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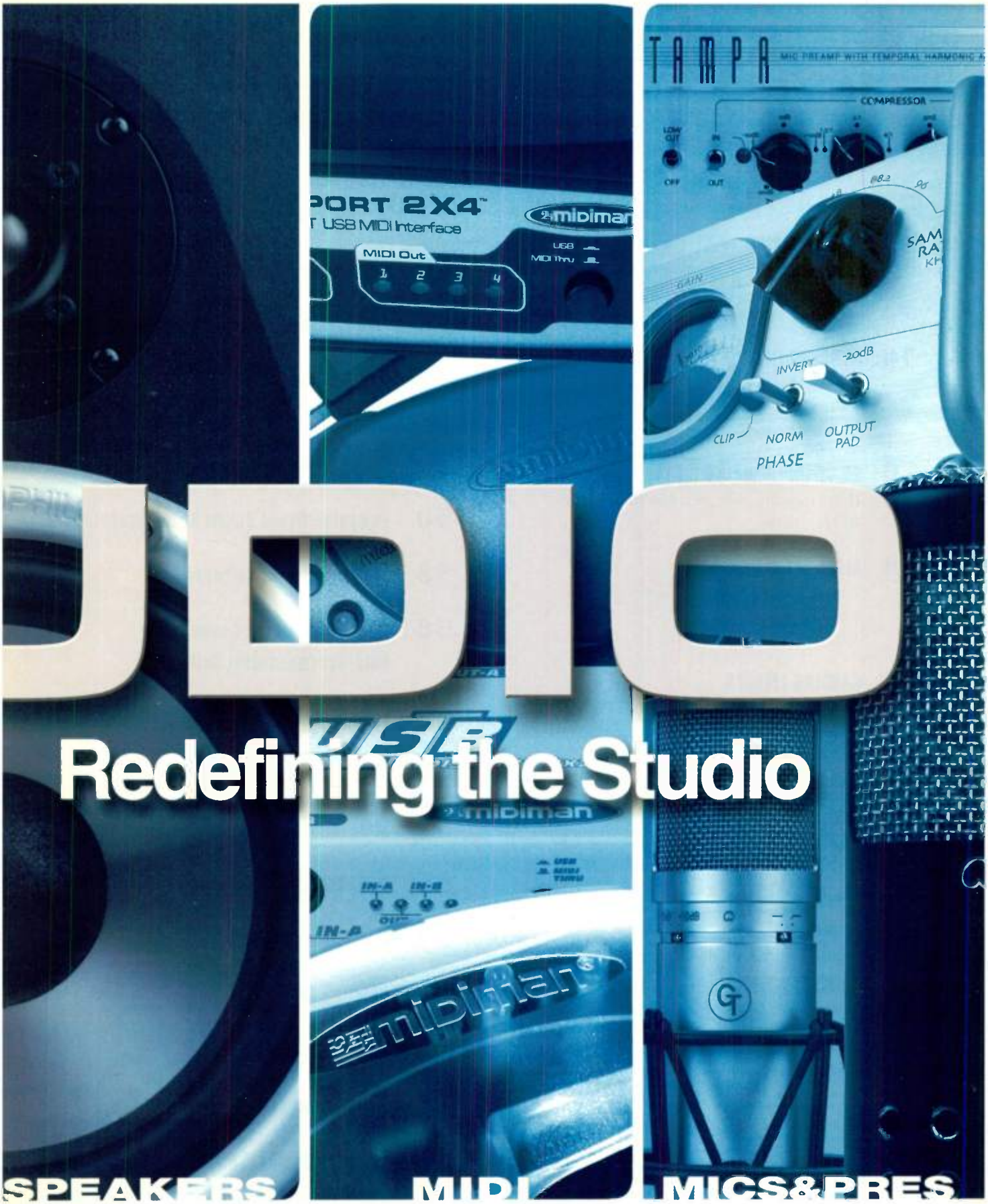

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COMPUTER MUSIC PRODUCT GUIDE™

2003 Edition

FEATURES

DEPARTMENTS

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"The compatibility champion is clearly the US-428."

- Brian Smithers, Electronic Musician, February 2002

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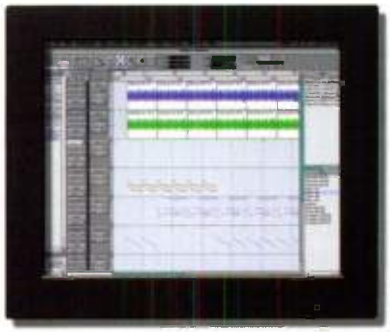

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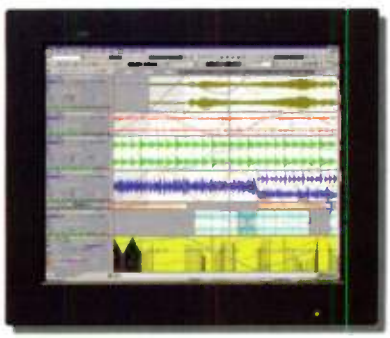

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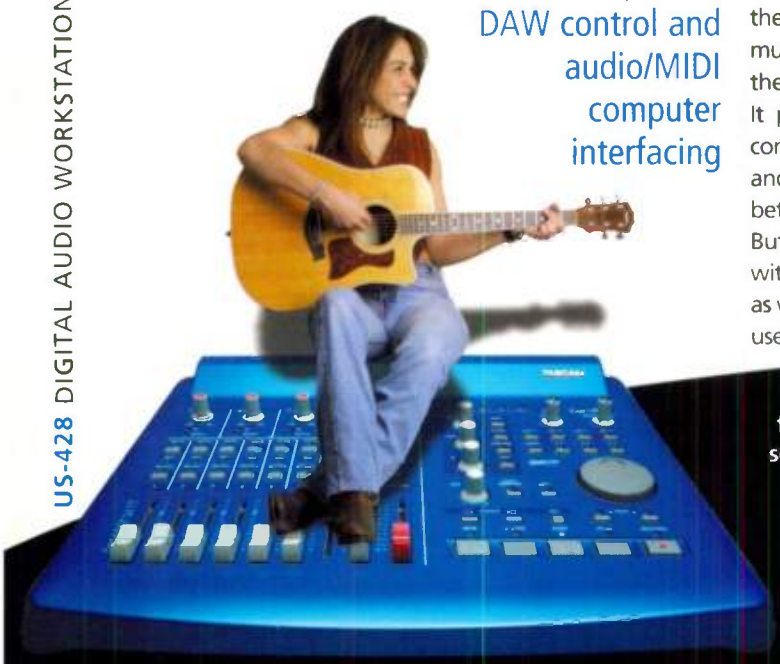

If your DAW control surface isn't compatible with your preferred DAW software, there are still some good uses for it...like a doorstop. Or a paperweight. But if you want the controller that works with the widest variety of music/audio software applications, your solution is clear: the US-428 by TASCAM and Frontier Design Group. It provides real faders and knobs to give you creative control of the parameters of your favorite audio software, and also acts as a high-quality audio and MIDI interface between your music and your USB-equipped Mac or PC. But the big advantage of the US-428 is that it's compatible with nearly every popular audio/MIDI software application as well as many virtual instruments, so no matter what you use to make music, it's ready to rock.

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Here are some of the innovative software developers who offer support for the US-428, with more apps added all the time. See the TASCAM web site for the latest info.

Editor's Note

Although you can build a fine electronic-music studio without a computer, having one gives you access to some of the most powerful and innovative music products ever created. Each year brings something we've never seen before. In *Electronic Musician* magazine's early years, many of our readers and all of our editors were among the few, the proud, the computer fanatics. Today, computers are mainstream household appliances, and we electronic musicians are even more involved with them than we were 15 years ago.

Obviously, **EM** reflects the editors' enthusiasm for computers as music-production tools, and we have traditionally dedicated a significant part of each issue to computer-music products and applications. But we have never published a comprehensive guide to computer-music products—until now. True, our annual *Personal Studio Buyer's Guide* includes digital audio sequencers, MIDI interfaces, DAWs, and control surfaces, but that represents only a few of the many types of computer-music programs and peripherals.

The *Computer Music Product Guide* changes all that. For the first time, you have a truly comprehensive reference work that covers every commercial computer-music production tool that we could find. But CMPG is more than just a list of companies, products, and list prices; we've also provided as many of the features and specifications as we could jam into 100 pages. Accompanying the charts are five carefully selected articles from the pages of *Electronic Musician*, which offer a wealth of tips for designing sounds, solving sync and timing issues, and more.

But we didn't stop there. A special Web "microsite" serves as an online companion to this guide. To find it, follow the CMPG link at www.emusician.com. The microsite includes additional relevant editorial from the pages of *Electronic Musician* and downloadable PDF versions of every chart in the guide. Furthermore, whenever you see the EM Web Clips icon in the magazine, it indicates that we have provided downloadable MP3 audio examples on the emusician.com site. To find the examples, just click on the matching EM Web Clips icon on our home page.

This guide is so handy, I don't know why we didn't start publishing it years ago. But now that we've created the first one, we plan to publish CMPG annually. Creating it required a lot of work by many people, but special thanks go to Tom Fulton, CMPG's charts editor, and to Linda Gough, CMPG's talented art director.

Electronic Musician presents
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Editor
– Tom Fulton, cmpg@primediabusiness.com
Editor in Chief
– Steve Oppenheimer, soppenheimer@primediabusiness.com
Managing Editor
– Patricia Hammond, phammond@primediabusiness.com
Assistant Editor
– Matt Gallagher, mgallagher@primediabusiness.com
Web Administrator
– Dan Cross

Art Director
– Linda Gough, linda@goughdesign.com
Group Art Director
– Dmitry Panich, dpanich@primediabusiness.com
Informational Graphics – Chuck Dahmer

Vice President – Entertainment Division
– Pete May, pmay@primediabusiness.com
Publisher
– John Pledger, jpledger@primediabusiness.com
Administrative Assistant
– Dianna Roberts, dtaylor@primediabusiness.com
Advertising Director
– Joe Perry, jperry@primediabusiness.com
East Coast Advertising Manager
– Jeff Donnenwerth, jdonnenwerth@primediabusiness.com
Northwest/Midwest Advertising Associate
– Stacey Moran, smoran@primediabusiness.com
Southwest Advertising Associate
– Mari Deetz, mdeetz@primediabusiness.com
Sales Assistant
– Anthony Gordon, agordon@primediabusiness.com
Marketing Director
– Christen Pocock, cpocock@primediabusiness.com
Marketing Manager
– Angela Muller Rehm, arehm@primediabusiness.com
Marketing Events Coordinator
– Alison Eigel, aeigel@primediabusiness.com
Classifieds/Marketplace Advertising Director
– Robin Boyce-Trubitt, rboyce@primediabusiness.com
West Coast Classified Sales Associate
– Kevin Blackford, kblackford@primediabusiness.com
East Coast Classified Sales Associate
– Jason Smith, jasmith@primediabusiness.com
Classifieds Managing Coordinator
– Monica Cromarty, mcromarty@primediabusiness.com
Classifieds Assistant
– Heather Choy, hchoy@primediabusiness.com

Vice President – Production
– Thomas Fogarty, tfogarty@primediabusiness.com
Senior Production Manager
– Curtis M. Pordes, cpordes@primediabusiness.com
Group Production Manager
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By Brian Smithers

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Double Vision

These days, both Macs and PCs support multiple video cards, enabling you to expand your desktop relatively easily and inexpensively. Adding a second 15-inch monitor and video card to your computer costs less than upgrading to a 21-inch monitor, and you actually end up with more total screen area. You'll also find that the total footprint of the two monitors is only slightly larger than that of the bigger monitor. For those of you whose minds aren't already reeling from the possibilities, let's first look at the advantages of a dual-monitor setup and then explore adding a second monitor to your system.

SIZE MATTERS

If you've ever programmed a synthesizer or sequencer from a two-line LCD, you'll find it hard to believe that you could ever complain about the limitations of a 17-inch computer monitor. (Next you'll be calling your 486 "too slow"!) Nevertheless, you must admit that when you launch your favorite software synthesizer or sampler along with your sequencer, you only have two options: run the programs full-screen and switch between them or try to squeeze them both onto your desktop.

As Fig. 1 shows, the "squeezing" approach is a losing proposition for a couple of reasons. First, if you set your display resolution to fit both programs comfortably, everything onscreen will probably be too small to read or manipulate. Second, most programs are designed to fit a standard display, so tiling the applications horizontally or vertically often distorts the user interface.

I constantly switch between my sequencer and my notation program, because I often compose in my sequencer and then import the resulting MIDI file into my score writer. If the translation isn't quite right, I have to edit the score by looking at the original sequence to see what I had in-

FIG. 1: Trying to squeeze two applications onto a single monitor is an exercise in futility. You can't do any serious work in either application's allotted space without scrolling around the screen. Switching between two full-screen applications is only marginally better.

FIG. 2: A second display monitor allows each program to have its own space. The Seer Systems SurReal window has gone from being too cramped to having more than enough room.

tended and then switch back to the score to make corrections. It definitely helps to have each program on its own screen, so I can simply glance back and forth.

Displaying each application on a separate monitor is clearly a superior solution. **Fig. 2** shows the same two programs as Fig. 1, but this time each is on its own screen. Everything necessary is now visible and within easy reach, unless of course you also want to see the sound card's mixer applet. Never fear—theoretically you can drive up to nine separate monitors on a Windows 98 machine, and your Mac will run out of PCI slots long before the operating system chokes from too many displays.

As you might have discovered, sometimes even a single program is too much for a lone monitor. In a typical digital audio sequencer, for example, once you have more than 12 tracks in your mixer view, the dreaded scrollbar appears. It's hard enough to mix with a mouse—now you have to scroll to reach all the faders.

A dual-display setup allows the user to stretch a single application across a greatly expanded desktop (see **Fig. 3**). This comes in handy for viewing longer tracks, squeezing more mixer channels onscreen, and displaying more subwindows, such as event lists, video displays, and piano-roll views. Although dual-monitor support is built into the operating system, stretching a program across multiple displays requires the cooperation of the application. According to Apple, any well-written Mac application will automatically spread itself across multiple displays, and the software makers with whom I spoke all claimed to offer support for multiple monitors on both platforms. Still, it's not a bad idea to check the Web sites of your favorite programs' manufacturers to see if there are known problems.

FIG. 3: A sophisticated digital audio sequencer such as Cubase VST can easily fill two monitors. If you move the Mixer view and the various other VST views to the right, you can devote the left screen to the Arrange window.

Double Vision

THE RIGHT STUFF

So what exactly do you need to expand your desktop studio's view? Well, if you have your platform's latest operating system, you're halfway there. Mac OS has supported multiple displays since the introduction of the Mac II in 1989. Microsoft finally added multiple-monitor support with Windows 98. There are some aftermarket multiple-monitor solutions for earlier Windows versions, but I'll focus here on OS-level support.

Naturally, you'll need a second video card and a PCI slot in which to put it. For both Mac and Windows users, finding slots can be a challenge. A Mac G3 or G4 user with an audio interface and a SCSI accelerator can put the second video card in that last PCI slot, but no room is left for additional system expansion. You could attach a PCI expansion chassis to your computer, but that adds significant cost. If your PC has an AGP slot, you can add an AGP video card and keep your PCI slots available for other hardware.

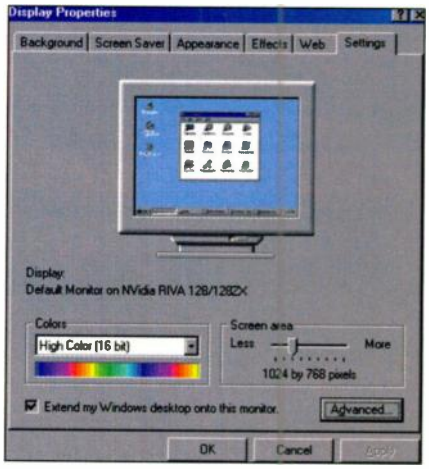
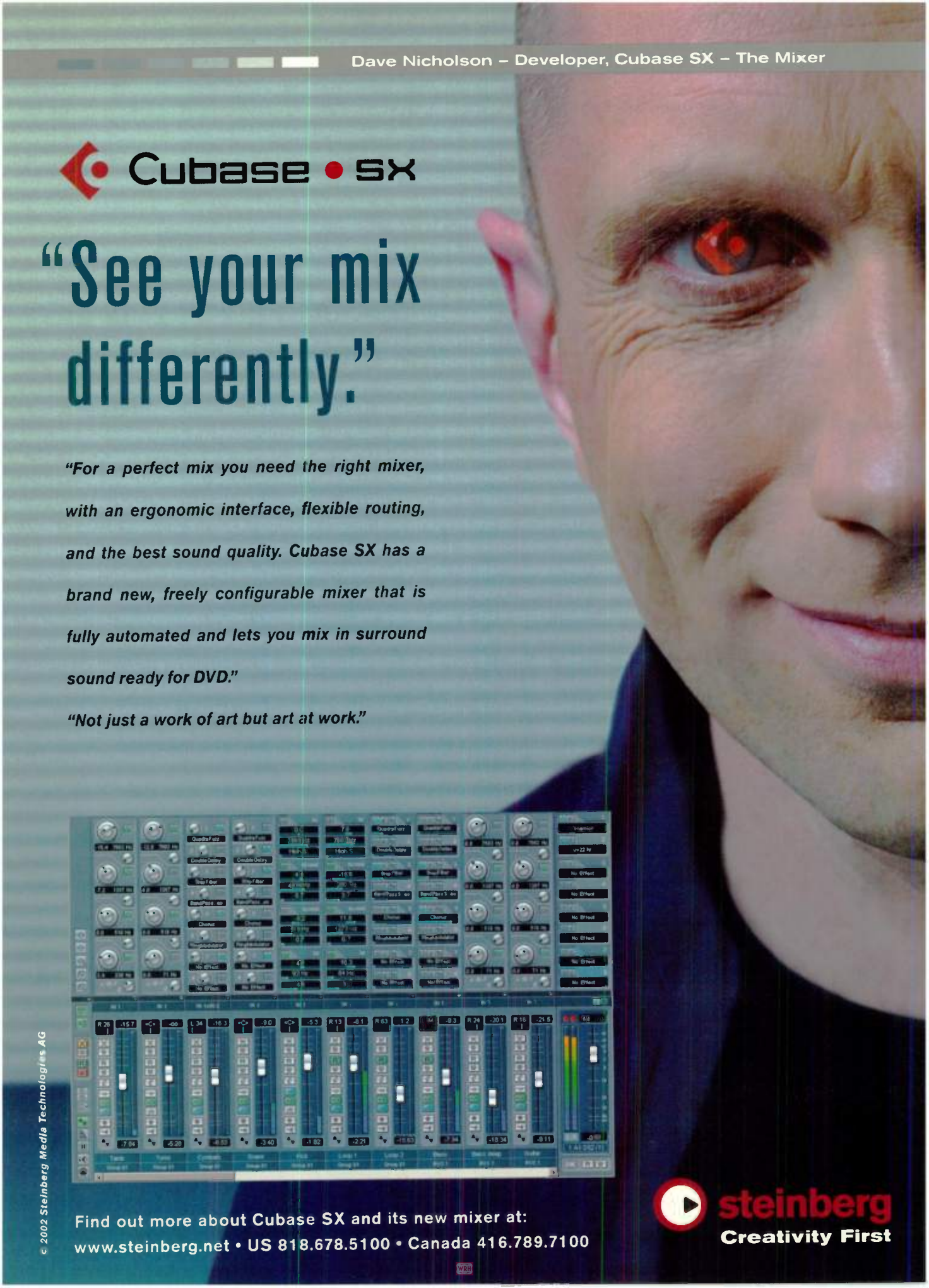


FIG. 4: Setting up an expanded desktop is child's play under Windows 98. You can double your work area just by clicking in the "Extend my Windows desktop onto this monitor" checkbox.

PC users have a file in their Windows directory called Display.txt that allows you to set up your system for multiple monitors. The file lists cards and chip sets (and sometimes specific driver versions) that are known to work in a multiple-monitor configuration, and provides step-by-step instructions for installing and configuring two or more video cards. It also includes trouble-

(continued on page 42)

FIG. 5: The Monitors control panel in Mac OS 9 lets you arrange your displays any way you want. Simply click on the Arrange button and drag the monitor icons into place.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By Brian Smithers

Synchronicity

Some thoughts on timing and sync issues from a musical perspective.

In music, as in life, timing is everything, and the technology of synchronization has evolved to address the persistent timing issues that arise from our increasingly complex desktop music systems. If you have more than one piece of gear in your studio, you probably need to start thinking about synchronization. As your studio becomes more complex, you must get a better understanding of how timing information is shared among devices and what level of timing accuracy is appropriate for your needs.

As you'll see, accurate timing is a context-sensitive notion that begins with the first rule of synchronization: No two clocks are identical, no matter how expensive they may be. World-class studios have to synchronize all of their equipment to a single clock to prevent things from drifting apart—and, to one degree or another, so do you.

YES, MASTER

The second rule is that accurate synchronization depends on all devices getting their timing information from a single *master clock*. Of course, this means that all of your other gear must be able to *slave* to an external clock, usually through a switch or a software checkbox labeled something like "Internal/External Clock." Ideally, you would use the most accurate clock in your studio as the master clock; if you have another device that functions only as a timing master, your options are more limited.

Timing information is carried from device to device by a signal known as *time code*. There are several different types of time code (see the sidebar "Syncspeak"), all of which are commonly lumped together under the term *SMPTE time code*, or just *SMPTE*. SMPTE divides the time line into hours, minutes, seconds, and frames in the format HH:MM:SS:FF. (The term *frames* refers to frames of film and reveals the origin of the standard.) A second is typically divided into a number of frames ranging from 24 to 30, depending on the film or video format being used.

Simply put, proper synchronization depends on conveying both location and rate. Without location information, two multitrack recorders can't start playback from the same point; without rate information, they will gradually drift apart from each other.

With analog tape machines, synchronization is accomplished by adjusting the speed of the drive motors to counteract any drift from the SMPTE time line. With digital devices, this coordination of speeds is achieved with *word clock*. A word-clock signal cues every digital audio device in the system to record, play back, or transfer each sample at the same time. Variations in the timing of

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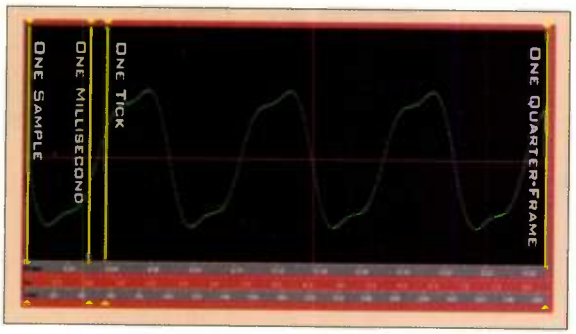

FIG. 1: It's important to understand the relative sizes of the time units used in synchronization. This diagram assumes a sample rate of 44.1 kHz, a frame rate of 30 fps, and MIDI resolution of 480 ppqn at a tempo of 100 bpm.

the master device are precisely duplicated in every slave device.

CLOSE ENOUGH FOR JAZZ?

Horticulturists will tell you that a weed is just the right plant in the wrong place. The same could be said of a wrong note. The question is, how far out of place does a note have to be before it becomes "wrong"? If members of an orchestral violin section sneak into a quiet note over the span of a fourth of a second, the note will blossom beautifully. However, that same quarter-second discrepancy between a trumpet and a tenor sax can turn an intricate bebop line into a chaotic echofest.

Synchronization technology enables us to guarantee accuracy in terms of picoseconds (millionths of a millisecond), but when does that kind of precision matter? It certainly doesn't in a typical multitrack session. Part of what makes live musicians sound alive is the subtle interaction of their minor imperfections. That's one reason why quantized MIDI sequences often sound overly mechanical: the parts line up too precisely. To counteract this excess precision, most sequencing software now features algorithms for "humanizing" (randomizing) a sequence and offers degrees of quantization for fixing only the most egregious rhythmic errors.

The more definite a sound's attack, the more it suffers from timing errors. If you record two drummers playing the same part, timing discrepancies introduced during the recording or playback process will be more obvious than with vocals or strings. To see for yourself just how forgiving our ears are of timing "errors" within an ensemble, try this experiment. Open your sequencer and record a simple drum or percussion part, such as a scale exercise on a marimba patch. Now copy it into another track and assign the new track to a xylophone patch. (Be sure to assign this track to a different MIDI channel.) Both parts should play back in perfect unison, as if the two timbres were layered at the patch level.

Now slide one part a tick or two later and see what happens. The results, of course, will depend on the tempo and the MIDI resolution you're using; but after a couple of ticks, you'll start to hear some "flamming" of each attack. As you slide the parts further away from each other, you'll hear each one more and more distinctly from the other, until at some point they cross the line and end up just sounding sloppy. Now change both parts to string patches and see how much further apart you can slide them before they sound wrong. Your ears will probably forgive about twice the discrepancy between string parts as between percussion parts.

If you're trying to sync a digital audio sequencer to your MDM for typ-

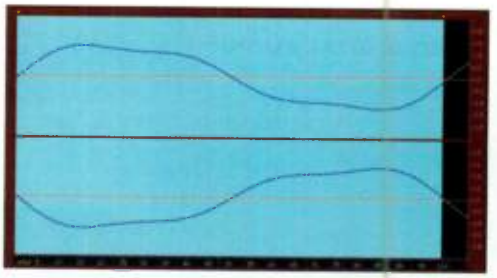

FIG. 2: One complete cycle of a 440 Hz waveform takes roughly 100 samples at a sample rate of 44.1 kHz. If you move one side of a stereo pair of such waveforms about 50 samples in either direction, the two sides will become 180 degrees out of phase and effectively cancel each other out.

ical multitrack sequencing and recording, then perhaps you don't require the highest-resolution synchronization hardware on the market. In fact, countless major recordings from the past decade have relied on MIDI Time Code (MTC) for this sort of arrangement. MTC is accurate to a quarter of a frame, which translates to a maximum error of about 8 milliseconds (see **Fig. 1**). That may sound like a lot, but consider two things: first, the typical margin of error is significantly less; and second, the errors in subsequent overdubs aren't cumulative.

Why does synchronization matter at all? After all, once an audio file is in your computer, you're going to drag it where you want it anyway. In fact, if you mix all of the audio in your computer, sync doesn't matter. But if you want to lay edited audio back to your MDM, you'll want to return it to where it came from with reasonable precision, and MTC does this adequately under many circumstances. (It pays to be resourceful, though. Once, caught without a viable sync arrangement, I re-recorded an edit back to tape—on the fly—and then nudged it into place with the recorder's track offset.)

CLOSE DOESN'T COUNT

Lest you think that synchronization is all hype, consider the task of fixing a digital glitch in the left channel of a stereo mix. You dump the single track from tape into your audio-editing program, clean up the problem using the Pencil tool, and lay the track back to tape. The result is chorusing, flanging, phase cancellation—you name it. Stereo pairs are extremely unforgiving of timing errors between channels.

If you open any stereo mix in your editor and drag one channel more than a few samples in either direction, the discrepancy is immediately apparent. Do a little math, and it's easy to see why. One complete cycle of a waveform at 440 Hz (the standard tuning A) takes about 100 samples, or 2.27 milliseconds. Drag the wave 50 samples in either direction and you've achieved complete phase cancellation (see **Fig. 2**). It takes only a fraction-of-a-millisecond discrepancy to create pronounced chorusing.

If you need to work within such tight tolerances, you'll want the ability to sync your gear to within at least a couple of samples. With the right combination of gear, you can even get sample-accurate synchronization. This is the purpose of ADAT's proprietary 9-pin sync connection: it enables you to achieve single-sample positioning accuracy. Whereas older DA-88s need a separate connection for sample-accurate sync, the TDIF connection carries all the required data.

Even lacking sample-accurate sync, you can move tracks back and forth without creating phase problems if you're resourceful. Using the aforementioned example, you could transfer both channels at once (instead of just the problematic left channel) to the computer for editing. They would arrive still in phase, and if you didn't

SYNCSPEAK

Black burst Synonymous with house sync, its name derives from the fact that it is a video signal with no picture, which would yield a black screen if displayed. Also known as *video sync.*

Frame rate The number of frames of film or video displayed per second. Film runs at 24 fps, video at 29.97 fps. Most music-only production is done at 30 fps.

House sync A video signal used as a master timing reference for video and audio devices. Like word clock, it conveys rate information but not location information.

LTC Longitudinal Time Code, the most common form of SMPTE in audio applications. The time code is converted into a modulated audio tone similar to modem noise and then striped (recorded) to one track of an audiotape recorder. The playback of that tone is subsequently read by a synchronizer, which controls the speed of slave devices.

MTC MIDI Time Code, a form of SMPTE that can be transmitted over MIDI connections.

SMPTE time code The now-ubiquitous format of hours:minutes:seconds:frames adopted by the Society of Motion Picture and Television Engineers for conveying location and timing information to video and audio devices. Also known simply as *SMPTE.*

Superclock Digidesign's version of word clock that runs at 256 times the sample rate for extra precision.

VITC Vertical Interval Time Code, a form of SMPTE commonly used in video applications. A video frame is drawn in two interlaced passes of the cathode ray gun. The point at which the gun resets itself from the bottom corner to start over at the top corner is called the *vertical blanking interval,* and time-code information is inserted at this point. The time-code display window on a video screen is derived from VITC.

Word clock The signal that defines the precise timing by which each sample is recorded, played, or transferred. Unlike time code, word clock doesn't carry location information.

change their relative position they would stay in phase when you transferred them together back to tape. They might end up offset by a few samples from their original position on tape, but if you choose your edit points according to phrase structure, this discrepancy shouldn't be noticeable. If your audio interface has enough inputs and outputs, you can even transfer an entire multimicrophone set of drum tracks at once.

LIKE CLOCKWORK

Synchronization doesn't have to be a nightmare, and it doesn't necessarily require that you have expensive gear. When you understand the timing issues of different musical contexts, keeping everything in sync is not that difficult. Ultimately, it boils down to a few points:

1. Use your most accurate clock source as the master timing reference.
2. Slave all other devices to the master clock.
3. Use sample-accurate sync to prevent phase problems between similar audio content.
4. Don't be afraid to rely on MTC in most situations.
5. Be resourceful; cheat whenever necessary.

Above all, use your ears. If it sounds right, it is right. Remember, it's all in the timing.

Brian Smithers *is searching for a master clock to sync his work/sleep cycle with Earth's day/night cycle. Contact him through his Web site, members.aol.com/notebooks1.*

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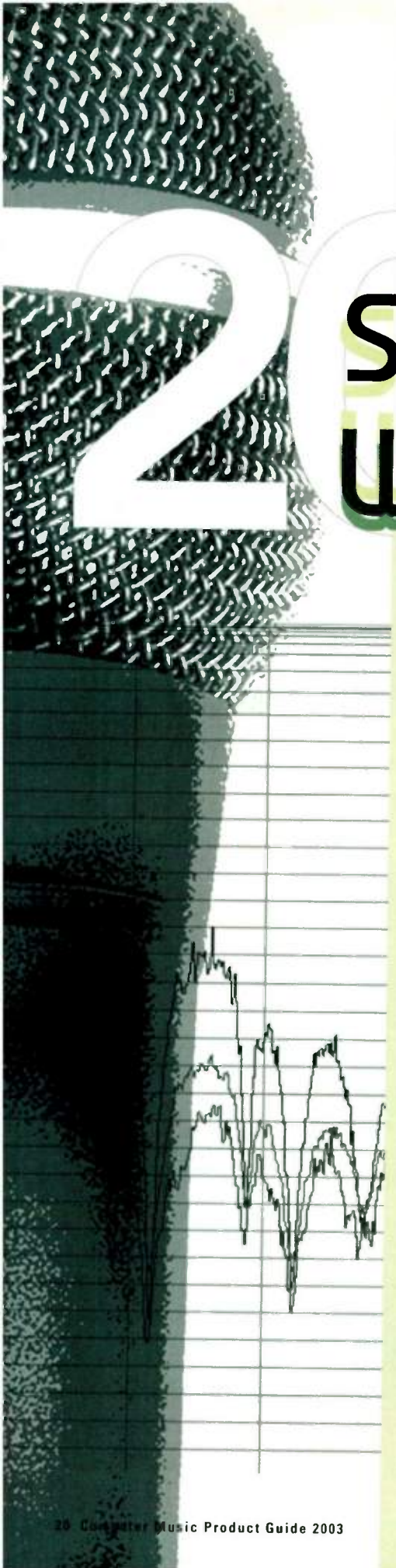

BY MARC FARLY

2 Sound-Warping Ideas

Many musicians share a deep-rooted pleasure in mangling ordinary sounds into unrecognizable creations. Not only does it satisfy the improviser in us, but we can arrive at timbres we never could have imagined existed. In this article, I'll look at some unorthodox ways to get both strange and relatively familiar sounds. You'll need a decent audio editor, but you'll be hunting around with a microphone, too. To get an idea of how I came up with many of these techniques, check out my audio examples on *Electronic Musician*'s Web site, www.emusician.com. EMWEB CLIPS

IT'S A SNAP

Low-frequency samples such as bass and kick drums can benefit if you cut off the sample attack so they don't start at a zero crossing. A *zero crossing* is a point in the waveform at which the signal passes from the negative side of zero to the positive or vice versa. In most audio editors, it occurs when the waveform crosses the horizontal centerline in the edit window. Though the degree of attack varies depending on the harmonic content of the sample and how far from the zero crossing the waveform starts, the sample will always have a percussive attack no matter how low you transpose it. For kick drums, this can simulate the snap of the beater hitting the drum even when you pitch it down for ultralow effects. For bass, pianos, and other pitched samples, this can keep the attack from getting mushy at a lower pitch. Use an envelope on the filter or the amplifier to shape the attack if the click sounds too harsh.

THE HOME IS FULL OF DRUMS

To create unique drum sounds, search the house for items that sound like drums. A good place to start is with a sheet of paper on a bed. Set up a microphone and recorder and try hitting the paper with a hand or a drumstick. This sounds very much like a snare drum with a tight release. Strike a leather or vinyl chair to get a kick drum. Drip a drop of water on a hot frying pan and get the sound of a hi-hat

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or a snare, depending on equalization. A car's interior is another source of good drum surfaces. Finding them is a good activity to keep you busy while you're waiting at a light.

To get a synth bass drum, plug an instrument cord into a mixer, crank up the gain, and tap the tip of the free end with a finger. As long as you don't let any other body part touch the metal connector (hold the free end by the cord), this should make a percussive hum. In a sample editor, create a quick fade-out on the hum portion of the sample or use the sampler's envelopes. With any of these tricks, creative equalization goes a long way toward providing more variety.

EVERY FILE IS A SOUND FILE

You can open any file as a raw audio file and play it back. In Windows, use a sound-editing application to open files or applications in their raw form. The program will probably ask for a sample rate and size—just fill in the blanks with whatever makes sense to you. Different values create different effects, so test a couple.

On the Macintosh, you can open any file in raw form or as a Sound Designer II (SDII) file, since the SDII format is essentially raw data. If the application tries to open the file as an SDII file, it will probably make assumptions about the sample rate and size. To make Macintosh sound editors regard the files as SDII, use a utility such as ResEdit or File Buddy to change the file type to SDII*f*. Make sure to experiment with a *copy* of the file, not the original. Also bear in mind that you will most likely end up with a harsh sound that could damage your ears or your speakers if played too loudly.

A lowpass filter softens the harshness a bit. Files with patterns in their data tend to work well. Try using pictures as a starting point. You can even paint pictures in a graphics application for the sole purpose of using them to invent a unique sound.

FAKE THE REVERB

Using a noise gate, you can make pink or white noise into the reverb tail for a drum hit. This is a very effective way to get that huge '80s snare-and-tom sound without tying up a reverb. Connect a noise source to the input of the gate. Send the drum hit to the sidechain input to act as the trigger. Set the gate's attack to a very fast value, but adjust the release to a relatively long time, such as 500 ms. Apply some EQ or other effects to the noise at either the input or output to color the noise to fit in with the rest of the mix.

A good source for noise is an old television set without an antenna. Use the headphone out if it has one. If you don't have a TV handy, most synths can provide the noise source, or you can get even more interesting effects from voices or other tonal elements—for example, car engines, airplanes, or an orchestra tuning up.

JUST SPIT IT OUT

Sometimes the best way to get that elusive sound is to make it yourself with your mouth. For example, a complex *whoosh* would take a long time to build, but you can make it in real time with your mouth. Do several takes and piece together the performance as needed. With lots of processing, it will take on the character required for the situation, and no one will know where it came from. Just don't let anyone see you doing this!

AUDIO BLUR

You can create backgrounds using tools that smear the sound into a homogeneous blend. One such software tool is Antares Systems' *Infinity* for the Macintosh. You can also achieve this effect with granular synthesis, a feature available in a number of shareware sound applications for Mac and Windows. Some examples of programs available on the Internet include *Chaosynth* (www.nyrsound.com/chaosynth.htm), *Crusher-X* (www.crusher-x.de/start.htm),

and *thOnk_0+2* (www.audioease.com/Pages/Free/FreeMain.html).

If you need a haunting background ambience, try processing some dark music played in a minor key, which will result in a very cold sound. Another interesting source, the voices of children playing, results in a sound that seems familiar yet unrecognizable.

PITCHED ATTACK

One old synth trick for getting quicker attacks is to make the pitch sweep down quickly during the attack. Apply a pitch envelope in which the sound starts up an octave or so, then ramps down to the sustain pitch within a few milliseconds. The goal is to hear not the actual sweep but a more percussive attack. The sound's initial pitch affects the timbre of this new attack. Experiment with the starting pitch until it sounds right.

DELAY TONE

Use a short delay with generous feedback if you want to create a resonant pitch. Calculate the delay time as the inverse of the desired frequency (delay time = 1 / frequency). For instance, to create an A 440, set the delay time to $\frac{1}{440}$ or 2.273 ms. Set the feedback to 80 percent as a starting point and adjust as needed to get the desired decay. Feed the delay with a single percussive sound or with a sound pitched at the desired note. Sample the delay's output and create a loop to use as an instrument. Make enough samples to map across the entire keyboard. You'll generally get a metallic sound.

HOT SOUND, COLD BOX

Try using an ice chest as an isolation chamber. Anything from a big camping ice chest to a cheap Styrofoam box will work. Place a small practice amp in the chest with a microphone and crank it up. Use blankets or pillows to tune the sound. This produces a loud sound without blasting the neighbors or creating undesired feedback.

WRONG WAY

You can use headphones and speakers as microphones; because they are

not designed for the purpose, they can yield interesting results. Since they're typically less sensitive than microphones, you have to set a higher gain or use a louder sound source. If you can detach one of the earpieces from the headphones, hold it against a surface in the same way a doctor holds a stethoscope to your chest.

Try holding the earpiece against the side of a container full of sloshing liquid. Since most headphones are dynamic, they can also pick up electrical fields, so hold the earpiece in front of a television set or computer screen—or down inside the case while the computer is running. (Don't touch anything in there with the computer turned on or you may end up damaging the computer!) The earpiece should pick up the sound of the computer "thinking." Cheap, portable-style headphones serve this purpose well, as do little speakers, which you'll find at Radio Shack and in transistor radios.

LITTLE BIG DRUM

Another fun use for a little speaker is as an electronic finger drum. Connect the speaker to an input on the mixer or some other preamp and tap lightly on the diaphragm. That light, papery sound becomes a large thump when amplified. Experiment with equalization and compression to make a tight drum sound.

FAKE FAKE VOICE

This technique creates a sound that simulates a vocoder, which in turn simulates a human voice. Create a continuous sound file that can act as the *carrier*—a synth pad, a noise source, or a background created through granular synthesis. Almost any harmonically rich sound you can think of will do. Create another sound file with speech. Single vocal sounds work the best.

As a starting point, record someone saying the letter *o*. Then, use a sound-editing program—such as Tom Erbe's shareware program *SoundHack* (www.gmeb.fr/SoftwareCompetition/Softs96/SoundHack.html) or BIAS *Peak* (www.bias-inc.com)—to convolve the two sounds together.

In *Peak*, copy the voice file to the clipboard, select the carrier file, and choose Convolve from the DSP menu. The resulting sound will sound like a vocoder speaking the letter *o*. Notice that the sound will sustain as long as the carrier file's duration, resulting in a long *ooo*. Build several of these phonemes and loop them to load into a sampler for playback. By carefully sequencing these samples, you can make them sound like spoken words.

SHIFTY TIMBRES

Many samplers and synths allow mapping of samples at pitches other than their roots and also allow detuning to a wide range of pitches. You can make unique new sounds by combining these features.

For instance, start with an acoustic-guitar keymap. Set the root notes for each of the samples at an octave higher than originally mapped. This should make the entire keymap sound an octave too low in pitch. Now set the detune up an octave to raise the pitch of the samples back up an octave, resulting in the proper pitches played by the "wrong" samples. Though you may still recognize the keymap as an acoustic guitar, it will have an entirely different character.

Try this trick going in the other direction—map the samples down an octave, then pitch them back up. Experiment with many different instruments. Note that some synths have this

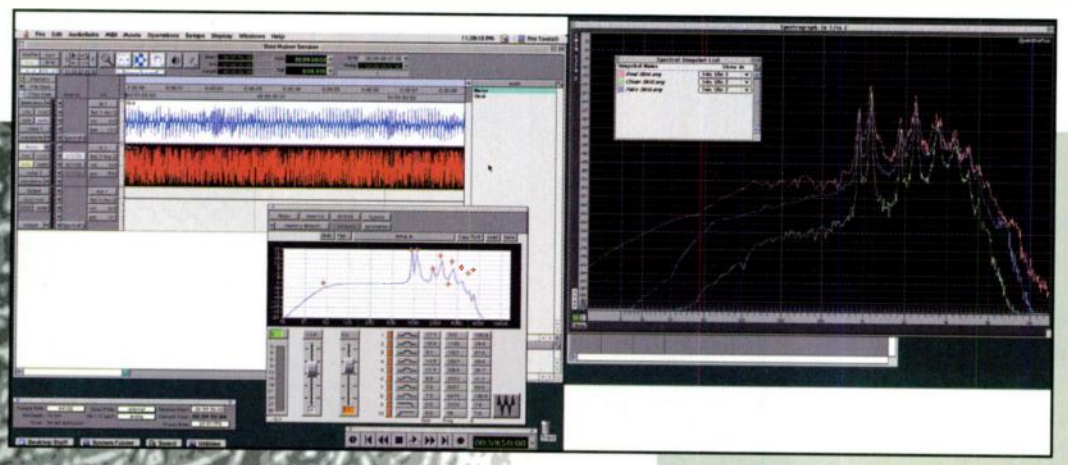

FIG. 1: By mimicking a tire-skid sound, you can create a file of any length and loop it more easily than the original, sampled skid sound.

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Arturia ThinkWare ReWire music Smart buy Mac

feature built in. The Kurzweil K2000 performs this trick with a single parameter called Timbre Shift.

SEE THE SOUND, BE THE SOUND

To mimic a complex sound such as a tire skid, begin by using a spectrum analyzer to view the harmonic content of the sound. Freeze the image so you can reference it. Feed a noise source such as pink noise through a ⅓-octave graphic equalizer or a multiband paragraphic equalizer such as Waves' *Q10*. Adjust the settings of the equalizer to match the curve shown by the spectrum analyzer. Pay particular attention to the frequencies and gains at each peak and valley. You'll find it helpful to view the output of the equalizer in another analyzer window to compare the pictures. Sometimes you'll need to cascade a couple more equalizers to achieve the necessary amounts of cut or boost at each of the frequencies. This should yield a sound that is as long as you need but matches the character of the original source, even if you started with a very short sound.

In **Fig. 1**, the Reference track contains a recording of a real tire skid. Its spectrum appears as a pink line in the Spectragraph screen in Metric Halo Labs' (www.mhlabs.com) *SpectraFoo* measurement software. The Noise track contains noise taken from a TV that was displaying static. Inserted on the Noise track are three instances of Waves' *Q10* equalizer, set up to match the spectrum of the skid. Two *Q10*s were necessary to provide more control over the final sound. The output appears as a blue graph. The third *Q10* adds enough extra control to clean up some of the noise in the sound and make it purer, as shown by the green graph. You can now bounce out this track as a file of any length and loop it more easily than you can the original skid sample.

MORE FEEDBACK

Using a microphone and loudspeaker, create a feedback loop and adjust the distance between the speaker and the microphone while watching a tuning meter to set the pitch of the feedback to the desired note. For example, adjust the distance between the microphone and the speaker until the feedback pitch is an A 440 and then map that sample to the A key on your sampler. Once you've set the distance and tuned the feedback, use a variety of sound sources as seeds—drum hits, yells, hand claps, or any other relatively short sound. While the feedback will almost always settle into a sinelike sound, each seed will yield a unique attack and decay. The time feedback takes to decay into the sine depends on the overall loudness, the gain of the microphone, and the acoustics of the room.

PLAY IT LIKE YOU MEAN IT

When sampling real instruments for realism, ideally you should have the player perform the desired notes in context. All too often, samples consist of single notes played as just that—and the usual result is a note played too loudly. Many piano banks sound like the player is pounding the instrument to death. To get around this problem, give the player a short scale to play, ending with the desired note sustained for as long as possible. Do this for each note and emphasize the importance of consistency. This method should result in more natural-sounding samples.

MICROLOOPS

Determine the duration of a single-cycle loop in samples, then fill it in with anything, even if it means scribbling a

(continued on page 66)

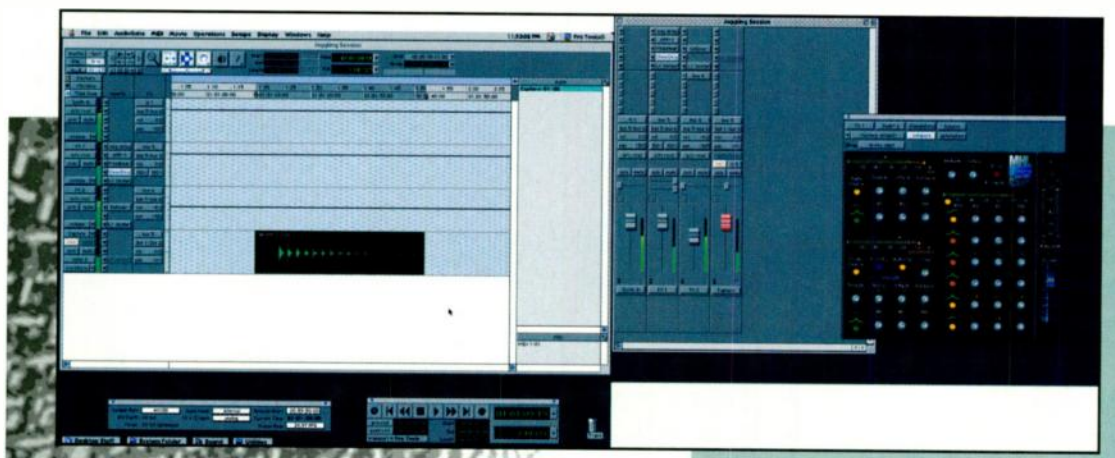

FIG. 2: Creating the Sound Juggler effect is fairly easy in Digidesign's Pro Tools and other software editors.

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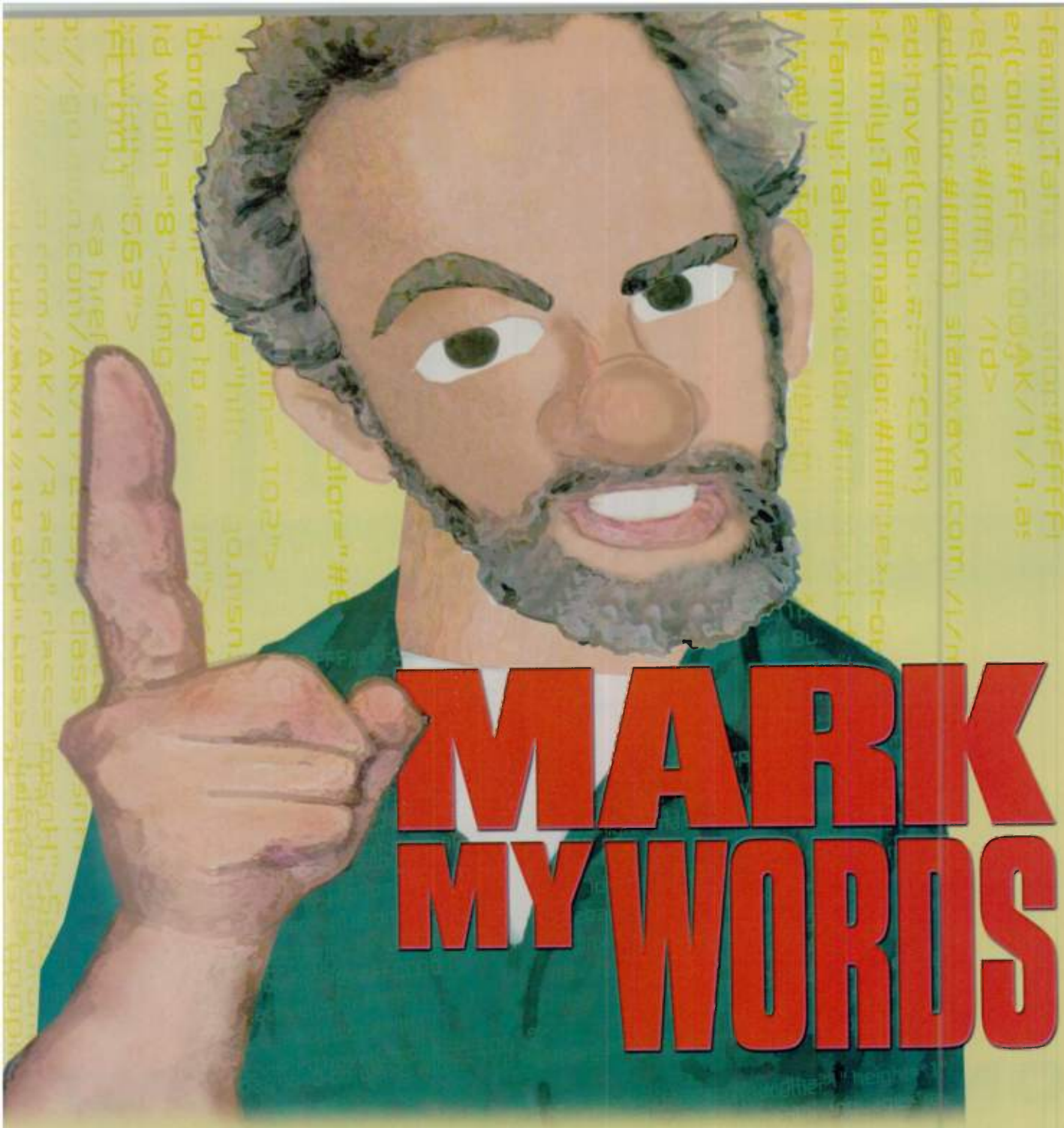

MARK MY WORDS

By Alan Gary Campbell

Unlock the code that makes the Web work.

You have the band's home page up. The counter works. You've even sold some CDs. You're about to breathe a sigh of relief, but then you sense them coming: XHTML, XML, WML, VRML. It's the invasion of the markup languages! Should you run? Should you hide? Should you take a correspondence course?

Never fear. I'll show you how to tame the tsunami of tag-based technology and give you working examples that you can try. Not all markup languages are equally important to musicians, so I'll start with the most significant ones. I'll also include some more esoteric languages that could become important in the future.

Illustration by Mike Cruz

WHAT IS A MARKUP LANGUAGE, ANYWAY?

Markup is a way to add indications to plain text that tell a computer what the text means (for example, a title, a heading, or a paragraph) or how it should look when it's printed or viewed on a video display. Unlike the text, the markup itself isn't displayed. Markup was first used in typesetting; the cryptic snippets between squiggles seen on a Linotype machine are markup.

If you've created a home page, you probably already know this markup:

```
<B>Bold</B>
```

It tells a Web browser to render the word *bold* in, well, bold. A markup instruction, commonly referred to as a *tag*, is typically enclosed between angle brackets, as seen in the example. Most tags come in pairs—a start and an end tag. A whole set of tags is a markup language.

Standardized Generalized Markup Language (SGML) is a powerful master language for defining markup. SGML has abilities beyond normal markup. It's the realm of markup scientists; you won't encounter it directly. SGML is the parent of the most famous markup language of all, HTML.

HTML, RULER OF THE WEB

HTML, or HyperText Markup Language, was created in the early 1990s from SGML so researchers could share information on networks, and later on the Web, more easily. (At that point, MP3, Yahoo, and eBay were figments of the imagination.) HTML was meant to be easy to use and be compatible with different browsers but still provide powerful features. Look at the following basic HTML example:

```
<HTML>

<HEAD>
<TITLE>Markup Languages for Electronic
Musicians</TITLE>
</HEAD>

<BODY BGCOLOR=#FFFFFF TEXT=#000000
LINK=#0000FF VLINK=#0000FF
ALINK=#999999>
<H1>Markup Languages for Electronic
Musicians</H1>
<IMG SRC="e-musician.gif" alt="Elec-
tronic Musician logo"
border=0 WIDTH=200 HEIGHT=40><BR>
<BR>
<P>
<A HREF="http://www.yahoo.com/">A
Link to Yahoo!'s Home Page</A>
</P>
</BODY>

</HTML>
```

The <HTML> and </HTML> tags define the start and end of the document and tell a browser that this is HTML. The <HEAD> and </HEAD> tags define information that the browser needs to understand before it displays the page. In this case, I provided a page title to display in the browser's title bar. The <BODY> and </BODY> tags define the information that will be displayed on the page. The <H1> and </H1> tags define a heading (typically rendered by a browser in a large bold font). The <IMG> tag defines an in-line image (in this case, EM's logo). The <BR> tag provides a line break. The <P> and </P> tags define a paragraph. The <A> and </A> tags define a hyperlink to another Web page (Yahoo's home page).

Note that several tags have additional information inside the tag delimiters (the angle brackets). Those bits of information are called *attributes*. The <BODY> tag has attributes for the text and link colors, and the <IMG> tag includes attributes for descriptive text and for the image border width and image size. Different tags allow different attributes, though not all Web browsers understand all attributes.

There are many other tags and attributes that you might want to use. Nonetheless, even basic HTML features such as in-line images and hyperlinks can provide a great deal of information to the user, which is one reason why HTML has gained such wide acceptance.

If you've experimented with HTML before, that is probably familiar stuff. But did you know that other kinds of markup can display the same information on all kinds of devices?

WAP: GOING WIRELESS

Wireless Web technology is a hot topic these days because it promises to deliver rich Web content to handheld devices such as cell phones and personal digital assistants (PDAs). Wireless Application Protocol (WAP) is a set of standards that describes how wireless devices are supposed to communicate. Unfortunately, most wireless providers have failed to deliver useful and engaging content, leading to mass consumer discontent that detractors have dubbed *Waplash*. Does that mean something is wrong with WAP? No! Even base-model Web-enabled cell phones, such as Sprint's Touchpoint, have intuitive navigation, good performance, and can display WAP graphics as well as text. Moreover, fast wireless connections are under development, along with the ability to download and store multimedia files, such as MP3s, to your phone. (Some U.S. cell phones double as MP3 players, but expect cutting-edge gear to arrive in Europe first, where conventional Internet connectivity is comparatively expensive.)

Adding WAP-capable pages to your site is easy, but there's a catch. Deploying WAP means deploying at least two kinds of markup, one for each type of Web-enabled phone.

The first is the Handheld Device Markup Language (HDML). HDML is an older markup for handheld devices that is somewhat limited in scope but is optimized for the technology in U.S. phones. It doesn't look like HTML, except superficially. Unlike an HTML page, an HDML page isn't based on a document, with familiar head and body elements, but on a *deck*, wherein each related HDML page is called a *card*, much like a stack of 3-by-5 index cards. That concept may seem a bit strange, but it's fairly intuitive once you get used to it. Common HDML cards include the Display card, used to display images and text, and the Choice card, which shows a choice of *tasks*, such as links to other HDML cards (a Choice card can also reveal an image or brief text). Here's the home-page example in equivalent HDML, based on a Choice card:

Liberate your art.

You want to play your music, not work it.

So why be limited by tools with poor functionality and high price tags?

You want *freedom.* Freedom to perfect your craft. Freedom from complicated gear that doesn't quite get the job done. Freedom to make and mix your art your way. You need tools that come out of the box, get right to work, and sound great. From the company that brings you affordable mixing consoles comes studio gear that gives you more *power*, more *precision*, and more *control*. Affordable. Reliable. Designed for the art you're creating today and the art you'll create tomorrow.

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COMPLETE CONTROL AT YOUR FINGERTIPS. Baby HUI™ and Mackie Control™ MIDI controllers with stepped encoders and touch-sensitive faders give you the freedom to change as many parameters as you have fingers, all at the same time. Tactile. Precise. Hands-on mixing, editing, automation, and navigation so intuitive you'll wonder how you lived without it. You can even customize the Mackie Control with a LEXAN® overlay specific to your software, and the Baby HUI through your software's Console Manager. Baby HUI and Mackie Control—get your hands on your tracks.

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```
<HDML VERSION=3.0 MARKABLE=TRUE>
<CHOICE TITLE="Markup Languages for
Electronic Musicians">
<ACTION TYPE=SOFT1 TASK=GO
DEST=bio.hdml LABEL=Bio>
<ACTION TYPE=HELP TASK=GO
DEST=help.hdml>
<IMG SRC=e-musician.bmp alt=e-musician>
<CE TASK=GO
DEST=http://www.yahoo.com/
LABEL=Link>A Link to Yahoo's Home Page
</CHOICE>
</HDML>
```

The <CE> (Choice Entry) tag defines a single task: the link to Yahoo's home page. (On a phone display, a long link title such as this will autoscroll from left to right to conserve screen space.) You can have as many as ten <CE> tags on a Choice card; the HDML browser numbers them automatically. For phones that display text captions, the Label attribute value is shown when you select the associated task. The Action tags allow you to control additional phone functions,

FIG. 1: HDML is not the newest markup language, but it is compatible with a large number of cell phones in the United States. Here is the HDML version of the test page as displayed on a cell phone.

based on the supplied attributes. The Type=Soft1 attribute allows you to assign a card and caption to the phone's primary "soft button" (here I linked to a theoretical author bio), and the Type=Help attribute lets you replace the phone's Help menu with your own.

WEBLIOGRAPHY

The Web offers vast resources about markup languages. Here's a sampling:

discML: www.discML.com
HDML Language Reference: http://developer.openwave.com/ja/htmldoc/331h/hdmlref
Introduction to VRML: http://home.netscape.com/eng/live3d/ intro_vrml.html
Introduction to XHTML: www.wdvl.com/Authoring/Languages/XML/XHTML
Mobilizing the Web with HDML: www.webreview.com/1998/10_09/webauthors/10_09_98_5.shtml
Online WBMP converter: www.teraflops.com/wbmp
WAPDrive: www.wapdrive.com
WAP/WML School: www.w3schools.com/wap/default.asp
XML 101: www.xml101.com/xml/default.asp
XML FAQ: www.ucc.ie/xml

Fig. 1 shows how that looks on a generic cell phone.

HDML is pretty useful, but it isn't part of the WAP specification, and Unwired Planet, the company that developed it and that supplies browsers for most Web-enabled U.S. phones, has switched to WAP. WAP incorporates Wireless Markup Language (WML), which is more like HTML. But many Web-enabled U.S. cell phones understand HDML, not WML. In addition, a lot of WML-capable phones display HDML far more legibly than they display WML.

Here is the home page in equivalent WML:

```
<?xml version="1.0"?>
<!DOCTYPE wml PUBLIC
"-//WAPFORUM//DTD WML 1.1//EN"
"http://www.wapforum.org/DTD/
wml_1.1.xml">
<wml>
<card id="Index" title="Markup
Languages for Electronic Musicians">
<p align="left">
<img src="e-musician.wbmp"
alt="e-musician"/>
</p>
<p align="left">
<a href="http://www.yahoo.com/"
title="Jobs">A Link to Yahoo!&#39;s
Home Page</a>
</p>
</card>
</wml>
```

Also based on a card concept, WML has more elements that are familiar from HTML, such as the <p>, <img>, and <a> tags. Because of the way WML is defined, tags must be in lowercase and attributes must be enclosed in quotes (to display a single quote, WML uses the character entity '). WML is picky about syntax, so if you try the examples on your site, be careful to enter the markup as shown.

Fig. 2 illustrates how that appears on a generic cell-phone display. The link is displayed rather crudely in the form of text enclosed in square brackets, which wraps to subsequent lines. That is not too user-friendly (it wastes what little screen space there is). Newer European cell phones show links with conventional underlines, which is better. Nevertheless, WML provides features that HDML does not, such as multimedia support, Java support, scripting support (called WMLscript), and secure connections. In the future, when more cell phones can take advantage of those features, WML will become the wireless markup language of choice.

FIG. 2: WML, which resembles HTML in many ways, is a newer language than HDML but is not compatible with many U.S. cell phones. This figure shows the WML version of the test page as displayed on a cell phone.

HDML and WML use graphics formats different from HTML. HDML uses the common Windows-compatible bitmap format (BMP), but WML employs the special Wireless Bitmap format (WBMP), which few graphic-editing programs support. Fortunately, several Web-based applications can convert Windows bitmaps to Wireless bitmaps (see the sidebar, "Webliography"). More limiting, though, is the display capability of cell phones and PDAs. Most devices can display only small (about 100-by-50 pixel) monochrome images. That means you have to resample any image you want to use to the smaller size and reduce the color depth, which works best with simple, high-contrast images.

THE LANGUAGE CREATOR: XML

EXtensible Markup Language (XML) is the current techno buzzword. You may have heard that XML will replace HTML. Well, yes and no. XML has the potential to redress some of HTML's deficiencies, and it can also do a lot more, though it can be difficult to use.

So what's wrong with HTML? Consider the example I gave at the beginning of this article. Although the markup is simple, it gives what markup scientists call *context* to the information on the page. That is, it's easy to detect which text forms a title, a heading, and a paragraph. That's important because a person or a computer program, such as a Web spider or database engine, can determine what the information means, as opposed to how it should look. The downside is that the browser or other software determines the appearance of the page—how big the heading should be, what fonts to use, how closely to space the lines and letters on the page, and so on.

Web designers have employed myriad work-arounds in HTML to obtain more control over page appearance and to add more interactive features. Those work-arounds include images used in place of text, tables used to position objects on the pages (not merely to format rows and columns of data), transparent images used as spacers, embedded scripts and programs, and in-line style definitions. For example, **Fig. 3** shows MP3.com's Electronic page (http://genres.mp3.com/music/electronic/), and **Fig. 4** shows just the first 63 of the page's 1,100 lines of markup. (See "Square One: What's in a

FIG. 3: MP3.com's Electronic page is a complex collection of text, graphics, and media files. Here is the page as displayed by Microsoft's *Internet Explorer* 5.

Web Page?" in the March 2001 issue.) That works, but the resulting complexity of tags and features all but obliterates context, no matter how expertly coded the markup is.

Consider how powerful it would be to create a markup language that maintains human-readable context and has custom tags for the information in question. What if that same language provided accurate control of appearance and the ability to add new features and functions as desired? You can do all that with XML. For example, this XML-based markup is intended to store a discography:

```
<discography>

<summary>
<title>Schmo Money - Dance Mix</title>
<artist>Joe Schmo</artist>
<label>Joe Schmo Records</label>
<number>001</number>
<format>CD</format>
</summary>

<tracklist>
<track>
<title>Schmo Money - Dance
Mix</title>
<time>10:19</time>
<note>Caution: Extreme
bass!</note>
</track>
<track>
<title>Schmo Money Live
(bonus track)</title>
<time>12:01</time>
<note>Live at the Podunk
Amphitheater</note>
</track>
</tracklist>

</discography>
```

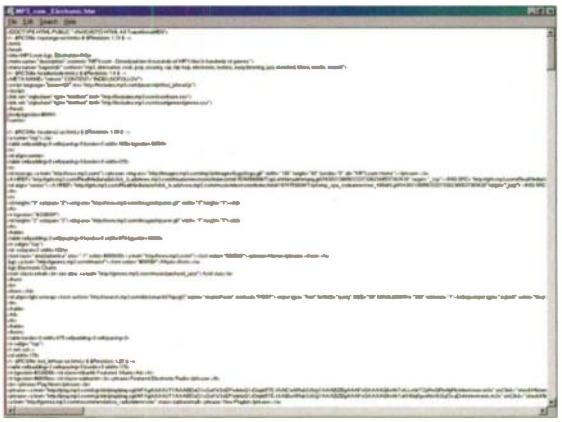
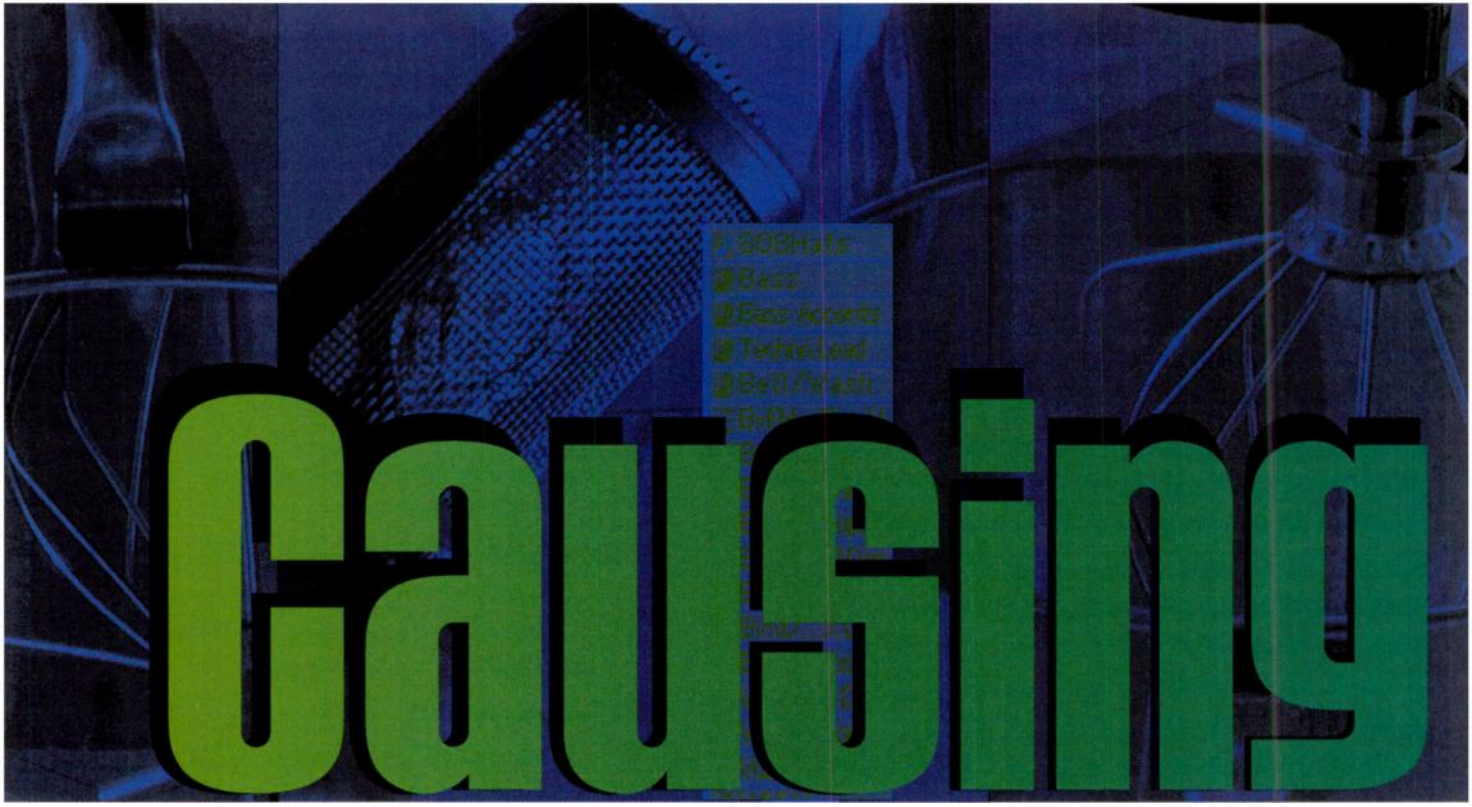


FIG. 4: The markup for a complex Web page can consist of hundreds of lines. This figure shows the first 63 lines of 1,100 used to create MP3.com's Electronic page.

All I did was create a tag set that encompasses the information I might like to store. I defined the context clearly and simply so that a computer (or a human) can understand it. That means that all kinds of devices and programs—Web browsers and spiders, phone browsers, MP3 players, databases, and so on—can use the information in ways that make sense. For example, a Web spider could index the information for future searches, a phone browser could

(continued on page 76)



Adding a new sonic flavoring to your music can help blast it out of a rut. For everyone whose recordings have been missing that special something lately, here are 12 easy sound-design recipes to get the studio juices flowing. Although some require you to supplement your computer with outboard gear, many can be done with software-based effects or simply by using offbeat techniques. To give you an idea of what's possible, I've uploaded MP3 examples of these projects to the DMPG page of *Electronic Musician*'s site, www.emusician.com. So grab your mouse and let's begin.

MORE ON THE WEB EM WEB CLIPS

Hear MP3 examples of these effects in the CMPG EM Web Clips section of www.emusician.com.

THE LAST SHALL BE FIRST

Normally, people think of reverberation as being the last effect in the chain, but things can get interesting if you place the reverb *before* other effects. For instance, I've created great distorted lead "guitar" sounds by running a basic sawtooth patch on a synthesizer through reverb and then into heavy distortion. The reverb produces random-sounding overlapping between notes, reminiscent of feedback. For more ambient sounds, try running the reverb output through a stereo modulation effect such as a chorus or phaser. The result is rich, swirling, and spacious.

FEELS GOOD? DO IT AGAIN

A friend of mine is fond of saying, "Nothing succeeds like excess." If you're working toward a unique sound but haven't found quite what you're looking for, try duplicating the processing. If you've used one chorus, use two; if you've used one reverb, add a second. You can place the duplicate effects either in series or parallel. I prefer to use reverbs in parallel, but experiment to see what works best for each project. Sometimes running two reverbs in series will smooth out the sound perfectly.

Vary the parameters between the two effects slightly to create a fuller, more complex sound. Using effects from two different manufacturers will almost guarantee that they'll sound a little different and (hopefully) complement each other.

BUG OR FEATURE?

Ever wonder how Garbage created the strange, sputtery effect on the bridge to "Stupid Girl" on their first album, *Garbage*? It wasn't the latest effects plug-in, or a painstakingly sculpted multi-effect masterpiece, but rather the sound of a malfunctioning digital multitrack recorder. When one of their machines suddenly went on the fritz, they were quick to recognize an interesting timbre. And so instead of hitting the Stop button and powering down, they whipped out a tape and started recording (using another machine, of course!).

Equipment malfunctions can be annoying interruptions, but they can also create happy accidents as the errant gear makes bizarre sounds you might never be able to create otherwise. So the next time your favorite studio toy is acting up and spewing out mangled audio, try recording its output instead of turning it off.

SAY GOOD-BYE TO THE DRY

Glen Phillips, former lead singer of Toad the Wet Sprocket (now a solo artist; see www.glenphillips.com), has a favorite trick for creating ambient pads. He will run his guitar through

12 QUICK RECIPES FOR HEAD-SPINNING SOUND.

EFFECTS

BY DAN PHILLIPS

delays and/or reverb—and perhaps a chorus as well—then record just the output of the effects, not the original dry signal. Using only the wet signal creates beautiful, lush pads that are wonderfully organic in quality but difficult to identify as a guitar. Of course, this trick can also work for other sources, such as keyboards and backing vocals.

HOUSE OF ODD

Back in the dawn of the sampler age, it was cool to explore the percussive possibilities of kitchen equipment, augmenting a rhythm track with spoons hitting glasses and pans crashing to the floor. While I still love a good cast-iron clank from time to time, household appliances can be a source of sustained, ambient sounds as well.

Try walking around your house and turning on any piece of electrical equipment—computer fans, food processors, blenders, razors, hair dryers, and so on. If there's a pitch within the noise, set up a mic and record it (see Fig. 1). With today's plentiful RAM and drive space, I'd recommend sampling 10 to 30 seconds of sound, so you can avoid (at least initially) the time-consuming task of looping. After the sound is in your computer or sampler, give it an envelope with slow attack and release times, run it through delay effects, reverb, and possibly a chorus, and *voilà*—a new ambient bed.

LOOKING FOR SYMPATHY

Have you ever been annoyed by something in the studio that rattles when the amps are turned up? Snare drums buzzing, lamp shades ringing, glasses dancing on a table? Those are called

JEAN MORRISON

FIG. 1: Household appliances make some surprisingly evocative noises. You can't plug a microphone into this kind of mixer, but you can capture and process its sound to create a unique ambient backdrop.

sympathetic resonances, and their energy can be harnessed for good as well as evil. For instance, try using a hand drum (such as a djembe) as a resonator. Using a boom stand, place a microphone deep inside the drum, and then sing into the open end (see **Fig. 2**). You might also try tuning the drum head to match the key of the song.

You can also use a speaker to run previously recorded audio through a drum and then record the result. Producer Ethan Johns used this trick on an upcoming CD collaboration by Glen Phillips and folk-circuit favorites Nickel Creek, turning a kick drum into a quirky reverb.


JEAN MORRISON

FIG. 2: By placing a mic deep inside the bell of a hand drum and singing into the neck, you can add an odd, filtered ambience to your vocals. Here I used a small-diaphragm condenser mic with an omni capsule.

BE YOUR OWN SAMPLE CD

This trick is from one of my favorite bands, Geggy Tah (www.geggytah.com). On its first CD, *Grand Opening*, the band took a single vocal phrase from one track and used that one sample to create almost all of the elements for a different song on the same album. The band members reused other elements from the first CD in their latest release, as well, lending a certain self-referential consistency to their oeuvre. So the next time you're about to reach for a sample CD, consider plundering your own catalog instead.

JUST FOR THE LFO OF IT

With a tempo-controlled low-frequency oscillator (LFO), you can set the frequency in terms of note length and beats per minute instead of Hertz. This makes it easy to program flangers, phasers, and other LFO-driven effects so that they pulse in time with the music. Many modern effects processors include tempo-controlled LFOs, which detect the tempo using MIDI or a tap-tempo button or footswitch.

Tempo-controlled LFOs are very slick for processing everything from drum loops to pads, but they can also become a sound in and of themselves. You can start with almost any source signal, including simple white noise. Run the signal through a tempo-controlled flanger or phaser set to cycle every eighth or 16th note. If you can set the LFOs for the left and right channels to be 180 degrees out of phase, so much the better. I like to use downward-sawtooth shapes for the LFOs, but other waveforms will work as well.

Next, crank up the resonance (or feedback) of the flanger or phaser until you can hear the pitch distinctly. Finally, tune the center frequency so that the LFO creates laserlike sweeps, and you have a distinctive element to add to a loop.

FEEDBACK...ACK...ACK...ACK

Have you ever been using a delay and accidentally created a positive feedback loop so the sound built in volume with every repeat until it was a pulsing, distorted mess? If so, you probably reached quickly to turn down the volume or yank out the patch cord. If you're interested in a creative experiment, however, feedback loops don't have to be a bad thing.

First, a word of caution: this exercise can create runaway volume levels, so before starting, make sure that you turn down your speakers to a very low volume, and don't use headphones. In order to create a feedback loop, begin with a delay effect. I like to use very long delays, between 8 and 40 seconds, but

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SOURCE CODE: DGBL

Algorithmic Composition Software

Manufacturer	Product	Version	Minimum System Requirements	Standalone or Plug-in	Architecture	Number of Modules	Supports User-created Modules	Audio Support	Polyphony	Random or Deterministic	Reads Bitmaps	Special Features	List Price
Cycling '74	M	2.5.8	Mac OS, 32 MB RAM	Standalone	Predefined	24	No	No	128	Random	No		$74
Pirkle & Associates, Inc.	Pirkle's Music Composition Studio	N/A	Windows, 95,98, NT, XP, Pentium, 5meg RAM	Standalone	Predefined	N/A	No	Yes	32	Deterministic	No	Generates classical (symphony, concerto, piano), jazz, blues, reggae. User involvement optional.	$79
SoundTrek	JAMMER Live	1.0	Windows 95, 98	Standalone	Predefined	N/A	No	No	N/A	Random	No	Real-time interactive back-up band software	$60
SoundTrek	JAMMER Professional	4.0	Windows 3.1, 95, 98, XP	Standalone	Predefined	N/A	No	No	N/A	Random	No	Song creation software	$129

FIG. 3: Interpolated delays let you change delay times smoothly, often creating an interesting pitch-bend effect during the transition. The Smoothing knob on this control panel for an Korg OASYS PCI sound card determines how long it takes to slide from one delay value to another.

short delays also produce good results.

You may be able to create the loop entirely within a single effects device by setting the delay's internal feedback volume so high that it's equal to or greater than the input level. You can also patch several effects (filters, delays, reverbs, pitch shifters, and so on) together in a chain so that the last one feeds back into the first.

Once you've created the loop, "seed" it with a bit of audio input—a noise burst, vocal phrase, keyboard or guitar lick, loop, or whatever catches your ear. Then wait for a while and allow it to build on itself. Sometimes I'll even walk out of the studio for ten minutes or more, then come back to hear what's happened.

Alternately, stick around as the loop builds and try modulating elements within the loop: change delay times, pitch-shift amounts, filter cutoffs, volume levels, and so forth. This is especially effective with long delays, because it takes a while for these changes to come back around.

Once the sound has built into something interesting, record the output. (Because hard disk space is so cheap and plentiful, I'll sometimes just press Record at the very beginning.) You can then load the sound into a sampler, import it into an audio track as an ambient bed, or use it as the basis for further experimentation.

SMOOTH MODULATOR

Sometimes called *modulatable* or *glide* delays, interpolated delays smooth out changes as you change the delay time, creating a temporary pitch-bend effect. (Choruses and flangers are essentially very short interpolated delays driven by LFOs. Delays that don't have interpolation will click as the delay time is changed.) You can find this type of delay on effects processors including the Korg OASYS PCI, the Lexicon PCM 81, and the Eventide DSP 4000, DSP 7000, and Orville.

Interpolated-delay algorithms generally allow access to the degree of smoothing, which means you can control the time it takes to slide from one delay setting to another (see **Fig. 3**). With higher degrees of smoothing, you can create very cool tape-stop and Munchkin effects by switching the delay time from very short to very long and back again. Use this in conjunction with feedback, as described in the previous tip, for even more interesting results.

TRIGGERED GATES

Gate triggering is currently my favorite production trick, and it's dead simple.

(continued on page 58)

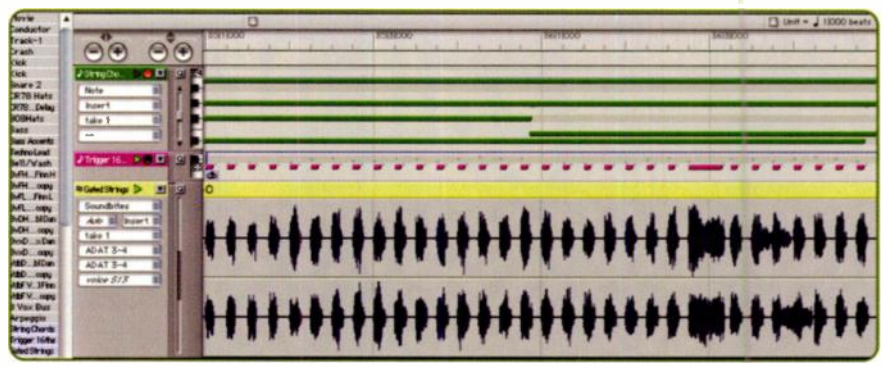
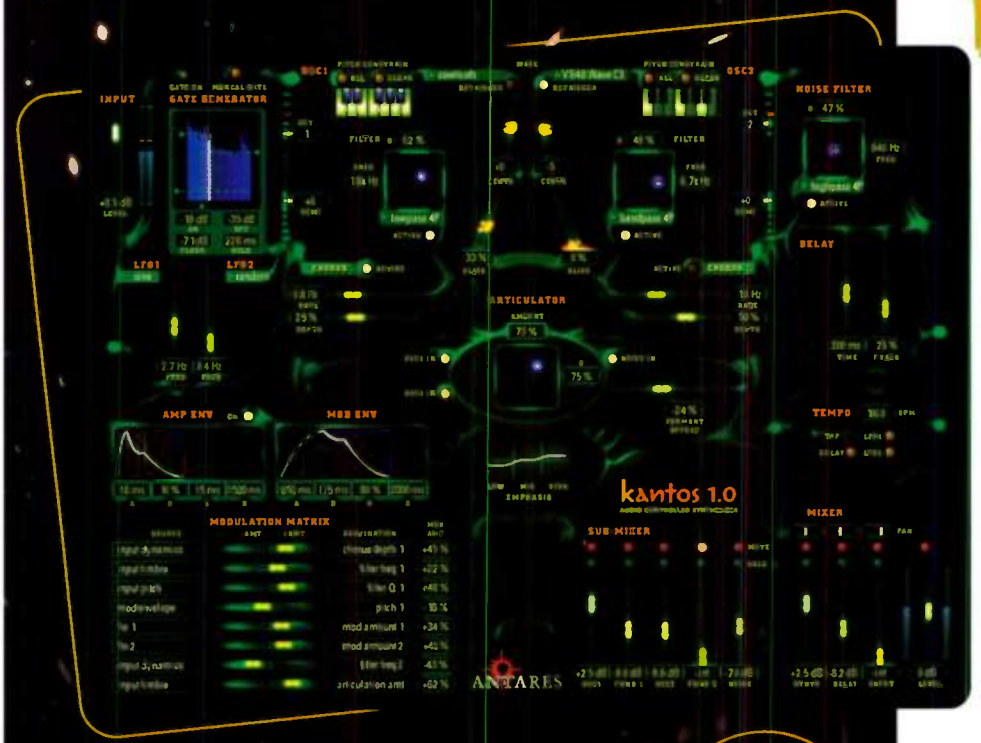


FIG. 4: In this window from MOTU *Digital Performer*, a MIDI track (green) is playing string chords on an E-mu e6400 Ultra sampler. The sampler's output is routed through a gate in an OASYS PCI, which is being triggered by the middle (purple) MIDI track. The stereo audio track at bottom shows the result: a rhythmic, pulsing string pad.

This changes everything.

kantos 1.0

AUDIO CONTROLLED SYNTHESIZER

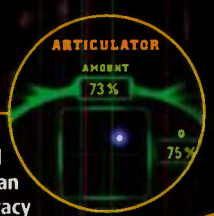


From the company that revolutionized vocal intonation processing comes kantos 1.0, a software-based synthesizer that finally liberates you from the tyranny of MIDI, keyboards, controllers or, in fact, anything that stands between you and the music you hear in your mind.

kantos 1.0 is controlled by audio. Any pitched monophonic audio.* Like your voice. Or a musical instrument. Live, in real time. kantos 1.0 analyzes incoming audio and instantaneously extracts pitch, dynamics, harmonic content and formant characteristics. This information is then used to control the kantos 1.0 sound engine. In ways never before possible with a conventional MIDI synth.

To learn more about kantos 1.0, visit our website at www.antarestech.com for audio demos, guided tours and more. Whether you are looking for an alternative to traditional controllers, or are looking to produce electronic music with a level of sonic innovation and dynamic expression that's simply not otherwise possible, kantos 1.0 will, quite literally, change the way you make music.

*Actually, kantos 1.0 can also respond to unpitched or polyphonic input. While the output isn't always predictable, it's rarely less than interesting. And particularly with rhythmic input, you can get extremely dynamic (and sometimes downright surprising) results.

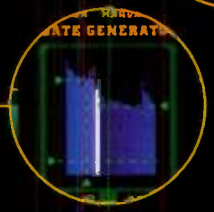


TIMBRAL ARTICULATOR

The heart of kantos 1.0. The articulator takes the harmonic and formant information from the input signal and dynamically applies it to the synthesized signal. It can reproduce the input's characteristics with uncanny accuracy or warp them into a universe of mutant forms.

WAVETABLE OSCILLATORS

Each wavetable oscillator includes its own independent multimode resonant filter and chorus generator. Additional wavetables will be available from our website. Or create your own with pretty much any sample editor.



GATE GENERATOR

The Gate Generator gives you control over the triggering and duration of the envelopes as well as retriggering the oscillators' wavetables. Also included is a variable-threshold noise gate to help clean up any annoying background noise in the control audio.

KANTOS 1.0 WILL INITIALLY BE AVAILABLE IN MAS, RTAS (MAC) AND VST (MAC) FORMATS, WITH DIRECTX FOLLOWING NOT TOO FAR BEHIND. CHECK OUR WEBSITE FOR DETAILS.

Electronic Musician 2003 EDITORS CHOICE

ANTARES

WHERE THE FUTURE'S STILL WHAT IT USED TO BE

1.0

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Audio Editors

Manufacturer	Product Name	Minimum System Requirements	Number of Audio Tracks	Record Resolution (word length in bits)	Sampling Rates (kHz)	Audio File Formats Supported	Plug-in Formats Supported
Berkley Integrated Audio Software (BIAS), Inc.	Peak 3.1	Mac OS 8.6/9 & OS X 10.1, 64 MB	2	32-bit	10,000 kHz	AIFF, SDII, WAV, MP3, MPEG-4, SND, .AU, .JAM image, SONIC AIFF, PARIS (.PAF)	VST
Blaze Audio	RipEditBurn 2.0	Win 9x, Me, 2000, XP	2	24-bit	Unlimited	WAV, MP3, RA, WMA	BAE
Celemony Software GmbH	Melodyne cre8 1.1	Mac OS 9, Mac OS X, Win 98, ME, 2000, XP, 256 MB RAM	8	16-bit	48 kHz	WAV, AIFF, SDII, SND	N/A
Celemony Software GmbH	Melodyne Studio Edition 1.1	Mac OS 9, Mac OS X, Win 98, ME, 2000, XP, 256 MB RAM	24	32-bit	192 kHz	WAV, AIFF, SDII, SND	N/A
FASoft	n-Track Studio 3.1	Win 95, 98, ME, NT, 2000, XP	Unlimited	24-bit	192 kHz	WAV, MP3, WMA, OGG	DirectX, VST, DirectXi, VSTi
GenieSys Voice L.C.	SampleRat 1.0	Intel Celeron 400, Win 98 SR, 32 MB RAM	2	32-bit	96 kHz	WAV	N/A
MAGIX Entertainment Corporation	MAGIX Music Studio 7	Win 95/98/ME/NT/2000/XP, 300 MHz CPU, 64MB RAM, 16-bit sounds & graphics card	32	24-bit	48 kHz	WAV, AIFF, MP3 (w/ optional encoder)	DIRECT X 6.0, VST 2.0
MAGIX Entertainment Corporation	MAGIX Music Studio 7 deLuxe	Win 95/98/ME/NT/2000/XP, 300 MHz CPU, 64MB RAM, 16-bit sounds & graphics card	64	24-bit	48 kHz	WAV, AIFF, MP3 (w/ optional encoder)	DIRECT X 6.0, VST 2.0
MAGIX Entertainment Corporation	MAGIX Music Maker 7	Win 95/98/ME/NT/2000/XP, 300 MHz CPU, 64MB RAM, 16-bit sounds & graphics card	64	16-bit	48 kHz	WAV, MP3(w/ optional encoder)	Direct X 6.0 & VST 2.0
MAGIX Entertainment Corporation	MAGIX Music Maker 7 deLuxe	Win 95/98/ME/NT/2000/XP, 300 MHz CPU, 64MB RAM, 16-bit sounds & graphics card	96	16-bit	48 kHz	WAV, MP3 (w/ optional encoder)	Direct X 6.0 & VST 2.0
MAGIX Entertainment Corporation	Samplitude 7.0	Win	Unlimited	32-bit float	up to 96 kHz	WAV, AIFF, MP3	Direct X & VST
Propellerheads Software	ReCycle 2.0	Mac OS 8.6, 64 MB RAM, PowerPC Win: Win 98 or later, Pentium, 64 MB RAM	2	16-bit	Unlimited	WAV, SDII, AIFF, REX, import from samplers	N/A
SADiE, Inc.	SADiE 24/96 4.2.1	PC, Win 98, 128k	24 per card	24-bit	96 kHz	SADiE, AES31, AIFF, WAV, SDII, DDP, and more	Cedar, DirectX
SoftLab-NSK	DDClip Pro 3.5	any Win platform, Pentium CPU	32	32-bit	Unlimited	WAV, AIFF, MP3	DirectX
Sonic Foundry, Inc	Sound Forge 6.0	200 MHz, 32 MB RAM, Win 98SE, Me, 2000, XP	2	24-bit, 32-bit	192 kHz	WAV, MP3, AIF, AVI, MOV, WMV, RM, OGG, PCA, WMA, OGG, AU/SND, DIG/SD, RAW, MPEG-1&2, VOX	DirectX
Steinberg North America	WaveLab 4.0	Pentium II 200 MHz or AMD K7 (Pentium III 500 MHz or AMD K7 recommended)	2	32-bit	192 kHz	WAV, AIFF, AU, RAW, SDII, Paris 24bit, ulaw, MP3, Sun/Java, and more	VST, DirectX, WaveLab
Syntrillium Software	Cool Edit 2000	Win 95, 98, ME, 2000, XP, 100 MHz, 16MB RAM	2	32-bit	192+ kHz	WAV, AIF, MP3, AU, VOX, PCM, and more	DirectX
Syntrillium Software	Cool Edit Pro 2.0	Win 98, ME, 2000, XP, 233 MHz, 64MB RAM	128	32-bit	192+ kHz	WAV, AIF, MP3PRO, WMA, CEL, AU, VOX, PCM, and more	DirectX
TC Works	Spark XL 2.6	Mac OS X or Classic, 128 MB RAM	2	32-bit	192 kHz	WAV, AIFF, SDII, MP3 and all Quicktime Formats	VST, MAS

(continued from page 12)

shooting advice and points out that new video cards released after the file was written may support multidisplay setups. In fact, most of the video cards at my local computer superstore were newer cards not listed in the file. As always, you should check the manufacturer's Web site for the most current information on compatibility issues.

Under Windows, one monitor is considered the primary display, and that's where the Windows startup logo, among other things, appears. Unfortunately, most PCs offer no system-level method for designating which card handles the primary display. Should the BIOS choose the wrong card for your primary display, simply change the order of the cards in the PCI slots. Once you've installed the second video card and the system has recognized it, all you have to do is right-click on your desktop, select Properties and then Settings, and check the box labeled "Extend my Windows desktop onto this monitor" (see **Fig. 4**). You can also get to the Display Properties window through the Control Panel folder.

The setup procedure for a Mac is virtually identical. Turn the computer off, install the second card, plug in the monitor, and power up again. The system should recognize the new display automatically. Open the Monitors & Sound control panel, click on the Arrange button, and drag the monitor icons into the arrangement you want (see **Fig. 5**).

DÉJÀ VIEW

Under both platforms, the two monitors can theoretically have different resolutions, but some Windows users warn against it. Give it a try if you like; you'll probably have no trouble as long as you don't go below 256 colors. Should your system balk at the second monitor, try setting both monitors to the same resolution and see whether that helps. If you're really picky about your display, consider using matched monitors so that their refresh rates are the same.

The other potential snag in setting up a dual-monitor system under either platform is PCI bandwidth. Some video cards don't play nicely with other PCI devices. For those cards, the top pri-

Number of Bundled Plug-ins	Sampler Support	Supports QuickTime and/or AVI Movies	Mixer	Automation	CD Burning	Control via MIDI	Pitch-shift Type	Time Compression/ Expansion	Levels of Undo	View and Edit at Single-sample level	Special Features	List Price
25	Yes	Yes	No	Yes	Yes	No	Traditional & Formant-preserving	Y/Y	Unlimited	Yes	Integrated Vbox environment for VST plug-ins, unlimited edit histories for each open document	$499
10	No	No	Yes	No	Yes	No	Traditional	Y/Y	1+	Yes		$40
N/A	No	No	Yes	No	No	No	Traditional & Formant-preserving	Y/Y	1	No	Detects notes in audio files and allows user to edit pitch, time, formats of each note individually	$395
N/A	No	No	Yes	No	No	No	Traditional & Formant-preserving	Y/Y	500	No	Detects notes in audio files and allows user to edit pitch, time, formats of each note individually	$995
5	Yes	Yes	Yes	Yes	No	Yes	Formant-preserving	Y/Y	Unlimited	Yes	Live input processing, MIDI & audio editing, supports WDM, Asio, MME and DirectSound	$42
N/A	No	No	No	No	No	No	Traditional & Formant-preserving	Y/Y	1	Yes	Specialized sample editor has editing functionality	$190
9	Yes	Yes	Yes	Yes	No	Yes	Traditional	Y/Y	Multiple	Yes	Bundled with full MIDI sequencer + 1,000 loops and samples, 4 virtual instruments	$50
14	Yes	Yes	Yes	Yes	Yes	Yes	Traditional	Y/Y	Multiple	Yes	Bundled with full MIDI sequencer + 3,000 loops and samples, 6 virtual instruments, sync w/ SMPTE, MTC	$100
9	No	Yes	Yes	Yes	No	No	Traditional	Y/Y	Multiple	No	8 virtual Instruments, karaoke, video creation w/ full control and editing, over 2,000 media samples	$50
10	No	Yes	Yes	Yes	No	No	Traditional	Y/Y	Multiple	No	11 virtual Instruments, karaoke, video creation w/ full control and editing, over 3,000 media samples	$80
N/A	Yes	Yes	Yes	Yes	Yes	Yes	Traditional	Y/Y	Unlimited	Yes	Object oriented editing, supports surround sound formats through 5.1, 3rd party controller support	Call
N/A	Yes	No	No	No	No	Yes	Traditional	Y/Y	1	No	Loop slicing software. Makes loops tempo and pitch independent	$179
N/A	No	No	Yes	Yes	Yes	No	Traditional	Y/Y	50	Yes		Call
22	No	Yes	Yes	Yes	No	No	Traditional	N/N	999	No	Profile-automated audio effects	$199
18+	Yes	Yes	Yes	No	Yes	Yes	Traditional & Formant-preserving	Y/Y	Unlimited	Yes	Real-time nondestructive editing, multitask backround rendering, modeless audio plug-in chainer	$500
10+	No	No	Yes	Yes	Yes	Yes	Traditional & Formant-preserving	Y/Y	N/A	Yes	Audio montage for multi-track editing, audio analysis tools, UV22HR dithering, batch processing	$599
20+	Yes	No	No	No	No	Yes	Traditional & Formant-preserving	Y/Y	Unlimited	Yes	Full-featured stereo editor, noise reduction, batch processing, mastering, spectral/freq analysis	$69
45+	Yes	Yes	Yes	Yes	Yes	Yes	Traditional & Formant-preserving	Y/Y	Unlimited	Yes	Stereo & multitrack editor, real-time FX & EQ, looping, data analysis, mastering, batch processing	$249
24	No	Yes	Yes	No	Yes	No	Traditional	Y/Y	Unlimited	Yes	Audio restoration analyzers, realtime effects matrix, synthesis, batch converter	$499

ority is getting video information through the pipeline at all costs. This can wreak havoc on PCI audio interfaces, and a dual-monitor system will only make matters worse. Before you take the leap and add that second video card, check with the manufacturer of your audio hardware to see what issues, if any, the company has had with video cards.

You can also find one-card solutions for Macs and PCs. These cards not only save you slots and resources, but also provide additional features for configuring your expanded desktop. (For PC users, such single cards may also offer support for Windows 95 and NT.) At $179, the G400 from Matrox is a relatively inexpensive Windows card. The G400's DualHead technology allows you to manage four display modes and eight combinations of display types, including analog flat panels. The card even lets you use an NTSC/PAL television monitor for your secondary display. For $200 to $700 more, you can have an Appian Graphics card, which supports two or four monitors and features a sophisticated application that's called *HydraVision*. *HydraVision* allows you to specify items such as which monitor displays which program and where dialog boxes pop up.

With multiple-monitor support standard in both major operating systems and dirt-cheap 15- and 17-inch monitors readily available, adding a second (or third) display has become a fairly inexpensive way to make your virtual workplace more productive. Just be sure to look before you leap; compatibility hasn't become a nonissue quite yet. Once you've gotten used to long track views, side-by-side full-screen displays, and 24-channel mixers without scroll bars, you'll wonder how you ever got by with just one monitor. Enjoy the view.

Brian Smithers *wonders whether applying this technology to clocks would result in more hours in a day. Share your thoughts with him through his Web site, members.aol.com/notebooks1.*

We welcome your feedback. E-mail us at emeditorial@primediabusiness.com.

Computer-Assisted Music-Education Software

Manufacturer	Product	Version	Type	Level	Minimum System Requirements	Special Features	List Price
Charanga Ltd	Guitar Coach	N/A	Guitar lessons	Beginner	Win 3.1, 95, 98, 2000, ME, NT, XP, 16 MB RAM	130 lessons, 200 video clips, 50 studies and songs, real audio, tuner, metronome	$40
Charanga Ltd	Electric Guitar Coach	N/A	Electric guitar lessons	Beginner	Win 3.1, 95, 98, 2000, ME, NT, XP, 16 MB RAM	200 video clips, 150 lessons covering lead, rhythm, technique and chords, 9 famous songs	$40
Charanga Ltd	Keyboard Coach	N/A	Electronic keyboard lessons	Beginner	Win 98, ME, 2000, XP, 64MB RAM, Pentium PC 233MHz or faster	Keyboard Roll shows you how to play, Music Coach checks your playing, Video Coach with over 50 clips	$50
ChordWizard Software Pty Ltd	ChordWizard Gold	2.0	Guitar chord/scale reference	All levels	Win 95, 98, ME, NT4, 2000, XP, Pentium 60 MHz, 16 MB RAM, MIDI sound card	Workshop for all fretted instruments, includes multimedia music theory tutorials	$45
Cool Breeze Systems, Inc.	Cool School Interactus	1-8	Software operation & production	All levels	Win 98, ME, XP, Mac 8, 9, X, 64 MB RAM	Interactive training CD-ROM, DVD and Web	$50-$100
Cool Breeze Systems, Inc.	www.CoolSchoolOnline.com	2.0	Software & production training	All levels	Win, Mac, QuickTime, Shockwave	Online courses & movie libraries - Pro Tools, DP, Logic, Cubase	$50
Cool Breeze Systems, Inc.	CSi vol.1 - Pro Tools Basics	1.2	Interactive training CD-ROM	Intermediate	Win 98, ME, XP, Mac 8, 9, X, 64 MB RAM	Software simulations, movie tutorials, glossary, quizzing	$100
Cool Breeze Systems, Inc.	CSi vol.2.1 - Pro Tools Tips & Plug-ins	2.1	Interactive training CD-ROM	All levels	Win 98, ME, XP, Mac 8, 9, X, 64 MB RAM	Software simulations, movie tutorials, glossary, quizzing	$100
Cool Breeze Systems, Inc.	CSi vol.3 - Desktop Audio	3.1	Interactive training CD-ROM	Beginner	Win 98, ME, XP, Mac 8, 9, X, 64 MB RAM	Software simulations, movie tutorials, glossary, quizzing	$80
Cool Breeze Systems, Inc.	CSi vol.4 - Logic Audio	4.1	Interactive training CD-ROM	Intermediate	Win 98, ME, XP, Mac 8, 9, X, 64 MB RAM	Software simulations, movie tutorials, glossary, quizzing	$80
Cool Breeze Systems, Inc.	CSi vol.5 - Pro Tools 5	5.1	Interactive training CD-ROM	All levels	Win 98, ME, XP, Mac 8, 9, X, 64 MB RAM	Software simulations, movie tutorials, glossary, quizzing	$100
Cool Breeze Systems, Inc.	CSi vol.6 - Digital Performer	6	Interactive training CD-ROM	Intermediate	Win 98, ME, XP, Mac 8, 9, X, 64 MB RAM	Software simulations, movie tutorials, glossary, quizzing	$80
Cool Breeze Systems, Inc.	CSi vol.7 - Cubase SX	7	Interactive training CD-ROM	Intermediate	Win 98, ME, XP, Mac 8, 9, X, 64 MB RAM	Software simulations, movie tutorials, glossary, quizzing	$80
Cool Breeze Systems, Inc.	CSi QuickStart - Mbox	1	Interactive training CD-ROM	Beginner	Win 98, ME, XP, Mac 8, 9, X, 64 MB RAM	Software simulations, movie tutorials, glossary, quizzing	$60
Cool Breeze Systems, Inc.	CSi QuickStart - Plug-ins	1	Interactive training CD-ROM	All levels	Win 98, ME, XP, Mac 8, 9, X, 64 MB RAM	Movie tutorials, operational techniques, audio examples	$60
Cool Breeze Systems, Inc.	CSi QuickStart - SampleCell	1	Interactive training CD-ROM	Intermediate	Win 98, ME, XP, Mac 8, 9, X, 64 MB RAM	Movie tutorials, operational techniques, audio examples	$60
DataSonics	Mastering Music	N/A	Theory/composing	All levels	Win 95 or higher, Mac 8 or higher	3 learning levels: Musicianship, Publishing, and Composing	$396
Datasonics	Mastering Music Prelude	2.0	Music lessons for ages 10-18	All levels	Win, IE 5.5, Pentium 266Mhz, 96 MB RAM	Covers the school curriculum across all levels aspects of music	$297
Datasonics	Mastering Music Lab Pack	2.0	Music lessons for ages 10-18	All levels	Win, IE 5.5, Pentium 266Mhz, 96 MB RAM	Unlimited site license covering music curriculum for all aspects of music	$1,980
Datasonics	Mastering Music 5 Site Licence	2.0	Music lessons for ages 10-18	All levels	Win, IE 5.5, Pentium 266Mhz, 96 MB RAM	5 site License covering music curriculum with all aspects of music	$990
Datasonics	Mastering Music Komposa	2.0	Lesson generator	All levels	Win, IE 5.5, Pentium 266Mhz, 96 MB RAM	Generates lessons for mastering music	$495
Datasonics	Music Master Professional	5.3	Sequencing, notation & audio	All levels	Win, Pentium 266MHz, 96 MB RAM	Integrated MIDI sequencing and notation	$264
Datasonics	Music Master Publisher	5.3	Notation with MIDI sequencing	All levels	Win, Pentium 266MHz, 96 MB RAM	Plays all the notation symbols eg repeats, codas, dynamics, mordents, trills	$132
Datasonics	Music Master Performa	5.3	Sequencing, audio, notation	All levels	Win, Pentium 266MHz, 96 MB RAM	Integrated MIDI and audio on one screen, Win XP-compatible	$124
Electronic Courseware Systems, Inc.	Clef Notes	N/A	Note reading	Beginner	Win 95 or higher, 8 MB RAM, Mac OS 7.1 or higher, 4 MB free RAM	Includes note reading on treble, bass, alto or tenor clef	$40
Electronic Courseware Systems, Inc.	Cloud 9 Music 1.5.1	1.5.1	Music fundamentals	Beginner	Win 95 or higher, 8 MB free real RAM, Mac OS 7.6.1 or higher, 8 MB free RAM	Audio directions. Program is exploratory for ages 3 - 9	$40
Electronic Courseware Systems, Inc.	Ear Challenger	4.0	Ear training	Beginner	Win 95 or higher, 8 MB RAM, Mac OS 7.1 or higher, 8 MB RAM	Designed to assist you in increasing your ability to remember a series of pitches	$40
Electronic Courseware Systems, Inc.	Super Ear Challenger	2.3	Ear training	Beginner	Win 95 or higher, 8 MB RAM, Mac OS 7.1 or higher, 8 MB RAM	Designed to develop ear training skills through memory and color	$40
Electronic Courseware Systems, Inc.	Early Keyboard Skills	1.5	Piano skill development	Beginner	Win 95 or higher, 8 MB RAM, Mac OS 7.1 or higher, 8 MB RAM, MIDI is optional	Introduction to basic piano skills such as note reading and piano key names	$40
Electronic Courseware Systems, Inc.	Early Music Skills	4.0	Music fundamentals	Beginner	Win 95 or higher, 8 MB RAM, Mac OS 7.1 or higher, 8 MB RAM	Introduces pre-note reading concepts to young children	$40
Electronic Courseware Systems, Inc.	Echos	3.0	Sightreading piano skills	Beginner	Win 95 or higher, 8 MB RAM, sound card, MIDI keyboard	Implements concepts of sightreading using MIDI keyboard	$80
Electronic Courseware Systems, Inc.	Elements of Music	3.0	Theory	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8MB RAM	May be used by children or adults for x card, Mac OS 7.1 or higher, 8MB RAM	$80

Computer-Assisted Music-Education Software

Manufacturer	Product	Version	Type	Level	Minimum System Requirements	Special Features	List Price
Electronic Courseware Systems, Inc.	Keyboard Arpeggios	2.42	Piano skill development	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI required.	Review piano arpeggio performace and fingerings to increase performance skills.	$40
Electronic Courseware Systems, Inc.	Keyboard Fingerings	2.4	Piano skill	Beginner	Win 95 or higher, 8 MB RAM, sound card, MIDI keyboard	Review standard and special fingerings for major, natural minor and harmonic minor scales.	$80
Electronic Courseware Systems, Inc.	Keyboard Note Drill	3.0	Note reading	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI optional.	Varying levels of difficulty helps develop note reading skills. May be used with or without MIDI	$40
Electronic Courseware Systems, Inc.	Keyboard Tutor	2.0	Piano skill development	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM	Introduction to basic piano skills. Unlimited practice of skills offered.	$40
Electronic Courseware Systems, Inc.	Keyboard Blues	3.0	Instrumental performance	Intermediate	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI required	Introduces simple blues chords, user can practice improvising with background chords	$80
Electronic Courseware Systems, Inc.	Keyboard Chords	3.0	Theory	Intermediate	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB free RAM. MIDI optional	Drill and practice program which teaches major, minor, diminished, & augmented chords. Keeps records.	$80
Electronic Courseware Systems, Inc.	Keyboard Jazz Harmonies	3.0	Theory	Advanced	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB free RAM. MIDI optional	Study chord symbols and 7th chords. Keeps records.	$80
Electronic Courseware Systems, Inc.	Keyboard Extended Jazz Harmonies	3.0	Theory, ear training	Advanced	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM. MIDI optional.	Learn 9th, 11th, and 13th chords both aurally and visually. Keeps records.	$80
Electronic Courseware Systems, Inc.	Keyboard Intervals	3.0	Theory	Intermediate	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI optional.	Learn major, minor, diminished, and augmented intervals. Keeps student records.	$80
Electronic Courseware Systems, Inc.	Keyboard Speed Reading	4.0	Instrumental performance	Intermediate	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI optional.	Timed drills help you develop quicker note reading skills. Keeps student records.	$40
Electronic Courseware Systems, Inc.	Keyboard Kapers	3.0	Ear training/note reading	Intermediate	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI optional.	Varying levels of difficulty allow long use of the included games. Hall of Fame displays high scores.	$40
Electronic Courseware Systems, Inc.	KIDS (Keyboard Introductory Development Series)	2.1	Note reading and piano skills	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI optional	Includes studies in solfege, note reading, and finger numbers for piano playing, many activities.	$50
Electronic Courseware Systems, Inc.	Musical Stairs	3.0	Theory	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI optional	Aural-visual game introduces intervallic relationships to young students.	$40
Electronic Courseware Systems, Inc.	Musicus	4.0	Rhythm comprehension	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI optional	May be used in Spanish or English. Fun and colorful games teaching note values and musical meter.	$30
Electronic Courseware Systems, Inc.	Challenge Musicus	2.5	Rhythm skills development	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB free RAM. MIDI optional.	Beginners-Advanced: colorful games, learn about notes, rhythms and meter.	$30
Electronic Courseware Systems, Inc.	Super Musicus	2.0	Note/rhythmic meter recognition	Intermediate	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB free RAM. MIDI optional.	Develops understanding of the relative length of notes and placement in music meter.	$30
Electronic Courseware Systems, Inc.	Note Detective	2.0	Piano skill development	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI optional	Discover basic piano skills with the help of Sherlock.	$100
Electronic Courseware Systems, Inc.	Note Speller	3.0	Note reading	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI optional	Timed games which develop note reading skills.	$40
Electronic Courseware Systems, Inc.	Ricochet	1.4	Piano skills, ear training	Beginner	Win 95 or higher, 8 MB RAM, sound card. MIDI optional	Learn to play popular tunes by playing the piano key that a colored ball has highlighted.	$30
Electronic Courseware Systems, Inc.	Rhythm Performance Test-Revised	2.0	Skill assessment	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM.	Assess rhythmic performance skills or overall music skills.	$100
Electronic Courseware Systems, Inc.	Smack-a-Note	1.5.3	Note reading	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM.	Click on the 'critters' that match the note names presented. Variety of skills included.	$20
Electronic Courseware Systems, Inc.	Symbol Simon	1.92	Music symbols and terminology	Beginner	Win 95 or higher, 8 MB RAM, sound card.	Team up with musical symbol sleuth, Simon, to learn music symbols and their definitions.	$40
Electronic Courseware Systems, Inc.	Tap It	3.5	Rhythm skills	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM.	Learn to keep a steady beat by listening or reading random rhythms. Full record keeping.	$40

Computer-Assisted Music-Education Software

Manufacturer	Product	Version	Type	Level	Minimum System Requirements	Special Features	List Price
Electronic Courseware Systems, Inc.	Tap It II	3.0	Rhythm skills development	Intermediate	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB free RAM. MIDI optional.	Tapping drills include syncopation, eighth and sixteenth note values. Varying tempos available.	$40
Electronic Courseware Systems, Inc.	Toon Up	1.2.2	Ear training	Beginner	Win 95 or higher, 8 MB RAM, sound card	Develops listening skills and intonation.	$40
Electronic Courseware Systems, Inc.	Tune It II	3.6	Ear training	Beginner	Mac OS 7.1 or higher, 8 MB RAM.	Practice in matching pitches and getting two pitches "in tune."	$40
Electronic Courseware Systems, Inc.	Audio Mirror	3.0	Vocal/pitch matching	Intermediate	Win 95 or higher, 8 MB RAM, Creative Labs Sound Blaster (no compatibles)	Sing or play into a mic attached to computer to match the sound presented. See if flat or sharp.	$80
Electronic Courseware Systems, Inc.	MIDI Jazz Improvisation I	N/A	Instrumental performance	Intermediate	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI required	Instrumentalists and vocalists can use this program to help develop improvisational skills.	$60
Electronic Courseware Systems, Inc.	MIDI Jazz Improvisation II	N/A	Instrumental Performance	Advanced	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM. MIDI required	Instrumentalists and vocalists can use this to assist in developing improvisational skills.	$60
Electronic Courseware Systems, Inc.	Music Composer Quiz	3.0	Music appreciation	Intermediate	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM.	Over 100 quiz questions are randomly chosen for testing knowledge. Student records retained.	$40
Electronic Courseware Systems, Inc.	Music Flash Cards	3.0	Theory	Intermediate	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM.	Includes drills on note naming, scales, key signatures, intervals and basic chords.	$100
Electronic Courseware Systems, Inc.	Music Terminology	3.0	Music fundamentals	Intermediate	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM.	Glossary of terms included along with 5 different types of testing.	$40
Electronic Courseware Systems, Inc.	Music Terminology for Bands, Orchestras & Choirs	2.0	Music fundamentals	Intermediate	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB RAM.	Quizzes on terms specific to each ensemble, general musical terms with definitions.	$40
Electronic Courseware Systems, Inc.	Rhythm Factory	1.0	Rhythm skills development	Intermediate	Win 95 or higher, 8 MB free RAM, sound card, Mac OS 8 or higher	Verbal instructions, recordkeeping and a colorful "factory" environment	$80
Electronic Courseware Systems, Inc.	Aural Skills Trainer	3.0	Ear training	Advanced	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB free RAM. MIDI optional.	Choose intervals, basic chords or seventh chords for studies and quizzing. Keeps records.	$100
Electronic Courseware Systems, Inc.	Functional Harmony	3.0	Theory	Advanced	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB free RAM. MIDI optional.	Choose studies: basic chords, diatonic 7ths, secondary dominants, or borrowed/altered chords.	$150
Electronic Courseware Systems, Inc.	Harmonic Progressions	3.0	Theory/ear training	Advanced	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB free RAM. MIDI optional.	Analyze chords, harmonic dictation and aural identification. Keeps records.	$200
Electronic Courseware Systems, Inc.	Music History Review: Composers	3.0	Music appreciation	Advanced	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB free RAM.	Test knowledge of composers from the Renaissance through the Twentieth Century. Keeps records.	$40
Electronic Courseware Systems, Inc.	Musique	N/A	Theory, ear training	Advanced	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB free RAM. MIDI optional	Collection of software with self-paced exercises for theory instruction.	$595
Electronic Courseware Systems, Inc.	TimeSketch Editor	4.2	Listening analysis	All levels	Win 95 or higher, 32 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	Create thematic analysis of audio CD, MP3, MIDI, WAV and AIF files.	$100
Electronic Courseware Systems, Inc.	Bach Magnificat/Vivaldi Gloria Sketches	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of each piece as you listen to the performance.	$40
Electronic Courseware Systems, Inc.	Bach Toccata & Fugue Sketch	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of this work as you listen to the performance.	$40
Electronic Courseware Systems, Inc.	Beethoven Piano Concerto No. 3 Sketch	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of this peice as you listen to the performance.	$40
Electronic Courseware Systems, Inc.	Beethoven Pathetique Sonata Sketch	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of this piece as you listen to the performance.	$40
Electronic Courseware Systems, Inc.	Beethoven Symphony No. 5 Sketch	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of this work as you listen to the performance.	$40
Electronic Courseware Systems, Inc.	Berlioz Symphony Fantastique Sketch	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of this piece as you listen to the performance.	$40
Electronic Courseware Systems, Inc.	Brahms Symphony No. 3 Sketch	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of this piece as you listen to the performance.	$40
Electronic Courseware Systems, Inc.	Brubeck Music Analyzed!	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of each piece as you listen to the performances.	$40
Electronic Courseware Systems, Inc.	Dvorak New World Symphony Sketch	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of this piece as you listen to the performance.	$40
Electronic Courseware Systems, Inc.	Miles Davis Music Analyzed!	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of each piece as you listen to the performances.	$40
Electronic Courseware Systems, Inc.	Grainger Lincolnshire Posey Sketch	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of this piece as you listen to the performance.	$40

Computer-Assisted Music-Education Software

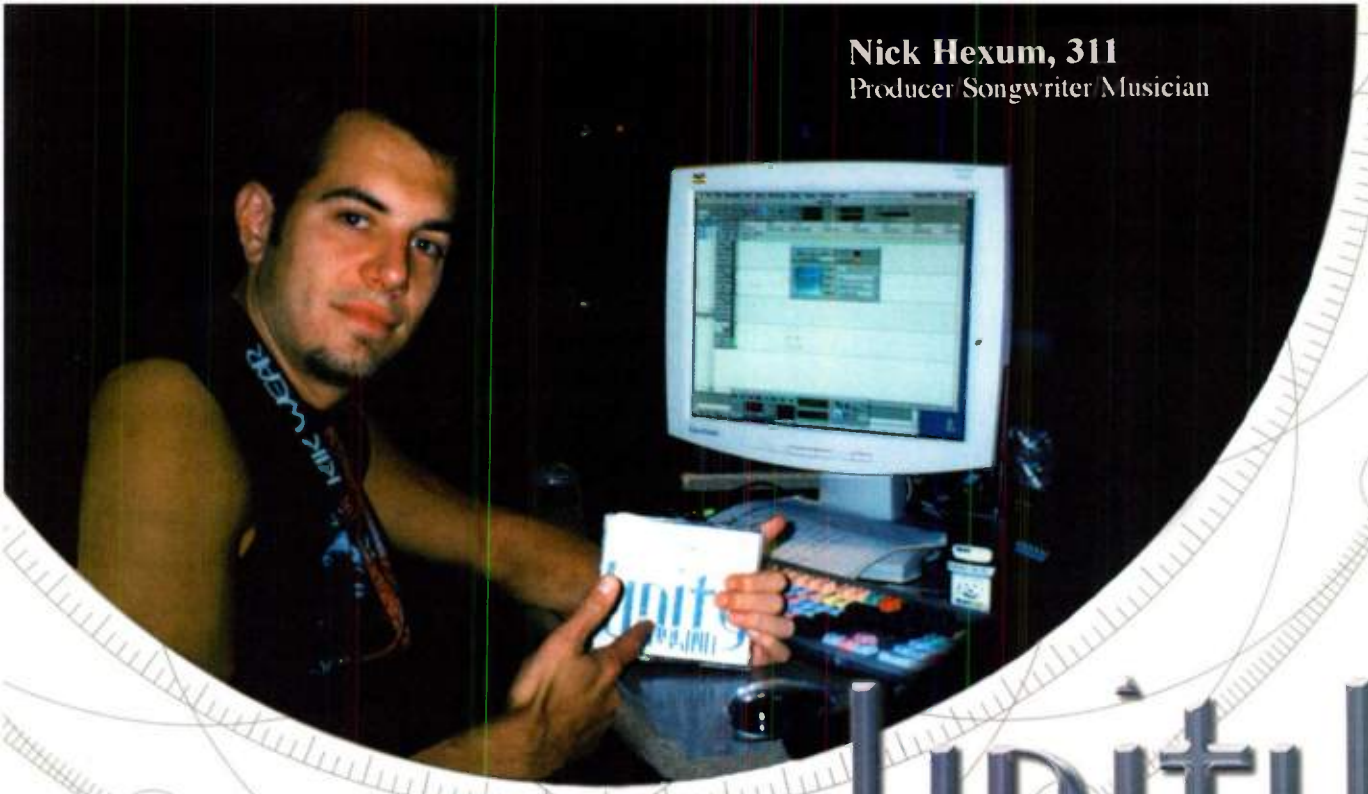
Manufacturer	Product	Version	Type	Level	Minimum System Requirements	Special Features	List Price
Electronic Courseware Systems, Inc.	Moussorgsky Pictures at an Exhibition Sketch	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of this piece as you listen to the performance.	$40
Electronic Courseware Systems, Inc.	Mozart Symphony No. 40 Sketch	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of this piece as you listen to the performance.	$40
Electronic Courseware Systems, Inc.	Schubert Unfinished Symphony Sketch	1.95	Listening analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of this piece as you listen to the performance.	$40
Electronic Courseware Systems, Inc.	Vaughan Williams/Barber Sketches	1.95	Listening Analysis	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM.	See the form analysis of each piece as you listen to the performances.	$40
Electronic Courseware Systems, Inc.	Adventures in Musicland	3.1	Note reading, ear training	Beginner	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB free RAM.	Features characters from Alice in Wonderland by Lewis Carroll. For ages 4 through 12.	$50
Electronic Courseware Systems, Inc.	Digital Music Mentor	1.11	Instrument/vocal performance	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 8 or higher, 8 MB free RAM. Microphone required.	Record exercises which others can study and then record their performance,portfolio builder	$40
Electronic Courseware Systems, Inc.	Spell and Define	3.0	Terminology/music fundamentals	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS7.1 or higher, 8 MB free RAM.	Teachers can create and customize vocabularies for student studies.	$25
Electronic Courseware Systems, Inc.	ECS Music Suite	N/A	Instrumental/vocal analysis	All levels	Win 95 or higher, 8 MB RAM, Creative Labs AWE32 or higher Sound Blaster, microphone.	This set includes the ECS Music Metronome and the ECS Music Tuner.	$40
Electronic Courseware Systems, Inc.	ECS Music Metronome	1.5	Performance	All levels	Win 95 or higher, 8 MB RAM, sound card, Mac OS 7.1 or higher, 8 MB free RAM.	Turn your computer into a metronome to assist in playing accurately in tempo.	$20
Electronic Courseware Systems, Inc.	ECS Music Tuner	5.1	Listening analysis/ performance	All levels	Win 95 or higher, 8 MB RAM, Creative Labs AWE32 or higher SoundBlaster Card, microphone.	Software tool designed to help user perform with better intonation, shows if you are sharp or flat.	$30
FMJ-Software	Chromatia Tuner	1.0	Chromatic multi-temperament I	All levels	Win 9X, ME, NT, 2K, XP	Instrument tuning software. 20 different temperaments, from historic tunings to modern.	$20
GenieSys Voice L.C.	MusicBall	1.0	Music game	Beginner	Win ME with DirectX 8.0, 64 MB, P-II-300	16 MIDI-tracks	$30
JustEnough Learning Co.	JustEnough Learning Kit	N/A	Instrumental performance	Beginner	Win 95, 98, ME, XP, 2000. 64 MB RAM. 120 MHz Power PC, 166 MHz Pentium or compatible	Video game. DVD player compatible. Four ways to learn.	$20
Line 6	GuitarPort	N/A	Artist and Berklee lessons	All levels	USB-equipped PCs that run Win 2000, XP	Tablature, Berklee online lessons, artist lessons, Line 6 amp modeling, effects, and a 24-bit USB	$180
MiBAC Music Software, Inc.	Music Lessons I Fundamentals (Windows)	N/A	Theory & ear-training	All levels	Win 95, 98, ME, NT4, 2000, XP, Sound Blaster and MIDI compatible.	Multiple skill levels, on-screen help, built-in music theory reference, record keeping	$120
MiBAC Music Software, Inc.	Music Lessons I Fundamentals (Mac)	N/A	Theory & ear-training	All levels	Mac 68 K or PowerMac, MacOS 7.5 or higher, MacOS 8 or MacOS 9 (MIDI optional).	Multiple skill levels, on-screen help, built-in music theory reference, record keeping	$150
MiBAC Music Software, Inc.	Music Lessons II Chords and Harmony	N/A	Theory & ear-training	Advanced	Win 95, 98, NT4, Win2000, XP, MacOS 7.5 or higher, MacOS 8 or MacOS 9.	Develops all skill areas: visual recognition, notation, playing (piano & guitar) and ear training.	$150
MIDIWorks Interactive	Composer Notes	2002	Composition & instrumentation	Advanced	Win 95, Mac OS 8.1	Interactive electronic book	$250
MIDIWorks Interactive	Junior Music Toolkit	N/A	Elementary creative music	Beginner	Win 95, Mac OS 8.2	Interactive electronic book	$90
MIDIworks Interactive	Composer Notes Vol. 1	N/A	Performance/writing	All levels	Win 95 or higher, 64 MB application RAM, Mac OS 8 or higher, 64 MB application RAM	Electronic book contains learning framework addressing composition for acoustic instruments & MIDI	$250
MIDIworks Interactive	Composer Notes Jr. Music Toolkit	N/A	Creativity	Beginner	Win 95 or higher, OS 8 or higher	Offers music activities for the elementary classroom.	$90
MIDIworks Interactive	Composer Notes Student Edition	N/A	Composition	All levels	Win 95 or higher, Mac OS 8 or higher	Program designed for single student use in studying composing and arranging music.	$50
miniMusic	BugBand	N/A	Sight reading	Beginner	Palm OS 2.0 and 30k free	Piano and guitar interface. Treble and bass clef.	$12
MJ and Associates	Global Voices in Song: Four Swazi Songs	N/A	Vocal performance	All levels	Win 95 or higher, 32 MB RAM, Mac OS 7.5.3 or higher, 32 MB RAM	Presents vocal music of a another culture using video materials and multimedia.	$200
MJ and Associates	Global Voices in Song: Folk Songs of Hungary	N/A	Vocal performance/ multi-cultural	All levels	Win 95 or higher, 32 MB RAM, Mac OS 7.5.3 or higher, 32 MB RAM	See a model performance, pronounced text, voice parts, choreography, written text & translation.	$200
PG Music Inc.	Band-in-a-Box	11	Instrumental performance, sight	All levels	Win 16 MB	Automatic accompaniment	$88
Pianomouse.com	Music Theory FUNdamentals	N/A	Theory	Beginner	Win 95 or higher, 32 MB RAM, soundcard, Mac OS8.1-9.1, 32 MB RAM	16 Lessons and games introducing basics of keyboard, pitch, music alphabet, notes and other areas.	$20
Pianomouse.com	Pianomouse Meets the Great Composers	N/A	Music appreciation	Intermediate	Win 95-ME, 32 MB RAM, soundcard. Mac OS 8.1-9.1, 32 MB RAM	Includes narrated composer biographies, puzzles, and games about 8 composers.	$20
Play Music Inc.	Play Guitar	2.0	Instrumental performance	Beginner	Win	MIDI animated fretboard w/ video synching	$50
Play Music Inc.	Play Blues Guitar	2.0	Instrumental performance	Intermediate	Win	Midi animated fretboard, 90 Mins Video	$50

Computer-Assisted Music-Education Software

Manufacturer	Product	Version	Type	Level	Minimum System Requirements	Special Features	List Price
Play Music Inc.	Play Rock Guitar	2.0	Instrumental performance	Intermediate	Win	Midi animated fretboard, Taught by GIT Instructor Keith Wyatt	$50
Pygraphics	3D Java	1.2.9	Drill design software	All levels	Win 95 or higher or Mac OS X, 400 mhz, 128 MB of RAM	Drill design software for marching bands	$799
Pygraphics	Online Amadeus	3.1.0	Pitch and rhythm training	Beginner	Win 95 or higher, 64 MB of RAM	Used with Standard of Excellence software	$295
Rising Software	Auralia	2.1	Ear-training	All levels	Win 95, 98, ME, NT, 2000, XP, Mac OS X	26 Topics, student tracking, customizable content	$149
Rising Software	Musition	2.0	Theory	All levels	Win 95, 98, ME, NT, 2000, XP, Mac OS X	25 Topics, student tracking, customizable content	149
SDG Soft	Guitar Magic	III	Instrumental - guitar	All levels	PC, Pentium 233, CD-ROM	University level guitar education	$289
Sibelius Software	Teaching Tools	N/A	Music fundamentals, theory	Beginner	Win 95, 98, Me, 2000, XP, NT4 or higher, 32 MB+ RAM, Mac G4, G3, iMac OS8.6 to 10.1 or later, 15 MB+ RAM	Exercise, worksheets, and other educational resources which help teach music with Sibelius software	$69
Trail Creek Systems	Ear Training Expedition Part 1	N/A	Ear training	Intermediate	Win 95 or higher	Covers pitch register, dictation, intervals and scales	$60
Trail Creek Systems	Ear Training Expedition Part 2	N/A	Ear training	Intermediate	Win 95 or higher	Covers inverted triads, augmented & diminished, rhythm, and circle of 5ths	$60
Virtual Virtuoso	Practice Assistant	1.31	Studies and etudes for strings	All levels	Win	Plays at any tempo, helps with intonation and rhythm	$59
Virtual Virtuoso	Performance Assistant	2.0	Concertos & pieces for strings	All levels	Win	Plays accompaniment and/or solo, at any tempo	$20
Virtual Virtuoso	Scale Master with MIDI Metronome	1.2	Scales & arpeggios for strings	All levels	Win	Plays all scales, any tempo. Displays notation on screen	$25
World Wide Woodshed	SlowGold	7	Slow down/ transcibe/practice	All levels	Win 95, 98, NT, 2000, ME, XP, 300 MHz Pentium , 32 MB RAM	Sound quality, transposition	$50
World Wide Woodshed	SlowBlast!	N/A	Slow down/ transcibe/practice	All levels	Win 95, 98, NT, 2000, ME, XP or Mac 8.6-9, X, sound card or chip, 300 MHz Pentium	Slow down or speed up, wave file support, real-time	$20

Computer Music Systems

Manufacturer	Product	CPU Range Offered	Case Types	Tech Support Period	Tech Support Type	Warranty (years)	Special Features	List Price
4Front Technologies	Open Sound System	Pentium/Sparc/ PowerPC/PA-RISC	Desktop/rackmount	1 year	Phone, email	2 years	Digital audio for UNIX operating systems	$20–$75
Carillon Audio Systems	Carillon AC-1	Pentium 4 2.0 to 3.0 gHz	Custom rackmount	Unlimited	Phone, email	3 years	5000 included audio samples, remote tech support, HTML How-to manuals on desk	$1,199 and up
Digital Audio Labs, Inc.	CardDeluxe	386 - any	Desktop	Unlimited	Phone, email	1 year	Win 95 - XP	$399
Hercules	Hercules 16/12 FW	Pentium II and up	Rackmount	Unlimited	Phone, email	1 year	24/96 - 16 In/12 Out, DV/FireWire card included	$899
MultipointUSA	Xeon Workstation	Xeon 2.8GHz	Rackmount, server, full sys.	Unlimited	Phone, e-mail, onsite	3-5 years	Continuous duty, quiet	$4,999–$9,999
SM PRO Audio	IN5 Multi I/O	Pentium II and up	Rackmount	Unlimited	Phone, email	1 year	Dual box mixer, format converter, recording interface	$399
SM PRO Audio	PR8 II	Pentium II and up	Rackmount	Unlimited	Phone, email	1 year	8 independent mic preamps, 8 combo XLR inputs with variable gain control	$1,195
ST Audio	SRC VI	Pentium II and up	Rackmount	Unlimited	Phone, email	1 year	Digital patchbay/switchbox for up to 6 AES/EBU and S/PDIF signal streams	$299
ST Audio	DSP2000 C-Port	Pentium II and up	Rackmount	Unlimited	Phone, email	1 year	2x balanced (XLR) inputs with built in pre-amps and switchable phantom power	$699
ST Audio	DSP3000 M-Port	Pentium II and up	Rackmount	1 year	Phone, email	1 year	Level meter display for each input channel (switchable to display output signal)	$1,195
ST Audio	DSP24 ADAT	Pentium II and up	PCI card	Unlimited	Phone, email	1 year	10x10 24-bit 100% Full-Duplex recording path support	$299
ST Audio	DSP24 Media 7.1	Pentium II and up	Rackmount	Unlimited	Phone, email	1 year	Onboard hardware synthesizer (Dream/Roland GS soundset)	$499
ST Audio	ADAM 24	Pentium II and up	Rackmount	Unlimited	Phone, email	1 year	8 analog mono inputs unbalanced, 8 analog mono outputs unbalanced	$449
Wave Digital Sytems	StudioG4, StudioPowerBook	G4 up, 1.2 gHz	Desktop, tower, rackmount	Unlimited	Phone, email	1 year	Preconfigured Macs for Pro Tools, Digital Performer, Nuendo, Logic Audio	$1,399



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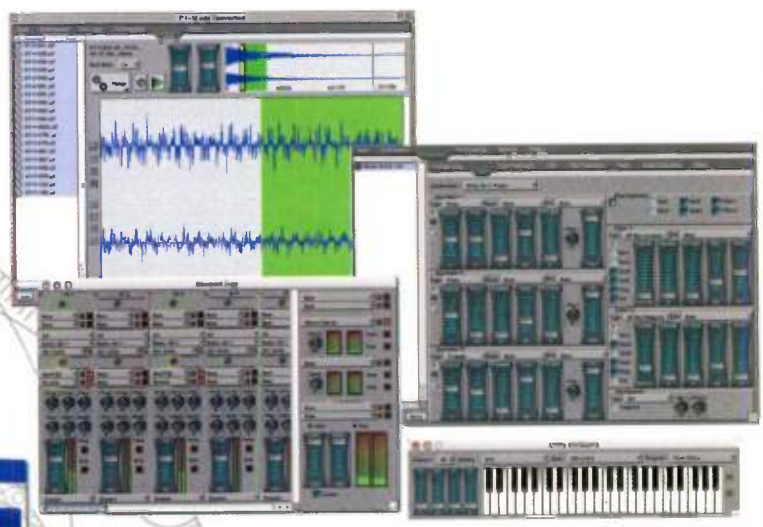

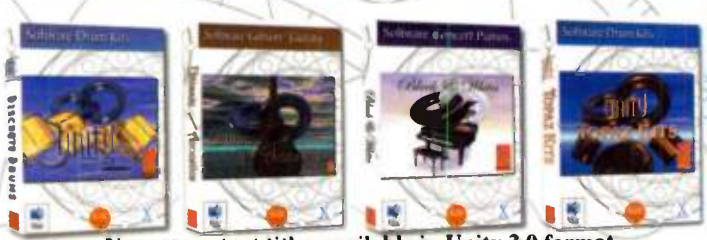

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Computer-Based Digital Audio Workstations

Manufacturer	Product	Analog I/O	Digital I/O	Platform Version	Bus Type	Plug-In Format(s) Supported	Sample Rate	A/D/A Converter/ Bit Rate
Aardvark	Aark 24 - PC Interface	N/A	S/PDIF (RCA, optical), ADAT (optical)	Win 95/98	PCI	DirectX, GSIF, ASIO 2	32, 44.1, 48 kHz	24-bit
Aardvark	Direct Pro 2496	4 XLR mic in/1/4" line In, 6 line out, hdph	S/PDIF	Win, Mac	PCI	VST, DirectX	96 kHz	24-bit
Aardvark	LX6	4 1/4" line in/ 6 line out, hdph out	S/PDIF	Win, Mac	PCI	VST, DirectX	96 kHz	24-bit
Aardvark	Q10	8 XLR mic/line inputs, 4 inserts, 10 out, 2 Hi-Z, hdph	S/PDIF	Win, Mac	PCI	VST, DirectX	96 kHz	24-bit
Aardvark	USB3	2 1/4" line in, 1 mic/guitar in, hdph out	None	Win, Mac	USB	VST, DirectX	48 kHz	24-bit
Alesis	ADAT/EDIT 2.0	ADAT Optical	ADAT optical	Win 95/98/NT/ 2000/NP, Mac	PCI	N/A	44.1, 48 kHz	N/A
Antex	SC22	2/2	N/A	Win 95/98/NT	PCI	N/A	6.25-50 kHz	20-bit
Antex	SC2000	(4/4) XLR	XLR AES/EBU, S/PDIF	Win NT/2000/XP	PCI	N/A	6.25-50 kHz	20-bit
Audiotrak	Inca 88	8/8	1/1 S/PDIF coaxial/optical	Win	PCI	N/A	48 kHz	16-bit
Audiotrak	Maya 7.1	2/8	1/1 S/PDIF coaxial/optical	Win	PCI	N/A	48 kHz	16-bit
Audiotrak	Maya 44	4/4	1/1 S/PDIF coaxial/optical	Win	PCI	N/A	48 kHz	16-bit
Audiotrak	Optoplay	0/2	0/1 stereo S/PDIF optical	Win	USB	N/A	96 kHz	32-bit
Berkley Integrated Audio Software (BIAS), Inc.	Deck 3.5	up to 64 - dependent upon audio interface	up to 64 - dependent upon audio interface	Mac		VST	60 kHz	N/A
CreamWare	Elektra	Stereo in/out	S/PDIF	Win	PCI	Proprietary	22-96 kHz	24-bit/96 kHz
CreamWare	Luna II	Stereo in/out	S/PDIF	Win	PCI	Proprietary	22-96 kHz	24-bit/96 kHz
CreamWare	PowerSampler	Stereo in/out	S/PDIF	Win	PCI	Proprietary	22-96 kHz	24-bit/96 kHz
CreamWare	Pulsar 1.31	2	(2) ADAT, S/PDIF	Win	PCI	Proprietary	22, 32 44.1, 48, 96 kHz	A/D 20-bit, D/A 24-bit
CreamWare	Pulsar II	2	(2) ADAT, S/PDIF	Win	PCI	Proprietary	22, 32 44.1, 48, 96 kHz	A/D 20-bit, D/A 24-bit
CreamWare	Pulsar XTC	Optional	Optional	Win	PCI	Proprietary	22-96 kHz	N/A
CreamWare	TripleDAT	2	(2) S/PDIF	Win	ISA	TripleDat	32 44.1, 48 kHz	18-bit
CreamWare	TripleDAT 2.5	2	(2) S/PDIF	Win	ISA	TripleDat	32, 44.1, 48 kHz	18-bit
Creative Labs	Sound Blaster Live	1/8" mic/line	S/PDIF	Win 95/98/NT	PCI	EAX	8-48 kHz	16-bit
Digidesign	Digi 001	(2)XLR, (6)1/4" TRS	ADAT, (2) S/PDIF	Mac, Win	PCI	RTAS, AudioSuite	44.1, 48 kHz	24-bit
Digidesign	Digi 001 Factory	(2)XLR, (6)1/4" TRS	ADAT, (2) S/PDIF	Mac, Win	PCI	RTAS, AudioSuite	44.1, 48 kHz	24-bit
Digidesign	Mbox	(2) XLR-1/4" TRS combo, 1/4" TRS	(2) S/PDIF	Mac/Win	USB	RTAS, AudioSuite	44.1, 48 kHz	24-bit
Digidesign	Pro Tools HD 1,2 &3	(Up to 96 channels)	(Up to 96 channels)	Mac, Win	PCI	TDM, HTDM, RTAS, AudioSuite	44.1, 48, 88.2, 96, 176.4,192 kHz	24-bit
Digidesign	Pro Tools 24 Mix/Mix Plus	8–72 channels	8–72 channels	Win 98, Mac	PCI	RTAS, TDM, AudioSuite	48, 44.1 kHz	24-bit (with 888/24 I/O interface)
Digigram	VX442	Four line in/out, balanced XLR	1 AES/EBU on XLR	Win, Mac	PCI	N/A	96 kHz	24
Digigram	VXpocket v2	2 XLR mic/line inputs, 2 XLR outputs	AES/EBU	Win, Mac	PC CardBus	Depends on application software	48 kHz	24-bit
Digigram	VXpocket 440	4 XLR mic/line inputs, 2 XLR outputs	AES/EBU	Win, Mac	PC CardBus	Depends on application software	48 kHz	24-bit
Digigram	VX222	Two mic/line in, two line out, balanced XLR	2 AES/EBU on XLR	Win, Mac	PCI	N/A	48 kHz	24-bit
Digital Audio Labs	CardDeluxe	(2/2) 1/4" TRS (gold tipped RCA)	S/PDIF	Win	PCI	Active Movie, DirectX	8–48 kHz	24-bit/128x, 24-bit/64x
Echo Digital Audio	Gina24	2 1/4" TRS balanced inputs, eight 1/4" TRS balanced outputs	ADAT optical, S/PDIF optical, S/PDIF coaxial	Win 98, ME, 2000, XP, Mac OS 9, OS X	PCI	N/A	96 kHz	24-bit
Echo Digital Audio	Layla24	8 1/4" TRS balanced	8 ADAT optical	Win 98, ME, 2000, XP, Mac OS 9, OS X	PCI	N/A	96 kHz	24-bit
Echo Digital Audio	Layla LapTop	8 1/4" TRS balanced	8 ADAT optical	Win 98, ME, 2000, XP, Mac OS 9, OS X	PC CardBus	N/A	96 kHz	24-bit
Echo Digital Audio	Mia	2 1/4" TRS balanced	S/PDIF	Win 98, ME, 2000, XP, Mac OS 9, OS X	PCI	N/A	96 kHz	24-bit

Digital Recorder Resolutions (max)	Sync Types	MIDI Control	# of Tracks/ Virtual Tracks	# of Locate Points	Effects/ Dynamic Processing	Additional Features	Price
24-bit	Word clock, S/PDIF, ADAT	Yes	N/A	N/A	N/N	Shielded box and PCI card, Steinberg ASIO drivers, DSP monitor mixer	$899
24-bit	MTC, MIDI	Yes	6/Unlimited	N/A	Y/Y	4 Class A mic preamps, DSP effects: compressor, reverb, EQ, zero latency, MIDI I/O	$699
24-bit	MTC, MIDI	Yes	6/Unlimited	N/A	Y/Y	DSP effects: compressor, EQ & reverb, MIDI I/O, shielded PCI card	$499
24-bit	Word Clock, MIDI, MTC	Yes	10/Unlimited	N/A	N/N	8 Class A mic preamps, phantom, DSP mixer	$1,099
N/A	N/A	No	2/Unlimited	N/A	N/N	Solid steel, knobs & faders for mixing, self-powered, laptop compatible	$299
24-bit	ADAT sync in/out	Yes	16/8	16 (ADAT/ connect)	Y/Y	Sample-accurate transfer, zero latency monitoring, ASIO 2.0 support	$399
N/A	LTC, VITC	No	4	N/A	N/N	Multi-card capability, Wintel & Alpha processor compatible	$595
N/A	SMPTE read/write, video	Yes	N/A	N/A	N/N	Video burning	$895
N/A	N/A	No	N/A	N/A	N/N		$280
N/A	N/A	No	N/A	N/A	N/N		$80
N/A	N/A	No	N/A	N/A	N/N		$130
N/A	N/A	No	N/A	N/A	N/N		$80
16-bit	N/A	Yes	64/999	Unlimited	N/Y	OMF Import, 5.1 Surround mixing, automated mixdown	$399
24-bit/96 kHz	N/A	In/out	N/A	N/A	Y/Y	Ultra-low-latency interface with drivers	$598
24-bit/96 kHz	N/A	In/out	N/A	N/A	Y/Y	Ultra-low-latency interface with drivers, (3) SHARC DSPs, 24-ch mixer, 16-ch surround mixer	$398
24-bit/96 kHz	N/A	In/out	N/A	N/A	Y/Y	Resonant filters, editing features, Multi mode	$598
24-bit	Optional sync plate available	No	N/A	N/A	Y/N	Mixing and routing capabilities	$1,298
24-bit	Optional sync plate available	No	N/A	N/A	Y/N	Mixing and routing capabilities	$1,398
N/A	N/A	No	N/A	N/A	Y/Y	Virtual synths, VST-based sampler	$999
16-bit	MIDI time code, MIDI clock, word clock	No	0/256	99	Y/Y	CD writing, warp mode on analog and digital chans simultaneously	$920
16-bit	MTZ, MIDI clock, word clock	No	0/256	99	Y/Y	CD writing, moves effects presets to/from ext devices, simultaneously digital/analog channels	$920
16-bit	MIDI	No	N/A	N/A	Y/Y	Includes Cakewalk, Sound Forge, Mixman software and digital I/O card	$199
24-bit	ADAT, S/PDIF	Yes	24/0	Unlimited	Y/Y	Two mic pres, 48V phantom, MIDI I/O, includes Pro Tools LE software	$995
24-bit	ADAT, S/PDIF	Yes	24/N/A	Unlimited	Y/Y	Two mic pres, 48V phantom, MIDI I/O, includes Pro Tools LE software	$1,345
24-bit	N/A	Software only	24/N/A	Unlimited	Y/Y	Focusrite pres, 48V phantom, 2 1/4" inserts, headphone jacks, zero-latency monitoring, includes Pro Tools LE software	$495
24-bit	LTC, VITC, MTC, BiPhase, Pilot Tone, AES/EBU, S/PDIF, ADAT	With MIDI I/O peripheral	128/0	Unlimited	Y/Y	Pro Tools software, ProControl and ProControl 24, Digidesign plug-ins	$7,995–$11,995
N/A	LTC, VITC, MTC, BIPhase, Pilot Tone, AES, EBU, S/PDIF, ADAT	Yes	64/128	Unlimited	Y/Y	ProControl support, Control/24 support, DigiRack plug-ins (EQ, dynamics, delay, time comp/exp, pitch shift) included	$5,995–$7,995
24-bit	N/A	No	N/A	N/A	N/N		$789
36-bit	SMPTE	No	N/A	N/A	N/N	Powered from PCM-CIA bus. No external power needed	$399
36-bit	SMPTE	No	N/A	N/A	N/N	Powered from PCM-CIA bus. No external power needed	$999
24-bit	N/A	No	N/A	N/A	N/N		$549
24-bit	Internal, ext. digital	No	N/A	N/A	N/N	Multiple card support	$399
24-bit	ADAT, S/PDIF	No	N/A	N/A	N/N	Support for WDM, ASIO2, GSIF	$495
24-bit	ADAT, Word Clock, MTC	Yes	N/A	N/A	N/N	Support for WDM, ASIO2, GSIF	$995
24-bit	ADAT, Word Clock, MTC	Yes	N/A	N/A	N/N	Support for WDM, ASIO2, GSIF	$995
24-bit	S/PDIF	No	N/A/8	N/A	N/N	8 virtual outputs. Support for WDM, ASIO2, GSIF	$249

Computer-Based Digital Audio Workstations

Manufacturer	Product	Analog I/O	Digital I/O	Platform Version	Bus Type	Plug-In Format(s) Supported	Sample Rate	A/D/A Converter/ Bit Rate
Echo Digital Audio	Mona	4 combo XLR-1/4" TRS balanced inputs w/pre-amps, 6 XLR-RCA outputs	ADAT optical, S/PDIF optical, S/PDIF coaxial	Win 98, ME, 2000, XP, Mac OS 9, OS X	PCI	N/A	96 kHz	24-bit
Echo Digital Audio	Mona LapTop	4 combo XLR-1/4" TRS balanced inputs w/ pre-amps, 6 XLR-RCA balanced outputs	ADAT optical, S/PDIF optical, S/PDIF coaxial	Win 98, ME, 2000, XP, Mac OS 9, OS X	PC CardBus	N/A	96 kHz	24-bit
Edirol	DA-2496	8 in, 8 out	Stereo I/O optical I and coaxia	Win 98, ME, 2000, XP, and coaxial	PCI	VST, DXi	96 kHz	24-bit
Edirol	UA-1A	Stereo I/O			USB	N/A	48 kHz	16-bit
Edirol	UA-1D		Stereo I/O optical and coaxial		USB	N/A	48 kHz	
Edirol	UA-3D	Stereo I/O	Stereo I/O	Win 98, ME, 2000, XP, Mac OS 9, OS X	USB	N/A	48 kHz	16-bit
Edirol	UA-5	Stereo I/O	Stereo I/O	Win 98, ME, 2000, XP, Mac OS 9, OS X	USB	N/A	96 kHz	24-bit
Edirol	U-8	XLR, 1/4" guitar in/ RCA in/out	S/PDIF (optical) I/O	Win 98, Mac	USB	DirectX, VST	44.1 khz	20-bit
Edirol	UA-20	(2/2) (2)1/4"-XLR combo, 1/4" guitar ins/ (2) RCA, (2) 1/4" outs, 1/8" headphone	S/PDIF (optical, coaxial)	Win, Mac	USB	N/A	44.1/48/96 kHz	24-bit A/D, 24-bit D/A
Edirol	UA-30 Audio Interface	RCA in/out, 1/4" guitar/mic	S/PDIF (coax, optical)	Win 98/2000, Mac	USB	DirectX, VST	44.1, 48 kHz	20-bit
Edirol	UA-100 Audio Canvas	RCA, 1/4" (guitar/mic)	S/PDIF (optical) out	Win 98, Mac	USB	DirectX, VST	44.1 khz	20-bit
Edirol	UA-700	Stereo I/O	Stereo I/O	Win 98, ME, 2000, XP, Mac OS 9, OS X	USB	N/A	96 kHz	24-bit
ESI - Ego Sys Inc.	GigaPort AG	0/8	1 S/PDIF optical out	Win, Mac	USB	N/A	48 kHz	24-bit
ESI - Ego Sys Inc.	GigaPort DG	0/0	8 channel ADAT Lightpipe out	Win, Mac	USB	N/A	48 kHz	16-bit
ESI - Ego Sys Inc.	WaMi Rack 192X	4/8	1/1	Win	PCI	N/A	192 kHz	24-bit
ESI - Ego Sys Inc.	Waveterminal 192L	2/6	1/1	Win	PCI	N/A	192 kHz	24-bit
ESI - Ego Sys Inc.	Waveterminal 192M	4/8	1/1	Win	PCI	N/A	192 kHz	24-bit
ESI - Ego Sys Inc.	Waveterminal 192X	2/6	1/1	Win	PCI	N/A	192 kHz	24-bit
ESI - Ego Sys Inc.	Waveterminal U-24	2/2	1/1 S/PDIF coaxial, 1/1S/PDIF optical	Win, Mac	USB	N/A	48 kHz	24-bit
Emagic	EMI 2/6	(2/6) RCA	(2/2) S/PDIF (coaxial)	Win ME/98/, Mac	USB	DirectX, VST	44.1, 48 kHz	24-bit
Event Electronics	Ezbus 1.2	In: 2x bal. XLR Mic, 14x bal. 1/4" line, 2x 1/4" inst. Out: 6x bal. 1/4" line, 1/4" st. headphone	ADAT optical I/O (doubles as S/PDIF in), coax S/PDIF in, 2 coax S/PDIF out, USB	Win, Mac	USB	N/A	96 kHz	24-bit
Event Electronics	EZ8 Optical Audio Interface	N/A	ADAT optical	Windows	PCI	N/A	96 kHz	24-bit
Frontier Design Group	Dakota PCI card		16 ADAT optical + 2 RCA/coax, expandable to 32 ADAT optical	Win 95, 98, ME, 2000, XP and Mac	PCI	N/A	44.1/48 kHz	
Frontier Design Group	Dakota PCI card + Tango24 A/D-D/A converters	8-32 balanced TRS 1/4" jacks	16 ADAT optical + 2 RCA/coax, expandable to 32 ADAT optical with Montana expansion card	Win 95, 98, ME, 2000, XP and Mac	PCI	N/A	44.1/48 kHz	24-bit
Frontier Design Group	WaveCenter/PCI card		8 ADAT optical + 2 RCA/coaxial	Win 95, 98, ME, 2000, XP and Mac	PCI	N/A	44.1/48 kHz	
Frontier Design Group	WaveCenter/PCI + Tango24	8 balanced TRS 1/4" jacks	8 ADAT optical + 2 RCA/coaxial	Win 95, 98, ME, 2000, XP and Mac	PCI	N/A	44.1/48 kHz	24-bit
Glyph Technologies, Inc.	Companion		2 x IEEE1394	Win, Mac	Firewire	all	192 kHz	
Glyph Technologies, Inc.	FireWire Trip		2 x IEEE1394	Win, Mac	Firewire	All	192 kHz	
Lynx	Lynx L22	(2/2) XLR	(2/2) S/PDIF or AES/EBU	Win 98/ME/NT/ 2000/XP, Mac	PCI	ASIO 2.0	44.1-192 (200 max) kHz	24-bit
Lynx	LynxONE	(2/2)	(2) AES/EBU or S/PDIF	Win 95/98/NT/ 2000, Mac, Linux	PCI	N/A	8–48 kHz (analog), 32–96 kHz (digital)	24-bit
Lynx	LynxTWO	(4/4)	(4/4) ADAT, TDIF	Win 95/98/NT/ 2000, Mac, Linux	PCI	N/A	8–192 kHz (analog), 32–96 kHz (digital)	24-bit

Digital Recorder Resolutions (max)	Sync Types	MIDI Control	# of Tracks/ Virtual Tracks	# of Locate Points	Effects/ Dynamic Processing	Additional Features	Price
24-bit	ADAT, S/PDIF	No	N/A	N/A	N/N	4 built-in pre-amps. Support for WDM, ASIO2, GSIF.	$995
24-bit	ADAT, S/PDIF	No	N/A	N/A	N/N	4 built-in pre-amps. Support for WDM, ASIO2, GSIF.	$995
N/A	Word clock	No	N/A	N/A	N/N	Phantom power, Hi-Z, MIDI in/out	$750
N/A	N/A	No	N/A	N/A	N/N		$90
N/A	N/A	No	N/A	N/A	N/N		$110
N/A	N/A	No	N/A	N/A	N/N	DTS & Dolby Digital pass-through	$215
N/A	N/A	No	N/A	N/A	N/N	Phantom power mic preamps	$355
N/A	MIDI	Yes	2 mono/1 stereo	N/A	Y/N	Includes Cool Edit Pro LE for Windows	$379
24-bit	N/A	Yes	2 mono/1 stereo	N/A	Y/Y	Phantom power, 24 db pad, in/out gain controls, peak indicators, WDM & ASIO drivers, MIDI I/O, mix 5 analog ins with guitar amp, mic modeling, and effects	$225
N/A	N/A	No	2 mono/1 stereo	N/A	N/N	Includes Cool Edit Pro LE for Windows	$225
N/A	MIDI	No	2 mono/1 stereo	N/A	Y/N	Built-in MIDI interface, includes software synthesizer	$595
N/A	N/A	Yes	N/A	N/A	Y/Y	Roland COSM Modeling, MIDI I/O, phantom power, mic & guitar preamps, phono preamp	$595
N/A	N/A	No	N/A	N/A	N/N		$200
N/A	N/A	No	N/A	N/A	N/N		$200
N/A	N/A	No	N/A	N/A	N/N		$750
N/A	N/A	No	N/A	N/A	N/N		$200
N/A	N/A	No	N/A	N/A	N/N		$250
N/A	N/A	No	N/A	N/A	N/N		$300
N/A	N/A	No	N/A	N/A	N/N		$300
24-bit	Word clock	No	Software dependent	N/A	N/N	N/A	$399
N/A	ADAT, S/PDIF, Word clock (out)	Yes	N/A	8	Y/Y	Programmable control surface, stand-alone digital mixer, jog/shuttle, audio routing matrix	$749
24-bit	ADAT	No	8/N/A	Host-dependent	N/N	Designed as 8-channel I/O Expander for EZbus and ADAT optical-equipped gear	$199
24-bit	ADAT, SMPTE, MTC	Yes	N/A	N/A	N/N	2x2 MIDI I/O, expandable to 8x8 with Sierra MIDI/SMPTE expansion option	$449
24-bit	ADAT, SMPTE, MTC, BNC word clock	Yes	N/A	N/A	N/N	2x2 MIDI, expandable to 8x8 MIDI with Sierra option	$899 bundle
24-bit	N/A	Yes	N/A	N/A	N/N	2x2 MIDI I/O	$329
24-bit	BNC word clock	Yes	N/A	N/A	N/N	2x2 MIDI I/O	$789 bundle
24-bit	N/A	No	N/A	N/A	N/N	QuietMetal, S.M.A.R.T. technology, Glyph FireWire, thermal sensing cooling	$599
24-bit	N/A	No	N/A	N/A	N/N	Up to 12 hot-swappable hard drives. QuietMetal(tm), S.M.A.R.T., thermal-sensing cooling	$5,000
24-bit	N/A	No	32/unlimited	N/A	N/N	L-Stream modules	$749
24-bit	AES/EBU, word clock, superclock	Yes	N/A	N/A	N/N	XLR audio and MIDI/clock I/O cables included	$549
24-bit	AES/EBU, word clock, superclock, SMPTE, NTSC	Yes	N/A	N/A	N/N	6-foot XLR audio cable, 2-foot sync cable, LS-ADAT, LS-TDIF	$1,095

Computer-Based Digital Audio Workstations

Manufacturer	Product	Analog I/O	Digital I/O	Platform Version	Bus Type	Plug-In Format(s) Supported	Sample Rate	A/D/A Converter/ Bit Rate
Mackie Designs	Mackie Broadcast Professional Soundscape 32	2 XLR inputs, 4 XLR outputs		PC Pentium or AMD, Windows 95 and up	PCI	N/A	96 kHz	24-bit
Mackie Designs	Mixtreme	Up to 16 with optional interface	(2) 8-ch TDIF (S/PDIF optional)	Win 95/98/NT4/2000	PCI	Soundscape Real Time DSP	Up to 48, 96 k Hz with ext super clock	24-bit
M-Audio	Delta 44	4 1/4" TRS in, 4 1/4" TRS out		Win 95-XP, Mac 8.6-9.22/10.1.5&10.2+,Linux	PCI	VST, DirectX	96 kHz	24-bit
M-Audio	Delta 66	4 1/4" TRS in, 4 1/4" TRS out	Coaxial S/PDIF in, Coaxial S/PDIF out	Win 95-XP, Mac 8.6-9.22/10.1.5&10.2+,Linux	PCI	VST, DirectX	96 kHz	24-bit
M-Audio	Delta 1010	8 1/4" TRS in, 8 1/4" TRS out	S/PDIF Coax in/out	Win 95-XP, Mac 8.6-9.22/10.1.5&10.2+,Linux	PCI	VST, DirectX	96 kHz	24-bit
M-Audio	Delta 1010LT	8 in, (2) XLR mic/line (6) RCA in, 8 RCA out	S/PDIF in/out	Win 95-XP, Mac 8.6-9.22/10.1.5&10.2+,Linux	PCI	VST, DirectX	96 kHz	24-bit
M-Audio	Delta Audiophile 2496	2 RCA in, 2 RCA out	S/PDIF in/S/PDIF out	Win 95-XP, Mac 8.6-9.22/10.1.5&10.2+,Linux	PCI	VST, DirectX	96 kHz	24-bit
M-Audio	Delta DIO2496	2 RCA out	TOSlink optical in/out, S/PDIF coax in/out	Win 95-XP, Mac 8.6-9.22/10.1.5&10.2+,Linux	PCI	VST, DirectX	96 kHz	24-bit
M-Audio	Delta Omni Studio	2 Mic & 1/4" pre-amp in, 2 line in, 4 stereo aux in, 4 direct out, 2 headph. out, mon & rec out	S/PDIF in/S/PDIF out	Win 95-XP, Mac 8.6-9.22/10.1.5&10.2+,Linux	PCI	VST, DirectX	96 kHz	24-bit
M-Audio	Delta R-Bus	2 RCA in, 2 RCA out	8 channel R-BUS, S/PDIF in/out	Win95-XP, Mac 8.6-9.22/10.1.5&10.2+	PCI	VST, DirectX	96 kHz	24-bit
M-Audio	Delta TDIF	2 RCA in, 2 RCA out	8 channel TDIF, S/PDIF in/out	Win95-XP, Mac 8.6-9.22/10.1.5&10.2+	PCI	VST, DirectX	96 kHz	24-bit
M-Audio	USB Audio Duo	2 XLR mic in/2 1/4" TRS in, 2 1/4" TRS out	S/PDIF Coaxial out	Win 98SE-XP / Mac OS 9.2.2& 10.1.5/10.2+	USB	VST, DirectX	96 kHz	24-bit
M-Audio	USB Audio Quattro 1.05	4 1/4" TRS		Win 95-XP and Mac OS 9.22&10.1.5/10.2+	USB	VST, DirectX	96 kHz	24-bit
Merging Technologies	PyraMix Virtual Studio 4.0	Optional 24-bit/96 kHz	ADAT, S/PDIF, MADI, AES/EBU, TDIF	Win NT/2000	PCI	Native, DirectX	32–92 kHz	24-bit
Micro Technology	Microsound 5.5	2, unbalanced	2 stereo, AES/EBU,	Win 98, ME, S/PDIF	PCI 2000, XP	DirectX	8-48 kHz	24-bit
Midiman	DMan PCI	(2/2) RCA	N/A	Win 95/98/NT	PCI	MME, DirectX	44.1, 48 kHz	18-bit
MOTU	24i	(24/2) 1/4" TRS	S/PDIF (RCA and Toslink) out	Win, Mac, ASIO, GSIF	PCI	All native	44.1, 48 kHz	24-bit
MOTU	308	N/A	(8) AES/EBU, 8 S/PDIF (coax)/ (8) S/PDIF (optical)	Win, Mac, ASIO, GSIF	PCI	All native	44.1, 48 kHz	24-bit
MOTU	828	(8/8) 1/4" TRS (2) XLR-1/4" combo	(2/2) S/PDIF (optical) or (8/8) ADAT	Win, Mac	Firewire (IEEE 1394)	All native	44.1, 48 kHz	24-bit
MOTU	896	(8/8) XLR-1/4" combo	(2/2) AES/EBU, (8/8) ADAT	Win ME/2000/XP, Mac OS 9	Firewire (IEEE 1394)	All native	44.1, 48, 88.2, 96 kHz	24-bit
MOTU	1224	(8/10) 1/4" TRS	AES/EBU	Win, Mac	PCI	All native	44.1, 48 kHz	24-bit
MOTU	1296	(12) XLR	AES/EBU	Win, Mac	PCI	All native	44.1, 48, 88.2, 96 kHz	24-bit
MOTU	2408mkII	(8/8) 1/4" TRS	S/PDIF, (3) ADAT Lightpipe, (3) TDIF	Win, Mac	PCI	All native	44.1, 48 kHz	24-bit
Mytek Digital	DAW 9624	(8/8) XLR (expandable)	(4) AES/EBU, ADAT (optional TDIF)	Win 95/NT, Mac BeOS, Linux	PCI	VST, DirectX	44.1, 48, 88.2, 96 kHz	24-bit
PreSonus Audio Electronics	FIREstation	8, TRS	10, ADAT, S/PDIF	Win, Mac	Firewire	N/A	48 kHz	24-bit
RME	Digi 96/8	N/A	ADAT, S/PDIF, AES/EBU	Win 98/ME/2000, Mac	PCI	VST, Direct X	32, 44.1, 48, 64, 88.2, 96 kHz	N/A
RME	Digi 96/8 PST	1/4" stereo	ADAT, S/PDIF, AES/EBU	Win 98/ME/2000/XP, Mac	PCI	VST, Direct X	32, 44.1, 48, 64, 88.2, 96 kHz	24-bit
RME	Digi 96/8 Pad	1/4" stereo	ADAT, S/PDIF, AES/EBU	Win 98/ME/2000/XP, Mac	PCI	VST, Direct X, ASIO	32, 44.1, 48, 64, 88.2, 96 kHz	24-bit
RME	Hammerfall 96/36	N/A	(2) ADAT, S/PDIF, AES/EBU	Win 98x/ME/2000/XP, Mac	PCI	VST, Direct X	32, 44.1, 48, 64, 88.2, 96 kHz	24-bit
RME	Hammerfall 96/52	N/A	(3) ADAT, S/PDIF, AES/EBU	Win 98/ME/2000/XP, Mac	PCI	VST, Direct X	32, 44.1, 48, 64, 88.2, 96 kHz	24-bit

Digital Recorder Resolutions (max)	Sync Types	MIDI Control	# of Tracks/ Virtual Tracks	# of Locate Points	Effects/ Dynamic Processing	Additional Features	Price
N/A	MIDI Song Position Pointer, MIDI clock, MIDI Time Code, SMPTE	Yes	N/A	N/A	Y/Y		$6,250
24-bit	Word clock, super clock, TDIF sync, S/PDIF sync	No	32/256	N/A	Y/Y		$549
N/A	N/A	No	4N/A	N/A	N/N	External break out box	$300
N/A	S/PDIF in/out	No	N/A	N/A	N/N	Includes break out box, works with Omni I/O, multi-card support, OS X support	$400
N/A	S/PDIF in/out, Midi Beat Clock, MTC, BNC	Yes	N/A	N/A	N/N	19" rack mount break out, multi-card, OS X support, zero latency monitoring	$800
N/A	S/PDIF in/out, MIDI Beat Clock, MTC, BNC	Yes	N/A	N/A	N/N	2-channel mic pre w/XLR input, multi-card, OS X support, zero-latency monitoring	$500
N/A	S/PDIF in/out, MIDI Beat Clock, MTC	Yes	N/A	N/A	N/N	Zero-latency monitoring, multi-card, OS X support	$230
N/A	S/PDIF in/out	No	N/A	N/A	N/N	2-in, 4-out 24-bit/96kHz full-duplex, multi-card, OS X support	$250
N/A	S/PDIF in/out	No	N/A	N/A	N/N	1U half rack I/O for Delta 66, zero-latency monitoring, multi-card, OS X support, includes Delta 66	$600
N/A	RMDB-II (R-BUS), S/PDIF in/out, MIDI Beat Clock, MTC, BNC	Yes	N/A	N/A	N/N	Monitor via stereo analog outputs, multi-card, OS X Support, zero-latency monitoring	350
N/A	S/PDIF, BNC, TDIF	No	N/A	N/A	N/N	Multi-card, OS X support, zero latency monitoring, TDIF sample rate: 8kHz to 48kHz	$350
N/A	N/A	No	2N/A	N/A	N/N	Standalone 24-bit 2-channel mic pre, zero-latency direct monitoring, OS X Support	$350
24-bit	MIDI Beat Clock, MTC	Yes	4/N/A	Host Dependent	N/N	Hooks to Omni Studio	$350
32-, 24-, 16-bit	SMPTE, VITC, MTC, word clock	Yes	Unlimited	Unlimited	Y/Y	Built-in CD mastering tools, automatable surround mixing grid, DSD option	$3,000
24/32-bit	N/A	No	Unlimited/N/A	Unlimited	Y/Y	More features standard, CD mastering, noise removal (optional)	$1,600
16-bit	MIDI clock	Yes	N/A	N/A	Y/N	Internal CD-ROM connector	$180
24-bit	Internal, word clock (in/out), ADAT sync (in)	No	Host dependent	Host dependent	Host dependent	111 dB S/N A-weighted, accepts -10 dB input with software boost, front-panel headphone	$1,195–$1,495
24-bit	Internal, word clock, AES/EBU, S/PDIF, Toslink	No	Host dependent	Host dependent	Host dependent	Standalone format conversion of up to 8 ch at a time	$695
24-bit	ADAT sync (sample-accurate, lightpipe	No	Host dependent	N/A	Host dependent	CueMix Plus no-latency monitoring, 2 mic inputs with mic pre-amps, front panel trims, main out volume knob	$795
24-bit	ADAT, word clock, optical	No	Host dependent	Host dependent	Host-software dependent	Expandable to 72 channels XLR main outs, cuemix notation monitors	$1,295
24-bit	Word clock, ADAT sync, AES/EBU	No	Host dependent	Host dependent	Host dependent	116 dB S/N A-weighted on inputs and XLR main outs, front-panel headphone control	$1,295
24-bit	Internal, word clock, AES/EBU, independent AES word in	No	Host dependent	Host dependent	Y/Y	117 dB S/N A-weighted, supports 5.1 surround I/O, AES/EBU I/O rate converters	$1,795–$2,095
24-bit	Word clock, lightpipe, ADAT, DTP	No	Host dependent	Host dependent	Host dependent	Works as standalone format converter, sample-accurate ADAT/Tascam transfers	$695–$995
32-bit, depending on 3rd party sftwr	Word clock, video, (SMPTE w/extra hardware)	Yes	8 (expandable)/64	N/A	Optional	Various format DIO cards for 8x96	$6,495
24-bit	ADAT, S/PDIF, BNC, MTC	No	N/A	N/A	N/N	Switchable tube preamps (2) w/sends, line mixer (12 ch), main & hphone outs,analog to dig. line level	$899
24-bit	N/A	No	8-channel	N/A	N/N	Digicheck software	$395
24-bit	N/A	No	8-channel	N/A	N/N	Digicheck software	$570
24-bit	N/A	No	8-channel	N/A	N/N	Digicheck software	$635
24-bit	ADAT	No	18-channel	N/A	N/N	Digicheck software	$575
24-bit	ADAT, word clock	No	26-channel	N/A	N/N	Digicheck software	$699

Computer-Based Digital Audio Workstations

Manufacturer	Product	Analog I/O	Digital I/O	Platform Version	Bus Type	Plug-In Format(s) Supported	Sample Rate	A/D/A Converter/ Bit Rate
RME	Hammerfall Digiface	1/4" TRS stereo line out, headphone out	(3) ADAT, S/PDIF	Win 98/ME/2000/XP, Mac	PCI/PCM CIA	VST, Direct X	32, 44.1, 48, 64, 88.2, 96 kHz	24-bit
RME	Hammerfall Multiface	(8) 1/4" TRS line	ADAT, S/PDIF	Win 98/ME/2000/XP, Mac	PCI/PCM CIA	VST, Direct X	32, 44.1, 48, 64, 88.2, 96 kHz	24-bit
SEK'D	ARC88	(8/8)	Toslink, S/PDIF	Win 95/98/NT, Mac	PCI	N/A	32, 44.1, 48 kHz	16-bit
SEK'D	Prodif 88	(2) balanced out	(8) AES/EBU in/out on XLR	Win 95/98/NT/ 2000/ME	PCI	N/A	44.1, 48, 88.2, 96 kHz	24-bit/96 kHz
SEK'D	Prodif Plus	(1/1) stereo	S/PDIF, AES/EBU, ADAT	Win 95/98/NT, Mac	PCI	N/A	11-96 kHz	20-bit
SEK'D	Prodif T 2496	N/A	(2) TDIF I/O	Win 95/98/ME/NT/ 2000, MME	PCI	N/A	44.1, 48, 96 kHz	N/A
SEK'D	Sequoia	N/A	N/A	Win 95/98/NT/ME	N/A	DirectX	22-192 kHz	N/A
SEK'D	Siena	8	N/A	Win 95/98/NT, Mac	PCI	DirectX	96 kHz	24-bit
Sonic Studio, LLC	Sonic Studio HD 1.8	Optional	Optional	Mac	PCI	N/A	192 kHz	
Sonorus	STUDI/O	Stereo monitor output	16 via 2x8 ADAT optical interfaces	Win 98/NT/2000, Mac, BeOS, Linux	PCI	N/A	44.1, 48, 88.2, 96 kHz	N/A
Sonorus	USB Studio D	(2) mic, (2) instrument, (2) phono, (4) line in, (2) line out, phone out	(2) S/PDIF I/O	Win, Mac	USB	N/A	44.1, 48 kHz	20-bit/128x
Steinberg North America	Nuendo Media Production System 1.6	24-bit, 96k configurable (or third party)	ADAT, TDIF, S/PDIF, AES-EBU configurable (or third party)	Win, Mac	PCI	VST, DirectX	384 kHz	24-bit
Swissonic	USB Studio D USB Studio	(16/4) stereo 1/4" TRS in, (2) mic	S/PDIF	Win, Mac	N/A	N/A	N/A	16-bit
TASCAM	PCI-822	N/A	(8) TDIF, S/PDIF	Win, Mac	PCI	N/A	44.1, 48 kHz	16-, 20-, 24-bit
TASCAM	US-224	2 XLR	S/PDIF	Win, Mac	USB	N/A	44.1 kHz	24-bit
TASCAM	US-428	(2) XLR, (4) 1/4" out	S/PDIF	Win, Mac	USB	N/A	44.1 kHz	24-bit A/D/A
TerraTec	DMX6fire	2 RCA line in/out, 1 mic in (1/4"), stereo phono (LP) in, MIDI	S/PDIF coax & optical	Win, Mac, Linux	PCI	Depends on application software	96 kHz	24-bit
TerraTec	EWS88D	Stereo monitor out (SystemSound) TRS miniplug on PCI card	ADAT, S/PDIF (optical & coax)	Win, Mac, Linux	PCI	Depends on application software	96 kHz	24-bit
TerraTec	EWS88MT	8 RCA line in/out (+4/-10 adj.), stereo mon. out (SystemSound), TRS miniplug on PCI card	S/PDIF (coax)	Win, Mac, Linux	PCI	Depends on application software	96 kHz	24-bit
TerraTec	EWS Clock	N/A	N/A	N/A	PCI	N/A	N/A	N/A
TerraTec	EWX2496	2 RCA line in/out	2 S/PDIF (optical)	Win, Mac, Linux	PCI	Depends on application software	96 kHz	24-bit
TerraTec	MIC2	8 XLR/TRS line input, 2 XLR mic input, 8 direct TRS output	ADAT, S/PDIF coax & optical	Win, Mac, Linux	Firewire	Depends on application software	96 kHz	24-bit
TerraTec	MIC2+	8 XLR/TRS line input, 2 XLR mic input, 8 direct TRS output	ADAT, S/PDIF coax & optical	Win, Mac, Linux	PCI	Depends on application software	96 kHz	24-bit
TerraTec	MIC8	8 XLR/TRS mic/line in and 8 direct TRS out	ADAT, S/PDIF coax & optical	Win, Mac, Linux	Firewire	Depends on application software	96 kHz	24-bit
TerraTec	MIC8+	8 XLR/TRS mic/line in and 8 direct TRS out	ADAT, S/PDIF coax & optical	Win, Mac, Linux	PCI	Depends on application software	96 kHz	24-bit
TerraTec	Phono Preamp USB	2 RCA line in, 2 RCA phono (LP) in		Win, Mac, Linux	USB	Depends on application software	96 kHz	24-bit
TerraTec	SoundSystem DMX	Stereo line input, (2) stereo outputs	S/PDIF (coaxial, optical)	Win	PCI	DirectX	32, 44.1, and 48 kHz	8/16-bit
TerraTec	SoundSystem XLerate	Stereo line input, stereo mic input, switchable stereo speaker/line output	N/A	Win	PCI	DirectX	Up to 48 kHz	8/16-bit
TerraTec	SoundSystem XLerate PRO	Stereo line input, (2) stereo outputs	Optical output	Win	PCI	DirectX	32, 44.1, 48 kHz	8/16-bit
Voyetra	Montego II Home Studio	1/2	S/PDIF (RCA or optical)	Win 95/98/NT	PCI	N/A	Up to 48 kHz	18-bit
Voyetra	Pinnacle Project Studio	3/1	S/PDIF (coaxial)	Win 3.1/95/98/NT	ISA	N/A	Up to 48 kHz	20-bit
Xytar	Audio Digital Mastering System (ADMS32)	8/8	S/PDIF, AES/EBU, ADAT	Win	PCI	Proprietary, DirectX	11.025–48 kHz	20-bit
YRS MIDI Systems	Digital Audio Workstation	8/8 RCA	2/2 S/PDIF (coaxial)	Win 98	PCI	VST, Direct X	8–96 kHz	A/D 24-bit, D/A 24-bit

Digital Recorder Resolutions (max)	Sync Types	MIDI Control	# of Tracks/ Virtual Tracks	# of Locate Points	Effects/ Dynamic Processing	Additional Features	Price
24-bit	Word clock, ADAT	Yes	26-channel	N/A	N/N	(2) MIDI I/O, Digicheck software, meter bridge	$715
24-bit	Word clock, ADAT	Yes	18-channel	N/A	N/N	MIDI I/O, Digicheck software, meter bridge	$910
24-bit	S/PDIF (dual card)	No	8	N/A	N/N	Input gain amplifier	$499
24-bit	Word clock	No	N/A	N/A	N/N		$799
24-bit	ADAT PLL Lock, AES, S/PDIF	No	10	N/A	N/N	Direct digital input from CD-ROM	$449
24-bit	DTRS	No	N/A	N/A	N/N		$599
32-bit	MTC, MC	Yes	System/999	Unlimited	N/N	EQ, comp, echo, reverb, FFT, convolution, declipping, denoising, stereo enhance, MIDI, CD burning, surround	$2,999
24-bit	MTC, MIDI clock	Yes	Unlimited	Unlimited	N/N	Built-in MIDI data filter driver	$499
24-bit	SMPTE	No	N/A	N/A	N/N	Professional Mastering System	$12,000
24-bit	MTC	No		N/A	N/N		$849
N/A	N/A	No	N/A	N/A	N/N	Stereo input VU meter, phantom powered, insert jacks	$849
32-bit	All	Yes	200/200	Unlimited	Y/Y	Scalable software/hardware combinations, unlimited undo/redo, surround, VST System Link	$1,299
N/A	N/A	No	N/A	N/A	N/N	19" rack-mount mixer with USB interface for Mac or Windows	$699–$849
N/A	N/A	No	N/A	N/A	N/N		$369
N/A	N/A	Yes	N/A	N/A	N/N		$375
24-bit	N/A	Yes	N/A	N/A	N/N		$625
36-bit	S/PDIF, MIDI clock, MTC	Yes	N/A	N/A	N/N	Breakout box can be internal/external, comes bundeled with Sound Laundry audio restoration software	$399
36-bit	ADAT, S/PDIF, MIDI clock, MTC	Yes	N/A	N/A	N/N	Bundeled Software: Emagic Logic, SEK'D Samplitude Project	$349
36-bit	S/PDIF, MIDI clock, MTC	Yes	N/A	N/A	N/N	Bundeled Software: Emagic Logic, SEK'D Samplitude Project	$349
N/A	N/A	No	N/A	N/A	N/N	Word clock option for TerraTec EWS88D and EWS88MT	$139
36-bit	S/PDIF, MIDI clock, MTC	Yes	N/A	N/A	N/N	Bundeled Software: Gigasampler, LOGIC, Wavelab Lite, Arturia Storm, Fruity Loops	$299
36-bit	ADAT, word clock, MIDI clock, MTC	Yes	N/A	N/A	N/N	Firewire is optional card. MIC2 can be used as a stand-alone A/D-D/A interface	$1,099
36-bit	ADAT, word clock, MIDI clock, MTC	Yes	N/A	N/A	N/N	Firewire is optional card. MIC2 can be used as a stand-alone A/D-D/A interface	$1,299
36-bit	ADAT, word clock, MIDI clock, MTC	Yes	N/A	N/A	N/N	Firewire is optional card. MIC8 can be used as a stand-alone A/D-D/A interface	$1,299
36-bit	ADAT, word clock, MIDI clock, MTC	Yes	N/A	N/A	N/N	Firewire is optional card. MIC8 can be used as a stand-alone A/D-D/A interface	$1,499
36-bit	N/A	No	N/A	N/A	Y/N	Bundeled Software: Digitizing (recording) software, Noise restoration software for de-clicking/noise	$139
N/A	N/A	Yes	N/A	N/A	Y/N		$199
N/A	N/A	Yes	N/A	N/A	Y/N		$80
N/A	N/A	Yes	N/A	N/A	Y/Y		$99
18-bit	SMPTE, MTC	Yes	System dependent	N/A	Y/Y	Includes Digital Orchestrator Pro, Roland GS-compliant wavetable daughter card	$299
20-bit	SMPTE, MTC	Yes	System dependent	N/A	Y/N	Includes Digital Orchestrator Pro, wavetable sampler, patch editor/librarian software	$460
16-bit	SMPTE, MTC	Optional	32/unlimited	Unlimited	Y/Y	Incl 17" monitor, 32-ch mic mixer, CD-R burner, Jaz drive, MP3 encoder/decoder	$7,499
24-bit	All	Yes	128	9	Y/Y	Customized to your specifications	$1,200–$2,400

Editor/Librarian Software

Manufacturer	Product	Type	Minimum System Requirements	Category Search Features
Emagic	SoundDiver	Editor/Librarian	Win 95, 98, NT, 2000, Mac OS 7.5.3	N/A
FMJ-Software	Awave Studio 8.5	Editor/Librarian	Win 9X, ME, NT, 2000, XP	N/A
Gefen Inc.	SFX Search	Librarian	Mac, Win, supports Digidesign, Pro Tools, Avid and other workstations	N/A
Gefen Inc.	SFX Net	Librarian	Mac, PC crossplatform software application versions, Mac and NT servers	Full bandwidth auditions, supports Digidesign, Pro Tools, Avid, Fairlight, other PC workstations
jambient Software	PowerMidiVerb4	Editor/Librarian	Win 98, XP, 32 MB	MidiVerb4
MAGIX Entertainment Corporation	MAGIX MP3 Maker Platinum	Editor	Win 95/98/ME/2000/NT/XP, 300 MHz CPU, 64MB RAM, 16 bit sound & graphics card	CDDB, local scan, network scan
MOTU	Unisyn	Editor/Librarian	Win 98SE or higher, Mac OS 8.5 or higher	Name, comment, date, type, keyword, wildcard
Riden Consulting, Inc.	The Recording Music Library 5.1	Librarian	Win 95, system 7.1	Search by any and all categories
Riden Consulting, Inc.	The Band Music Library 5.1	Librarian	Win 95, system 7.1	Search by any and all fields
Riden Consulting, Inc.	The Choral Music Library 5.1	Librarian	Win 95, System 7.1	Search by any and all fields
Riden Consulting, Inc.	The Orchestra Music Library 5.1	Librarian	Win 95, system 7.1	Search by any and all fields
Riden Consulting, Inc.	The Keyboard Music Library 5.1	Librarian	Win 95, system 7.1	Search by any or all fields
Riden Consulting, Inc.	The Church Music Library 5.1	Librarian	Win 95, system 7.1	Search by any or all fields
Riden Consulting, Inc.	The Organist Music Library Plus 5.1	Librarian	Win 95, system 7.1	Search by any or all categories
Riden Consulting, Inc.	The Singer Music Library 5.1	Librarian	Win 95, system 7.1	Search by any or all categories
Sonic Desktop Software, Inc.	SmartSound Sonicfire Pro 2.1	Editor/Librarian	Win 98 or higher, Mac 9.0 or higher, 16 MB RAM, 16 MB disk space	N/A
Sound Quest Inc.	Midi Quest Universal Editor/ Librarian 4	Editor/Librarian	Mac, Atari, Amiga, 1MB	Search by name, comment, 16 assignable keys, duplicates, similar sounds
Sound Quest Inc.	Midi Quest Universal Editor/ Librarian 8	Editor/Librarian	Win 95, 98, ME, NT, 2000, XP, 16MB	Search by name, comment, 16 assignable keys, duplicates, similar sounds
Sound Quest Inc.	Midi Quest Jr. 7	Librarian	Win 95, 98, ME, NT, 2000, XP	Search by name, comment, 16 assignable keys, duplicates, similar sounds
Sound Quest Inc.	Solo Quest Editor/Librarian 7	Editor/Librarian	Win 95, 98, ME, NT, 2000, XP	Search by name, comment, 16 assignable keys, duplicates, similar sounds
Soundminer Inc.	Soundminer 3.0	Editor/Librarian	Mac Classic and OS X	Multiple category search
Soundminer Inc.	Ripper 1.30	Editor/Librarian	Mac Classic and OSX	Digitizes CD
Terzoid Software	NoiZe 3.0	Editor/Librarian	Win 95, 98se, ME	Keyword, name, description, notes
Terzoid Software	NoiZe Lib 3.0	Librarian	Win 95, 98se, ME	Keyword, name, description, notes

Interactive Music-Composition/Auto-Accompaniment Software

Manufacturer	Product	Minimum System Requirements	Audio Support	# of Chords per Measure	# of Styles	# Editable/User-created Styles	Maximum # of Generated Parts	Generates Chord Progression	Generates Solo Part	Melody Harmonizing	Odd Meters	Prints Chart/ Notation/Tablature	Records User Performance	Records MIDI Control Change Messages	Resolution (ppqn)	Replaces Individual Parts	Style Changes Within Song	Support for nonGM/ XG Instruments	Special Features	List Price
GenieSys Voice L.C.	Uhm-Tza-Tzar 1.0	P-II-266, Win 98, 32 MB RAM	No	32	Unlimited	Unlimited	5	Yes	Yes	No	Yes	N/N/N	MIDI	Yes	960 ppqn	Yes	No	No	Virtual 5-channel MIDI ins/outs driver	$35
Gulbransen	Digital Hymnal	None	Yes	N/A	127	None	3	No	Yes	Yes	Yes	N/N/N	N/A	No	N/A	No	Yes	No		$995
MiBAC Music Software, Inc.	MiBAC Jazz	Win 95, 98, ME, 2000, XP, Mac OS 8, 9	Yes	2	12	None	3	Yes	No	No	No	Y/N/N	N/A	Yes	Variable	Yes	Yes	Yes	Generates jazz accompaniments for piano, bass, and drums. Export MIDI files	$125

(continued from page 40)

Start out with a pad—strings, vocals, analog sawtooth, or the like. Next, send the pad through a gate that has external triggering ("keying") capabilities; for this, you could use a plug-in, an analog gate with a key input, or a MIDI-controlled gate. Next, the fun begins.

Create a monophonic rhythm pattern in your sequencer to use as the gate trigger (see Fig. 4). You could use straight eighth or 16th notes, but you'll get more interesting results by varying the rhythm, the note duration, or both. Next, send the output to the gate's trigger input. If the gate responds directly to MIDI Note On messages, you're done. If it requires an audio key input, assign the MIDI track to a synth patch with a fast release time (for precise duration control), and then use the

Import/Export File Types	Number of Supported Devices	Number of Included Templates	Patch Randomize	Software Link to Sequencer	Test-sequence Playback	User-programmable Editors	Special Features	List Price
SMF, SYX, Galaxy	346	N/A	Yes	Yes	Yes	Yes	Patch overview, screen sets	$199
200 formats	200	N/A	No	No	No	Yes	Multi-purpose audio tool, reads many audio carrying file formats,	$120
400 CDs sampled into AIFF or WAV sound files	N/A	N/A	No	No	No	No	Access/audition SFX instantly - multiple work stations can access the same SFX files at same time	$99
Sound Designer II, AIFF, WAV, MP3 and others. It supports any format that Quicktime 4.0 supports	N/A	N/A	No	No	Yes	No	Auditions and transfers any sound instantly from hard disk to workstation	$995
SYX	1	N/A	No	No	No	No	Specially-designed for the MidiVerb4	$20
Import/export: WAV, MP3, MP3PRO, WMA, OGGVORBIS, CDDA, import only: ASF, REALAUDIO	Multiple	N/A	No	No	Yes	No	Built-in WAV editor, CD burning, cross fades, Internet radio	$40
SYX, X-OR, Galaxy	300	N/A	Yes	Yes	Yes	Yes	Unlimited undo/redo, studio snapshots, window sets, compare patch/bank, auto keyword assignment	$195
FM*, SLK, TAB, TXT, WK1, WKS, DIF	1	Many	No	No	No	No	Designed for the home collector	$49
FM*, SLK, TAB, TXT, WK1, WKS, DIF	1	Many	No	No	No	No	Manages all aspects of the school band program	$129
FM*, SLK, TAB, TXT, WK1, WKS, DIF	1	Many	No	No	No	No	Manages all aspects of the school choral program	$129
FM*, SLK, TAB, TXT, WK1, WKS, DIF	1	Many	No	No	No	No	Manages all aspects of the orchestra program	$129
FM*, SLK, TAB, TXT, WK1, WKS, DIF	1	Many	No	No	No	No	Manages all aspects of the piano/keyboard teacher	$129
FM*, SLK, TAB, TXT, WK1, WKS, DIF	1	Many	No	No	No	No	Manages all aspects of the church music program	$129
FM*, SLK, TAB, TXT, WK1, WKS, DIF	1	Many	No	No	No	No	18,000 hymns cross-referenced with 3000 hymn tunes	$199
FM*, SLK, TAB, TXT, WK1, WKS, DIF	1	Many	No	No	No	No	Designed for the classical singer/teacher	$129
AIFF, WAV, MP3 (import only), QuickTime, any QuickTime-compatible file type	N/A	N/A	No	No	No	No	Audio editing software, music library, soundtrack creation software, professionally edits pre-recorded royalty-free music	$349
SYX, SMF, customizable import filters	300	600	Yes	No	Yes	Yes		$99
SYX, SMF, customizable import filters	500	1039	Yes	Yes	Yes	Yes	VST plug-in, MFX plug-in, parent/child editing, Sonar Name support, skins, 70,000 patches, automation	$249
SYX, SMF, custom import filters	400	400	Yes	No	Yes	No	Sonar Name support, 60,000 patches, video tutorials, patch auditioning	$79
SYX, SMF, customizable import filters	300	800	Yes	No	Yes	No	Parent/child editing, Sonar Name support, skins, 60,000 patches, automation	$99
SD2F, AIFF,WAV, AIFC, MP3, MP4, Samplecell	N/A	N/A	No	Yes	No	No	Feature list at www.soundminer.com	$795
AIFF, MP4, SD2F	N/A	N/A	No	No	No	No	Converts commercial SFX CDs to format with embedded metadata	$295
SYX	50	33	Yes	No	Yes	No	Project oriented, multiple windows, customizable layouts, variable size banks, virtual keyboard	$100
SYX	50	N/A	No	No	Yes	Yes	Project oriented, multiple windows, interactive librarian module creator	$40

synthesizer's audio output as the key.

At this point, your pad will have become a pulsing rhythm, controlled by the gate. If the gate allows it, work with the attack and release controls to hone the sound. Now you can experiment: Add a tempo delay after the gate to augment the rhythm (with a tempo delay, you can set the time in note-length and tempo instead of milliseconds). Program filter sweeps or other timbral changes in the pad. Vary the gate's attack and release in real time. Change the duration of the trigger pulses.

Here's another variation, suggested by musician and producer Thomas Dolby Robertson: program the gate (or expander) so the volume is not completely off when the gate is closed. That lets the pad continue to sustain, with the triggered gate providing a gentle pulse on top.

DARTH VOCODER

The name *vocoder* comes from what the device was originally intended to do—encode voices for data-efficient telephones. While the technology never came into common use for those weekend calls to Grandma, it did give us the processed vocal timbres of Laurie Anderson's "O Superman" and Styx's "Mr. Roboto."

For a completely different sound, and one that blends more easily into a mix, try giving the vocoder a rhythmic twist by using drums instead of vocals for the modulator input. (The modulator input controls the output sound's rhythmic and harmonic content, whereas the *carrier* input provides the dry sound.)

Use a pad with high-frequency content, such as airy vocals or strings, for the carrier. The result is similar to the effects of the triggered-gate trick, but with a unique, softer twist. For a thick, unusual drum timbre, try using white or filtered noise as the carrier and then mix the vocoder output with the dry signal. The final effect is something like a compressed room reverb run through a fluttery cassette tape—weird and ear twisting.

AN EVEN DOZEN

So, that's the wrap: 12 tricks to break out of the sonic doldrums. Stop by the DMPG page at www.emusician.com to hear them in action, try a few yourself, and then go and invent some of your own!

Singer/songwriter/producer **Dan Phillips** *is also a product manager at Korg R&D. Check out his music at www.danphillips.com.*

We welcome your feedback. E-mail us at emeditorial@primediabusiness.com.

Loop Sequencers

Manufacturer	Product	Version	Minimum System Requirements	Audio Recording/ File Editing	Bit Resolution	Sampling Rate (kHz)	Audio Volume Automation	File Formats Supported
A Designs	MP-2	N/A	None	Y/N	N/A	N/A	No	WAV
Ableton	Live	1.52	Mac OS9, OSX, Win 98, 2000, XP, ME	Y/N	24-bit	96 kHz	Yes	WAV, AIFF
BitHeadz, Inc.	Phrazer	2.0	Mac OS 9.X, OSX	Y/N	24-bit	96 kHz	Yes	WAV, AIFF, SD II, MP3, ACID I & II, CD Audio
Cycling '74	radiaL	1	Mac OS, 128 MB RAM	Y/N	32-bit	N/A	Yes	WAV, AIFF, SDII, MP3
IK Multimedia	GrooveMaker	2.5	Mac OS 8.5, OS X, Win 95, 98, ME, NT, 2000, XP 128 MB RAM	Y/Y	16-bit	44 kHz	No	WAV, AIFF, MP3
Sonic Foundry, Inc.	Acid Pro	4.0	Win 98SE, ME, 2000, XP, 300 MHz CPU, 64 MB RAM (128 MB recomm.)	Y/Y	16-bit, 24-bit	192 kHz	Yes	WAV, AIF, AVI, MOV, MP3 MPG, OGG, MID, PCA, RM, WMV, WMA
Syntrillium Software	Cool Edit Pro	2.0	Win 98, ME, 2000, XP, 233 MHz CPU, 64MB RAM	Y/Y	32-bit	192+ kHz	Yes	WAV, AIF, MP3, MP3PRO, WMA, CEL, AU, VOX, PCM, more

MIDI Control Surfaces

Manufacturer	Product	Minimum System Requirements	Computer Interface	Displays	Number of Faders	Number of Knobs	Footpedal Inputs	Software-assignable Switches
Doepfer	Pocket Dial	Any	MIDI	N/A	N/A	16	N/A	N/A
Doepfer	Pocket Fader	Any	MIDI	N/A	16	N/A	N/A	N/A
Doepfer	Drehbank	Any	MIDI	N/A	N/A	2x64	N/A	N/A
Doepfer	Rgelwerk	Any	MIDI	2x16	24	N/A	N/A	48
Emagic Soft- und Hardware GmbH	Logic Control	Logic Platinum 5 or higher, 1 free MIDI in & 1 MIDI out port	MIDI	Multi-function display, channel assignment, song position information	9	8	2	N/A
Event Electronics	Ezbus 1.2	Win, Mac	USB	LCD / LED	9	1	1	37
Evolution	UC-16	Win 98, ME, 2000, XP, 128MB, Mac OS 9 / X / Jaguar	USB, MIDI	3 digit blue LED display	N/A	16	N/A	N/A
JLCooper Electronics	CS-32 Mini Desk	Cross-platform	USB, MIDI	LED	32	6	N/A	116
JLCooper Electronics	MCS-3800 USB Software Option	Mac Os 9.2. X, Win	USB	N/A	N/A	N/A	N/A	N/A
JLCooper Electronics	MCS-Bridge, Channel display and pan option 1.05	Cross-platform	Telephone connection to MCS-3000 series	8 Multi color switches/display	N/A	16	N/A	8
JLCooper Electronics	MCS3-USB 2.0	Win, Mac	USB	N/A	N/A	N/A	N/A	24
JLCooper Electronics	FM-4/100	Win, Mac	USB, Serial, MIDI		4	N/A	N/A	10
Mackie Designs	HUI	N/A	Serial	N/A	8	13	2	8
Mackie Designs	Baby HUI	N/A	MIDI	N/A	8	8	N/A	N/A
Mackie Designs	Mackie Control	N/A	MIDI	N/A	9	8	N/A	N/A
Mil Productions	Modularing 3.0	Mac OS 8.6	USB, MIDI	15	Unlimited	Unlimited	N/A	Unlimited
Mixed Logic	Mixed Logic M24 1.5	Win, Mac	USB, MIDI	LCD	24	54	N/A	147
Steinberg North America	Houston	Win 98SE, 2000, XP with Cubase 5 or Nuendo 1.5 or higher	USB, MIDI	LED	9	8	N/A	50+

Plug-in Formats Supported	Includes DSP Effects	Effects Parameter Automation	Live-input Effects (Input Monitoring)	Event List	MIDI Controller Support	MIDI Recording/ Editing/Playback	Step Sequencer	Multiple Loops per Track	Multitrack Audio Editing	Special Features	List Price
N/A	No	No	Yes	No	No	N/N/N	No	No	Yes	Stereo tube mic pre direct ins, phase switch, phantom switch, 600 ohm to 10k switch, combo xlr/1/4	$1,499
VST	Yes	Yes	Yes	No	Yes	N/N/N	No	No	No	Resampling/Time-Warping/Rewire/unlimited undo/ASIO	$349
DirectConnect, MAS, Rewire	Yes	No	No	No	Yes	N/N/N	No	Yes	No	QuickTime movie support, support for live performance	$299
VST	Yes	Yes	Yes	No	Yes	Y/N/N	Yes	No	No		$249
N/A	No	No	No	No	Yes	N/N/N	No	Yes	Yes	Patented random groove generator, include up to 1000 loops	$129
DirectX, VSTi, DLS	Yes	Yes	Yes	Yes	Yes	Y/Y/Y	Yes	No	Yes	5.1 surround mixing, ASIO, MIDI piano roll editing, alternate time signatures, Yamaha OPT support	$500
DirectX	Yes	No	No	No	Yes	N/N/Y	No	Yes	Yes	Stereo and multitrack editor, 45+ FX, real-time FX & EQ, multi-I/O, mastering, batch processing	$249

Sends Sysex Strings	Transport Controls	Track Switches	Automation Type	Dimensions (Inches)	Weight (lbs.)	Special Features	Price
No	No	N/A	N/A	9.5x3.5x2.5	4	Endless encoders	$239
No	No	N/A	N/A	10x4.5x2.5	4	ALPS faders	$239
Yes	No	N/A	N/A	17.25x5x2	8	Two bank buttons, CC and Sysex programmable	$450
No	No	48 programmable buttons	N/A	19x9x3.5	8	ALPS faders, all faders and buttons are fully programmable	$750
Yes	Yes	4 buttons with integrated LED for functions such as record, solo	MIDI	17.6x3.8x17.8	11		$1,299
No	Yes	11	MIDI	16.75x2.25x9.5	12	Audio interface w/ mic/line/inst. ins, 8 x analog outs, ADAT & S/PDIF I/O, dig. mixr w/ EQ & dyn	$749
No	No	None	MIDI	12x2x4.8	2	25 non-volatile memories to store 25 sets	$139
No	Yes	Mute, solo, select, memory location, target channel strip	MIDI	8.75x1.5x6.5	2.5	Jog/shuttle, 32 physical faders, transport, rotary controls for EQ, pan and plug-ins	$600
No	No	Mute, solo, select, insert	MIDI	N/A	N/A	Allows MCS-3000 series controllers to control any application via USB with custom editor software	$300
No	No	Rec, meter, pan	MIDI	9.25x6.25x2.0	3	Pro Tools Support added to new revision 1.05 using Hui personality	$1,000
No	Yes	user-assignable	MIDI	6.5x7x1.25	5	Custom software can create keysets to control any DAW or NLE Video application	$600
No	No	Mute, solo, select, aux	MIDI	6.5x8.5x3	5	Professional, motorized, touch sensitive faders, compact design	$900
No	Yes	Mute, solo, select, auto, rec/rdy, insert, v sel.	MIDI	20.8x6.9x22.6	37		$3,999
No	No	Mute, solo	MIDI	14.6x3.4x10.1	7.6		$799
No	Yes	Mute, solo, channel select, record arming, V-Pot	MIDI			Mackie Control Extender, to create a larger control surface console, available	$1,299
Yes	Yes	All MIDI spec supported	MIDI	depends on screen size	N/A	Modular software for building electronic music system	$320
Yes	Yes	Mute, solo, select, pre/post anc multi-function soft switch for rec enable, automation, more	MIDI, internal	37.5x6x16.5	38	Large number of dedicated controls per channel, control of plug-in effects	$3,499
No	Yes	User-assignable	MIDI			Touch-sensitive, motorized faders, optimized for VST, 99 locator points	$1,499

MIDI Interfaces/Patch Bays/Processors

Manufacturer	Product	Computer Interface	# of MIDI ins/Outs	Merging	Filtering	Rechannelizing	Controller Remapping	Keyboard Split/Zones	# of Patches	Synchronization Type	Special Features	List Price
DACS	MIDI Patch Bay	N/A	10/10	Yes	No	No	No	0/0	40	N/A	Simplicity	$275
DACS	MIDI Patch Bay	N/A	10/10	No	No	No	No	No	40	N/A	Uses 1/4" patch cords	$295
Digidesign	MIDI I/O	Win, Mac	10/10	Yes	Yes	Yes	No	No	N/A	N/A	USB-powered, Full OMS/WDM compatibility, Hardware Thru mode, super accurate time-stamping	$595
Doepfer	MSYII	MIDI	1/2	No	No	No	No	N/A	N/A	MIDI, Sync24 clock output	MIDI to Sync24 clock output	$110
Doepfer	MCV4	MIDI	1/1	No	No	No	No	N/A	N/A	Control voltage and gate for analog synthesizers	Two MIDI assignable CV outputs	$138
Doepfer	MCV24	MIDI	1/2	No	No	No	No	N/A	16	MIDI, control voltage, gate	Four high res. CV outs for pitch and 20 outs for gate or cv	$595
Edirol	UM-1S	USB	1/1	No	No	No	No	N/A	N/A	MIDI clock, MTC	USB powered, USB cable attached, high-speed MIDI data transmission that is not software dependent	$45
Edirol	UM-1	USB	1/1	No	No	No	No	N/A	N/A	MIDI clock, MTC	Comes with built-in MIDI cables, high-speed MIDI transmission regardless of software used	$55
Edirol	UM-2	USB	2/2	No	No	No	No	N/A	N/A	MIDI clock, MTC	USB powered, high-speed MIDI transmission regardless of software used	$85
Edirol	UM-550	USB	5/5	Yes	Yes	No	No	N/A	5	MIDI clock, MTC	High-speed MIDI processing that is not software dependent, stackable up to 4 units	$240
Edirol	UM-880	USB	8/8	Yes	Yes	No	No	N/A	8	MIDI clock, MTC	High-speed processing that is not software dependent, stack up to 4 units	$375
ESI - Ego Sys Inc.	Miditerminal 4140	Parallel	4/4	No	No	No	No	N/A	N/A	SMPTE, MTC		$150
Emagic	MT4	USB	2/4	Yes	Yes	No	No	No	32	N/A	Software included for patch bay programing, Mac/PC	$199
Emagic	AMT 8	USB, Serial	8/8	Yes	Yes	No	No	No	32	N/A	Expandable to 192 MIDI I/O, Mac/PC	$499
Emagic	Unitor 8 MkII	USB, Serial	8/8	Yes	Yes	No	No	No	32	SMPTE, VITC	VTC burn-in, click in, OMS, Mac/PC	$799
Encore Electronics	Expressionist 2 MIDI/CV interface	Win, Mac	1/1	Yes	Yes	No	No	6	100	MIDI clock	16-bit D/A all channels	$499
Friend Chip	DMX12/8	Win, Mac	1/1	No	No	No	No	No	N/A	N/A	6 optical in/out, 6 coaxial in/out, S/PDIF and ADAT	$500
Frontier Design Group	Sierra expansion for Dakota	Dakota PCI card	8/8	No	No	No	No	N/A	N/A	SMPTE, MTC		$299
Infusion Systems	I-CubeX	N/A	1/1	No	No	No	No	No	1	N/A	Use with our Sensors to create alternate MIDI controllers	$625
JLCooper Electronics	MLA-XLR Midi Line Amplifier	MIDI	1/1	No	No	No	No	N/A	N/A	MIDI	Midi line amplifier MIDI-to-XLR transmitter receiver for long distance MIDI over standard XLR cable	$200
JLCooper Electronics	MLA-1/MLA-10	N/A	4/4	No	No	No	No	No	N/A	N/A	Extends MIDI cable runs over 1,000'	$370/$500
JL Cooper Electronics	9 Pin/MMC	Win, Mac	1/1	No	No	No	No	No	N/A	GVG, ESAM2, MIDI, MMC	Control MMC via VTR 9-pin control	$500
JL Cooper Electronics	MMC/9 Pin +	Win, Mac	1/1	No	No	No	No	No	N/A	Output	VTR 9-pin control	$500
M-Audio	Bi-Port 2x4	Serial	2/4	No	No	No	No	N/A	N/A	Midi beat clock, MTC, SMPTE	Serial MIDI interface, Mac 8.6-9.22 and Win 95-XP, stand-alone SMPTE reader/writer	$180
M-Audio	Macman	Mac	1/3	No	No	No	No	No	N/A	N/A	Passive thru, serial thru (geo port)	$60
M-Audio	Merge 2x2	N/A	2/2	Yes	No	No	No	No	N/A	N/A		$100
M-Audio	Portman PC/P	Win	1/1	No	No	No	No	No	N/A	N/A	Includes cable (parallel)	$80
M-Audio	Portman PC/S	Serial	1/1	No	No	No	No	No	N/A	N/A	Includes PC serial cable	$80
M-Audio	Thru 1x4	N/A	1/4	No	No	No	No	No	N/A	N/A		$60
M-Audio	Thru 3x8	N/A	3/8	No	No	No	No	No	N/A	N/A		$100
M-Audio	Winman 1x1	Win	1/1	No	No	No	No	No	N/A	N/A		$70
M-Audio	Winman 2x2	Win	2/2	No	No	No	No	No	N/A	N/A		$90
M-Audio	Winman 4x4/S	Win	4/4	Yes	No	No	No	No	N/A	N/A	64-chan, ISA, native Win 95 drivers, 4x4 patch bay	$250
M-Audio	USB Midisport Uno	USB	1/1	No	No	No	No	N/A	N/A	MIDI beat clock, MTC	USB bus powered, includes connectors, OS support for Win 98/ME/2K/XP, Mac OS 8.6-9.2.2 & 10.1.5/10.2+	$50

I'M BIASED

David Torn aka splattercell
Guitarist/Texturalist/Producer

Collaborators include: david bowie • ryuichi sakamoto • carter burwell • kd lang • david sylvian • cliff martinez • me'shell ndegéocello • chute • page hamilton • b.l.u.e.

Soundtrack work includes: traffic • a knight's tale • three kings • heist • the velvet goldmine • simone

Photographed by Karjean Ng at the studio of film composer Carter Burwell, New York City

David Torn is a genuine musician's musician — one of the most respected of our time.

Whether working with David Bowie on his latest album, or creating trademark textural soundscapes for *Traffic* and other blockbuster movies, or crafting a new splattercell CD, David's aesthetic for raw sonic exploration goes far beyond a conventional approach to music, let alone guitar. And to help him make his discoveries, David turns to BIAS software.

As he puts it, "I'm not much interested in what's been done before, especially when it comes to my own work. I need to keep uncovering new ground — and I love how BIAS products help me do that so intuitively, with critical speed & stability. Like my guitar, they feel like they were built just for me, letting me create a vocabulary for the language of my music."

It only makes sense that BIAS software is an integral part of David's creative process. After all, we share a common focus: the intersection of technology and art, where creativity flows on a path of least resistance. And it's from this place we create tools to help *you* define your own unique vocabulary.

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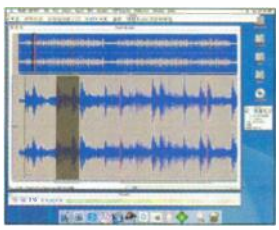

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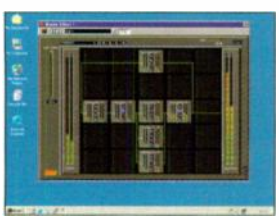

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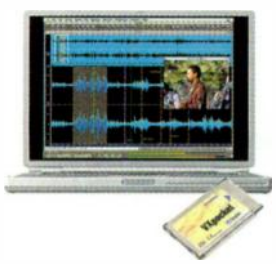

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MIDI Interfaces/Patch Bays/Processors

Manufacturer	Product	Computer Interface	# of MIDI ins/Outs	Merging	Filtering	Rechannelizing	Controller Remapping	Keyboard Split/Zones	# of Patches	Synchronization Type	Special Features	List Price
M-Audio	USB Midisport 1x1	USB	1/1	No	No	No	No	N/A	N/A	MIDI beat clock, MTC	USB bus powered, OS support for Win 98/ME/2K/XP and Mac OS 8.6-9.2.2 and 10.1.5/10.2+	$70
M-Audio	USB Midisport 2x2	USB	2/2	No	No	No	No	N/A	N/A	MIDI beat clock, MTC	USB bus powered, OS support for Win 98/ME/2K/XP and Mac OS 8.6-9.2.2 and 10.1.5/10.2+	$90
M-Audio	USB Midisport 4x4	USB	4/4	No	No	No	No	N/A	N/A	MIDI beat clock, MTC	USB bus powered, OS support for Win 98/ME/2K/XP and Mac OS 8.6-9.2.2 and 10.1.5/10.2+	$200
M-Audio	USB Midisport 8x8/s	USB, Serial	8/8	Yes	No	Yes	No	N/A	8	Midi beat clock, MTC, SMPTE	USB bus powered, OS support for Win 98/ME/2K/XP and Mac OS 8.6-9.2.2 and 10.1.5/10.2+	$400
MIDI Solutions	Mapper	N/A	1/1	No	No	No	Yes	No	N/A	N/A	MIDI-powered, prog via SysEx	$149
MIDI Solutions	Merger/ Quadra Merge/M8	N/A	2/1, 4/1, 8/1	Yes	No	No	No	No	N/A	N/A	MIDI-powered	$79/$129/ $279
MIDI Solutions	Relay R8	N/A	1/1	No	No	No	No	No	128	N/A	MIDI-powered	$149/$479
MIDI Solutions	Router	N/A	1/2	No	Yes	Yes	No	10	N/A	N/A	MIDI-powered, prog via SysEx	$149
MIDI Solutions	Thru, Quadra Thru/T8	N/A	1/2, 1/4, 1/8	No	No	No	No	No	N/A	N/A	Messages appearing at In sent to all outs, MIDI-powered	$49/$59/ $199
MIDI Solutions	Velocity Converter	N/A	1/1	No	No	No	No	No	40	N/A	Applies velocity curves to MIDI data, MIDI-powered, prog via SysEx	$149
MIDIator	MP-128EP	Parallel	1/2	No	No	No	No	No	N/A	N/A		$80
MIDIator	MP-128NP	Parallel	2/4	No	No	No	No	No	N/A	N/A		$110
MIDIator	MP-128SP	Parallel	2/8	No	No	No	No	No	N/A	SMPTE	SMPTE in and out	$180
MIDIator	MS-101	Serial	1/1	No	No	No	No	No	N/A	N/A		$70
MIDIator	MS-124	Serial	1/4	No	No	No	No	No	N/A	N/A		$100
MIDIator	UM1	N/A	1/1	No	No	No	No	No	N/A	N/A	Keyboard encoder, solenoid low side driver up to 128 lines	$215–$345
MIDIator	UM2	N/A	1/1	No	No	No	No	No	N/A	N/A	Solenoid driver up to 128 lines	$195–$330
MIDITEMP	Multistation 2.0	USB	8/8	Yes	Yes	Yes	Yes	Yes/16	16384	MIDI clock, MTC	MIDI file player, MP3 player, 8 tracks Wave player, remote controller with touch	$2,600
MIDITEMP	Multiplayer MP88-CDW 4.30	SCSI	8/8	Yes	Yes	Yes	Yes	Yes/16	1024	MIDI clock	MIDI file player, wave player, CD-ROM, harddisk, remote controller	$1,500
MOTU	FastLane Serial	Mac serial	1/3	No	No	No	No	No	N/A	N/A	Powers off computer, bypass for use when computer is off	$59
MOTU	FastLane USB	USB	2/2	No	No	No	No	No	N/A	N/A	5 colors + charcoal, thru button passes MIDI in to out w/computer off	$79
MOTU	Micro Express-USB	USB, serial	4/6	Yes	Yes	Yes	No	No	16	SMPTE, MTC	Operates w/o computer, supps MMC, converts click to MIDI, 2 pedal ins	$295
MOTU	MIDI Express XT-USB	USB, serial	8/9	Yes	Yes	Yes	No	No	16	SMPTE, MTC	Operates w/o computer, supps MMC, converts click to MIDI, 2 pedal ins	$395
MOTU	MIDI Timepiece AV-USB	USB, serial	8/8	Yes	Yes	Yes	No	No	128	SMPTE, MTC, video, word clock	Operates w/o computer, MIDI time stamping, many A/V sync features	$595
MOTU	PC MIDI Flyer	Parallel	2/2	No	No	No	No	No	N/A	N/A	Powers off computer, bypass for use when computer is off	$89
MOTU	Pocket Express	Serial, Parallel	2/4	No	No	No	No	No	N/A	SMPTE, MTC	Operates w/o computer, SMPTE free-wheeling over drop-outs	$165
Native Instruments	4 Control	Win, Mac	1/1	Yes	No	No	Yes	No	N/A	N/A		$199
Rolls	RFX MP1288 MIDI Wizard	N/A	1/1	Yes	No	No	Yes	No	128	N/A	MIDI song select & strt/stp, up to 8 program changes on 8 MIDI chans w/1 switch, 8 CCs	$200
Steinberg North America	MIDEX 3	USB	1/3	Yes	Yes	Yes	Yes	Yes	N/A	N/A	LTB (Linear Time Base) technology for sub-millisecond timing	$149
Steinberg North America	MIDEX 8	USB	8/8	Yes	Yes	Yes	Yes	Yes	N/A	N/A	LTB (Linear Time Base) technology for sub-millisecond timing	$499
Tech 21, Inc.	SansAmp XDI	Audio Direct Box	0/0	No	No	No	No	N/A	N/A	N/A	Audio direct box connects between computer sound cards and musical instruments	$95
Yamaha	UW 500	Win, Mac	1/1	No	No	No	No	No	N/A	MIDI	20-bit A/D stereo record and playback, optical I/O, software suite	$400
Yamaha	UX 16	Win, Mac	1/1	No	No	No	No	No	N/A	N/A	(2) status LED	$50
Yamaha	UX 96	Win, Mac	1/1	No	No	No	No	No	N/A	MIDI	USB powered, to host serial port	$90
Yamaha	UX 256	USB	6/6	Yes	No	No	No	No	N/A	N/A	Bundeled patch bay software for Mac and PC, self-powered	$300

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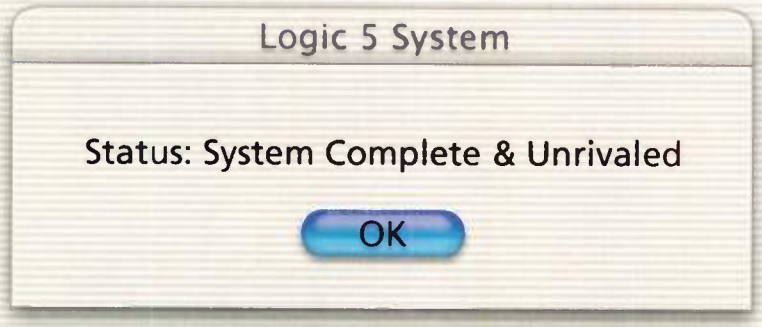
Music Production Software



The most modern, reliable equipment is an important requirement for successful professional music production. Apple has created an operating system that more than meets these special demands: Mac OS X. With the release of Logic Platinum 5.4, Emagic is the first manufacturer to deliver a host program that supports Audio Units, Apple's new, system-level standard for DSP plug-ins. In addition, Logic Platinum 5.4 for OS X contains over 50 integrated effect plug-ins and support for all Emagic's optional Software Instruments (right). REX files are also supported, as is Emagic's current range of audio, MIDI and controller hardware. Choose the unrivaled complete studio solution for Mac OS X to fulfill the most important requirement for your success.

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MIDI Keyboard Controllers

Manufacturer	Product	Number of Keys	Full-size Keys	Type of Action	Aftertouch	Number of Zones/Overlapping	Computer Interface	Displays	Footswitchable Patch Changes	Independent MIDI Ins/Outs
Alternate Mode, Inc.	malletKAT 4.0	39	No	Un-weighted	Poly	Unlimited	None	4,16	Chains	1/2
Doepfer	PK88	88	Yes	Weighted	None	0/No	MIDI	None	None	0/2
Doepfer	LMK4+	88	Yes	Weighted	Channel	4/Yes	MIDI	2x16	Increment	2/2
Edirol	PC-160A	32	Yes	Un-weighted	Channel	1/No	None	LED indicator	None	0/1
Edirol	PC-70	49	Yes	Un-weighted	Channel	1/No	None	LED display (3 digit)	None	0/1
Edirol	PC-300	49	Yes	Un-weighted	Channel	1/No	USB, MIDI	LED indicator	None	0/1
Edirol	PCR-50	49	Yes	Un-weighted	Channel	1/No	USB	LED	None	1/1
Edirol	PCR-30	32	Yes	Un-weighted	Channel	1/No	USB	LED	None	1/1
Evolution	MK-225C	25	Yes	Un-weighted	None	0/No	USB, MIDI, Gameport	LED (3 digit blue)	None	0/1
Evolution	MK-249	49	Yes	Un-weighted	None	0/No	USB, MIDI, Gameport	LED (3 digit blue)	None	0/1
Evolution	MK-249C	49	Yes	Un-weighted	None	0/No	USB, MIDI, Gameport	LED (3 digit blue)	None	0/1
Evolution	MK-361	61	Yes	Un-weighted	None	0/No	USB, MIDI, Gameport	LED (3 digit blue)	None	0/1
Evolution	MK-361C	61	Yes	Un-weighted	None	0/No	USB, MIDI, Gameport	LED (3 digit blue)	None	0/1
M-Audio	USB Keystation 49	49	Yes	Un-weighted	None	0/No	USB	LED (3 digit)	None	0/1
M-Audio	USB Keystation 61	61	Yes	Un-weighted	None	0/No	USB	LED (3 digit)	None	0/1
M-Audio	Oxygen 8	24	Yes	Un-weighted	None	0/No	USB	LED (3 digit)	None	0/1
Miditech	Midistudio 2	49	Yes	Un-weighted	None	1/No	USB	LED (3 digit)	Increment	1/1
Miditech	Midicontrol 2	49	Yes	Un-weighted	None	1/No	USB	LED (3 digit)	Increment	1/1
TerraTec	Midimaster USB	49	Yes	Un-weighted	Poly	0/No	USB	LED (3 digit)	Chains	0/1

(continued from page 26)

random squiggle in the waveform editor using the drawing tool. To determine the duration of the loop in samples, calculate the inverse of the desired frequency in hertz and multiply the result by the sample rate. (For example, to make a single-cycle A 440 at a 44.1 kHz sample rate, multiply 1/100 by 44,100, which equals roughly 100.27 samples.) Since there are no fractional samples, round the number to the nearest integer and use the sampler's tuning feature to correct the pitch. Once you've determined a loop duration, fill it in. The easiest way to do this is to take a recording of anything, including music, and set the loop points at some arbitrary point in the sound.

As long as the loop duration is as you calculated, you should get the desired note. If the sample editor allows the loop points to move together during playback, you can easily search the source file for the perfect timbre. One benefit of these tiny loops is that they load into a sampler very quickly, even from a floppy disk—and one disk can hold thousands of them.

SOUND JUGGLING

You can set up two effects boxes to feed each other, juggling a chunk of audio back and forth. At least one of the effects units needs to have a delay, around 500 ms or so. While shorter delays will work, they increase the risk that the effect could get out of hand. For clarity's sake, I'll call the first effects unit FX1 and the second unit FX2. Connect FX1's input to the mixer's aux send 1 and its output to the mixer's input 1. Connect FX2's input to the mixer's aux send 2 and its output to the mixer's input 2. Turn up the aux 2 send on channel 1 and turn up the aux 1 send on channel 2. This should create a feedback loop that includes the two effects units and the two mixer channels. Bus the output of one or both mixer channels to a recorder to capture the mayhem.

Now you need to get the ball rolling, so run any kind of signal into mixer channel 3 and turn up aux send 1 or 2 to seed the loop. Short bursts of music from CDs or a spoken word into a microphone are all you need. You should hear a repeating and evolving rhythm as the two effects units pass the sound back and forth. Tweak the EQ and the channel levels to keep the ball in the air. Apply as many effects to the mess as possible so the sound is constantly changing. If you'll be using the repeating sound as a rhythm element, set the total delay time to fit the desired tempo. Otherwise, just edit out the good iterations and load them into a sampler.

Creating this effect is easier in a software-based environment such as Digidesign's *Pro Tools*. In **Fig. 2**, the first track, called Synth In, is a mono aux input used to get a sound into the session as a seed. In this case, a keyboard synthesizer with a marimba patch is the sound source. The two effects tracks are feeding each other, so that the sound passes continuously back and forth.

The first insert on FX1 is a long delay, set for 2 seconds. This is the key to keeping everything under control.

Programmable Continuous Footpedals	Programmable Footswitches	Programmable Controllers	System Real-time Controls	Velocity Curves: # of Preset/Programmable	Dimensions (WxHxD)	Weight (lbs.)	Special Features	Price
2	2	Keyboard acts as slider/wheel	Yes	8/0	47x11x2.5	28 lbs.	Latch modes per pad, keyboard acts as multiple cc# controller	$1,999
1	1	0	N/A	N/A	53.1x10.6x4.3	40 lbs.	Built into flight case with handle, pop the lid, plug and play	$850
1	2	3	Start, stop, continue, clock	8/0	57x10.2x3.9	48 lbs.	Built into a flight case with removable lid.	$1,200
0	0	1	Sequencer start/stop button	1/0	22.9x3.1x7.1	4.4 lbs.	Aftertouch assignable to data slider, bundled with Steinberg Cubasis A/V	$155
0	0	1	N/A	1/0	33.3x2.9x8.3	6 lbs.	Aftertouch assignable to data slider, octave shift buttons	$160
0	0	1	N/A	1/0	32.1x3.2x6.9	5.7 lbs.	Aftertouch assignable to data slider, bundled with Steinberg Cubasis A/V	$225
1	1	8 faders, 8 knobs, 9 buttons	Start, stop, continue	N/A	N/A	N/A	Faders, knobs, buttons assignable to Note, Timing clock, Control Change, RPN, NRPN, SysEx.	TBA
1	1	8 faders, 8 knobs, 8 buttons.	Start, stop, continue	N/A	N/A	N/A	Faders, knobs, and buttons can be assigned to Note, Timing clock, Control Change, RPN, NRPN, SysEx.	TBA
0	0	1 wheel, 8 rotary	N/A	12/0	18.9x3.9x8.3	4.4 lbs.	Fully Class Compliant	$159
0	0	1 slider, 1 wheel	N/A	12/0	31.5x3.2x8.3	7 lbs.	Provides USB / MIDI interface	$189
0	0	1 slider, 1 wheel, 12 rotary	N/A	12/0	31.5x3.9x8.3	7 lbs.	Provides USB / MIDI interface	$210
0	0	1 slider, 1 wheel	N/A	12/0	38.2x3.2x8.3	9 lbs.	Provides USB / MIDI interface	$239
0	0	1 slider, 1 wheel, 16 rotary	N/A	12/0	38.2x3.9x8.3	9 lbs.	Provides USB / MIDI interface	$285
0	0	1 slider, any CC#	N/A	1/1	30x9x2.5	N/A	USB bus powered/battery/power supply, USB MIDI out, Win 98-XP & Mac OS 8.6-9.22/10.1.5&10.2 + support	$230
0	0	1 slider	N/A	1/1	36x8.5x3	N/A	USB bus powered/external power supply, support for Win 98-XP & Mac OS 8.6-9.2.2 /10.1.5&10.2	$280
0	0	8 knobs, 5 banks of knobs, any CC#, each on any MIDI Channel	1 programmable slider	1/1	16x9.5x3	N/A	USB bus powered/battery/power supply, 5 banks of 8 programmable knobs, OS X support	$180
0	1	1 pitch wheel, 1 mod wheel	N/A	N/A	33x8x3	7.5 lbs.	Splitpoint	$199
0	1	1 pitch wheel, 1 mod wheel	14 assignable controllers	1/0	30x9x3	7 lbs.	Splitpoint	$299
1	1	1 pitch wheel, 1 mod wheel	N/A	N/A	33.5x9.8x4.3	10 lbs.	10 programmable preset memories, non-volatile. Acts as a MIDI interface via USB. MAC & PC drivers.	$399

The next insert is Digidesign's *DPP-1* pitch-shifting plug-in, set to raise the pitch by 300 cents, with feedback set to about 85 percent with a very short delay time. In this case, the sound is a rapid series of tones that quickly go up in pitch, like the sound of a magic spell being cast in the cartoons *(bling!)*. Wave Mechanics' *Pitch Blender* provides some chorus and phasing to add to the weirdness. The fourth insert is Metric Halo Labs' *ChannelStrip,* which provides a great deal of sound control in one plug-in. Here it is gating, compressing, and equalizing to maintain the percussive character of the sound without putting too much snap on the head. Waves' *L1* simply keeps the sound from clipping should it get out of control. It can also make up some gain if necessary.

Finally, Digidesign's *DeEsser* comes in handy if one frequency starts to get too pronounced. The sound will likely screech if that occurs; *DeEsser* can tame the rogue frequency. A send from FX2 to the track named Capture ensures that you can record the mayhem. This send is postfader, so you can dump the fader if things get really ugly. The Capture track provides monitoring.

WHOOSH!

You can precisely control the sounds of movement to fit any given situation. Start with a noise source such as a jet roar, the wind, the ocean, an untuned TV set, or even the flame on a propane torch. These organic sources work better than digitally created noise, which tends to sound too pure. Run the noise through a short delay set up to act as a phaser or flanger, but disable the modulation. Instead, change the delay time as needed to create the desired movement.

To make the *whoosh* approach the listener, gradually reduce the delay time. Increase the delay time to make the *whoosh* go away. Setting up the delay for automation is the key to making this work. Pro Tools offers a good option, but a MIDI-controlled delay can work, too. To fatten up the sound, follow the delay with some distortion and heavy compression.

DEEP SWEEP

Use downward sine sweeps to give bass drums more weight. If the starting frequency is up where any system can reproduce it, it gets heard. If the ending frequency is really low, it shakes the ground in systems that can handle it but gives the perception of deep bass in systems that can't, since they will play just enough of the descent to imply depth. It's best to limit the low end of the sweep to at least 25 Hz to avoid robbing the amplifier of power. This approach works both for synth drums and for real drums. Just vary the mix to achieve the desired realism. Most synths can create this effect, but some software tools do an even better job; for example, check out *Stomper Ultra++* for Windows (www.master-zap.com/stomper).

Marc Farly *is an audio director at Electronic Arts, where he forces big sounds into small video-game spaces.*

We welcome your feedback. E-mail us at emeditorial@primediabusiness.com.

Miscellaneous Software

Manufacturer	Product	Version	Minimum System Requirements	Type	Special Features	List Price
AIPL	Singulator	1.4	Win 95, 98, NT, ME, Pentium 90 CPU, 16 MB RAM (32 for NT), 16 colors, 1 MB disk space	Audio recording software, make CDS	Records albums, tapes & DATs onto PC while auto-separating songs in real-time, stopping when done	$29
AcousticX Software Corporation	AcousticX	N/A	Win 95, 98, 20 MB disk free space, 486 or higher	Room acoustics software	Speaker boundary interference, ray tracing, reverb time, modal response modules	$400
Ahead Software AG	Feurio!	N/A	Win 95, 98, NT, 2000, ME, XP, Pentium 90, 16 MB RAM, hard disk space: 8 MB	Audio CD recording software	Digital ripping of CDs, managing and editing of song files, burning the final CD, music database	$29
Ahead Software AG	Nero Burning ROM	N/A	Win 95, 98, NT, 2000, XP, ME, Pentium 90, 16 MB RAM, hard disk space: 12 MB	CD/DVD recording software	Audio editor, ideal for 1:1 backup copies of CDs, create audio CD in three steps	$49
APB Tools	TH-S	2.0	Mac OS9, 256 MB	G3, G4	Multichannel cue/show playback system	$2,190
Audio Ease	BarbaBatch	3.1	Mac OS 8.6	Batch sound file conversion	Sample rate converter	$395
Automation Services Company, Inc.	SendKeys	1.0	Win 98SE, 2000, XP - see requirements for Cakewalk and Sonar	Utility for Sonar	Custom keyboard macros for Cakewalk and Sonar	$15
Blaze Audio	MIDIMaster Karaoke	3.5	Win 9X, ME, 2000, XP	Karaoke and music education	Sing with MIDI karaoke files, record your voice, record duets	$30
Cycling '74	Cyclops	1	Mac OS, 128 MB RAM	Video tracking		$99
Cycling '74	Max	4.1	Mac OS, 128 MB RAM	Programming environment		$295
Cycling '74	Jitter	1	Mac OS, 128 MB RAM	Video processing software		$395
Discrete Drums	Series One Rock Alternative	N/A	Host application (Pro Tools, Digital performer, Sonar etc)		Mixable multitrack drums	$299
Discrete Drums	Series Two	N/A	Host application (Pro Tools, Digital performer, Sonar etc)	Multitrack drum library	Integrated multitrack drums and multitrack percussion. Up to 16 mixable tracks	$549
Discrete Drums	Turbulent Filth Monsters	N/A	Host application or BOSS BR-1180, Roland CDX-1	16-bit stereo WAV files	Remixed by Craig Anderton, techno industrial loops retain human feel	$99
Edtech	Swizz Army Cable Tester	N/A		1/4", XLR, 1/8", TT, MIDI, RCA	Phantom power detect, tone generator, XLR shield detector	$180
FMJ-Software	Awave Audio	8.0	Win 9X, ME, NT, 2000, XP	Audio file format batch converter	Convert from the 60 available audio file formats, and read into 30 output formats.	$50
FXpansion Audio UK Ltd	VST-DX Adapter	4.0	Win 95, 32MB RAM, Pentium-60	Plug-in format adaptor	Converts VST plug-ins to DX, VSTi plug-ins to DXi/DX2. Converts presets-automation	$60
Gallery	VirtualVTR	2.0	Mac OS 9.2 QT 5	Quicktime-based VTR	Standalone video machine based on Quicktime	$699
Gig Logic, Inc.	GIGORAMA Soloflight	1.0	Win 95, 98, ME, XP, 64MB RAM	Gig management	Book gigs, print contracts, song and set lists, financial summaries	$70
Gig Logic, Inc.	GIGORAMA Virtual Network	1.0	Win 95, 98, ME, XP	Band management	Track gigs, create a virtual network that allow users to transfer gig stats to bandmates	$90
Gig Logic, Inc.	GIGORAMA Virtual Network Reader	1.0	Win 95, 98, ME, 64 MB RAM	gig data transfer portal	Allows band members and musicians to receive personal gig data from GIGORAMA Virtual Network users	Free
Gig Logic, Inc.	GIGORAMA Gig Importer	1.0	Win 95, 98, ME, 64 MB RAM	Bonus plug-in	Imports hundreds of clubs and venues into GIGORAMA software Clubs and Venues database	Free
Innovative Music Systems, Inc.	intelliScore Standard	4.0	Win XP, NT, ME, 98, 95, 2000, Pentium, 20 MB RAM	WAV and MP3 to MIDI converter software	Helps transcribe monophonic audio files, control MIDI in real-time, captures expression	$59
Innovative Music Systems, Inc.	intelliScore Polyphonic	4.0	Win XP, NT, ME, 98, 95, 2000, Pentium, 20 MB RAM	WAV and MP3 to MIDI converter software	Helps transcribe polyphonic audio files, control MIDI in real-time, captures expression	$79
KEYFAX NewMedia	Twiddly Bits MIDI Samples	N/A	MIDI Sequencer: Mac, PC, workstation	MIDI samples	Live recorded MIDI performances for composition	$40
Korg USA	Karma MW (for Korg Karma Music Workstation)	1.0	Win 98, ME, NT, XP 64 MB RAM, Pentium III/233 MHz, Power Mac OS 8.6-9.x, 604/166 MHz	Editor for the KARMA algorithmic music function	Turn phrases and Triton arps into GEs, edit all 400+ GE parameters	$150
Mezzo Technologies	Mezzo Mirror	4.5	Mac (G3 min. recommended), OS9 and higher (OSX required for CD/DVD-R support)	Backup, disk mirroring	Project-based disk mirroring supports Pro Tools, Digital Performer, background data transfer	$299
Mezzo Technologies	Mezzo for Digital Performer	4.5	Mac (G3 min. recommended), OS9 and higher	Backup, archiving, asset management	Custom support of Digital Performer file format, background data transfers, online database	$399
Mezzo Technologies	Mezzo for Pro Tools	4.5	Mac (G3 min. recommended), OS9 and higher	Backup, archiving, asset management	Custom support of Pro Tools Session file format, background data transfers, online database	$499
Micro Technology Unlimited	Microstudio	2.316	Win 98, 2000, XP, 128MB, 256MB, 350MHz	Karaoke CDG duplication/playing	With a CDR drive, duplicate Karaoke CDG discs, play, custom assembly	$40
Micro Technology Unlimited	Keyrite	1.202	Win 98, 2000, XP, 128MB, 256MB, 700MHz	Key change audio and Karaoke files	Change pitch of Karaoke CDG files and preserve the lyrics sync	$55
Micro Technology Unlimited	Vogone	2.104	Win 98, 2000, XP, 128MB, 256MB, 700MHz	Vocal reducer/eliminator	Process WAV files to reduce/remove vocals for Karaoke singing	$55
Micro Technology Unlimited	Karaoke Home Producer	3.100	Win 98, 2000, XP, 128MB, 256MB, 350MHz	Software	Create Karaoke CDG files by syching music and lyrics. Designed for easy use by non-technical users	$130
Micro Technology Unlimited	Hoster	1.200	Win 2000, XP, 256MB, 1GHz	Run Karaoke CDG shows from a PC	Import CDG songs to hard drive, create play list for singers, uses dual display	$450

Miscellaneous Software

Manufacturer	Product	Version	Minimum System Requirements	Type	Special Features	List Price
Micromat Inc.	SoundMaker	1.0.3	Mac System 7 or higher, 5 MB RAM	Sound editing	Create custom effects. Open, edit, save almost any sound format	$70
Micromat Inc.	Drive 10	1.1.2	Mac OS X, 64 MB RAM, CD or DVD drive	Utilities	Utility program for Mac OS X, includes bootable 70 OS X CD. Optimizes OS X drive.	$70
Micromat Inc.	TechTool Pro	3.0.7	Mac 7.5.5 or higher, 5 MB RAM, CD or DVD drive.	Utilities	Recovers lost data, repairs drive problems, recovers deleted files, over 300 tests.	$100
MicroSound International Ltd	Wow! Bach	N/A	Win 95, 98, 2000, Me, XP, 64MB RAM	interactive, can reorchestrate	Brandenburg Concertos with scores, includes 2 audio CD's	$40
MicroSound International Ltd	SuperConductor	N/A	Win 95, 98, 2000, ME, XP, Mac	Stand alone software, synth, sequencer, sampler	Create, interpret, perform new and classical works	$395
MicroSound International Ltd	SuperConductor Pro II	N/A	Win 98, 2000, ME, XP	Combined sequencer, synth, sampler	24-bit performance, expressive intonation tuning (EIT)	$695
MicroSound International Ltd	SuperConductor Deluxe	N/A	Win 95, 98, Me, 2000, XP, Mac 32 MB RAM	Stand alone software, synth, sequencer, sampler	Perform, interpret, and create classical orchestral, solo works	$160
MI Productions	MODULARING	3.0	Mac OS 8.6 OS X soon available	Modular sequencers, synth and sample players	Collection of software to start, from music/loop creation to live performance	$320
Molto Music	Musicians Online Practice Planner	N/A	Internet connection with Mac or Win	Performance management software	Database program available on website, keep practice logs and rosters online	$75 and up
Music Manager Software	Master Music Manager	4.0	Mac, Win cross-platform	Music library, administration	Comprehensive music library, membership, inventory, calendar, directory, recordings	$400
Music Manager Software	WorshipManager	4.0	Mac, Win cross-platform	Worship planning	Reference for over 30 hymnals & song books	$200
My Sheet Music	My Sheet Music	N/A	Win 95 or higher, Mac OS 7 or higher, internet connection	Performance software	Print sheet music in any key, for over 100 different instruments. Includes over 350 selections.	$40
Nineblocks	MiniMidi	3	PalmOS3.1	Palm PDA	Normal MIDI and DMIDI network protocol support	$10
Optek Music Systems, inc.	Fretlight Guitar	2	Connects to PC, Mac, PDA		Lights in the fretboard show chords, scales, riffs, songs	$500
QSound Labs	QTools/AX	2.04.001	Win 95 +	DirectX plug-in	Three seperate directX plug-ins at www.qsound.com/products	$80
Reel Drums	Reel Drums volume One - Joe Franco	N/A	Pro Tools, Nuendo, Sonar, GigaSampler	Drum samples in song format	13 and 14 track song sessions of drum performances, organzied by music style and tempo	$299
reFuse Software	reFuse	1.01	Mac OS 8.1 - 9.2	Utility	Audio and transport linking between Pro Tools and Reason	$29
SeerMusic Systems	ReMixer/WaveMaker	1.10	Win 9x, ME	SeerMusic and Midifile playback, mixing app	Rendering to WAV or MP3, web audio, sonification, synth/sampler engine as Reality	Freeware $25
Shubb Software	Gigmaster	4.5	Win 95 and up, 18 MB - power Mac 18 MB	Organizationial database software for musicians	Gigbook performance list, financial reports, songbook database, contacts and contracts	$80
Sound Quest Inc.	SQ Midi Tools	1	Win 95, 98, ME, NT, 2000, XP	MIDI Utilities	11 Programs, 30, 000 patches, Drum Pattern Sequencer, Midi Quest Jr 6, MIDIXer, MidiMapper	$89
Sound Quest Inc.	Infinity	2	Win 95, 98, ME, NT, 2000, XP, 64MB RAM	Audio and MIDI development tool	Create custom audio, MIDI and mutimedia tools using 370+ different objects (stand-alone, VST, DX)	$399
Sounds Logical	ReSample	1.1	Win 98, ME, NT, 2000	Batch WAV file sample rate conversion		$30
SSoM software	Music Admin Pro	N/A	Win 95 or higher, Mac OS 8 or higher	Management software	Administration solution handling all aspects of running a dept., band program or studio	$595
Symbolic Sound Corporation	Kyma	5.26	Win ME, Mac OS 9.1	Sound design workstation	All major synth/proc. methods including granular/ additive/aggregate synthesis, spectral, vocoding	$3,300
The Groove-Doctors	RH1 Rock/Hard Rock Music Production Set	1.0	Win, Mac w/ audio recording software	SDII, WAV, AIFF, 16/24 bit	Drums, bass, guitars- 35, 000+ mixed/multi-trk pre-cut loops, 5 tempos in all keys, video tutorial	$500
The Groove-Doctors	RH1R1 Rock/Hard Rock Rectifier Guitar	1.0	Win, Mac w/ audio recording software	SDII, WAV, AIFF, 16/24 bit	Rectifier Guitar addition to the RH1 Set. 7, 000+ loops, 5 bpms, audio audition CD, video/manual disc	$159/$179
The Groove-Doctors	RP1 Rock/Pop/Country Music Production Set	1.0	Win, Mac w/ audio recording software	SDII, WAV, AIFF, 16/24 bit	Drums, bass, guitars- 35, 000+ mixed/multi-trk pre-cut loops, 5 tempos in all keys, video tutorial	$500
The Groove-Doctors	DV1 Drum Vault	1.0	Win, Mac w/ audio recording software	SDII, WAV, AIFF, 16/24 bit	70, 000+ mixed/multi-trk pre-cut loops/fills, 5 bpms, audio audition CDs, notation charts, video	$449/$529
The Groove-Doctors	DP1 & DP2 Hard Rock/Pop/Country Drum Packs	1.0	Win, Mac w/ audio recording software	SDII, WAV, AIFF, 16/24 bit	35, 000+ mixed/multi-trk pre-cut loops/fills, 5 bpms, audio audition CDs, notation charts, video	$399/$479
Trillium Lane Labs	TL Metro	1.0	Mac	Digidesign Pro Tools Utility	Metronome, 50 to 250 bpm, vols. 1/4, 1/8 1/16 notes, triplets/tap tempo, samples included	$249
Trillium Lane Labs	TL InTune	1.0	Mac	Digidesign Pro Tools Utility	Digital tuner, TDM plug-in, tuning fork, ships w/20 guitar type presets, add'l presets avail	$249
WaveAccess-MindPeak	WaveRider Pro	2.5	Wintel 486	Brainwave-to-MIDI converter	Plays four channels of biological signals in the voices, keys and scales of your choice	$1,700
WaveAccess-MindPeak	WaveRider jr.	2.5	Wintel 486	Brainwave-to-MIDI converter	Plays two channels of biological signals in the voices, keys, and scales of your choice	$950
YEAH! Solutions Ltd	Music Publisher +	2.65	Win		Publishing/record company/film company/etc. administration	$1,750 sgl user

We bet **YOU** will hear with **Perfect Pitch**

...with this secret key that unlocks your natural ear for music!

Learn to recognize EXACT tones and chords—BY EAR!

Close your eyes and play a tone—any tone. Now, without peeking at the keyboard, WHAT IS THE TONE YOU HEAR?

No clue?

Play any chord at random. Listen carefully. Is it E major...A minor...F♯7?

Still stumped? Don't worry!

Many musicians are shocked to discover how little pitch recognition they actually possess. Yet with just a few ear-opening instructions, we bet YOU will begin to name tones and chords—**ALL BY EAR**—regardless of your current ability.

And we'll prove it to you!

Why YOU need Perfect Pitch

Your ear is *everything* to your music!

Why? Because music is a *hearing* art. Whether you perform, compose, arrange, play by ear, improvise, sight-read, or just enjoy listening to music, all your talents are ROOTED in your command of the musical language—your ability to hear and evaluate *pitches*. Perfect Pitch is the Master Key that *unlocks* your natural ear for music—so you can:

- Copy chords *straight off a CD*
- Find desired tones BY EAR—instead of searching by hand or eye
- Sing tones *directly from memory*
- Hear sheet music *mentally*—in correct pitch
- Identify keys of songs *by ear alone*
- Master the language of music...*and more!*

Perfect Pitch *maximizes* your ear so your playing and creativity can *EXPLODE*. Your performance *automatically* becomes more refined, your confidence gets rock solid, and every song you play takes on a whole new dimension of satisfaction.

Musicians around the globe have told us they'd give *anything* to possess the awesome powers of Perfect Pitch. Fortunately, you don't have to give your right arm.

Perfect Pitch is already a *natural talent* hidden deep inside you, crying to be set free. To discover your own Perfect Pitch, all you need is the personal guidance you get from David Lucas Burge in his **Perfect Pitch® Ear Training SuperCourse**—*the #1 best-selling music self-development series for 22 years straight.*

Research at two leading universities (see web site) plus *thousands* of musicians—of all instruments and all styles—have long proven this powerful method for gaining the ultimate ear for music. These are real people like *you*—musicians in 120 countries worldwide.

The Secret to Perfect Pitch:

Most of us were taught that only a chosen few are "born" with Perfect Pitch (like Bach or Mozart)—and the rest of us can forget about it. *Not so!*

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Once your ear tunes in to these pitch colors, you *automatically* know the exact tones and chords that you hear. *This is Perfect Pitch.*

It's fun and exciting—and so simple a child can learn it!

(continued...)

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to keep your Course *(and we bet you will)*, you'll enjoy 3 more CDs *(all included)* with advanced Master Classes.

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We have backed the David Lucas Burge **Perfect Pitch® Ear Training SuperCourse** for 22 years now, because—IT WORKS! We've found that 97.5% of our new musicians experience their first taste of Perfect Pitch—*immediately!* (The rest usually get it after they listen a little closer.) With this instant success rate, we get very few returns.

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Notation Software

Manufacturer	Product	Minimum System Requirements	Imported File Formats	Includes Fonts	Supports Alternative Fonts	Alternate Note Heads	Chord Symbols/ Transposition/ Auto-Irets	Cross-staff/Cross-measure Beaming	Max # Staves/Voices per Staff/MIDI Channels per Staff	MIDI File Import/Export	MIDI Step Time Entry/Real Time Entry	Music Input via Mouse/Via Computer Keyboard	Non-standard Key Signatures
Adept Music Notation Solutions, Inc.	Nightingale Music Notation Software	Mac OS 7.0–9.2	MIDI, NoteScan, Notelist, Finale ETF (v.3, 3.5 only)	Yes	Yes	Yes	Y/Y/N	Y/Y	64/31/1	Y/Y	Y/Y	Y/Y	No
Adept Music Notation Solutions, Inc.	NightLight 2002 Music Notation Software	Mac OS 7.0 5MB RAM	MIDI, Notelist	Yes	Yes	Yes	Y/Y/N	Y/Y	9/31/1	Y/Y	Y/Y	Y/Y	No
GenieSoft Music Software	Overture 3	Win or Mac	MIDI, Encore, and MusicTime	Yes	Yes	Yes	Y/Y/Y	Y/Y	64/8/8	Y/Y	N/A/Y	Y/Y	No
GenieSoft Music Software	Score Writer 2	Win or Mac	MIDI, Encore, and MusicTime	Yes	No	Yes	Y/Y/N	N/N	16/4/4	Y/Y	N/A/Y	Y/Y	No
Graphire Corporation	Music Press	Mac system 7, 16 MB RAM, Win, 95, 32 MB RAM		Yes	No	Yes	Y/Y/Y	Y/Y	Unlimited/4/1	N/Y	Y/N	Y/Y	No
MakeMusic!, Inc./ Coda Music Technologies	Finale 2003	Mac 8.6, Win 98, 64MB RAM	MIDI, Encore, TIFF, EPS, SCORE, Rhapsody, SharpEye, SmartScore, MIDIScan, Finale Family Files	Yes	Yes	Yes	Y/Y/Y	Y/Y	Unlimited/8/6	Y/Y	Y/Y	Y/Y	Yes
MakeMusic!, Inc./ Coda Music Technologies	Finale Guitar	Mac 8.6, Win 98 64MB RAM	MIDI, SMartScore, Encore, Rhapsody, MidiScan, All same or earlier version Finale Family Files	Yes	Yes	Yes	Y/Y/Y	N/N	32/8/6	Y/Y	Y/Y	Y/Y	No
MakeMusic!, Inc./ Coda Music Technologies	PrintMusic!	Mac 8.6, Win 98 64MB RAM	MIDI, SmartScore, Encore, Rhapsody, MIDIScan, All same or earlier version Finale Family Files	Yes	No	No	Y/Y/Y	N/N	24/8/6	Y/Y	Y/Y	Y/Y	No
MakeMusic!, Inc./ Coda Music Technologies	NotePad Plus	Mac 8.6, Win 98	MIDI, All same or earlier version Finale Family Files	Yes	No	No	N/Y/N	N/N	8/8/1	Y/Y	N/N	Y/N	No
MakeMusic!, Inc./ Coda Music Technologies	Finale NotePad	Mac 8.6, Win 98	All same or earlier version Finale Family Files	Yes	No	No	N/Y/N	N/N	8/4/1	N/N	N/N	Y/N	No
miniMusic	NotePad	Palm OS 2.0 and higher, 100K free		No	No	No	N/Y/N	N/N	2/4/4	N/Y	N/N	N/N	No
Musitek	SmartScore Pro	Win 9x, NT, ME, 2000, XP 120 MHz Pentium CPU, 24 MB RAM	TIFF, MIDI, ENF, NIFF	Yes	No	No	Y/Y/N	Y/N	32/4/4	Y/Y	Y/Y	Y/Y	Yes
Musitek	SmartScore Songboook Edition	Win 9x, NT, ME, 2000, XP 120 MHz Pentium CPU, 24 MB RAM	TIFF, MIDI, ENF, NIFF	Yes	No	No	Y/Y/N	Y/N	3/4/4	Y/Y	Y/Y	Y/Y	Yes
Musitek	SmartScore MIDI Edition	Win 9x, NT, ME, 2000, XP 120 MHz Pentium CPU, 24 MB RAM	TIFF, MIDI, ENF, NIFF	Yes	No	No	N/Y/N	Y/N	4/4/4	Y/Y	Y/Y	Y/Y	Yes
Musitek	SmartScore Piano Edition	Win 9x, NT, ME, 2000, XP 120 MHz Pentium CPU, 24 MB RAM	TIFF, MIDI, ENF, NIFF	Yes	No	No	N/Y/N	Y/N	2/4/4	Y/Y	Y/Y	Y/Y	Yes
Musitek	SmartScore Guitar Edition	Win 9x, NT, ME, 2000, XP 120 MHz Pentium CPU, 24 MB RAM	TIFF, MIDI, ENF, NIFF	Yes	No	No	Y/Y/N	Y/N	1/4/4	Y/Y	Y/Y	Y/N/A	Yes
Notation Technologies	Play Music	Win 95, 98, 2000, ME, XP, 16 MB RAM	MIDI, MusicTime, Rhapsody, Encore	Yes	Yes	Yes	Y/Y/Y	Y/Y	24/8/8	Y/Y	Y/Y	Y/Y	Yes
Personal Composer, Inc.	Personal Composer 44	Win 95 - XP	MIDI, NIFF	Yes	Yes	Yes	Y/Y/N	Y/N	44/4/1	Y/Y	Y/Y	Y/Y	No
Personal Composer, Inc.	PC-16	Win 95 - XP, 64 MB RAM	MIDI, NIFF	Yes	Yes	Yes	Y/Y/N	Y/N	16/4/1	Y/Y	Y/Y	Y/Y	No
Personal Composer, Inc.	PC-8	Win 95 - XP, 64 MB RAM	MIDI	Yes	Yes	Yes	Y/Y/N	N/A	8/4/1	Y/Y	Y/Y	Y/Y	No
Sibelius Software	Sibelius	Win 95, 98, Me, 2000, XP, NT4, 32MB RAM, Mac G4/G3/iMac, OS 8.6-10.1 15MB RAM	Finale, SCORE, Allegro, Printmusic, MIDI, TIFF	Yes	Yes	Yes	Y/Y/Y	Y/Y	Unlimited/4/1	Y/N	N/A/Y	Y/Y	Yes
Yowza Software	MusEdit Music Notation Software	Win 95, 98, ME, NT, 2000, XP, 32 MB RAM	MusEdit, text, MIDI, ABC	Yes	Yes	Yes	Y/Y/Y	N/N	20/4/1	Y/Y	Y/Y	Y/Y	Yes

Complex Meters/ Non-metric Music	Parts Dynamically Linked to Score	Rhythmic Range	Tuplet Range	Scanning/OCR	Single-line Percussion Staff	Tablature/User-definable	Tablature Converts To/From Standard Notation	Text: Lyric/Headers & Footers/Annotative	Transposition	Special Features	List Price
Y/Y	No	128th note to double whole note	Unlimited	Y/N	Yes	Y/Y	N/N	Y/Y/Y	Chromatic, diatonic, enharmonic	QuickChange and Get Info interfaces, Threader Tool, NoteScan Program ($29.00)	$200
Y/Y	No	128th note to double whole note	Unlimited	N/N	Yes	Y/Y	N/N	Y/N/Y	Chromatic, diatonic, enharmonic	QuickChange and Get Info interfaces, Threader Tool, four page maximum	Free
Y/Y	N/A	128th note to double whole note	(2–99) including nested tuplets	N/N	Yes	Y/Y	N/Y	Y/Y/Y	Chromatic, diatonic, enharmonic	Full graphical editing of all MIDI data in Graphic Window	$349
N/N	No	128th note to double whole note	(2–99)	N/N	No	N/N	N/N	Y/Y/Y	Chromatic, diatonic, enharmonic	Opens Overture 3 files. Scores are cross-platform compatible	$59
Y/Y	Yes	128th note to double whole note	Unlimited	N/N	Yes	N/Y	N/A/Y	Y/Y/Y	Chromatic, diatonic, enharmonic	High-end printing features	$600
Y/Y	No	128th note to double whole note	Unlimited	Y/N/A	Yes	Y/Y	Y/Y	Y/Y/Y	All	Exercise wizard, auto-harmonizing, instant orchestration, engraver slurs, rhythm section generator	$600/$300
N/Y	No	128th note to double whole note	128th note to double whole note	Y/N	Yes	Y/Y	Y/Y	Y/Y/Y	All	Exports as TIFF, MicNotator, Rhyming Dictionary, Smart Music Accompaniment	$100
N/N	No	128th note to double whole note	128th note to double whole note: unlimited nesting	Y/N	Yes	N/N	N/N	Y/Y/Y	All	Engraver slurs, MicNotator (realtime entry from acoustic inst.), exports as Smart Music Accompaniment	$70
N/N	No	32nd note to whole note	32nd note to whole note: 3 nested layers	N/N	Yes	N/N	N/N	Y/Y/Y	Key signature only	Exports as SmartMusic Accompaniment	$10
N/N	No	32nd note to whole note	33rd note to whole note: 3 nested layers	N/N	Yes	N/N	N/N	Y/Y/Y	Key signature only	Opens any same or earlier version Finale Family File, exports as Smart Music Accompaniment	Free
N/N	No	16th-triplet note to whole note		N/N	No	N/N	N/N	N/N/N	Chromatic	Pen-based input and editing on handheld computers	$30
N/N	Yes	128th note to double whole note	6 presets plus user-defined	Y/Y	Yes	N/N	N/N	Y/Y/Y	Chromatic, diatonic, enharmonic	Exports scanned music to Finale import format (FIN)	$400
N/N	Yes	128th note to double whole note	6 presets plus user-defined	Y/Y	Yes	N/N	N/N	Y/Y/Y	Chromatic, diatonic, enharmonic	Exports formated pages to Finale-readable format (FIN)	$200
N/N	Yes	128th note to double whole note	6 presets plus user-defined	Y/N	Yes	N/N	N/A	N/Y/N	Chromatic, diatonic, enharmonic		$100
N/N	Yes	128th note to double whole note	6 presets plus user-defined	Y/N	Yes	N/N	N/A	N/Y/N	Chromatic, diatonic, enharmonic		$100
N/N	Yes	128th note to double whole note	6 presets plus user defined	Y/N	Yes	N/N	N/A	N/Y/N	Chromatic, diatonic, enharmonic		$100
Y/Y	Yes	128th note	Yes	N/N	Yes	Y/Y	N/N	Y/Y/Y	All		$50
N/N	No	128th note to double whole note	15:X	N/N	Yes	Y/N	N/N	Y/Y/Y	Chromatic, enharmonic, diatonic, modal	Imports/exports graphics, imports NIFF	$200
N/N	No	128th note to double whole note	15:X	N/N	Yes	Y/N	N/N	Y/Y/Y	Chromatic, diatonic, enharmonic		$140
N/N	No	128th note to double whole note		N/N	Yes	Y/N	N/N	Y/Y/Y	Chromatic, diatonic, enharmonic		$70
Y/Y	No	512th note to 'Longa'	Unlimited	Y/Y	Yes	Y/Y	Y/Y	Y/Y/Y	All	Internet publishing, enhanced playback, OS X carbonized, auto-arrange, Flexitime note entry	$299/$599
Y/Y	No	64th note to double whole note	Unlimited	N/N	Yes	Y/Y	Y/Y	Y/Y/Y	Chromatic	Image export, custom chord diagrams, alternate tunings, 284 pg. printed manual	$79

Sequencers

Manufacturer	Product	Platform	Number of Simultaneous MIDI Tracks	Maximum Clock Resolution (PPQN)	Quantization Types	Sequencing Method	Editing Views	Graphic Faders	Sysex Editing	Looping	Number of Audio Tracks
Cakewalk	Guitar Tracks Pro	Win 98/SE/ME/ 2000/XP	N/A	Sample accurate	N/A	Linear audio recording	Audio edit, mixer	Up to 42	No	Yes	32
Cakewalk	Home Studio 2002	Win 98/SE/ME/ 2000/XP	Unlimited	960	Groove, swing %, tick offset	Linear, pattern	Piano roll, sysx, event, notation, console, studioware, tempo, markers	Unlimited	Yes	Yes	Unlimited
Cakewalk	Plasma	Win 98/SE/ME/ 2000/XP	Unlimited	960	Groove, swing by %, tick offset	Linear, pattern	Piano roll, track, loop explorer,loop editor event console, big time, video, temp	Unlimited	No	Yes	Unlimited
Cakewalk	Sonar 2.0	Win 98/SE/ME/ 2000/XP	Unlimited	960	Groove, swing, percentage, randomize	Linear, step	Piano roll, track view, console view	Unlimited	Yes	Yes	Unlimited
Emagic	Logic Audio 5	Mac OS 9	Unlimited	1/3840	Realtime MIDI quantize, groove templates	Linear, step, pattern	Matrix, event, hyper, transform, key change, score editors	Unlimited	Yes	Yes	48
Emagic	Logic Audio Gold 5	Mac OS 9 & X	Unlimited	1/3840 note	Realtime MIDI quantize, groove templates	Linear, step, pattern	Matrix, event, hyper, transform, time signature, key change, score editors	Unlimited	Yes	Yes	128
Emagic	Logic Audio Platinum 5.3	Mac OS 9 & X	Unlimited	1/3840 note	Realtime MIDI quantize, groove templates	Linear, step, pattern	Matrix, event, hyper, transform, time signature, key change, score editors	Unlimited	Yes	Yes	192
Emagic	MicroLogic AV 4.7	Mac, Win 98/ME/ 2000/XP	Unlimited	960	Normal, swing	Linear	List, score, matrix	Yes	No	Yes	16
FASoft	n-Track Studio	Win 95/98/NT	Unlimited	960	Grid	Linear	Timeline, piano roll, events list	Yes	Yes	Yes	Unlimited
Future Retro	Mobius	Hardware	1	16th note	Up to 16th note	Loop-based step	N/A	No	Yes	Yes	0
Howling Dog Systems	Power Chords Pro 2.1b	Win 3.1, 9x, NT, 2000, XP	N/A	96	Strum, humanize, roll/pick, quantize	Pattern, loop	Piano roll	0	No	Yes	20
Image-Line Software	Fruityloops 3.56	Win 95, 98, 2000, ME, XP	999	768	Groove, swing, percentage	Step, pattern	Piano roll, track and event	16	No	Yes	999
Midisoft	Studio Recording Session 1.0	Win 95	Unlimited	1,000	Percentage	Linear	Notation, MIDI list	Yes	Yes	No	8
Mil Productions	Modularing 3.0	Mac	Memory-dependent	999	Exclusive real time steps shifting system	All types	Analog, matrix, pad, controllers	Unlimited	Yes	Yes	0
miniMusic	BeatPad	Palm OS	12	N/A	N/A	Pattern	Melodic, drum	16	No	Yes	0
MOTU	FreeStyle 2.3 (Mac/PC)	Mac, Win	Trackless	960	Straight, offset	Linear, loop	Piano roll, notation, event list	No	Yes	Yes	0
MOTU	Performer 6	Mac	Unlimited	480	Input, output, swing, groove,humanize, GrooveEditor	Linear, pattern, chunk	Graphic, event list, notation	Yes	Yes	Yes	8
MOTU	Digital Performer 3.1	Mac	Unlimited	Config-urable	Input, output, swing, groove, humanize	Linear, pattern	Track overview, graphic, drum editor, event list, notation	Yes	Yes	Yes	Unlimited
Musicator	Musicator Win 4.0	Win 95/98/ME/ NT/2000	255	480	Swing, percentage	Linear	Track/passage/bar, roll view, notation, audio, effects	Yes	Yes	Yes	32
Personal Composer	Personal Composer	Win	8, 16, 44	1024	Note-on, note-off	Linear	Page, scroll, split-screen	Yes	No	No	0
PG Music Inc.	PowerTracks Pro Audio 8.0	Win	48	960	Swing	Step, linear, pattern	Piano roll, track, event, notation	48	Yes	Yes	48
Roland	MC-50mkII	Roland S-MRC	8 (32 chan)	96	Grid	Linear, step	Track, event	No	Yes	Yes	0
Steinberg	Cubase SX 1.0	Win 98SE, 2000, XP, Mac OSX	Unlimited	Sub-sample	Groove, soft, analytic	Linear, cycle, mix, overdub, step, punch	Key (piano roll), drum, list, sysex, score, logical	Unlimited	Yes	Yes	200
Steinberg	Cubase VST 5.1	Win 95/98/ME/ 2000/XP, Mac OS 9	Unlimited	1,920	Over, note on, interactive, analytic, freeze, groove	Linear, loop	Key, list, score, drum logical, controller	Yes	Yes	Yes	72
Steinberg	Cubasis 3.0	Win 98/ME/ 2000/XP, Mac OS 8.6	+64	384	Normal, over	Linear	Key, list, score	Yes	Yes	Yes	48
Synapse Audio	Orion Platinum 3.0	Win 98, ME, 2000, XP	128	768	Shuffle, groove, humanize	Pattern, step	Piano roll, pattern events, song events	128	No	Yes	128
Technosaurus	Cyclodon	Hardware 16 step sequencer	N/A	N/A	N/A	16-step	N/A	No	No	Yes	0

Integrated MIDI/Audio Edit Screen	Audio Effects	Dynamics Processing	Time Compression & Expansion	Pitch-shift Type	Sample-rate Conversion	DSP Plug-in Formats	Audio-to-MIDI Conversion	Extracts Timing From Audio	Special Features	Price
No	2-band EQ, amp sim, chorus, delay, flanger, dynamics processor, limiter, 4-band parametric EQ, pitch shifter, reverb	Yes	No	Formant-preserving	Yes	DirectX	No	No	Import ACID wave files, Revalver SE amp simulator, delay time calc, tuner, support for multi-I/O audio hardware, support for 24-bit/96kHz audio, includes Fruity Loops Express 2.7	$139
Yes	Reverb, chorus, flange, delay, parametric EQ	Yes	Yes	Yes	No	DirectX, DX	No	No	Input monitoring, DD wave loops, AUI, slip editing, ACID file support	$129
Yes	FX pad, parametric EQ, pitch shift, delay, reverb, flange, chorus	Yes	Yes	Yes	Yes	DirectX, DXi	No	No	DD audio loops, WAV files, MIDI FX, input monitoring, ACID file support, extra CD of loop content	$49
Yes	StudioVerb, parametric EQ, delay, chorus, flange, expander, gate, limiter, tape saturation, pitch	Yes	Yes	Traditional and formant-preserving	Yes	DirectX, DXi, MFX	No	Yes		$479
Yes	28 integrated high-end effect plug-ins	Yes	Yes	Traditional and formant-preserving	Yes	3 synthesizers included: ES P, ES M and ES E	No	No	3 step undo/redo, 3 synthesizers included: ES P, ES M and ES E	$399
Yes	42 effect plug-ins included: various delays, re-verbs, distortions, dynamics, modulation effect	Yes	Yes	Traditional and formant-preserving	Yes	TDM, VST/VST2 (not on Mac OS X), ReWire1, Adobe Premiere & AudioSuite	No	No	Total recall mixing and automation, 3 software-instruments included, freely configurable interface	$649
Yes	Over 50 effect plug-ins included: various delays, re-verbs, distortions, dynamics, modulation effect	Yes	Yes	Traditional and formant-preserving	Yes	RTAS, MAS, TDM, VST/VST2 (not on Mac OS X), ReWire1, Adobe Premiere & AudioSuite	Yes	Yes	Total recall mixing and automation, 3 software-instruments included, freely configurable interface	$949
Yes	9 native plug-ins	Yes	No	N/A	Yes	ASIO	No	No	ASIO 2.0, Audiowerk8/2, Direct I/O, MME/Mac AV, real-time seq edit, supports E-magic, ESX24, ESI, EVP88	$99
Yes	Reverb, echo, pitch shift, chorus, EQ	No	Yes	Formant-preserving	Yes	DirectX, VST, DXi, VSTi	No	No	Works with WDM and ASIO drivers	$35–$55
No	N/A	No	No	N/A	No	N/A	No	No	Copy/paste pattern shifting, realtime pattern editing, MIDI to control voltage conversion	$325
N/A	N/A	No	No	N/A	No	N/A	No	No	Configurable stringed instrument interface, chord+plucking/strumming pattern sequencing	$60
No	Reverb, chorus, phaser, flanger	Yes	Yes	Traditional and formant-preserving	Yes	VST, VSTi, DX, DXi, Buzz	No	Yes	Integrated speech synthesizer	$99
No	Delay, echo, chorus, flanger, EQ	Yes	No	Traditional	Yes	N/A	No	No	Multisequence playback, articulation marks, more	$150
No	Reverb, delay, echo, chorus, saturator	Yes	No	Traditional	No	VST, Direct Connect	No	No	24 modular sequencers, synths and sample players with remote control of user interface	$320
No	N/A	No	No	N/A	No	N/A	No	No	Touch screen interface on any Palm OS handheld	$30
No	N/A	No	No	N/A	No	N/A	No	No	Sense tempo, note-spelling algorithms, step sequencing	$195
Yes	EQ, dyn, chorus, flanger, delay, phase shifter, autopan, echo, trml	Yes	No	N/A	No	MAS	No	No	QuickTime support, Unisyn, custom consoles for Roland VS-880, window sets, WYSIWYG notation editing	$495
Yes	50+ native MIDI and audioplug-ins	Yes	Yes	Formant and traditional	Yes	TDM, MAS, Premiere	No	No	MIDI time stamping, MAS plug-in automation, 24-bit waveform editor, support QuickTime	$795
Yes	N/A	No	No	N/A	Yes	N/A	No	No	Notation, front-panel controls for GS, XG, SC-88 PRO FX	$299
No	NA	No	No	N/A	No	NA	No	No	Transpose, copy to WP and DTP apps	$70–$200
Yes	Real time DirectX and other	Yes	Yes	Traditional	Yes	DirectX	Yes	No	MIDI chord interpretation	$49
No	N/A	No	No	N/A	No	N/A	No	No	2 MIDI outs, 1.4 MB floppy drive, read/write, mid	$795
Yes	Reverbs, delays, chorus, flange, vocode, de-esser, distortion, many more	Yes	Yes	Traditional and formant-preserving	Yes	VST, DirectX	No	Yes	Surround mixing, full score, UV22HR dithering, VST System Link, unlimited undo/redo, VST intruments	$799
Yes	4-band EQ, reverb, chorus, delay, pan, fuzz, special, overdrive, flange	Yes	Yes	Yes	Yes	VST, DirectX	No	Yes	Built-in virtual instruments: JXile, CS40, LM7, UBI, VSM, LTB linear time base for MIDI timing, PIII, PIV, AMD processor optimized, 11 new virtual effects: datube, phatsync, vocoder, more	$500
Yes	Yes, realtime	Yes	Yes	N/A	No	VST, DirectX	No	No	VST instruments, built-in synth bass, drum, universal sound module, MP3 and RealAudio export, mastering and CDR software, surround simulation	$100
Yes	Delay, reverb, dynamics, EQ, distortion, chorus, flanger, phaser, misc	Yes	Yes	Traditional	Yes	DX, VST	No	Yes	Groove Slicer, Genetics, chord & groove templates, event editing tools, multiFX control	$199
No	N/A	No	No	Knobs	No	N/A	No	No	Analog 16-step sequencer	$329

Sequencers

Manufacturer	Product	Platform	Number of Simultaneous MIDI Tracks	Maximum Clock Resolution (PPQN)	Quantization Types	Sequencing Method	Editing Views	Graphic Faders	Sysex Editing	Looping	Number of Audio Tracks
Voyetra	Digital Orchestrator Pro	Win 3.1/95/ NT 4.0	Unlimited	1,920	Intensity, sensitivity, offset, inside/outside range	Linear	Graphic controller, MIDI mixer, multitrack, notation, conductor	Yes	Yes	Yes	Unlimited
WinJammer	WinJammer Professional Version 5.0	Win 3.1/95/NT	256	960	Swing, groove, input, variable strength	Linear	Piano roll, event list, score, drum view	Yes	Yes	Yes	0
Yamaha	QY 100	Hardware	24	480	Percentage, swing	Linear, pattern	Event list	16	Yes	Yes	0
Yamaha	QY 700	Hardware sequencer tone generator	48	480	Percentage, swing, groove templates	Linear, pattern	Piano roll, event list	48	Yes	Yes	0
Yamaha	RM1x	Hardware sequencer	16	480	Grid, percentage, groove templates	Step, real, pattern, linear	Event, track, pattern chain	Yes	Yes	Yes	0
Yamaha	RS 7000	Hardware sequencer TG sampler	16	480	Percentage, swing, groove grid	Linear, pattern	Event list	16	Yes	Yes	16
Yamaha	XGworks 3.0	PC	100	480	Strength, sensitivity, swing, gate, velocity	Step, real, pattern, linear	Track view, piano roll, staff, drum, event list	Yes	Yes	Yes	6

(continued from page 35)

display it as WML, or a database engine could import it. But I have to create only one type of markup, instead of one for each application.

I didn't attempt to define how the information might look when displayed. If I want to specify the layout and appearance of the information for a specific application, I can put those instructions in a separate, related document called a *style sheet*. I can provide style sheets for various purposes (such as a default style sheet for typical Web displays and a special style sheet that instructs a browser to use larger, high-contrast type to aid visually-impaired users).

The basic concepts behind XML are fairly straightforward. Frustratingly, an XML-based language is useless without an application that understands it. I can't just take the new language and open it in a magic XML reader. I have to create a program (called a *parser* in techspeak) that understands the tags and knows what to do with them. If I want other people to be able to use the language with their applications, I'll also have to create a Document Type Definition (DTD), which defines in computer terms what the language does. I may also want to create various style sheets. None of that is beyond the reach of a serious avocational Web programmer, but it can be daunting: it's not easy to learn.

Fortunately, XML is becoming widely established, and in the near future, you'll find many complete XML applications available to process many kinds of information. In fact, the example borrows from Discographic Markup Language (discML), which has a simple, browser-based parser and editor available for free. Although XML is called a markup language, it's more correctly considered a *metalanguage* because it is used to create other languages.

XHTML = HTML IN TRANSITION

Wouldn't it be cool if you could combine some of XML's features with the things that are familiar and easy to use in HTML? That's the idea behind eXtensible Hypertext Markup Language (XHTML). Based on XML, XHTML encompasses the standard tags of HTML version 4.0. Here's the markup language home page in XHTML:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE html PUBLIC
"-//W3C//DTD XHTML 1.0 Strict//EN"
"DTD/xhtml1-strict.dtd">
<html>
<head>
<title>Markup Languages for Electronic
Musicians</title>
</head>

<body bgcolor="#FFFFFF" text="#000000"
link="#0000FF" vlink="#0000FF"
alink="#999999">
<img src="e-musician.gif" border="0"
width="200" height="40" /><br />
<br />
<a href="http://www.yahoo.com/">A Link
to Yahoo!'s Home Page</a>
</body>

</html>
```

Because XHTML is based on XML, its syntax is stricter than HTML's. XHTML documents must be identified as XML-based in the first line, and the XHTML DTD must be referenced explicitly in the second line. Tags and attributes must be in lowercase, attribute values (including numbers) must be in quotes, and "empty" tags, such as the line break (<br>), must have a closing slash. That's more trouble than regular HTML, but XHTML is designed to be readable by all kinds of devices and applications, which HTML is not, yet still be readable by conventional Web browsers, including older browsers (with some restrictions). XHTML is still

Integrated MIDI/Audio Edit Screen	Audio Effects	Dynamics Processing	Time Compression & Expansion	Pitch-shift Type	Sample-rate Conversion	DSP Plug-in Formats	Audio-to-MIDI Conversion	Extracts Timing From Audio	Special Features	Price
Yes	EQ, delay	Yes	Yes	Traditional	Yes	N/A	No	No	Mixdown, export to ACM-compat, export to any avail codes	$199
No	N/A	No	No	N/A	No	N/A	No	No		$200
No	(3) hardware, (11) reverb, chorus, (43) variation	No	No	N/A	No	N/A	No	No	A/D input with effects for guitar and microphone	$630
No	(3) processors, (63) effects	No	No	N/A	No	N/A	No	No	XG tone generator, phrase database, FDD 2 MIDI outs, pitch and modulation	$1,495
No	(11) reverb, (11) chorus, (43) variation	Yes	Yes	Normal	No	N/A	No	No	654 normal voices, 46 drum kits, 3.5 FDD, SMF compatable, 8 realtime control knobs with 16 parameters	$900
Yes	(4) hardware, (12) reverb, (2) delay/chorus, (100) variation, (8) master	No	Yes	Intelligent Slice Type X	Yes	N/A	Yes	No	Integrated sampling sequencer, AIEB2 output expander, SIMMs expansion	$1,695
Yes	Hardware dependent	Yes	Yes	Normal	Via software (TWE)	Propietary (hardware)	Yes	Yes	Guitar arranger, auto arranger, XG editor, Voice to score, multiple notation formats	$100

in development, but future versions promise the power to add new tags, functions, and features to HTML—the "extensible" part of eXtensible Hypertext Markup Language.

MORE MLS

VRML (pronounced "vur-mul") is often misidentified as a markup language, but the acronym actually stands for Virtual Reality Modeling Language. VRML allows the creation of dynamic, 3-D scenes, or "worlds," that can be viewed in a compatible browser (or with a browser plug-in). VRML structure and syntax are very different from those of markup languages and are closer to those of scripting languages. This code fragment defines the right front wheel in a 3-D rendering of a sports car:

```
DEF RightFrontWheel Separator {
 Transform {
  translation -2.0 0 -2
}
Material {
 diffuseColor 0 1.0 0
}
USE Wheel
}
```

VRML supports the creation of highly complex scenes from building blocks such as that. Moreover, VRML definitions can be imported into even more powerful modeling tools as a starting point for state-of-the-art visual effects, such as those used in film and video production.

Dynamic HyperText Markup Language (DHTML) is a language that's frequently referenced among Web designers, and it certainly sounds like a markup language—but it doesn't exist. DHTML is just a convenient acronym that refers broadly to the dynamic, interactive features that various Web browsers support. Because dynamic features are such an important part of the Web designer's toolkit, that acronym gets tossed around a lot. Without direct reference to a specific Web browser or software development environment, though, it's rather nebulous.

A MARKUP TEST-DRIVE

If you have a Web site, you can test-drive the HTML, XHTML, HDML, and WML examples. Simply open your favorite text editor (such as *Notepad* in Windows or *SimpleText* on the Mac) and enter the markup as shown. Then comes the slightly tricky part. You have to save each file with the correct extension. For HTML or XHTML files, use the extension .html (.htm will also work); for HDML files, use .hdml, and use .wml for WML files. Save the files as text only. Then, upload the files to your site or personal home page as text files (not as binary files). To view your HDML or WML test pages on a cell phone or PDA, access the device's Goto or Enter URL function and enter the complete address, including the extension.

Most Web servers are configured to understand those file types and send them with the correct headers (information that the server sends to the browser to tell it what to expect). If you receive an "unknown file type" or similar error when you attempt to read an XHTML, HDML, WML, or XML file, contact your Web site's administrator for help. For HDML and WML files, you can get a free WAP site from WAPdrive.

Markup languages are the key to unlocking the power of the Web, and as a desktop musician, it's a good idea to learn how they work. I hope this article will help you make the most of these languages, but stay tuned for further developments—markup is a moving target, to say the least.

Former **EM** *contributing editor* **Alan Gary Campbell** *is developing the Discographic Markup Language (discML) to facilitate broadly compatible storage of discographic information for sound recordings.*

We welcome your feedback. E-mail us at emeditorial@primediabusiness.com.

Signal-Processing Software

Manufacturer	Product	Version	Processor Type	Minimum System Requirements	Format and Platform	Automation	Operates In Real-time	Special Features	
4Front Technologies	OSS/3D	5.5	Spatialization, bass boost, reverb, exciter, DVD mixdown	Win, Intel P3 or higher, 64 MB RAM	DirectSound, Winamp	Yes	Yes	Spatialization, bass boost, reverb, exciter, DVD mixdown, surround sound emulation	$10–$1
AIPL	WarmTone	2.2	Dynamics processor	Win 95, Pentium 90 CPU, 16 MB RAM, 256 colors, 1 MB disk space, Direct X compatible audio studio	Direct X	No	No	Add 24-bit analog warmth & compression to PC digital audio, shareware	$
AIPL	SpinCycle	2.1		Direct X audio record. studio, Win 95, Pentium 120 CPU, 16 MB RAM, 256 colors, 1 MB disk space	Direct X, Win 95/98/NT/ME	No	No	Add 24-bit rotary speaker sound to PC digital audio, shareware	$
Antares Audio Technologies	Auto-Tune 3	N/A	Intonation processor	Computer compatible with host application	RTAS,VST(mac)MAS, TDM,DX	No	No	Pitch correction	$29 $5
Antares Audio Technologies	Mic Modeler	N/A	Modeling	Mac OS 8.6, Win 9x or higher	DX, RTAS(Mac), VST(Mac), MOTU	Yes	Yes	Enhances mic sound	$2
ANWIDA Soft	DX Reverb	1.1	Reverb	DirectX host, DX Media 5.2, 200 MHz Pentium CPU, 32MB RAM, Win 9x/Me/NT4/2000/XP	DirectX plug-in, Win 9x/Me/NT4/ 2000/XP	No	Yes	2 small room, 2 medium rooms, 2 large rooms/halls, 2 plate reverbs, 2 gate rev., 1 inverse rev	$1
ANWIDA Soft	DX Reverb Light	1.0	Reverb	DirectX host, DX Media 5.2, 166 MHz Pentium CPU, 16MB RAM, Win 9x/Me/NT4/2000/XP	DirectX plug-in, Win 9x/Me/NT4/ 2000/XP	No	Yes		Fr
ANWIDA Soft	DX Modulation Pack	1.0	Modulation effects: phaser, flanger, chorus, tremolo, c-delay and modulated resonant LP filter	DirectX host, DX Media 5.2, 200 MHz Pentium CPU, 32MB RAM, Win 9x/Me/NT4/ 2000/XP	DirectX plug-ins, Win 9x/Me/NT4/ 2000/XP	No	Yes		$
ANWIDA Soft	CX1V	1.0	Compressor/expander	VST2.0 host, 200 MHz Pentium CPU, 32MB RAM, Win 9x/Me/NT4/2000/XP	VST/PC plug-in, Win 9x/Me/NT4/2000/XP	Yes	Yes	Look ahead, hard/soft knee, above threshold monitoring	$
ANWIDA Soft	GEQ15V	1.0	15 band - 2/3 octave graphic equalizer	VST2.0 host, 200 MHz Pentium CPU, 32MB RAM, Win 9x/Me/NT4/2000/XP	VST/PC plug-in, Win 9x/Me/NT4/2000/XP	Yes	Yes		$
ANWIDA Soft	GEQ31V	1.0	31 band - 1/3 octave graphic equalizer	VST2.0 host, 200 MHz Pentium CPU, 32MB RAM, Win 9x/Me/NT4/2000/XP	VST/PC plug-in, Win 9x/Me/NT4/2000/XP	Yes	Yes		$
ANWIDA Soft	Graphic Equalizer Pro	2.2	Stereo 15 band - 2/3 octave graphic equalizer	166 MHz Pentium CPU, 16MB RAM, Win 9x/Me/NT4/2000/XP	Stand-alone, PC, Win 9x/Me/NT4/2000/XP	No	Yes	Realtime processing of sound card inputs, off-line and real-time processing of .WAV files	$
Audio Ease	Altiverb	2	Reverb	Mac G4, OS9, 40MB free	MAS, VST, RTAS	Yes	Yes	Sampled acoustics processor	$4
Audio Ease	Altiverb HTDM	2	Reverb	Mac G4 733MHz, OS9, 40MB Free	HTDM, RTAS, MAS, VST	Yes	Yes	Sampled acoustics processor	$7
Audio Ease	Nautilus Bundle	1	Exotic effects	Mac OS 8.6, 10MB free	MAS	Yes	Yes	Sound sculpting tools	$2
Audio Ease	Rocket Science Bundle	2	Room simulation, vower filter	Mac OS 8.6, 5MB free	MAS	Yes	Yes	2D Sound positioning, talking filter, envelope follower	$1
Berkley Integrated Audio Software (BIAS), Inc.	Vbox	1.1	Multi-effects control environment for VST plug-ins	Mac OS 8.6/9 & OS X 10.1, 64mb, Win 95 or higher, 64 MB	Stand-alone and VST plug-in	No	Yes	Combine, route, and mix hundreds of plug-ins per channel, audio file or live feed	$
Berkley Integrated Audio Software (BIAS), Inc.	SuperFreq	N/A	Scalable 10-band paragraphic equalizer	Mac OS 8.6/9 & OS X 10.1	VST	No	Yes	Optionally, SuperFreq can be launched as a 4, 6, or 8, or 10-band paragraphic EQ	$7
CreamWare Audio Solutions Inc.	Masterverb Pro	N/A	Reverb	Win 95/98/2000/XP, 400 MHz, 128 RAM, Mac OS 8.6 up to 9.2, G3 B/W, 400 MHz, 128 MB RAM	PC, MaC, VST, stand-alone,Scope Fusion Platform	Yes	Yes	Effect with zero latency, no CPU-load	$1
CreamWare Audio Solutions Inc.	Vinco	1	Compressor	SCOPE Fusion Platform 3.1	Scope Fusion Platform	Yes	Yes	High-end vintage compressor	$1
Cycling '74	pluggo	3	Variety	Mac OS, 128 MB	VST, MAS, RTAS	Yes	Yes	Over 100 plug-ins and synths	$1
DARTech, Inc.	DART Pro 98	1.1.13	Click/hiss removal, wideband noise removal, hum removal, equalizer	Intel or AMD CPU (400MHz or higher) 64 MB RAM, 1.2 GB HD	Win 95/98/ME, Win NT, Win 2000, Win XP or XP Pro	No	Yes	DirectX support, CD-burning utility included	$9
DARTech, Inc.	DART XP Pro	1.x	Click/hiss removal, wideband noise removal, equalizer, pitch and time compression/expansion, reverb	Intel or AMD CPU (400MHz or higher) 64 MB RAM, 1.2 GB HD	Win 95/98/ME, Win NT, Win 2000, Win XP or XP Pro	No	Yes	Audio restoration, noise reduction, CD burning utility included	$1
delaydots.com	Phat Pro DX	2.2	Sub-harmonic processor	Win 9x, 128 MB RAM	DirectX only	No	No	Two bass enhancing modes, full controllable limiter. Recommended for DD 5.1 LFE channel processing	$2
delaydots.com	Spectral Plug-ins Pack	1.3	Spectral processors	Win 9x, 128 MB RAM	DirectX, VST PC	Yes	Yes	Three banks of presets created by Martin Walker	$5
delaydots.com	Sound Designers Plug-ins Pack	2.2	Pitch shifter, subharmonic processor, distortion device	Win 9x, 128 MB RAM	DirectX, VST PC	Yes	Yes	Phat Pro DX (advanced version of Phat, subharmonic generator) as bonus for bundle buyers	$5
DSound	VL2 Multi Channel Valve Interface	N/A	Vintage tube processing	Mac or Win computer with a POWERCORE DSP Card	POWERCORE VST, MAS for Mac and Win	Yes	Yes	Surround processing requires Steinberg's Nuendo	$27
DUY	DUY DSPider	2.0	Modular plug-in builder	Mac OS9, 2 MB RAM	TDM (Mix & HD) / Mac	Yes	Yes	DUY DSPider allows user to make plug-ins modularily	$1,19

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Signal-Processing Software

Manufacturer	Product	Version	Processor Type	Minimum System Requirements	Format and Platform	Automation	Operates In Real-time	Special Features	List Price
DUY	DUY ReDSPider	2.0	Plug-in library (includes reverb, dynamics processor, NR, synth FX, EQs, distortion)	Mac OS9, 2 MB RAM	TDM (Mix & HD) / Mac	Yes	Yes	Plug-in library of over 200 plug-ins which can be loaded from any Digidesign host	$545
DUY	DUY Analog Bundle	2.0	Analog-sound simulation (tubes/valves & tape saturation).	Mac OS9, 2 MB RAM	TDM (Mix & HD) / Mac	Yes	Yes	DUY Analog Bundle includes DUY DaD Tape and DaD Valve analog simulation plug-ins	$875
DUY	DUY Global Bundle	2.0	Analog simulation (tapes/tubes), dynamics, stereo enhancer, plug-in libraries	Mac OS9, 2 MB RAM	TDM (Mix & HD) / Mac	Yes	Yes	Includes DUY DaD Tape, DaD Valve, ReDSPider, Shape, Max and Wide plug-ins	$1,545
DUY	DUY EverPack RTAS/Audiosuite	1.8.5	Reverb, analog tube simulation, stereo enhancer, dynamics	Mac OS9, 2 MB RAM	RTAS & Audiosuite / Mac	Yes	Yes	Includes DUY DaD Valve, Z-Room, Shape, Max DUY and Wide plug-ins	$425
DUY	DUY EverPack for VST	1.5/1.1	Reverb, analog tube simulation, stereo enhancer, dynamics	Mac OS9, 2 MB RAM	VST / Mac	Yes	Yes	Includes DUY DaD Valve, Z-Room, Shape, Max DUY and Wide plug-ins for VST	$229
DUY	DUY EverPack for MAS	1.4	Reverb, analog tube simulation, stereo enhancer, dynamics	Mac OS9, 2 MB RAM	MAS-MOTU / Mac	Yes	Yes	Includes DUY DaD Valve, Z-Room, Shape, Max DUY and DUY Wide plug-ins for MOTU/MAS	$249
DUY	DUY EverPack for Premiere	1.5	Reverb, analog tube simulation, stereo enhancer, dynamics	Mac OS9, 2 MB RAM	Premiere / Mac	No	No	Includes DUY DaD Valve, Z-Room, Shape, Max DUY and Wide plug-ins for Adobe Premiere	$229
Ebtech	Hum Eliminator (Model HE-2)	N/A	Ground loop eliminator (2 channel)	N/A	Stand-alone	No	Yes	Also converts lines to truly balanced	$90
Ebtech	Hum Eliminator (Model HE-8)	N/A	Ground loop eliminator	N/A	Stand-alone	No	Yes	Also converts lines to truly balanced	$285
Ebtech	Line Level Shifter (Model LLS-2)	N/A	Translates between +4dBu and -10dBV	N/A	Stand-alone	No	Yes	2 channels, contains hum elimination and line balancing	$100
Ebtech	Line Level Shifter (Model HE-8)	N/A	Translates between +4dBu and -10dBV	N/A	Stand-alone	No	Yes	8 channels, contains hum elimination and line balancing	$345
Elemental Audio Systems	Firium	1.0	Linear phase EQ	Mac OS 9 or X, PowerPC G3	VST	No	Yes	Spectrum analyzer, draw EQ freehand, mastering quality	$129
Elemental Audio Systems	Eqium	1.0	EQ	Mac OS 9 or X, PowerPC G3	VST	No	Yes	Unlimited bands, 11 filter types, hum removal filters	$129
Epinoisis Software	Digital Ear	4.2	Audio-to-MIDI converter	Pentium class, 16MB RAM, Sound Card	Win 95/98/2000/XP	No	Yes	Converts audio to MIDI in real-time, tracks brightness and volume	$80
Epinoisis Software	Digital Ear Real-Time	4.02	Audio (.wav)-to-MIDI converter	32MB RAM, Soundcard, Win 95/98/XP/2000/NT	Win 95/98/XP/2000/NT	No	Yes	Real-time conversion, pitch, volume & brightness conversion	$120
FASoft	ParEQ	1.2	Paragraphic EQ	Win 95-98-ME-NT-2000-XP	DirectX	Yes	Yes		$18
FASoft	Compressor	1.1	Dynamics processor	Win 95-98-ME-NT-2000-XP	DirectX	Yes	Yes		$20
GenieSys Voice L.C.	DeClipper	2.0	Audio restoration	Intel P-II-266, Win 98 SR, 32 MB	DirectX Plug-In/ Win 98/ME/NT/2000/XP	Yes	Yes	Restore overclipping distortions in audio file	$20
GenieSys Voice L.C.	SchizoRat Pack	1.0	Spectral & harmonic FFT-analysis/synth	Intel Celeron 400, Window ME, 64MB	DirectX Plug-In/ Win 98/ME/NT/2000/XP	Yes	Yes	Pack includes 5 DirectX plug-ins	$48
IK Multimedia	Amplitube	1.0	Guitar amp and FX modeling plug-in	MAC/PC, MacOS 8.6 or later, Win 95/98/ME/NT/2000/XP, 192MB	VST, RTAS, HTDM, DX	Yes	Yes	1260 amp combinations including pre, eq, amp, cabinet, mic, stomp, rack effects	$399
IK Multimedia	T-RackS plug-in/ T-RackS 24	1.0/2.0	Analog mastering suite	MAC/PC MacOS 8.6 or later, Win 95/98/NT/ME/2000/XP, 128MB	VST, RTAS, HTDM/stand-alone	Yes	Yes	Analog modeled, eq, compressor, multi-band limiter, soft clipping stage	$299–$399
iZotope, Inc.	Ozone	2.0	Multiband dynamics, equalization, reverb, loudness maximizer, exciter, imaging and dither	Win 98, NT, 2000, ME, XP, 450 MHz Pentium II or higher, 64 MB RAM	DirectX	Yes	Yes	Complete 64-bit analog modeled mastering system	$199
iZotope, Inc.	Vinyl	1.5	Lo-fi vinyl record simulation	Win 98, NT, 2000, ME, XP, Pentium II or higher, 64 MB RAM	DirectX	No	Yes	64-bit lo-fi record player emulation	Free
MAGIX Entertainment Corporation	MAGIX Audio Cleaning Lab	3.0	NR: declicker, decrackler, denoiser, dehissor, multiband compression, brilliance/EQ	Win 95/98/ME/NT/2000/XP, 166 MHz, 32 MB RAM, 16 Bit graphics & sound card	stand-alone, Win	Yes	Yes	Direct X support, CD Burning, Karaoke, 22 pro FX, 4-ch surround, spectral analysis	$50
Metric Halo	ChannelStrip	1.2.3	EQ, gate, compressor	Mac OS	TDM, RTAS/AS, MAS, VST	Yes	Yes	3 plugs in one interface	$299–$699
Mixman Technologies, Inc.	Mixman VST	N/A	25 DSP algorithms	Wintel, 98, Me, 2k, XP	VST plug-in for Cubase	No	Yes	Includes Mixman track playback and loading, plus DSP	$79
Native Instruments	NI-Spektral Delay	1.5	Delay	Mac OS 8.6 or higher, G3 300 MHz, 128 MB RAM. Win 98, Pentium 400 MHz, 128 MB RAM	Standalone, VST 2.0, Direct Sound, DirectConnect, ASIO, SoundManager, DXi, MME	Yes	Yes	Real-time Fast Fourier Transformation, level, delay time, feedback level for each band	$299

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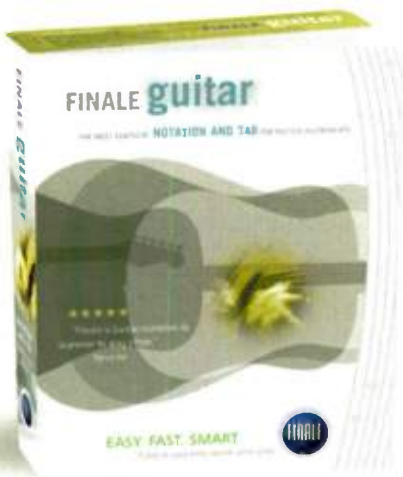

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Signal-Processing Software

Manufacturer	Product	Version	Processor Type	Minimum System Requirements	Format and Platform	Automation	Operates In Real-time	Special Features	List Price
Prosoniq	Orange Vocoder	2.0	Vocoder	Apple G3, OS 8.1/PC Pentium II/266	VST: Mac and PC (RTAS Mac only)	Yes	Yes		$199
Prosoniq	Magenta	1.0	Pitch resynthesizer	Mac:350 MHz PPC	Mac and PC (RTAS Mac only)	Yes	Yes	Choir maker	$199
Prosoniq	VST Bundle	1.0	Reverb, 3D/VoxCiter:effect rack voc. processing/effect rack mastering/ PiWarp:Sounddesign	Mac: PPC601/120MHz PC: PentiumII/266	VST: Mac and PC (RTAS Mac only)	Yes	Yes		$349
Prosoniq	TimeFactory	1.8	Time stretch/pitchshift	PC PentiumII 266MHz/Mac PPC 120MHz	Stand-alone Mac/PC	No	No	Batch processing	$449
Prosoniq	sonicWORX Studio	2.6	Complete mastering and restoration	Mac PPC G3	Mac only, OS 8.6	Yes	Yes	Batch processing/voice reduction	$449
Prosoniq	sonicWORX PowerBundle	2.6	Mastering, restoration, sound design	Mac G3	Mac only, OS 8.7	Yes	Yes	70 Soundesign algorithms, complete mastering and restoration	$649
PSPaudioware.com s.c.	PSP VintageWarmer	N/A	Dynamics processor	Mac/PC 128 MB RAM	VST, DirectX, MAS, RTAS	Yes	Yes	Single or multi-band signal processing	$149
PSPaudioware.com s.c.	PSP VintageMeter	N/A	Metering plug-in	Mac/PC 128 MB RAM	VST, DirectX, MAS	Yes	Yes	Provides professional VU and PPM metering for mono and stereo tracks	Free
PSPaudioware.com s.c.	Lexicon PSP 42	N/A	Stereo delay and phrase sampler	Mac/PC 128 MB	VST, DirectX, MAS, RTAS	Yes	Yes	Up to 9600 ms of delay time depending on internal sampling frequency, phrase sampler capability	$149
PSPaudioware.com s.c.	PSP StereoPack	N/A	Stereo plug-in	Mac/PC 64 MB	VST, DirectX, MAS	Yes	Yes	Stereo enhancer, stereo controller, stereo analyser, pseudo stereo	$24
PSPaudioware.com s.c.	PSP MixPack	N/A	Dynamics processors	Mac/PC 128 MB	VST, DirectX, MAS	Yes	Yes	Mix saturator, mix treble, mix bass, mix pressor	$100
PSPaudioware.com s.c.	PSP PianoVerb	N/A	Reverb	Mac/PC 128 MB RAM	VST, DirectX, MAS	Yes	Yes	Reproduces reverberation originally provided by piano strings	Free
Serato Audio Research	Equalizer	N/A	Spectrum analyzer, graphic EQ	Mac OS & Win	RTAS & HTDM for Mac OS & Win	Yes	Yes	Phase linear, automatic room tuning, edit eq curves over a spectrum analysis	$299
Serato Audio Research	Scratch - studio edition	N/A	Record scratching within Pro Tools	Mac OS & Win	RTAS & HTDM	No	Yes	Scratch digital samples or sound files in Pro Tools using your existing turntables or mouse	$299
Serato Audio Research	Pitch	N/A	Pitch	Mac OS, Win	RTAS & TDM Mac OS & Win	Yes	Yes	Polyphonic, real time, multi-channel pitch shifting with midi control	$399
Serato Audio Research	Pitch n Time 2	N/A	Pitch shifting and time compression/expansion	Mac OS & Win	Audiosuite - Pro Tools 4.0 and higher including HD & Pro Tools Free	No	No	Artifact-free pitch shifting and time compression/expansion	$799
Sonic Timeworks	Equalizer V1	1.1	EQ	Win98/ME/NT/2000/XP, Pentium II	DirectX	Yes	Yes	TrueResponse	$249
Sonic Timeworks	ReverbX	1.01	Reverb	ProTools/ProTools LE Windows/Mac	RTAS	Yes	Yes		$149
Sonic Timeworks	ReverbX	1.03	Reverb	Win98/ME/NT/2000/XP, Pentium II	DirectX	Yes	Yes		$249
Sonic Timeworks	CompressorX	1.01	Dynamics	ProTools/ProTools LE Windows/Mac	RTAS	Yes	Yes		$149
Sonic Timeworks	CompressorX	1.3	Dynamics	Win98/ME/NT/2000/XP, Pentium II	DirectX	Yes	Yes		$179
Sonic Timeworks	ChannelX	1.01	EQ/Dynamics	ProTools/ProTools LE Windows/Mac	RTAS	Yes	Yes		$149
Sonic Timeworks	X-Bundle	1.01	Reverb/EQ/Dynamics	ProTools/ProTools LE Windows/Mac	RTAS	Yes	Yes		$349
Sonic Timeworks	Studio Bundle	3.1	Reverb/EQ/Dynamics	Windows/Mac	Creamware SFP SCOPE/Pulsar	No	Yes		$499
Sony Electronics Inc.	Oxford Plug-in PTH-REQM	1	EQ	Approved Digidesign CPU and Hardware configuration	MacOS, Win 9x X Hardware configuration	Yes	Yes	5 separate sections with HF and LF selectable to shelf, 4 EQ styles	$850
Sony Electronics Inc.	Oxford Plug-in PTH-GEQM	1	EQ	Approved Digidesign CPU	MacOS, Win 9x or higher	Yes	Yes	GML 8200 Emulation	$1,200
Sony Electronics Inc.	Oxford Plug-in PCR-3EQG	1	EQ	Approved TC Works CPU	Mac OS 9.0.4, Win 98SE/ME/2000/XP	Yes	Yes	4 selectable EQ styles, noise below -130dBr, 2 seperate HF and LF filters	$540
Sound Toys by Wave Mechanics	FlangeThing	1.0	Analog tape flange simulation	Pro Tools 5.0	RTAS, TDM, Mac, Win	Yes	Yes	Rhythmic modulated tape flanging	$249
Sound Toys by Wave Mechanics	PhaseMistress	1.0	Phasing	Pro Tools 5.0	RTAS, TDM, Mac, Win	Yes	Yes	Analog modeling phase shifter, tempo locked modulation	$249
Sound Toys by Wave Mechanics	FilterFreak	1.0	48db/octave resonant filtering	Pro Tools 5.0	RTAS, TDM, Mac, Win	Yes	Yes	Super Steep Filter and tempo modulation	$349
Sounds Logical	WaveWarp	2.0.4	Multi-effects	Win 98/Me/NT4/2000/XP	Stand-alone, DirectX	No	Yes	Modular, hundreds of components, unlimited combinations	$199
Syntrillium Software	Cool Edit Audio Cleanup Plug-In	2000	Audio restoration	Win 95, 98, ME, 2000, XP, 100 MHz, 16MB	Cool Edit 2000	No	No	Click/pop elimination, hiss/noise reduction, clip restoration	$49
Syntrillium Software	Cool Edit Pro EQ Plug-In	2000	EQ/filter bundle	Win 95, 98, ME, 2000, XP, 100 MHz, 16MB	Cool Edit 2000	No	Yes	10/20/30 band graphic EQ, parametric EQ, notch filter, scientific filter	$49
TC Works	Assimilator	1.0	EQ assimilation and morphing	Mac or PC, VST/MAS Sequencer, PowerCore	DSP, PowerCore	Yes	Yes	Learns EQ curves to apply to material	$249
TC Works	Native Bundle	3.0	Dyn. processor, limiter, reverb, graphic/parametric EQ, filter, sidechainer	Mac OS X or Classic/Win, 128 MB RAM, VST/MAS Sequencer	VST/MAS, Mac or Win	Yes	Yes	Pro EQs, Filter plug-In with Envelope Follower	$399

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Signal-Processing Software

Manufacturer	Product	Version	Processor Type	Minimum System Requirements	Format and Platform	Automation	Operates In Real-time	Special Features	List Price
TC Works	TC Tools	3.5	Reverb, EQ, chorus/delay	Pro Tools 24 Mix or HD	TDM - HD	Yes	Yes	New support HD and 96k	$999
TC Works	Master X3	2.2	Mastering processor	Mac or PC, VST/MAS Sequencer, PowerCore	DSP, Powercore	Yes	Yes	Multiband dynamics and dithering	$249
TC Works	Master X3	3.0	Mastering processor	Pro Tools 24 Mix or HD	TDM	Yes	Yes	Multiband dynamics and dithering	$499
TC Works	FX Machine	2.5	Multi-FX and synth generator	Mac OS Classic or Win, 128 MB RAM, VST/MAS Sequencer	VST/MAS, Mac or Win	No	Yes	21 plug-ins included, doubles up as VST Instrument, Sonic Destructor upon Registration	$199
TC Works	PowerCore	1.6	DSP hardware platform with 7 included plug-ins	Mac or PC, 128 MB RAM, VST/MAS Sequencer	DSP card for Mac and PC	Yes	Yes	Includes MegaReverb, ClassicVerb, Chorus-Delay, EQ, VoiceStrip, Vintage CL, PowerCore 01 Synth	$1,199
Ultrafunk	fx:compressor	R3	Dynamics processor	Win 95/98/Me/NT4/2000/XP	DirectX and VST	Yes	Yes		$50
Ultrafunk	fx:delay	R3	Delay	Win 95/98/Me/NT4/2000/XP	DirectX and VST	Yes	Yes		$50
Ultrafunk	fx:equalizer	R3	Equalizer	Win 95/98/Me/NT4/2000/XP	DirectX and VST	Yes	Yes		$50
Ultrafunk	fx:gate	R3	Dynamics processor	Win 95/98/Me/NT4/2000/XP	DirectX and VST	Yes	Yes		$50
Ultrafunk	fx:modulator	R3	Modulator	Win 95/98/Me/NT4/2000/XP	DirectX and VST	Yes	Yes		$50
Ultrafunk	fx:multiband	R3	Dynamics processor	Win 95/98/Me/NT4/2000/XP	DirectX and VST	Yes	Yes		$100
Ultrafunk	fx:phase	R3	Phase processor	Win 95/98/Me/NT4/2000/XP	DirectX and VST	Yes	Yes		$25
Ultrafunk	fx:reverb	R3	Reverb	Win 95/98/Me/NT4/2000/XP	DirectX and VST	Yes	Yes		$50
Ultrafunk	fx:surround	R3	Surround/stereo processor	Win 95/98/Me/NT4/2000/XP	DirectX and VST	Yes	Yes		$50
Ultrafunk	fx:wahwah	R3	Equalizer	Win 95/98/Me/NT4/2000/XP	DirectX and VST	Yes	Yes		$25
Ultrafunk	Sonitus: fx plug-in pack	R3		Win 95/98/Me/NT4/2000/XP	DirectX and VST	Yes	Yes	Includes all ten Sonitus:fx plug-ins. Save $200 - 40% off the individual total price.	$299
Waldorf	D-Coder	1.0	Vocoder synthesizer	Mac or PC, VST/MAS Sequencer, PowerCore	DSP, Powercore	Yes	Yes	Synth & Vocoding at same time, < 100 bands of Vocoding, Carrier Plug-In for external audio input	$249
Wave Arts	TrackPlug	3.02	EQ, compressor, gate		DX/VST, Mac/Win	Yes	Yes	Low CPU-loading EQ/Compressor/Gate	$130
Wave Arts	MasterVerb	3.02	Reverb	Mac / Win	DX/VST, Mac/Win	Yes	Yes	Reverb with minimal processor load	$150
Wave Mechanics	Pure Pitch	2.7	Pitch change, harmonizer	Pro Tools TDM 5.0	TDM, Mac, Win NT, XP, 2000	Yes	Yes	Formant preserving vocal pitch processor	$495
Wave Mechanics	Pitch Doctor	2.7	Pitch correction	Pro Tools TDM 5.0	TDM, Mac, Win NT, XP, 2000	Yes	Yes	Formant preserving automatic tuning plugin	$495
Wave Mechanics	Sound Blender	1.2	Multi-effects	Pro Tools TDM 5.0	TDM, Mac, Win XP, NT, 2000	Yes	Yes	Diatonic harmonizing, delay, chorus, filter and modulation effects	$495
Wave Mechanics	Speed	1.2	Time compression, expansion and pitch shifting	Pro Tools 5.0	Audio Suite, Mac, Win XP, NT, 2000	Yes	Yes	Polyphonic pitch and time correction	$495
Wave Mechanics	Ultra Tools	2.2	Pitch, time and effects	Pro Tools TDM 5.0	TDM, Mac, Win XP, NT, 2000	Yes	Yes	Complete effects bundle including Pure Pitch, Pitch Doctor, Sound Blender, and Speed	$1,195
Waves, Ltd.	Native Power Pack	3.5	EQ, compressor/gate/expander, limiter, delay, reverb, de-esser, stereo imager	Mac OS 9, G3 or G4 recommended, PC Win 98, NT, 2000, XP, RAM 128 MB Basic, 256 MB multi-track	RTAS, AudioSuite, VST, MAS, and DirectX	Yes	Yes	All in one bundle with all the essentials and includes 8 plug-ins.	$500
Waves, Ltd.	Masters Native Bundle	3.5	L2 Ultramaximizer, linear phase EQ/Compressor	Mac OS 9, G3 or G4 recommended, PC Win 98, NT, 2000, XP, RAM 128 MB Basic, 256 MB multi-track	RTAS, AudioSuite, VST, MAS, and DirectX	Yes	Yes	Linear phase EQ & Multiband introduce no phase distortions Includes the award winning L2	$900
Waves, Ltd.	Gold Native Bundle	3.5	EQ, reverb, dynamics, psycho-acoustics, delay, flange, chorus, comp/gate/expansion, lim., more	Mac OS 9, G3 or G4 recommended, PC Win 98, NT, 2000, XP, RAM 128 MB Basic, 256 MB multi-track	RTAS, AudioSuite, VST, MAS, and DirectX	Yes	Yes	Includes Native Power Pack, ProFX, and Renaissance Collection Bundles C4, PAZ, MaxxBass, AudioTrack.	$1,300
Waves, Ltd.	Platinum Native Bundle	3.5	EQ, reverb, dynamics, psycho-acoustics, delay, flange, chorus, comp/gate/expansion, lim., more	Mac OS 9, G3 or G4 recommended, PC Win 98, NT, 2000, XP, RAM 128 MB Basic, 256 MB multi-track	RTAS, AudioSuite, MAS, VST, DirectX	Yes	Yes	Includes Waves Gold Bundle, Masters Bundle, and Renaissance Collection 2	$2,100
Waves, Ltd.	TDM Bundle	3.5	EQ, comp/gate/expander, lim., delay, reverb, psycho-acoustic analyzer, de-esser, stereo imager	Mac OS 9, G3 or G4 recommended, RAM 128 MB Basic, 256 MB multi-track	HD, TDM, RTAS, AudioSuite, VST, MAS, and DirectX	Yes	Yes	All in one bundle, includes 9 plug-ins, compatible with HD	$1,000
Waves, Ltd.	Masters TDM Bundle	3.5	L2 Ultramaximizer, linear phase EQ/multiband	Mac OS 9, G3 or G4 recommended, RAM 128 MB Basic, 256 MB multi-track	HD, TDM, RTAS, AudioSuite, VST, MAS, and DirectX	Yes	Yes	Linear phase EQ & Multiband introduce no phase distortions. Also includes the L2 Limiter.	$1,800
Waves, Ltd.	Gold TDM Bundle	3.5	EQ, reverb, dynamics, psycho-acoustics, delay, flange, chorus, comp/gate/expansion, lim., more	Mac OS 9, G3 or G4 recommended, RAM 128 MB Basic, 256 MB multi-track	HD, TDM, RTAS, AudioSuite, VST, MAS, and DirectX	Yes	Yes	Includes the TDM, ProFX, and Renaissance Collection Bundles, Plus C4, PS22, MaxxBass, and AudioTrack.	$2,600

Signal-Processing Software

Manufacturer	Product	Version	Processor Type	Minimum System Requirements	Format and Platform	Automation	Operates In Real-time	Special Features	List Price
Waves, Ltd.	Platinum TDM Bundle	3.5	EQ, comp., reverb, delay, chorus, flange, linear phase, dynamics, psycho-acoustics, stereo maker, phase	Mac OS 9, G3 or G4 strongly recommended, 128MB basic, 256 MB multi-track	HTDM, TDM, VST, RTAS, AudioSuite, MAS, DirectX	Yes	Yes	Includes Waves Gold, Masters, Renaissance Collections 1 and 2, ProFX, and the TDM Bundles	$4,200
Waves, Ltd.	ProFX Plus Native	3.5	Special effects, chorus, flange, 6-voice creative pitch shifter, delay	Mac OS 9, G3 or G4 recommended, PC Win 98, NT, 2000, XP: RAM 128 MB Basic, 256 MB multi-track	RTAS, AudioSuite, VST, MAS, and DirectX	Yes	Yes	Plastic surgery of sound, flexible	$500
Waves, Ltd.	ProFX Plus TDM	3.5	Special effects, flange, chorus, delay, 6-voice creative shifter	Mac OS 9, G3 or G4 recommended, PC Win 98, NT, 2000, XP: RAM 128 MB Basic, 256 MB multi-track	HD, TDM, RTAS, AudioSuite, VST, MAS, and DirectX	Yes	Yes	Plastic surgery of sound,flexible, includes 6 plug-ins	$1,000
Waves, Ltd.	Renaissance Collection Native	3.5	Compressor, EQ, reverb	Mac OS 9, G3 or G4 recommended, PC Win 98, NT, 2000, XP: RAM 128 MB Basic, 256 MB multi-track	RTAS, AudioSuite, VST, MAS, and DirectX	Yes	Yes	Includes RenEQ, RenComp, and RenVerb	$300
Waves, Ltd.	Renaissance Collection 2 Native	3.5	Vocal processor, bass enhancer, de-esser, psycho-acoustics	Mac OS 9, G3 or G4 recommended, PC Win 98, NT, 2000, XP: RAM 128 MB Basic, 256 MB multi-track	RTAS, AudioSuite, VST, MAS, and DirectX	Yes	Yes	New psycho-acoustic tools, includes 3 plug-ins	$200
Waves, Ltd.	Renaissance Collection TDM	3.5	Compressor, EQ, reverb	Mac OS 9, G3 or G4 recommended, RAM 128 MB Basic, 256 MB multi-track	HD, TDM, RTAS, AudioSuite, VST, MAS, and DirectX	Yes	Yes	Includes the RenEQ, RenComp, and RenVerb	$600
Waves, Ltd.	Renaissance Collection 2 TDM	3.5	Vocal processor, bass enhancer, de-esser, psycho-acoustics	Mac OS 9, G3 or G4 recommended, RAM 128 MB Basic, 256 MB multi-track	HD, TDM, RTAS, AudioSuite, VST, MAS, and DirectX	Yes	Yes	New psycho-acoustic tools, includes 3 plug-ins	$400
Waves, Ltd.	Restoration Bundle	3.5	Noise reduction, hum removal, click removal, crackle removal	Mac OS 9, G3 or G4 recommended, PC Win 98, NT, 2000, XP: RAM 128 MB Basic, 256 MB multi-track	RTAS, AudioSuite, V ST, MAS, and DirectX	Yes	Yes	Software based restoration and noise reduction. Includes 4 plug-ins.	$1,200
zplane. development	z.matrix	1.01	Surround Panning Module	PC, Mac	Creamware Pulsar/Scope	Yes	Yes	Support for up to 16 loudspeaker, doppler effect, source grouping	$498

Software Synths, Samplers, Sound-Design Software, and Software Drum Machines

Manufacturer	Product	Version	Type	Minimum System Requirements	Automation	Number of Envelope Generators	Format	Multitimbral (number of parts) per Instance	Modulation Sources (Number/Type)
Access Music GmbH	Indigo TDM	N/A	Synth	Win, Mac	Yes	2	TDM	20	30
Antares Audio Technologies	kantos	1.0	Audio controlled synth	Win 9x or higher, Mac OS 8.6	No	2		1	7
Applied Acoustics Systems	Tassman	2.1	Synth	Win 98, SE, 2000, XP, PIII 500 MHz	Yes	N/A	Stand-alone, DXi, VSTi	N/A	Unlimited: LFO, ADSR, envelope follower, keyboard
Applied Acoustics Systems	Lounge Lizard EP	1	Synth /emulation of electric pianos	Win 98/SE/2000/XP, Mac OS 9.x/PIII 450 MHz, G3 400 MHz	Yes	N/A	Stand-alone, VSTi, DXi, MAS	N/A	3: keyboard, velocity, LFO
Arturia	Storm Music Studio	2.0	Virtual studio including synths, drum machines and effects	Win 9x/2000/ME/XP - Mac OS 9.x/ Mac OS X - 128 MB RAM	Yes	N/A	Stand-alone, VSTi, ReWire	N/A	N/A
BitHeadz, Inc.	Unity AS-1	3.0.4	Analog synth	Mac OS 8.6-9.x, 10.1 G3 500 MHz, 128 MB RAM	No	N/A	Stand-alone, VST, MAS, RTAS	CPU-dependent	CPU-dependent
BitHeadz, Inc.	Unity DS-1	3.0.4	Sampler	Mac OS 8.6-9.x, 10.1 G3 500 MHz, 128 MB RAM	No	N/A	Stand-alone, VST, MAS, RTAS	CPU-dependent	CPU-dependent
BitHeadz, Inc.	Unity Session	3.0.4	Synth /sampler	Mac OS 8.6-9.x, 10.1 G3 500 MHz, 128 MB RAM	No	N/A	Stand-alone, VST, MAS, RTAS	CPU-dependent	CPU-dependent
Blueshock	Tsunami	1.03	Soft synth	Win 95 or higher	Yes	2	Stand-alone, VSTi	1	3: LFO, envelope, ring modulation
Blueshock	Tsunami	1.5	Virtual analogue synth	Win 95 or higher, MacOS 8.0 or higher	Yes	2	VSTi, DXi, AU (in development)	N/A	3: LFO, envelope, ring modulation
Chicken Systems, Inc.	Translator	3.0	Sample conversion software	Win 95, MacOS 8.6, 32 MB RAM	Yes	N/A		N/A	N/A
CreamWare Audio Solutions Inc.	Minimax	N/A	Synth	SCOPE Fusion Platform 3.1	Yes	2	SCOPE Fusion Platform	1	N/A
CreamWare Audio Solutions Inc.	Modular	3	Synth, sound-design	SCOPE Fusion Platform 3.1	Yes	Unlimited	SCOPE Fusion Platform	1	N/A
Cycling '74	Max/MSP	4/2	Sound-design	Mac OS, 128 MB RAM	No	Unlimited	Stand-alone	Unlimited	Unlimited
EastWest	ProSamples	N/A	Soundware		No	N/A		N/A	N/A
Edirol	HQ HyperCanvas	N/A	Synth	Win 98/ME/SE/2000/XP, 128 MB RAM, MacOS 8.6, 9.x, 192 MB RAM	Yes	N/A	VST, DXi	16	2 per patch/modulation, tremelo
Edirol	HQ SuperQuartet	N/A	Synth	Win 98/ME/SE/2000/XP, 128 MB RAM, MacOS 8.6, 9.x, 192 MB RAM	Yes	N/A	VST, DXi	16	2 per patch/modulation, tremelo
Edirol	HQ Orchestral	N/A	Synth	Win 98/ME/SE/2000/XP, 128 MB RAM, MacOS 8.6, 9.x, 192 MB RAM	Yes	N/A	VST, DXi	16	3 per patch/modulation, random modulation, vibrato
Edirol	Virtual Sound Canvas	N/A	Synth	Win 98/ME/SE/2000/XP, 64 MB RAM, MacOS 8.6, 9.x, 128 MB RAM	Yes	N/A	Stand-alone, VST, DXi	16	2 per patch/modulation, tremelo
eowave	iSynth	1.2	Sound design	Mac G3 OS 8.6	Yes	4	RTAS, VST, MAS	5	10
FXpansion Audio UK Ltd	DR-008	1.11	Drum machine	Pentium 2 233	Yes	Varies	DXi, DXi2, VSTi	96	Varies
IK Multimedia	SampleTank	1.1	Sound module	Win 95/98/ME/NT/2000/XP, RAM 128MB, Mac OS 8.5 or higher	Yes	2	VST, MAS, RTAS	16	24 typical MIDI
jambient Software	jambient	0.9	Sampler-synth	Win 98, XP	Yes	N/A	Stand-alone	16	N/A
Mil Productions	MODULAR-RING	3.0	Synth, sampler, drum machine, sequencers	Mac OS 8.6	Yes	2 or 3 per unit	Modularing/midishare	8 or 16	1/parameter
Mixman Technologies, Inc.	Mixman StudioXPro	N/A	Real-time sample playback, step sequencer and DSP	Win 98, ME, 2000, XP, 64 MB RAM	No	N/A	Stand-alone	256	N/A
Muon Software Ltd	Electron	1	Synthesiser	Win 9x-XP, 64 MB RAM, Mac OS9 64 MB RAM	Yes	2	VSTi	1	2 ADSR, 2 LFO
Muon Software Ltd	Tau Pro	1	Bass/lead monosynth	Win 9x-XP, 64 MB RAM, Mac OS9 128 MB RAM	Yes	1	VSTi	1	2
Native Instruments	Pro-53	3.0	Synth	Win 98/2000/ME/XP, Pentium 266 MHz, 64 MB RAM, Mac OS 8.6 or higher, G3 266 MHz, 64 MB RAM	Yes	2	Stand-alone, VST 2.0, MAS, DXi	N/A	6: LFO, oscillator modulation, 2 envelopes, velocity, keyposition, LFO rate from delay FX

Filters (Number/Type)	Oscillators (Number/Type)	Real-time Editing	Number of Programs/Performances	Synthesis Methods	Special Features	Price
2	2	Yes	N/A	Virtual analog		$798
3 filters, 2P high pass, 4P high pass, 2 & 4 pole band pass	4: two wavetable, 2 LFO	Yes	20+/N/A	Wavetable, user-added waveforms	Driven by audio input, extracts pitch, dynamics added waveforms	$299
Low-pass, band-pass, high-pass, comb, phaser, flanger etc.	Unlimited: vco, strings, plates, membranes, bars, flute, FM sinus etc.	Yes	Unlimited/Unlimited	Physical modeling	Fully modular, modules reproducing acoustic objects	$399
4: wah wah, phaser, tremolo, delay	3: tone, tine, noise	Yes	16/N/A	Physical modeling	Emulation of electric pianos: Rhodes, Wurlitzer, RMI	$199
N/A	N/A	Yes	N/A	Sample playback (with time-stretching and pitch-shifting), wavetables, analog model, physical model	Composition wizard, Hall (Internet chat and file exchange tool), 10 effects, built-in sequencer	$149
2 filters/13 filter types	3 stereo	Yes	1700/N/A	Analog model	Tables, built-in FX	$259
2 filters/13 filter types	2 stereo	Yes	N/A	Sample playback	Support for multiple sample file formats, tables, built-in FX	$449
2 filters/13 filter types	Sampler has 2 stereo, synth has 3 stereo	Yes	2500+/N/A	Sample playback, analog model, FM, physical modeling	Stream from disk, support for mult. sample file types, built-in FX, tables, split/layered programs	$649
1 24 dB low pass filter	4: 3 waveform and 1 noise	Yes	64/N/A	Analog model		$69
1 24 dB low pass filter	4: 3 waveform and 1 noise	Yes	64/N/A	Subtractive, analog model	Waveform drawing and morphing	$69
N/A	N/A	Yes	N/A	N/A	444x44 matrix of sampler formats, transferrable between each other	$150
1 per voice, 24 db/octave	3	Yes	400+/N/A	Analog model	Complete emulation of the minimoog	$249
N/A	N/A	No	N/A	N/A	More than 200 modules and 100 patches	$249
Unlimited	Unlimited	Yes	N/A	Any		$495
	N/A	No	N/A	N/A		$50
1 per patch/cutoff, resonance	N/A	Yes	70/384	Sample playback	Software synth for general MIDI 2 sounds	$205
1 per patch/cutoff, resonance	N/A	Yes	70/384	Sample playback	Software synth for acoustic and electric rhythm section instruments: piano, bass, guitar and drums	$250
1 per patch/cutoff, resonance	N/A	Yes	145/216	Sample playback	Software synth for orchestral instruments, style templates	$385
1 per patch/cutoff, resonance	N/A	Yes	902/N/A	Sample playback	GM2/GS compatible, MIDI to .WAV/AIFF file conversion, 100 royalty-free MIDI files included	$50
lp, bp, hp	20	Yes	100/100	Sample, analog model	Integrated sequencer	$79
2 per voice HP/LP	20	Yes	200+/N/A	Sample playback, analog model, FM, percussion model	Modular drum machine, 600+MB of sounds, ready-to-use groove library, multiple outs	$149
1 + 4 FX selectable among 20 DSP effects	2 PCM	Yes	Unlimited/Unlimited	Sample playback	Built-in multi effects, 4 effects per voice, reads AKAI CD	$279–$499
N/A	N/A	Yes	N/A	Sample playback	Joystick control, drag and drop sample loading, 3d spatializing, scripting	$50
1 per synth	2 per synth	Yes	16/Unlimited	Substractive, wavetable, sample source	Stereo synth engine for HD recording into QuickTime format. Support ASIO and Direct Connect.	$320
N/A	N/A	No	N/A	Real-time sample playback up to 32 proprietary tracks, each up to 128 samples per track	W.A.R.P (real-time FX), scratching, overdub recording, step sequencer, DSP module, editing	$110
2 LP/HP/BP/BR with flexible routing	3	Yes	32/N/A	Subtractive	X-Y controller, flexible filter routing	$75
LP18, LP24, LP36	2	Yes	32/N/A	TB303 model + real-time wave modulation	Built-in stereo FX, realtime wave modulation, sync, ringmod	$30
2 24dB low-pass filter with resonance and self-oscillation, additional high-pass filter mode	2 oscillators with 3 waveforms plus noise	Yes	576/N/A	Subtractive	Fashioned after the vintage cult synths of the 80's, includes effects unit	$199

Software Synths, Samplers, Sound-Design Software, and Software Drum Machines

Manufacturer	Product	Version	Type	Minimum System Requirements	Automation	Number of Envelope Generators	Format	Multitimbral (number of parts) per Instance	Modulation Sources (Number/Type)
Native Instruments	Reaktor	3.0	Modular synth	Win 98/2000/ME/XP, Pentium 300 MHz, 128 MB RAM, Mac OS 8.6 or higher, G3 300 MHz, 128 MB RAM	Yes	Unlimited	Stand-alone, VST 2.0, MAS, DXi	16	Unlimited
Native Instruments	Reaktor Session	1.0	Modular synth	Win 98/2000/ME/XP, Pentium 300 MHz, 128 MB RAM, Mac OS 8.6 or higher, G3 300 MHz 128 MB RAM	Yes	Unlimited	Stand-alone, VST 2.0, MAS, DXi	16	Unlimited
Native Instruments	Battery	1.01	Drum sampler	Win 98/2000/ME/XP, Pentium 266 MHz, 64 MB RAM, Mac OS 8.6 or higher, G3 266 MHz, 64 MB RAM	Yes	2	Stand-alone, VST 2.0, MAS, DXi	N/A	8cc's/5 ext/constant loopcount/random unipolar/bipolar
Native Instruments	Kontakt	1.1	Sampler	Win 98/2000/ME/XP, Pentium 300 MHz, 128 MB RAM, Mac OS 8.6 or higher, G3 300 MHz, 128 MB RAM	Yes	3	Stand-alone, VST 2.0, MAS, DXi, OMS	N/A	7 ext/6 LFO (sin, tri, sq, saw, rand, mult), 3 env (dbd, ahdsr, 32 step), 3 special (sequencer, env follower, glide)
Native Instruments	Absynth	1.3.3	Semi modular synth	Win 98/2000/XP, Pentium 400 MHZ, 128 MB RAM, Mac G3 400 MHz, 128 MB RAM (plug-in use)	Yes	19	Stand-alone, VST 2.0, MAS, DXi	N/A	12 envelopes: 3 LFO 9 MIDI ccs
Native Instruments	B4	1.1	Tonewheel organ	Win 98/2000/ME/XP or NT 4.0, Pentium 233 MHz, Mac OS 8.6 or higher, PPC 604, 233 MHz, 64 MB RAM	Yes	N/A	VST 2.0, MAS, DXi	N/A	N/A
Native Instruments	FM7	1.1	Synth	Win 98/2000/ME/XP, Pentium III 450 MHz, 128 MB RAM, 16-bit sound card, Mac OS 8.6 or higher, G4 400 MHz, 128 MB RAM	Yes	16	Stand-alone, VST 2.0, MAS, DXi	N/A	2 LFO, 128 MIDI ccs (external)
Nyr Sound Ltd	Chaosynth	2	Soft synth	Win 9x, VST Host or Emotions (by Nyr Sound)	Yes	8	VST and Emotions	Unlimited	Granules, 8 LFO, 8 SAH, 8 envelopes + controllers
PlugSound	Vol. 1 Keyboards Collection	N/A	Synth	Win 98, ME, 2000, NT, XP, Mac OS 8.6 128 MB RAM	Yes	N/A	VST, MAS, RTAS	N/A	N/A
PlugSound	Vol. 2 Fretted Instruments	N/A	Synth	Win 98, ME, 2000, NT, XP, Mac OS 8.6 128 MB RAM	Yes	N/A	VST, MAS, RTAS	N/A	N/A
PlugSound	Vol. 3 Drums & Percs Elements	N/A	Synth	Win 98, ME, 2000, NT, XP, Mac OS 8.6 128 MB RAM	Yes	N/A	VST, MAS, RTAS	N/A	N/A
PlugSound	Vol. 4 Hip Hop & R n' B Toolkit	N/A	Synth	Win 98, ME, 2000, NT, XP, Mac OS 8.6 128 MB RAM	Yes	N/A	VST, MAS, RTAS	N/A	N/A
PlugSound	Vol. 5 World of Synthesizers	N/A	Synth	Win 98, ME, 2000, NT, XP, Mac OS 8.6 128 MB RAM	Yes	N/A	VST, MAS, RTAS	N/A	N/A
PlugSound	Vol. 6 Global Collection	N/A	Synth	Win 98, ME, 2000, NT, XP, Mac OS 8.6 128 MB RAM	Yes	N/A	VST, MAS, RTAS	N/A	N/A
Propellerheads Software	Reason	2.0	Music production instrument	Win 98/Me/2000/XP, PII 300, 128 MB RAM, Mac OS 9/X, G3/233, 128 MB RAM	Yes	N/A	Stand alone	N/A	N/A
Propellerheads Software	ReBirth	2.0.1	Techno micro composer	Win 95 or higher, Pentium, 64 MB RAM, Mac OS 8, PowerPC, 64 MB RAM	Yes	2	Stand-alone	N/A	N/A
SeerMusic Systems	SuperConductor Pro	3.4	Sampler, interpreter	Win, Mac, 64 MB RAM	Yes	Unlimited	Stand-alone	128	N/A
SeerMusic Systems	Reality	1.56	Softsynth, sampler, sound design	Win 9x, ME, 64MB RAM	Yes	4+	Stand-alone or integrate with any sequencer.	16	Unlimited
SeerMusic Systems	SurReal	1.01	Synth, sampler	Win 9x, ME, 64MB RAM	Yes	4	Stand-alone, integrates into any sequencer	16	Unlimited
Software Technology	VAZ 2010	1.03	Synth	Win 9x, 2000, NT, XP, Pentium, 32 MB RAM	Yes	2	Stand-alone, VSTi, DXi	16	19, 2 can be set to MIDI controller, 2 are controlled by the built-in sequencer
Software Technology	VAZ Modular	2.5	Modular analogue synth	Win 9x, 98, Me, NT, 2000, XP, Pentium II, 32 MB RAM	Yes	255	Stand-alone, VSTi, DXi	16	Unlimited
Sound Quest Inc.	Infinity	2.0	Synth, sampler, drum machine, sound-design	Win 95/98/ME/NT/2000/XP, 64 MB RAM	Yes	Unlimited	Stand-alone, VSTi, DXi	N/A	Unlimited
Spectrasonics	Stylus Vinyl Groove Module	1.03	Groove Box	Win 98 or higher, 300 mHz PIII or better, Mac OS 9 or higher, 266 mHz G3 or better	Yes	3	VST Mac/PC, RTAS, MAS	1	15 including LFOs, envelopes, randomizer, cc11, key position, wheels, more

Filters (Number/Type)	Oscillators (Number/Type)	Real-time Editing	Number of Programs/Performances	Synthesis Methods	Special Features	Price
Unlimited	Unlimited	Yes	Thousands/N/A	Subtractive, FM, wavetable, sampling, granular, additive, Resynthesis and more	Native modular real-time software for synthesis, sampling and effects processing, instruments and presets	$499
Unlimited	Unlimited	Yes	Thousands/N/A	Subtractive, FM, wavetable, sampling, granular, additive, Resynthesis and more	REAKTOR Audio engine for synthesis, sampling, and effects, library of instruments	$349
N/A	N/A	Yes	Unlimited/Unlimited	Sampling	For drum sounds, 54 inst., each w/128 velocity layers, tuning, vol., pitch, bit reduction, shaper, FX Loop	$199
11: 1 Pole LP, 2 Pole LP, 4 Pole LP, 1 Pole Hp, 2 Pole Hp, 4 Pole Hp, 1+1 Pole Bp, 2+2 Pole Bp, 6 pole LP/2+2 Pole Notch/ 3 x 2 Pole Multi/6-36 DB	N/A	Yes	Unlimited/Unlimited	Granular, resynthesis, sampling	Dynamic resource allocation, real-time granular time-stretching, comprehensive modulation capabilities	$399
8 lpf -6dB, lpf-12dB, lpf-24dB, hpf-6dB, hpf -12dB, bpf, notch, comb	6 Wavetable, Draw, Wav extract, sine, etc.	Yes	700/N/A	Additive, subtractive, FM, AM, ring modulation, and waveshaping	68 brkpoints per env, semimodular struct., drawable waveforms, authentic tonewheel organ simulation	$299
N/A	91 oscillators/virtual tonewheels	Yes	120/N/A	Additive	Authentic simulation of the original tonewheel organ, scanner vibrato/chorus, rotary speaker	$235
3, hp, bp, lp filter types can be crossfaded with one another	6 oscillators with 32 different waveforms	Yes	290/N/A	FM synthesis, subtractive, wavetable	Extended sound architecture, analog-style editing, graphical editors	$299
8 filters selectable from LP24, LP12, HP and BP	Up to 64 controlled by cellular automata	Yes	Unlimited/N/A	Granular driven by Cellular Automata	Cellular Automata	$90
Low pass, high pass	N/A	Yes	N/A	Subtractive sample playback	Each sample voice engages its own playback system	$100
Low pass, high pass	N/A	Yes	N/A	Subtractive sample playback	Each sample voice engages its own playback system	$100
Low pass, high pass	N/A	Yes	N/A	Subtractive sample playback	Each sample voice engages its own playback system	$100
Low pass, high pass	N/A	Yes	N/A	Subtractive sample playback	Each sample voice engages its own playback system	$100
Low pass, high pass	N/A	Yes	N/A	Subtractive sample playback	Each sample voice engages its own playback system	$100
Low pass, high pass	N/A	Yes	N/A	Subtractive sample playback	Each sample voice engages its own playback system	$100
N/A	N/A	Yes	N/A	Samples, subtractive analog mode, GrainTable synthesis, REX playback	Configurable rack of instruments, expands with user's needs.	$399
3	2	Yes	N/A	Analog modeling	Accurate software emulation of the classic techno boxes: TB-303, TR-808 and TR-909	$179
N/A	N/A	Yes	1000+/128	Hierarchical pulse, predictive note shaping, organic vibrato, expressive intonation tuning	Create realistic performances	$300
4 multimode filters	4 Oscillators, 4 LFO	Yes	1000+/128	Sample playback, virtual analog, advanced FM, physical models, model synthesis, combined synthesis		$160
4 multimode filters	4 Oscillators, 4 LFO	No	1000+/64	Sample playback, virtual analog, advanced FM, physical models, model synthesis, combined synthesis	Plays back Banksets created in Reality and SF2's. Authors SeerMusic Works	$55
9, with 2/4 Pole Multimode variations, including resonance and separation modulation	2 plus 2 LFO (1 of which can be used as a 3rd oscillator)	Yes	Unlimited/Unlimited	Analog, sample playback, subtractive	Analog polyphonic sequencer per part. Hosts VST/DX and VSTi plug-ins. 16 channel mixer with effects	$169
255 12 including Type A,B with low, band & high pass Type C low pass 2/4 pole	Up to 255 per part, with a choice of several, including granular and wavetable	Yes	128/Unlimited	Sample, analog model, granular, wavetable	Authentic ananlogue sound, modules for creating new sounds	$299
Unlimited - Reson, low/high pass, low/high shelf, parametric EQ, band pass, band reject, FIR, IIR	Unlimited - saw, square, pw, sine, pulse, triangle, pulse impulse, parabola, custom	Yes	Unlimited/Unlimited	Subtractive, additive, sample playback, FM, Karplus-strong	User-creatable custom instruments, includes 14 synths, 7 organs, 2 drum machines, over 40 effects	$399
Master Filter, plus 3 low pass and 1 hi pass filters	1 (sample based)	Yes	3,000/3,000	Sample playback, subtractive	Groove Control, 38,000 samples, groove randomization, groove menus, zone editing	$299

Software Synths, Samplers, Sound-Design Software, and Software Drum Machines

Manufacturer	Product	Version	Type	Minimum System Requirements	Automation	Number of Envelope Generators	Format	Multitimbral (number of parts) per instance	Modulation Sources (Number/Type)
Spectrasonics	Trilogy Total Bass Module	1.0	Sample based all-bass module	Win 98 or higher, 500 mHz PIII or better, Mac OS 8 or higher, 350 mHz G3 or better	Yes	6	VST Mac/PC, RTAS, MAS	2	19 including LFOs, envelopes, randomizer, cc11, key position, wheels, more
Spectrasonics	Atmosphere Dream Synth Module	1.0	Sample based layering synth	Win 98 or higher, 600 mHz PIII or better, Mac OS 9 or higher, 500 mHz G3 or better	Yes	6	VST Mac/PC, RTAS, MAS	2	19 including LFOs, envelopes, randomizer, cc11, key position, wheels, more
Synapse Audio	Junglist	3.1	Synth	Win 98/ME/2000/XP, Mac OS, 8 MB RAM	Yes	3	DXi, VSTi	1	1 LFO on amplitude, filter or both
VirSyn Software Synthesizer	VirSyn TERA	1.1	Synth	Win 98, XP, Mac OS 9, 128MB RAM	Yes	4	Stand-alone, VSTi	16	19: keytrack, pitch, velocity, aftertouch, modwheel, pitchbend, sequ. control, envelopes, LFO, etc.
Wavelength Devices	Gemini Mega-Synth	N/A	Virtual analogue synth	Win, Mac	Yes	5	CreamWare SFP	DSP-dependent	Complex Matrix
Wavelength Devices	Mutant Synthesizer	N/A	Virtual analogue synth	Win, Mac	Yes	3	CreamWare SFP	DSP-dependent	Cross-modulation/ filter modulation
Wavelength Devices	Plasma Drumsynth	N/A	Drum machine	Win, Mac	Yes	N/A	CreamWare SFP	12	N/A
Wavelength Devices	Transfusion Stereo Filterbank	N/A	Filterbank/effect generator	Win, Mac	Yes	1	CreamWare SFP	N/A	1 EG/2 LFO/velocity/ aftertouch/key-tracking
Wavelength Devices	Germ Synthesizer/Expander	N/A	Synth	Win, Mac	Yes	2	CreamWare SFP	DSP-dependent	EG/LFO/velocity/ aftertouch/ various external mod features
Wavelength Devices	FreakMod Hybrid Synth	N/A	Synth	Win, Mac	Yes	14	CreamWare SFP	DSP-dependent	Freely assignable FM Matrix
Wavelength Devices	drumVOX	N/A	Drum machine	Win, Mac	Yes	4	CreamWare SFP	N/A	Feedback/noise/EG/ velocity/ringmod
WaveMachine Labs	Drumagog	3.0	Drum Replacer plug-in	Win 98/2000/ME/XP	No	N/A	Direct-X	256	N/A
Zarg Music	Ambient	2.1	Synth		No	3	Pulsar, VSTi	1	N/A
Zarg Music	Dark Star	2.0	Synth	Win, Mac	Yes	3	CreamWare	1	2 LFO, envelope follower
Zarg Music	Comb Pro 2	2.3	Synth	Win, Mac	Yes	3	CreamWare	1	3 LFO, envelope follower, external In
Zarg Music	Orion	2.1	Synth	Win, Mac	Yes	2	CreamWare	1	4 LFO, oscillator 2, filter envelope
Zarg Music	Orion Custom	2.4	Synth	Win, Mac	Yes	2	CreamWare	1	5 LFO and envelope
Zarg Music	Pro One/Pro One Solo	1.2/1.4.1	Synth	Win, Mac	Yes	2	CreamWare	1	1 LFO, Osc 2, filter envelope
Zarg Music	Prophet (standard)	1.1	Synth	Win, Mac	Yes	2	CreamWare	1	LFO, Osc 2, envelope
Zarg Music	Prophet Plus	2.01	Synth	Win, Mac 9.0	Yes	2	CreamWare	1	LFO, Osc 2, noise
Zarg Music	Red Dwarf	1.0	Synth	Win, Mac 9.x	Yes	4	CreamWare	1	3 LFO, 4 envelopes, envelope follower, extrernal input
Zarg Music	Red Dwarf EX	1.2	Synth	Win, Mac 9.x	Yes	8	CreamWare	1	2 LFO, all envelopes, mod wheel, AT, external in
Zarg Music	Rotor 48	3.2	Synth	Win, Mac 9.x	Yes	2	CreamWare	1	1 LFO, ring mod, 4 "rotors"
Zarg Music	Rotor 48RD	1.1	Synth	Win, Mac 9.x	Yes	2	CreamWare	1	LFO, envelope
Zarg Music	Rotor Jr.	1.1	Synth	Win, Mac 9.x	Yes	2	CreamWare	1	LFO, mod envelope, wheel, aftertouch, velocity

Filters (Number/Type)	Oscillators (Number/Type)	Real-time Editing	Number of Programs/Performances	Synthesis Methods	Special Features	Price
Master Filter, plus 3 low pass and 1 hi pass filters	2 (sample based)	Yes	500/500	Sample playback, subtractive	True staccato sample-mapping, mono-legato glide modes, acoustic/electric/synth bass	$399
Master Filter, plus 3 low pass and 1 hi pass filters	2 (sample based)	Yes	2,000/1,000	Sample playback, subtractive	Interactive layering control, programmable sample start points	$399
LP, BP, HP, LP+Notch	2 in Single Mode, 4 in Dual Voice mode	Yes	100/N/A	Analog model, FM, subtractive	Dual voice+Unison mode, bass boost, percussive mode	$69
3 /24/18/12dB LP/HP/BP/BS, formant filter	9: 64 waveforms, spectrum oscillator	Yes	16,384/Unlimited	Analog model, FM, spectrum synthesis, additive, physical modeling, formant synthesis, wave shaping	8D Sound access, song/step sequencer, built-in mixer/effects	$279
12 mixable filters in two filter banks	2 multimode oscillators: sine/triangle/saw up/saw down/square PW/input signal	Yes	Unlimited/N/A	Subtractive	Modular-style routing	$20 shareware
Switchable low/high/band/notch custom filter algorithm	2 morphing oscillators: 1 sine to saw, 1 sine to PW	Yes	Unlimited/N/A	Subtractive	Ideal for leads and basslines	$20 shareware
N/A	12 vintage-style analogue drum sounds	Yes	Unlimited/N/A	Subtractive/FM	Velocity control, bass-presence, percussive timbre variety	$20 shareware
9 mixable filters	Dedicated ringmod oscillator/noise	Yes	Unlimited/N/A		Harmonically-rich distortions, metallic ringmod timbres, complex, linear, spatial soundscapes	$20 shareware
Mixable low/high/band 4-pole	Mixable audio-in/sine/square/saw (phase)/pulse (phase & width)/white & pink noise/feedback	Yes	Unlimited/N/A	Semi-modular subtractive/FM	Modulation flexibility	$20 shareware
4-pole lowpass filter	6 sine oscillators + noise/bit crushing	Yes	Unlimited/N/A	Subtractive/FM	Designed for analogue synth fans	$20 shareware
N/A	Custom/FM	Yes	Unlimited/N/A	Subtractive/FM	Produces a variety of electronic percussion sounds, more	$20 shareware
N/A	N/A	Yes	N/A	Drum Replacer	Visual triggering, MIDI output, GIG file import, advanced sample management	$99–$269
2 multimode 12 dB filters, series or parallel	8: standard waveforms, wavetables, samples	No	100/N/A	Analog model, sample playback, subtractive	Panning for each filter, user can assign each oscillator to a pan position between the filters	$199
4: 12/24 dB lowpass, 12 dB multimode, comb, free filter bank of 8 bandpass filters	4: multimode, Juno-style, sample playback, noise, external input.	Yes	50/N/A	Analog model, sample playback, subtractive	EQ, overdrive, stereo chorus & delay included, filters series are fully reconfigurable	$160
2: a 12 dB multimode (high-, low-, and bandpass) and a Comb	2 "spectral" oscillators, fully variable from sine to saw or sine to pulse	Yes	75/N/A	Analog model, comb filter provides physical modeling-type sounds	Effects include EQ, stereo delay, and 2 6-channel insert racks, mono & stereo	$140
1 24 dB lowpass	2 multimode	Yes	40/N/A	Analog model, AM cross-modulation	Audio outs of the 2 oscillators can be multiplied in 3 ways, emulating FM	$140
4: Lowpass 24 dB, highpass 12 dB, 12 24 dB bandpass, and comb	3: 2 multimode and 1 "Juno" style	Yes	101/N/A	Subtractive analog model, AM cross-modulation	Effects include EQ, stereo flanger and stereo delay	$160
1 24 dB CEM 3320 emulation lowpass	2 CEM 3340 emulation	Yes	121/N/A	Subtractive analog model	Pro One includes step sequencer and polyphonic	$99/$49
1 24 dB CEM 3320 emulation lowpass	2 CEM 3340 emulation	Yes	124/N/A	Subtractive analog model	Reproduces the Sequential Circuits Prophet 5 sound, adding velocity control	$129
1 24 dB CEM 3320 emulation lowpass	2 CEM emulation, 2 WAV (sample playback)	Yes	170/N/A	Subtractive, analog model, sample playback	Expanded Prophet, effects include distortion, chorus/flanger, delay. Extensive aftertouch controls	$229
User-definable from filter library	User-definable from oscillator library	Yes	70/N/A	Subtractive, FM, analog model	Semi-modular synth, customizable filters, oscillators, and envs for each preset	$160
2 filter slots - user decides, possible LP, HP, BP, comb	2 slots - multimode, spectral, wavetable, sample playback, user selectable	Yes	70N/A	Subtractive, analog model, sample playback, semi-modular	Same as Red dwarf, but adds WAV oscs, 4 for env slots, 9 mod matrix paths	$210
1 12 dB multimode (LP, HP, BP)	48: selectable from multimode, sample playback, or external ins	Yes	32/N/A	Subtractive, 4 stage crossfading "rotors" give unusual new timbres at audio rates	Each rotor plays 4 oscs sequentially, varible crossfade provides "atmospheric" pad sounds	$99
1 - user selectable semi-modular design	48: selectable from multimode, sample playback, or external ins	Yes	30/N/A	Semi-modular version of the Rotor 48, subtractive, 4-stage crossfade modulation	Same as Rotor 48, user-configurable "semi-modular" (like Red Dwarf), FX included	$99
1 - user selectable semi-modular design	4: user selectable from RD library, sample playback, or External ins	Yes	20/N/A	Subtractive, sample playback	Semi-modular, 1/4 of the Rotor 48RD, with additional pitch modulations	$60

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Sr. Vice President/Chief Information Officer
– Kris Paper, kpaper@primediabusiness.com
Sr. Vice President – Business Development
– Eric Jacobson, ejacobson@primediabusiness.com
Vice President – Content Licensing & Development
– Andrew Elston, aelston@primediabusiness.com
Vice President – Corporate Communications/Marketing
– Karen Garrison, kgarrison@primediabusiness.com
Sr. Vice President – Finance
– Tom Flynn, tflynn@primediabusiness.com
Interim Vice President – Human Resources
– Kurt Nelson, knelson@primediabusiness.com
Vice President – New Media
– Andy Feldman, afeldman@primediabusiness.com
Vice President – Technology
– Cindi Reding, creding@primediabusiness.com

PRIMEDIA Business-to-Business Group
– 745 Fifth Ave., New York, NY 10151
Interim President & Chief Executive Officer
–Charles McCurdy, cmccurdy@primedia.com
Chief Creative Officer
– Craig Reiss, creiss@primedia.com
Creative Director
– Alan Alpanian, aalpanian@primediabusiness.com

PRIMEDIA Inc.
Chairman & Chief Executive Officer
– Tom Rogers, trogers@primedia.com
Vice Chairman & General Counsel
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President
– Charles McCurdy, cmccurdy@primedia.com

Editorial, Advertising, and Business Offices: 6400 Hollis St., Suite 12, Emeryville, CA 94608, USA. (510) 653-3307.

CORPORATE OFFICE: PRIMEDIA Business Magazines & Media Inc., 9800 Metcalf, Overland Park, KS 66212 — 913-341-1300 — primediabusiness.com

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Contact Sheet

4Front Technologies tel. (310) 202-8530; e-mail info@opensound.com; Web www.opensound.com

Aardvark tel. (734) 665-8899; e-mail info@aardvark-pro.com; Web www.aardvarkaudio.com

Ableton tel 49-30-288-7630; e-mail contact@ableton.com; Web www.ableton.com

Access Music GmbH tel. 49-2361-902-956; e-mail info@access-music.de; Web www.access-music.de

AcousticX Corporation tel. (416) 868-0809; e-mail acoustic@sprynet.com, Web www.pilchner-schoustal.com/old/acoustic-x

Adept Music Notation Solutions, Inc. tel. (215) 736-8237; e-mail info@ngale.com; Web www.ngale.com

A Designs tel. (818) 716-4153; e-mail pmontessi@earthlink.net; Web www.adesignsaudio.com

Ahead Software AG tel. 49-7248-911-800, e-mail info@nero.com, Web www.nero.com

AIPL tel. (509) 427-5374; e-mail levy@aipl.com; Web www.aipl.com

Alternate Mode, Inc. tel. (413) 594-5190, e-mail kat1993@aol.com; Web www.alternatemode.com

Antares Audio Technologies tel. (831) 461-7800; e-mail info@antarestech.com; Web www.antarestech.com

Anwida Soft tel. 39-0721-200-044, e-mail info@anwida.com; Web www.anwida.com

APB Tools tel 49-39-398-9520; e-mail info@apbtools.com; Web www.apbtools.com

Applied Acoustics Systems tel (514) 871-4963; e-mail info@applied-acoustics.com; Web www.applied-acoustics.com

Arturia tel. 33-43802-0555; e-mail info@arturia.com; Web www.arturia.com

Audio Ease tel. 31-30-243-3606; e-mail info@audioease.com; Web www.audioease.com

Audiotrak tel. (408) 519-5774; e-mail sales@esi-pro.com; Web www.audiotrak.net

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Cakewalk, Inc. tel. (617) 423-9004, e-mail sales@cakewalk.com; Web www.cakewalk.com

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ISP Technologies, Inc. tel. (248) 620-6795; e-mail info@ispteчhnologies.com; Web www.ispteчhnologies.com

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MAZ Sound Tools e-mail info@maz-sound.com; Web www.maz-sound.com

Metric Halo tel (845) 831-8600; e-mail info@mhlabs.com; Web www.mhlabs.com

Mezzo Technologies tel. (831) 461-2121, e-mail sales@mezzotechnologies.com; Web www.mezzotechnologies.com

MIBAC Music Software, Inc. tel. (507) 645-5851, e-mail info@mibac.com, Web www.mibac.com

Microboards Technology tel. (952) 556-1600; e-mail sales@microboards.com; Web www.microboards.com

Micromat, Inc. tel. (707) 566-3831; e-mail info@micromat.com; Web www.micromat.com

MicroSound International Ltd. tel. (707) 939-1566; e-mail mclynes1@aol.com; Web www.superconductor.com

Micro Technology Unlimited tel. (919) 870-0344; e-mail info@mtu.com; Web www.mtu.com

MIDITEMP tel. 49-8133-2488; e-mail miditemp@miditemp.com; Web www.miditemp.com

MIDIWorks Interactive tel. 644-475-4083; e-mail info@ midiworksinteractive.com; Web www.midiworksinteractive.com

Mil Productions tel. 33-47-402-5195; e-mail info@milprod.com; Web www.milprod.com

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Mixed Logic tel. (440) 826-1676; e-mail info@mixedlogic.com; Web www.mixedlogic.com

Mixman Technologies, Inc. tel. (415) 221-4200; e-mail info@mixman.com; Web www.mixman.com

Morley tel. (847) 639-4646; e-mail morleypedals@hotmail.com; Web www.morleypedals.com

Motifator.com tel. (831) 460-0172; e-mail info@motifator.com; Web www.motifator.com

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Muon Software Ltd. tel. 44-7976-939-752; e-mail service@muon-software.com; Web www.muon-software.com

Music Manager Software tel. (800) 282-9220; e-mail sales@musicmanager.com; Web www.musicmanager.com

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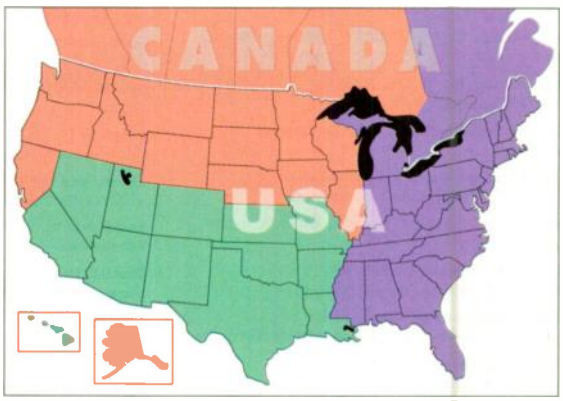

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