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Electronic Musician®

December 1995

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1 WHAT IS VLZ? *VLZ stands for Very Low Impedance. Originally developed for our 8•Bus consoles, it's a unique Mackie approach to circuit design that reduces thermal noise and seriously cuts down on crosstalk. The end result is that VLZ design cuts circuit thermal noise in half! VLZ demands high current — which requires a beefy power supply. So we give you one — and it's internal, too. (No clumsy wall-warts!)*

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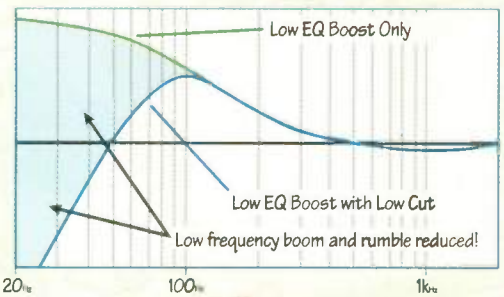
8 LO CUT FILTER *(Chs. 1-4). With the exception of bass guitar, low frequency synth sounds and kick drums, almost all sound is in the audio range above 75Hz. Our Lo Cut Filter reduces or eliminates unwanted frequencies below 75Hz. It's great for cleaning up the "mud" in recording and live sound work, and also lets you boost lower vocal ranges without increasing stage rumble, bass guitar, etc. It's like having a second Lo EQ control centered at a higher frequency.*



9 A MUTE ON EVERY CHANNEL PLUS AN EXTRA STEREO BUS! *As on our CR-1604, pressing a MUTE switch UNassigns the channel from the main L/R bus and reassigns it to the Alt 3-4 output. You can create two stereo pairs for output to a 4-track, bounce multiple tracks onto 2 more tracks, or preview a source that's not in the main mix yet.*

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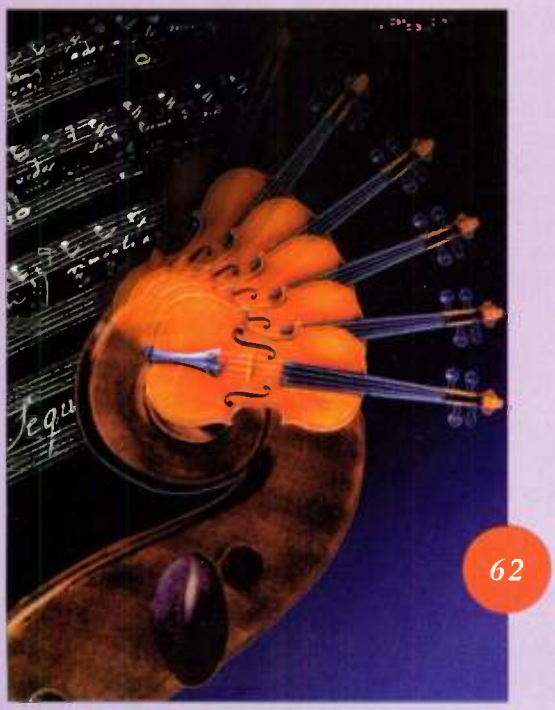
I N S I

FEATURES

DEPARTMENTS

Electronic Musician®
DECEMBER 1995 VOL. 11, NO. 12

COLUMNS

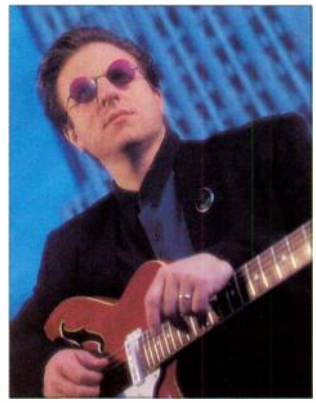


REVIEWS

Cover: Photo by Eric Harger.

Talk Soup

The crusade for audio solidarity continues.



ROBERT PERRY

I have a big mouth, and I never know when to shut up. So if I often sound like a broken record, please don't be embarrassed for me. It's simply the way I communicate. However, the Surgeon General *has* asked that I post a warning about RRS (Repetitive Rant Syndrome), so here it goes: The following column is part of a recurring theme. Read on at your own risk.

The 99th Audio Engineering Society convention, held this past October in New York City, proved once again (here comes that skipping needle) that the professional recording community is embracing the "little people" who own personal and project studios. This wasn't always the case. When I joined **EM** four years ago, the AES show was like some snooty British club, where you could only elude the bouncer if your "school tie" was emblazoned with an SSL, Neve, or Euphonix logo. That pretty much left home recordists—who spend upwards of $100,000 on their houses, *not* their mixing consoles—out in the cold.

But the times have been a changin' for a while now, and this convention was like a comfy neighborhood bar packed wall-to-wall with your best friends. Although high-end audio remains the spiritual core of the show, high-quality, affordable gear was busting out all over. The invasion of home- and project-studio tools was so pervasive that Opcode's Keith Borman enthused, "Hey, this is really *our* show now." And when I met superproducer Tony Visconti at the NARAS booth, he wasn't raving about the new $1 million Sony OXF-R3 digital console, he was extolling the coolness of the $150 A.R.T. Tube MP mic preamp. I love it!

The only problem with this glorious unification of pro and project sensibilities is that Senior Editor Steve Oppenheimer and I were run ragged trying to keep track of all the great toys. To handle the sheer number of products unveiled at AES, we've expanded "What's New" to six pages this issue. (And if you see Steve, be sure to thank him. He had to write the entire product report in two days to make our deadline, and he's *still* exhausted from the effort!)

We also tried something wacky this issue. "Cheap Thrills" on p. 34 marks the first time that **EM** has commissioned a custom photo shoot for an entire products feature. We wanted to give you fabulous readers a holiday treat, and a photo essay on "cheap and cheerful" gear seemed to be just the thing. Art Director Linda Birch and photographer Eric Harger produced a gorgeous, fashion magazine-style sheen for the layout. It's a departure for us, and I hope you dig it.

While I'm doling out praise, I want to thank the marvelous **EM** staff for hanging in through thick and thin the past year to produce the hippest music-technology mag on the racks (or in your mailbox). You can catch their names to the right of my column, and if you like this magazine, every single one of them deserves a cheer. They are extremely dedicated and talented, and I'm so happy that they let me play with them five days a week.

And so, another year has run its course. I hope that good things have left their mark on you and your music and that 1996 continues to be fruitful. After all, we need a ton of great songs, symphonies, and soundtracks to banish the specters of poverty, intolerance, and war. Let's write a better world.

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East Coast Advertising Office
tel. (203) 838-9100, fax (203) 838-2550

Subscription Services Office
(Address changes and customer-service inquiries)
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Electronic Musician: (ISSN: 0884-4720) is published monthly by Cardinal Business Media, Inc., 6400 Hollis St., #12, Emeryville, CA 94608. ©1995. This is Volume 11, Number 12, December 1995. One year (12 issues) subscription is $24; outside the U.S. is $49.95. Second Class postage paid at Oakland, CA, and additional mailing offices. POSTMASTER: Send address changes to Electronic Musician, PO Box 41525, Nashville, TN 37204. Editeur Responsable (Belgique): Christian Desmet, Vuurgatstraat 92, 3090 Overijse, Belgique. Canadian GST #129597951. Canada Post International Publications Mail Product (Canadian Distribution) Sales Agreement No. 0478741.

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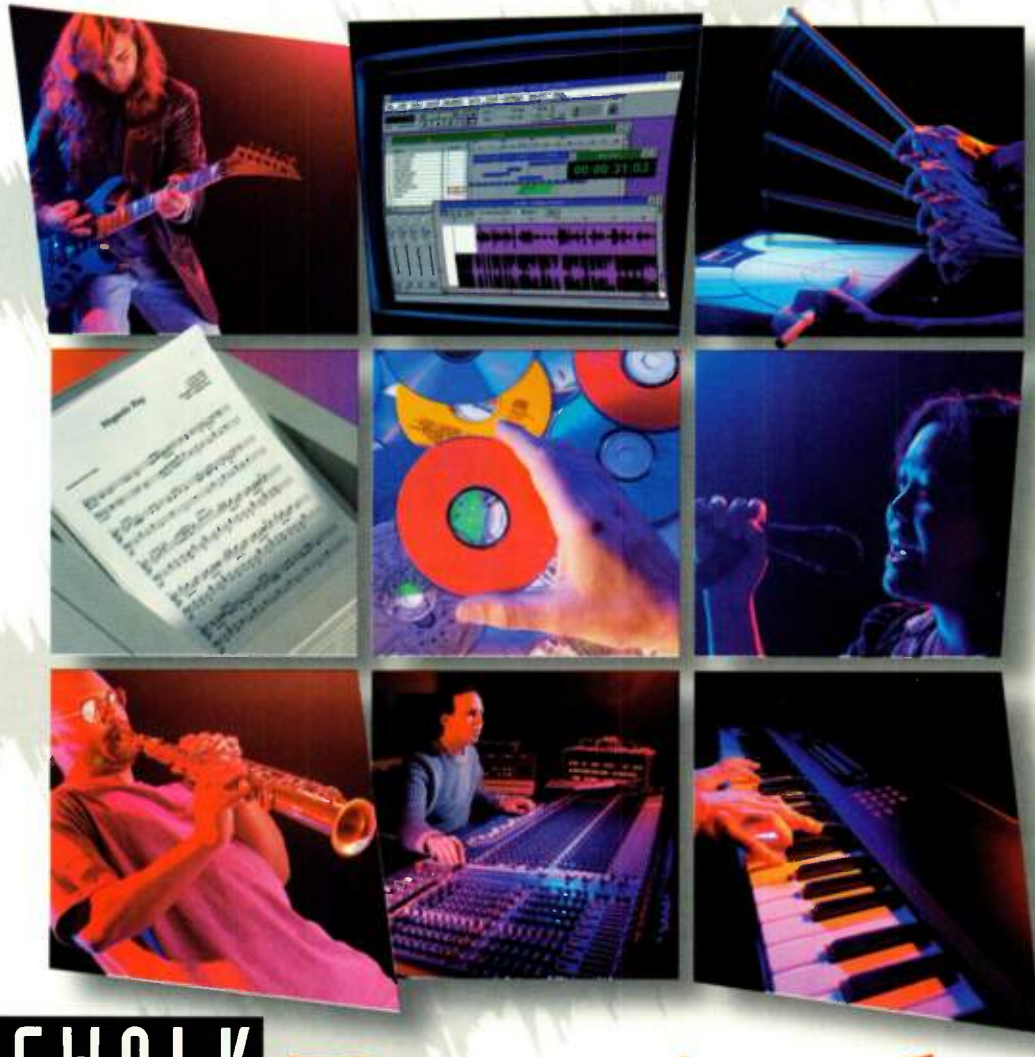

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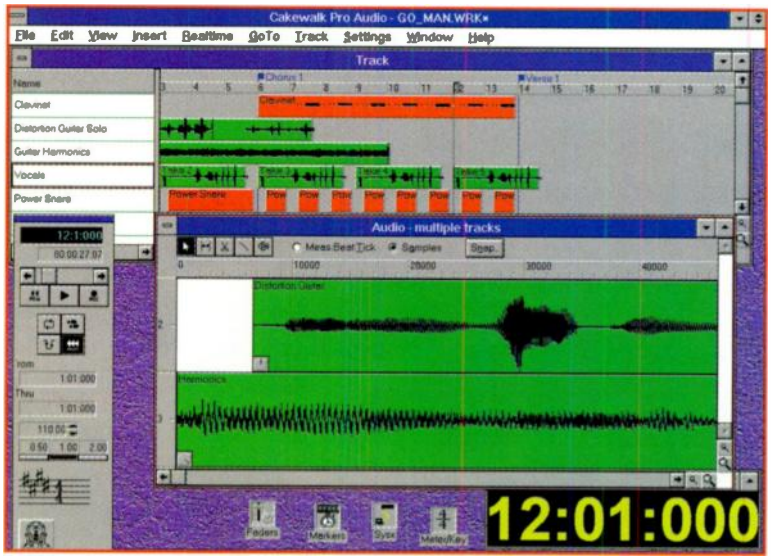

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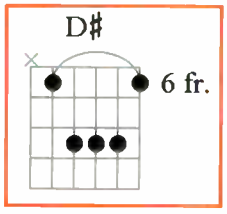

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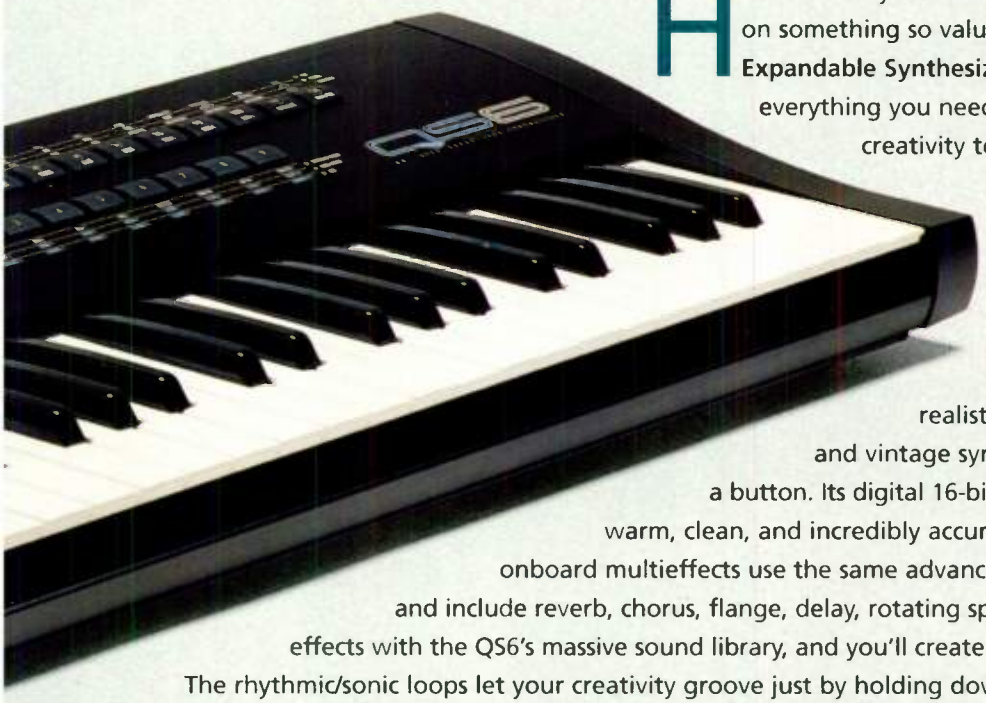

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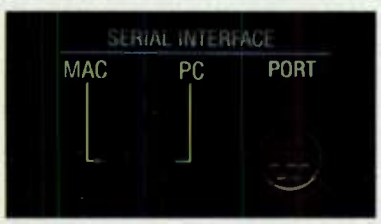

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The QS6 uses the same advanced synthesis architecture as its big brother, the QuadraSynth Plus™. True 64-voice polyphony lets you assemble complex sequences and rich, stacked chords. Its 16 channel multitimbral Mixes and a built-in computer interface (also for both Mac and PC) give you easy access to the world of MIDI sequencing, software and composition. In fact, we've included a free CD-ROM with the QS6 that's packed with extra sounds, killer sequences, and Steinberg's Cubase Lite™ sequencing software to help get your creative juices flowing.

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LETTERS

LISTEN!

The October 1995 issue is one of your best ever. It has just the right mix of product reviews, thought-provoking interviews, and helpful and interesting articles.

The only way this issue could have been any better is if it included a DIY feature. I realize it's difficult to do these articles, but I always enjoy seeing them and have even made several of them over the years.

The cover story ("Power Tools") was great. It's so rare to see a publication acknowledge that manufacturers' specifications don't mean a thing and encourage consumers and musicians to listen to the audio products they want to purchase.

Of course, blind listening tests have some problems of their own, but you should trust the best audio-measurement tools you have—your ears.

I encourage you to not lose this viewpoint while writing future reviews and features. The reason musicians love certain pieces of equipment, such as an old Fender Twin or a Mackie mixer, has more to do with the gear's (carefully engineered) sound than its "silent" spec sheet.

Benjamin Emmerich
San Rafael, CA

ALL PATCHED UP

I just finished your October issue, and I enjoyed it tremendously. I couldn't help but giggle at Greg Pedersen's observation about patch cords on all those early modular synthesizers ("Creative Space: Wright at Home"). The photo caption said, in effect, "If you're still complaining about nested parameter menus, check out all these cords!"

I haven't done a lot of programming on digital synths, but I teethed on modular Moogs and I loved the patch-cord system. This was an environment in which I could play with more than one knob at a time, physically tweaking a sound with my hands and body, rather than paging through a manual like a robot. Thanks for the nostalgia. Keep 'em coming; your mag is a feast!

bobbog2@aol.com

MORE OS/2

Regarding Steve O.'s response to Paul L. Dial ("Letters," October 1995), Window's multimedia applications, such as sequencers, under OS/2 are fairly unusable. I believe that this has something to do with the OS/2 timing. However, IBM is in the finishing stages of a MIDI subsystem for OS/2, so "real" native multimedia applications may be around the corner. The stability of the OS/2 kernel would make a great place for these native applications.

Kevin Mooneyham
krmoon3@ibm.net

In response to Paul Dial's letter, there is one clarification worth noting. You said, "Sure, you can run Windows applications within OS/2 Warp, but then you're just running Windows on top of another operating system." This implies Windows is an operating system.

Windows, when taken for granted, can give the impression of being an operating system. Windows is an application written to run on top of DOS (Disk Operating System). Without DOS as the foundation, Windows would be useless. Unlike Windows and Windows 95, OS/2 is its own operating system in the truest sense of the phrase. I sometimes think of Windows as a sophisticated menuing system that also provides an API for DOS. This is simplistic and accurate. Windows 3.1 won't run under the OS/2 environment, but Windows 3.1 applications will.

Ronnie Cusmano
rjc@asbinc.com

NET FANFARE

I just read your article entitled "Networking with E-Mail" (October 1995), and I want to thank you for such an informative piece of work. I'm a graduate student in music at the University of Cincinnati and am scheduled to present a lecture at the Southeast Horn Workshop this year on using the Internet. I will be sure to mention your article to the other horn players at the workshop.

Glen Tuolmaala
tuolmaga@ucunix.san.uc.edu

ANALOG SERVICE TIPS

Alan Gary Campbell's "Service Clinic: Analog Service, Part 1" (October 1995) was a very instructive article, and I'd like to share a few extra helpful details.

In the explanation of the design philosophy behind the use of bipolar power supplies, Campbell writes that using a bipolar (dual, plus-and-minus) power supply "simplifies circuit design, especially in circuits that use operational amplifier ICs, and it facilitates the amplification and processing of AC signals." Although his explanation is correct, many AC amplifying and processing circuits are fed by single-polarity power supplies and use a half-supply (power-supply voltage) reference to establish an equilibrium point around which the AC signal voltage is allowed to swing.

Secondly, I commend the inclusion of one of the most universal points of troubleshooting—checking diodes. For the aspiring techs still sitting on the edges of their chairs, here are some typical readings: For a diode in a powered-down circuit, the readings depend on the circuit and the particular

BUD PEEN

meter used, but in the meter's diode-checking position, forward readings in the .300 to .600 range are common. To measure diode "voltage drops" in a powered-up circuit with the meter set up to read voltage, typical readings are between about .550 and .750 volts for a silicon diode and around .250 and .450 volts for germanium and Shottke types, respectively. Also, you should keep in mind that similar methods can be used for checking the diode junctions of silicon transistors.

Ben Solomon
Holland, OH

OOPS

I thoroughly enjoyed the series of short articles on ethnic percussion and sequencing ("Bang a Gong," August 1995), especially the one on Indonesian gamelan. Although the article suggested several titles of records to audition and study technique, there was no reference on how to get in touch with Nonesuch Records. Can you supply me with that information?

Bruce Pelley
Clinton, MA

Bruce—The address for Nonesuch Records is 590 5th Ave., 16th Floor, New York, NY 10036-4782; tel. (212) 575-6720; fax (212) 575-6592.—Diane L.

TAKES YOUR BREATH AWAY

I recorded a classical acoustic-guitar solo with an Audio-Technica AT4033 microphone on a 4-track recorder. The recording was excellent, but unfortunately, my breathing was audible from time to time on the track. I tried to reduce the breathing noise using an equalizer but so far have had no success. Can you suggest any equipment that can be used to reduce noises like breathing or show me a trick or two on how to use the equalizer to resolve this problem?

Dennis K. Ly
Houston, TX

Dennis—If you love the sound of your guitar on tape, I don't recommend messing with perfection by patching in an equalizer to "fix" problems. As soon as you start cutting and boosting frequencies, your ideal guitar sound may evaporate quite rapidly. Breathing and fret (or other performance) noises are common problems with solo-instrument recordings. Some engineers just consider such things as a necessary component of human performance and ignore them. For example, I have a beautiful recording of Rudolf Serkin playing Beethoven's "Moonlight Sonata" where his labored breathing is almost as loud as the piece's soft passages.

However, if you want to diminish breathing without compromising tone, try patching an expander between the microphone and the input channel on your mixer. Simply put, an expander lowers the volume of signals under a user-set threshold. Because the sound of the guitar is usually louder than the breathing, you can set the expander to pull the breaths further below the source signal (the guitar).

I tried this trick with a solo folk singer and was able to get breathing, room noises, and fret squeaks practically inaudible. It wasn't a miracle cure, but it prevented the outside noises from distracting the listener from the performance. If you decide just to let things be, keep in mind that adding reverb to the guitar during the mixdown will accentuate the sounds of breathing and finger noises.—Michael M.

EMULATOR INFO

I just acquired an E-mu Emulator II Plus sampler and have a few questions about it.

What is still available for this instrument (samples, literature, memory expansion kits, and so on)? What is the sampling rate and resolution of this keyboard? How much memory does the EII have? Beside Northstar, who is supporting the EII today? Can I do any editing from my IBM/Windows computer via MIDI or the serial port on the back of the EII? Can I slap a hard drive in as is, or does it require more than a drive and cable? Are there any current user's groups? Was the software v. 2.3 the last version? Was the EII the last Emulator before the EIII?

Finally, if there are any **EM** readers who own this sampler and want to trade samples, please contact me through e-mail.

Phil Hopp
phil.hopp%uocc@
cjbbs.com

Phil—We asked E-mu customer-service ace Mark Camp for help on this one. Our hero was able to supply most of the Emulator II answers you seek.

The Emulator II was the immediate predecessor to the Emulator III. It sampled with 12-bit resolution at 27.778 kHz and had approximately 512 KB of RAM. There never was an Emulator II memory-expansion kit in the current sense of the term. E-mu used to offer the Plus upgrade, which let you have two banks loaded at once and toggle between the two, but that upgrade is long gone.

Similarly, the hard-drive kits and the parts for mounting an internal drive are no longer available. The final software revs were v. 2.3 for non-HD units (those without internal drives); v. 2.6 for EII HD; and v. 3.1 for EII with 3.0 SCAN, whether HD or not. (The OS version that made the instrument 8-part multitimbral was v. 3.0 SCAN; v. 3.1 was the final upgrade.)

E-mu no longer offers samples for the EII. If you want to find EII samples from third parties, you will have to do some research, as few companies actively promote EII products. (The product is obsolete and was discontinued long ago.) I suggest you try long-established companies such as InVision, Q Up Arts, Northstar, Eye & I, and East West.

Finally, keep your eye on the **EM** *classified ads; you never know what you might find from small companies. You might even want to take out your own classified ad; with luck, every EII user that reads* **EM** *will see it. That's probably the closest you can come to creating an EII user group.—Steve O.*

THIS I GOTTA SEE

I love your magazine. It swells my salivary glands when I see it in the mail, and to flip through the pages makes me high as a kite.

Apple-O
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USEFUL PRAISE

I learn more from one issue of **EM** than from four issues of anything else. And the stuff I learn is stuff I can use. Thanks again. You're doing a great job and filling a great need in the music field.

Robert Conn III
sniper1586@aol.com

WE WELCOME YOUR FEEDBACK.

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WHAT'S NEW

By Steve Oppenheimer

▲ VOCE V3

Continuing to do what it does best, Voce introduced its third organ module. The V3 ($1,195) specializes in emulating the Hammond B3 tone-wheel organ. The unit offers 147-voice polyphony (two 61-note manuals and a 25-note pedal manual) and is 3-part multitimbral. Like most Voce modules, it uses simple additive synthesis, layering digital "tone wheels" in a manner analogous to the way sounds are built with drawbars in a real B3. You can change "drawbar" settings via MIDI Control Change messages and save the settings in any of 128 user memory locations. Extensive MIDI control is provided over most of the V3's parameters.

The classic B3 effects are here, including vibrato/chorus, rotating-speaker simulation, key-click percussion, tone-wheel leakage, and tube-like overdrive. Speaker-cabinet simulation is included, too. Because the unit has separate, dedicated circuitry for the vibrato/chorus and the rotating-speaker simulation, you can combine these effects. The rotating-speaker effect is based on Voce's SPIN effects processor. You can choose between and modify several rotating-speaker programs and MIDI maps.

Ease of use is aided by front-panel volume, overdrive, percussion (volume, decay, second/third harmonic select, on/off), rotating-speaker (slow/fast, Spin/Break, on/off), and vibrato/chorus controls. A footswitch can trigger the rotating speaker effect, and an Expression footpedal is supported. The 1U rack-mount unit has an effects loop, programmable EQ, and stereo outputs. Voce; tel. (201) 939-0052; fax (201) 939-6914; e-mail voce@ipeline.com.

Circle #401 on Reader Service Card

▲ VESTAX HDR-8

The magic number of digital audio tracks appears to be eight, as witnessed by the overwhelming number of 8-track systems currently on the market. Vestax has joined the party, adding the HDR-8 ($2,495) to its line of modular hard-disk recorders.

Other than the number of tracks, the unit is very similar to the 6-track HDR-6 (reviewed in the August 1995 **EM**). It features a MIDI-controllable digital mixer with pan, gain, and 2-band parametric EQ on each channel. There are two switchable pre/post-fader aux sends and two stereo aux returns.

Up to four tracks can be recorded simultaneously: two tracks in the analog domain via balanced TRS, ¼-inch mic/line inputs and two tracks via the optical and coaxial S/PDIF I/O. The optional AD-2 card ($190) adds two more analog inputs, allowing you to simultaneously record four tracks with analog inputs. An optional AES/EBU I/O is planned, and an optional SCSI interface ($350) is available now.

The unit features 24-bit internal processing, 18-bit A/D converters, and 20-bit DACs. Levels are monitored on 10-segment LED ladders. Internal track merging is supported, as are "undo-able" delete, move, copy, and paste. There is an 8-point (per song) autolocator with zero return, selection single play, and selection loop play. You can punch in and out automatically or with a footswitch. The HDR-8 sends MTC and MIDI Clock with Song Position Pointer and responds to MIDI Machine Control; VTC and LTC SMPTE sync interfaces are optional.

Vestax also offers the FX-1 digital multi-effects board ($249), which offers 128 preset effects, including delay, reverb, chorus, flanger, and combination effects. The effects processor sends and receives signals in the digital domain via the HDR's aux send.

Remote-control fans should check out Vestax's MX-1 (price tba). The unit uses MIDI to control all mixer parameters on the fly for up to four HDR-6s and HDR-8s. It also stores up to 99 mixer snapshots.

Finally, Vestax announced free *MP-6* and *MP-8* control software for the HDR-6 and HDR-8. These Windows applications let you control all digital mixer parameters and set up both continuous and snapshot automation. The programs supply eight autolocate points and support MMC and MTC. A Mac version is under development. Vestax USA; tel. (707) 427-1920; fax (707) 427-2023.

Circle #402 on Reader Service Card

Dreams do come true!

You've always known the features you've needed in a MIDI keyboard controller, but the high price-tags of feature-rich controllers have made owning one seem like an impossible dream. That is until now...Fatar introduces five controllers with the features you need at prices you can afford, starting as low as $199.95. The ST-610/Plus with aftertouch, ST-610, ST-490/Plus, ST-49, and CMS-61 all have features you've dreamed of as well as some you probably haven't.

For instance, the CMS-61 (pictured) has an ergonomic design which allows it to fit comfortably in with your computer's set-up.* And all of these remarkable Fatar controllers are extremely user-friendly. You'll get more, but won't pay more for a Fatar. So stop in at you local dealer and try a new Fatar MIDI controller. Or send $2.00 for a full color catalog, or $5.00 for a CD-ROM interactive product demo, and see how Fatar can make your fantasy become a reality.

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▶ ROLAND EXPANSION MODULES

Most synths and sound modules provide a broad selection of sounds for all seasons and musical styles. That's great for a foundation instrument or for those who play many types of music. But if you need an in-depth, genre-specific selection of sounds, you might be wise to invest in a specialty sound module.

Following this logic, all but one of Roland's new 1U rack-mount Sound Expansion Modules offer genre-specific sounds drawn from the company's JV-series synths, XP-50 Music Workstation, Sound Canvas library, and SR-JV80 Expansion Boards, as well as some completely new sounds. Five modules have been introduced so far. All include a simple effects processor with eight reverbs and three choruses, and all except the M-GS64 (discussed shortly) feature 28-voice polyphony and 8-part multitimbral operation.

As its name implies, the M-SE1 String Ensemble ($795) specializes in string patches (170 of them), with control of performance nuances such as arco, spiccato, pizzicato, and marcato. Roland processed some of the patches with its RSS 3-D technology to make them sound as if they are in a real performance space.

The M-OC1 Orchestra ($795) delivers 8 MB of waveforms, including 226 Patches from the SR-JV80-02 Orchestral Expansion Board. Although the main focus is on strings, brasses, and woodwinds, you also get orchestral percussion, complete with performance techniques such as rolls and flams.

Vintage synthesizer lovers will want to check out the M-VS1 Vintage Synth ($795), which features 8 MB of sounds, including 255 Patches from the SR-JV80-04 Vintage Synth Expansion Board. In addition to sounds from such classic Roland synths as the Jupiter, Super Jupiter, Juno, System 700, TB-303, SH series, and D-50, you get sounds from the Minimoog, Oberheim 2-Voice, Prophet-5, and more. Vintage rhythm sounds from such stalwarts as the TR-808 and CR-78 also are included.

The M-DC1 Dance module ($795) provides 10 MB of sounds from the new SR-JV80-06 Dance Expansion Board. These include vintage Roland drum machines, voices, scratches, phrase loops (e.g., acoustic drums with a "human" feel), industrial beats, and other contemporary dance-oriented sounds.

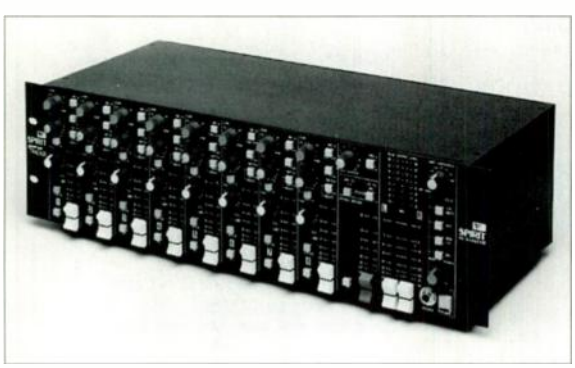
The M-GS64 ($895) is a bit different from the others. To begin with, it is not genre specific; essentially, it is a rack-mount version of the SC-88 Super Sound Canvas with two pairs of assignable stereo outputs and a GS sound set. In addition, it features 64-voice polyphony and 32-part multitimbral operation (thanks to two MIDI In ports). The module comes with 654 Tones and 24 rhythm sets. Roland Corporation US; tel. (213) 685-5141; fax (213) 722-0911.

Circle #403 on Reader Service Card

▼ SPIRIT PROTRACKER

Live recording should be kept simple; after all, you're trying to capture the band's live sound not reinvent it. So when you're recording on location with an 8-track modular digital multitrack tape or hard-disk recorder, it's wise to use a straightforward mixer optimized for the purpose. That's the logic behind Spirit's 3U rack-mount ProTracker 8-channel mixer ($999.95).

Each of the inline mixer's channels includes both a mic input with gain pot and individually switchable phantom power and a balanced line input with built-in DI capability. The mic preamps are improved over previous Spirit designs, boasting 60 dB of gain range. The channel insert uses separate send and return jacks, and the insert and aux send are switchable pre/post-fader. They also can be switched between the channel and tape (monitor) path. Linear faders are provided for each channel, the stereo return, and the L/R master buses. Pan pots are included for each channel.



The direct tape inputs and outputs are switchable for +4 dBu/-10 dBV operation and allow permanent tape send/return cabling to a rack-mounted multitrack deck. PFL monitoring is provided on the channels and stereo returns, and a highpass filter on each channel reduces mic popping and stage rumble. A limiter with threshold control and 300 µs attack time can be switched individually into each channel, and channel Overload and Limiter indicators are provided.

For small bands, you can even route the main mix to channels 7 and 8 without affecting the other six channels, providing front-of-house stereo mixing and simultaneous 6-track recording. The monitor/headphone bus can be switched between the main mix, 2-track tape return, aux bus, and channels 7 and 8. In addition, you can daisy chain multiple ProTrackers with an expansion socket.

An internal, universal, switching power supply provides 100 to 240 VAC operation, which is mighty convenient in the unpredictable world of location recording. Spirit; tel. (801) 566-8800; fax (801) 566-7005.

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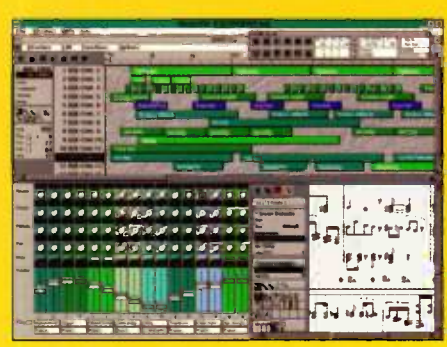

and effects. User definable color coding for all tracks and a powerful interactive notation section provide maximum overview and easy handling. Should you one day desire more functionality and power, you can simply upgrade to Logic.

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perfect tool for producing music in professional or home studio environments. Logic for Windows (also available for Macintosh) will offer you entirely new possibilities and its flexibility will amaze you again and again.

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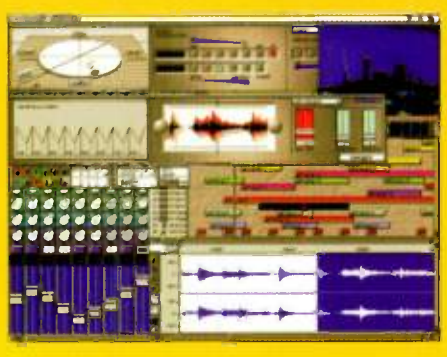

the Time Machine™, the Quantize Engine™, the Silencer™, the Groove Machine™ , the Audio Energizer™, the Audio to Score Streamer™, Audio to MIDI Groove Templates™ and more. You owe it to yourself to seriously check out this program before you consider buying anything else.

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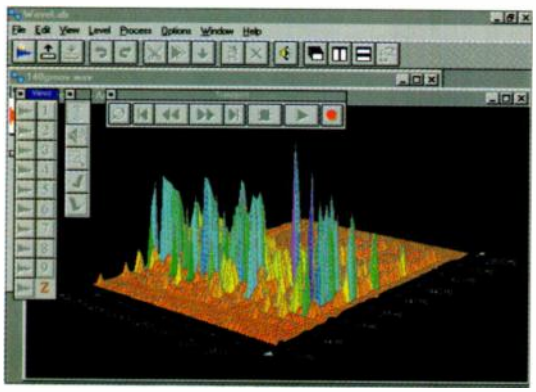
▼ STEINBERG WAVELAB

Having already established its digital audio prowess with *Cubase Audio, ReCycle, Time Bandit, Cubasis Audio,* and several DSP plug-ins for Digidesign systems, Steinberg released its first dedicated digital-audio editor. *WaveLab* ($299 until January 31, 1996; $499 thereafter) is a 32-bit application for Windows 95 and Windows NT that offers



true multitasking, including loading, editing, saving, and processing while the music is playing. The user interface features drag-and-drop editing. *WaveLab* works with any Windows 95-compatible sound card.

The program offers sample-accurate, real-time editing with unlimited zoom. You can normalize gain and draw custom fades and crossfades. The time correction and pitch shifting are based on Steinberg's highly respected *Time Bandit* technology. Effects include harmony processing, chorus, parametric EQ, and dynamics processing. Not only does it provide 3-D spectrum analysis, it offers several spectral displays with adjustable viewpoint (MultiView).

WaveLab not only supports WAV and AIFF files, it lets you cut, copy, and paste between the two formats. It handles sample-rate conversion and supports extended stereo/dual mono files, which Session 8 users will appreciate. To top it off, you get batch processing and an integrated database, AudioAccess, that helps you manage audio files and projects.

Steinberg also announced *Cubase Audio 3.0 TDM* for Macintosh ($799), which provides support for between sixteen and 48 physical audio tracks using Digidesign's high-speed TDM audio bus. The TDM system is presented as a virtual patch bay within *Cubase Audio,* with a virtual effects rack. The upgrade also includes MovieManager support, which allows simultaneous editing of multiple QuickTime movies, with a direct link to the audio. OMS 2.0 is supported, too. Finally, the upgrade provides all the new features of *Cubase Score* 2.0.

Speaking of *Cubase Score* 2.0 ($549), the Windows version of that upgrade is now shipping. Aside from a redesigned, color user interface, the program integrates StyleTrax interactive auto-accompaniment Styles, the Studio Module sound and instrument manager, and the CueTrax graphic tempo editor (an alternative to the usual Mastertrack). You also get more than 230 new features, including guitar tablature and drum notation.

Steinberg also introduced several new TDM plug-ins. *TimeGuard* ($399) measures timing delays between two tracks in real time, making it a software equivalent of Jeanius Electronics' Russian Dragon timing analyzer. In the "why didn't someone think of this before" department is *Tun-A* ($149), a chromatic and guitar tuner plug-in.

Finally, the *Spectralizer* plug-in ($1,399) provides sonic optimization without the artifacts found in hardware enhancers and without affecting the phase. Mono and stereo versions of the program are provided. According to Steinberg, the *Spectralizer* makes recordings sound crisper, clearer, and more "present." You can adjust the effect's strength and emulate the sound of an analog enhancer, if desired. The second and third harmonics can be individually adjusted. Steinberg North America; tel. (818) 993-4091; fax (818) 701-7452; e-mail steinberg@aol.com.

Circle #405 on Reader Service Card

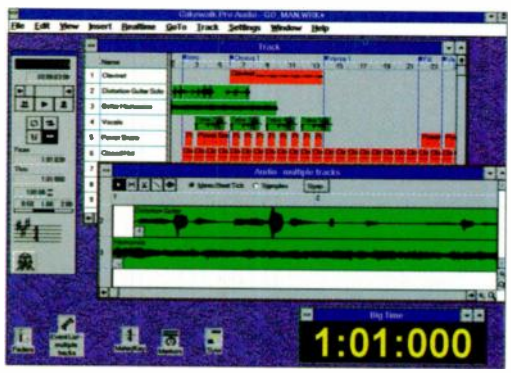
▶ CAKEWALK PRO AUDIO

Cakewalk Pro has long been one of the top PC sequencers, so it appears a harbinger that Cakewalk Software (formerly Twelve Tone Systems) unveiled its long-awaited *Cakewalk Pro Audio* ($399) at the AES show. The unchallenged reign of the Mac in the pro audio world may be ending.

The program lets you record at between 11 kHz and 44.1 kHz using any Windows sound card. The number of audio tracks is not limited by the software and depends on the sound card and the computer. *Cakewalk Pro Audio* uses advanced disk caching and file sharing to minimize RAM and hard-disk requirements and CPU processing. The audio continuously resyncs with the MIDI tracks for tight playback with no drift.

The program lets you cut, copy, and paste audio; split/combine audio clips; normalize; remove silence; extract timing; and reverse the region. Groove quantize to audio is provided. You can scrub the audio, mix tracks, draw custom fades, and apply graphic and parametric EQ. Onscreen "VU" meters monitor levels.

The user interface includes an improved Track view that lets you create and edit "clips" of music comprising any length of MIDI or audio data. You can then visually build songs by copying and pasting. The upgraded program also offers enhanced notation features, though only for MIDI data. It supports guitar chord grids, hairpins, pedal markings, expression text, and lyrics.



The *Cakewalk Pro Audio CD Deluxe Edition* ($479), adds the *Musician's Toolbox,* a 600 MB collection of multimedia tools, digital audio grooves, MIDI files, and tutorials. Cakewalk Music Software; tel. (800) 234-1171 or (617) 926-2480; fax (617) 924-6657; 60midiaben@compuserve.com.

Circle #406 on Reader Service Card

99TH AUDIO ENGINEERING SOCIETY CONVENTION ▲ ▲ ▲ ▲

It's gratifying when you have long pursued a less-traveled road and your industry finally comes around to join you. Indeed, the message delivered at this year's AES Convention is that the world of pro audio has come to worship at the shrine of the small project studio. We who work with computers, synths, and digital audio are no longer the industry's poor stepchildren, as was the case only a few years ago; we are now highly respected and fiercely pursued customers.

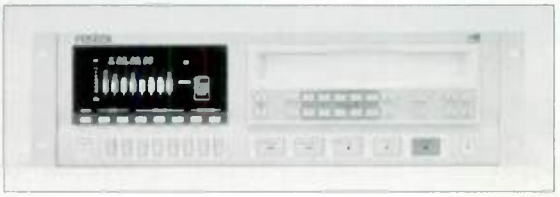
The continuing dominance of digital-audio production led the way. Digidesign announced several welcome improvements to its computer-based systems for both Mac and PC (see sidebar "AES Report: The World of Digidesign"), but perhaps even more impressive were the nineteen third-party software developers. A host of hot TDM and Sound Designer plug-ins further expanded the Digidesign systems, especially for the Mac platform. The show was also a strong vehicle for such Macintosh stalwarts as Sonic Solutions and Opcode; indeed, the two companies showed Opcode's *Studio Vision Pro* running on Sonic's state-of-the-art audio cards.

Meanwhile, Windows software from

Akai DR8

Digital Audio Labs, Innovative Quality Software, Sonic Foundry, Tracer, Cakewalk (formerly Twelve Tone Systems), Steinberg, Spectral, and others served notice that the Mac's once-unchallenged supremacy in the pro-audio world is fast eroding. We saw hard-disk recorders, digital audio sequencers, sample editors, and noise-reduction software, all at an increasingly impressive technological level.

Computer-based systems were only a part of this year's digital-audio story. Akai showed the DR16 ($4,995), a 16-track version of its DR8 modular hard-disk recorder ($3,499), Vestax introduced the HDR-8, and Fostex showed its hard-disk-based DMT-8 Multitracker (see the November 1995 "What's New").



Fostex CX-8

In the world of modular digital multitrack tape decks, Fostex and Panasonic announced new units based on the Alesis XT ($3,499), an upgraded ADAT that was described in the November 1995 "What's New." The Fostex version, called the CX-8, is almost identical to the Alesis version and carries the same price tag, but it offers a DB25 connector instead of the Elco connector for its +4 dB outputs. In contrast, Fostex's RD-8 ($4,300) has many more features than the original ADAT, so although Alesis is discontinuing the original ADAT, the RD-8 will still be available.

The Panasonic XT-based unit, dubbed the MDA-1 (price not announced), was announced but not shown. It differs from the Alesis XT in that it substitutes XLRs for the Elco connector and has relay-switched outputs, which won't pass system noise when no audio signal is present.

The digital-audio revolution has, in almost Marxian fashion, brought about its technological antithesis: a revival of tube technology. You couldn't take ten steps down any aisle at AES without spotting yet another tube-based preamp, compressor, or EQ. This retro action is especially impressive considering that just a few years ago, most recordists thought the tube was going the way of the phonograph. Judging from the plethora of tube-based products at the Fall 1995 AES show, as with analog synths, the predictions of tube technology's demise were clearly premature. As one wag put it, "Analog is back, and it's pissed!"

New consoles are flourishing, too. Aside from the usual high-ticket items—for instance, Sony showed a feature-laden, all-digital console that costs as much as a house—new boards of all types proliferated. Leading the way was Yamaha's previously announced 02R digital mixer (see the October 1995 "What's New"). But even miniature mixers that just a few years ago didn't dare show their faceplates at a pro-audio show were proudly displayed by such established manufacturers as Mackie, Soundtracs, and Samson. Also on display were an assortment of fine-looking new microphones, close-field reference monitors, multi-effects processors, direct boxes, and wireless systems.

Overall, this year's AES show emphasized a continuation of recent trends, rather than overwhelming breakthroughs. Our industry appears healthy, the technology is steadily maturing, and project studios are finally getting respect. The pro-audio world is beating a path to the **EM** reader's door in 1996. How sweet it is!

▼ GROOVE TUBES CL1

A long-time advocate of tube technology, Groove Tubes is well positioned to take advantage of the tube revival. Not only did the company show three tube-based condenser microphones—the MD-1 cardioid, $780; MD-2 cardioid, with gold diaphragm and sensitivity control, $1,295; and MD-3 switchable cardioid/omni, with large gold diaphragm and sensitivity control, $1,795—it also offered a tube compressor, a tube EQ, and a tube preamp. All GT tube devices use the company's PS2a external power supply ($350), which can power three daisy-chained units.

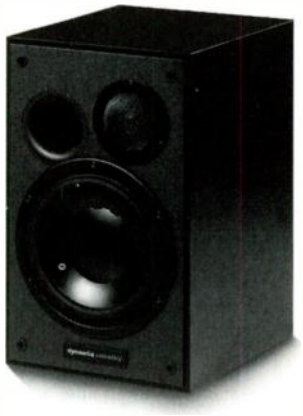
The CL1 tube compressor/limiter ($1,295) is a half-rackspace, mono unit. A stereo version, the CL1s ($1,895), contains two independent CL1 units that fill one rackspace. With the stereo unit, you can run in dual mono or linked stereo. Controls include ratio (2:1, 4:1, 8:1, and 12:1), threshold, gain reduction, low/high input sensitivity (optimizes the input level to the gain reduction and sidechain circuits), output makeup gain, attack, release, and VU meter select (gain reduction or output level). That's right, you get real VU meters, which usually are more accurate than LED ladders. Both balanced XLR and unbalanced ¼-inch I/O are provided, and a sidechain is included.

The quasiparametric EQ1 5-band tube EQ ($695) offers a wide variety of possible settings, thanks to five cut/boost level controls and four variable crossover controls, each of which selects between three crossover points. (These are true crossover points in that they define the break point between filter bands.) Like the CL1, the EQ1 has both XLR and ¼-inch I/O. The output is at unity gain, and levels are indicated by a 3-stage LED. The EQ1 can operate at +4 dBm or -14 dBm levels. Groove Tubes; tel. (818) 361-4500; fax (818) 365-9884.

Circle #407 on Reader Service Card

▶ DYNAUDIO ACOUSTICS BM15

Responding to user requests for a close-field reference monitor that can produce high sound-pressure levels and offers extended bass response, Dynaudio Acoustics introduced the BM15 ($1,599/pr.). The mids and bass are reproduced by a new 8.4-inch woofer, which is driven by the same coil and magnet system used in the bass drivers in the company's top-of-the-line M4. The tweeter is a modified 28 mm Esotec. The 2-way, passive crossover is set at 2.5 kHz.



The system can handle 150 to 350W/side into four ohms, and it can handle peaks of up to 1 kW. Although it was designed for nearfield use, it can also be used in midfield applications. The frequency response is rated at 40 Hz to 20 kHz (±3 dB), THD + IMD is <0.1% (reference level 88 dB, any frequency). The enclosure measures 17.4 × 10.8 × 13.4 inches and weighs 22 pounds. AXI (distributor); tel. (617) 982-2626; fax (617) 982-2610.

Circle #408 on Reader Service Card

▼ APHEX 661

Aphex led the way in the battle of the tube processors, winning a *Mix* magazine Technical Excellence and Creativity (TEC) award for its popular Model 107 Tubessence preamp. Tubessence technology does not use transformers and operates at low plate voltages. According to Aphex, this patented, hybrid approach results in lower heat levels, increased tube life, and more consistent sonic results than are possible with traditional tube designs.

Following up on this success, Aphex introduced the 1U rack-mount Model 661 Tube Expressor ($750), a Tubessence-based compressor/limiter. The unit can operate manually (Expressor mode) or automatically (Easyrider mode).

The 661 offers a full set of manual controls, including input, threshold, attack, release, ratio, high-frequency expander compression ratio, corner frequency, and output. It includes a sidechain, unlinked mono processing, stereo linking, and master/slave linking. The user can select between three compression curves: hard knee, soft knee, or no knee. The 661 can operate at +4 or ,-10 dB levels, and LED meters are provided for gain reduction and output level.

The inputs and outputs are servo balanced. The inputs are designed to maintain headroom while absorbing the high common-mode voltages that often occur with long cable runs. The output can be run unbalanced without the 6 dB loss that often occurs when running unbalanced lines with balanced outs.

The Tube Expressor includes Aphex's High Frequency Expander (HFX) feature, which automatically decompresses the high frequencies by up to 6 dB, with user-adjustable corner frequency and ratio. According to the manufacturer, this allows you to use high compression ratios with less high-frequency loss than is possible with regular compressors.

At the same time, the company's unique Spectral Phase Refractor technology enhances the bass portion of your sound without actually boosting the low frequencies. Aphex Systems; tel. (818) 767-2929; fax (818) 767-2641.

Circle #409 on Reader Service Card

We couldn't have said it better ourselves.

"*Out of this world, exceptionally realistic, unbelievable bass end,* and *dirt when needed*, are just some of the tired expressions that could be dragged from the cliche cupboard, because this is one mother of a synth...If you want classic analog sounds then forget the secondhand pages and buy a Prophecy, and if you want to explore virtual modeling then this is the cheapest way so far. The Prophecy will be a classic in the way of the DX7, D50 and M1." – **Future Music**

"The Prophecy is a monophonic solo instrument with a projected price that puts it into the *I gotta get one* bracket. If I hadn't been told this was a digital machine, I would have accepted the analog sounds without question. I don't think I need to be a prophet to predict that the Prophecy is going to be in demand." – **Sound on Sound**

"Love at first sight. This is a synth for the future which incorporates all the best of synths past. If you like to twist, change and control sounds as you play; if you like analog; if you like realistic emulations of brass and wind; in fact if you're interested in synthesis at all, you really have to try the Korg *Prophecy*. In my humble opinion, it's the best keyboard currently available in this price range – or anywhere near it." – **Making Music**

"Divine Prophecy. If you're looking for a synthesizer that doesn't only play, but that also shapes sound, check out Korg's latest synth called the Prophecy Solo Synthesizer." – **EQ**

"Keyboard mavens will probably love this, Korg has a hot new synthesizer...Rick Wakeman's a fan: *Occasionally, and I mean occasionally, something really innovative and exciting to play appears. Prophecy comes under that rare heading.*" – **Music Monthly**

"This is an instrument that reassures sonic originality, creativity and spontaneity at a time when recreative preset-itis has become the norm. Quite simply, this is a stunning synth." – **Keyboard Review**

"This little board packs a serious punch. I really liked how the data ribbon is built onto the pitch wheel...it provides a new outlet for expression" – **Memphis Musician**

"The Korg *Prophecy*, a 37-key synthesizer featuring Korg's DSP-based Multi-Oscillator Synthesis System, has gotten a big thumbs-up from Rick Wakeman. If you heard its wailing analog-like tones at NAMM, you'd know why." – **Musician Magazine**

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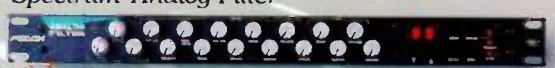

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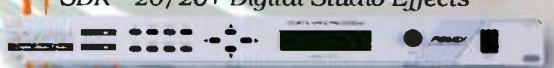
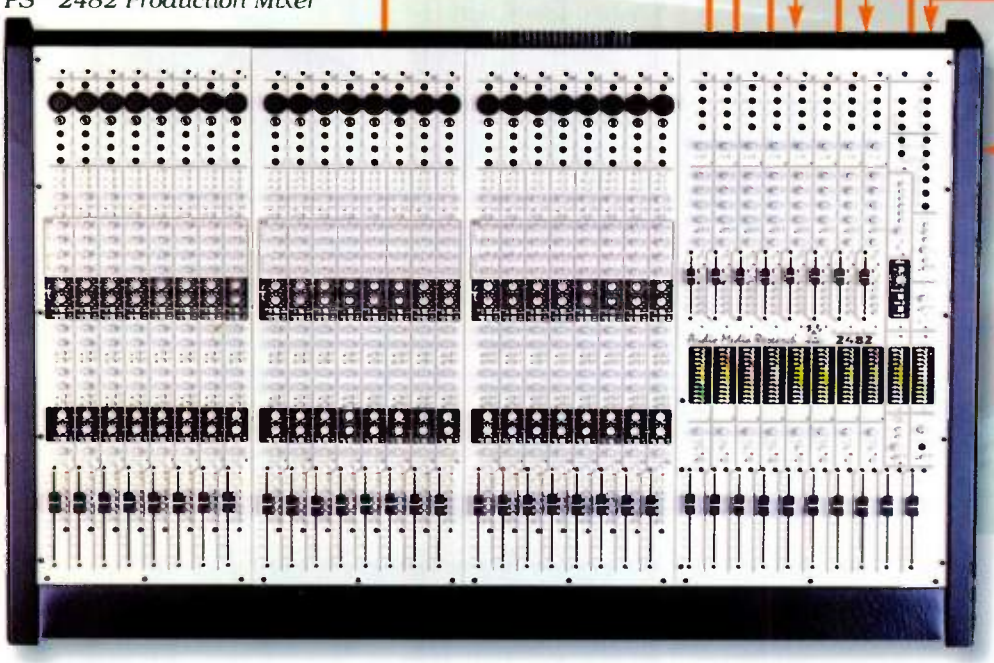


VMP™ 2 Vacuum Tube Preamplifier

PS™ 2482 Production Mixer



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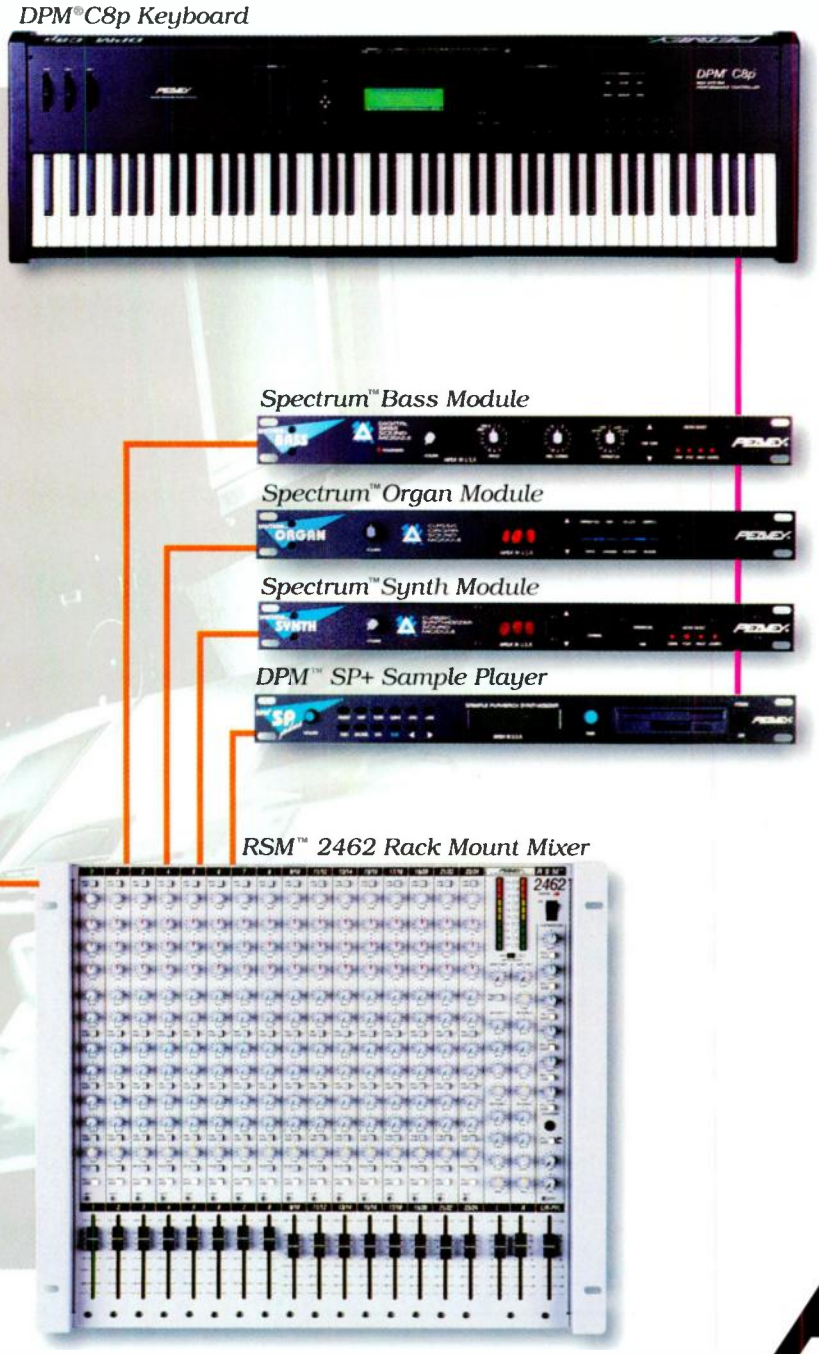

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AES REPORT: THE WORLD OF DIGIDESIGN ▲ ▲ ▲ ▲

Digidesign and its "development partners" dominated a large section of the AES show floor, demonstrating clearly that computer-based music production has arrived in a big way. To begin with, Digidesign has repositioned its software line: thanks to the company's new PowerMix technology for DAE, *Pro Tools* 3.2 ($795; $249 upgrade from Session 8) will work with all the company's audio cards, including Session 8 and Audiomedia. The recently released *Session* software ($199) will still be available as a lower-cost alternative.

Digidesign also announced AudioSuite, a plug-in architecture that allows upgraded DSP plug-ins to operate with just a Power Mac or fast Windows CPU. Digidesign had many more AES announcements, including *DINR* 2.0 ($995), a TDM-compatible version of its noise-reduction program; Audiomedia III ($995; includes *Session*), a PCI-based card previously announced as Audiomedia II PCI; and a TDM module for SampleCell II ($495).

Circle #410 on Reader Service Card

▼ T.C. ELECTRONIC

The latest from t.c. electronic is *TC Tools* ($995), a TDM plug-in that provides the Reverb 1 and 2 algorithms from the company's powerful M5000 effects processor, and the chorus from the TC 1210 Spatial Expander. You can control its parameters via onscreen faders or the TC Graphic control screen. Digidesign (distributor); tel. (415) 688-0600; fax (415) 327-0777; e-mail 74774. 3122@compuserve.com.

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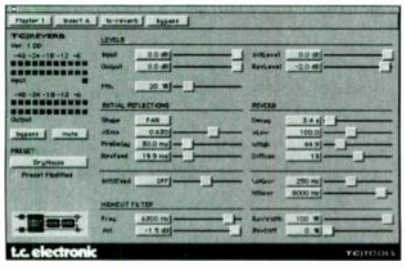

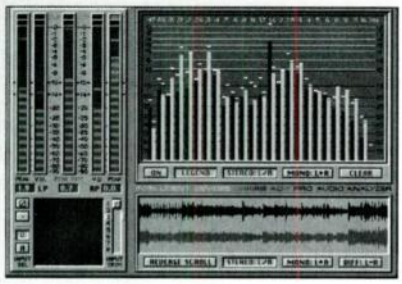

▲ INTELLIGENT DEVICES

So popular was the Intelligent Devices booth that at times it was tough to get a look at the *AD-1 Pro Audio Analyzer* ($349). This program, which runs as a TDM plug-in or as a stand-alone application for Audiomedia or Power Mac (with no additional hardware), provides precise, simultaneous stereo peak and average metering, clip indication, headroom margin indication, L/R sum and difference, real-time spectral analysis, phase metering, and waveform history display.

The five 240-element meters show every peak even if only one sample long. The spectrum analyzer is true dual-channel/mono and uses two 1,024-point Fourier engines with a 74 dB digital peak-log display. The phase scope shows actual stereo imaging depth and L/R discorrelation. Ten presets store 24 adjustable parameters.

A *Plus* version is available ($499) that has at least 40 more features, including DC offset and correction and the ability to lock to SMPTE time code and print the total history of clips with their location. All modules can zoom out to full screen. RiCharde & Company (distributor); tel. (408) 688-8593; fax (408) 688-8595; e-mail richarde@got.net.

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APB TOOLS

On the unusual side was APB Tools' *EM I Eternal Machine* ($695), a Sound Designer plug-in that simultaneously applies dynamic time compression/expansion (0.01 to 100); dynamic pitch shifting (-36 to +48 semitones, with cents resolution); and dynamic filtering (morphing) with up to 100 arbitrary filter curves anywhere in the sound file and up to 2,048 bands.

All *EM I* parameters are graphically edited with "rubberband"-type envelopes that you drag onscreen to shape the sound changes. The combined effect as the pitches, timbre, and timebase change dynamically over time can be startling. However, due to its demanding computational requirements, the program is not real time. RiCharde & Company (distributor); tel. (408) 688-8593; fax (408) 688-8595; e-mail richarde@got.net.

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ANTARES SYSTEMS

AnTares Systems, formerly known as Jupiter Systems, showed the *Spectral Shaping Tool* (*SST;* $699), a TDM and Sound Designer II plug-in that allows you to tune your Digidesign system to match your speaker system and listening room. It offers multiple calibration signals, including sweep and noise signals of various durations.

Different audio environments can be stored for later recall. You can use precalibrated mics, or use your own mics by specifying their frequency response characteristics. RiCharde & Company (distributor); tel. (408) 688-8593; fax (408) 688-8595; e-mail richarde@got.net.

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FOCUSRITE

The third-party Digidesign development-partners area at AES was a madhouse, with nineteen third-party developers showing their wares. To start things rolling, Focusrite and Digidesign announced a codeveloped digital EQ plug-in based on Focusrite's RED 2 parametric EQ. The program will be distributed by Digidesign and will list for under $1,000. Digidesign; tel. (415) 688-0600; fax (415) 327-0777; e-mail 74774.3122@compuserve.com. ●

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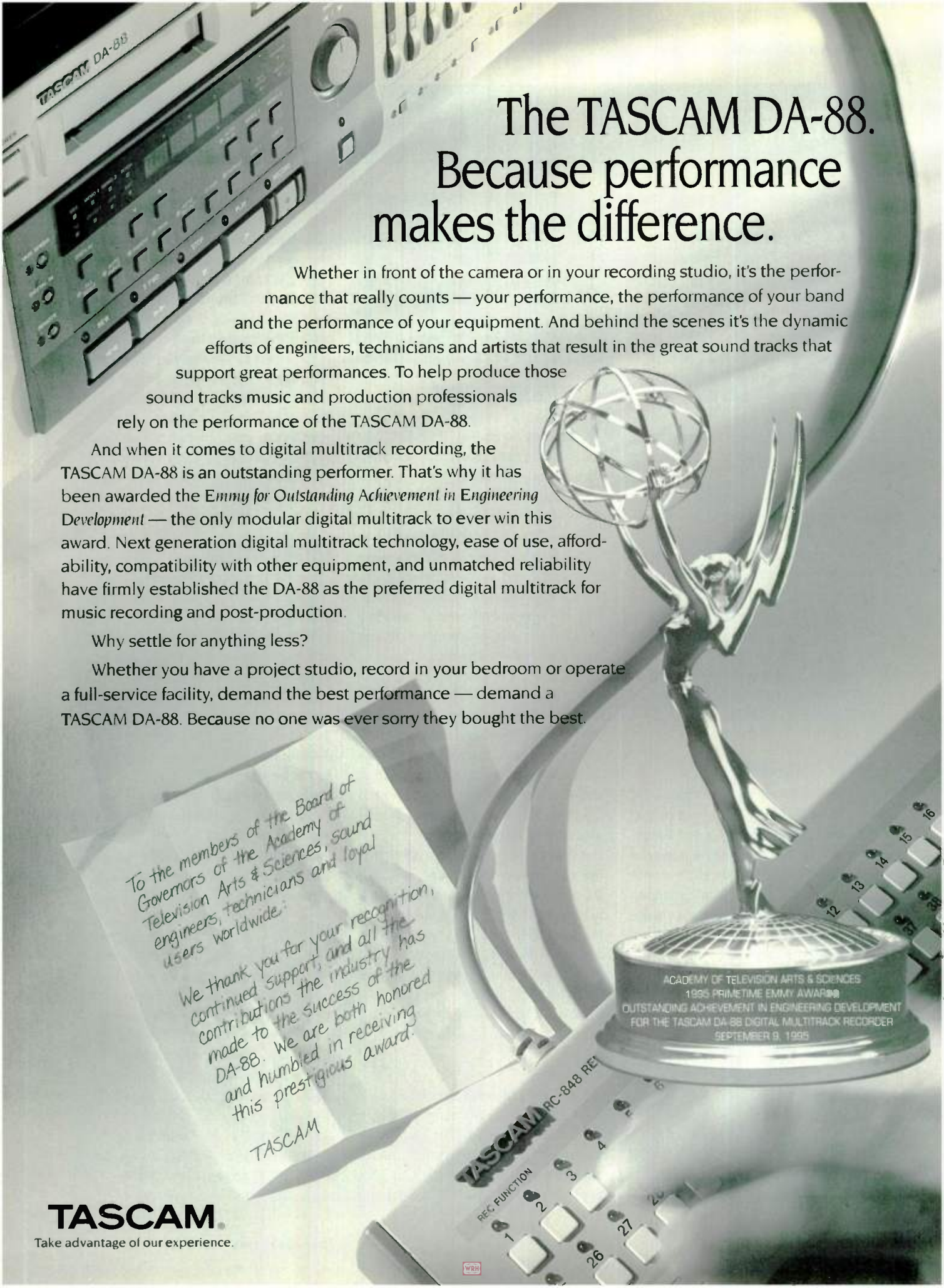

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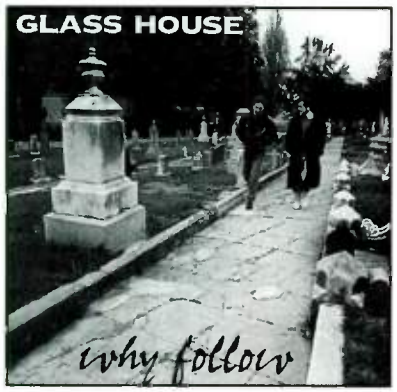

Throwing Stones

Glass House bares its musical soul.

By Mary Cosola

As in affairs of the heart, finding that special someone to share your musical life with can seem downright impossible. I'm sure some of you remember that much-debated study a few years back that suggested women over 40 have a better chance of getting killed by a terrorist than getting married. Sometimes, creating a mutually satisfying songwriting collaboration is just as elusive. It took Mark Vickness two years from the time he started writing songs for his project Glass House to find vocalist David Worm. It took another five for the duo to put out their first CD, *Why Follow.*

Vickness decided to return to the pop music scene after receiving his master's degree in composition from the California Institute of the Arts. Having auditioned singer after singer, he considered chucking the whole idea. He placed a classified ad listing some gear for sale, and Worm responded. The two got to talking and decided to give each other a listen.

"When Mark and I started working together the rapport was wonderful," says Worm. "There was a lot of stuff I wanted to say musically that Mark helped facilitate." Vickness adds, "There's an element to the songwriting collaboration that I find therapeutic. We don't think of this as a commercial product as much as something we just need to do."

The music on the CD is a soulful blending of musical styles, including rock, funk, and jazz, with Worm's impassioned vocals delivering the duo's heartfelt lyrics. Several of the songs on *Why Follow* deal with racism and other social issues. "It's a fine line to walk," says Vickness, "because we don't want to sound preachy. 'Where I Belong?' is written from the point of view of a child watching the Rodney King riots from his window and thinking, 'Could this really be how I'm supposed to be growing up?'"

The harmony born of five years of songwriting collaboration paid off when it came time to record their songs. "We had developed a rhythm between us in terms of working at home," says Vickness. "We wanted to capture that rapport on the CD, so we recorded it in my home studio."

Neither partner likes the idea of recording with isolation booths, and because Vickness' studio is set up in a spare bedroom, there wasn't much room for one anyway. "Certainly, there's a lot to be said for using an iso booth to minimize outside noise," says Vickness, "but the minute there's a wall between the performer and the producer, it's hard to communicate. Ever since we started recording together, I've had David within arm's reach."

"That way he can squeeze whatever note he wants out of me," laughs Worm. "Seriously, though, it's the best way for us to record. It's like feeding off the energy of an audience."

Vickness extended this production technique to the drum tracks, which had to be recorded in a pro studio. "When we were working with drummers, they were in the booth, and we were in the control room," he says. "When we weren't getting the performance we wanted, I said, 'That's it. I'm going in there.' I danced around in front of the drummer while he played, waved my arms, anything to get the performance we needed. And it worked. It's also a lot of fun to record that way." ❦

For more information, contact Organelle Records, 197 John St., Oakland, CA 94611; e-mail mark@aimnet.com. Clips of three songs from Why Follow *are available on the Internet via IUMA at http://www.iuma.com.*

David Worm (left) and Mark Vickness.

Pack your troubles in your old gig bag and have some big holiday fun!

Cheap Thrills

It's no coincidence that we speak of "playing" music; if music making weren't so much fun, few of us would do it. Sure, we work long and hard when in the throes of recording a project, but we do it because we love it. (Okay, *some* musicians do it for fame, sex, and money.)

Sometimes, though, we get buried in the technical details of sophisticated and relatively expensive gear. Then, if we're not careful to maintain our perspective, music making can start feeling too much like drudgery. Well, that simply doesn't cut it. Even serious professionals need to enjoy their work, and sometimes we all need to take a break and focus on the lighter side. And what better time than the holiday season to kick back and enjoy the small pleasures of electronic music?

So let's temporarily put aside our day-to-day production headaches, stop concerning ourselves with serious, expensive products, and just play with some useful toys! The **EM** editors have selected more than a dozen "cheap and cheerful" electronic-music products that would make great holiday gifts for your friends—or for you. Everything on our wish list is practical, easy to use, and lists for less than $150. Mind you, we could have put together a much longer list, but that would feel too much like drudgery.

by Steve Oppenheimer


Photography
by
Eric Harger
A R T
TUBE MP
SPARKY
Radio Shack
SOUND LEVEL METER

Rok Sak rack bags

Hauling your rack gear is a lot easier with lightweight Rok Sak rack bags, which feature a high-impact polymer hard shell covered by a cordura nylon outer shell with zippered covers.

$114 (4U x 15.5")

Littlite

You can't tweak what you can't see. Fortunately, a nifty stand- or socket-mounted, gooseneck Littlite will shed plenty of light on your rig.

$60

KAT poleKAT

A polecat is a smelly, striped animal to be avoided. In contrast, KAT's poleKAT is a friendly sort, offering two edge-like playing surfaces for triggering electronic hi-hats, cymbals, and other sounds.

$149

Announcing an advancement in GM so dramatic, it will change the way you listen to music.

And it will change the way you create music. The XG standard from Yamaha gives you more control, more voices and more possibilities to make the most expressive sequenced music ever.

Advertisements are prone to overstatement. We invite you to hear for yourself how the Yamaha XG technology instantly and forever improves GM from a "gee, that's nice" standard to an *expressive* musical necessity. Visit any authorized Yamaha DMI dealer for an XG demonstration.*

Yamaha MU50 Tone Generator (480 XG voices, 32-note polyphony)

GM supports only 128 voices. XG enables up to thousands, all GM compatible. The only limit is your tone generator's capacity. XG also allows many more channels than GM for rhythm parts, giving you the ability to easily create complex drum and percussion tracks.

Effects and controllers are as critical as voices. XG significantly beefs up the number and control of these parameters. At its most basic level, XG supports a minimum of three internal effects (reverb, chorus and a switchable global or "insertion" effect). It also adds support for 23 control change messages beyond GM such as sostenuto and soft pedal, filter cutoff and resonance and portamento.

The XG standard is expandable. Higher level XG devices, like the Yamaha MU80 tone generator, include many more features such as a fourth internal insertion effect and an internal stereo graphic EQ so you can create *complete* productions completely under MIDI control. The MU80 also provides 64 note polyphony and the ability to input two channels of external audio, like your voice and your guitar, and mix them and add effects just as if they were synthesizer voices.

Yamaha MU80 Tone Generator (537 XG voices, 64-note polyphony)

QS300 Production Synthesizer (480 XG voices, 32-note polyphony)

And XG, at all levels, expands GM to a minimum of 32 note polyphony. For more information on XG, download "An Introduction to XG" from America Online→ Keyword SSS→ Industry News→Yamaha→Product Brochures.

XG is the future of music. And it's here today. Check out the exceptional potential of XG on Yamaha MU50 and MU80 tone generators, the QS300 production synthesizer and the DB50XG sound daughter board. You'll hear why XG makes your music sound so incredible and realistic, we hate to call it a STANDARD.

DB50XG Sound Daughter Board (480 XG voices, 32-note polyphony)

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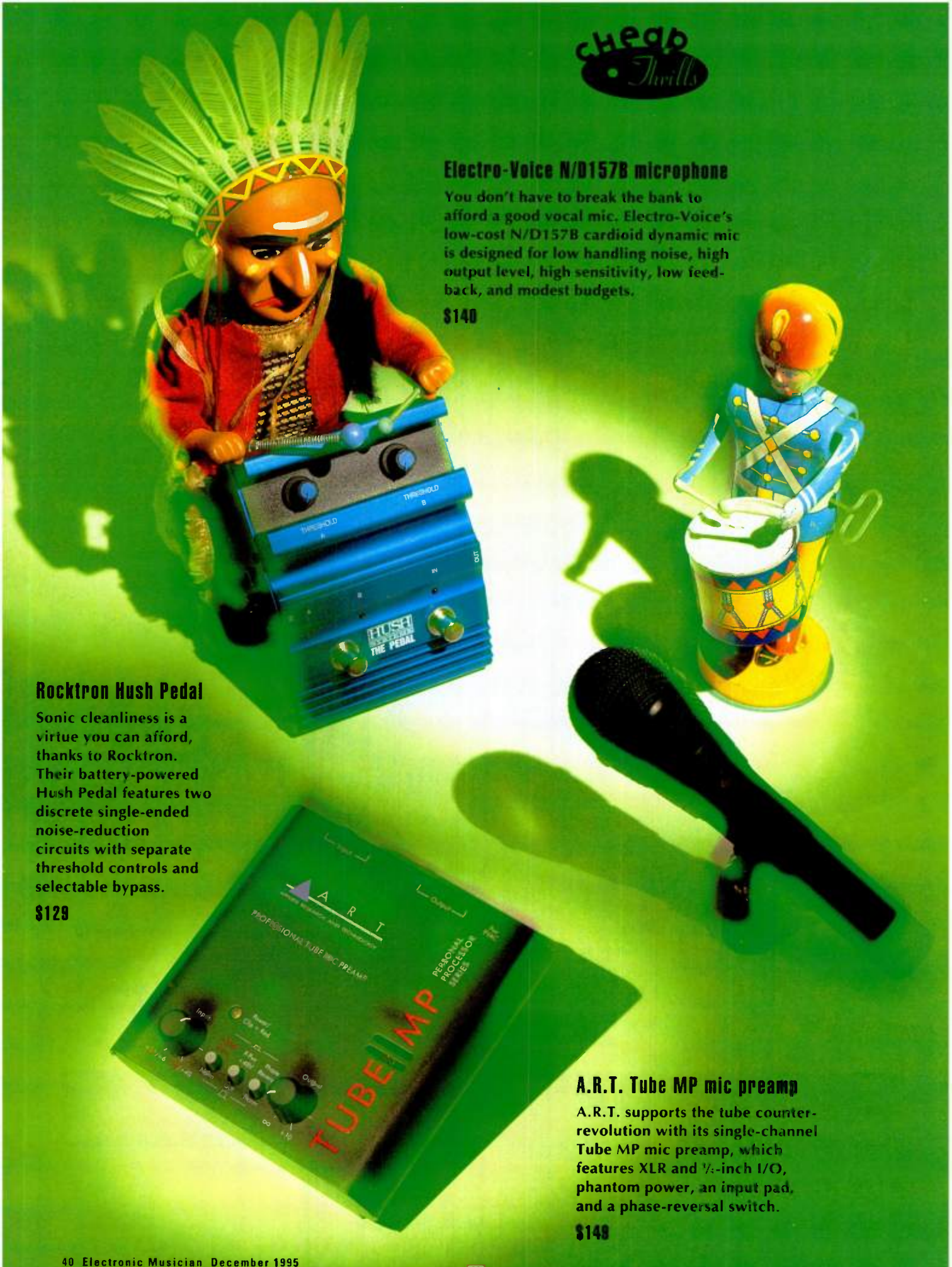

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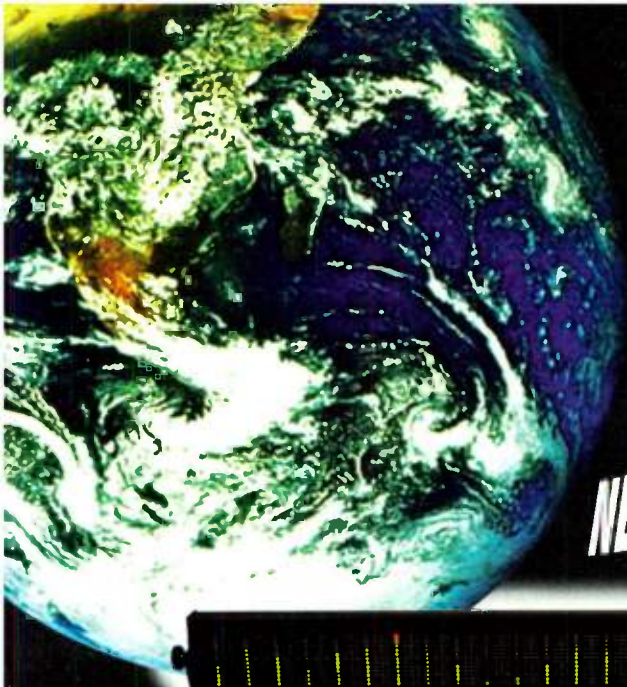

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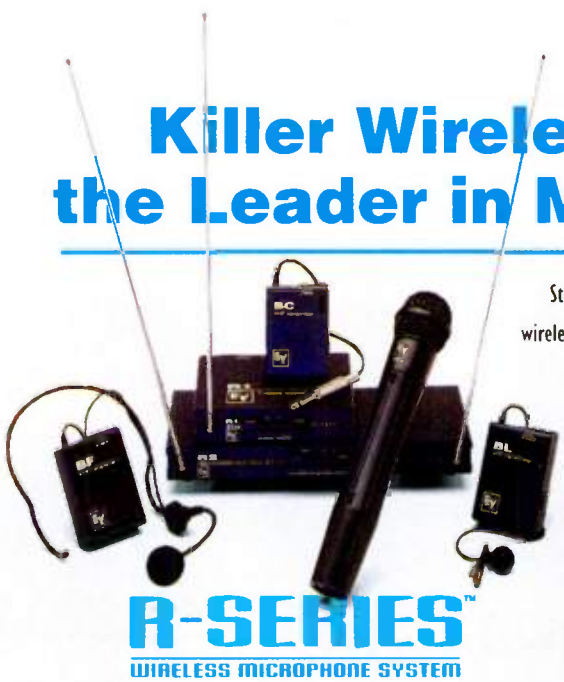

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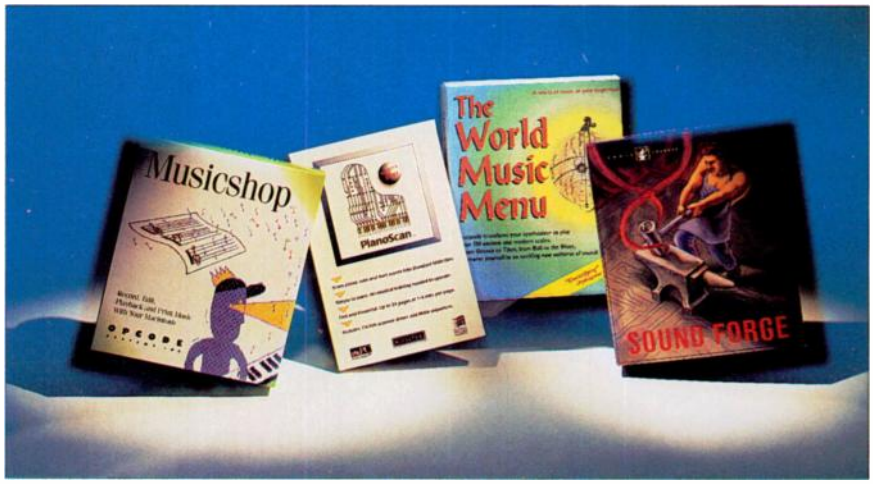

BUT WAIT! THERE'S MORE!

Although our main feature focuses on nifty, affordable hardware, we have many other suggestions for your gift-giving (and gift-receiving) pleasure. For example, so many sample libraries and collections of synth patches are available for under $150 that we can't even begin to list them. Aside from the sampler manufacturers' libraries, you can buy amazing sounds from such vendors as Ilio, InVision, Northstar, Q Up Arts, Big Fish, Spectrasonics, OSC, Greytsounds, Eye & I, and Sampleheads. Synth patches also can be purchased from many sources, including Patchman, Kid Nepro, Syntaur, and Pro Rec. For details, re-read your **EM** back issues, paying special attention to classified ads, reviews, and the "What's New" column.

Music software makes a great holiday gift, too, especially because it has become simultaneously more powerful and more affordable than ever before. For example, having already raised the features level for waveform editors with its original *Sound Forge* for Windows, Sonic Foundry recently released *Sound Forge XP,* a low-cost version ($149). Similarly, having already introduced *MIDISCAN* for Windows, the first optical character-recognition program for music, Musitek has unveiled *PianoScan* ($99), which offers all the same OCR features for up to two staves.

Mac folks might enjoy Opcode's popular *Musicshop* ($149), a surprisingly powerful, entry-level, 16-track sequencer with graphic editing and low-level standard music notation. If you prefer a gift with global implications, consider Free Play Productions' *World Music Menu* ($99), which lets you set up compatible MIDI instruments with alternative-tuning systems from around the globe. Consistent with its global orientation, it is available for both Mac and Windows.

Don't overlook Mix Bookshelf, which offers a warehouse full of outstanding music-oriented books (including several by **EM** editors) and instructional videos, not to mention **EM** back issues. Other Mix Bookshelf special attractions include the *Mix Reference Disc,* which contains a variety of standard test tones for setting up and adjusting your studio gear, and the *Recording Industry Sourcebook,* which lists virtually every music-industry contact you're likely to need. And to get in the proper festive mood, make sure to don your **EM** hat and T-shirt, also available from Mix Bookshelf.

Last, make sure to put some money aside for the best deal of the year: an **EM** subscription brings the best in electronic-music product information and applications to your door all year long!

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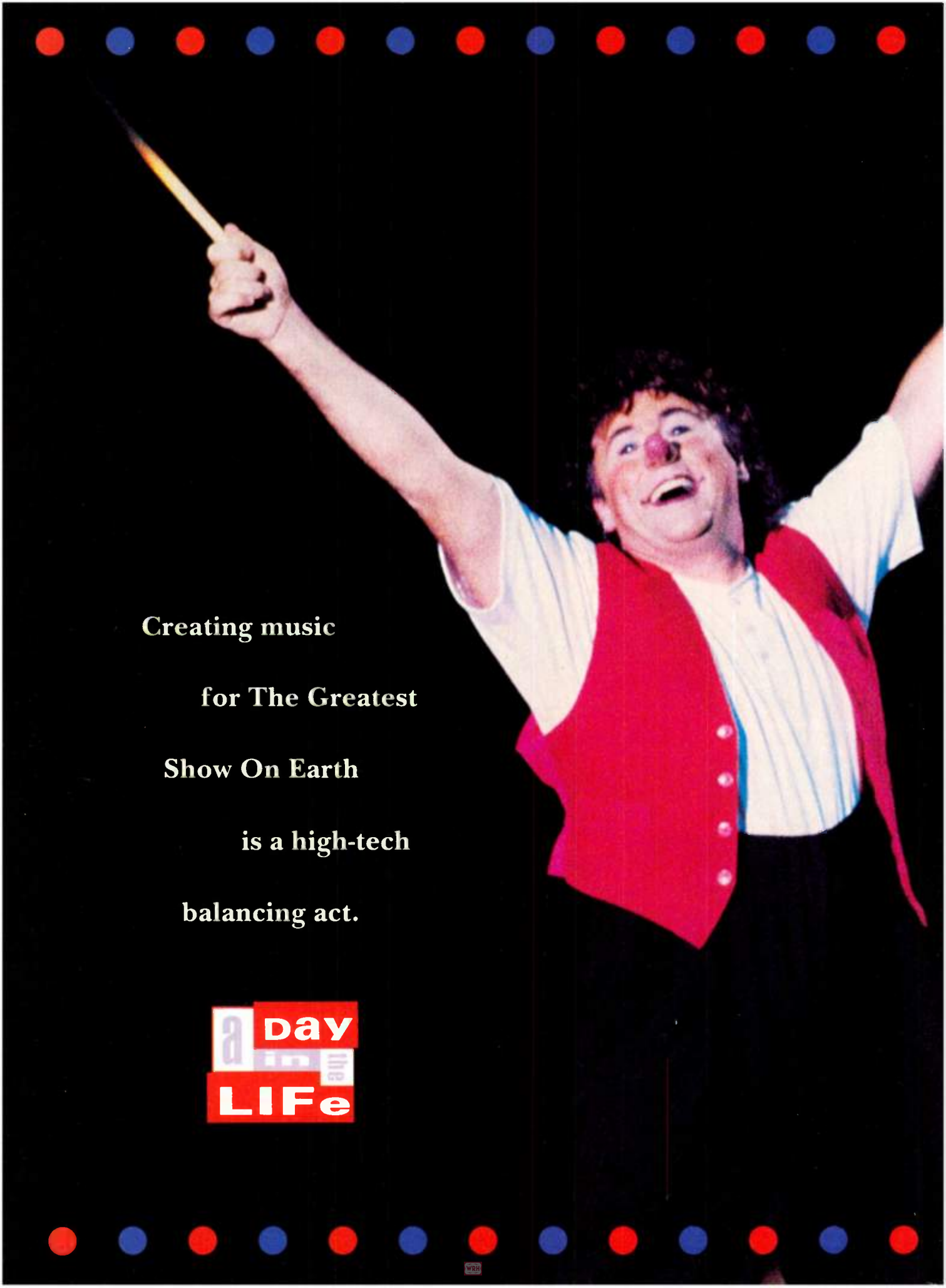
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a DAY in the LIFE

MIDI Under the Big Top

By Brian Knave

Lithe bungee jumpers in fluorescent bodysuits plummet and loop, pirouette and spin, tracing swirls of green light high in the darkened coliseum. Helmeted BMXers freestyle from ramp to ramp, somersault backward through rings of fire, coax their bikes through graceful contortions of midair madness. Inside the Globe of Death, a young woman stands calmly while three motorcycles buzz around her like angry hornets. And framing the mood for each act, each moment of far folly or near death, is the appropriate music: mounting drum roll and cymbal crash; suspenseful swell of strings and punch of horns; or pandemonium of MIDI guitar over phat urban backbeat.

MIDI guitar? Urban backbeat? If this doesn't sound like the circus of your childhood, that's because it *ain't*. But don't be alarmed: musical innovation, variety, and the embracing of popular styles have been hallmarks of the American circus since the mid 1800s when 30-piece bands regaled big-top audiences with everything from marches, galops, folk songs, and quicksteps to classical overtures, waltzes, and sacred music.

Photography by Claire Arnaud

Home-entertainment centers were scarce in those days; when the circus rolled into town, the mayor proclaimed a holiday, and people turned out in droves to witness clowns, daredevils, menagerie, and music. Not merely the latest in visual delights, the circus was also a rolling exhibition of emerging musical technology: the steam calliope; bell wagon; organ chimes; and, in 1914, the una-fon, an "electric calliope" that used a solenoid to power hammers that beat out tunes on xylophone-like bars. As Research Director Fred Dahlinger of Circus World Museum states, "Circus parades of the late-nineteenth and twentieth centuries included more unique forms of music than any other staged spectacle in the history of mankind."

Today's circus music is equally wide ranging. During a tight 2-hour, 20-minute show, the nine members of the Ringling Bros. and Barnum & Bailey Greatest Show On Earth Band perform more than 100 pieces of music, including classic galops and marches, jazz, Latin, funk, hip hop, techno pop, and a broad sampling of rock 'n' roll—not to mention the occasional strain of Middle Eastern or Afro-Cuban music. "Ringling Brothers is one of the few places you can come and hear a retrospective of American music all within one show," says Ringmaster Eric Michael Gillett, who, with his cabaret-style tenor voice, hosts The Greatest Show On Earth.

GEARING UP

Keeping abreast of the newest musical styles means keeping up with the latest musical equipment. In this department, the Ringling Circus Band is no slouch. Keyboardist Matt Cross, who joined in 1979, began his circus career playing a Yamaha console organ and kicking bass pedals. By the mid 1980s he had moved on to two Yamaha DX7 FM synthesizers. "I was always into synths," he says. "I still have an ARP 2600 sitting at home."

Cross next upgraded to an E-mu Emax, followed by an Emax 2 "loaded to the gills" with 8 MB of RAM. "I thought, '*Boy*, that's a lot of memory!'" says Cross.

How quickly our memories dim! Only a year ago, Cross dumped the entire rig for two Kurzweil K2000s and one rackmount K2000R. His latest main axe is loaded with 64 MB of RAM and a 500 MB hard drive. The second K2000 has 34 MB of RAM and a 360 MB hard drive. Cross' K2000R has 16 MB of RAM but no hard drive, so he feeds it with a SyQuest 88 and a CD-ROM drive. It contains redundant files and is maintained strictly as a backup.

"I can do the whole show on one K2000 keyboard," says Cross, "but the other is crucial as a spare. We can't stop the show if there is a problem." As further protection, Cross carries a 2,000-watt backup battery to keep him up and running in case of a power outage.

THE MEYER SIM SYSTEM II

The SIM System is a computer-based analyzer that calculates acoustic properties of a space so that an engineer can apply electronic corrections to equalize the sound. The engineer takes readings from SIM measurement mics placed strategically around the room. These readings take into account room reflections and interference patterns, as well as temperature, humidity, and audience density of each miked area.

Properly used, the SIM system can dramatically improve both frequency and phase response, returning each speaker to its original, free-field performance specifications. The result, ideally, is accurate equalization: each audience member hears the same balanced, stereo image of the sound, no matter where he or she is sitting.

For The Greatest Show On Earth, this is accomplished by clusters of main and auxiliary speakers augmented by "delay" speakers placed above the audience throughout the arena's upper seating areas.

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COURTESY RINGLING BROS. AND BARNUM & BAILEY CIRCUS

The 9-piece Ringling Circus Band. Top row, L to R: Brett Barlow, Bob Martin, Keith Green, and George Hooks. Bottom row, L to R: Mark Griffith, Graham Gillespie, Marjorie Poe, Ken Huskey, and Matt Cross. (Griffith, Gillespie, and Poe are no longer with the band.)

And what does a fellow *do* with 64 MB of RAM? Plenty. Cross is responsible for most of the sound effects (the drummer covers the rest), plus he triggers samples of lengthy musical pieces or intricate vocal harmonies during specific parts of the show. For example, featured clown David Larible drags three audience members into the center ring for a mock performance of an opera. Outfitted with hats and swords, the impromptu performers lip sync soaring vocal parts from original recordings of classic opera. These parts were dubbed from old LPs—complete with scratches—to DAT and then loaded into the K2000 via MiniDisc. Though barely more than a minute long, the opera samples take up 14 MB of RAM. They sound, of course, just like the records.

"When we first started doing the opera," recalls Cross, "I didn't have a hard drive, so I had to load the whole thing through the floppy drive. It took fourteen floppies and the entire 15-minute intermission. I didn't even get a chance to go to the bathroom."

The opera skit gets lots of laughs.

WHAT ARE YOU, A GUITAR PLAYER OR A TAP DANCER?

Thanks to the Sony HR-GP5 processor, you can get the effects you want without performing the ol' soft shoe. That's because you don't need a tangled mess of cables and pedals to access the HR-GP5's multitude of effects.

The HR-GP5 has the ability to generate up to seven effects at the same time. Such as Compressor, Distortion, EQ, Amp Simulator, modulation effects like Chorus and Intelligent Pitch Shifting, as well as Reverb. Yes, all the power of seven foot pedals in a 1/2 rack processor. That's convenience.

As if that wasn't enough, there are also 38 different structure combinations for each preset. Effects are easily edited — the jog shuttle wheel and six direct function keys allow quick recall of settings. So, if you want your chorus before your pitch shift but after your reverb, just turn the wheel. Try doing that with your pedals. Add to the mix 100 Preset Effects and 100 User Memory Settings. And if you're playing live, there's the HR-RC5 Foot Controller for easy, hands-off operation. That's flexibility.

As Guitar Shop magazine stated, "*The HR-GP5 shines with great sound, an exemplary user interface and a new standard for signal processing in a guitar processor.*"* So, if you're in the market for a feature-packed guitar processor, why not give it a test drive. And remember, foot to the floor optional.

For more information call 1-800-635-SONY, ext. GP5.

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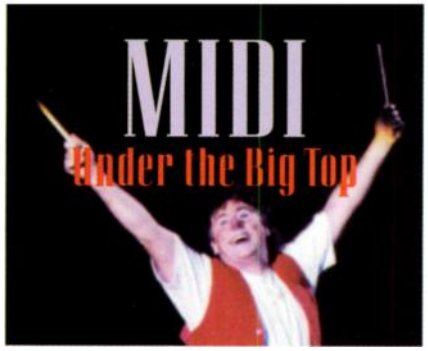
 *"Guitar Shop, December 1994."



Halfway through, the music starts to skip because of a stuck "needle." The clown delivers a swift kick to the singer's butt, putting the needle back on track. Cross creates the effect with a simple loop. Watching closely on his video monitor, he sounds a fanciful "thwack" in time with the kick, which stops the loop and returns the audience to the opera's "tragic" climax.

VIRTUAL VOCALS

Another number, "Urban Jungle," is a huge production featuring the hip tumbling troupe Chicago Kidz, who dive and somersault over a row of elephants while a seemingly endless procession of children and teens dances throughout the arena. Gillett, backed by tight vocal harmonies, displays his rock and rap vocal chops over the band's energetic funk groove. The piece gives the impression that the dancers are singing backup ("Groovin', groovin', groovin'!"), but in fact, the vocals are triggered by Cross from the keyboard.

"It's one of the biggest things I did," says Cross. "They gave me a DAT tape, and I took it from there, creating and editing the samples. The piece is in two different keys. It took a lot of work, but the alternative was playing to a click track, and that's grueling. Besides, it's performed at a slightly different tempo each time. This way, we just play the music, I watch the show, and when it's time for the harmonies, I punch them in."

CLAIRE ARNAUD

Frequent changes in tempo, timbre, and musical style require steadfast concentration from the band throughout the 2-hour-plus Greatest Show On Earth.

Cross frequently finds it necessary to split his keyboard three ways or more. During the finale of the opera skit, for example, the top of the K2000 is dedicated to melody and the middle to a pad, while single keys in the lower register are set to trigger various samples and sequences. "I set it up so I can hit one key and—boom—the keyboard is split and ready to go."

For his string sounds, Cross uses a Korg Wavestation A/D, controlled by the K2000. "I tweak it quite a bit," he says, "to give the strings a grittier sound." Also in Cross' rack is a Mark of the Unicorn MIDI Time Piece II and a Mackie CR-1604 mixer. Previously,

he used the MIDI Time Piece as a patch bay for all his gear, but now the K2000 controls everything directly. He still keeps the MIDI Time Piece around to do occasional computer stuff.

"I like the Mackie because it's clean and durable—this gig's hard on equipment—and it allows me to control my monitor balance without affecting the rest of the band," explains Cross. "Plus, I get to hear myself in stereo. For monitors, I use custom-molded earpieces fitted with Sony electronics. They sound great."

CRITICAL BEAT

If there's one instrument that has been a mainstay of circus music since the days of the one-ring tent show, it's the drums. No other instrument creates so much of the drama, suspense, and thrill of achievement we experience with each circus act. Clearly, "drums" is not just one instrument—especially these days.

Consider veteran circus drummer George Hooks' sprawling rig. In addition to the "standard" 7-piece acoustic kit and 9-cymbal spread, Hooks employs three poleKATs, one hatKAT, a drumKAT 3.5 controller, one Drum Workshop trigger pedal, a ddrum trigger each on kick and snare, and, lurking Bonham-like behind the array, the ever-impressive kettledrum.

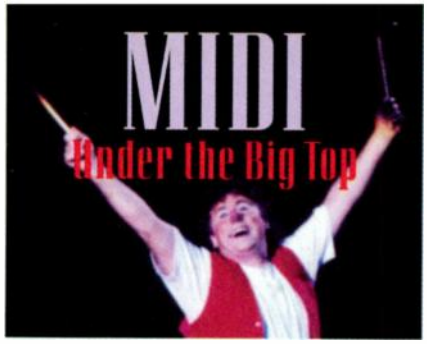
CLAIRE ARNAUD

Veteran drummer George Hooks at the helm of his well-integrated acoustic/electronic drum kit.

Just opposite the kettledrum is Hooks' equipment rack, which houses a Roland TD-7, Akai S950, Korg DRM-1, Kawai XD-5, and Kawai 8-channel mixer. AKG are the primary mics, with C 451s overhead, a D 112 on the kick, and C 408 clamp-ons for snare batter and all toms but the largest floor tom, which gets a Sennheiser MD-421. "I also put a 421 on the bottom of the snare," says Hooks, "like Jeff Porcaro used to." And the metronome clamped next to the hi-hat? "That's for when I've had too much coffee!"

Hooks, who has held the Ringling drum chair for nearly twelve years, has spent a lot of time and thought integrating his acoustic and electronic drums. "I want my kit to sound like one instrument," he says. "That's my goal." That goal is reflected in the layout of drums and triggers, Hooks' ambidextrous chops (he's a southpaw using a right-handed setup), and even his choice of drumheads.

"I use Remo Fiberskyns, tuned tight so they cut, because they sound the most like calfskin," says Hooks. "With all the [electronic] conga stuff I do, it makes the set sound more integrated,



instead of acoustic versus electronic." To tune his drums to the show, Hooks references to tones on a preset marimba patch. "But I have to tune a bit sharp because the heads go flat as soon as you beat on them.

ERGONOMICS

Being a pro drummer who favors a tight setup, I was impressed by how close Hooks has managed to mount his three poleKAT triggers. They're so tightly clustered near the snare and mounted toms that most drummers—myself included—would have difficulty moving around without inadvertently smacking them. But one look at the perfectly centered stick marks on each drum head told me that Hooks is a precision hitter. It's this level of precision, along with thorough knowledge of his gear, that allows Hooks to so effectively incorporate electronics into his acoustic kit.

"I mainly use the Roland TD-7 for all the really nice sampled sounds," he explains. "It has a *killer* talking drum. I also layer with the Kawai XD-5. It's not as clean as the TD-7, but it has some nice gongs and tabla and a marimba that I use for composing. For my Moroccan patch, I use the Korg DRM-1. It's only 12 bit, but it has a nice built-in sequencer and a remote control for easy access to all the parameters. Plus, it just sounds cool. Maybe it's obsolete, but it works great for me.

"Before the keyboardist got the K2000s, I used to do all the whistles, bells, and other samples. But that's his department now," Hooks continues. "I just try to reinforce what he does. There's an excellent sampled timpani roll I use from the Akai S950. As for the DW trigger pedal, I keep it mostly for backup, in case I break a bass drum head. We play eleven to thirteen shows a week—three on Saturday—so you have to be prepared. I was considering going to a trapKAT, but just the other day we lost power and there were no monitors. *That's* why I don't play all electronic instruments. Besides, I like cymbals too much."

CLAIRE ARNAUD

Guitarist Dave Nichols soloing on his MIDI-retrofitted Gibson Les Paul Studio.

GUITARS ET AL.

Guitarist Dave Nichols had only been with the band a couple of weeks when I caught the show at the Oakland Coliseum, but already he seemed comfortable with the MIDI guitar rig he inherited from former axeman Mark Griffith.

"The Roland GR-1 synthesizer and GK-2 pickup are real user friendly," says Nichols. "I'd never played through a guitar synth before, and I was up and running in no time. All I had to do was set the string sensitivity on the pickup so it was right for my guitar. I didn't even have to tweak the sounds much. They already had it all set up."

Nichols plays his Les Paul Studio through a solid-state Hughes and Kettner amp. "I usually use a Fender, but I wasn't so keen on bringing my tube amps on the road." He is happy with the gig, though, and finds it challenging. "If you're going to be stuck playing the same show over and over, I'd rather it have a lot of variety. It's not like we're playing country tunes all night."

The other new band member is Benjamin Maney, who replaces former keyboardist Marjorie Poe. Maney plays a Korg 01/W Pro that has a customized patch or two. "He does the traditional keyboard parts," explains Cross, "and I get all the weird stuff."

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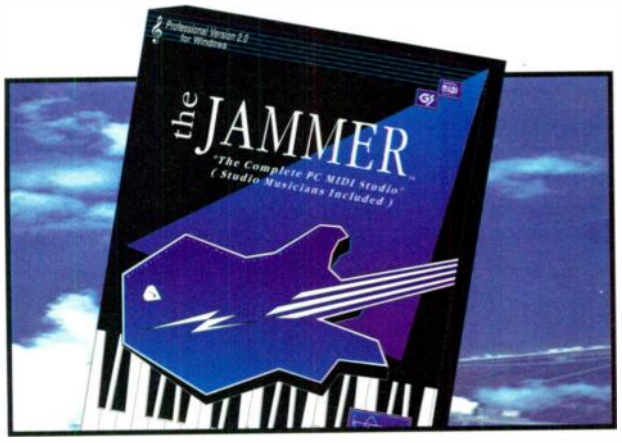

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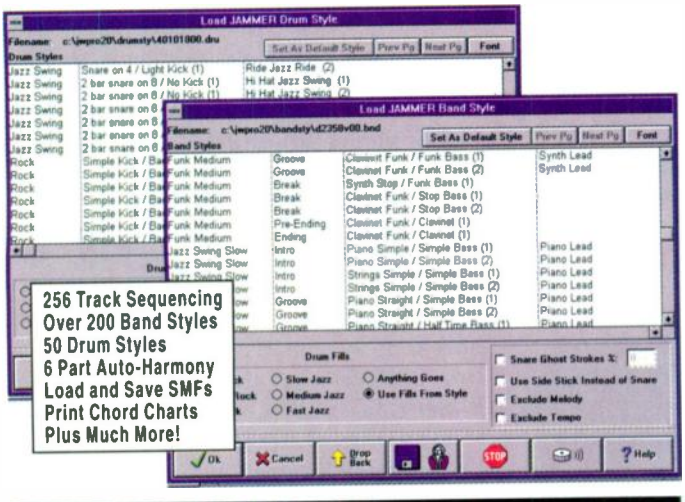

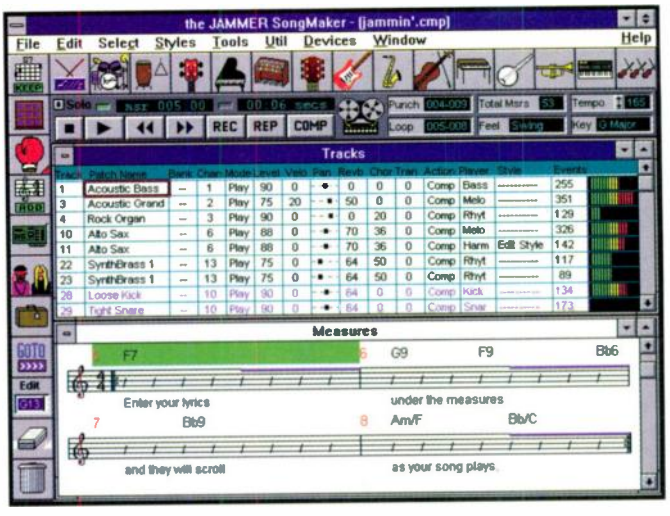

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rest of the band is acoustic: two trumpets, trombone, and sax. The wind players use clip-on mics, and each is equipped with a spot monitor. The monitor mix is done directly behind the band on a Yamaha 3210 board. The monitor mixer uses Alesis 3630s to compress the bass, keys, and ringleader's voice. He'll be adding some Aphex Expressors soon, which will be set as limiters. "I don't want to blast anyone's ears out in case something happens."

LADIES AND GENTLEMEN!

Consisting of top musicians with impeccable chops, the Ringling Circus Band plays more than 500 shows a year, which possibly makes them the busiest band in the world. To say this band is tight is like saying rain is wet. A reviewer from *The New York Times* saw the show recently and claimed in his review that the music was pre-recorded. It was a backhanded compliment, of course. All I can think is that he must have been sitting opposite the band, in the farthest-away seat in the stadium, his view blocked by elephants. From there, perhaps, he could not conceive that so many styles of music, brilliantly executed and seamlessly woven together, could emanate in real time from nine real musicians.

His mistake might also be attributed to the "effectiveness" of the Meyer Sound System, which uses the high-tech SIM System II (see sidebar) to control unruly delays and deliver equal sound to all sides of a room. The mix I heard was good, but through the relatively small and widely spaced speakers, it seemed distant and somewhat "canned." Also, the levels were so low that I found myself straining to hear individual instruments. This was even more apparent when I listened to a cassette of the board mix at home and heard all the great stuff I'd missed during the show.

Because of the number of small children in the audience, the house mixer is understandably cautious about sound levels; but it seems to me the colossal visual impact of the circus deserves equally colossal sound. After all, we take our kids to see visually dynamic movies with loud soundtracks. We'd hardly expect to watch *Jurassic Park* at low volume, so maybe it's time to pump up the volume under the big top as well! Great players should be heard as well as seen.

AND THE BAND PLAYS ON

Nineteen ninety-five marks the 125th anniversary for the Ringling Bros. and Barnum & Bailey Circus. There's only one way to last that long in show business: with feet planted firmly in tradition and eyes on the future. The Ringling Circus Band fulfills that contract to a tee. I haven't a clue what they'll sound like in another 125 years, but I'm willing to bet they'll be using the latest musical technology to play the hippest new tunes. Who knows, they might even cover the occasional old standard—something from, say, 1995.

EM *Assistant Editor* **Brian Knave** *never dreamed of running away to join the circus: between home and school, life was already enough of a zoo.*

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ELECTRONIC musicians who want to simulate an acoustic orchestra face a daunting challenge. Of course, the electronic sounds must be as realistic as possible, but there's more to it than that. Many people try to breathe life into a sampled oboe with a wind controller or spend sleepless nights editing MIDI Volume and Velocities to make a string line soar. Sometimes, they get lucky and are moved by the result. Many times, however, the MIDI tracks still don't sound quite right.

Tuning Up

Dynamic intonation helps fill your MIDI tracks with life.

Combining electronic simulations with their acoustic counterparts presents musicians with a different set of problems. Trying to match samples to an acoustic performance is tricky, and making them flow together seamlessly requires lots of tweaking, patience, and luck.

Much has been written about alternate controller techniques, and the inherent inaccuracy of human timing has been microscopically scrutinized. Although nothing replaces knowing how to properly write for the intended instruments, continuing research and development is leading to more realistic sampled and synthesized acoustic-instrument sounds. Nevertheless, many electronic simulations still sound lifeless and unnatural. Why do these aural fabrications fail to convince, excite, and stir the spirit?

By Rob Shrock

Illustration by Lou Beach

One area that is often overlooked in this quest is the minute and ever changing alterations to pitch that good musicians make as they play a musical line. In particular, fretless-string players (violinists, cellists, etc.), trombonists, and singers constantly adjust their intonation as the musical phrase and their ears dictate. Other brass and woodwind players do the same thing to a lesser extent with adjustments to their embouchure. This process is a major factor in giving a sense of belonging, purpose, and direction to a succession of notes. As a result, the notes become a musical phrase, full of life.

THEORY

Modern keyboard instruments (including piano) are tuned to a standard called *equal temperament*. In this tuning, the octave is divided into twelve equal intervals called *semitones* or *half steps*. Equal temperament was developed in response to earlier tunings that don't divide the octave into equal semitones. In these earlier tunings, some of the intervals and chords sound exceptionally in tune, but others sound terribly out of tune, which makes certain keys highly dissonant.

Equal temperament is a compromise that sounds equally in tune (and equally out of tune) in all keys. Except for octaves, no interval in equal temperament is perfectly in tune, but they are all "acceptably" in tune. When you add this to the fact that you can modulate to any key with impunity, you begin to see why equal temperament became so popular for acoustic keyboards, which can't adjust the pitch of individual notes on the fly.

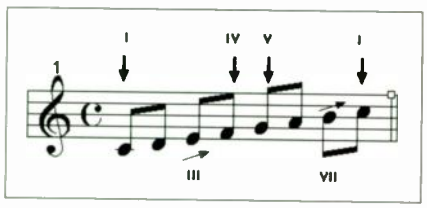

FIG. 1: In major-key melodies, the third and seventh degrees of the scale are shifted upward to accentuate their "gravitational attraction" to the fourth and root, respectively. The root, fourth, and fifth degrees are points of melodic repose and should not be shifted.

As mentioned earlier, though, strings and winds suffer no such limitations. Good players of these instruments make minute adjustments to the pitch of each note according to the musical circumstances. If they are playing with pianos or other fixed-pitch, equal-tempered instruments, these adjustments are reduced but not eliminated.

In an orchestral setting, the strings take the most liberty with pitch. For example, they have a tendency to broaden the intervals as they play higher in their range, particularly if there is no equal-tempered reference to match. But this does not sound bad. In fact, a string section can play wide variations in pitch and still sound in tune. Orchestral woodwinds and brass play more equal-tempered pitches and keep the strings in check during full ensemble passages.

Musical expression is directly related to the contrast of tension and release between the notes in a melodic line, the chords in a harmonic progression, and the moments of rhythmic movement and repose. No single note can be isolated from its neighboring notes, which highlights an inherent problem with samplers: the notes have no sense of context. In a sampler, each note was recorded in isolation and is played back identically each and every time, even if its relationship to other notes changes.

As a result of this situation, electronic musicians must modulate the notes in various ways (specifically volume, timbre, pitch) to give them a sense of context among the notes around them. If a musical line or chord sounds "in tune," it is the result of a dynamic process that expresses the organic relationship between the notes instead of intervals based on a mathematical formula. In addition, the perception of timbre is greatly affected by minute shifts in pitch, which also add life to a musical line.

MELODY IS NOT HARMONY

The intonation of an ensemble is different depending on whether it is playing a melody line or harmonic background, especially sustained chords. These contrasts in pitch between the melodic and harmonic components are not only natural but desirable. They add to the sense of tension and release, and when they are missing in our keyboard-oriented simulations, we can feel it. If we include these contrasts in electronic simulations, the simulations will be more realistic, and the music created with them will be more vibrant.

In Western diatonic melodies, semitones naturally exhibit a "gravitational pull" toward adjacent notes depending on their place in a given scale. The tonic, subdominant, and dominant notes (root, fourth, and fifth) of a tonality (key) are stationary points of repose toward which the other notes of the scale are drawn. As a result, pure intonation is maintained between these notes.

In major-key melodies, the third and seventh degrees of the scale have a natural tendency to be drawn upward to the fourth and tonic, respectively (see **Fig. 1**). The resolution of the leading tone (seventh) to the tonic is accentuated by raising its pitch. Because the third and seventh degrees are adjusted upward, the second and sixth degrees have a tendency to pull upward as well, although not quite as drastically. This balances the distance between their neighboring notes.

The major third and major sixth are slightly sharp in equal temperament to begin with and don't need to be adjusted much. The major seventh is usually raised a little more than it normally occurs in equal temperament, and the major second is usually fine until you get into the higher octaves of strings; remember, they have a tendency to expand at the top of their range, so their entire upper range must sometimes be raised in pitch.

Thirds pose an interesting problem: When they are part of a melody line functioning as leading tones to the fourth, they are raised in pitch. But when the melody comes to a rest on the third, it is dropped below its equal-tempered position to enhance the sense of resolution. The equal-tempered third does not match well in either case and should be adjusted according to function.

In minor scales, the gravitational attraction between melodic notes varies dramatically and, as such, must be treated differently than in major scales, even the relative major scale. The melodic pull in a minor tonality is

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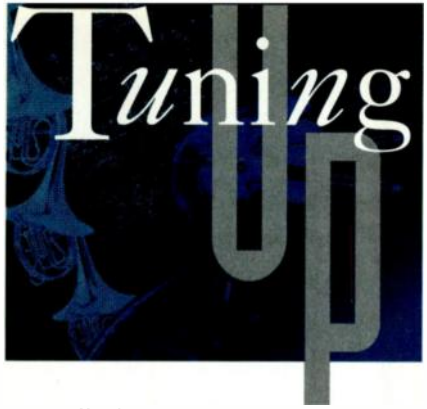

generally downward instead of upward. For example, in the key of C minor, the A♭ is the sixth scale degree and exhibits a downward pull toward the fifth, thus the pitch is slightly lowered. In the key of E♭ major (the relative of C minor), the A♭ is the fourth scale degree and must be played as a perfect interval (see **Fig. 2**). The exact pitch of the A♭ is different depending on the context in which it is used.

In minor keys, the melodic third, sixth, and minor seventh are lowered relative to equal temperament. I typically leave the second alone, which results in a very narrow interval between the second and third.

In melodies with a strong harmonic minor content, I tend to raise the major seventh even a little more than I do for major melodies to emphasize the attraction to the tonic. In this case, the interval between the minor sixth and major seventh is very wide, but it is very beautiful. Minor melodies take on a highly mournful quality that is simply not evident when played in equal temperament.

In both major and minor keys, the overall melodic tendency to keep in mind is that half steps in the scale "want" to be closer together. Major and augmented intervals are widened, whereas minor and diminished intervals are narrowed.

HARMONY IS NOT MELODY

In harmonic applications, when several notes are played together in a chord, the pitch adjustments are quite different from melodic concerns. For example, the equal-tempered major third is quite wide with respect to a purely tuned major third. As a result, the third in major chords must be lowered to sound more in tune. Conversely, the equal-tempered minor third is narrower than a pure minor third, so thirds in minor chords must be raised. Concentrating on this one alteration alone will help the stability of the harmonic backdrop immensely. Don't worry about rubbing against the melodic content; these pitch discrepancies are natural and musical.

Unfortunately, each note serves different functions based on its role in the harmonic progression in a typical piece of music. Attempting to alter the pitch of individual notes in real time is an exercise in frustration, although it can be accomplished with MIDI Program Changes, Control Changes, and SysEx (more on this in a moment). Even the most basic harmonic progression within a given tonality includes notes that must be pitch-shifted from one chord to the next if all of the chords in the piece are to be in tune.

For example, in a simple II-IV-V-I progression, the fifth of the II chord (sixth scale tone; A in the key of C) does not create a pleasant fifth if it is lowered to make a good third for the IV chord (see **Fig. 3**). In equal temperament, fifths are a little too narrow to begin with, so lowering the A further would end up sounding pretty sour. In this example, I would lower the A in the IV chord only slightly. A drastic adjustment would also reduce the static effect created by a common note in the II and IV chords (the A). This is a situation in which patience, determination, and a good ear are especially valuable.

If you are creating a piece that combines equal-tempered instruments (such as piano) with orchestra, don't worry about the "clash" between tunings. This is easily tolerated and has been for centuries (except by violinists, who really hate it). The same goes for pop music: tons of great records have full string sections and background vocals sensually rubbing their dynamic tunings against the static tuning of the piano and guitars. In fact, this is part of the sound we are trying to re-create.

PREPARATION

Before we get to altering the tuning of your sounds, we must establish a point of reference. Chances are that a lot of the sounds in your rig aren't in tune, even to equal temperament. Sampled sounds are often inconsistent; I have gone through hundreds of megabytes and fine tuned individual samples within certain programs.

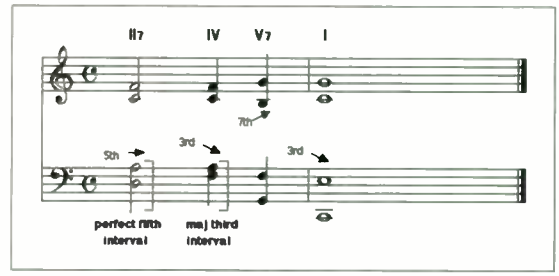

FIG. 3: In a II-IV-V-I progression, the fifth of the II chord does not create a pleasant fifth if it is lowered to make a good third for the IV chord. The pitch of that note must be shifted downward as the harmony progresses from II to IV. Thirds in major chords should be lowered, while the leading tone in the V chord should raised as it moves to the tonic.

First of all, drag out your tuner, and make sure it's a reliable one. In addition, use only this tuner from now on, because there can be slight variations from one manufacturer to another. A consistant reference is critical in this for creating your own tunings.

Programs can have different overall pitch levels due to a number of factors, including processing, factory fine-tune settings, and the aforementioned inconsistencies between manufacturers. In fact, it's a good idea to check all your sounds before recording them. Don't trust the synth's display; get out the tuner. Even if you're recording equal-tempered keyboards and guitars, compensating for the variables that affect the global pitch can greatly help a track sound more focused.

APPLICATION

So how do you apply all this information to everyday situations? Good question. I have been trying to find the answer to that question for almost two years. Be prepared for a lot of work and possible heartbreak. Until the

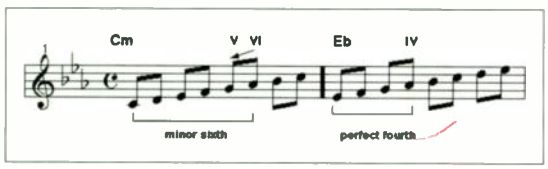

FIG. 2: In minor-key melodies, the sixth degree should be lowered to accentuate its gravitational attraction to the fifth. In the relative major, however, the same note is the fourth degree, which must not be shifted. As a result, the same note exhibits different pitch levels depending on the context.

new plans from ENSONIQ

make music think ENSONIQ

now under construction: the 1682-fx mixer

Construction crews have broken ground for the newest addition to ENSONIQ's MIDI city: the 1682-fx mixing board. Plans call for an 8-bus board, with built-in effects from our DP Series processors, open to the public in January, 1996. *(It's just around the corner!)*

Our planners surveyed the needs of the mixing community. We studied everything from basic entry-level boards to big studio consoles that most of us only dream about. The result: an affordable board that's perfect for home studio recording, remote recording, or live sound. Big enough that you've got room to work, but small enough to fit any 10-space rack. It's the perfect complement to your 8-track, with superb audio quality and the features you need. *(Including a lot that you won't find in any other board priced under $2500!)*

If you're in the market for a mixer, you owe it to yourself to check out the 1682-fx. But for now, you'll have to be content with a peek at our plans. We'll show you more when we're ready to cut the ribbon. *(Your tax dollars at work – courtesy of ENSONIQ!)*

Every ENSONIQ instrument is made in America. Call us at 800-553-5151, or fax 610-647-8908. You can also try our automated fax retrieval system at 1-800-257-1439. We can even be reached via CompuServe, GO MIENSONIQ, and at http://www.ensoniq.com on the Web. Whew!

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Tuning Up

MIDI Tuning Standard is widely implemented (see the sidebar, "MIDI Tuning Standard"), we must deal with the proprietary tuning systems of various manufacturers.

Some units have user-definable tuning tables, which are a good place to start. However, these tables also present two problems: First, there are rarely enough programmable tuning locations, which makes it difficult to store lots of tables for different tonalities. Second, the tables usually affect all multitimbral parts in an instrument globally. This is not sufficient when trying to mix various orchestral and equal-tempered sounds in a multitimbral instrument.

It is better, but much more tedious, to retune individual notes within a program. You must be able to fine tune the samples themselves to establish true equal temperament and then retune each key on the instrument to accommodate different melodic and harmonic circumstances. This approach allows you to create a separate program for each set of note alterations. However, this is usually possible only in samplers and high-end synths, not in a typical multitimbral module.

My main sampler is a Kurzweil K2000RS. When I'm recording a single melodic line and I have the opportunity to punch in at the points of

MIDI TUNING STANDARD

Anyone who wants to utilize altered tunings in his or her music must go through many and varied machinations with his or her gear. However, it doesn't have to be that way. The MIDI Manufacturers' Association (MMA) added the MIDI Tuning Standard (MTS) to the official MIDI specification four years ago. This addendum standardizes the representation of microtuning data and how it is shared between different instruments. Unfortunately, the only products that currently implement MTS are the Multisound cards from Turtle Beach (for which the company deserves many kudos).

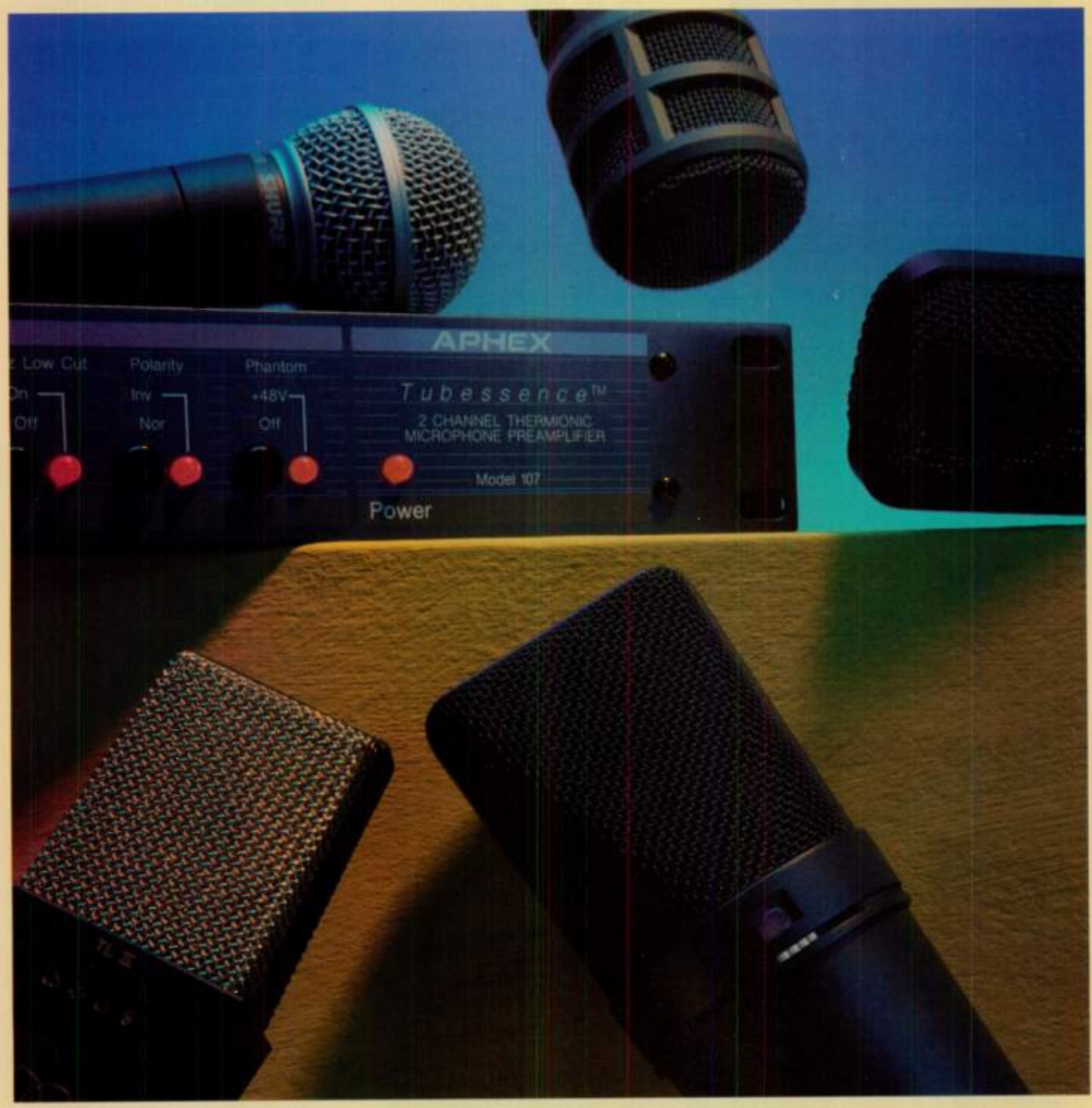
MTS lets you change tuning tables and retune individual notes on the fly, even as the notes are sounding. Any sounding note is instantly retuned, which must not result in glitches, forced Note Offs, retriggering, or other audible artifacts.

However, there are some circumstances in which you might want the sounding note to remain at its previous pitch until it sounds again (for example, in anticipation of an upcoming modulation to a new tonal center). MTS suggests that manufacturers implement a software switch that determines whether the instrument will instantly retune sounding notes or wait and retune subsequent notes in response to a Tuning Change message.

Any MIDI note that is playable by the instrument must be tunable to any frequency in the proposed range, from 8 Hz to 13.3 kHz. (This range arises from the fact that three bytes are used to represent frequency. The first byte represents the nearest equal-tempered semitone below the desired frequency, and the remaining two bytes specify the fraction of a semitone above the first byte with a resolution of 0.0061 cents.) The standard also strongly suggests, but does not enforce, an exponential (constant cents) rather than linear (constant Hertz) tuning resolution across the instrument's frequency range.

MTS addresses many of the challenges currently faced by microtonal explorers. Manufacturers must implement MTS in future products if this exploration is to expand beyond its current limitations. Of course, the only way to make sure this happens is to communicate your desires. Contact the manufacturers and request that they implement MTS as soon as possible. The growth of electronic music depends on developing important areas such as this.—*Scott Wilkinson*

Upgrade all your microphones



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different tonality, I often use the global tuning tables to retune the necessary pitches. This particular approach works fairly well if I can stop, make the appropriate adjustments or call up a new table, and punch in at the new tonality. The K2000 can also store dozens of global tuning tables, which is a real convenience.

More useful (but tedious) is creating new keymaps with key ranges that consist of single notes, which allows each note to be tuned individually. In particular, this works much better than global tuning tables for chords. Unlike the global tuning table, however, a separate key range must be specified and edited for the appropriate note(s) in each octave. This is more work, but it offers far more flexibility. Each of these altered keymaps must be stored together in the same bank and be readily available.

Naming and organizing all these programs and keymaps is tedious and sometimes frustrating. I organize my programs based first on tonal center (C, C♯, D, etc.), and then I divide them into melodic vs. harmonic, major vs. minor, and so on. I suggest starting with the sounds you use most often. Just getting my ensemble strings dialed in has made me a coffee addict, and I

FOR MORE INFO...

Many aspects of microtonality offer a rich resource of musical opportunities. The concepts presented here apply to the Western musical tradition, but many other types of music use non-equal-tempered sets of pitches.

If you are interested in the tunings used by cultures around the world, check out *World Music Menu* for the Mac or PC from Free Play Productions (tel. 310/459-8614; fax 310/459-8801; e-mail 76314.1406@compuserve.com). This software retunes many popular synths to different world tunings. It includes several Western tunings that were used before equal temperament became *de rigeur* about 200 years ago. (*World Music Menu* was reviewed in the September 1995 **EM**.)

A great resource for information on alternate tunings is the Just Intonation Network (tel. 415/864-8123; fax 415/864-8726; e-mail jinetwk@dnai.com; Web http://www.dnai.com/~jinetwk). Mills College in Oakland, California, offers an Internet mailing list devoted to alternate tunings; the subscription address is listproc@eartha.mills.edu.

If you are new to alternate tunings, see "From the Top: Microtuning" in the March 1994 **EM**. Also check out *Tuning In: Microtonality in Electronic Music* by **EM** Technical Editor Scott Wilkinson (available from Mix Bookshelf; tel. 800/233-9604 or 510/653-3307; fax 510/653-5142).

seem to be constantly adjusting and adding to the collection.

I hesitate to offer the specific detuning values I use because this is such a subjective area. On the other hand, it does provide a starting point from which to establish your own values. For chords in my particular string library, I tend to tune major thirds down about 5 to 10 cents from their equal-tempered values, and minor thirds are shifted up about 8 to 10 cents. Major sixths come down about 3 to 5 cents, and minor sixths are tuned up about 8 to 12 cents. Dominant sevenths depend a lot on the third, but they usually come up a couple of cents.

For melodies, the major third goes up about 3 to 4 cents, and the minor third comes down about 8 to 12 cents. Major sixths are usually left alone, and minor sixths come down about 10 to 15 cents. I typically raise major sevenths about 4 to 8 cents, except in the harmonic minor mode, where I raise them 12 to 17 cents.

These ranges depend on many factors, including the character of vibrato in the sample, accuracy of original pitch, interpretation of the musical context, and how much sugar is in your bloodstream at the moment. It's all subject to interpretation.

In a MIDI sequencing environment, Program Changes can be a big help. Simply send the appropriate Program Change each time you need a new set of altered notes. The tonal center of music can change quite often, and it is not unusual to change programs three or four times in a passage for any given instrument. To do this, it is crucial to know what is happening in the music, where to find the appropriate program with the desired pitch alterations, and how to implement a smooth program change. Speaking of which, many instruments abruptly cut off any active sound or glitch in other ways when they receive a Program Change. To avoid this problem, alternate between two identical programs on separate channels.

TUNING OUT

No matter how much preparation you do, each piece of music is unique; the pitch alterations from one tune might be too drastic or not drastic enough for another. The most important piece of advice I can offer you is this: listen with your ears and your heart. You will know when it is right for you. The process of retuning your gear can be very frustrating, but I can assure you that the difference, however small, is well worth it.

I hope that electronic musicians will not ignore the characteristics of intonation that are part of our Western culture and musical subconscious. We all know there is a "blue" note between the minor and major third. Now is the time to explore the subtleties between the other notes. They are there and waiting, ready to add more emphasis to timbre, resonance to harmony, and life to melody.

Composer/producer **Rob Shrock** *is using dynamic intonation on his solo instrumental album due out early next year. He is also the keyboardist/arranger for Dionne Warwick and Burt Bacharach. Thanks to Laura Halladay and Mary Maneikis for their expert knowledge and insight into orchestral intonation.*

Hot Licks

Electric guitars rule the rock roost, but a clever keyboardist can sample their primal power.

BY JIM MILLER

From blues and fusion to surf music and heavy metal, no musical instrument is as closely associated with rock 'n' roll as the electric guitar. In fact, the electric guitar has so dominated the modern music scene for the last three-and-a-half decades that it's hard to imagine most rock and pop tunes without it. Even in a supporting role, the guitar is all but indispensable in contemporary popular music.

All of which means that if you're writing any kind of rock music, you'd better have access to some exceptional guitar sounds. And if you're like thousands of other musicians who are slaving away in home studios trying to create a marketable product, it can be a real problem to create that crucial guitar groove if you only play keyboards.

Even though most of today's top synths and sample-playback units come with a variety of onboard guitar sounds, the truth is no current ROM-based preset labeled "E.Guitar" can possibly cover all the tones you need. To illustrate why, let's take a closer look at just one guitar: a Gibson Les Paul.

First of all, the Les Paul has three possible pickup positions—bridge, neck, or both—each of which creates a distinctive tone. You can pick the strings close to the bridge for a brighter sound or near the neck for a warmer tone. You can set your amplifier for a clean sound, slightly

Illustration by Patrick Corrigan


PATRICK

overdrive it for some smooth tube distortion, or max it out for a screaming lead tone. Add different picking techniques, a variety of outboard processors, different amps, plus a wide range of miking positions, and you have an overwhelming tonal spectrum that just can't be duplicated using the limited guitar sounds found on most synthesizers, no matter how good.

What you need is that most versatile of modern electronic instruments, the digital sampler. With a sampler and enough RAM, you can come pretty close to creating a sonically believable guitar-performance track without having a guitarist in your studio.

SAMPLING THE SIX-STRING

In my experience, guitars are quite a bit easier to sample than pianos, violins, or woodwinds. Guitars are not only readily accessible, they're also relatively easy to loop. Your toughest job is to find a player and select the guitars and amps you want to sample, subjects we'll cover later in this article.

If you've read any of my previous sampling articles in **EM**, you know I always recommend that you hire (or barter with) someone who knows how to play the instrument you're going to sample. Almost everyone knows a guitar player, and if not, one can usually be found via classified ads or inquiries at your local music store. It may seem like a pretty simple thing to rent a guitar and amp and maintain a "do it yourself" attitude, but I can assure you that things will go much faster and you will obtain far better results by using a real guitarist.

Of course, he or she need not be the best player in town, capable of ripping off blazing 32nd-note arpeggios at the drop of a hat. It is more important that the person be familiar enough with playing techniques to be able to give you the voicings and specific sounds you want to sample. Fortunately, almost any moderately competent guitarist can produce the sounds you need.

Admittedly, a really *great* guitar tone is not easy to come by and involves a good deal of trial and error. Even famous guitar players admit that they are rarely pleased with their recorded sound, preferring their "live" tone quality. Working in a studio is sterile compared to working on stage, and there is more pressure upon the recording engineer (in this case, you) to coax a good performance from your guitarist and, of course, capture it in a sample using good recording techniques.

CHOOSE YOUR WEAPON

Once you've chosen a guitar player, the next step is to decide which guitars you want to sample. In addition to one or more electrics, you'll want an acoustic guitar sample (see the "Sampling Acoustics" sidebar). You might be in luck and find that the player you've hired owns a number of guitars, or you may be faced with visiting your local music store and renting additional instruments. If you're going to do a thorough job, you want at least two types of electrics: one with humbucking pickups, such as a Gibson Les Paul, for the beefy tones, and one with single-coil pickups, such as a Fender Stratocaster, for the funky tones.

You can even take this to extremes and find hollow-body or semihollow-body guitars (e.g., a Gibson ES-335 or Gretsch Tennessean), variations on humbucking pickups (i.e., coil tapping), and variations on single-coil pickups (e.g., a Fender Telecaster or Jazzmaster, each of which has two slightly different single-coil pickups that are located farther apart than the Strat's, producing a different tone). Many modern guitars include a humbucker and one or more single-coil pickups, plus coil tapping. Some guitars may even have active tone circuits or unusual pickups (such as the classic Danelectro "lipstick tube" pickups). Each of these variations contribute to subtle or dramatic tonal differences.

Only you can judge which particular sound you're going for. Your guitarist (or the guitar tech at your friendly, neighborhood music store) can help you make this choice by demonstrating a wide range of instruments. Listen carefully. Take your time and pick the best instruments you possibly can. Don't fall into the trap of assuming that a certain instrument has the sound you want without listening to variations on that particular design. A Telecaster might be exactly what you're looking for, but a newer Tele-style guitar might produce a more appropriate sound than the real thing. Trust your ears.

CONSIDERING AMPS

Once you've chosen your guitars, you also have to consider your guitar amp or, if you intend to sample direct through the mixer, your amp/speaker emulator (more on this later). If you are going to use an amp, you should choose one that will give you the widest variety of timbres, from ultraclean to totally distorted, which pretty much means a tube amp.

Many modern amps include a master volume control that allows you to overdrive the preamp section, a specialty of the original MESA/Boogie amps. Other amps have more sophisticated control over both preamp and power-amp distortion. You can also crank just about any tube amp up to full volume and get satisfying amounts of tube distortion—remember to protect your ears and the sensitivities of your neighbors—and then add outboard processing to put you over the edge into total grunge.

I've had great results with Peavey

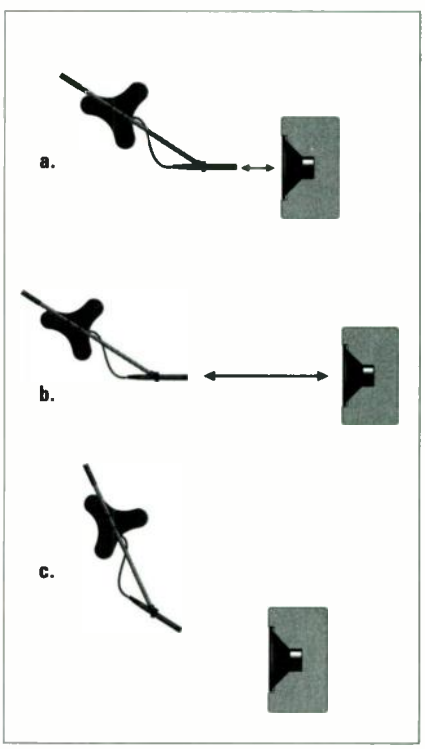

FIG. 1: Mic placement greatly affects the overall sound of a sample. The three basic mic positions include (a) directly in front of the speaker, (b) two to three feet away from the speaker, and (c) at an angle to the speaker.

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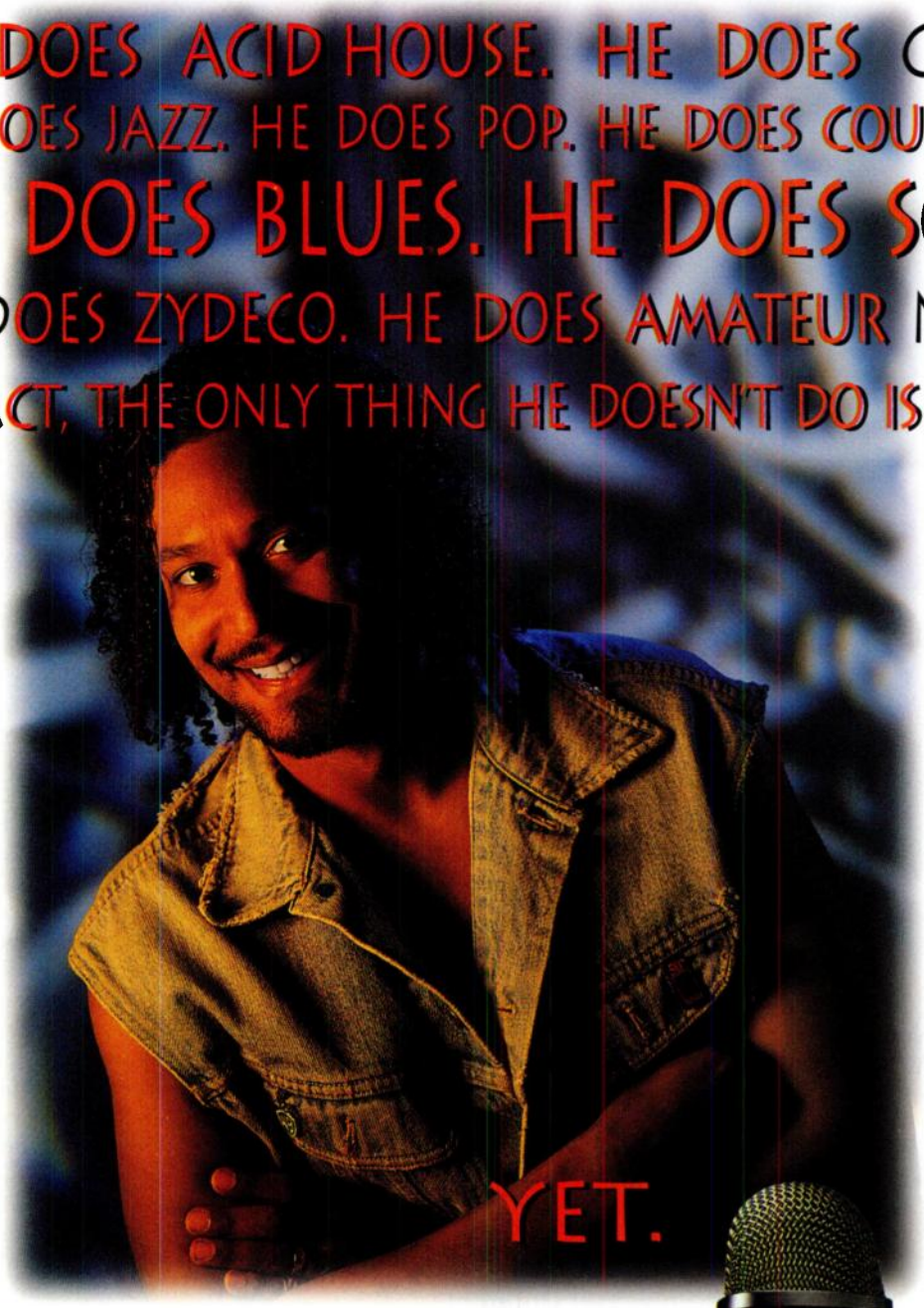
IN FACT, THE ONLY THING HE DOESN'T DO IS POLKA.



YET.

AS HOUSE ENGINEER FOR THE APOLLO THEATRE IN N.Y., SCOOTER SCOTT HAS DONE IT ALL WITH TRI-POWER. IN FACT, THE ONLY THING THAT KEEPS HIM FROM DOING POLKA, TOO, IS AN ANGRY MOB. TRI-POWER. IT CUTS THROUGH THE MUSIC.

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WRH

Hot Licks

Classic amps, which provide awesome control over tone quality plus exceptional overdrive abilities. True, they don't quite have the sweet tone of a vintage Fender, but for overall variety, they're hard to beat. Of course, many other amps can do the job, and your guitarist and local dealer can help you select an appropriate model.

As with guitars, don't let yourself be locked into any preconceived idea about which amp sounds best. Of course, if a killer Marshall 100-watt stack sound is exactly what you're going for, look no further.

AMP SIMULATORS

A number of innovative products on the market claim to emulate the sound of classic amplifiers. These amp simulators essentially function as a direct box and processor, allowing you to connect the guitar's output directly into a line input on your mixer, DAT, or sampler. For the most part, these products do just what they claim, with a minor caveat: no amp simulator can capture that subtle feeling of room ambience you get when miking an amp. Although reverb units can help, I've never been convinced that *any* reverb unit can really capture the sound of a real room, not to mention the fact that changing the position of a mic in relation to an amp can dramatically change the overall sound.

Nevertheless, in many cases, the benefits offered by such units far outweigh their drawbacks, and they may be ideal for your particular needs. I've had excellent results from the Tech 21 Sans-Amp PSA-1 (reviewed in the October 1994 **EM**) and the DigiTech GSP-2001. Both produce a wide range of sounds, from clean and bright to down and dirty, and both feature presets, which makes tone auditioning and selection a snap. In addition, because you don't have open mics, you can talk while recording without interfering with your sound, and no passing car or truck blowing its horn will spoil the perfect sample.

A new twist in amplifier simulation is offered by Roland's VG-8 V•Guitar

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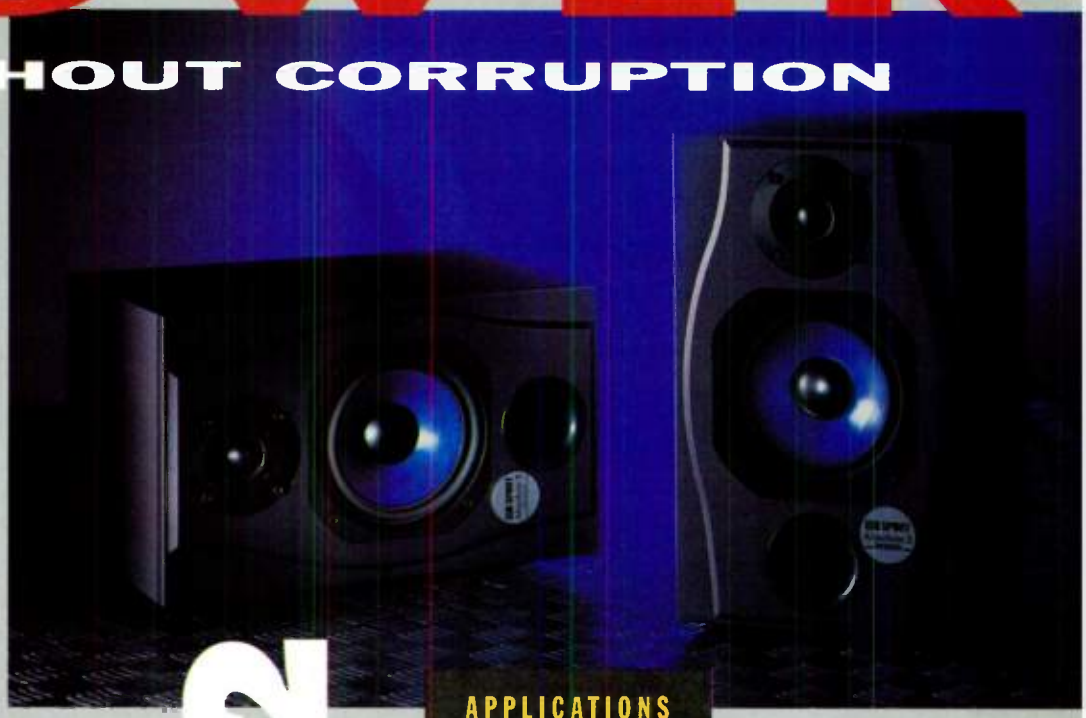


ABSOLUTE 2

GURU APPROVED

Like all Spirit products, Absolute 2 is designed and built in the UK. We set an exacting brief for our team of British monitor specialists to create an affordable loudspeaker, capable of delivering the clear, honest sound of Spirit mixers. But before the result could bear the Spirit name, it had to pass the guru test. Would it measure up to Graham Blyth's standards of excellence? As the designer of many classic mixers over the last 25 years, he knows a thing about accurate monitoring, and he's a hard man to please. Fortunately the design team excelled themselves, turning in a speaker with professional performance at an unbelievable price: a speaker that Graham, and all the Spirit team, can welcome into the Spirit range.

When we looked around for an affordable speaker that matched Spirit standards of audio accuracy and quality, we found there was no such thing - so we built it ourselves. The result is Absolute 2, the only loudspeaker in its price range to deliver this much power with this much precision - a thumping 100W of professional sound.

Whatever the size of your studio, whether you're mixing music or dubbing sound for picture, the basic requirements for an effective nearfield monitoring system are the same: an uncoloured, flat frequency response, minimal distortion, and an ability to deliver high volume when you need it.

Absolute 2 offers all this, at a price that no other professional monitoring system can touch - because we know from our experience with mixers that good design and high quality construction doesn't have to cost more.

APPLICATIONS

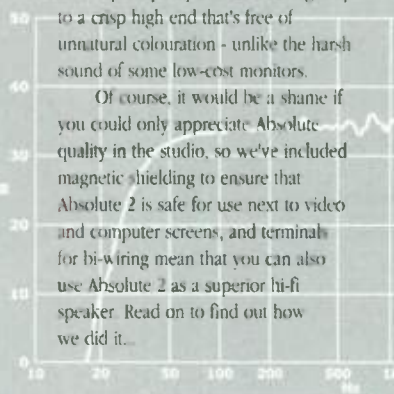
Studio nearfield monitoring

Video edit and post-production suites

Multimedia

The advanced vented cabinet design complements the 6.5"/165mm low-frequency driver to give smooth, extended bass response. The soft-dome tweeter and high quality crossover keep the frequency response smooth right up to a crisp high end that's free of unnatural colouration - unlike the harsh sound of some low-cost monitors.

Of course, it would be a shame if you could only appreciate Absolute quality in the studio, so we've included magnetic shielding to ensure that Absolute 2 is safe for use next to video and computer screens, and terminals for bi-wiring mean that you can also use Absolute 2 as a superior hi-fi speaker. Read on to find out how we did it...



THE INSIDE STORY

- As with Spirit mixers, the electronic design of Absolute 2 uses **high quality components**, including film capacitors and an air-cored inductor, in a circuit that embodies classically simple design principles. Terminals allow **bi-wired** as well as standard connections.
- Rather than compromise with off-the-shelf components, we use **custom hardware** built to our specifications - both drivers are exclusive to Absolute 2.
- The **ferro-fluid cooled soft-dome tweeter** ensures minimal distortion, with excellent heat dispersion. Not only does that mean a more accurate sound, but it puts less strain on your ears after long periods of high-volume monitoring - and don't pretend you don't like it loud!
- The LF driver features a **solid cast chassis** and **30mm edge-wound voice coil**, for optimum efficiency and cooling. That means you can push Absolute 2 to the limits and still hear music, not distortion.
- The vented cabinet employs a **special port design** that does more than simply deliver extended bass response. With its carefully chosen dimensions, air turbulence is reduced, contributing to Absolute 2's smooth, uncoloured low frequency characteristics.

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Shown, front to rear: Artist Series 110-ELC, SPL Series 1225 Mk. II, and Tour Series 2912's and 118s subwoofers.

Tour Series concert rig courtesy of Spectrum Audio.

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ELECTRONICS

System (reviewed in the November 1995 **EM**). This sophisticated device uses any guitar with a Roland GK-2a pickup as a source and applies DSP-based, mathematical models to simulate the physical, magnetic, and electronic characteristics of various guitar bodies, pickups, amps, and microphones.

Once again, trust your ears. If you can't tell the difference between an amp and an amp simulator, the odds are neither will anyone else.

LET'S GET BUSY

You've chosen your guitars, lined up your amps, and now you're ready to get to work. I suggest you always record to DAT or another high-quality recording medium, rather than directly into the sampler. Having to constantly sample, then compare the result, and then typically resample a number of times is enormously time consuming, and I don't recommend it. By recording to DAT, you'll end up with a permanent master library of all the sounds the guitarist produced. You can go back at your leisure and select the most appropriate sounds for your current needs.

Another crucial task that is often overlooked—and I've been guilty of this myself—is taking accurate and extensive notes about the session. Nothing is tougher than trying to reconstruct the order in which you sampled your guitars without written notes, particularly when you're listening to your recordings months later. Audio cues are also quite helpful if you have an open mic. Have the guitarist state which instrument and amp is being used at the beginning of each section, along with any relevant information concerning amp settings, effects, and so on. It is also helpful to have the guitarist announce the root of each note before each take. You'll thank me for this advice later.

Before you begin recording, sit down and discuss exactly what you want the guitarist to do. Do you want two or three takes of each note? How long do you want each note held? Get feedback (no pun intended) about the particular styles and techniques the guitarist can produce for you.

Although you can create a beautiful custom collection of guitar sounds with enough sample RAM, you simply cannot accurately duplicate all of the playing styles and subtle nuances a good guitarist can create. It's best to realize this up front. You want to create a sonic palette made up of broad brush strokes that say to the average listener, "Hey, that's a guitar!" If Clapton or Beck are going to be stopping by your place to listen to the final product, you might want to rethink things at this point.

A METHOD TO THE MADNESS

The first step I take in sampling any electric guitar is to find the cleanest, clearest tone the instrument can produce through any amp I have on hand. Let's say we're recording a Les Paul through a Fender Deluxe Reverb amp. Start with one pickup position, say the bridge (or treble) position. Record as many notes as you want on each string. Remember that there are distinct differences between the same notes played at different places on the neck: an open D (or fourth) string sounds quite different from the same note played at the tenth fret on the lowest E (or sixth) string.

I strive for a balanced, "ringing" effect on the first set of samples, so I focus on using as many open notes as I can, which obviously is six. That means my final samples will be E2 (in keyboard terms), A2, D3, G3, B3, and E4, after which I will move up the neck on the high E string to add A4, D5, and G5. This set of samples produces a nice rhythm sound for strumming effects. I typically record at least six seconds worth of the lowest notes, working my way up to about three seconds on the highest notes. Rule of thumb: Always record more than you think you'll need.

Next, I like to record the same set of pitches, this time taking samples played farther up the neck for more of a solo sound. As there is only one low E, I use the same one for this set and then either an open A (fifth string) or an A2 on the E string at the fifth fret. (This is a matter of personal taste.) Next, my D is on the fifth (A) string at the fifth fret, my G3 is at the tenth fret of the A string, B3 at the ninth fret of the third (D) string, E4 at the fourteenth fret of the D string, A4 at the fourteenth fret of the third (G) string, and so on. By playing higher up the neck, you create a much different timbre than that produced by open strings, one much better for just about any type of soloing.

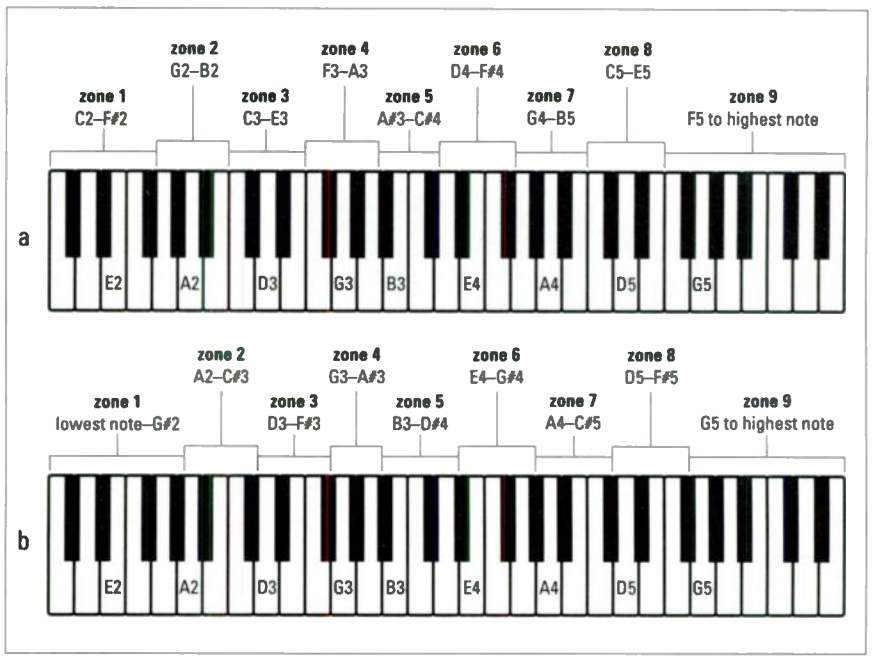

FIG. 2: In order to create a realistic guitar performance, samples must be properly mapped to the keyboard. In the top example (a), only the top and bottom samples transpose up or down by more than two semitones. This provides a clean, realistic sound. A second mapping scheme (b) places the original sample as the lowest note and transposes it up to the next sample, which provides a brighter, funkier tone.

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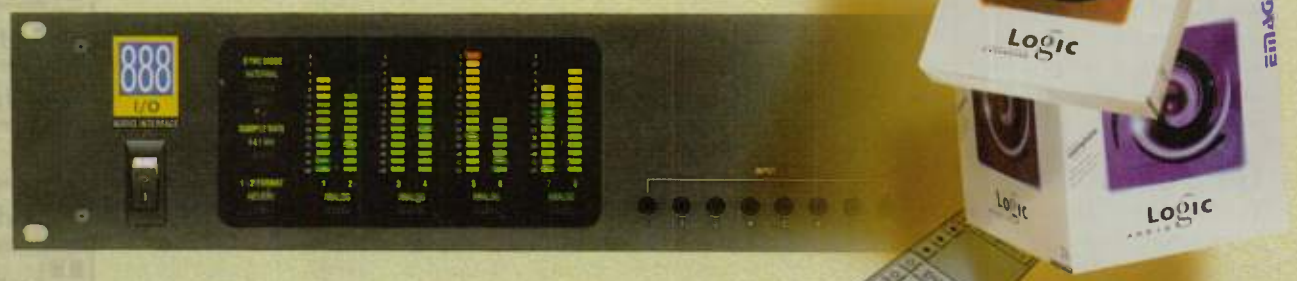

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Hot Licks

Electric guitars rule the rock roost, but a clever keyboardist can sample their primal power

One trick that works well for guitars and many other string instruments is to have the performer play a note once, wait a few seconds, then pick the note again. Having the string already "excited" and then picking the note once more creates a much more realistic sound, particularly in the critical attack portion. Try this. I think you'll be pleasantly surprised. You can also have the guitarist keep his or her finger off the string until he or she is ready to hit a particular note and then have the guitarist bring the finger down on the proper fret just as the string is being picked to create a more percussive, better articulated sound. Try both techniques, and see which one works for you.

Repeat the process with the other two pickup positions, and you will have a usable, clean Les Paul tone for lead and rhythm applications. You may also want to consider whether you want to change to a new set of strings at this point for a brighter tone with more "twang." I like the contrast between samples of a guitar with "aged" strings and one with new strings. Older strings generally sound warmer and have just a bit more attack. Also remember to record additional characteristic guitar sounds such as harmonics, which can be brought in using Velocity cross-switching during performance for added realism. Fingerboard squeaks and string scrapes with a pick also add to the overall impression of a real guitar when added judiciously to your compositions.

At this point, you can move on to samples of the same guitar with different amp settings or a different amp altogether. I recommend at least getting clean, dirty (semidistorted), and very distorted tones from each guitar, which should cover most applications.

WHERE TO GO FROM HERE

To take things a step further, you can try different tone settings, different mic positions, or even different mics. I've had remarkable success using a Shure SM57 dynamic mic on electric guitar samples, particularly when I crank up the amp and play loud. For more detail and richness, my favorite mic is the AKG C 414.

However, even more important than which microphone you choose is where you place it in relation to the amp (see **Fig. 1**). Initially, try placing the mic directly in front of the speaker. If you are using a 4 × 12 cabinet, pick just one of the speakers and place the mic about six to ten inches away from the grille cloth. For a more open, spacious sound, try placing the mic two to three feet (or even more) away from the speaker. Also try placing the microphone at an angle (off axis) to the cabinet to pick up more overtones. In many cases, mic placement can affect the final sound as much as your choice of amplifier.

When miking speakers, it is important to isolate the monitor sound from the source sound; otherwise, it is difficult to judge the effectiveness of your mic placement accurately, particularly if the guitar player has the amp cranked up. If your studio setup precludes physical isolation from the source sound (which would be unfortunate), try recording a minute or two of the guitar player playing individual notes and chords and then play it back to determine whether that particular mic placement gives you the sound you're after.

You can also sample with effects such as distortion boxes, each of which can produce remarkably different tones, from a mellow tube overdrive (e.g., using the popular Ibanez TS9) to metal thrash tones (as with a BOSS MT-2 Metal Zone). The best of these pedals allow you to fine tune your sound using a variety of drive and tone controls. In the case of Tech 21's XXL pedal, a "warp" control actually manipulates the structure and balance of odd and even harmonics.

Effects such as wah-wah are best left for real-time performance with the completed samples, as such effects depend on phrasing. (Distortion effects can also be phrase dependent, so you might prefer to sample the guitars dry and add distortion later, in real time.) Similarly, processing such as delay, flange, phaser, and chorus is also best left for the postsampling performance, as these are time based, and the transposition (up and down) of various samples will wreak havoc on such effects.

TECHNICAL CONSIDERATIONS

To conserve precious sample memory, I recommend sampling your final guitar sounds at no more than 32 kHz. I've even had great results at rates as low as 22 kHz with some electric basses and guitars with humbuckers. Most guitars (even Strats) have little or no high-frequency energy above 8 to 10 kHz. Few guitar amps can even reproduce frequencies that high. Try different sample rates and see whether you can hear a difference.

One exception to this rule is bright, fuzzed-out notes where the odd/even harmonic structure may be quite rich in the upper frequencies. Another is acoustic 6-string, and particularly 12-string, guitars; these instruments have a great deal of energy in the higher frequencies, and I would never sample them at any less than a 32 kHz rate.

As previously mentioned, looping electric guitars is relatively easy, and most of today's samplers do an outstanding job without having to resort to computer-based looping software. Most guitars can be single-cycle looped using a linear crossfade. You'll probably have to experiment a bit to find the point at which the guitar string has settled into a relatively static, nonevolving tone, usually (depending upon the string being sampled) from two to five seconds into the sound.

More complex sounds, such as those with serious distortion, may loop best with a long (2- to 3-second), equal-power, crossfade loop that starts about two to three seconds into the sound. In a pinch, you can also single-cycle loop a fuzz guitar right after the initial attack, before the sound has a chance to evolve, which is a practical consideration if RAM is at a premium. Steel-string and nylon-string acoustic guitars also generally loop easily, particularly with longer samples.

If you have one of the latest mega-memory samplers (such as the E-mu EIV or Kurzweil K2500), you can build a great virtual guitar with all of your samples in one bank. This way, you can switch programs the same way a guitarist would switch pickups. You can even create Velocity-sensitive programs that switch between lightly picked notes and hard-picked notes as well as bring in artifacts, such as a bit of fret buzz. These techniques add realism to the final performance and are particularly useful for acoustic guitar samples.

For almost all electric guitar sounds, monaural samples work just fine. You gain almost nothing (and lose precious memory and polyphony) by sampling in stereo. In most of today's music, instruments are recorded in mono and then placed left to right within the stereo soundfield during mixdown. Acoustic guitars may be an exception: a spacious acoustic sample can sound lush when added to a mix, provided you have the tracks available.

MAKING A PLAY

Now that you have your guitar samples, you need to play them back as realistically as possible. Correctly mapping the samples to the keyboard is a good first step. I generally use two mapping schemes (see **Fig. 2**). In the first, samples are transposed up or down by no more than two semitones, which provides a clean, realistic sound. Limiting the lowest note to E2 and the highest to about C6 provides maximum verisimilitude. In the second example, samples are transposed up from the original pitch, which provides a brighter and funkier sound.

Most single-note lead lines can be played from the keyboard and will sound fine; just think "guitar" as you play in order to phrase like the real

SAMPLING ACOUSTICS

Because there are an almost infinite range of different mics and mic positions, miking an acoustic guitar is more art than science. Condenser mics work best in capturing the subtle overtones produced by acoustics (including nylon-string guitars), but a high-quality dynamic mic can also produce interesting results. If you have access to more than one mic, try each in turn to judge which produces the most realistic sound.

Mic placement is critical. Placing a mic directly over the soundhole of an acoustic guitar results in an overly boomy sound. It is generally best to place your mic about a foot or so away from the guitar, just a bit higher than the sound hole and pointed slightly toward either the bridge or neck, depending upon the tone you desire. Try a variety of positions; have the guitar player noodle around and adjust the microphone while you monitor through headphones. Within minutes, you should be able to zero in on the sweet spot.

For stereo, turn one mic toward the bridge and the other toward the neck (see **Fig. A**). Some acoustics now come with built-in piezo pickups, and although these don't accurately capture the beautifully complex overtones of a fine acoustic, it's worth sampling the guitar using just the internal pickups for a clean, modern, electro-acoustic sound.

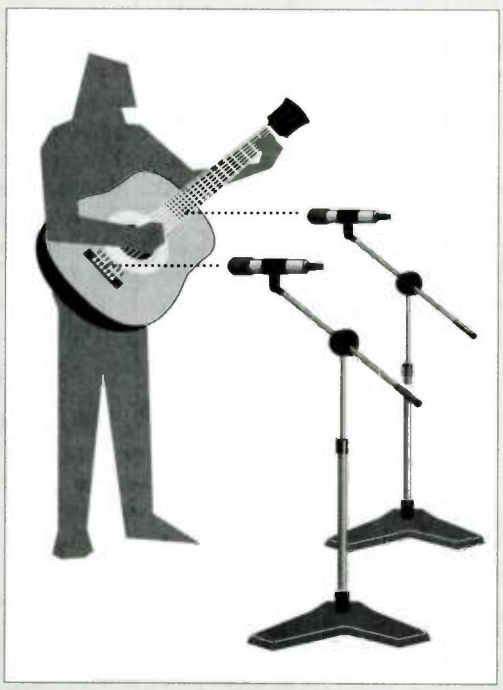
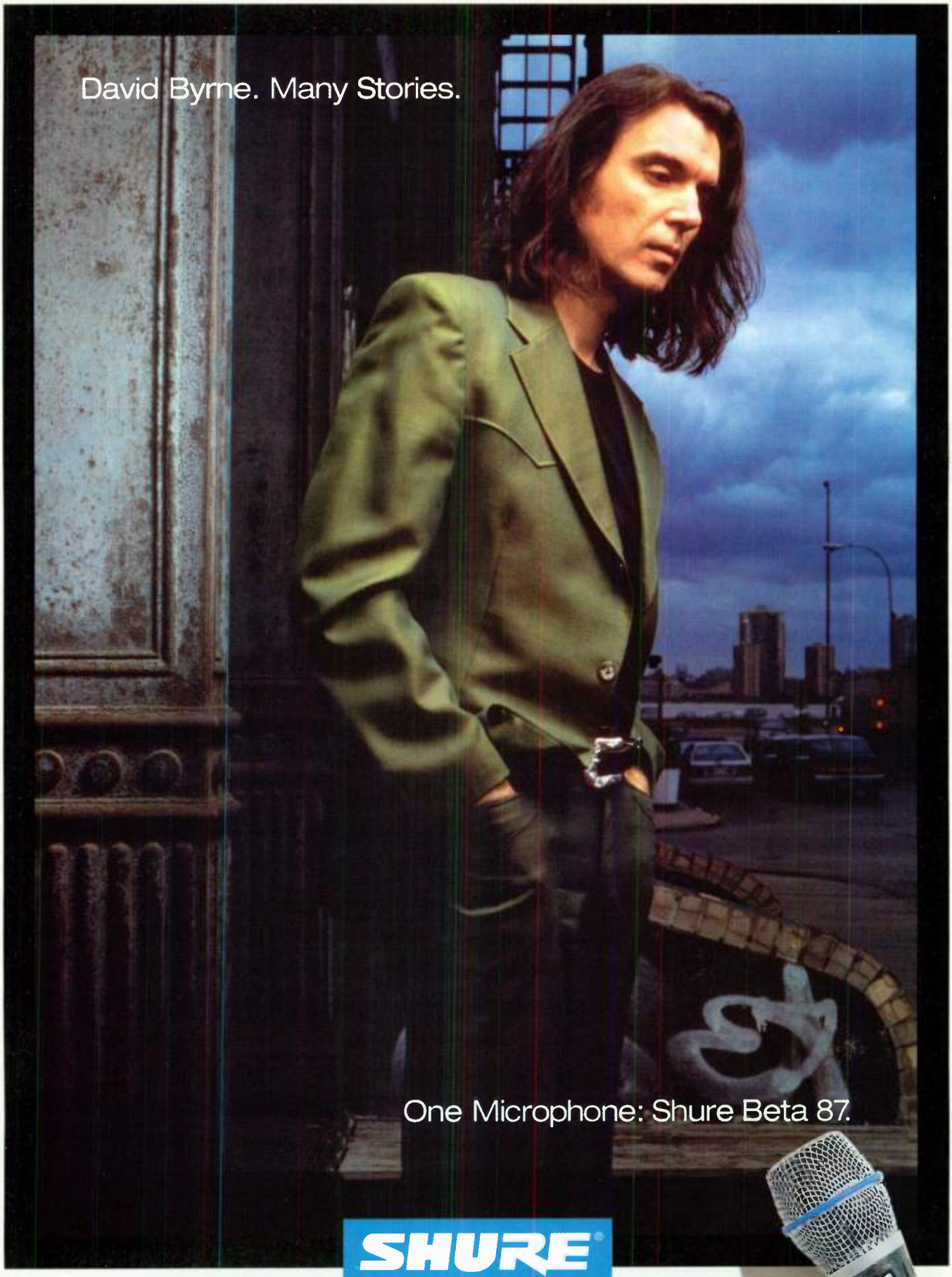


FIG. A: To mic an acoustic guitar in stereo, aim one mic toward the bridge and the other toward the neck.



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thing. The most difficult assignment for accurate guitar emulations is producing realistic strums, big rolling chords, and the distinctive "chucka-chucka" of a fast rhythm-guitar part.

Until recently, you had to do a lot of work to get things to sound right. You had to correctly voice your chords as well as roll your fingers across the keyboard to simulate the tiny time delays created as individual guitar strings are picked when playing a chord. Many have also tried sampling actual major and minor chords—real memory hogs, but useful in some applications.

Another factor is that most guitars (except slides and fretless basses) can only produce vibrato by going sharp, because the frets prevent a note from being smoothly altered downward. To accurately duplicate this characteristic, your LFO should be a positive-tracking sine or triangle wave, so the sound will not fall below the original pitch. This is a seemingly minor point, but it adds just a tiny bit more realism.

If you have the available memory, another option is to include both vibrato and nonvibrato samples and then use an assignable mod wheel or data slider to crossfade in the vibrato at the appropriate point on your solo. This produces a very realistic sound, much more believable than using an LFO, because each player's vibrato is a bit different.

In this scenario, all you need to actually sample for the vibrato effect is just that: the vibrato. Simply truncate the sample to eliminate the nonvibrato part of the sound and then loop just a few cycles of the vibrato effect. This keeps your files small and manageable. However, note that you will need to create more vibrato files than original nonvibrato files, because the vibrato effect does not readily transpose up and down, getting faster as it transposes up and slower as it is transposed down. I prefer to transpose up and down no more than a single semitone.

Finally, you can also take a clean sampled guitar sound and process it through an effects pedal in performance, just as you would a real guitar. This is particularly useful if your sampler has limited memory. You can even use more than one effect and get even closer to re-creating the performance of an actual guitar part.

FINAL CHORD

Although guitars are not hard to sample, a great guitar sample takes a lot of work. I've been sampling for close to ten years, and each set of guitar samples I create takes me several days to complete, including the selection of the sound, recording and looping, and then building programs.

So be patient, listen carefully, and pick a good player who's willing to work with you. You'll be rewarded for your efforts with guitar sounds that will probably never go out of style.

Jim Miller *is the author of numerous* **EM** *articles on sampling. He is currently putting the finishing touches on the* Ultimate Guitar *sample collection for Sweetwater Sound.*

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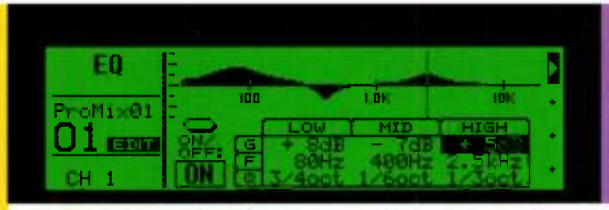

ProMix 01 parametric eq gives you dozens of frequency centers in three overlapping bands, from a very low 32 Hz to a sparkling 18 kHz. Q is adjustable in 1/6th octave steps with low and high frequency shelf. A graphic LCD display shows the details of every move you make.

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ProMix 01 AND THE SUBTLE ART OF eq.

Mixing is something like painting. Whether it's for a live audience or in the studio, equalization, or eq, is like the "palette and brushes" that let you adjust the shade and tint of each sound in your mix.

In the eq world, true parametric eq is the most precise of all. But it can be very expensive. It's normally available only as an integral part of a large console. Or as a separate add-on unit that can cost thousands.

So why would someone pay big bucks for parametric eq? With ProMix 01 you can afford to find out—because ProMix 01 is the only mixer in its class with true parametric eq on every input channel.

Fundamentals and harmonics: the hues and tints of music.

Each sound in your mix is made up of many "colors" or frequencies. If you look closely at a shiny object, you notice it's not simply gold or silver—it displays a complex array of colors that let you know it's reflective. When you listen to a sound by itself, you mostly hear its predominant frequency—the fundamental. But like the shiny object, if you listen closely you'll hear subtle frequencies called harmonics that give the sound its character.

Eq lets you control these subtleties. Making an acoustic guitar seem larger than life—more out-front—by simply boosting the high-frequency harmonics from the strings. So the guitar becomes more noticeable in your mix, without actually raising its volume.

You can also use eq to solve problems in a mix. Such as removing feedback in a live concert; removing hum or noise from an electric instrument; or taking the "edge" off an instrument that's stealing attention from a lead vocal. With eq, you can make sounds stand out or blend in. In short, it's the accent that can turn a group of sounds into a great mix.

A different shade of blue?

Most equalizers give you a pre-determined choice of two or three frequency locations at which you can boost or cut. That can be really limiting—like having only two or three colors to paint with. You'll quickly discover this when you want to add presence to your vocal track, solve a feedback problem, or remove electronic "hum," and need frequencies that fixed-band equalizers don't provide. Parametric eq, as provided by ProMix 01, gives you a spectrum of frequency choices. Like having all the colors of a color wheel available to paint with.

What size brush?

In addition to frequency and gain controls, the true parametric eq on ProMix 01 includes a Quality Factor or "Q" control. Going back to our painting analogy, Q is like the width of your paintbrush. It lets you determine how wide or fine an effect you want the eq to have. Unlike the pseudo-parametric or "sweep" eq some mixers provide, true parametric eq lets you boost and cut subtleties in your mix with the precision of a Renaissance artist.

The ProMix "Paint Box."

Now that you know why parametric eq is so highly regarded, just imagine applying that artistic freedom to your next project. What could you do with more colors and more control over them? With 3-band parametric eq on every channel and the main stereo output, ProMix 01 gives you dozens of frequency centers to choose from. It's like enhancing your mix with a paintbox that includes every color in the rainbow.

A memory for the details.

ProMix 01 also saves you time by remembering all your eq settings in memory. So once you've found that magic eq curve, you can instantly call it up weeks later, along with all the other settings in your mix. ProMix 01 even includes a built-in eq library which holds 30 time-tested eq curves for you to use. You can call these up as starting points, modify them according to taste, and store your own custom settings in the library for use at any time. The large, backlit LCD display gives you visual as well as precise numeric representation of your eq on each channel—making eq'ing with ProMix 01 an illuminating experience indeed.

We could go on and on about ProMix 01's other advantages. But that's another ad. In the meantime, get the book and see the movie. **Just call 1-800-937-7171, ext. 550** for your free copy of the new ProMix 01 Application Guide and Video. Then take a spin at the dealer nearest you, and see how ProMix 01's parametric eq handles the curves.

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SERVICE CLINIC

Analog Service, Part 3

Top tech tips for troubleshooting analog keyboard circuits.

By Alan Gary Campbell

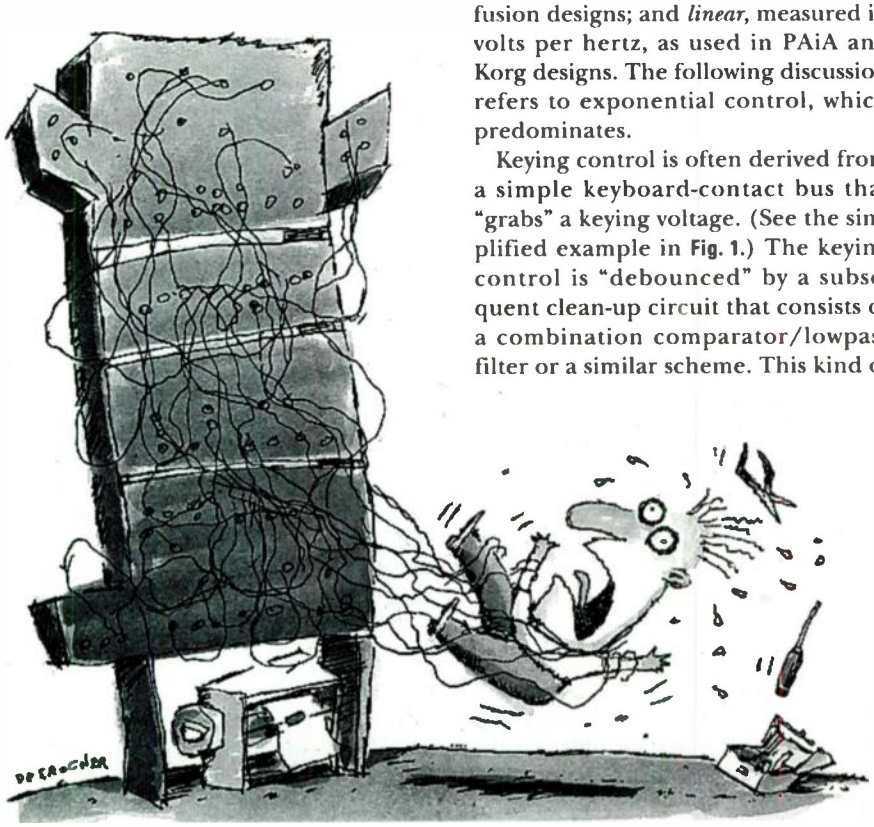
Of primary importance for an analog synth is a keyboard controller that can provide key on/off logic and a control voltage to alter pitch in a useful and predictable way. There are two voltage-control schemes for analog synths: *exponential,* measured in volts per octave, as used in Moog, ARP, Octave-Plateau, Oberheim, and Polyfusion designs; and *linear,* measured in volts per hertz, as used in PAiA and Korg designs. The following discussion refers to exponential control, which predominates.

Keying control is often derived from a simple keyboard-contact bus that "grabs" a keying voltage. (See the simplified example in **Fig. 1.**) The keying control is "debounced" by a subsequent clean-up circuit that consists of a combination comparator/lowpass filter or a similar scheme. This kind of keying circuit typically produces zero volts with all keys up and a constant, system-compatible, positive voltage with one or more keys down. Hence, it is referred to as a positive-logic voltage gate or simply a "gate."

Gates are easily interfaced with both TTL and CMOS logic and are now considered standard, but early Moog synths used a different scheme (see **Fig. 2**). Moog engineers considered it more reliable for the keying bus to provide a current sink, rather than a voltage source, and designed their keying control around a negative-logic, current-sinking circuit commonly referred to as a "shorting trigger," "switch trigger," or simply "S-Trigger."

(The nomenclature in standard usage is undeniably misleading: the gate, not the voltage trigger or "V-Trigger," is the functional equivalent of the S-Trigger. Both gate and S-Trigger voltages endure as long as any key remains down, but the V-Trigger, added in some later designs for more flexible envelope control, is merely a brief pulse produced when a new key is struck.)

The keyboard control voltage is a stepwise, quantized output derived from a series string of equal-value, precision resistors (typically 100Ω, 1%) driven by a constant-current source (see **Fig. 3**). The simplicity of this control-voltage scheme reflects one of the advantages of exponential design: because the



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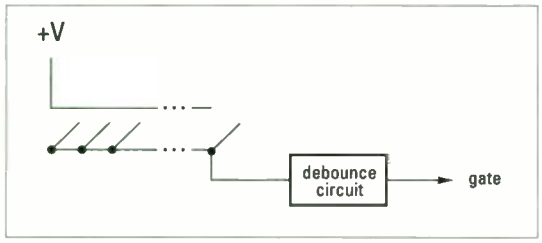


FIG. 1: In this simplified positive-logic voltage gate, the keying control is derived from a simple keyboard-contact bus that "grabs" a keying voltage. The control is "debounced" by a clean-up circuit, which usually consists of a comparator and lowpass filter.

modules respond exponentially, the control voltages that are necessary to produce a chromatic, equal-tempered scale form a simple, linear progression.

Thus, in a standard 1-volt-per-octave, exponential system, the keyboard control voltage increases exactly 1/12 volt per semitone. In other words, the keyboard resistor string is a repetitive voltage divider that chops the total keyboard voltage (the number of octaves times 1 volt) into equal steps. The constant-current source maintains accuracy under load.

TROUBLESHOOTING

By far the most common analog-keyboard symptoms are caused by keyboard-contact contamination, oxidation, and wear. A classic failure mode for a Minimoog that has been sitting unplayed involves wild pitch fluctuations caused by nothing more serious than dirty contacts. (Armed with this tip, you might be able to get a good, but seldom-used Mini cheap: just turn it on and say, "Listen to this!")

The J-wire contacts typical of vintage synthesizers can be cleaned with denatured alcohol on a cotton swab or sprayed with nonabrasive contact cleaner one key at a time. You should spray sparingly and then work each key at least ten times. The bus bars should also be cleaned thoroughly. *Caution: Alcohol is highly flammable. Keep away from heat and other sources of combustion.*

J-wires usually break before they incur serious wear, but bus bars, unfortunately, often have significant surface wear in which the plating is badly eroded. A bus bar can sometimes be rotated in place to expose an unworn surface, but this is a delicate and risky procedure that should be attempted only as a last resort. The J-wires to be replaced should be trimmed short—wear your safety goggles!—and the new wire carefully tack-soldered in place. With older designs, it may be necessary to cut off the base of the new J-wire and wrap the wire around the stub for support before soldering.

Gate and S-Trigger malfunctions can almost always be traced to a bad diode or a single transistor or IC in the keying circuit. It is usually a fairly straightforward process to troubleshoot the circuit with a DMM or by parts substitution. Note that the Cinch-Jones plugs used with Moog S-Trigger inputs and outputs are available from Radio Shack (catalog numbers 274-202 [male] and 274-201 [female]).

Control-voltage circuit malfunctions are more often found in the output sample-hold than in the constant-current source. Typically, the sample-hold capacitor becomes leaky and causes the pitch to "sag" when notes are held. (Some older keyboards do this even when they're not malfunctioning!) Sample-hold caps should be replaced only with low-leakage, polystyrene types; for older synths that use other types, this is a useful upgrade. Flux residue *must* be removed in such high-impedance circuits, or it will form a leakage path and negate the repair. Use denatured alcohol on a clean toothbrush and *scrub*.

Rarely, a resistor in the keyboard string will fail. An exact replacement for the typical 100Ω, 1% tolerance, ¼-watt type is included in Radio Shack's metal-film resistor assortment (catalog number 271-309). However, a 2% tolerance, ¼-watt, metal film resistor (RCA or equivalent), available from most electronics supply stores, can be substituted with very little loss of overall accuracy.

Sometimes the sample-hold buffer IC that follows the cap (typically an op amp) fails and "pegs" the output near the positive- or negative-supply voltage. This results in an absence of apparent audible keyboard response, as the oscillators are droning at supersonic or subaudio frequencies. Again,

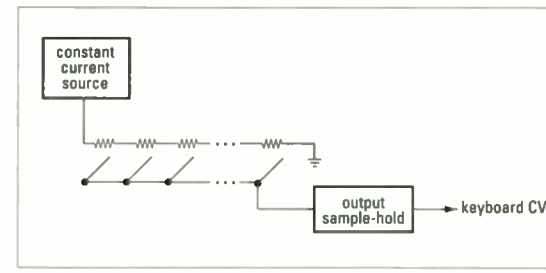


FIG. 3: The keyboard control voltage is a stepwise, quantized output derived from a series string of equal-value, precision resistors (typically 100Ω, 1%) driven by a constant-current source.

the PC board must be defluxed after repair. Use an exact replacement for the IC unless you know your chips. Avoid using an IC socket in this critical circuit unless a second failure occurs and repeated desoldering might damage the board. Use only a high-quality (*not* Radio Shack) socket.

Be careful not to confuse oscillator and keyboard symptoms. A synth that plays somewhat out of tune but is otherwise functional probably has a calibration error, an oscillator exponential-converter failure, or a high-frequency-compensation subcircuit failure. A keyboard constant-current-source failure generally yields a synth that plays wildly and unpredictably out of tune or not at all. If you're uncertain of the source of a failure, simply measure the keyboard control-voltage output with a DMM; it should increase in obviously linear steps.

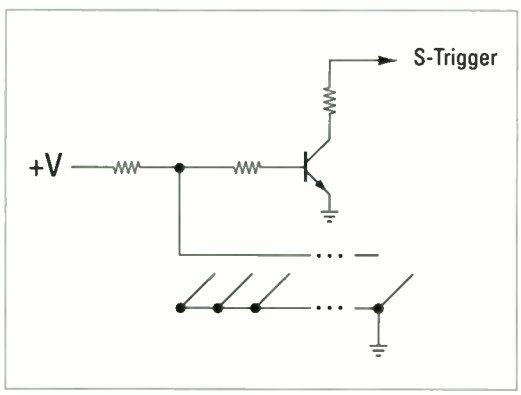
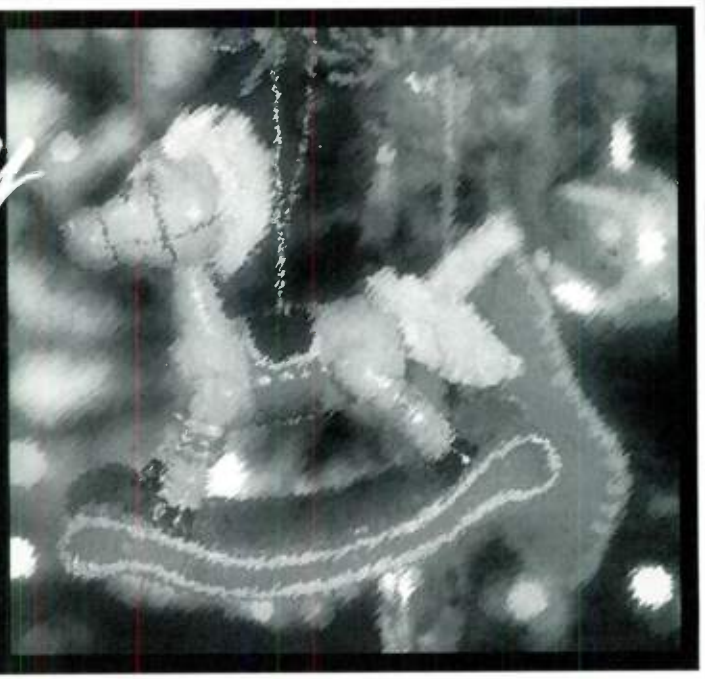


FIG. 2: Instead of using a gate, early Moog synths used a keying control based around a negative-logic, current-sinking circuit commonly referred to as a "shorting trigger," "switch trigger," or simply "S-Trigger."

This Holiday Season:



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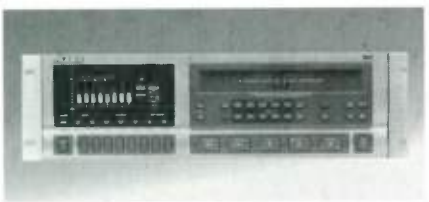

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GLIDE CIRCUITS

Analog keyboard "glide" circuits, also referred to as "portamento" and "lag" circuits, can be as simple as a potentiometer configured as a 2-terminal, variable resistor and wired in series with the keyboard sample-hold cap. Some designs use a separate, additional sample-hold circuit for glide effects, but the principle is the same: the series resistance increases the time constant of the sample-hold circuit, "smoothing" the normally quantized voltage-level transitions between notes.

▼

The most common symptoms are caused by keyboard-contact contamination, oxidation, and wear.

When a glide circuit based on the keyboard sample-hold malfunctions, and no other symptoms are observed, the problem is likely to be a worn-out pot. Some glide circuits omit an on/off switch, a dubious practice sure to cause trouble eventually, when normal wear results in increased pot end resistance and a glitchy glide function that won't reliably adjust to zero. For glide circuits based on a separate sample-hold, troubleshooting techniques are analogous to those applied to a keyboard sample-hold.

ADVANCED CIRCUITS

Some keyboard controllers for analog synths are capable of 2-note or multi-note operation. A complement of basic logic ICs is required to accomplish this, so such keyboards are technically hybrid, not analog. In typical older designs, each output has its own sample-hold circuit, and troubleshooting these is no different than with a single-note circuit. Specific troubleshooting techniques for hybrid circuits will be covered in an upcoming column.

EM *Contributing Editor* **Alan Gary Campbell** *is the owner of Musitech.*

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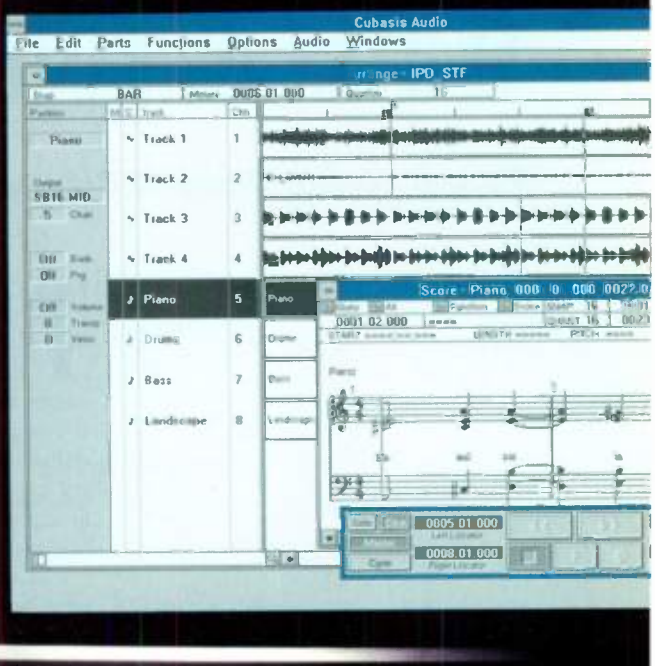

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Watts & Volts & Logs, Oh My!

To get to the Decibel City, we must follow the copper brick road.

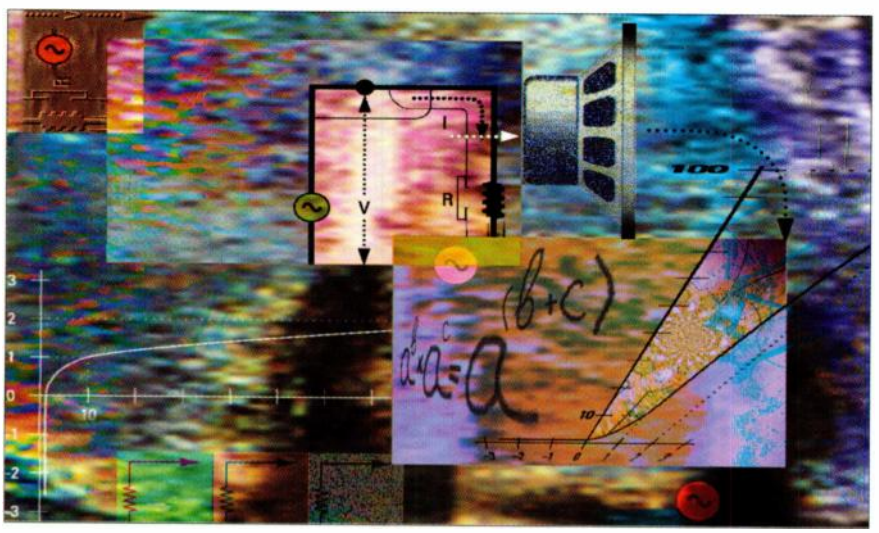
By Scott Wilkinson

The buffeting winds of change bring new gizmos that make the lives of electronic musicians ever more exciting. However, these winds also bring confusion, especially if you've never ventured into the fundamental electrical and mathematical concepts that underlie the operation of all audio equipment. These concepts are important for a number of reasons. For example, manufacturer specs mean nothing without them. (Some specs mean nothing anyway, but that's another story.) In addition, these concepts are essential to understanding *decibels*.

Glancing through any issue of **EM**, you will see numerous references to "dBu," "dBV," "dB SPL," or just plain old "dB." As you may already know, dB stands for decibel. You may also have some notion that decibels are used to measure signal levels. However, most people don't understand exactly what decibels are or how they are used in the world of audio devices. Even audio professionals are often a bit fuzzy about the decibel's precise nature.

This is understandable; decibels can be quite confusing. There are many different types of decibels, and manufacturers use them in their specs with reckless abandon, which adds to the confusion. To clear away the fog surrounding this essential concept, we must start with some basics of electricity and mathematics. After all, audio signals are nothing more than electrons flowing through a conductor of one sort or another. In addition, decibels depend on mathematical concepts called *exponents* and *logarithms*.

As you read this information, its immediate relevance to decibels might not be clear. But have faith; although it might not be apparent at the moment, these concepts are vital to understanding decibels. We'll dig directly into decibels next month.



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CURRENT AND VOLTAGE

As mentioned, audio signals consist of electrons flowing through a conductor, such as a copper wire. This flow of electrons is called a *current*. The amount of current is measured in units

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called *amperes* (named after French physicist Andre Ampere) or *amps* (abbreviated *a*), and it is represented by the letter *I* in electrical equations.

There are two types of current: *direct* and *alternating*. Direct current (DC) flows steadily in one direction through a conductor; alternating current (AC) changes direction in the conductor at various frequencies. Analog audio signals are alternating currents with waveforms and frequencies that correspond to acoustic sounds.

An *electromotive force* (EMF) causes current to flow. (This name makes sense when you think about it: EMF is a force that causes electrons to move.) EMF is more commonly called *voltage*, which is measured in *volts* (after Italian physicist Alessandro Volta) and is abbreviated *V*. It is represented by the letters *V* or *E* in electrical equations. Voltage is produced in many different ways, such as chemical reactions in a battery.

▼

Logs act like "mathematical compressors."

One helpful analogy is to think of voltage as the height of a hill. Because there is a difference in height between the top and bottom of the hill, a ball rolls down the hill under the influence of gravity. When the ball is at the top of the hill, it is said to have *potential energy;* that is, it has the potential to move down the hill. As it rolls down the hill, the potential energy is converted into *kinetic energy*, the energy of motion.

In this analogy, the top and bottom of the hill are at different heights, and the ball moves from one to the other. The same is true for voltage. Any voltage source has two *poles*, and electrons flow from one to the other. There is said to be a *potential difference* between these poles. The greater the difference, the more potential for moving electrons. This potential can't be fulfilled until the two poles of the voltage source (which correspond to the top and bottom of the hill) are connected by a conductor. If you connect the poles in this way, you create a *circuit*, or closed loop, through which the current flows.

One common voltage source is a battery, which has a positive and a negative pole. If you connect a conductor to these poles, electrons will flow from the negative pole to the positive pole. (If you've ever played with magnets, you know that opposite poles attract and similar poles repel each other. The same is true for electrons, which are negatively charged. They are repelled by the negative pole of a battery and attracted to the positive pole.)

Because a battery's voltage produces a direct current, its voltage is specified in VDC. If the poles of a voltage source alternate (as they do in a power outlet in the wall, for example), the current changes direction periodically, and the voltage source is specified in VAC.

Measuring the voltage from a battery or other DC source is easy. Returning to the hill analogy, the higher the hill, the more potential energy the ball has. The voltage from a battery is analogous to the height of the hill: the more voltage, the more potential it has for moving electrons. To measure the voltage of a battery, simply attach the two leads from a voltmeter to the poles and read the voltage.

Measuring alternating voltages is not quite so straightforward. You could simply measure the highest voltage level as it varies up and down, but what if this peak level changes from one cycle to the next? Taking the average of several peaks would give a more accurate value, but engineers have devised an even better way to measure alternating voltages: *root mean square* (RMS). First, you measure the instantaneous voltage value at many points during one complete cycle. (This is similar to audio sampling.) Then, you square each voltage value (that is, multiply the value by itself). Next, you calculate the average of these squared values and take the square root of this average. If the voltage variation takes the form of a sine wave (as the voltage from a wall outlet does), the calculation becomes simpler: multiply the peak value by 0.707.

This is relatively complicated, but it yields a voltage value that is meaningful, even if the peak levels change over time. Of course, anyone who wants to measure an alternating voltage simply connects a voltmeter to the poles of the voltage source. The voltmeter does all the squaring and averaging, giving you a readout in volts RMS.

IMPEDANCE AND POWER

In virtually all electrical circuits, there is some opposition to the flow of current. Even copper wire opposes the flow of current to some degree. (The only exception is a circuit made with superconducting material, which exhibits practically no opposition.)

The opposition to direct current flow is called *resistance.* It is measured in units called *ohms* (after German physicist Georg Ohm) and abbreviated with the Greek letter omega (Ω). Resistance is represented by the letter R in electrical equations. The opposition to alternating current is called *impedance,* which is also measured in ohms but is represented by the letter Z in electrical equations. Impedance is the sum of any DC resistance and the *reactance* of the circuit, which is measured in ohms and represented by the letter X in equations. Among other things, reactance depends on the frequency of the alternating current.

The impedance of a circuit determines the *load* it places on the voltage source. If the circuit's impedance is high, it doesn't let much current flow, which places little demand on the voltage source to move electrons. This is said to present a small load to the voltage source. However, if the impedance is low, the circuit doesn't resist the flow of current, which places greater demand on the voltage source to move electrons. This is said to place a large load on the source. As you can see, impedance and load are inversely related; if the impedance is high, the load is small and vice versa.

The relationship between voltage, current, and impedance is defined by *Ohm's Law,* which was derived by Ohm in the early nineteenth century. This law can be stated in three different but equivalent ways:

$$V = I \times Z$$

$$I = \frac{V}{Z}$$

$$Z = \frac{V}{I}$$

(Ohm's law is also valid for DC resistance; simply substitute R for Z.)

Among other things, Ohm's Law clarifies the concept of load. Look at the first form of the law. If the voltage remains constant, the current is high if the impedance is low and vice-versa.

Another common electrical quantity is *power,* which measures how much "work" can be done by a given voltage and current through a given impedance. It is represented by the letter P in electrical equations, measured in units called *watts* (named after Scottish engineer James Watt), and abbreviated W. DC electrical power is defined by *Joule's Law* (named after British physicist James Joule):

$$P = V \times I$$

If the voltage and current alternate, as in an audio signal, so does the power. As a result, alternating power is often expressed in watts RMS. This should be familiar to anyone who has shopped for a power amplifier. Joule's Law is slightly different for AC circuits:

$$P = K \times V \times I$$

K is a constant called the *power factor* that depends on the reactance of the circuit. It's value is always between +1 and -1.

Here's another analogy that helps illustrate these concepts. Imagine a water tower with a pipe and a valve that lets the water flow from the tank and turn a water wheel (see **Fig. 1**). The distance between the tank and the water wheel corresponds to voltage; the higher the

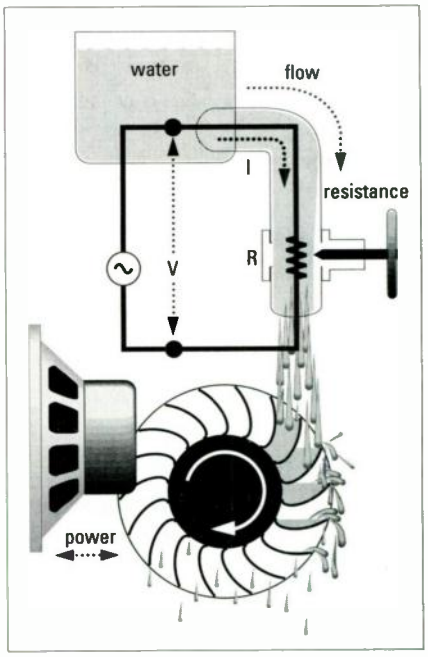

FIG. 1: This mechanical water system is analogous to a simple electrical circuit. The height of the water tank above the water wheel corresponds to voltage, and the flow of water through the pipe corresponds to current. The valve offers resistance to the flow of water, which corresponds to impedance, and the wheel turns as the water falls on it, which corresponds to power.

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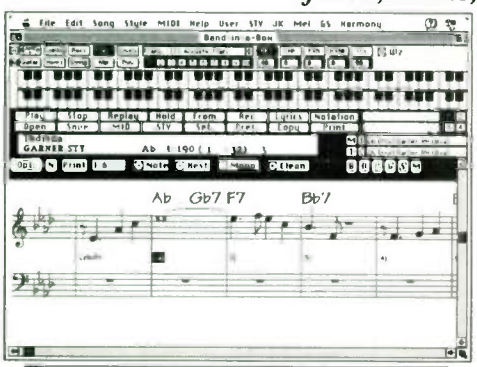

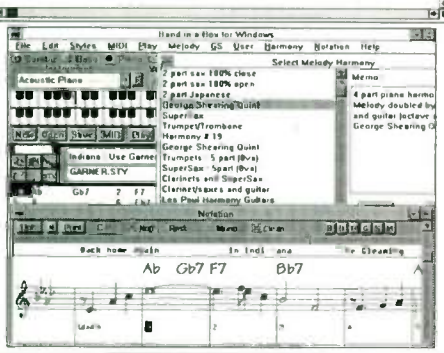

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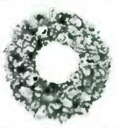

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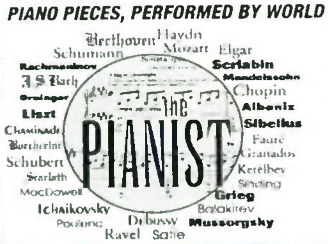

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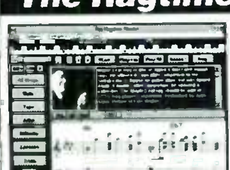

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tank above the wheel, the more potential there is for the water to flow. Of course, the flow of water through the pipe corresponds to current.

The valve can be opened to different degrees, letting more or less water through. As you might guess, this corresponds to impedance. The water turns the water wheel, which allows the wheel to perform work (e.g., grinding flour). This corresponds to power. As you can see, if the valve is mostly closed (impedance is high), little water flows (current is low), and the wheel does little work (power is low). On the other hand, if the valve is mostly open (impedance is low), lots of water flows (current is high), and the wheel can do lots of work (power is high).

EXPONENTS AND LOGARITHMS

The branch of mathematics that deals with exponents and logarithms frightens many people, but it's really not all that complicated. Exponents simply provide a simple and elegant way to represent the result of multiplying the same number together several times. For example, consider the following equation:

$2 \times 2 \times 2 \times 2 \times 2 = 2^5 = 32$

In this example, the "2" is called the *base* and the "5" is called the *exponent.*

Exponents can help us express very large numbers with fewer digits. For example, 10,000,000 = 10^7. You can even use fractional exponents. For example, $5^{2.3} = 40.52$. In fact, you can make a graph of the relationship between exponents and the value they generate for a given base (see **Fig. 2a**).

Exponents can also help express mathematical formulas more elegantly. For example, let's take a look at Joule's Law again.

$P = V \times I$

From Ohm's Law, we know that $I = V/R$. If we substitute V/R for I in Joule's Law, we get:

$$P = V \times \left(\frac{V}{R}\right) = \frac{(V \times V)}{R} = \frac{V^2}{R}$$

We can make a similar substitution for V, which is equal to $I \times R$:

$P = (I \times R) \times I = (I \times I) \times R = I^2 \times R$

Now, we have three equivalent expressions of Joule's Law:

$$P = V \times I$$

$$P = \frac{V^2}{R}$$

$$P = I^2 \times R$$

Exponents exhibit some cool properties. Three of the coolest are:

$$a^b \times a^c = a^{(b+c)}$$

$$\frac{a^b}{a^c} = a^{(b-c)}$$

$$\left(a^b\right)^c = a^{(bc)}$$

Let's plug some numbers into the first of these equations to see how it works:

$2^4 \times 2^3 = 16 \times 8 = 128$

$2^4 \times 2^3 = 2^{(4+3)} = 2^7 = 128$

As an exercise, try plugging these numbers into the other two equations to verify that they work.

Logarithms (or *logs*) are simply the opposite of exponents. They are defined as follows:

If $a = b^c$ then $c = \log_b a$

This is difficult to put into English, but I'll give it a try. Logarithms identify the exponent *(c)* to which you would raise the base *(b)* to obtain the number you are taking the logarithm of *(a).*

In many applications, the base is assumed to be 10 because of scientific notation (e.g., 25,000,000 = 2.5×10^7). As a result, the base is not overtly specified; it is assumed to be 10. In this case, the definition of logarithms would look like this:

If $a = 10^c$ then $c = \log a$

For example, $100 = 10^2$, so log 100 = 2. This also works with fractional exponents. For example, $20 = 10^{1.301}$, so log 20 = 1.301. If you create a chart of the relationship between various numbers and the logs of those numbers, you see that this graph is identical to the exponent graph flipped across a diagonal (see **Fig. 2b**). To calculate logs, it's best to use a calculator with a log function.

Logs help us manipulate large numbers more easily. They also help us manipulate large ranges of numbers, which is why they are used in decibels: audio signal levels encompass a *very* large range of possible values. In fact, logs act like "mathematical compressors." Just as an audio compressor accepts a large range of input levels and outputs a smaller range of levels, logarithms accept a large range of numbers and return a much smaller range of numbers. The graph in **Fig. 2b** even resembles the graph of a compressor's input vs. output.

Logs also exhibit some cool properties, which arise from their intimate relationship with exponents. Here are the three properties of logs that correspond to the properties of exponents listed earlier:

$$\log(a \times b) = \log a + \log b$$

$$\log\left(\frac{a}{b}\right) = \log a - \log b$$

$$\log\left(a^b\right) = b \times \log a$$

OFF TO SEE THE WIZARD

The concepts of voltage, current, impedance, power, and logarithms are essential to understanding basic electrical circuits and specifications. In addition, without a solid grasp of these fundamentals, decibels are nothing more than a confused dream with hidden meaning and purpose.

But now we're through the poppy field, and we're off to see the Decibel Wizard next month. Just remember to keep this issue handy and click your heels together three times as you say, "There's no place like **EM**."

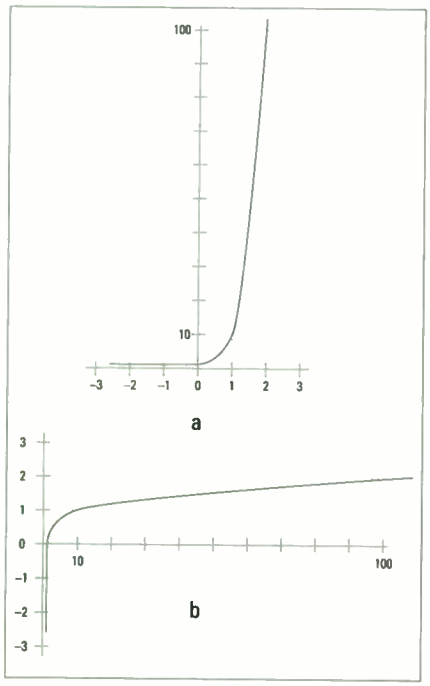

FIG. 2: If you raise a specific number to different exponents, the result grows quickly as the exponent increases (a). In this case, $y = 10^x$. On the other hand, if you take the log of different numbers, the result grows very slowly as the initial numbers increase dramatically (b). In this case, $y = \log x$. Notice that the graph in (b) resembles the graph of an audio compressor's performance.

EM *Tech Editor* **Scott Wilkinson** *wrote most of this column in a hotel room in the Napa Valley wine country, much to his dismay.*

WE LEFT OUT THE NOISE, TOO.

Although it's become something of a pro audio standard, the CR-1604 isn't the only 16-channel compact mixer around. Compare 'em knob-for-knob, button-for-button and you'll also discover that the CR-1604 is not the leader when it comes to sheer number of doohickies and thingamabobs.

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RECORDING MUSICIAN

Unplugged and Dangerous

Chuck your mixer and multitrack to unveil the acoustic truth.

By Brian Knave

Gearheads often fall into the trap of thinking that more equipment means better results. Over-the-top signal processing may be fine if you're producing a soundtrack for *The X-Files,* but if you're documenting the pristine timbres of acoustic instruments, you'd better unplug your effects rack. And while you're at it, unplug your mixer and multitrack, too.

Here's why: the typical multitracking process relies heavily on close-miking techniques that can destroy sonic reality. When you stick a microphone inches from an instrument, the mic hears an unrealistic concentration of sound rather than the instrument's overall tone as it interacts with an acoustic environment. Close miking also deprives listeners of organic spatial and directional perspectives, because the mic is capturing the sound from just inches away. (You don't listen to an orchestra by sticking your ear a foot from the first violin, do you?) These factors can sabotage the dulcet tones of acoustic instruments and can make an acoustic track sound downright *unnatural.*

So why mess with a good thing? With two condenser mics, a mic preamp, and a record head, you can capture an honest, unadulterated sound directly onto tape. Direct-to-stereo recording has been around longer than Dick Clark, but enhanced by modern gear, this stripped-down approach can produce outstanding results. The bottom line is, the less gear you put between artist and recorder, the better your chance of capturing the "truth" of a live acoustic performance.

To illustrate how less can be more when tracking acoustic ensembles, we'll visit a state-of-the-art, "2-mic live" recording session for singer/songwriter Lori Lieberman. Then, I'll engineer a low-rent version of the Lieberman session to see whether comparable results can be achieved by the typical home recordist.

JEFFREY MAYER

Lori Lieberman (shown performing with the Gay Men's Chorus of Los Angeles at Borders Books in Santa Monica, California) recorded her *a thousand dreams* album direct-to-digital using just two omnidirectional microphones.

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RECORDING ME SOFTLY

Lieberman's self-titled debut album (Capitol Records, 1971) featured the original recording of "Killing Me Softly," the song that won a Grammy for Roberta Flack in 1973. After recording six albums for major labels, Lieberman was in the midst of a 16-year hiatus when she had a chance encounter with Joseph Cali of Cello Music & Film Systems.

Cali had always loved Lieberman's songs and voice but felt she had been overproduced during her years with Capitol. After hearing home-studio tapes of her new material, he was inspired to produce an album using one of the sophisticated Cello systems designed by Mark Levinson (see sidebar, "The Cello System").

"If I hadn't heard what music can sound like on the Cello recording system, I wouldn't have been inspired to make this record," admits Cali. "I told Lori, 'If you are willing to do an acoustic album, recorded 2-mic live, you will never sound better.'"

The next step was finding a label. Levinson introduced Cali to Gene Pope, who had once operated a Cello showroom in Russia. Pope was so impressed by the gear that he bought his own Cello system, added a Nagra-D digital recorder, and launched Popemusic, a label dedicated to transcendent audio.

"We seek the Holy Grail of audio reproduction—transparency, realism, soundstaging, and dynamic range—to bring the listener as close as possible to the original performance," says Pope. "We strive for the gooseflesh effect."

THE CELLO SYSTEM

The Cello recording system begins with two B&K omnidirectional instrumentation microphones. Also known as measuring mics, these mics are designed for precise sound-level measurements. They are used primarily in industry; speaker companies often use them to measure response, and they are also used for legal matters, such as determining sonic-boom levels of jets flying over a residential area. Frequency specs for some of B&K's models range from 2.6 Hz to 140 kHz. Such range is made possible, in part, by a separate 120-volt power supply, rather than standard 48-volt phantom.

Levinson uses B&K 4133s (4 Hz to 40 kHz) and a modified B&K 2807 120-volt power supply. The signal is then routed into his own Cello custom preamps and Cello 8.1 A/D converters (manufactured by Apogee to Cello specifications).

The recording medium is a 4-track Nagra-D digital recorder. Two tracks of the Nagra are dedicated to capturing the performance while the other two tracks make simultaneous safety copies. "You have to hear this system to understand what it is," says Levinson. "It's a spiritual experience to hear music reproduced with such accuracy."

Levinson's Cello system and Pope's label were the perfect match for Cali, who soon found himself executive producer of Lieberman's album. The product of their efforts, *a thousand dreams,* bears witness to the potential of high-tech stereo recording.

LOOK, MA, NO MIXER!

Pope and Cali persuaded Levinson to engineer the project. It was no piece of cake: on some cuts as many as five players, ten backup singers, and Lieberman perform all at once. Because there was no mixer in the chain, the skill came in knowing where—and how—to place microphones and musicians.

"I don't have a dogmatic approach," says Levinson. "I place the mics so you hear everything in balance. You just have to find that spot. It's an art. It's not something you can readily convey to people."

Lieberman recalls that Levinson's miking technique seemed to focus on the two most important instruments for each song. "He would walk around the room listening, go into the control room and listen through headphones, and then come out and move the players around in a way that made incredible changes in the sound," she says. "Even if the orchestration was exactly the same, Mark would rearrange everything for each song. On 'One Thing,' I was basically singing into the sound hole of Dean Park's guitar. I was crouched down, and he was sitting up on a riser. The harmonica player's sheet music was taped to my back, so every time he had a solo, I had to move my head. I felt like an actor on a set. Gene Pope said the session resembled an advanced yoga class."

The 2-mic live approach was no small challenge, even for the top session musicians that Cali assembled for the project. Accustomed to conventional multitrack sessions—where they often walk in, record their parts, and leave without hearing the entire song—the musicians were surprised to learn they would be playing each selection all the way through until the ensemble nailed a perfect, *complete* take. But the biggest challenge was shouldered by Lieberman, who had to adapt her singing style to the recording process.

"My usual mic technique for concerts and multitrack sessions didn't transfer to the 2-mic live session," she laments. "I had to learn to sing all over again, while the clock was running. For example, anytime I sung a word with a 'p' sound, I couldn't move my head a little off mic to hide the plosive. They could hear the tone change! I had to learn to sing a 'p' silently. And also, there were no compressors, limiters, headphones, or vocal booths. All the musicians were standing *so* close to me. I had to sing very quietly and listen more carefully to myself than I ever had before."

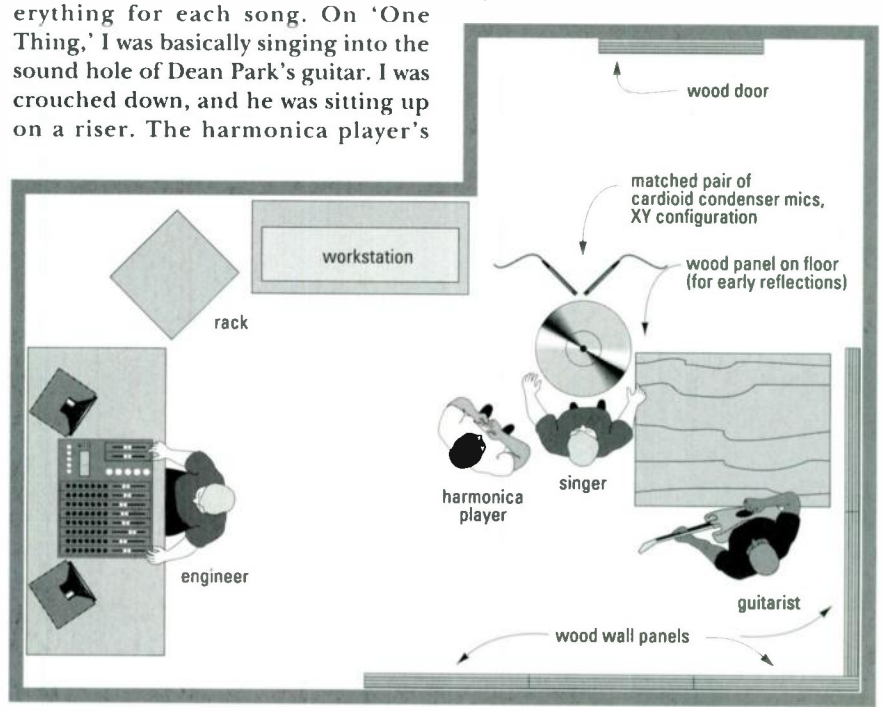

FIG. 1: The mic and musician positions for my 2-mic live test session. The trio was recorded directly to DAT, *sans* mixer and effects. I used the cymbal (positioned in front of the singer) to create signal reflections and liven up a dry, dull vocal sound.

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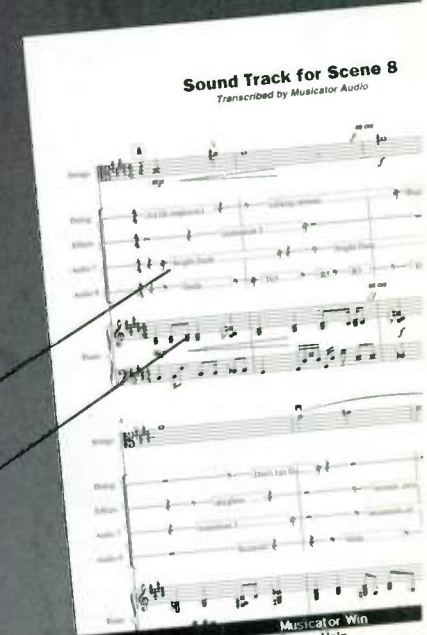

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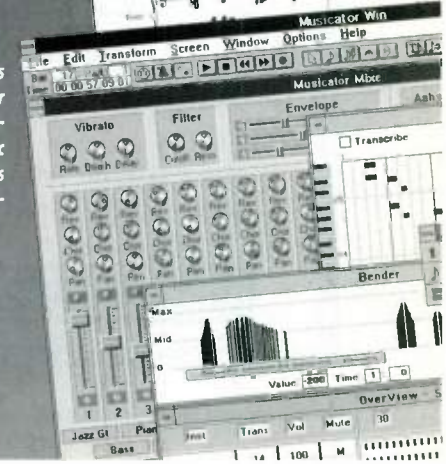

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For all the toil and trouble, however, the results are impressive. On the title cut, Lieberman is backed by the Gay Men's Chorus of Los Angeles, and the blend of voices is rich, natural, and well balanced. On the other hand, as one might expect from a recording with no compression or effects, the sound is dry with a wide dynamic range. Lieberman's vocal prevails in the mix—an aesthetic choice—and possesses a refreshingly unadorned, crystalline quality. The only problem was getting a good piano sound, a situation for which Lieberman takes the blame.

The 4-track Nagra-D digital audio deck used for the Lieberman project records at 24 bits per sample onto standard, ¼-inch metal oxide tape.

"We recorded in the John Raitt Theater at Pepperdine University in Malibu, and I chose it for all the wrong reasons," she admits. "I liked the location, the way the room looked, and how it felt to stand on stage. Unfortunately, it was very difficult to record a piano in that room because there was a bad slap echo. They had to bring in a lot of [absorptive] panels to try and tame the room acoustics. Now I know that the room is probably responsible for about 90 percent of how the recording turns out. Everything affects the sound: where the windows are, how high the ceiling is, and whether the space is predominently dead or live."

NITTY GRITTY

Levinson's sole microphone setup for *a thousand dreams* consisted of two Brüel & Kjær omnidirectional, instrumentation mics mounted on a single stand in a tightly spaced pair. "He put them in a triangle configuration, about four inches apart from one another," recalls Lieberman. "Although everything was positioned differently for each song, I was usually singing right between the two mics, from a distance of eight to ten inches."

What's curious is Levinson's choice of an omnidirectional mic rather than one with a cardioid pattern. Traditional recording methodology holds that placing a pair of omni mics less than two feet apart is a sure recipe for midrange phase cancellation. Given the full-bodied sound of *a thousand dreams*, however, the performance of the B&Ks obviously contradicts this theory.

"B&Ks tend to be in phase at all frequencies, regardless of whether they are placed off-axis or near another mic," maintains Gary Baldassari, a highly experienced stereo field recordist and director of engineering at Incorporated Magi. "With any other mic at, say, 90 degrees off axis, you start getting coloration. But you can break all the rules with B&Ks. The off-axis coloration is so minimal that I would defy anyone to hear it."

On a less technical note, both Levinson and Pope claim that omnidirectional microphones pick up the most "emotional content" of a musical performance. Pope did extensive comparisons between mics and polar patterns and shared his results with fellow audio engineers. "We all agreed that the tracks recorded with the omni mics were more *moving*," he says. "They picked up details such as the scratch of a violin bow against the strings. Omnidirectional mic patterns are more difficult to use, but they hear microdynamics that other mics miss."

DON'T TRY THIS AT HOME?

Levinson is reluctant to discuss how one might go about employing 2-mic live-recording techniques in a personal or project studio. In fact, he insists it is impossible to get results comparable to the *a thousand dreams* session without the Cello system.

"I don't want to mislead people," he says. "For the most part, conventional studio gear sounds terrible. My results come from using extremely expensive equipment that's not even available off the shelf. That's what makes the sound

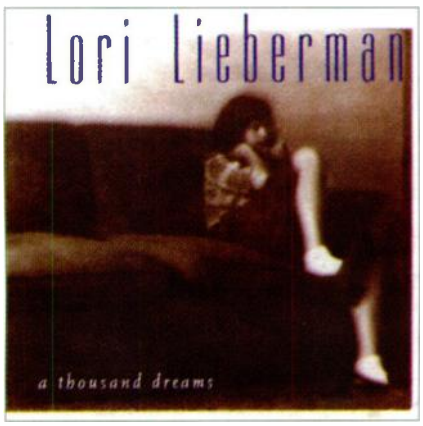
possible. There's no substitution for the gear."

Regardless of the gear you have, however, the 2-mic live approach is worth considering if you want to record more organic-sounding acoustic performances. And Baldassari was very encouraging when I told him I was planning to do a direct-to-stereo session with a matched pair of AKG C 460s.

"I think you can get 90 percent of the sound Levinson got," he says. "The B&Ks and the Cello gear are what makes up the other ten percent. The real secret is finding the balance points. You have to experiment by moving the mics around until you find the spot that captures the utmost clarity. Don't place the mics haphazardly and then reach for the EQ. The trick is to do EQ with mic placement."

I love a challenge, so I decided to give the 2-mic live session a go. The band was a spartan acoustic trio: steel-string guitar, harmonica, and vocals. Unfortunately, because my garage studio is no bigger than a bedroom, the walls were deadened considerably to kill reflections. So, before the session started, I brought in six large wood panels and positioned them to produce some ambient reflections in the room. In addition, I knew the space was far too small to get a wide stereo perspective from omnidirectional mics, so I cheated a little and set up my AKG C 460 cardioids in the faithful XY configuration.

I ran the C 460s through an Aphex Tubessence preamp and patched the



Lieberman's label, Popemusic, is dedicated to releasing acoustic music that is recorded direct-to-stereo. Label founder Gene Pope compares 2-mic live recording to working on a blank canvas and multitracking to painting by the numbers.

outputs directly into the unbalanced inputs on my TASCAM DA-30 DAT machine. (The Aphex doesn't have balanced line outs.) After listening to the musicians playing in each part of the room, I found the spot with the best tonal and spatial balance and placed the mics. I had the singer stand 18 to 24 inches from the mics and directed her to sing precisely to the small space between them (see **Fig. 1**). The mics were positioned almost a foot above her head, pointing down at approximately a 30-degree angle.

After listening to the first test recordings, I was distressed by how dry the vocal sounded. I rearranged a few panels to liven things up a bit more and, as a last resort, mounted a 22-inch ride cymbal between the microphones and the vocalist. When the cymbal was positioned just beneath the singer's shoulder level, the reflections added a very desirable, plate reverb-type sheen to the voice.

Getting a good guitar timbre was less of a chore. I had the guitarist stand slightly behind and to the right of the vocalist. The sound hole of his Martin acoustic guitar was aimed at the left microphone. I brought him closer to the mics during a finger-picked ballad and moved him back a few feet for the songs he strummed with a pick. In each case, the resulting sound was clear and remarkably well balanced.

The harmonica player ended up just to the left of the singer, leaning in somewhat while soloing. This position directed most of the harmonica sound toward the right mic, which helped balance the predominant guitar on the left.

Obviously, the instrumentation at my test session was not as challenging as the ensemble used for *a thousand dreams*—consequently, I've gained an even greater respect for Levinson's and Pope's abilities—but I proved I could approximate the 2-mic live method and results with average home-studio gear. And although the limitations of the recording space prevented me from getting a lush vocal sound, the recordings actually turned out great. The overall sound was sharp, articulate, and surprisingly well mixed. In only a few hours, we ended up with a tape that documented the trio's sound with startling immediacy and realism. As Pope likes to say, "This is as honest as it gets."

BOTH WORLDS

The purpose of this article is not to encourage you to abandon multitracking and signal processing but to suggest another strategy for your bag of studio tricks. (I'm not about to chuck my ADAT!) And why not enjoy the best of both worlds? Because it captures a natural, ambient perspective, the 2-mic live approach can be used in conjunction with conventional multitracking to enhance the soundstage. For example, you could mix expansive, stereo percussion and background vocal tracks with your close-miked tracks.

Ultimately, technique and equipment become peripheral concerns; it's the end result that counts. Don't be afraid to experiment, even if it means using less gear (and doing more with what you've got). And if people tell you something *can't* be done, smile and keep the peace. Then, when their backs are turned, do it anyway.

EM *Assistant Editor* **Brian Knave** *has been doing more with less for years—and is just about sick to death of it.*

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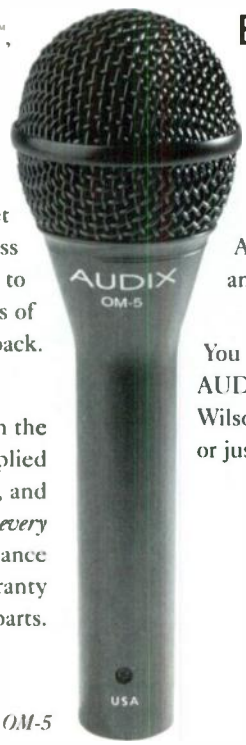

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Multimedia Demos

A simple demo tape may be the key to an interactive career.

By Scott R. Garrigus

The multimedia industry, although on the brink of great success, is still trying to define itself. The industry's leisurely financial development may be making some investors nervous, but multimedia, with all its growing pains, continues to create unique job opportunities for musicians. Unlike the record industry, where hierarchies are firmly entrenched, multimedia companies are more open to new ideas and new talent. And you don't have to look like Jon Bon Jovi or Mariah Carey to get some attention!

However, there is still one inherent similarity between the recording and multimedia industries: you need an absolutely brilliant demo to secure a gig. Multimedia developers are constantly on the lookout for savvy musicians who can help enliven educational CD-ROMs, computer games, and other interactive media. And now that complete digital audio scores are possible, the field is wide open for acoustic musicians and MIDI sequencists alike. Yes, it is a good time to expand your career horizons. But first, you have to produce the right demo tape.

A MIDI-file demo landed composer Scott Garrigus the music and sound-design gig for *Bobby's Big Adventures* (Valley ComputerWorks). Look for it online in the shareware-game forums.

IT'S IN THE DELIVERY

The best way to demonstrate your musical abilities is to present them in context. Multimedia developers are more likely to consider hiring you if they can view a game or multimedia project you've worked on. Unfortunately, this strategy is pretty much a Catch-22: it's difficult to amass a resume of completed projects before you've been offered your first gig. Luckily, it's not impossible to beat the "no credits/no gig" tyranny. If you're handy with multimedia authoring software such as Adobe's *Premiere*, you can design your own project and use it to showcase your music.

"A mixed-mode CD-ROM with Red Book audio and PC-compatible MIDI files in the data track is the ultimate demo," says Hamilton Altstatt, audio manager at Knowledge Adventure.

If the "ultimate" is a little out of your

technical (and financial) reach, you can still produce a viable multimedia demo by using videotape. Have a visual artist create an original work for your soundtrack, or simply replace the audio track of old films with your own score. Don't worry about video quality or narrative coherence; the main thing you're selling is how well your music enhances the power of images.

"I put together a video [demo] of several little music projects and an independent short film I'd scored," says composer Keith Snyder. "I got a scoring job with Symantec, and it was the short film that clinched the deal."

Even if producing a video demo is outside of your means, you're not out of the running. You can still get jobs with a simple, old-fashioned audiocassette. It's true! When I started seeking multimedia gigs, I also wanted to record an instrumental album. Because I was on a pretty tight budget, I wasn't able to afford two projects, so I just combined the two. My cassette album, *Pieces of Imagination*, also became my multimedia demo, and it brought me my first scoring gig.

DO YOU HEAR WHAT I HEAR?

No matter what delivery method you use, it's the music that remains the critical element. Unfortunately, multimedia developers often disagree on what is important to them.

"The pieces on the demo should reflect the widest variety of music you can provide, because you never know exactly what style the producer is looking for," maintains Rob Herman, audio producer for Viacom New Media.

"A variety of styles is helpful, but a composer shouldn't throw something on the tape because he or she thinks they need a bossa nova tune to round out the demo," counters Fletcher Beasley, audio director for Adrenaline Entertainment. "I get some tapes that seem to have been thrown together quickly to show that the composer can write game music. As a result, these demos *sound* like they were thrown together. I would much rather hear what people consider their best work than something they think I want to hear."

What developers *do* agree on, however, is that composers should know something about the work they're soliciting.

JOB OPPORTUNITIES

These composers are all on the lookout for new talent they can call upon to subcontract scoring gigs. So put what you've learned to work, and send out those demo tapes! It may be a while before you hear back from them, however, so be patient. Good luck.

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North Salem, NH 03073

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Robert Herman
Audio Producer
Viacom New Media
1000 Asbury Dr., Suite 15
Buffalo Grove, IL 60089

THE ASSOCIATION GAME

The ability to make interesting and unique music is an important requirement for a musician in the multimedia field, but it's not the only one. In order to get gigs, you've got to get out there and network! And one of the best ways to do that is to join a multimedia organization.

The Computer Game Developers' Association (CGDA) is a group of professionals in the interactive entertainment industry. CGDA membership is open to anyone with an interest in interactive entertainment or educational software. Memberships are only available on an individual basis (no companies are allowed at this time), and the cost is $75 per calendar year. Contact Ernest W. Adams, President, CDGA, 555 Bryant St., Suite 330, Palo Alto, CA 94301; tel. (415) 948-2432; fax (415) 948-2744; e-mail ewadams@netcom. com.

The Interactive Audio Special Interest Group (IA-SIG) is sponsored by the MIDI Manufacturers Association (MMA) and exists to allow developers of audio software, hardware, and content to exchange ideas about interactive audio. The goal of the group is to improve the performance of interactive applications by influencing hardware and software design. Conversations are conducted through private mail lists on the Internet and current topics include 3-D audio, General MIDI, interactive composition, and downloadable sound formats. Recommendations from the group will be published by the MMA and may be incorporated into future audio and MIDI standards. Anyone with a commercial interest in multimedia audio can join and participate in the discussions. The individual membership fee for a calendar year is $25. Contact MMA, PO Box 3173, La Habra, CA 90632-3173; e-mail MMA@earthlink.net.

The Women's Interactive Entertainment Association (WIEA) is a fairly new, but fast-growing organization. It's goal is to strengthen the network of relationships among women in the industry, encourage more women to join the industry (particularly in technical positions), advocate the development of more gender-neutral and female-specific products, and encourage publishers to market their products in gender-neutral ways. Anyone interested in issues concerning women and the interactive entertainment industry may join. Charter memberships are currently available for $75. (They will go up to $150 after January 1, 1996.) Contact WIEA, PO Box 1127, San Carlos, CA 94070; tel. (415) 568-1268; fax (415) 802-3297; e-mail kdonlon@segaoa.com.

It's disrespectful—and a total waste of everyone's time—to ship a multimedia producer a tape crammed with inappropriate music. Computer games are not Hollywood movies; many interactive projects have unique musical requirements that can't be addressed with a generic "film composer" demo.

"If you want to show an understanding of the idiom, go rent some games," counsels Mark Miller, audio director for Sega of America. "Try to understand through immersion, not guess work."

PRESENTATION COUNTS

The best composer in the world will never get a shot if his or her demo doesn't get played. In a tough field, presentation is critical. Overworked decision makers usually don't have time to deal with anything that doesn't conform to their submission standards. Don't even try to bend the rules. You won't win. Here are some basic submission guidelines, but you should also check with a company to get its exact policies before you mail your tape.

Keep it short. Multimedia developers are very busy, and most don't have time to listen to an hour's worth of music on every demo. Ten or fifteen minutes should be plenty of time to show them what you've got, and be sure to keep each individual piece within one minute or so.

Get their attention. "Put your best piece first," says Herman. This is one instance where saving the best for last is not a good thing. "I find that someone listening to a demo tape forms an opinion from the first moment they start listening," adds Donald Griffin of Computer Music Consulting. "You can usually spot a bad composer within the first 30 to 60 seconds."

Quality counts. Nobody likes to listen to dull, tinny, or distorted tracks. If you don't have the means to make a good recording, get help. Go to a pro recording studio, or impose on a friend who is doing excellent work in his or her personal studio. Do whatever it takes to ensure that the sound quality of your demo matches the compositional quality of your scores. "Bad-sounding demos are insulting and put forth the impression that audio quality is not important to you," says Sega's Miller.

Be professional. Be sure to label everything with your name and telephone number. Your labels don't have to be designed by a graphic artist and custom printed, but keep in mind that a hand-scribbled label sends the same message as a bad-sounding cassette. Also, include a short cover letter with your tape, but try not to oversell yourself. Self-hype is not considered good form.

GET THAT GIG

Hopefully, you now have a good idea about what you should and shouldn't do when it comes to putting together a demo for multimedia developers. It's surprising what you can accomplish in such a technologically rich field with a simple cassette or video submission. The focus is really on the quality of your music, so give it your best shot. And remember, if you want to be treated professionally, you have to present yourself as a professional.

When **Scott R. Garrigus** *isn't busy working or reading e-mail (garrigus@pan.com), you can usually find him having fun on his home page (http://home.aol.com/scottg68).*

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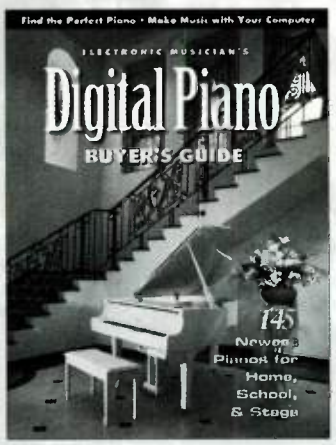

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Electronic Musician

Reviews

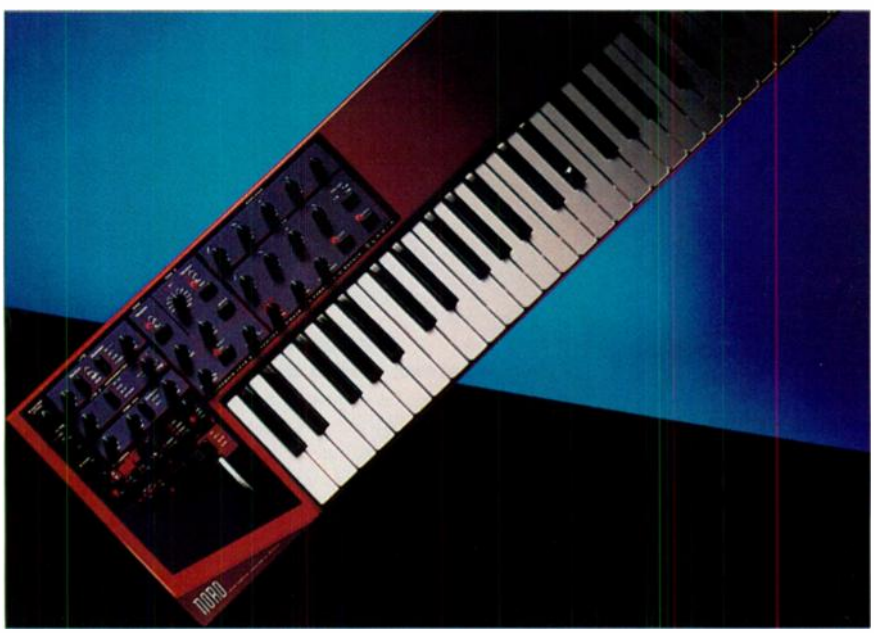
Clavia Nord Lead

By Peter Freeman

Can a digital instrument really sound like an analog synth?

Despite the recent renewed interest in analog synthesis, almost all new analog synths have been monophonic. The only major exception is Oberheim's pricey OB-Mx, which is a genuine polyphonic, programmable, analog instrument. Otherwise, if you wanted to play polyphonically with an old-time synth sound, you had to use vintage gear with occasional significant upkeep, transportability, and reliability problems. Musicians who didn't want to buy an OB-Mx and couldn't find or maintain vintage machines were out of luck.

To fill this void, the Clavia folks (makers of ddrum electronic percussion products) came up with a surprisingly good alternative: the Nord Lead. Touted as "virtual analog," the Nord Lead is actually a digital instrument that uses a superbly programmed mathematical model of an analog synthesizer. It sounds and behaves more like the genuine article than any previous digital synth I've heard.



Clavia's powerful Nord Lead can sound amazingly like an analog synthesizer, but it's also capable of many digital, FM-like sounds.

DESIGN

The Nord Lead is packaged in a loud, racy red enclosure with a 4-octave, Velocity-sensitive (but unfortunately not Pressure-sensitive) keyboard and a handful of knobs and buttons. The Shift button provides access to many hidden functions and parameters. A 4U rack-mount version is also available, but of course it lacks the keyboard's cool controller features.

The Nord Lead's most unusual controller is the Pitch Stick, a firmly spring-loaded, wooden pitch-bend lever with an indentation on top for the player's finger. It has no "dead" area, so its response is smooth and immediate. The only other controller on the Nord Lead is a nice wheel with a comfortable, stone-like texture and feel to it. The wheel can be routed to LFO1 amount, oscillator 2 amount, FM amount, or filter cutoff, and it can also be used as a morphing control (discussed later).

The back panel includes two ¼-inch audio output jacks, a ¼-inch stereo headphone jack, and MIDI In/Out ports. There is no MIDI Thru port, and you can't assign the Out as a Thru. A ¼-inch footpedal input can accept a continuous expression pedal (which duplicates the mod wheel) or a sustain pedal that is normally open or closed; one of these three options is selected in software. It would be better if there were two pedal inputs, one for an expression pedal and one for a sustain pedal. In addition, the expression pedal should be assignable to any Control Change instead of duplicating the mod wheel.

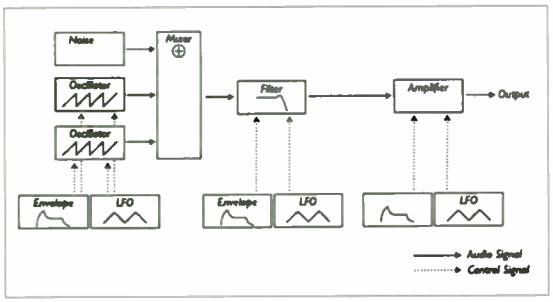


FIG. 1: The Nord Lead's voice architecture is very similar to that of a subtractive analog synth. (Courtesy Clavia.)

The stock unit has 99 Program memories, 40 of which are user programmable. Four Program Slots (A through D) let you layer Programs or quickly switch between them. I particularly like this arrangement, which is intuitive and fast.

VOICE ARCHITECTURE

The basic architecture of the instrument is modeled after the traditional analog setup (see **Fig. 1**). Two oscillators produce triangle, sawtooth, and pulse waves. Oscillator 2 can also generate white noise. In addition, oscillator 2 can modulate the frequency of oscillator 1, which brings FM synthesis into the equation. Knobs control the oscillator 1/2 mix, coarse and fine tuning of oscillator 2, pulse width for both oscillators, and FM amount (level of oscillator 2 modulating oscillator 1). A switch enables hard sync (see **Fig. 2**).

The multimode filter can be bandpass, 24 dB/octave highpass or lowpass, or 12 dB/octave lowpass, and it offers controls for filter envelope amount, cutoff, and resonance. There is a keyboard-tracking on/off switch for the filter, and a Velocity switch enables/disables Velocity control of the filter envelope amount (discussed shortly). Naturally, there is an amplifier stage with gain control, and dedicated ADSR envelope generators modulate the filter and amplifier. The envelopes are updated with every calculated sample, providing extremely high resolution.

Directly to the left of the oscillator section are the LFO and modulation controls. There are two independent LFOs and a 2-stage envelope that can modulate either FM amount or oscillator 2 frequency. LFO1 can be routed to both oscillators, oscillator 2 only, filter cutoff, or pulse width, whereas LFO2 can be sent to both oscillators or the amplifier. The arpeggiator, which shares its controls with LFO2 via the Shift button, can play all currently held notes on the keyboard, from lowest to highest (Arp Up), from highest to lowest (Arp Down), or both (Arp Up/Down).

POLYPHONY

The Nord Lead comes standard with 4-voice polyphony. However, you can add eight more voices with an optional expansion card. I highly recommend this; the instrument is capable of a vast range of sounds beyond monophonic lead and bass timbres, and a 4-voice unit can quickly leave you feeling straitjacketed. Adding the 8-voice expander also lets you use a standard PCMCIA card to store additional Programs and Performances. (A 64 KB card stores 100 Programs and 100 Performances, but a 128 KB card stores 297 Programs and 300 Performances.)

The Nord Lead operates in Poly, Mono, and Unison voice modes, as with conventional analog synths. Unlike a

conventional analog machine, however, Unison mode on the Nord Lead synth doesn't reduce your polyphony to mono: you can still play polyphonically, although the actual polyphony depends on how many Programs are layered. Thus, all the instrument's voices aren't used in Unison mode.

An interesting aspect of the Nord's Unison mode presented itself when I began layering different versions of the same sound (a resonant vocal pad) across the four Program Slots with each version in Unison mode. This provided some really thick layers, each with slightly different filter, tuning, and envelope settings. Each of the respective filter cutoff frequencies was controlled by the mod wheel. The resulting sound was amazing.

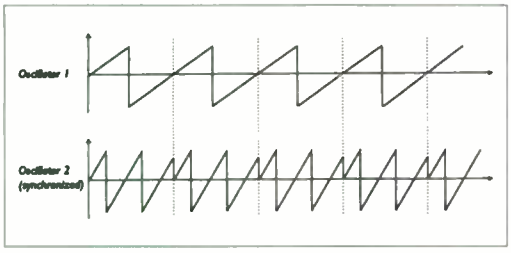


FIG. 2: When the two oscillators are synched, their frequencies are locked, with oscillator 1 as the master. Changes in oscillator 1's frequency are immediately reflected in oscillator 2. If you alter oscillator 2's frequency, the result is a timbral change in the combined sound, rather than a frequency change in oscillator 1. (Courtesy Clavia.)

The unit has two audio outputs and offers four mono/stereo output-assignment modes. Unfortunately, these modes are global, affecting all Programs in the instrument. Mode 1 is straight monaural operation except for Unison programs, in which the voices are stereo. Mode 2 is completely monaural for all Programs. Mode 3 is stereo for all Programs, with each voice alternating between the two outputs. In Mode 4, Programs assigned to slots A and C appear at the left output, and programs in slots B and D appear at the right output, which lets you route the two groups of sounds to separate mixer channels or signal-processor inputs.

MIDI IMPLEMENTATION

The Nord Lead's MIDI implementation is quite good for the most part. Each Program Slot can receive note messages, Control Changes (including Volume), Bank Select, and Program Changes on its own MIDI channel. You have real-time MIDI control over all front-panel knob and switch functions except Master Level. Fortunately, this is accomplished with Control Changes, not System Exclusive, making it easy to use. The factory default setting enables the instrument to send and receive these messages, so all you have to do is make the connections to your sequencer, and you're ready to twiddle knobs and record your moves. SysEx Bulk Dump/Load is also supported. On the down side, Aftertouch and All Notes Off are not recognized at all.

Among the most interesting aspects of the Nord Lead is its Velocity/Morph section, which lets you do a number of things. You can control virtually every parameter on the instrument with MIDI Velocity, creating a Velocity Morph that crossfades between user-selected parameter values. Changing Velocity values can radically alter the entire Program. This can also be done via the Nord Lead's mod wheel, making it into a simultaneous crossfade/morphing control for as many parameters as desired.

The Special Functions offer good external MIDI control possibilities. For example, the LFO and arpeggiator sync to MIDI Clock, and you can externally trigger the filter and amplifier envelopes on a separate MIDI channel. You can also perform external Velocity Morphing on a separate channel.

SOUND QUALITY

The Nord Lead sounds excellent, and I was surprised at its sonic flexibility. Programming with traditional analog synthesis techniques works exactly as expected, so much so that it's difficult to believe this is a digital instrument. The developers obviously have put in many hours with analog instruments and know what an analog synth actually sounds like.

The unit is capable of almost anything you would want from an analog synthesizer, including powerful bass sounds, wide pads and sustaining textures, percussive noises, unpitched effects, and a myriad of other sounds. The filter produces really nice-sounding musical results with or without the resonance cranked up.

PRESETS

Many of the 99 factory Programs are quite good. However, the instrument is so well suited for synth programmers that I suspect most people will be less interested in the presets than they would be with conventional sample-playback synths. Nevertheless, the presets provide good starting points for creating new sounds and illustrate this instrument's impressive timbral scope. Clavia obviously put sufficient time into creating quality factory sounds.

In general, the presets show off the instrument's ability to go from convincingly analog-like pads, brass, percussion, and bass sounds to almost DX7-ish, digital-sounding FM textures. I especially like Program 51, a unison, monophonic sustaining sound with FM controlled by the wheel, and Program 65, which is a good example of the instrument's Velocity-modulation capabilities. Another winner is Program 97, a textural, slow pad that goes through many timbral changes.

TAKE THE LEAD

One of the most immediately appealing qualities of the Nord Lead is its responsiveness. Playing the keyboard, twiddling knobs, and pushing buttons make it leap to attention, and you never get the sense that it is struggling to keep up. This is worth noting; some digitally controlled synths suffer from a bit of "processor strain" because their CPUs just barely have enough horsepower to handle their tasks. This can result in a sluggish overall feel and can

Product Summary

PRODUCT:
Clavia Nord Lead synthesizer
PRICE:
keyboard: $2,395
rack-mount: $1,995
8-voice expander: $695
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Armadillo Enterprises
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cause artifacts such as "zipper noise" when turning knobs. The Nord Lead has none of these problems. It was designed with more than enough DSP resources to run comfortably without being overloaded. I give major points to its designers for this.

The manual supplied with the instrument is well written, clear, and easy to read. All functions are covered in detail, and there is an index. Step-by-step directions are given for executing the more involved functions (such as the Velocity Morph options), so they are easily mastered. I give it very good marks in this department, too.

Complaints? There are a few modifications I would like to see in future versions of the instrument. First, I want control over stereo placement in at least three ways: individual voice panning, the ability to assign LFOs and other modulation sources to control panning, and MIDI Pan control. Second, the ability to specify negative modulation for all routings (especially the wheel) would be very useful. In addition, I would like to be able to edit the Programs in all four Program Slots simultaneously (as in the Roland JD-series' Layer/Active mode). Finally, Aftertouch should be recognized and assignable to any parameter, even if the keyboard doesn't send it, and the expression pedal should be independent of the mod wheel. Thanks to the Nord Lead's software-based nature, it's conceivable that these capabilities could be added in a software revision.

This synth is quite impressive, especially for a completely digital model of an analog machine. If I didn't know the Nord Lead wasn't really analog, I would be hard-pressed to tell from working with it. Its combination of great sound; a smooth, responsive Pitch Stick and mod wheel; and an array of knobs and switches for the important sound-altering controls make it an ideal choice for live work or involved studio applications. It works well, and it's intelligently designed and built. In short, it is totally happening and gets my top recommendation.

Peter Freeman *is a freelance bassist, synthesist, and composer living in New York City. He has worked with such artists as John Cale, Jon Hassell, Chris Spedding, L. Shankar, Sussan Deihim, Richard Horowitz, and Seal.*

Peavey Spectrum Organ

By Julian Colbeck

This sound module has a B3 in its bonnet.

Sound modules dedicated to a particular type of instrumental sound are in fashion, and Peavey is in the vanguard. The company produced the Spectrum Bass in 1993, followed by the Spectrum Synth, and now the Spectrum Organ. The rationale behind this approach is absolutely right on. There's a certain blandness to "I can do everything" workstations. Successful music making is about character, which is defined by limitations and idiosyncrasies.

Organs are a prime case in point. Many modern musicians have never heard a real Hammond B3 with Leslie cabinet in tow. This snarling, asthmatic monster is so riddled with audio blemishes—clicks, pops, distortion, and irregularities—that back in the 1950s and '60s, organists had to adapt their entire playing technique around them. Why? Because playing it felt good, and it gave their performance character.

The blood-and-guts world of the Hammond organ is the very antithesis of the antiseptic, dainty world of digital. Nevertheless, the sample-based Spectrum Organ is intended to bring the sound of the Hammond B3 into the digital age.

FIRST GLANCE

The Spectrum Organ is an unassuming, 1U rack-mount module with 32-voice polyphony. On the front panel, a 3-digit LED display is joined by a pair of up/down buttons. Eight additional buttons access various parameters: transpose, fine tune, release click on/off, vibrato, overdrive, speaker simulator, rotary-speaker simulator, and reverb. Four of these buttons do double duty by providing access to the MIDI parameters when pressed in pairs.

Back-panel jacks accept a CV footpedal jack for controlling the volume and a momentary footswitch for changing the speed of the rotating-speaker simulation. MIDI In, Out, and Thru

ports and two audio outputs round out the package.

The Spectrum Organ includes 128 presets that range from a wide variety of Hammond B3s to pipe organs and classic instruments from Vox, Farfisa, Korg, and others. These organs were sampled and now comprise 67 separate 16-bit waves in 1 MB of ROM. The effects can be tweaked, and the presets can be edited and saved externally. However, the unit lacks nonvolatile RAM, so true editing requires an external storage device and a sequencer or external MIDI controller such as the Peavey PC 1600 ($349.99; discussed later), which is capable of storing and sending Control Change and System Exclusive messages in real time.

Each preset consists of up to four layers to which ROM waves are assigned. One layer usually is used to add a percussion sound that replicates the Hammond's Percussion feature (see **Fig. 1**). The Percussion layer is a short tone at the beginning of each note that corresponds to the second or third harmonic. All four layers can be set to their own volume, keyboard range, Velocity range, and tuning, but this requires a PC 1600 or its equivalent.

SOUNDS

When you turn it on, the Spectrum Organ defaults to MIDI channel 1 and Program 0, which is a nice, fat, bristling B3 with an impressive shovelful of grit in the sound. Program 1 is more subdued, with some added key click, whereas Program 2 is quite rich, with a little too much vibrato for my taste. Program 3 has that distinctive Hammond percussive attack on the first note in a legato passage, but it didn't feel quite right when I was just playing around. The sharp attack on the first note is a bit too severe and loud. It's like playing a cheap, single-filter synth.

▼ A Hammond without a Leslie is like a hot dog without mustard.

I was pleased to find that I could tell the difference between a Hammond and a Korg CX3 and tell a Vox from the more nasal Farfisa. However, I wish there were more pipe organs. These comprise just eight presets, and none of them really blasts as a pipe organ can.

The Vox and Farfisa presets are great fun, and I amused myself by comparing the Spectrum Organ's Farfisa presets with my genuine 1964 Farfisa Compact, a piece of industrial design right up there with the Coca-Cola bottle. The Spectrum Organ captures the Farfisa's whinny to a tee. And you don't have to endure the 60 Hz hum, either.

EDITING

Editing on the Spectrum Organ is an exercise in dexterity. First, you press the button (or buttons) that correspond to the parameter you want to change. You must continue to hold this button while you press the up or down button to change the value. Peavey points out that the system is "well liked"

by other Spectrum-module users, but I found it to be a bit cumbersome.

The release click can be turned on or off, but only for Programs that use the B3 waves. This click is a mild thumping noise as you lift your fingers off the keys, and it gives the Spectrum Organ's B3 sounds an extra bit of authenticity. However, it would have been more useful to include an attack click instead of a release click. The attack click can be one of two things: the deliberate addition of a percussive sound

▼

The Vox and Farfisa presets are great fun.

to the beginning of each note or an accidental click that mimics the Hammond's perennially dirty key contacts, which add a characteristic spitting or clicking to the sound.

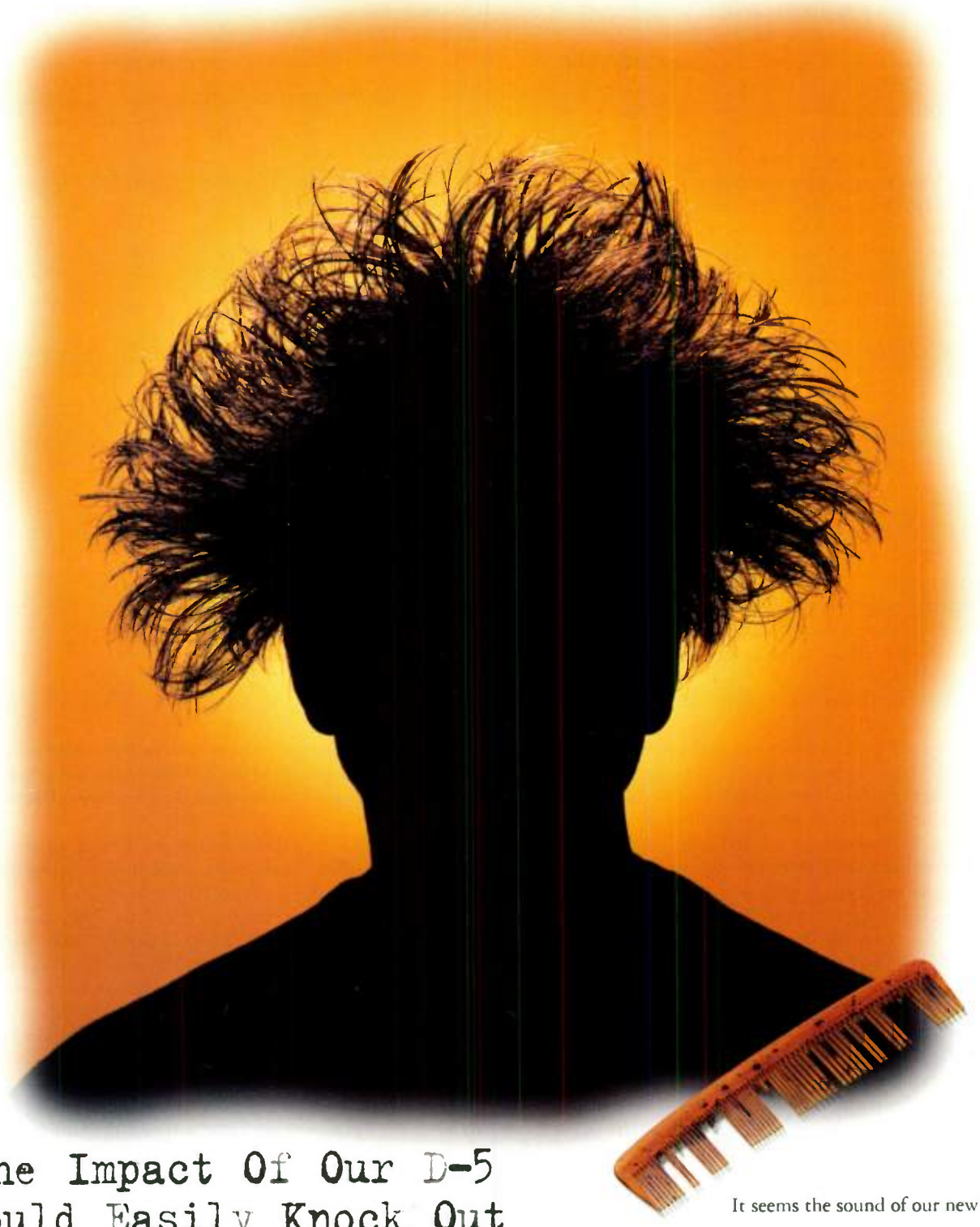
An accidental click is not available, which is too bad, as it was one of the most popular features on the CX3 and is part of the sample used in preset 97. On the other hand, you can add a percussive click to the sound in the Percussion Layer. Again, you must use a PC 1600 or its equivalent to do this.

There are six vibrato settings, ranging from pure vibratos to mixed vibrato and dry signals. I always thought the Hammond vibrato was fairly nasty, and on a synth organ, the effect merely sounds like a bad loop job. The Drive button adds simulated speaker distortion at ten levels from mild to "out of control," as Peavey says in the manual.

Product Summary

PRODUCT:
Spectrum Organ
PRICE:
$399
MANUFACTURER:
Peavey Electronics Corp.
tel. (601) 483-5365
fax (601) 486-1278
CIRCLE #438 ON READER SERVICE CARD

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ●
EASE OF USE	● ● ● ◖
QUALITY OF SOUNDS	● ● ● ●
VALUE	● ● ● ●



The Impact Of Our D-5 Could Easily Knock Out A Few Teeth.

It seems the sound of our new DAT recorder is leaving quite an impression. It's no wonder. Never before has such unparalleled performance been available at such an amazing value. With 4-motor professional transport, AES/EBU S/PDIF inputs, one-bit converters, 3 sampling frequencies, jog/shuttle controls, and Fostex's renowned heritage in professional DAT recording—the D-5 clearly stands out. Way out. Call (310)-921-1112 and see for yourself why this DAT recorder is head and shoulders above everything else.

FOSTEX

The overdrive is nicely messy. It's not a pretty sound, but it's just right.

The Speaker function simulates different types of speakers with a resonant lowpass filter. This is really a glorified preset tone control with ten settings, from a simple lowering of the cutoff frequency to a boosted resonance with a slow "wah" attack. There is no way to change this setting, so what you hear is what you get in this department.

A Hammond without a Leslie is like a hot dog without mustard, Letterman without Shaffer, or the San Francisco Bay Area without fog. It just isn't the same. Let me describe a Leslie for those who might not be familiar with this classic speaker: it's an amplifier and speaker system in a big wooden box. The bass speaker slowly spins around in one direction while a high-frequency horn spins around in the other direction. The rotational speed is under user control (slow or fast). This produces a powerful, swirling Doppler effect to which Hammond organs are particularly well suited.

Plugging a momentary footswitch into the appropriate jack lets you toggle between fast and slow speeds in the Spectrum Organ's rotating-speaker simulation. This can also be accomplished with the mod wheel on your controller keyboard. If you connect a MIDI controller such as the PC 1600 to the Spectrum Organ, you can set precise speeds as well as speed-up and slow-down factors for the rotary effect.

The reverb provides some short delays, some medium-length reverbs with one or two choices of high-frequency damping, and a couple of gated reverbs. Unfortunately, there is no description of what this function's ten settings actually do, so you must use your ears and find the setting you like.

It's important to understand that these edit functions are global: they cannot be stored with each patch. If you change the reverb on one sound, it will apply to all sounds equally. I don't think this will pose any problems in the studio, but it could be quite restrictive in live performance.

PC 1600

Although you can edit the Spectrum Organ with any device that can send and receive Control Changes and System Exclusive in real time, editing is easier with the PC 1600 MIDI Controller. (Fortunately, most basic control parameters are editable with Control Changes.) There are two approaches to using the PC 1600 with the Spectrum Organ: Basic Use and Advanced Use. A moment's preparation is required for either option. First, you must connect the MIDI Out from the Spectrum Organ to the MIDI In of the PC 1600, and tell the Spectrum Organ to send "Organ Control" data to the PC 1600. Then reconnect your system as follows: MIDI Out from the controller keyboard to MIDI In on the PC 1600 and MIDI Out from the PC 1600 to the MIDI In of the Spectrum Organ module.

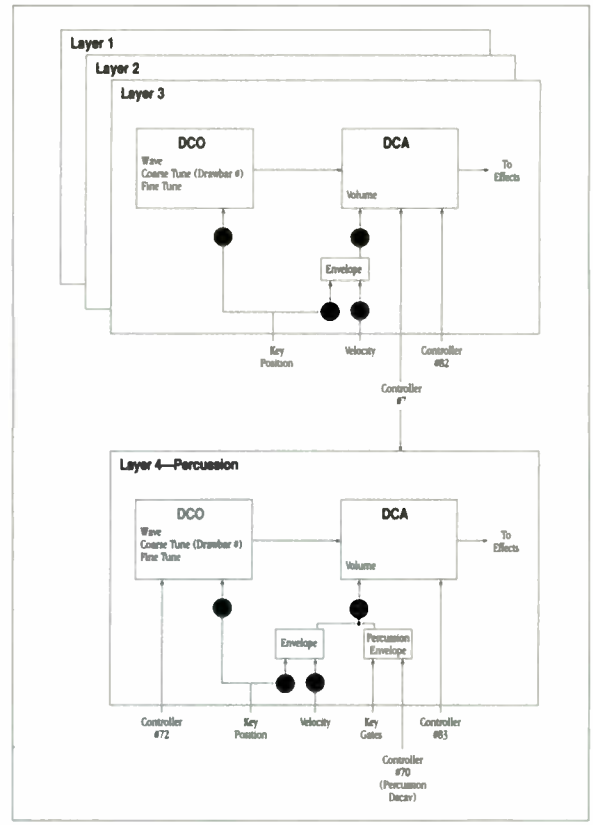


FIG. 1: Each program includes up to four Layers: three sampled and looped waveforms and one Percussion Layer that sounds during the attack portion of the sound. (Courtesy Peavey Electronics.)

Basic Use assigns the PC 1600's sliders to control the following parameters: volume of drawbars (ROM waves) 1 through 4, Percussion layer pitch and decay, vibrato mode and speed, overdrive and reverb levels, and fine and coarse transposition. The buttons on the PC 1600 mute drawbar waves 1 through 4; select the second or third harmonic of the Percussion layer; select slow or fast Percussion decay; and turn reverb, overdrive, and rotary speaker on or off.

These parameters are adjustable in real time, which can obviously enhance live performances. In addition, all this data can be sent to a sequencer, allowing such brilliant tricks as tone mixing, adding sudden splashes of reverb, accelerating vibratos, crazy transpositions, and more. Unfortunately, however, the manual makes no mention of this application at all.

On the other hand, the manual goes into elaborate detail about Advanced Use, which lets you program sounds from scratch. In this mode, you can assign ROM waves to a patch and establish your own envelopes, Velocity scaling, keyboard zones, and fine-tuning values. In addition, you have microscopic control over the rotary-speaker simulator's speed-up and slow-down times, volumes, and pan width; distortion settings; filter and Q values; vibrato depths and delays; and reverb room sizes and high-frequency damping values.

A few people might wade into these advanced waters, but most users will flip through the presets and perhaps

The Spectrum Organ offers good, serviceable, sampled emulations of classic-organ sounds, such as various Hammond B3s, pipe organs, and instruments from Vox, Farfisa, and Korg.

take advantage of Basic Use mode, which is great fun. The ability to do things like change vibrato speed on a Vox Continental sound is superb. You can also record the controller data into a sequencer during a subsequent pass and merge the note and controller tracks together.

CONCLUSIONS

Without the PC 1600, the Spectrum Organ is a good, serviceable provider of organ sounds. There are a few strange inclusions (e.g., release click) and unfortunate omissions (e.g., no "accidental" attack click and no nonvolatile RAM), but it's well worth the sticker price. With the PC 1600, it becomes a treasure chest of instant, custom sounds. Peavey would be crazy not to make a big deal of this combo. Ideally, the PC 1600 should be bundled with the Spectrum Organ in a package. Together, they'd be flying out of the door.

Julian Colbeck *is author of the* Keyfax *series of synthesizer buyer's guides, whose* Omnibus Edition *should be available from Mix Publications by the time you read this.*

Artic Software Tabestry 2.0 (Win)

By Riley Wilson

Economy tablature software for fretheads.

For guitarists and bassists, tablature (or "tab") is an invaluable aid in learning music. Every guitar and bass magazine prints transcriptions in tab and standard notation. Many guitar teachers prefer tab over standard notation, because it indicates exactly where to play notes on the fingerboard.

Most guitarists have at least a cursory knowledge of tab, so an inexpensive computer program that generates this type of notation is a great idea. Until now, however, the only choices have been expensive notation programs or unwieldy ASCII formats. Fortunately, there is another option: Artic Software's *Tabestry*, an inexpensive tab program for Windows computers. Although it's not likely to revolutionize the music software market, *Tabestry* is a big step in the right direction for guitarists.

FIRST GLANCE

Tabestry is an updated version of a shareware program called *Bucket o' Tab. Tabestry* offers several improvements. For example, you can input notes with the mouse and hear them played back with one of three built-in sampled guitar sounds. In addition, you can play the music on a MIDI sound card or sound module. This lets you check rhythms, note durations, and so on. You can then print out the results using a variety of fonts, including TrueType fonts.

Tabestry lets you select four to seven strings and even supports alternate tunings for use with guitar, bass, banjo, and mandolin. You can also import ASCII tab files. With the number of tab charts floating around on the Internet, this last feature will be welcomed by many players. Finally, you can export *Tabestry* charts to ASCII or Standard

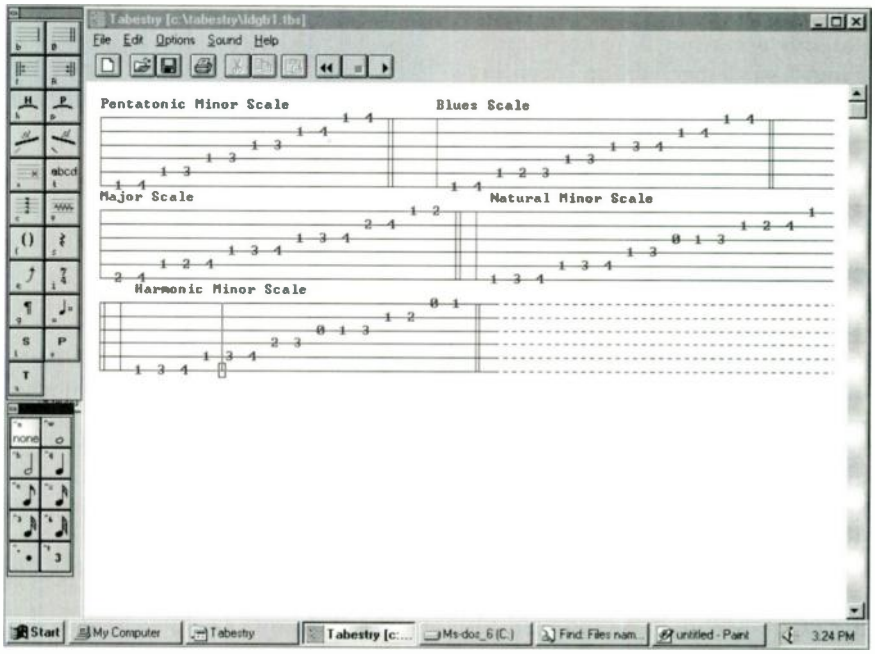


FIG. 1: The main screen includes two floating tool palettes, one with tab symbols and the other with rhythmic values.

MIDI Files (SMFs) for playback on a sequencer or the Windows Media Player.

Installing *Tabestry* is a breeze, and it's not copy protected. Artic includes a modest tutorial to help you get used to the program. Once it's up and running, you are greeted by the main screen. Two floating tool boxes include tab and rhythmic symbols (see **Fig. 1**). A third set of icons across the top of the screen lets you save, print, etc. However, there is no explanation of these icons anywhere in the documentation. According to Artic, this oversight will be corrected in subsequent versions.

KEEPING TABS

To enter notes, you use the up and down arrow keys to place the cursor on the correct string and type the fret number. Notes above the ninth fret are entered in conjunction with the Shift key. *Tabestry* includes many tab-specific symbols, including hammer-ons, pull-offs, slides, vibrato, ghost notes, chords, bends, slap, pop, and tap (see **Fig. 2**), all of which are selected from a palette with the mouse. In addition, you can insert traditional markings, such as bar lines, double bar lines, beginning and end repeat marks, rests, time signatures, tempo markers, and even text above the tab staff. Unfortunately, you can't enter notes directly from a MIDI controller, and you can't import Standard MIDI Files (SMFs). However, Artic intends to add these features eventually.

A reasonably complete rhythm toolbox lets you designate each note as a whole, half, quarter, eighth, sixteenth, 32nd, or 64th note. *Tabestry* also allows dotted notes and triplets. Unfortunately, ties are not supported in version 2.0. As with the slap, pop, and tap symbols, all notes, chords, rests, and ghost notes are entered with the current duration until you change it. I'd like to see a switch that toggles this feature on and off.

Entering chords is relatively easy; just activate the chord icon in the toolbox and put two to seven notes across the strings. However, you must still use the arrow keys to place each note, which is somewhat annoying. In chord mode,

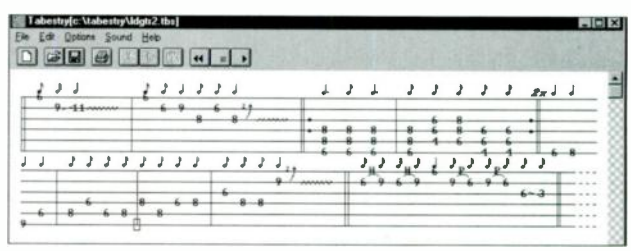


FIG. 2: Complicated tablature can be created with *Tabestry*.

the software should (but doesn't) automatically move from one string to the next as you type fret numbers. In addition, you can't place notes of different duration at the same rhythmic position.

Perhaps the coolest thing about *Tabestry* is the ability to hear a piece in its entirety or audition any section before you print it. The program can also play the notes as you enter them, which reduces errors during the transcription process. Unfortunately, the playback function is rather limited.

For example, I transcribed Dan Fogelberg's "Longer" in an open-G tuning. (The program's support of open tunings will lead many guitarists to buy the program.) The chart plays back adequately, but the lack of ties makes it sound rather stiff and jerky. In addition, the playback momentarily pauses every few lines. According to Artic, the severity of this problem depends on the speed of your computer, the type of video card you have, and the installed drivers.

Tabestry plays its files using its built-in samples or MIDI. The samples include clean guitar, distorted guitar, and bass. Unfortunately, sample playback is monophonic, which isn't very useful. MIDI playback is fully polyphonic.

Product Summary

PRODUCT:
Tabestry 2.0
PRICE:
$59
SYSTEM REQUIREMENTS:
80386 or better PC; Windows 3.1 or later; 4 MB RAM (8 MB recommended); VGA or better monitor; sound card or sound module for polyphonic playback
MANUFACTURER:
Artic Software
tel. (800) 892-0677
or (414) 534-4309
fax (414) 534-7809
e-mail 74777.2745@compuserve.com
CIRCLE #439 ON READER SERVICE CARD

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ●
EASE OF USE	● ● ● ◖
DOCUMENTATION	● ● ●
VALUE	● ● ● ●

ALWAYS FRETTING

Tabestry offers a lot for $59. There are clearly some omissions, most notably the lack of tied notes. The playback quality is bad news, and monophonic playback, in particular, is absurd for this type of program. But otherwise, *Tabestry* does a fine job. Compared with more expensive notation packages that let you play music and print out a score, *Tabestry* is easier to use and a lot cheaper. It's also much better than ASCII.

One requirement for getting the most out of the program is a knowledge of tablature. The ability to read music, especially rhythms, is also highly recommended. You may not create charts any faster with *Tabestry* than you could by hand, but the results certainly look better on the printed page. Many guitar and bass teachers will appreciate having charts available at the touch of a button. The flexibility of the fonts lets you create a variety of good-looking versions, even on an inexpensive dot-matrix printer. The ability to hear notes as you enter them makes creating accurate charts a breeze.

▼

Unfortunately, *Tabestry*'s sample playback is monophonic, which isn't useful.

Artic says subsequent versions may support ties, automatic chord typing, and a host of other features, such as entering notes from a MIDI controller and SMF importing. I know many Macintosh users who would like to see this program ported over to Macs, but Artic has no plans to do this.

Tabestry is a solid program for serious string instrumentalists, transcribers, and teachers. If you have a Windows PC and play or teach guitar, you'd be silly not to get a copy.

Riley Wilson *is a professional guitarist/teacher and alumnus of Musicians' Institute. He has written for* Gig, Guitar World, Guitar School, *and* Vintage Guitar *magazines.*

Yamaha MU80 Tone Generator

By Jim Pierson-Perry

A General MIDI sound module on steroids.

The rate at which new synths hit the market is astounding. They burst on the scene like supernovae, dazzling us with new "gee whiz" features and sonic sophistication, only to fade away as next year's models appear. This is particularly true in the General MIDI market, where manufacturers must address users with different levels of experience and needs, such as games, home recording, karaoke, and music for multimedia. Not only must synths meet price/performance goals, they must also be easy to use and connect to existing computer, audio, and other MIDI gear.

The MU80 is Yamaha's latest top-of-the-line GM offering, replacing last year's well-received TG300. The unit ushers in a new product line based on Yamaha's XG superset of the General MIDI standard (see sidebar "XG: The Next Generation") and offers a new "gee whiz" feature: external audio inputs that are digitized and sent through the effects processors with MIDI control of volume, pan, effect, and send levels.

FIRST GLANCE

The MU80 is a sample-playback module capable of 64-note polyphony across 32 multitimbral Parts, each of which is assigned its own program (called a Voice in Yamahaspeak). It holds 729 sounds and 21 drum kits in 8 MB of sample ROM. In addition, it offers five effects processors. Its 1U half-rack size and built-in serial interface for Mac, IBM, and NEC computers make it ideal for a computer-music system as well as for gigs.

The front panel has a large, backlit LCD, six buttons to select operating modes, and nine more buttons for editing operations. You can feed two channels of external audio into the unit through a ¼-inch stereo jack with a knob to adjust input gain. (These are special A/D inputs; more on this in a moment.) Headphones connect to an ⅛-inch stereo minijack. The back panel holds the computer serial port, interface selection switch, MIDI In/Out/Thru ports, and a pair of ¼-inch audio outputs.

Two separate MIDI In ports are provided. Under standard MIDI operation, the A port controls multitimbral Parts 1 through 16, the B port controls Parts 17 through 32, and only the A port echoes to MIDI Thru. Unfortunately, under most circumstances, the computer can access only Parts 1 through 16 via the serial interface.

The LCD goes well beyond text-only displays, offering a variety of graphic images and icons. During normal use, the display shows real-time Velocity levels for the Parts in two groups of sixteen or all 32 Parts at once. This default can be changed to display any one of seven selectable controllers: Volume, Expression, Pan, note shift (transposition), or effects-send levels. The MIDI channel and Voice name are displayed for the currently selected Part, along with the associated Bank and Voice numbers and an icon representing the type of sound (guitar, keyboard, etc.).

LOADS OF MODES

Like the TG300, the MU80 has two operating modes: Multi and Performance. Multi mode provides standard multitimbral operation in which each Part acts as an independent synth with its own Voice assignment, MIDI channel, and so on. Performance mode slaves four Parts together as a single instrument. Although each Part has its own Voice assignment and Part parameters, they all respond to a single MIDI channel. The ability to create splits and layers in this mode turns the MU80 into a dynamite lead synth. The current mode is always displayed in the LCD and can be changed only by pressing a front-panel button.

There are three Multi modes—XG, TG300, and C/M—each providing a different sound palette. XG mode provides 537 Voices, eleven drum kits, and all the editing capabilities of the new XG format. TG300 mode emulates the sounds from the GM-B sound block of the TG300 (614 Voices and ten drum kits), which was compatible with Roland's GS superset of General MIDI. C/M mode emulates the old Roland MT-32 sound palette (128 Voices and one drum kit). The TG300 and C/M modes provide backward compatibility with older sequences based on those systems.

In addition to the Multi and Performance modes, each Part includes two mode settings. These establish the Part as a Normal Voice or Drum Part and determine whether it plays monophonically or polyphonically. In XG or TG300 Mode, any of the 32 Parts can be assigned to Normal or Drum as desired. C/M Mode, however, assigns Parts 10 and 26 as Drums and all other Parts as Normal Voices.

ARCHITECTURE

A Multi-mode setup includes 32 synth Parts, two A/D Parts for the external audio inputs (described later), and a few global controls. Individual Parts can be soloed or muted at any time. Voice waveform, Volume, Expression, Pan, MIDI channel, and effects-send levels are edited directly from the front

Yamaha's MU80 features impressive sounds, 64-voice polyphony, and two audio inputs that digitize external signals and route them through the effects. It is also the first synth to implement Yamaha's XG format, which is a superset of GM.

FIG. 1: Because of the MU80's small display and numerous hidden parameters that can only be addressed via SysEx, you may prefer to program it with a custom template such as this mixer screen from EMAGIC's *Logic* sequencer.

panel. Global settings for master volume, transposition, and effects-return levels are also set from the front panel.

The Pan parameter can be set to a fixed position, or it can randomly move with each new note. Unfortunately, the TG300's Scaling Pan feature was omitted from the MU80. This feature sets the pan position by MIDI note number, which is great for piano and strings. The MU80 responds dynamically to pan changes while notes are sounding, unlike modules such as the AVS Summit or TG100, which wait for the next note to make any changes in pan position.

In Edit mode, you can access most of the synthesis parameters. (Some parameters can only be accessed via SysEx, as I'll discuss later.) For Normal Parts, these include lowpass-filter cutoff frequency and resonance; separate pitch-envelope settings and main-envelope settings; vibrato rate, depth, and delay; detune; Velocity sensitivity; portamento; note and Velocity limits (for setting splits and layers); dry send to the effects processor; pitch-bend range; and LFO pitch-depth sensitivity to the mod wheel.

There are two types of Drum Parts: standard and editable. The standard version works like most GM synths—you select a drum kit with a Program Change—and parameters apply equally to all drum sounds. Far more interesting are four editable Drum Parts. Each individual drum sound can be modified with several parameters, including pitch, volume, pan, effects-send level, filter cutoff frequency and resonance, envelope settings, individual-note mute, and Alternate Group number. Only one drum sound assigned to a particular Alternate Group can play at a time (e.g., open and closed hi-hats), and up to 127 different Alternate Groups can be established. Among the few noneditable settings are the actual drum-sound assignments; you cannot create custom kits.

Editing Performances is similar to editing in Multi mode, but there are additional controls at the Part and Performance levels. Pressing the Play button toggles between the standard display and an undocumented display showing the four voices used in the current Performance. An assignable MIDI controller can be defined in a Performance and used to control the amplitude and filter cutoff of individual Parts in real time. This is great for live performance; you could sweep the filter or crossfade sounds with a foot controller. Effects settings are also saved as part of a Performance.

Multi-mode settings cannot be saved except as SysEx files in an external device. Typically, these files are included at the start of a sequence file to ensure that the module is set up properly before the song starts to play. However, current settings are preserved by a battery when the unit is powered off. In contrast, the MU80 stores 128 user-defined Performances along with 128 presets (of which the last 64 are just repeats of the first; what a waste of ROM). The Performances are selected via Program Change.

ADVANCED EDITING

Surprisingly absent in all modes are parameters to allow Aftertouch control of synthesis elements. The only similar control in Multi mode is Modulation to LFO Pitch Depth. Performance mode fares only slightly better. You can define an assignable controller (except Aftertouch), but it controls both the filter cutoff and amplitude; you can't have separate controls for each parameter.

Digging into the MU80 *MIDI Data Guide*, however, reveals that a number of these control parameters really do

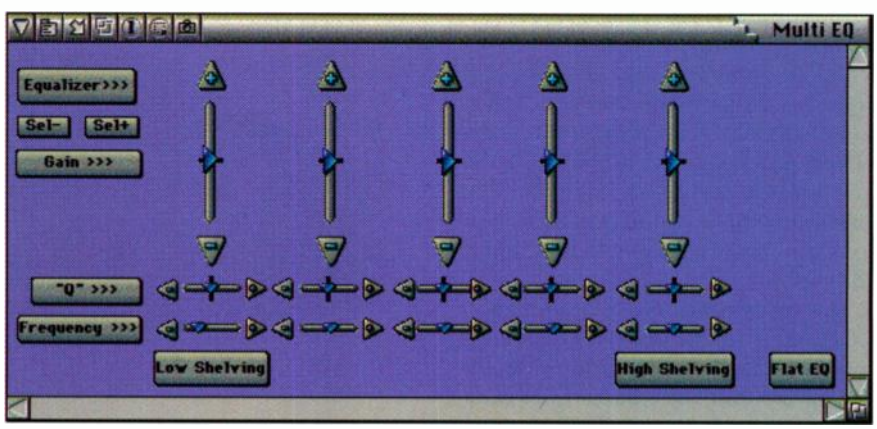


FIG. 2: When controlling the MU80 from its front panel, you can program a simple, 5-band graphic EQ. But when addressed via System Exclusive, the EQ becomes fully parametric, as shown in this template from Mark of the Unicorn's *Performer*.

exist in Multi mode. Unfortunately, there's no way to access them without SysEx. (Ouch!) These hidden parameters let you control pitch, filter cutoff and resonance, amplitude, Variation effect depth, and the LFO. Modulation sources include Aftertouch, Pitch Bend, Modulation, or assignable controllers 1 and 2. That's right, you can define a second assignable controller, but only via SysEx. Additional settings let you reserve polyphony and filter out virtually any MIDI message for selected Parts. These extra parameters are not available in Performance Mode.

This was a poor design decision, and Yamaha is sending mixed signals. On one hand, the XG format supports a wealth of new real-time timbral controls. On the other hand, some basic synthesis control parameters are hobbled. The majority of General MIDI users are probably not comfortable with SysEx programming. Even if they are willing to dig in and learn, access to these parameters requires a computer or keyboard capable of sending the appropriate messages.

There is a ray of hope for PC users. Sonic Foundry is working on a generic XG editor that will address any XG product, and Sound Quest now offers full editor support for the MU80 in its *MIDI Quest* universal editor/librarian program for Windows. Sound Quest also has a stand-alone version under Windows in the *Solo Quest* patch-editor series. An MU80 editor module might be released for the Mac version of *MIDI Quest* sometime in the future. Opcode will include librarian support for the MU80 in the next release of *Galaxy*, but the company is uncertain about the timing for an editor. Mark of the Unicorn intends to provide an editor for its *Unisyn* universal patch-editor system, timing to be determined.

On the plus side, those willing to venture into SysEx have a handy resource. Selecting any edit parameter and pressing the Enter button twice displays the corresponding SysEx code. You can even "roll your own" control software if your sequencer supports custom SysEx control templates (see **Fig. 1**).

EFFECTS

The MU80 provides an excellent selection of onboard effects with 44 different algorithms distributed among five independent processors. These processors include reverb (with twelve

algorithms), chorus (ten algorithms), distortion (three algorithms), 5-band EQ, and the catch-all Variation (with a whopping 45 algorithms).

The Variation effects include copies of all the chorus and most of the reverb algorithms, allowing multistage or parallel processing. Additional Variation algorithms include rotary-speaker simulation, overdrive, distortion, amp

XG: THE NEXT GENERATION

The MU80 marks the first complete implementation of Yamaha's new XG format, an acronym for eXtended General MIDI. This is a superset of the General MIDI Level 1 standard along the lines of Roland's more modest GS format. The XG format was inspired by a desire to provide increased synthesis capability and musical expressiveness while preserving backward compatibility with General MIDI.

In particular, the XG format provides increased polyphony, access to multiple sound banks, new Control Change messages for synthesis parameters and effects, and optional use of digitized audio inputs as multitimbral Parts under MIDI control (see table, "GM vs. XG").

The XG Control Change messages support real-time changes to Portamento (CC 5, 65, and 84); Sostenuto and Soft Pedal (CC 66 and 67); Envelope Attack and Release Times (CC 72 and 73); Filter Resonance and Cutoff Frequency (CC 71 and 74); Reverb, Chorus, and Variation Effect Sends (CC 91, 93, and 94); and Data Increment/Decrement (CC 96 and 97). At a finer level, Nonregistered Parameters allow real-time changes to synthesis elements of a synth Part and individual drum sounds within a kit. In addition, all MIDI Mode messages (Omni On/Off, Poly/Mono, All Notes Off, etc.) are supported.

The MU50 is the first device to meet the minimum requirements of XG, but the MU80 goes beyond the minimum specs with features such as extra polyphony, digitized audio inputs, a 5-band equalizer, etc. Yamaha intends the XG format as a design guide to be shared with others rather than as a candidate for General MIDI 2.0 or an equivalent formal standard. In fact, Yamaha is willing to evaluate synths from other manufacturers with respect to the format. Devices in compliance can bear the XG logo.

GM vs. XG

Feature	GM	XG
Polyphony	24	32
Multitimbral Parts	16	16 + audio inputs (optional)
Sound Banks	1 (128 Sounds)	47
Drum Kits	1 (47 Sounds)	9 (71 Sounds/Kit) + 2 Sound Effects Kits (50 Sounds Total)
Recognized Control Changes	1, 6, 7, 10, 11, 28, 84, 100, 101, 121, 123	0, 1, 5, 6, 7, 10, 11, 32, 38, 64-67, 71-74, 84, 91, 93, 94, 96-101, 120-127
Registered Parameter Numbers	0-2	0-2
Nonregistered Parameter Numbers	not specified	supported
Aftertouch	Channel	Channel, Poly
Synthesis Elements	not specified	lowpass filter
Effects	not specified	reverb, chorus, variation
SysEx	GM On/Off	GM On/Off, XG On/Off, Master Volume, Master Tuning, Parameter Request/Change, Dump Request

simulation, wah-wah, compression, noise gate, and a host of frequency manipulations such as EQ, Aural Exciter (licensed from Aphex), and pitch change. A number of delays and specialized reverbs (which are not found in the reverb unit) round out the Variation options. Five to fifteen different parameters are provided for each effect, so you can fine tune the algorithms for your needs.

There are two possible signal paths through the effects units, depending on how the Variation effect is applied (more in a moment). Reverb and chorus are always applied to the entire system (including the A/D Parts). Distortion can be applied only to a single Part.

The final mix goes through the 5-band graphic EQ, which offers five named, user-selectable sets of preset frequency bands. (For example, in the Rock EQ, the bands are set at 125 Hz, 200 Hz, 1.2 kHz, 2.2 kHz, and 6.3 kHz.) You can adjust the levels in each band by ±12 dB. Although it is a simple graphic EQ when programmed from the front panel, the EQ becomes fully parametric; i.e., you can control the center frequency, Q (bandwidth), and gain, when controlled via SysEx. You can also make each band shelving or peaking and lowpass, highpass, or bandpass (see **Fig. 2**). Why, oh why, didn't Yamaha let the user control this from the front panel?

Variation effects can be applied globally (System) or just to a single Part (Insert). This is very flexible and a big improvement over previous onboard effect routings. Using the Variation module as an Insert effect, you could apply different reverbs to a vocal A/D Part and the backing music, send a single Part through a rotary speaker or wah-wah effect, or delay a Part with respect to the rest of the mix. The Variation effect can also apply to all Parts equally, providing multistage reverb or chorusing, echoes, or pre-EQ processing through the Aural Exciter or compressor.

The number and quality of effects are better than any GM module I've heard. The overall audio quality is very good with no noise or glitches as you change effect parameters. Different reverb and chorus algorithms are well differentiated from each other. The accompanying *MIDI Data Guide* is very helpful, with clear descriptions of the effects and their attendant parameters.

AUDIO INPUTS

Ever since the revered Roland Sound Canvas, many GM modules have included an external audio input, which is mixed with the internal synth sounds at the final output. The MU80 takes this concept a major step forward by actually digitizing the stereo audio inputs and sending them to the effects processors with the regular synth Parts. These A/D Parts can be controlled just like regular Parts, including Volume, Expression, Pan, and effect sends. The only unsupported function is Transpose, which is not surprising: pitch shifters are not inexpensive items.

Bank Select messages on the MIDI channel assigned to the A/D Part tell the MU80 what kind of audio input to expect and sets the input gain accordingly. The available options are microphone, guitar, keyboard, and audio (e.g., CD player). Program Changes call up preset effects programs designed for the different audio types, such as karaoke, flanged guitar, and rotary organ. If these options are too tame, turn on the Var Send control and roll your own effects. For example, humming a low drone into a mike with the Auto Wah effect makes a passable didjeridoo.

A/D Parts can be used in both Multi and Performance modes. Vocals and guitars are obvious inputs, but the audio inputs can also be used to bring in the signal from devices such as Proteus modules that have no onboard effects. Alternatively, you could use an A/D Part for vocals and connect the MU80 output to a stereo tape deck to cut a complete demo.

SOUNDS

So how does the unit actually sound? Pretty darn good! I'd have no qualms taking the MU80 head-to-head against any GM synth I've heard. Even without the excellent effects, the Voices sound convincing and full. The only obvious limitations become apparent when orchestral sounds are taken far outside their normal instrumental range, which is no real surprise or problem.

Voices are grouped in banks of 128 programs and called up via Bank Select and Program Change messages. Bank 0 is the default General MIDI sound set; the other banks include variations of these programs organized by common synthesis characteristics (e.g., fast attack, detuned, doubled, Velocity

crossfades, alternate waveforms, etc.). If you send a Bank Select and a Program Change that corresponds to an empty location, you get the standard GM sound in Bank 0.

The pianos, organs, strings, and synth sounds are particularly outstanding. The acoustic pianos sound more full than I remember from the TG300, and they work well in a big mix or as solo sounds. You'd have no trouble covering most keyboard gigs with an MU80 and a controller keyboard.

Guitars and basses are well represented with plenty of stock and processed timbres. The choir sounds, typically the bane of many synths, are surprisingly good in chords, although looping and multisample artifacts can be heard playing single notes. The brass and saxes are a cut above normal, but the woodwinds are just average.

Synth leads are strong, and the pads and ambience Voices (e.g., "Goblins" and "Sound Trak") offer a variety of useful soundscapes. Ethnic sounds are a mixed bag, running from good ("Fiddle") to weak ("Bagpipes" and "Sitar").

But wait—there's more! Moving to the variation banks reveals gems like "HornOrch" (fifth horns), "DX+Analg" (DX piano with synth vox), "Converge" (analog sweep), "JumpBrss" (synth brass), and enough different organs, pianos, and guitars to cover about anything you're likely to need.

The drums come off equally well, with plenty of clean, punchy presence, especially in the Rock Kit. Cymbals have realistic post-hit ringing, without the noisy grunge I've heard in other GM modules. The XG drum kits emphasize rock and jazz; orchestral sounds, such as timpani and hand cymbals, are available in TG300 mode.

The preset Performances offer a taste of what the MU80 can do when played live. These presets illustrate different Part and effects setups and provide lots of immediately useful sounds. Examples include "Concert Grand," "Clean EG," "Old Days Organ," and "DX Heaven." Splits and layers are illustrated in "Nylon EP," in which the mod wheel layers electric piano on top of guitar; "AnalogAge"; and "Creation," which includes Velocity splits, portamento, and mod wheel-controlled filter changes.

Though most presets use similar hall reverb and basic chorus settings, a number of Variation effects are used, as well. These include mod wheel-controlled rotary speakers for organs, various delays in pad and special-effects sounds, guitar and bass wah-wahs, and EQ processing on strings and brass. Even contrived sounds of limited musical use (e.g., "Samurai" and "Devil's House") provide good examples of Part and effects programming.

The new XG-recognized Control Change messages let you alter the sounds before a sequence begins, but they also provide real-time timbral control ranging from simple filter sweeps to over-the-top effects. For example, send an Attack Time message (CC 73) with a value of 127 (longest possible attack time). Hit and hold a brass chord with your left hand, and then snap the Attack Time back to 10 or 20. Play repeated arpeggiated chords with your right hand as the initial chord continues to build to maximum amplitude while slowly sending a filter sweep (Brightness, CC 74) with a foot pedal. This produces great crescendo fanfare.

THE COMPUTER CONNECTION

Like earlier Yamaha GM modules, the MU80 includes a built-in computer interface. A switch on the back selects whether the unit responds to the MIDI In ports or the serial port, which can be connected to a PC compatible or Macintosh. The serial connection requires a special cable that is not provided with the unit but is readily available at computer stores or mail order.

Mac users have it easy. I had the MU80 up and running with my venerable IIci within three minutes. I had no problems with Steinberg's *Cubase*, PG Music's *Band-in-a-Box*, or other software as long as I only wanted to use

Product Summary

PRODUCT:
MU80 Tone Generator
PRICE:
$895
MANUFACTURER:
Yamaha Corporation of America
tel. (714) 522-9011
fax (714) 739-2680
CIRCLE #440 ON READER SERVICE CARD

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ●
EASE OF USE	● ● ● ● ◖
SOUND QUALITY	● ● ● ●
VALUE	● ● ● ● ◖

Parts 1 through 16. Telling *Cubase* I had a MOTU MIDI Time Piece let me access Parts 17 through 32 for playback only. I could play Parts 17 through 32 live from the B port while *Cubase* played sequences with all Parts, but I could not record into the sequencer from the B port. The same is true when using Opcode's OMS. Others have reported success with MOTU's *Performer* and FreeMIDI, but I wasn't able to try them. There are no problems addressing all Parts from the two MIDI In ports with a multiport MIDI interface, such as the MIDI Time Piece, but most computer users will probably want to use the MU80 serial interface and not buy more equipment.

Things are tougher for PC users. The current MU80 serial driver (available from Yamaha) was written to work with the existing Windows MIDI Mapper software, which only supports 16-channel operation. The driver also works fine for 16-channel access under Windows 95. However, those wanting to reach all 32 Parts through the computer will have to wait for a forthcoming, updated driver from Yamaha.

WRAP-UP

The MU80 ups the ante in the high-end General MIDI market. It has great sounds, great effects, and double the polyphony and Parts of earlier models; and it handles external audio inputs with flair. Although Yamaha has made aspects of the new XG format available in earlier tone generators, it's nice to see the approach standardized. The added real-time timbre controller capabilities are valuable for both sequencing and live playing.

Those who just want the sounds without the extra high-end power should consider the MU50 ($595), a junior version of the MU80. This unit has essentially the same sound set (although it uses a different chip) and meets the XG specifications, but with only 32-voice polyphony, sixteen Parts, and no digitized audio ins. It is also available as a daughterboard that plugs into any Wave Blaster-compatible sound card for PCs (DB50XG: $249.95).

My only major complaint about the MU80 is that a number of parameters are out of reach for users without ready access to SysEx. This is a disappointing limitation, although an editor program would solve the problem for computer-based musicians. The MU80's use in computer-music systems is also restricted until current software is upgraded to address 32 (or more) Parts through direct serial-port access.

However, many users will be more than satisfied with the quality of its sounds and ease of use. Its primary competitor is the Roland SC-88, but in my opinion, the MU80 clearly holds the "bang for the buck" title in the GM module market—at least, for now.

Jim Pierson-Perry *is a scientist by day, musician by night, and tired between. He lives in radio-free Elkton, Maryland, somewhere between Twin Peaks and Castle Rock.*

Charlie Lab Digitar

By Geary Yelton

Realistic guitar phrasing for the nonguitarist.

As synthesists, we're often expected to emulate a host of acoustic and electric instruments, many of which we have never played. Thanks to the broad spectrum of sounds offered by today's synthesizers and samplers, re-creating these traditional instrument timbres is the easy part: just dial up the right patch, and you can fool most of the people most of the time.

The hard part is learning all the subtleties and nuances of playing dozens of different musical instruments like "real" players would. Given that the guitar is omnipresent in popular music, a common challenge is to convincingly play a guitar part. But voicing chords like a guitarist usually requires some advance planning, and rolling chords like a guitarist strums the strings requires precise playing technique.

Years ago, Oberheim came out with Strummer, a box that could take a chord played on a MIDI keyboard and revoice it to simulate the voicing and strum of a real guitar. Now there's a new kid on the block: an Italian company called Charlie Lab has done Oberheim one better with the Digitar.

STRIPPED-DOWN GUITAR

Although it's touted as a "MIDI controller," the Digitar is actually a combination controller and MIDI processor. Its main function is to revoice sequenced or MIDI keyboard-triggered chords to sound as if they were played on a guitar. Its six "strings" can be picked, strummed, or plucked like real guitar strings. If you play guitar enough to have developed a right-hand

By revoicing MIDI notes to sound like they were picked or strummed on a 6-string guitar, Charlie Lab's Digitar can make a keyboardist sound like a guitarist.

technique, you can play synthesized guitar parts that could make almost anybody swear they were hearing a real guitar. Even if you know nothing about guitar voicings, with the right synth patch, the Digitar can really make you sound like a guitarist.

The Digitar package includes two separate devices that connect with a coiled telephone cord that stretches ten feet. The main Digitar performance unit weighs less than a pound, and it has a built-in nylon belt that straps around your waist so you can place it in a natural playing position. If you're sitting, it can rest comfortably in your lap or sit on a tabletop in front of you.

The DG10 power supply/MIDI interface weighs about 1.5 pounds and features MIDI In, Out, and Thru ports as well as a jack for the phone cord and a built-in AC power cord. There's no power switch and no external power supply. Normally, the lack of a wall wart is a wonderful thing, but without a switch or even a cord to unplug, there's no elegant way to turn off the Digitar.

The Digitar's "strings" are rigid steel rods with about ⅛ inch of "give" at one end. Although they're not flexible like real strings, it doesn't take long to get used to them. Because there's no pitch-to-MIDI conversion, tracking is excellent. By pressing on either side of the bridge, you can step through menu choices and change parameter values. Below the bridge are six buttons, two of which are user-assignable function buttons, and a 4-character LED display (see **Fig. 1**).

The Digitar does not create its own note messages; the notes it produces depend on what chord you play into it with a MIDI keyboard or a sequencer. When you play the strings, the Digitar revoices the incoming notes according to its current program and sends the resulting MIDI note data to the synthesizer.

MIDI input to the Digitar should be no fewer than three notes and no more than four. In Rhythm mode (discussed later), playing 3- and 4-note chords on the keyboard yields 5- or 6-note guitar chords. When you release the keys, the Digitar sends another MIDI note message on a different MIDI channel, which usually plays a fret-noise sound (which is included in the GM sound set). The sound of fingers sliding across strings between chords adds greatly to the realism. The combination of direct control of the strings and fret noise

when you change chords is very convincing.

The Digitar is set up to send Program Changes to any instrument that conforms to the General MIDI standard. For non-GM instruments, you can specify the appropriate Program Changes. For this review, I used it with a Roland SC-88 Sound Canvas.

Only the standard guitar tuning is supported; alternate tunings aren't possible. The Digitar recognizes eighteen chord types in every key, each in three inversions. A little math reveals that it can play 648 different chords!

MODES AND FUNCTIONS

There are four global modes for playing the Digitar: Rhythm, Economy, All Channels, and Lead. The most useful is Rhythm mode, which lets you play all six strings with your fingers or a pick. Economy mode is similar, but only the highest four strings are played. It's intended to save polyphony.

In Rhythm mode, the inversion you play on the keyboard doesn't affect the guitar chord position. Instead, there are four inversion presets. In Position 1, chords are always played in the lowest possible position on the guitar neck. Position 2 plays in the middle of the neck, and Position 3 plays at the top. The fourth position preset, Auto Selection, changes the position depending on how high you play on the keyboard. I've never tried some of these fingerings on my guitar, and some of the fingerings I normally use are apparently impossible in Rhythm mode. Some chords don't sound the sixth string, just like on a guitar.

In the All Channels mode, note data received on up to twelve MIDI channels is revoiced. The idea is that the Digitar can automatically improvise guitar voicings for canned sequences, but unless all twelve channels are playing the same four notes, this mode is practically useless.

Lead mode maps each note you play on the keyboard to a different Digitar string, making it possible to play chord clusters that aren't recognized in Rhythm mode. By changing notes on the keyboard and triggering them with the strings, solos are possible, but if all you want is to play guitar leads, why bother? It's easier just to play the parts on the keyboard. On the other hand, Lead mode makes sense for picking the Digitar's strings to play mandolin or banjo parts that would be difficult on a keyboard.

You don't even have to play the keyboard; you can enter the chords into your sequencer with an alternative controller or in step time and play

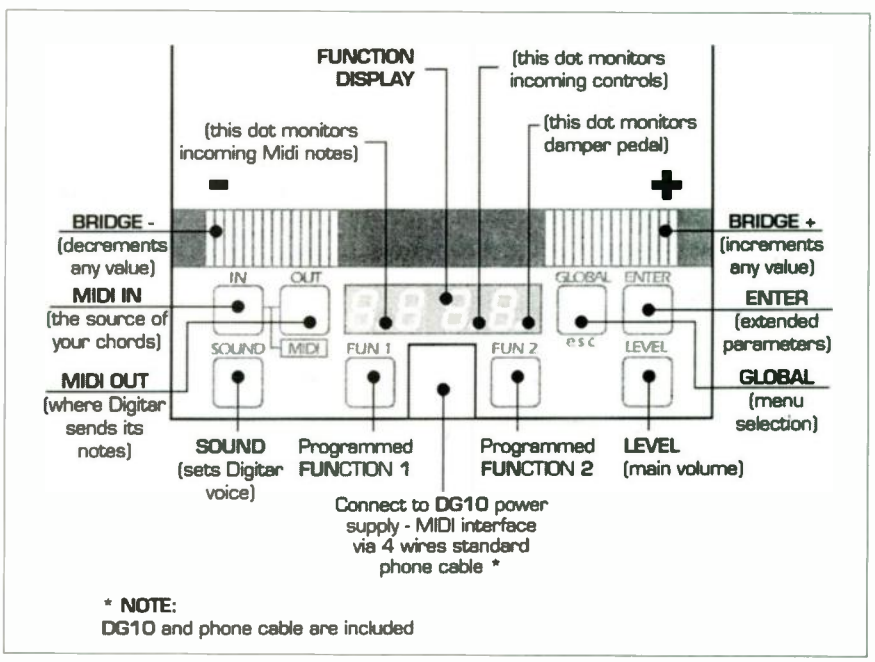


FIG. 1: Although it includes many good features, the Digitar's operating system is nonintuitive, especially because of the 4-character display. However, the controls are close at hand. For example, pressing on either side of the bridge steps through menu choices and increments parameter values. (Courtesy Charlie Lab.)

the Digitar's strings in real time during playback. You can even let an algorithmic-composition program crank out a chord sequence and strum along. You also can send MIDI Clock messages from the Digitar, making it possible to control the sequencer's tempo in real time by strumming quarter-note chords. This is useful when the sequencer is sending chord changes to the Digitar.

There are eight user programs, which are inexplicably called Sounds. Because the Digitar doesn't support System Exclusive, there's no way to store Sounds offline. You can step through the Sounds by first pressing the Sounds button and then pressing either side of the bridge. The manual never explains which parameters are global and which are included in each Sound, but each Sound certainly stores a Program Change number, a Bank Select number (if necessary), a fret-noise Program Change number, a Volume value for the primary and fret-noise programs, and so on.

Factory defaults select steel-string, chorus, funk/pop, 12-string, and overdrive guitars on General MIDI devices that conform to the Roland GS standard, which offers more guitar-sound variations than GM. By default, the noise setting selects fret noise on a different MIDI channel than the guitar sound. Any synth program can be assigned to the noise setting, from breath noise to barking dog.

Sustain mode (Staccato or Legato) controls whether notes are cut off or sustained until the next chord change. You can use the keyboard's sustain pedal to hold notes, but only in Lead mode. There are four preset pitch-bend modes, which let you slide from chord to chord, more or less simulating steel-guitar technique. You can also determine the dynamic response (similar to a Velocity curve). Southpaws can even reverse the strings for left-handed playing.

STRING 'EM UP

If you're a keyboardist, you probably would have to play the Digitar a lot to become proficient. The strumming/picking hand not only triggers the notes you're playing, it also controls articulation and dynamics. A guitarist, on the other hand, might have an easier time because the keyboard part is easier to master: all that's required is a

rudimentary knowledge of block chords on the keyboard.

The Digitar definitely fulfills the primary purpose of any new toy: it stimulates creativity, resulting in fresh, new approaches to making music. Hooray for anything that does that. I haven't written any songs I wouldn't have written without it, but I have recorded previously real guitar parts into my favorite MIDI sequencer.

Is it a MIDI controller or a MIDI processor? Floor wax or dessert topping? I prefer to call it a VDA processor (VDAP) for voicing, dynamics, and articulation. The world needs more VDAPs, don't you think? Behold the genesis of a definition: A VDAP is a device or software program that helps the synthesizer sound more like some other instrument. The Digitar is a perfect example of a VDAP. As a musical instrument, though, it falls short of perfection.

The strings are only half the length of an average adult male's hand. They should be longer so you could have more precise control, allowing more margin for error. Also, the bridge is the main input device for changing parameter values, and it's much too easy to press the bridge accidentally with the heel of your hand while playing. Fortunately, you can set the Digitar so that when the bridge is pressed, the unit sends an All Notes Off command rather than changing a parameter.

The Digitar is full of flexible features, but its operating system is less than intuitive. Part of the problem is the cryptic command set made necessary by a 4-character display. Remembering how to program it can be frustrating at first.

The poorly translated and poorly

Product Summary

PRODUCT:
Charlie Lab Digitar MIDI processor/controller
PRICE:
$449
DISTRIBUTOR:
RiCharde & Co.
tel. (408) 688-8593
fax (408) 688-8595
CIRCLE #441 ON READER SERVICE CARD

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ●
EASE OF USE	● ●
DOCUMENTATION	●
VALUE	● ● ●

organized manual isn't much help. It eschews the top-down tutorial approach in favor of stream-of-consciousness documentation. It tells you how to do things but not why you want to do them. It starts out explaining how to change the MIDI channels and never really explains the MIDI signal path. What does the incoming channel control? What does the outgoing channel control? Once you get it all hooked up and play the Digitar, though, you'll probably figure out how it works. A better manual and a power switch would improve things immensely.

Still, I'd recommend the Digitar to anyone who wants to play more realistic guitar parts from a synth. And imagine the possibilities of playing totally nonguitar sounds with guitar voicings, dynamics, and articulation! For simulating guitar with MIDI keyboards, though, nothing comes close to the Digitar.

Some people live in the past. **Geary Yelton** *lives far in the future.*

M&K S-90/V-125 Speaker System

By Lawrence E. Ullman

This versatile satellite/subwoofer combo gets down.

In the last few years, it seems as though every manufacturer in the electronic music business has introduced a close-field reference monitor. The vast majority of these speakers adhere to the same simple formula: a dome tweeter and a small (6- to 8-inch) mid/woofer mounted in a compact enclosure.

The similarity between these small, 2-way monitor systems arises as a result of fundamental physical and practical constraints. Properly designed and constructed, these small speakers have inherent attributes that make them ideal for close-field monitoring, including image coherence at close range, pinpoint imaging, and placement versatility. (For details of studio monitor design, see "Square One: Nearer My Monitor to Thee" in the June 1995 **EM**.)

What they *don't* have is bass extension; small 2-way speakers simply don't go low enough to reproduce the two lowest musical octaves (20 to 80 Hz) adequately. The home-theater and audiophile worlds addressed this problem long ago by adding dedicated subwoofers—speakers that are dedicated to reproducing low frequencies—to their systems. The subwoofer not only fills in the missing bass, but when properly implemented with a line-level highpass filter, it allows the "satellite" monitors (and the amp driving them) to concentrate on the midrange and treble frequencies, where they are most efficient.

Despite the obvious advantages, sat/sub monitoring systems are still uncommon in studios. However, this may soon change. In the July 1995 **EM**, I reviewed the Bag End Studio System A, a magnificent but expensive monitoring package. This time, I'm going to examine a much more down-to-earth system from one of the originators of the sat/sub concept, Miller & Kreisel Sound Corporation.

Although M&K has focused its efforts on the high-end consumer market in recent years, the company's roots are firmly planted in professional ground. Founded 21 years ago as an audiophile "direct-to-disc" record label, M&K entered the speaker business when recording engineer Ken Kreisel discovered that none of the portable playback monitors available at the time had sufficient dynamic range and bass extension for his purposes.

This led Kreisel to develop the company's first high-end subwoofer, which was soon followed by small monitors for use in onsite recordings and in the M&K studio. Today the company offers an extensive line of high-performance speakers, including the S-90 satellites and V-125 subwoofer.

SWISS ARMY SPEAKERS

The first thing you notice about the S-90 satellites is their trapezoidal shape; the cabinets flare from a 10-inch-wide front baffle to an 11.75-inch back panel. Although more complex and expensive to manufacture than the usual rectangular box, this shape offers several advantages. The nonparallel sides reduce internal standing waves and provide increased internal volume while still allowing a narrow baffle.

The cabinets are solidly constructed of heavy MDF with excellent overall fit

and finish; the review samples were finished in black oak. Although the cabinets can be oriented horizontally, the sloping sides mean the speaker will be angled downward unless propped up. (Of course, the downward tilt could be useful if you need to mount the speakers up high on a shelf.) The back panel is tapped for industry-standard Omnimount brackets, further adding to the speaker's mounting flexibility.

In fact, if I had to sum up the S-90 satellites in one word, it would be "versatile." Here at *chez Ullman,* speakers get put through the wringer. Over the several months I've had the S-90s, they've moved from studio to home theater and back again many times. In addition to serving as close-field monitors, the S-90s were used (and abused, but more on that later) extensively during my recent comparison test of four power amps (see "Power Tools" in the October 1995 **EM**). They have also covered all the bases in my home theater, handling at various times the main left and right front channels, the center channel (one speaker), and even the surrounds.

Although small monitors tend to be inherently versatile, the S-90 has a Swiss army-knife character that goes well beyond the norm. In particular, a pair of 3-position switches on the back panel allow the speaker to be "dialed in" to compensate for various mounting positions and tonal-balance preferences.

The Midrange Contour switch's three positions are labeled Normal, Special, and Low Efficiency. According to the simple but well-written manual, Normal provides the "flattest frequency response in most rooms and installation conditions," and indeed I found this to be true; most of my auditioning was done in this position. Low Efficiency trades efficiency and output for a warmer, mellower midbass sound, according to M&K. I found it too recessed and dark to be useful in a studio-monitoring context.

Special maximizes output and dynamic range and is brighter and more forward sounding than Normal. This position is designed to compensate for the boost in midbass response that occurs when a speaker is placed against a wall or other room surface. Because most of my listening was done with the speakers mounted on stands away from walls (that is, in the "free field"), I found the Special position too bright and harsh. However, it worked perfectly when I mounted the S-90s up high on the walls for surround use. If you must place your monitors against a wall (a real no-no with most speakers) this setting may be just what the doctor ordered.

More complex than a simple level control, the Treble Contour switch adjusts the speaker's upper midrange and treble balance. Of the three positions, Mid Tweeter is the flattest; according to M&K, it provides a flat on-axis response to beyond 20 kHz. Low Tweeter produces an attenuation of high frequencies, and Normal produces a slightly increased treble response above approximately 4 kHz characteristic when measured on axis. In general, I found the Mid position provided the best response in my small studio, but the brighter Normal setting suited my larger and more absorptive home theater.

A pair of frequency contour switches on the back of the M&K S-90 satellite speaker makes this a versatile 2-way close-field monitor.

S-90 Specifications

System Type	2-way
Woofer	6.5 inches
Tweeter	1 inch
Frequency Response	72 Hz–20 kHz ±2 dB
Crossover Frequency	2 kHz
Power	50–200W
Impedance	4Ω
Weight	16 lbs.
Dimensions (height x depth)	12 x 9.75 inches

DRIVER'S ED

The S-90's driver complement includes a 6.5-inch polypropylene woofer and a 1-inch silk-dome tweeter. The crossover frequency is 2 kHz; there is no provision for biwiring. Pieces of gray foam are glued on the baffle directly above the tweeter and at about ten and two o'clock above the woofer. According to the company, these reduce diffraction and help tune the speaker's off-axis frequency response. Looks-wise, foam is not my cup of tea; unlike most monitors, the S-90s look best with their black-cloth grilles on.

During the review period, I had occasion to become intimately acquainted with the S-90's tweeter. When I was researching the story on power amplifiers, part of the test involved matching the output level of each channel on four amps. This was accomplished using a 350 Hz sine-wave tone sourced from a test CD. Folks, I'm here to tell you that playing a steady tone for more than two hours at a 85 dB SPL is not conducive to a speaker's continued health. You guessed it: I fried one of the M&K's tweeters.

In the end, my little mishap proved educational. M&K quickly sent out a new pair of tweeters, which gave me a chance to examine their construction in detail. The S-90's tweeters look quite different from most. In a normal tweeter, the back wave from the dome reflects off the magnet assembly and exits the tweeter as an out-of-phase "ghost signal." As you might expect, this can smear the main signal.

In contrast, the magnet assemblies on the M&K tweeters are shaped like a ring. This allows the back wave to pass through the hole in the magnet and

into a several-inches-long, closed tube that extends from the back of each tweeter. Called a *transmission line,* the tube attenuates the back wave, preventing it from smearing the main signal. As a side benefit, the transmission line also lowers the tweeter's resonance point, which allows it to operate in a more linear fashion over a wider range.

Replacing the tweeter (or the woofer, for that matter) is quite easy. It is secured with just four screws and is connected to the crossover with color-coded wires terminated with slip-on connectors. However, because the tweeter is set very tight and flush into the baffle, I decided to remove the crossover board from the back panel and push the tweeter out from behind. This too proved educational: the cross-

▼

The satellites seemed to breathe a sigh of relief.

over itself is beautifully made, using very high-quality parts, including precision resistors and hand-wound, air-core inductors. Momma always told me to learn from my mistakes.

SATELLITE SOUND

Used on their own, the S-90s are excellent close-field reference monitors. In particular, they have a clear, neutral character that allows different mixes to sound different. Lesser speakers often impart their own sonic signature to the sound, which tends to make all recordings sound similar. On the M&Ks, complex studio productions such as Laurie Anderson's *Strange Angels* CD are rendered in all their crisp, multilayered, heavily processed glory, whereas a minimalist audiophile disc such as Lori Lieberman's *a thousand dreams* (recorded live with just a pair of B&K omni mics) sounds exactly like what it is: a magnificently recorded live performance. (To learn more about the unusual recording of Lieberman's CD, see "Recording Musician: Unplugged and Dangerous" on p. 102.) To me, this ability to accurately render subtle spatial clues is one of the hallmarks of a good speaker.

On a more prosaic level, close-field monitors must have superb imaging to allow the engineer to pan sounds accurately during mixdown. Although not the equal of a dual-concentric design such as the Tannoy System 8, the S-90s are quite competent in this department. When tracking and mixing down, I was able to place drum and synth sounds with precision anywhere within the stereo soundfield.

With the speakers three feet apart, slightly toed in, and located with the tweeter slightly above ear height, the center image was focused and well defined. Most close-field monitors I've heard are very up-front; the image is a 2-dimensional plane that hangs suspended between the front baffles. On the M&Ks, the soundfield had considerable depth and seemed to emanate from just behind the speakers.

Finally, the S-90s are very dynamic and are capable of playing quite loud without strain. There is also detail aplenty, but without the bright, harsh, etched quality that so many small monitors exhibit. With the Midrange switch set to Normal and the Treble switch set to Mid, I was able to monitor at high levels for hours at a stretch without feeling like a hot needle was being driven through my brain.

With a 12-inch woofer driven by an integral 125-watt amp, the M&K V-125 subwoofer fills in the lowest two musical octaves.

GETTIN' DOWN

Like all similar speakers, the S-90s have restricted low-frequency response. What bass the S-90 does have is reasonably tight and punchy; as an acoustic suspension (sealed-box) design, the speaker's response falls off rapidly and evenly below about 80 Hz. (Their frequency response is given as 72 Hz to 20 kHz, ±2 dB, which is similar to other 2-way monitors with 6-inch woofers.)

There's no getting around it: if you want to monitor with small speakers but still want full-range sound, a subwoofer is mandatory. To accompany the S-90 satellites, M&K sent along a V-125 powered subwoofer. One of the more cost-effective models in their line, the V-125 features a single, forward-firing 12-inch woofer powered by an integral 125-watt amp.

In a properly implemented satellite/subwoofer system, a very steep lowpass filter keeps high frequencies out of the sub while a highpass filter prevents the low frequencies from reaching the satellites. A 36 dB/octave lowpass filter is built into V-125; the crossover frequency is adjustable from 50 to 125 Hz using a rear-panel knob.

The V-125 features both line-level (RCA jack) and speaker-level (spring clip) inputs, which allows the highpass filter to be implemented in either of two ways. The speaker-level inputs receive the full-range output of your power amplifier, pass the signal through an integral 80 Hz highpass filter, and send the filtered signal on to the satellite speakers via a pair of spring-clip outputs.

The line-level RCA input jacks, on the other hand, are designed to be used in conjunction with an external highpass filter, such as M&K's VF-80 ($75). The VF-80 is a little black box that accepts the line-level stereo output from your mixer or preamp, passes the signal through an 80 Hz highpass filter (9 dB/octave), and sends the filtered signal along to your power amp. A pair of Sub Out jacks pass the full-range signal along to the subwoofer's line-level inputs, where the sub's built-in lowpass filter takes over.

The line-level scheme is greatly superior for a number of reasons, chief among them the fact that it creates a true biamped system. If you use the speaker-level input, the amp receives (and attempts to reproduce) a full-range signal from the preamp. By handling things at line level, the satellite amp never sees the low frequencies; they are instead routed directly to the sub, which has its own amp. This reduces intermodulation distortion and provides greater headroom and dynamic range. Believe me, if you're going to use this or any other subwoofer, the VF-80 is $75 well spent.

WOOF, WOOF, WOOF!

Once you have your system set up, the subwoofer must be adjusted so it blends seamlessly with the satellites. In addition to the Low Pass Filter control previously mentioned, the V-125 has a Bass Level control and a Phase Reversal switch on its rear panel.

Although you can set all three controls by ear, a much easier and potentially more accurate way is to use the suite of subwoofer evaluation and setup test tracks on Delos' *Surround Spectacular* test CD (DE 3179). M&K recommends setting the Low Pass Filter to 85 Hz as a starting point; after listening to the "Subwoofer Blend" tracks (28 and 29), I ended up lowering it to about 80 Hz.

The disc also has a number of tones that are used to set the subwoofer's phase. According to the V-125's manual, the Phase Reversal switch is necessary because when satellite speakers are located separately from the subwoofer, each speaker is at a different distance from your ear, which can cause phase differences between the satellites and subs. When using the Delos disc, you simply listen to (or measure) the sound level while flipping the Phase switch; the louder position is correct. Finally, the disc provides a track that is used in conjunction with an SPL meter to set the woofer's output level.

When all is said and done, however, the proof is in the listening. If you have gotten the subwoofer set up properly, acoustic bass tracks, bass drums, and especially male voices will be full and deep without being boomy. In my home theater, I find deep-voiced news

anchors to be the perfect test signal; if the woofer is set too loud, their voices will be accompanied by a low, easily localizable rumble. A rule of thumb: If the bass seems to be coming from the sub and not the satellites, the sub is too loud, or the crossover frequency is too high, or both.

THE CASE FOR BASS

Using the S-90s with the V-125 subwoofer and VF-80 highpass filter forms a synergistic whole that is greater than the sum of its parts. With everything dialed in, the satellites seemed to breathe a sigh of relief. The system's imaging and overall dynamic range were greatly improved. And oh, such glorious bass! Kick drums now come with a body attached, instead of just the beater thwacking into the head. And you know all those kick-drum variations you get on a drum-sampling CD? I could finally clearly distinguish the difference between, say, a 22 × 17-inch Sonor with and without wool cover.

The important thing to remember is the subwoofer is not adding *extra* bass; that would merely distort your mix. Instead, the subwoofer extends the range of your close-field monitoring system, allowing you to enjoy the benefits of small monitors without sacrificing the lowest musical octaves. It's like replacing your minimonitors with a pair of huge main monitors (well, almost).

Although it's true that some consumer playback systems don't go all the way down to 20 Hz, that doesn't mean your reference monitoring system should aim for the lowest common denominator! There's a lot of important musical information below 80 Hz, as well as undesirable noise from mic handling, air conditioning, etc. Your monitoring system is supposed to tell you exactly what's going down on tape. This one leaves nothing out. Can yours make the same claim?

Every once in a while, Associate Editor **Lawrence E. Ullman** *gets to turn off the pink noise and actually listen to some music for a change.*

Product Summary

PRODUCT:
S-90 satellite/V-125 subwoofer
PRICE:
S-90 (unshielded): $950/pair
S-90 (shielded): $995/pair
V-125 (shielded): $750
MANUFACTURER:
Miller & Kreisel Sound Corp.
tel. (310) 204-2854
fax (310) 202-8782
Web http://www.mksound.com/mksound
CIRCLE #442 ON READER SERVICE CARD

EM METERS	RATING PRODUCTS FROM 1 TO 5
AUDIO QUALITY	● ● ● ●
VALUE	● ● ● ●

Roland GI-10

By Erik Hawkins

A no-nonsense guitar-to-MIDI interface.

I don't mean to sound like an advertisement, but let's face it: Roland has reigned as the king of guitar-to-MIDI converters for more than a decade. With such a track record, it comes as no surprise that Roland's latest MIDI guitar product, the GI-10 Guitar MIDI Interface, once again sets a new standard. An easy-to-use, no-nonsense unit, the GI-10 provides better performance than its predecessors for less money and raises the bar that the competition must hurdle.

Until I tried the GI-10, I felt that guitar-to-MIDI converters left much to be desired. I was never pleased with the way they handled, and I always felt like I had to adjust my playing style to meet the converter's tracking abilities. I've spent many sessions in abject fear that the false triggers and delayed notes spit out by my guitar converter would turn my composition into the definitive score for misplaced MIDI messages.

With the GI-10, my fears have all but ended. From the start, I was able to dig into my guitar with no holds barred. The GI-10 followed almost all my licks accurately, from hammer-ons to pull-offs to bends to mad speed licks. No doubt about it: tracking response times are vastly improved compared to Roland's first-generation GR-series

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RATE THE ARTICLES IN THIS ISSUE!

DECEMBER 1995

We want to know what you think of the articles in *Electronic Musician*! Now you can use your reader service card to give us feedback about **EM**'s editorial coverage. We have assigned a rating number to each of the main articles in this issue. Please select a rating for each article and circle the appropriate number on your reader service card:

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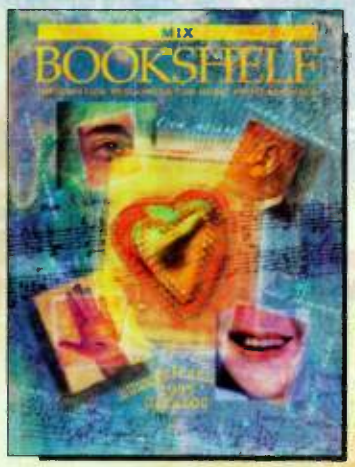
MIX

BOOKSHELF

INFORMATION RESOURCES FOR MUSIC PROFESSIONALS



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We pride ourselves on our knowledgeable staff, offering accurate, no-hype recommendations and attentive customer service.

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Plan For 1996...

Great Studios of the World 1996 Calendar

From Mix *magazine* **CAL96) $9.95**

Once again, *Mix* magazine presents the enormously popular *Great Studios of the World* calendar! Our lavish, high-quality, full-color calendar features:

- Twelve premier recording facilities
- Important dates in recording and music history
- Industry conferences and trade shows
- Birthdays of prominent recording artists, producers and engineers

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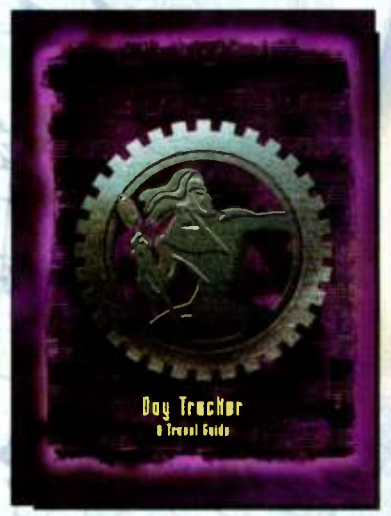

1996 Recording Industry Sourcebook Day Tracker & Travel Guide

1951-DT) $9.95

Previously available only with the *Recording Industry Sourcebook*, this appointment book and touring resource has doubled in size and can now be purchased as a separate item. A two-page spread for each month gives you plenty of space to write down all of the important events in your life, but the really unique element of this appointment book is useful directories of:

- Hotels
- Clubs and other venues
- Restaurants
- Airlines
- Air charter companies
- Limousines
- Messenger services
- Car rental companies
- Overnight shippers
- Travel services
- Insurance companies
- Security systems

All in all, you get over 60 pages of listing resources to help you plan a tour and survive on the road.

Music & Entertainment DIRECTORIES

1995 Recording Industry Sourcebook

©1995, 475 pp. (Spiral)

This massive industry guide is a top-quality, spiral-bound, tab-divided directory with over 12,000 updated listings in 55 categories. It offers comprehensive directories of record labels, producers, managers, distributors, attorneys, equipment suppliers, music video companies, media contacts and much more. Entries list contact names, titles, phone and fax numbers, styles of music preferred and information on whether they'll accept unsolicited demos. **1950A) reg. $75.00, now $59.96**

End of Year Special! 20% Discount!

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Recording Industry Sourcebase

We also offer our unparalleled database on 3.5" disks for Macintosh or Windows! You get 55 categories covering music business and production. The package includes *ACT!* contact management software and a copy of the *Sourcebook* itself.

Sourcebase for Macintosh **1946MA) $295.00**

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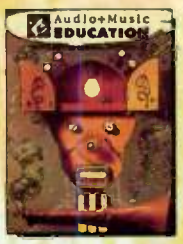

AUDIO AND MUSIC EDUCATION 1995

©1995, 88 pp. (Bound)

AME) $15.00

Our comprehensive listing of programs from all over the U.S. and Canada in music recording, music technology, electronic music, music business, audio post-production, sound reinforcement, broadcast communications and music theory. Also includes articles on careers and choosing a program, plus resource listings of industry organizations, publications and software manufacturers.

ONSTAGE 1995

©1995, 96 pp. (Bound)

OS) $15.00

Onstage encompasses all segments of audio performance in a single annual directory. Listings include remote recording, sound reinforcement, lighting companies, equipment retail and rental, arenas and stadiums, booking agencies, managers, touring companies, promoters, production personnel, insurance companies, security services, corporate sponsors, festivals and more!

1996 MIX MASTER DIRECTORY

©1995, 208 pp. (Bound)

996A) $24.95

The *Master Directory*, available in December, is our national business-to-business directory for the audio industry, featuring manufacturer listings with new and current products, cross-indexed by product type. It also lists audio recording and video production facilities; sound-reinforcement and remote-recording companies; mastering, duplication and CD-replication services; independent engineers and producers; studio designers and suppliers; recording schools, seminars and programs; trade organizations; and more.

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A revolutionary new microphone

This unique, fully interactive CD-ROM lines up the top professional microphones, both classic and contemporary, for a series of audio comparison tests on dozens of instruments. A superb resource for professionals and students alike, the disc features:

From Cardinal Business Media, also publishers of Mix®, Electronic Musician® and Mix Bookshelf®

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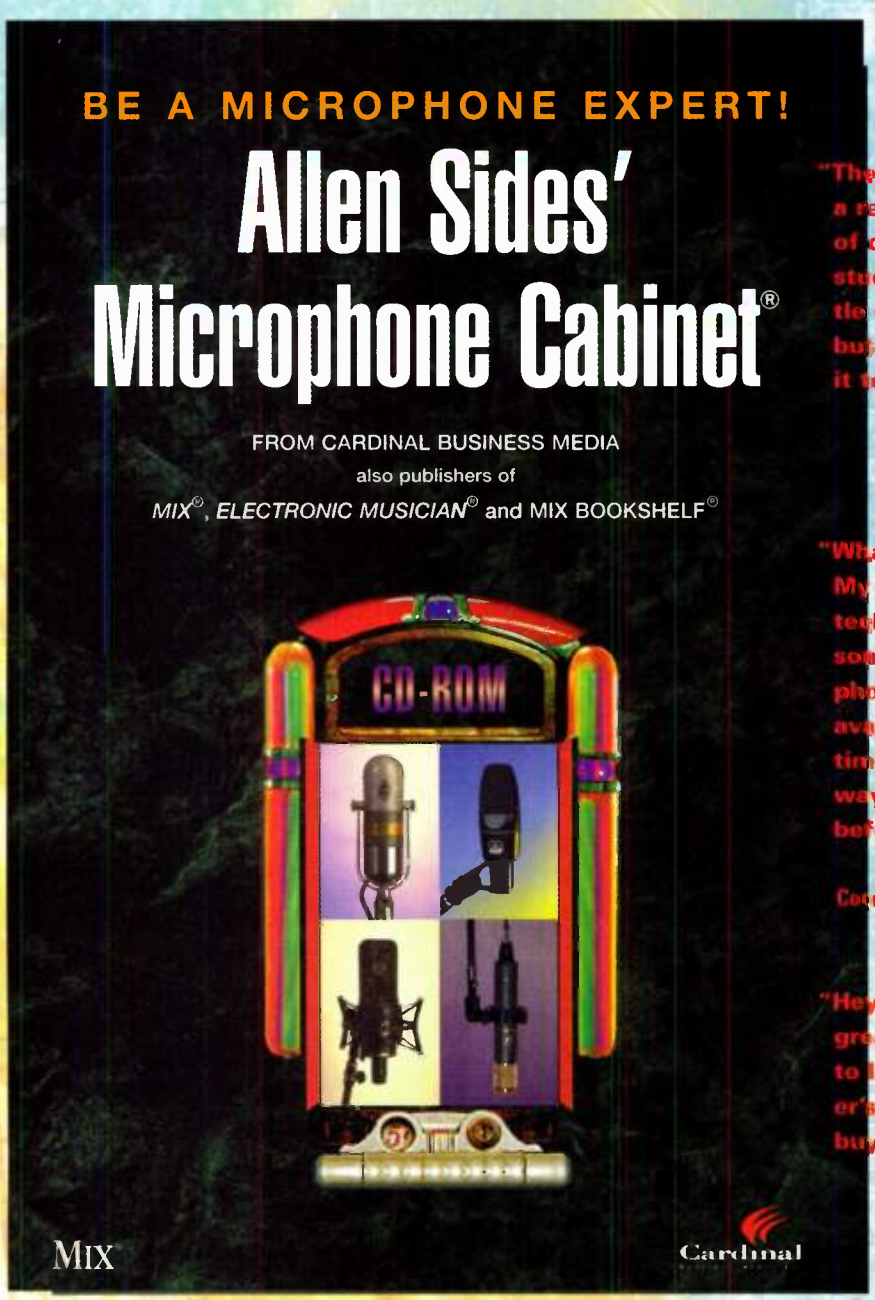
- 16-bit Red Book audio samples of the selected mics and instruments, as played by session pros like drummer Hal Blaine and guitarist Elliot Easton.
- Allen Sides' "Tips" for getting the best sound from each microphone on the selected instrument.
- A high-resolution color photograph of each microphone and the mic placement setup for each instrument.
- Complete specifications for each microphone, including frequency response diagrams and polar patterns.
- A color photograph of each musical instrument, with description and characteristics.
- A "Microphone Basics" section by noted author John Woram, including information on microphone design, characteristics and usage.
- A directory of the microphone manufacturers, with a list of currently produced models.

This amazing disc features tests of 66 mics and 33 different instruments. These include six different drums and cymbals, several types of percussion, five guitars, a Hammond B-3 organ and a wide variety of brass, woodwinds and strings. The microphones were chosen from the world-renowned collection at Sides' Ocean Way/Record One studios in Los Angeles, including models from: AKG, Audix, Audio-Technica, B&K, Beyer, Coles, Crown, Electro-Voice, Groove Tube, Milab, Neumann, RCA, Sanken, Schoeps, Sennheiser, Shure, Sony and Telefunken. Sort by microphone to check out the best instruments for each, or sort by instrument to see which mics you should use. The disc also includes a directory of microphone manufacturers and their current product lines.

Item MC) $69.95

Mix BOOKSHELF

auditioning tool on CD-ROM!



"The Microphone Cabinet is now a required reference tool for all of our classes. It really shows students the importance of subtle differences between mics, but best of all, I can secretly use it too!"

David Gibson
Founder and Chief Administrator
California Recording Institute

"What a great educational tool! My students can now learn the technical specifications and the sonic characteristics of microphones which normally aren't available to them. With studio time in such demand, it's a great way to get to know the mics before going into the studio."

Wesley Bulla
Coordinator of Recording Studio Curriculum
Belmont University

"Hey, I got the CD-ROM and it's great! Finally, you get a chance to look in a top engineer/producer's toolbox without having to buy all of the tools."

David Miles Huber
Author and musician

Allen Sides has recorded and mixed sessions for dozens of world-class artists such as Ry Cooder, Count Basie, Ray Charles, Sinead O'Connor and Brian Setzer. His Ocean Way Studios is a three-time winner of *Mix* magazine's coveted TEC Award for Outstanding Recording Studio.

David Schwartz, producer of this CD-ROM project, is the founder and senior consulting editor of *Mix*, the world's leading magazine for sound and music recording and production.

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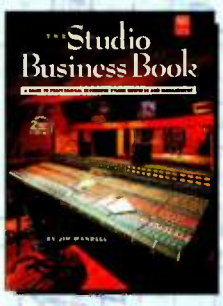
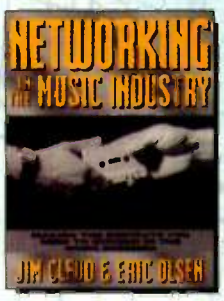
BESTSELLERS



THE STUDIO BUSINESS BOOK, Revised Edition

Jim Mandell
©1994, 288 pp. (P)
1319A) $34.95

The updated MixBooks edition of this informative, wide-ranging guide offers in-depth, detailed, specific information on all aspects of putting together and managing a recording studio, including: writing a business plan; getting funding; buying equipment; determining expenses and rates; bidding on projects; developing new income and contacts; advertising and PR; scheduling; managing, hiring and firing personnel; and more. It also includes a reference guide to studio terms and technology, a list of industry organizations and a recommended reading list.



NETWORKING IN THE MUSIC INDUSTRY

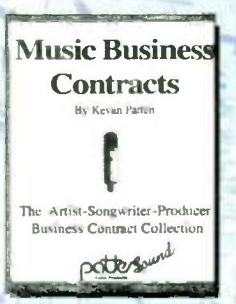
Clevo & Olsen
©1993, 225 pp. (P)
3052A) $19.95

Find ways to meet other music professionals who can help your career with this streetwise book. Learn how to use music conferences, video, computer bulletin boards, music associations and the press to make valuable new contacts. Includes candid discussions of label/artist relationships, music publishing and the indie scene.

101 WAYS TO MAKE MONEY RIGHT NOW IN THE MUSIC BUSINESS

Bob Baker
©1992, 140 pp. (P)
3045A) $14.95

If your career plan only covers gigging and recording, you could be ignoring dozens of money-making opportunities. Use this book to discover specialized niches you may have overlooked, generate extra revenue and jump-start your career. Don't spend a lifetime paying dues—explore these untapped markets and cash in now!



MUSIC BUSINESS CONTRACTS

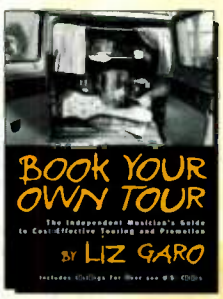
Kevan Patten
©1993, 44 pp. (Bound) plus disk.
Macintosh: **3031-MA) $49.95**
IBM (3.5" disk): **3031-P3A) $49.95**

Cut down on your legal fees with this collection of essential music contracts on computer disk! You get a wide variety of contracts for recording and publishing deals, plus forms for songwriters, vocalists, performers, joint ventures/partnerships and producers—43 contracts in all. The documents are in Microsoft Word format for Macintosh or PC.

RELEASING AN INDEPENDENT RECORD, 5th Ed.

Gary Hustwit
©1995, 182 pp. (P)
3025A) $24.95

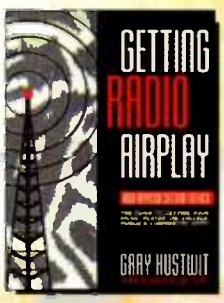
Updated edition shows, step by step, how to run your own record label and market your music on a national level. Learn how to get reviewed by the press, work with distributors, sell direct to retailers and tour behind your album. Features all-new sections on publishing and performing rights, sample contracts and a music publisher directory, plus expanded, updated directory information, including over 3,000 contacts in retail, distribution, print media and booking.



BOOK YOUR OWN TOUR

Liz Garo
©1995, 175 pp. (P)
3049A) $19.95

City-by-city directories of clubs, promoters, record stores, radio stations, print media and other fun stuff, like where to sleep and eat for cheap. Includes sections on putting together promo packages for clubs, dealing with club owners and promoters, getting paid and using local media, as well as sample contracts, tons of interviews with folks who've been through it all. There is even a van buyer's guide and directions for building a loft! This is by far the most complete title of its kind.



GETTING RADIO AIRPLAY, 2nd Ed.

Gary Hustwit
©1993, 125 pp. (P)
3027A) $19.95

Learn how to get your record played on radio and make waves for your band by being smart about sending out review albums and professionally following up with phone calls. Features interviews with radio station music directors, record label promotions staff and independent artists who've done it. Includes new, updated college and commercial radio directories.

MIX REFERENCE DISC

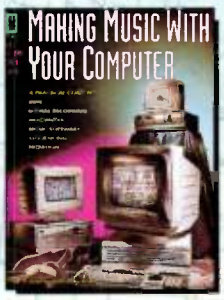
From Mix magazine
©1994, one compact disc
MRD) $14.95

This versatile professional tool has a variety of applications, including tape-deck alignment, audio-equipment calibration, testing sound-system performance, troubleshooting and diagnostics. It features alignment tones, 1/3-octave bands, frequency sweeps, a digital black-noise check and frequency response tests, at a fraction of the cost of competing test-tone CDs.

Bookshelf BESTSELLERS

MODULAR DIGITAL MULTITRACKS: The Power User's Guide
George Petersen
©1994, 128 pp. (P)
003A) $29.95

The only book on the revolutionary new modular digital recorders! Petersen provides unbiased evaluations of the units and various peripherals; inside tips on connecting and operating them; advanced techniques for synchronization, editing and mixing; features that aren't mentioned in the manufacturers' literature; and secret commands and undocumented error messages. And the book pays for itself, with instructions for making your own cables and snakes!



MAKING MUSIC WITH YOUR COMPUTER
David (Rudy) Trubitt, ed.
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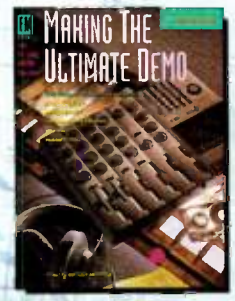
013A) $17.95

A valuable introduction to the basics of computer music—whether you're a computer user entering the world of music and sound or a musician searching for the right computer, this book will help you get the most out of today's electronic music technology. You'll learn how computers contribute to the creative process and get tips on selecting programs and gear, plus info on MIDI sequencing, music notation, hard-disk recording and desktop multimedia, a directory of manufacturers and an extensive glossary.



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This book will teach you how to record and market a demo tape—a critical step toward gaining exposure for your music. You'll learn how to record killer vocal and instrumental tracks, use signal processing like the pros and make intelligent mixdown decisions. And once your ultimate demo is "in the can," you'll know how to release and promote your recording on a budget and approach record labels without wasting your time. Packed with tips from industry veterans, this book will improve both the sound of your recordings and your prospects for success.

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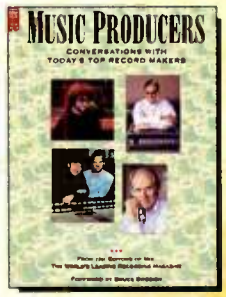

MUSIC PRODUCERS: Conversations With Today's Top Record Makers
The Editors of Mix
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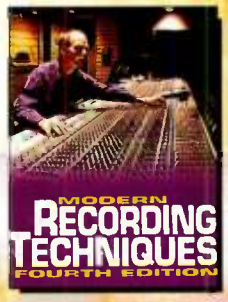
006A) $17.95

Twenty-four producers, including Don Dixon (R.E.M.), Bruce Fairbairn (Aerosmith), Daniel Lanois (U2), Bill Laswell (P.I.L.), Jeff Lynne (Tom Petty), George Martin (Beatles), Hugh Padgham (Sting), Phil Ramone (Billy Joel), Rick Rubin (Red Hot Chili Peppers), Don Was (Bonnie Raitt) and 13 others, discuss how they got started, how they mediate between labels and artists, what equipment they prefer, analog/digital format decisions, how they "build" a mix and much more.



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Bookshelf BESTSELLERS

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Christopher Yavelow

In-depth analysis of over 800 Mac hardware and software options for MIDI sequencing, notation, digital audio, sampling and multimedia, plus System 7 coverage. ©1992, 1,398 pp. (P) **3522B) $37.95**

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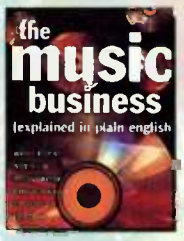
This classic advanced book on studio planning and construction covers acoustics, soundproofing and studio and control room design. ©1984, 209 pp. (Spiral) **1300C) $29.95**



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Naggar, Esq. & Brandstetter, Esq.

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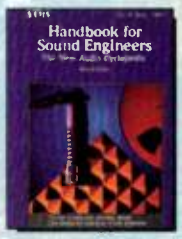

HANDBOOK FOR SOUND ENGINEERS: The New Audio Cyclopedia, 2nd Ed.

Glen Ballou, ed.

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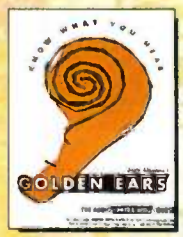

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converters. Similarly, the GI-10's user interface shows dramatic improvements over those on previous models (e.g., the GR-50). It's a breeze to work with.

THE LAYOUT

The GI-10 is a half-rack unit that can be rack-mounted with the optional RAD-50 adapter ($34.95). Power is supplied by a detachable 9VAC adapter, and a power switch is on the rear panel.

To properly experience the GI-10 you'll need the following items: a guitar fitted with a GK-2A pickup ($275), the 13-pin cable that connects the GI-10 to the GK-2A (which comes with the GI-10, not the GK-2A), and a MIDI sound module or keyboard. (In case you don't want to alter an existing guitar, three guitar manufacturers offer "Roland-ready" instruments fitted with a GK-2A, including a Fender Strat, two Ovation models, and nylon and steel-string acoustics from Godin.)

There are two inputs on the GI-10's front panel. One is a 13-pin connector that accepts the output of a GK-series pickup. GK-2A pickups send not only pitch information from each string but also increment/decrement and MIDI Volume information via three controls mounted on the pickup.

The other input is a ¼-inch jack that can be used to connect a microphone. This allows the unit to function as a pitch-to-MIDI converter for vocals, instruments, or guitars that aren't fitted with a GK-2A pickup. The microphone input is strictly monophonic, so forget about playing chords into it. A knob to the right of the ¼-inch jack adjusts the input level. Anything plugged into the mic input jack takes precedence over the GK input. As we'll see, however, this input is of limited practical use.

The only display is an 8-segment, 3-character LED whose messages are downright cryptic. Luckily, there aren't too many parameters, so you should be able to memorize the messages (or should I say, "hieroglyphics") quickly. However, in case you forget some of the more difficult messages, a map of parameters and their associated values is printed on the right side of the unit to help jog your memory. The map takes up a good fifth of the unit's face, which gives you an idea of how few controls this unit actually has. The main controls are a set of parameter increment/decrement buttons and a set of Value increment/decrement buttons. The Value buttons are accessible via the GK pickup, but not the parameter buttons.

The rear of the GI-10 has MIDI In and Out jacks. The MIDI Out can be switched to a MIDI Thru, allowing other controllers (e.g., a keyboard or drum controller) to be used instead of the GI-10. Of course, if the port is acting as a Thru, you can't use the unit as a MIDI guitar converter. If you want to simultaneously use the GI-10 and, for instance, a MIDI foot controller, you will need a MIDI merger or patch bay.

Also on the back panel are ¼-inch jacks to accommodate a sustain pedal and an expression pedal. The sustain-pedal input can be used with any normally-closed momentary footswitch and offers two types of Hold. Hold 1 is like a regular keyboard sustain pedal: it sustains everything you play. According to Roland (I didn't test this), with Hold 2, you can play a chord with some of the six guitar strings, sustain them with the pedal, and then play an unsustained part on the remaining strings. This was intended to work with certain features of Roland's Intelligent Arranger-series keyboards.

The expression-pedal input can be used with any normal CV pedal to send MIDI Control Change 1 (Modulation) or CC 11 (Expression). It's surprising Roland didn't use CC 7 for Volume, but CC 11 potentially offers more control possibilities if your synthesizer allows Expression to modulate a variety of parameters in addition to Volume (e.g., filters or loop modulation points). The GI-10 would be even cooler if it could send multiple, selectable Control Change messages simultaneously with its Expression pedal.

Roland's GI-10 guitar-to-MIDI interface offers superior tracking in a compact, no-nonsense package.

THE PARAMETERS

Including the Play and Tuner functions, the unit has a total of nine functions: MIDI Channel Assign, Bend Range, Poly/Mono Operation, Octave Shift, Pitch Bend Data Thin, Attack Noise Filter, Pedal Assign, Touch Sensitivity, Pickup Sensitivity, and Master Tune.

Most of these parameters are self-explanatory, especially to anybody familiar with previous Roland guitar-to-MIDI interfaces. However, Pitch Bend Data Thin, Attack Noise Filter, Pickup Sensitivity, and Touch Sensitivity are special features designed to enhance the operation of Roland's interface, and these need a little explanation.

The GI-10 sends out enormous amounts of Pitch Bend data, which can overwhelm a sequencer with limited event memory. The Pitch Bend Data Thin parameter can limit the amount of Pitch Bend data that is sent out so that memory problems do not arise. This function has three settings: Normal, Off, and On.

According to the GI-10's user manual, the Normal setting constrains the Pitch Bend data to an amount equal to the capacity of your sequencer; how it knows the capacity of your sequencer is beyond me. (Maybe it's psychic.) The On setting constrains the data more than the Normal setting, and the Off setting puts no constraints on the Pitch Bend data at all. I couldn't hear much difference between the Normal and Off settings when bending notes. I could hear a dramatic difference between these settings and the On setting, though; it causes Pitch Bend to be stepped and therefore far less smooth.

The Attack Noise Filter parameter addresses the problem of mistracking that often occurs upon the initial attack of a guitar string. When a guitar string is first plucked, its pitch wavers for an instant before settling down. At

that instant, it is difficult for the interface to recognize the pitch of the guitar string. Anyone who has used one of Roland's older converters and heard weird harmonics and glitches at the beginning of notes has experienced this problem.

Turning on the Attack Noise Filter parameter (it is either on or off) causes the GI-10 to wait until the pitch of the note is stable before sending the corresponding MIDI note. According to Roland, this causes a slight delay from the time the guitar string is struck to the time the MIDI note is sent, but it greatly decreases tracking problems. I didn't hear much delay, but I noticed a decrease in tracking errors. Unfortunately, I also noticed that performances with the Attack Noise Filter engaged were less expressive.

Pickup Sensitivity, as its name implies, lets you vary the response of GK-2A pickups without having to physically reposition the pickup. This is crucial, because the pickup's distance and angle from the strings, as well as the string gauge and body type, affect how the pickup tracks. Unlike older interfaces (e.g., the GR-50 or the GR-70) that could only have their pickup sensitivity adjusted through tedious hacking, the GI-10 has an easily reached page that allows each string's pickup to be individually tweaked to optimize the tracking of its corresponding string. (GK-2A pickups consist of six monophonic pickups, one for each string.) Each pickup can be set to a value ranging from one to eight.

Like the Roland GR-09 guitar synth, the GI-10 has a Touch Sensitivity parameter with three values to accommodate fingerpicking, normal flatpicking, and hard flatpicking. This parameter is similar to simple Velocity offsets on some keyboards.

Together, the Pickup and Touch Sensitivity parameters allow the GI-10 to be quickly and efficiently optimized to track different playing styles on different guitars. For example, I generally have to use a pick with most guitar controllers to get a readable attack. With the GI-10, however, I could adjust tracking to follow my preferred style of playing: fingerpicking with no fingernails. (This yields a very soft attack that most guitar controllers can't follow.) The combination of my fingerpicking, the GI-10's great tracking, and an organ patch on my Voce synth resulted in a great setup for jazz organ comping.

ALL STRUNG OUT

The GI-10 is the least expensive and easiest to operate guitar-to-MIDI interface from Roland. But if Roland was after simplicity and cost effectiveness, why did they bother to include the microphone input? I tried plugging in both a microphone and the direct audio output of a guitar to the ¼-inch microphone input. With the guitar, the GI-10 tracked simple lead lines well, but as soon as I tried anything fancy, it got lost.

The unit had a very difficult time tracking the human voice (so what's new?) but did much better on instruments that emitted pure, simple tones. For example, I tried miking a vibraphone and a saxophone. As long as I stayed simple and didn't play anything too fast, the GI-10 tracked these instruments quite well. My take on the microphone input is that it can create some cool special effects, but I couldn't find much use for it when it came to doing serious music.

According to Roland, the microphone input function was included on the GI-10 by popular demand; the company receives several calls a week from consumers desperate for a pitch-to-MIDI converter, and this was a simple way to grant their wish. As a guitarist, however, I would gladly trade the microphone input for a backlit LCD that displays comprehensive and decipherable messages. No doubt, the backlit LCD would cost more than the current LED, but omitting the mic input would offset the price difference and greatly improve the unit's user interface.

The GI-10 is the only unit of its kind in its price range. What is really important about any guitar-to-MIDI converter is how well it tracks, and the GI-10 tracks incredibly well. Right now, it is simply the best.

Erik Hawkins *is a producer and musician in Los Angeles county and the San Francisco Bay Area. He is an associate of Digisonic Studios in Berkeley.*

Product Summary

PRODUCT:
GI-10 guitar-to-MIDI converter
PRICE:
$695
MANUFACTURER:
Roland Corporation US
tel. (213) 685-5141
fax (213) 722-0911
CIRCLE #443 ON READER SERVICE CARD

EM METERS	RATING PRODUCTS FROM 1 TO 5
FEATURES	● ● ● ◖
EASE OF USE	● ● ● ◖
DOCUMENTATION	● ● ●
VALUE	● ● ● ◖

The Synclavier Co. S/Link 2.0 (Mac)

By Darius Taghavy

A universal translator for audio files.

Sometimes I feel like Multi is my middle name. In the course of creating multiplatform, multimedia software, I often need to transfer and convert files between multiple—but not always compatible—Amiga, Atari, MS-DOS, Mac, and Windows applications.

Until recently, I've relied on dissidents' *MIDI Sample Wrench* to convert audio files. This Amiga sample editor (reviewed in the February 1990 issue of **EM**) supports bulk file conversions between several formats, but only via complex macros. The process is fairly easy for programmers like me, but not for nontechnical types. Furthermore, *Sample Wrench* does not support the Sound Designer II format. And even if it did, it doesn't run on the Macintosh. The sad fact is, despite the platform's dominant position in the music industry, Macintosh multimedia producers and musicians have had to get by without a commercial bulk audio-file conversion program.

With the introduction of *S/Link,* a sample transfer and translation program for the Mac, The Synclavier Company has filled the gap. *S/Link* supports many formats, including AIFF, Amiga 8SVX, Macintosh System 7, QuickTime, raw audio (Intel and Motorola byte-ordering), Sound Designer I and II, Sun, NeXT, AU, SND, Creative Labs VOC, and Windows WAV. Mono and stereo samples are supported, as are several

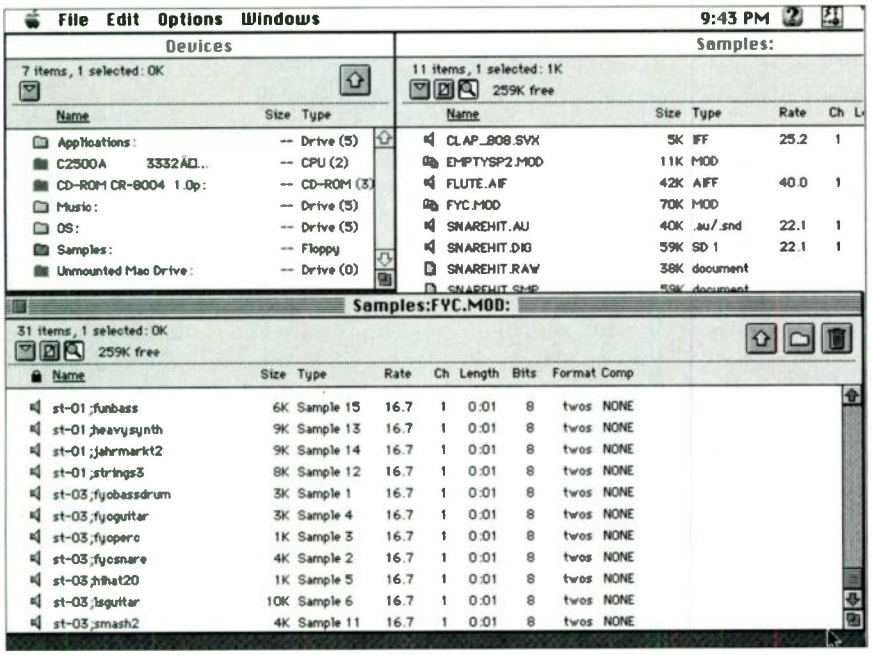


FIG. 1: The Device Directory window looks and operates very much like the Mac Finder. You simply select the files you want to copy/convert and "drag and drop" them into another window.

compression schemes. *S/Link* can also convert sample rates and resolutions. In addition to samples, the program also supports conversion between OMF files, Synclavier sequences, and Amiga/PC MOD files (read only).

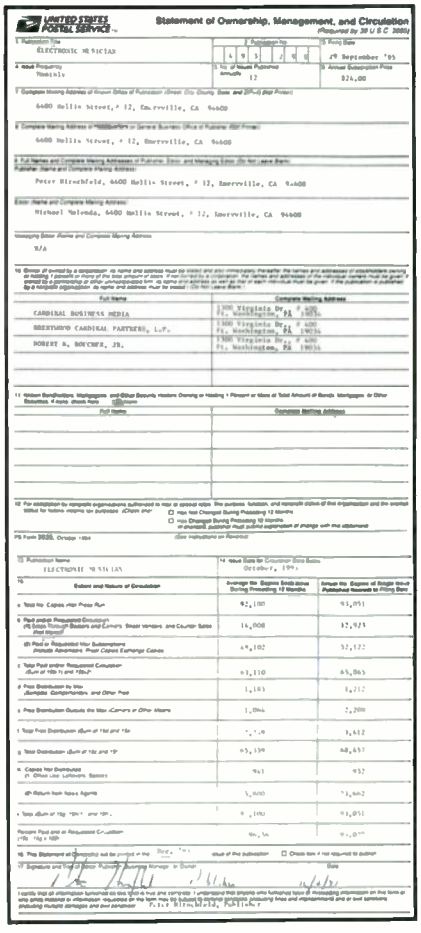
PRICE OF ADMISSION

S/Link requires at least a 68020 processor and a floating-point processor (or FPU emulation software) or a Power Mac, running System 7.0 or later with Sound Manager 3.0 or later. QuickTime is supported, but optional. No external hardware is necessary, but obviously if you don't have a Mac with built-in 16-bit sound, you'd be well advised to get a 16-bit sound card such as Digidesign's Audiomedia II. The package comes with two disks: one contains a native Power Mac version, the other a version for 68K processors. I reviewed the latter.

After perusing the easy-to-read, 35-page manual (which offers no application notes), I was ready to install the program on a removable SyQuest cartridge. Unfortunately, like many other Macintosh music applications, *S/Link* uses a disk-based copy-protection scheme with two "authorizations." Running the program's installer was simple enough. After copying all the necessary files, it politely informed me that the authorization process was complete, one authorization remained, and that I could use the program now. I did, and everything worked fine.

However, the next time I booted the system and tried to launch *S/Link*, a dialog box complained that this was an "unauthorized copy" and asked me to insert the key disk. I obliged and was led back into the install program, which offered to authorize the program. Lacking alternatives, I proceeded. Like the first time around, the installer claimed everything was dandy, except I now had zero authorizations left. Something was clearly not right, but at least the program ran. On the next bootup, however—you guessed it—"unauthorized copy: please insert key disk." Needless to say, the authorization count was now zero, and the installer refused to proceed.

After several phone conversations over a three-week period with various Synclavier employees, I was informed that there were indeed some problems with certain system configurations and that a fix in the form of a new revision was on the way. According to Brian George at Synclavier, very few people have reported any problems, but there are several hundred copies out there with the same installer version that gave me trouble. If you experience the symptoms I described, contact Synclavier for an update. Because I did not receive the update until after deadline, I ran the program directly from the key disk.



ON THE JOB

Once running, *S/Link* is easy to use. It has a point-and-click graphical user interface for transferring data between directories, even across different disks, SCSI devices, and Apple Talk networks. Its mouse control is intuitive, and plenty of keyboard shortcuts speed operation once you know your way around.

S/Link's main window, the Device Directory window, is where you view sample properties and select samples and folders (see **Fig. 1**). This window looks and operates very much like the Mac Finder. Each time you double-click on a device or drawer, you get a new Device Directory window that shows its contents. You select the files you want to copy (single files, directories, or any combination) and simply drag and drop your selection into another window to copy/convert.

At its most basic level, *S/Link* can transfer single files, but its real power lies in its ability to transfer collections of samples while optionally converting them to a different format and preserving your folder hierarchy. This is obviously much more fun than re-creating an intricate, nested subfolder layout on your target device and then transferring samples one by one, especially if you're a multimedia producer facing the staggering amounts of data that can fit on a CD-ROM.

To validate this point, I loaded up a copy of *Kaboom!* This CD-ROM disc contains 1,000 samples, including eighteen cartoon-character sounds, which I decided would be fun additions to one of my *Amiga Vision* scripts. *Amiga Vision* is a multimedia authoring application that only accepts IFF 8SVX files, whereas *Kaboom!* contains samples in AIFF and WAV formats.

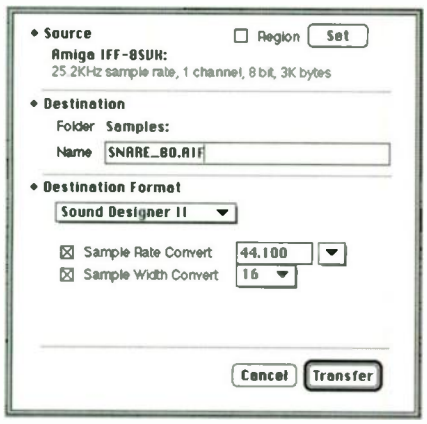


FIG. 2: Sample translation parameters are quickly and easily set in *S/Link*'s Transfer dialog using pop-up menus.

I inserted the CD-ROM in my player, selected Rescan (you have to do this whenever you change a device), and double-clicked a few more times to arrive at the desired subfolder. I then dragged the folder's icon to the SyQuest-disk icon in the root Device Directory window. This action caused the Transfer dialog box to appear (see **Fig. 2**). Using the dialog's pop-up menus, I set the destination format to 8-bit Amiga IFF-8SVX. A click on the Transfer button initiated the copy/conversion process.

After *S/Link* had completed its job, I ejected the SyQuest cartridge. Then, using the Cross-Mac file system for the Amiga, I mounted this Mac-formatted SyQuest cartridge under Amiga DOS (which is similar to *PC Exchange* on the Mac) and—*voila!*—Toontown meets *Amiga Vision*! I'm sure you understand that I didn't feel like verifying the other 982 samples, but these samples survived the trip just fine.

MUSIC EXCHANGE

The next project was of a more musical nature. I wanted to trigger a happening funk bass sample from within *Cakewalk Pro* 3.0. But even though the FM clavinet on my budget PC sound card sounds surprisingly good, the basses lack punch, to put it mildly. I do have a great bass sample, but it's stored in AIFF format on a Mac-formatted SyQuest, and *Cakewalk* only reads Windows WAV samples. Once again, *S/Link* came to the rescue.

I opened the folder containing the sample and a few mouse-clicks later, *S/Link* had transferred it from my SyQuest cartridge to a high-density MS-DOS floppy (formatted using *PC Exchange*). Along the way, the program simultaneously converted the sample to WAV format. Moments later, my funk groove finally pumped.

I then turned my attention to MOD files, a format that originated on the Amiga, spread to the PC, and now enjoys great popularity on both platforms. MOD files are self-contained music files, i.e., they contain samples and the note and pitch-bend information necessary to play them as a song. Because *S/Link* reads MOD files and writes OMF files, it is now possible to move files

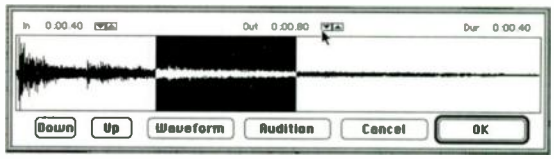


FIG. 3: Although extremely basic compared to a dedicated sample editor, *S/Link* has a Waveform window that provides a graphic way to extract a region from a sample.

from the cheapest electronic music setup (a bare-bones Amiga 500) to the most expensive Avid system. Because I don't have an Avid AudioStation (it costs more than $24,000), I couldn't test that conversion. I could, however, extract samples from MOD files, which turned out to be an enlightening experience, as I discovered many useful bass, percussion, and effects samples that use as little as 1 KB of storage.

Having all the most popular editors at my disposal, such as *Sound Designer II* and *Sound Forge*, gave me ample opportunity to throw all kinds of different file formats at *S/Link*. I paid special attention to loop points, which, by the way, are only supported by a few formats. (I tested AIFF and Sound Designer II.) If you have ever created a smooth sustain loop, you know that it can take a lot of effort. The last thing you want a conversion utility to do is mess with or, heaven forbid, lose those loop markers. I am glad to report that *S/Link* converted everything, including loops, without hiccups.

EXTRA, EXTRA

S/Link also has a few extra features. For example, you can use it to audition samples via your Mac's internal sound-generating hardware. Simply hit the space bar, and you'll hear the active selection. *S/Link* uses Apple's Sound Manager 3.0 (or later), which means no additional hardware is needed, even on Macs with 8-bit sound. And if you want better sound quality, you can use Digidesign's Sound Driver to patch Sound Manager to reroute all audio through the D/A converters of a Digidesign card, such as Audiomedia II.

The Sound Doctor window allows you to interpret *any* file as an audio sample. The manual contains a goofy suggestion to audition spreadsheet or word-processor files to discover what they sound like. Yeah, right! Of more practical value is the potential to recover, at least partially, samples from

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files with damaged sound headers and to import unusual file types that have no header information. In either case, it helps to know the sample rate and bits per sample, but you can also experiment with these values until things sound right.

Finally, you can view a sample's waveform graphically and extract part of it as a new sample (see **Fig. 3**). This allows you to lift sections of an audio CD to be used as musical samples, for example. Don't get your hopes up, though; the waveform display and editing features are as bare-bones as they get. They are definitely not meant to be a substitute for a dedicated sample editor.

Product Summary

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MISSING LINKS

If *S/Link* could write to, and not just read from, MOD files, it would make game designers very happy, as they could use Pro Tools, Avid editors, or a Synclavier to create top-notch game soundtracks. Another great feature would be dithering, as in *Sound Designer II*, to decrease quantization artifacts when down-sampling from 16- to 8-bit. This would allow the highest possible audio quality when bulk converting professional 16-bit libraries to be used in games and multimedia applications.

I would also welcome sampler support, especially direct transfers via SCSI. Finally, additional compression drivers might be handy, such as those for Microsoft's Audio Compression Manager (ACM), which is gaining in popularity.

CONCLUSION

If you only need to convert a few samples here and there, chances are that you can already do so if you own a good sound editor, especially if the samples use common file formats. Just don't try to use such a tool to convert a large CD-ROM library manually when facing a tight production schedule; you'll need the patience of Tibetan monk or nerves of steel. For those who routinely need to convert samples between different formats or need to support an unusual format, *S/Link* 2.0 will get the job done with minimum fuzz, er, fuss.

Darius "Multi" Taghavy *seeks his beloved Oakland ZXI-200, natural finish, neck-thru-body electric guitar with a 6-digit serial number, sold in Germany only. It disappeared in the summer of 1985 from NYC/JFK. If you have one that was not bought directly from a German owner, please contact me via* **EM**.

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TECH PAGE

Interactive Light

MIDI control gets cast in a new light.

By Scott Wilkinson

Almost all musical instruments require physical contact to play them. The most notable exception is the Theremin, which is played by waving your hands in the air near two antennas. The experience of controlling sound without tactile feedback is strange, but it offers a certain freedom that can be very exhilarating. Now, a company called Interactive Light (tel. 310/581-8411; fax 310/452-7443; e-mail vincentdef@aol.com) is developing light-based controllers that promise to go way beyond Leon Theremin's famous invention.

The company was formed several years ago to create a music system that could be controlled by dancers on stage. The dancers would break invisible beams of light with different parts of their bodies as they moved, controlling music, sound effects, lights, and all other performance parameters. After a suitable preexisting technology could not be found, they developed their own: Smart Beam.

The Smart Beam concept is based on emitting infrared (IR) light in pulses that occur several thousand times per second. A photodiode, which senses light intensity and translates different intensity levels into electrical signals, is located right next to the emitter. If you position an object to reflect light from the emitter to the photodiode, it detects the change in light level and sends a corresponding electrical signal to a microprocessor. An optical filter blocks all but IR wavelengths, and the microprocessor is programmed to ignore ambient, steady-state light from any source.

The shape of the pulsed beam and the photodiode's field of view are determined by carefully controlled optics. The intersection of the beam shape and the field of view along with the intensity of the reflected light from any position define the shape of the active sensing area with surprising precision. The microprocessor includes many sensing and filtering algorithms, which further refine the sensing area's shape.

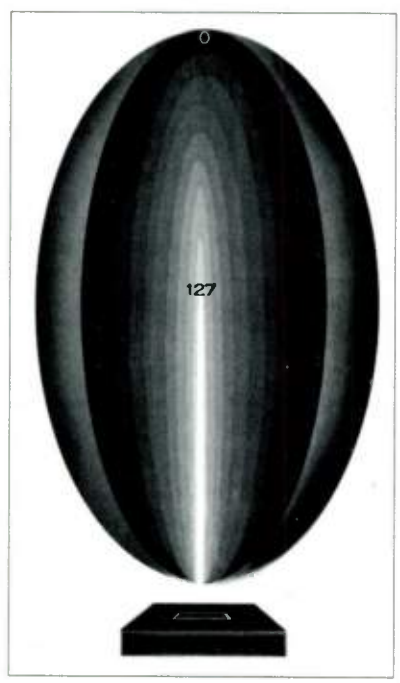

FIG. 1: The Dimension Beam generates an egg-shaped sensing area that is divided into many layers, each corresponding to a different MIDI message value.

The sensing area can be divided into many layers that resemble the layers of an onion (see **Fig. 1**). Each layer is defined by the distance at which the reflected-light level remains constant at various angles. If you move an object closer to the emitter/sensor pair, the reflected-light level increases. This causes the photodiode to send corresponding signals to the microprocessor, which translates these signals into various messages. Not only that, the system can measure the velocity of an object entering the sensing area, thanks to its well-defined boundaries.

This research and development has led to a number of interesting products. For example, the Dimension Beam generates a sensing area in the shape of an ovoid onion. As you move an object from the outer surface to the center of this area, the unit sends different values of Pitch Bend, Note On/Off, or any Control Change. This lets you control synths, effects, lights, and other parameters by moving an object—your hand, the headstock of a guitar, etc.—through the sensing area.

The company is also working on a line of products under the Light Harp moniker. These products include several emitter/sensor pairs that can be configured in many different ways. For example, the Body Harp consists of eight emitter/sensor panels that form an octagon around the performer. Each panel sends a Note On when something enters its Velocity-sensitive beam, and the height of the object above the panel controls Volume. Clearly, Interactive Light is doing some very exciting work, and I look forward to playing with their toys.

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