

## Chapter 6.

# Computer-Based MIDI and Digital Recording

Chapters 4 and 5 presented various stand-alone or modular digital recording options. Another possible configuration is the use of a Macintosh or Windows computer as the heart of the home or professional studio.

The main advantage of a computer in the digital studio is versatility. There is a variety of software for recording MIDI and digital audio. The disadvantage of using a computer is that it can be complex and confusing to set up and configure. It can take longer to learn a computer system than it can to learn modular and portable digital recording equipment. I recommend you use the computer as the central part of the studio only if you are fairly comfortable using software and you have a computer made within the last couple of years.

In a computer-based recording studio, the computer functions as the hard disk recorder and the software governs mixing, processing, and effects. The computer can be used in a variety of ways in the digital world. These include:

- MIDI sequencing only (no digital audio).
- MIDI sequencing and digital audio using no additional hardware.
- MIDI sequencing and digital audio with a digital audio plug-in card.
- Digital/audio recording with a digital audio plug-in card and interface.

Options 1 and 2 above will be discussed in this chapter and options 3 and 4 above will be discussed in chapters 7 and 8, respectively.

## Macintosh or Windows?

One of the most common questions asked is which computer should be used for digital recording. The choices are Macintosh or Windows. There are some differences between Macintosh and Windows computers. However, either can be used as the central component for both MIDI and digital audio recording. Software is available from entry- to professional-level for both computer platforms. Many software titles are available for both Mac and Windows; such products are referred to as cross-platform software.

My advice is to purchase the computer model for which you can get the most help, support, and advice. If you are planning to record in your home, ask around to see if there are people you know that use a particular brand of computer for home recording. If you are going to operate a recording studio, check with other existing studios to see which computer model they are using. The same advice holds true if you are a music educator. The key is finding an individual or company to use as a model and a basis for comparison. It is also helpful to use equipment similar to your friends' and colleagues' so you can call on them for advice and help when needed.

## Computer Hardware Considerations

The microprocessor is the heart of any computer. The faster the speed the better. Processor speed is measured in *megahertz*—a unit of frequency equal to 1 million hertz. It is abbreviated MHz. Computers running at 300 MHz or 400 MHz are common as of this writing. RAM, or random access memory, refers to the computer's temporary storage capability. RAM is where the software is loaded and where the songs you are recording are stored prior to being saved to disk. You almost can't have enough RAM if you are working with digital audio. Be sure to have enough RAM to run the software you intend to use. (I am purposely avoiding recommending specific requirements for processor speed, hard disk capacity, RAM, and other issues, as they change very quickly.)

If MIDI sequencing will be your primary function, computer processor speed and hard disk storage is not a major concern. This is because MIDI only records performance information. Therefore, the "average size of a MIDI file is relatively small, usually between 25k and 100k, depending upon the complexity of the piece. If you plan to record digital audio, the computer should have a fast processor and a large hard drive for storage. The reasoning here is that digital audio creates files that are quite large. A fast processor is needed because recording digital audio can be taxing to a computer's processor. The maker of the digital audio software you plan to purchase will list recommended system requirements for its use. Be sure your computer has the capacity to run the software. I also suggest you look for current articles in *Electronic Musician* and *Keyboard* magazines.

## Storage Options

Computers can come equipped with several types of disk storage. (Disk storage is where the files are stored.) For a small studio, a computer's internal hard drive may be sufficient. In this case, be sure to purchase the most hard disk storage you can afford. Storage capacity is represented in gigabytes (GB). The more gigabytes the hard drive has, the better.

It is advisable to have a backup system for archiving files. See chapter 9 for specific recommendations on storage and backup systems. It is also a good idea to purchase an uninterruptible power supply so the computer will continue to run if there is a power outage in the studio. These devices can be purchased at computer stores. Some models cost less than \$200.

When I am looking for computer hardware recommendations, I usually turn to articles by Walter Mossberg, whose writing appears in several national publications. Every six months or so he writes an article on what to look for when purchasing a computer. His articles are available online. For a complete listing of Mossberg's articles go to <http://ptech.wsj.com/archive.html>. Mossberg writes in a down-to-earth style and gives specific advice on hardware.

## Computer System Types

There are two basic types of computers used in recording: desktop and portable (usually referred to as laptops). The desktop computer typically has two distinct parts: a case that houses the computer's processor and a separate monitor. The laptop or portable computer is an all-in-one computer that is small and light enough to fit on one's lap. The advantage is portability.

The best choice for digital audio recording at the mid and high levels is to use a desktop computer system with expansion slots. These computers have internal slots where digital audio cards can be inserted. Some desktop models, such as Apple Computer's iMac, do not have internal slots. It is possible to use entry-level audio software on these machines (discussed in this chapter). But since they currently do not support add-on digital audio cards, they are not recommended for mid- to high-level applications. Portable computers do not typically have expansion slots, so they are not as usable as desktop models. However, it is possible to add expansion slots to laptops (discussed in chapter 7).

### Connecting a Macintosh via MIDI

To record and play back MIDI with a Macintosh computer, you will need a MIDI interface, as there is none built in. You can either purchase a MIDI interface separately or buy a MIDI keyboard with a built-in MIDI interface. If you are buying a separate MIDI interface, be sure that it is compatible with the model of Macintosh you are using. The iMac, G3, and G4 Macintosh computers use something called a USB, or Uniform Serial Bus, to communicate with external devices. Older Macintosh models that don't use USB require a different MIDI interface, which plugs into the Macintosh's serial port. Check with your local music store to be sure that you are purchasing the proper interface.

The interface cable connects to the back panel of the Macintosh. MIDI cables are then connected to the MIDI keyboard or MIDI instrument.

It is important to remember that MIDI itself does not make any sound. It merely transmits information about the performance. In order to hear the performance, you must connect the outputs from the MIDI keyboard to an amplifier and speaker or use headphones.

### Connecting a PC to MIDI

There are basically two options with Windows computers. A MIDI interface card can be purchased and installed into one of the computer's internal slots. The second, most common, and simplest way to connect MIDI is to use the PC's built-in sound card. All sound cards that are SoundBlaster AWE32, AWE64, SB32, or are compatible with these, come with built-in MIDI capability. All you need is a MIDI cable, which you can buy for about \$15. This cable connects to the game port on the computer's sound-card, which is usually located on the back panel of the central processing unit (referred to as the CPU). A game controller can also be used by plugging it to the MIDI cable.

Another option is to purchase a dedicated MIDI interface card that plugs into one of the expansion slots in the PC. This is not necessary except for older PCs that do not have a MIDI-compatible sound card. Several companies, including MusicQuest, Midiman, and Roland, make MIDI cards. The industry standard is the Roland MPU-401/AT. These cards reduce the processing requirements from the computer and result in minimal CPU load and great dependability.

There are also advantages to upgrading to a better quality sound card. Soundcards can be purchased for between \$100 and \$200. The basic soundcards are Creative Labs SoundBlaster cards, which currently offer several options including the AWE32, AWE64, or SB32. These cards include a MIDI interface and built-in MIDI sound synthesis. There are many other sound cards that offer better sound

quality than the SoundBlaster models, including the Roland RAP-10; Turtle Beach Monterrey, MultiSound, Pinnacle, or Tropez; AVM Apex; and Ensoniq Soundscape. These cards represent the low- and mid-level soundcard options. High-end digital audio cards will be addressed in chapter 7.

### Internal or External MIDI Output

MIDI information must be interpreted and converted to an audio signal. This can be done inside the MIDI keyboard. You may also use the built-in MIDI synthesis that is a part of all Macintosh and Windows computers. For Macintosh this is called QuickTime Musical Instruments, developed by Apple Computer. For Windows, the internal soundcard has built-in MIDI sound capabilities.

Usually, a MIDI keyboard will have better sound quality than the computer's built-in sound. However, if you are using an older MIDI keyboard model, the computer's built-in sound quality may be superior. If you want the sound output to come from the MIDI keyboard connect the audio outputs on the back of the keyboard to the amplifier and speakers or headphones.

If you want use the computer's built-in sounds, you can play back through the computer's built-in speakers or you can connect the sound card audio output to external speakers and/or headphones.

### Software

With a computer, software is required to record MIDI and digital audio. First select the software program and then the hardware to run it. There are many different types of software for music: notation software for printing, instructional software for learning musical concepts, and MIDI sequencing and digital audio software. There are programs for all levels of applications from amateur to professional. It is relatively easy to determine the target audience for a particular piece of software. It is usually reflected in the cost. Basic, entry-level programs can cost under \$150. Software for the professional recording studio can run between \$250 and \$1,000.

### MIDI Sequencing

If budget is a primary consideration, then MIDI sequencing can be the least expensive way to enter the world of digital recording. Most MIDI sequencing software also allows for recording digital audio tracks. MIDI sequencing can be accomplished using a keyboard workstation such as the Korg Triton or Kurzweil K2000 as described in chapter 2. However, a computer can also be used for MIDI sequencing.

If you intend to record MIDI, a MIDI keyboard is recommended for note entry and playback. At this stage there are essentially three components: a computer, MIDI keyboard, and MIDI-sequencing software.

### MIDI Sequencing Software

There are two types of MIDI sequencing software: programs that record only MIDI data and programs that record both MIDI and digital audio. The very basic MIDI sequencing software packages offer only MIDI sequencing without digital audio options. These packages are designed for the novice computer user, music hobbyist, or student. Some of the software titles in this area include Mastertracks Pro and FreeStyle. Each is available for Macintosh and Windows.

FreeStyle by Mark of the Unicorn (MOTU) for Macintosh and Windows is a MIDI sequencing program designed for the novice user. (The list price is \$199 as of this writing.) This program includes excellent music notation printing options. FreeStyle is designed for the person with little or no sequencing background. The screen display resembles a tape recorder and can be mastered quickly. If you are interested in recording MIDI and already have a MIDI instrument and interface, check out FreeStyle. A free demo version can be downloaded at from the company's Web site that is listed in the appendix.

Once FreeStyle is installed and a MIDI keyboard is connected, recording can begin. Separate tracks of music, called "takes" in FreeStyle, can be recorded. The tracks/takes feature allows the user to layer multiple parts.

FreeStyle is designed to be simple and easy to use. Just click on an instrument, select the desired sound, press Record, and then input the performance on the MIDI instrument. Several takes can be recorded for each sound or part and then played back.

One of the advantages of using a MIDI sequencer is that performance information can be translated into printed music notation. FreeStyle does an especially good job of transcribing music notation, and it is easy to play in the parts from the MIDI keyboard and then print them out.

Keep in mind that FreeStyle is not designed to be a notation program whose primary purpose is to print out scores and parts, although it does an excellent job printing lead sheets, melodies, and parts. There are several programs designed to be used for music notation, among them Finale, Sibelius, and Encore.

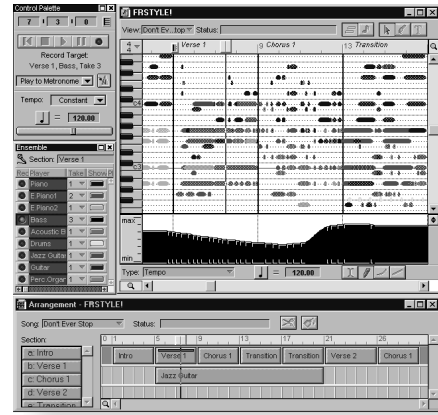


Figure 6.1. FreeStyle by MOTU



Figure 6.2. FreeStyle Takes



Figure 6.3. Notation Example from FreeStyle

## Learning to Sequence

There are several publications and other materials available to help you learn the art of sequencing. An excellent book on the topic is Paul Gilbreath's *Guide to MIDI Orchestration* (Music Works). The book is full of tips and suggestions for making musical-sounding sequences. Other products to assist the novice include Don Muro's book *The Art of Sequencing* (WB Publications). Muro's book is designed for the novice to intermediate user and provides a step-by-step method for entering a sequence using any software sequencer or integrated sequencer.

## Instant Arrangement Software

Some software packages can be thought of as specialized MIDI sequencing programs designed to create arrangements. Two packages that can be useful in creating MIDI sequences include Band-in-a-Box (available for Macintosh and Windows) by PG Music and Jammer (available for Windows only) by SoundTrek. Both programs offer a range of built-in capabilities that can assist in creating professional-sounding songs and arrangements. Band-in-a-Box has more built-in options but Jammer includes 256 tracks for MIDI sequencing. Band-in-a-Box version 9 can record a single track of digital audio.

### Band-in-a-Box

Band-in-a-Box is a powerful program which sells for under \$100. It comes with a variety of built-in pop, jazz, and rock styles. Within some styles the program automatically creates string and guitar parts. Band-in-a-Box also has the ability to notate and print a lead sheet.

To create a song using Band-in-a-Box, chords are typed in using the computer's typewriter keyboard. For example: C7, Cmin, and Caug, are entered into the appropriate measure.

Once the chord symbols are entered, the next step is to select a style, such as jazz, rock, bossa nova, or waltz. There are twenty-four basic styles in Band-in-a-Box and several hundred more styles from which to choose.

After entering the chords and selecting a style, click on the play button and Band-in-a-Box instantly creates an accompaniment including piano, bass, and drums. Once the chords are entered, a melody can be recorded using Band-in-a-Box's one track built-in sequencer.

Band-in-a-Box also has an automatic harmony function. After playing in a melody, select one of the two hundred harmony styles. The melody you entered will be instantly harmonized according to the selected style.

Band-in-a-Box can even create a solo in the style of many of the great jazz stars. Simply select the name of the style or artist, such as Miles Davis or John Coltrane, and Band-in-a-Box will create a solo in his or her style. Every time you press play, the solo will be slightly different.

Beginning in version 8 of Band-in-a-Box, it is possible to ask the program to create entire songs. A song can be composed by Band-in-a-Box in the style of your choice with intro, chords, melody, arrangement, and improvisations. These are all created by the program, different every time. You can actually create an original song in less than one second! Once the song is generated, the chords and melody became part of the regular Band-in-a-Box tracks and can be edited, modified, and printed. It is also possible to enter a chord progression, choose a melodic style, and ask Band-in-a-Box to create an original melody.

Band-in-a-Box also includes a printing function so that each of the various parts can be printed in music notation. You can print a copy of the bass part, melody, piano, or any other part generated by Band-in-a-Box. In fact, the notation printing option makes this an excellent program for creating lead sheets.

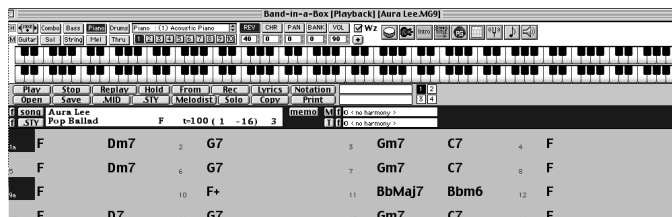


Figure 6.4. Band-in-a-Box with Chords

## Transferring to Other Programs

It is possible to create a song in Band-in-a-Box and then export it to another MIDI program, such as a MIDI sequencer, to add additional tracks. It is possible to share MIDI files with other programs by saving the file as a Standard MIDI File (see chapter 2). Choose Save As from the File menu and choose Standard MIDI file. Then open a MIDI sequencer program such as FreeStyle and open the Band-in-a-Box file. The parts can now be edited and other tracks added as needed.

## MIDI Input via Acoustic Instruments

In chapter 2, the concept of using alternate MIDI controllers was introduced. It is also possible to use a pitch-to-MIDI converter designed to transfer other signals into MIDI. The program AutoScore for Mac and Windows is an example of software designed to be used to convert acoustic sounds into MIDI data. The advantage of using a pitch-to-MIDI is that after the performance is converted to MIDI it can be transposed or printed out.

## Editor/Librarian Software

Electronic keyboards are capable of producing hundreds of different sounds. Each sound is created by specific settings. When you look at the front panel of an electronic instrument, it may have dozens of controllers and ways to manipulate a particular sound. One advantage of using digital electronic instruments is that the sounds can be altered to better suit specific needs. For example, a string sound, sometimes referred to as a patch, could be edited to remove vibrato or tremolo. This editing could be done using the instrument's front panel display. However, it is much easier to make edits to sounds by using a computer and software designed for this purpose called editor/librarian software. Here is how it works: you connect your MIDI instrument to a Macintosh or Windows computer via a MIDI interface. Having installed the editor/librarian software, you can then edit and store the custom sounds you want to use with your instruments. The librarian portion allows you to store, organize, and recall the sounds you've created and want to use with your MIDI instruments and playback devices. The editor portion of the program gives you control over the creation of new sounds. Editing can be done on the computer screen.

## Macintosh and Windows Editor/Librarian Software

Editor/librarian programs are available for Macintosh and Windows computers include Midi Quest by Sound Quest and Unisyn by Mark of the Unicorn. Midi Quest supports 360 different MIDI instruments and includes more than 55,000 patches and extensive video tutorials. The program allows the user to create, edit, and store thousands of sounds that can be used with different MIDI instruments and sound modules.

Unisyn by Mark of the Unicorn, is available for Macintosh and Windows computers and offers features

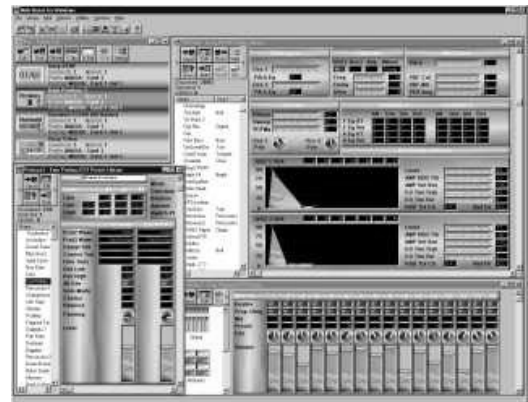


Figure 6.5. Midi Quest

similar to Midi Quest. You can modify a sound in Unisyn using graphic envelope controls and faders. It is also possible to generate entire banks of new sounds with a click of the mouse using blend, randomize, and copy/paste parameter features. Unisyn can store thousands of sounds and recall them instantly using database-style search criteria, such as “plucked electric bass” with “bright stereo flange.”

## Digital Signal Processing (DSP)

It is frequently desirable to record MIDI with digital audio. In other words, while you record MIDI tracks, you can plug in a microphone and record live vocals and/or instrumental parts. Thanks to digital signals processing, most MIDI sequencing software lets you do this.

As introduced in chapter 2, the term Digital Signal Processing, or DSP, is the act of sampling and editing a digital signal. In previous chapters, we discussed stand-alone hardware units that let you record digitally. Digital recording can also be accomplished using a Windows or Macintosh computer. As with MIDI sequencing, DSP has its own hardware and software considerations. Hardware consists of the Macintosh or Windows built-in computer hardware, plus additional equipment such as DSP plug-in cards and interfaces for greater flexibility and power. These cards will be introduced in chapters 7 and 8. Software is used to record and process digital signals. The class of software ranges from packages for the hobbyist to recording professional. Each of these areas will be dealt with in following chapters.

## Digital Audio Recording

A basic understanding of how computers deal with digital audio is necessary in order to make an informed decision about which digital audio recording system is best for you. Power Macintosh, G3, and G4 Macintosh models have built-in digital audio capabilities. In order to record digital audio on a Windows PC, you need a soundcard or audio card. An analog-to-digital converter is attached to the line-in or microphone in (mic in) jack, usually located on the back panel of the computer. The analog signal can be from any source, such as a microphone or electronic instrument. After the analog signal is converted to digital it is then stored on the computer’s hard drive. It can be manipulated by the software to edit, add effects, and mix. To get the information out of the computer, line-out jacks are used. These function as digital-to-analog converters, referred to as DAC. The line out or speaker out is sent to the amplifier or headphones.

There are two different outputs, one for MIDI and one for digital audio. The MIDI output comes from the audio outputs on the back of a MIDI instrument. The digital audio output comes from the computer’s line-out jacks. Both outputs must be connected to the mixer or amplifier.

It is also possible to use a more complex interface that will handle and route both MIDI and digital audio. This will be addressed in chapters 7 and 8.

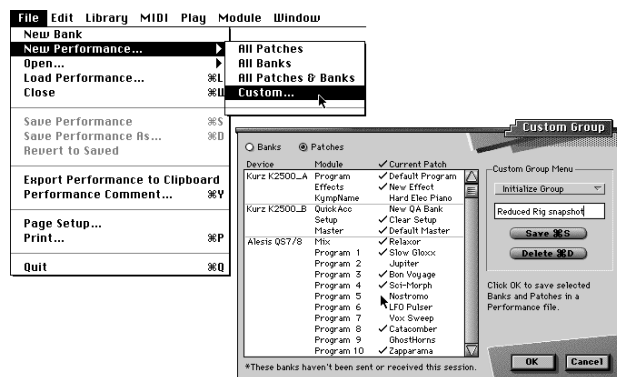


Figure 6.6. Unisyn Editor/Librarian

## MIDI/Digital Audio Software

So far, we have only considered software that is designed for MIDI sequencing. The next level of software allows for both MIDI sequencing and digital audio to be recorded together with the same program. As with most types of software, entry-level and high-end options are available. Entry-level MIDI/digital audio software utilizes the built-in capabilities of the Macintosh and Windows PC. High-end options require an additional DSP hardware device, called an audio card, which plugs inside the computer. This chapter will provide an overview of some entry-level software options. In chapters 7 and 8 we will deal with high-end MIDI and digital audio software.

## Entry-Level Windows MIDI/Digital Audio Sequencers

In entry-level software programs, there is a limit to the number of digital audio tracks that can be used. Some programs limit the number of tracks to eight or sixteen. Also, the built-in effects are limited. The entry-level programs are designed for the home user, music hobbyist, student, or for those on a very tight budget.

For Windows computers, there are many MIDI/digital audio programs from which to choose. Entry-level software typically costs under \$100. The trade-off is that the software is not designed for high-end recording, mixing, and editing. The programs in this range do include some complex features, which until just a few years ago were found only on top-of-the-line programs.

Home Studio by Cakewalk, Power Tracks Pro Audio by PG Music, Cubasis AV by Steinberg, and MicroLogic by Emagic, all with list prices under \$150, are designed to be used on a Windows PC (with a minimum of a 486 processor). These products can record MIDI and multiple tracks of digital audio; they also have a music printing option. (Of course, you'll need a printer to print out parts and scores.)

Of these, Power Tracks Pro Audio (Windows only) by PGMusic is the cheapest way to get into the world of MIDI/digital audio. This software lists for an amazing \$29. Don't let the price fool you! There are many high-end features that make this a very attractive entry-level program.

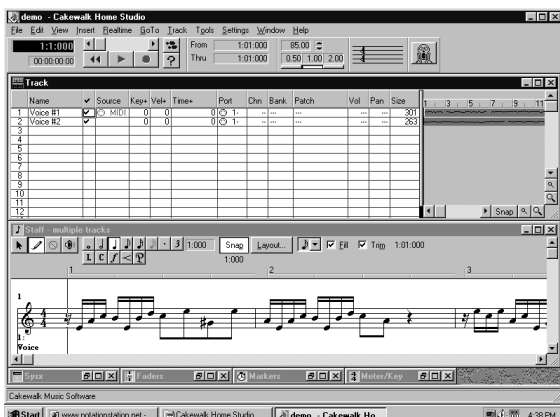


Figure 6.7. Cakewalk Home Studio

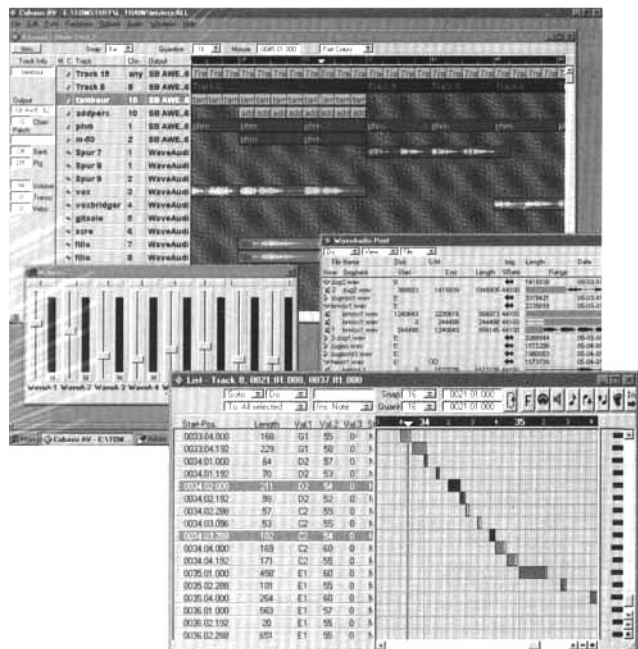


Figure 6.8. Steinberg's Cubasis

Home Studio by Cakewalk, Cubasis AV by Steinberg, and MicroLogic by Emagic are all entry-level programs, but each is part of a family of software with both low-end and high-end versions. Cakewalk, the makers of Home Studio, also produces a Pro Audio version. Steinberg, which publishes Cubasis VST PC, offers two products for the high-end user: Cubase VST and Cubase VST/24. If you find you want to upgrade to the more powerful product, the transition will be relatively easy because you will already be familiar with the basic operation and feel of the software.

With all of the above-mentioned programs, there is no additional hardware required; the built-in soundcard in the PC can be used to record and play back digital audio.

### Entry-Level Macintosh MIDI/Digital Audio Software

The Macintosh does not have as many entry-level MIDI/digital audio software options as Windows. Under the \$150 list price are Emagic's Micrologic and Opcode's Vision DSP. Both programs offer integrated MIDI and digital audio. They can record digital audio using Sound Manager, Macintosh's built-in digital audio software. Of the two entry-level software options, MicroLogic is the better choice, as Opcode, maker of Vision DSP, is currently not upgrading.

### Which Program to Buy?

All of the programs mentioned in this chapter are competitively priced, so cost is not a major factor. One way to review them is to go to the program's Web site and download a demo version. A comprehensive list of company Web sites is listed in appendix A. Spend some time using each program to see if it suits your needs. Also, contact people you know who are using digital audio software and ask for their opinions. If you use the same software as your friends or coworkers, you can turn to them for help and assistance. If you think you may be upgrading to a high-end program in the future you may want to go with one of the programs supported by a line of software such as Cubase, Home Studio, and MicroLogic.

### Summary

This chapter focused on some of the entry-level options. These programs are designed for the home user, music hobbyist, and student. The mid-level to high-end digital audio software is covered in chapters 7 and 8.

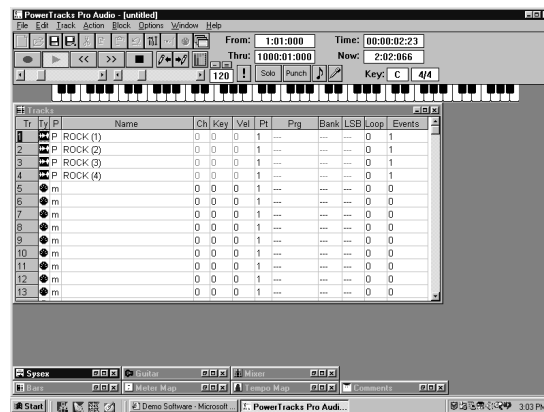


Figure 6.9. PGMusic's Powertracks Pro

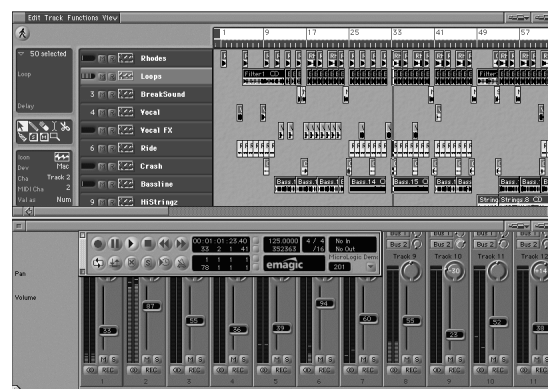


Figure 6.10. Emagic's MicroLogic