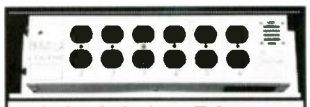

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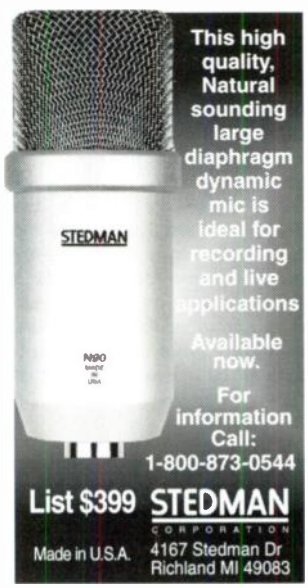

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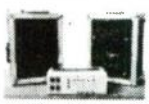

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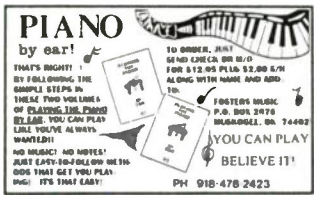

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TECH PAGE

Maximum Mpact

Media processors promise spectacular performance.

By Scott Wilkinson

As computer-based multimedia matures, the need for more powerful data processing continues to grow. These days, most systems depend on various add-on cards (e.g., sound cards and video accelerators) and application-specific integrated circuits (ASICs) to process different types of data.

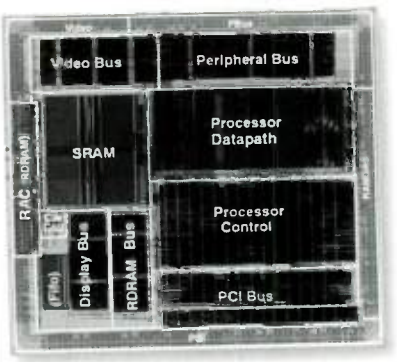
However, this hodgepodge approach is giving way to a new trend toward integrated *media processors*. These programmable chips simultaneously process several types of multimedia data, e.g., audio, video, and graphics. In addition, media processors typically include data-compression capabilities. These devices eliminate the inefficiencies and potential conflicts that arise from using cards and ASICs from different manufacturers.

Chromatic Research (tel. 408/752-9100; fax 408/752-9101; e-mail info@chromatic.com; Web http://www.mpact.com) is working with Toshiba and LG Semicon to develop the Mpact media processor, a single-chip solution for Windows 95 PCI machines. Toshiba and LG Semicon will manufacture and sell the chip; Chromatic Research will supply the necessary software.

The Mpact chip combines a single-instruction, multiple-data architecture and very long instruction words of up to 72 bits. Five concurrent I/O and memory controllers provide parallel processing. In addition, Mpact is designed to function as a coprocessor with the host CPU via the PCI bus. The chip can sustain 2,000 MOPS (millions of integer operations per second), with peaks of up to 20,000 MOPS for certain video applications. In contrast, a 120 MHz Pentium performs 200 MOPS, and the next-generation P6 is expected to execute 300 MOPS.

Of course, the hardware is nothing without software. The Mpact system software includes a real-time kernel that supplements the insufficient real-time support offered by the kernel of Windows 95. The software also makes use of Microsoft's DirectX application-programming interfaces (APIs), which provide device-independent interfaces between the hardware and software. In addition, it supports Intel's MMX multimedia extensions for x86 and Pentium processors, including the new P55C Pentium.

At a higher level, Chromatic Research is developing software modules to enable different multimedia functions. These functions include 2-D and 3-D graphics, video compression and decompression, audio, fax/modem, telephony, and video conferencing.



The PCI-based Mpact media processor handles several types of data simultaneously.

The Mpact's audio capabilities include various forms of coding, such as MPEG-1 Layers 1 and 2, Dolby Pro Logic, and Dolby AC-3. Synthesis technologies include FM, wavetable, and waveguide (physical modeling). Using wavetable synthesis, the chip can generate 32-voice polyphony across 32 independent timbres. The wavetable is based on Synclavier samples, and the onboard sounds include a General MIDI bank. The effects include reverb, chorus, and noise cancellation in addition to SRS 3-D sound and 3-D positional audio using the DirectSound API. Audio processing can employ a resolution of up to 36 bits at sample rates up to 48 kHz.

The processor's video capabilities include MPEG-1 and MPEG-2 coding at frame rates up to 30 fps, VGA and SVGA 2-D graphics, and 3-D graphics with full rendering. The Mpact can also handle various forms of data communications, such as modem transmissions up to 33.6 Kbps, faxing at up to 14.4 Kbps, and video conferencing over normal telephone lines and ISDN. It can provide telephony functions, including a full-duplex speakerphone, Caller ID, and voice mail. It even includes MIDI I/O.

The appearance of so-called "Web PCs" and TV set-top boxes with telecommunications capabilities depends on the ability to process vast amounts of visual and audio data quickly and efficiently. As a result, we are likely to see a lot of R&D resources dedicated to developing media processors such as Mpact in the near future.

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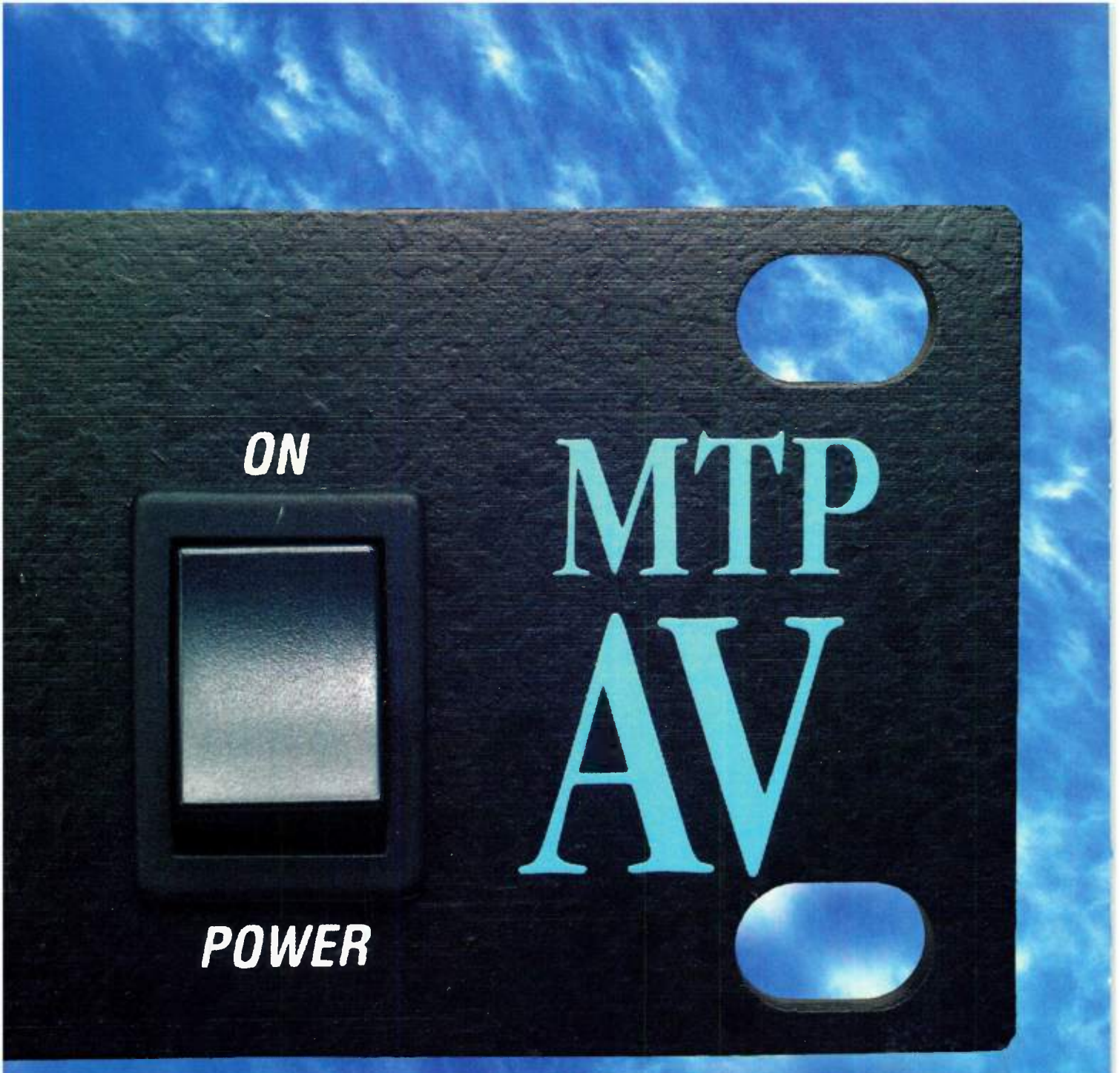

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