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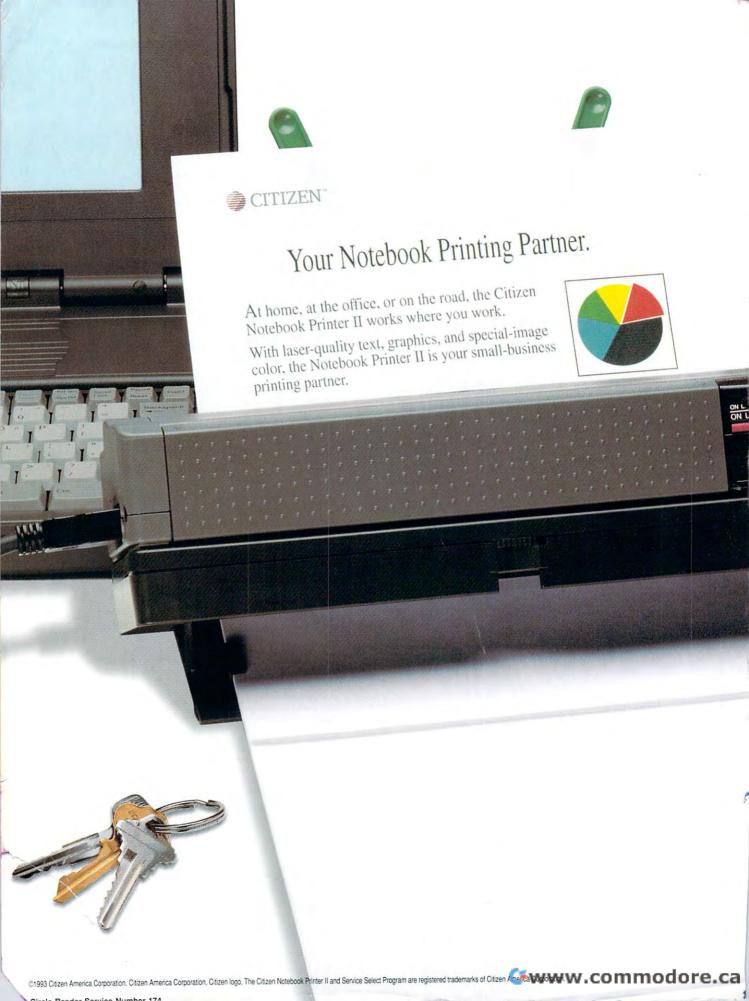
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COMPUTE

VOLUME 15, NO. 11, ISSUE 158

NOVEMBER 1993

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Computer illustrations for the new Multimedia PC section by Rob Schuster.

New in this issue of COMPUTE is the first installment of a regular special section on multimedia, called Multimedia PC. To get started with our new Multimedia PC section, first turn to "Fast Forward" on page 77 for a look at the hot-off-the-press MPC Level 2 standard and an explanation of what it means to you. Then flip over to page 78 for our feature, "Open Windows to Sound," and get the scoop on just what's involved in adding sonic splendor to Windows. Next, take a look at "New Multimedia Products" on page 86 for info on leading-edge multimedia hardware and software. And finally, turn to page 100 for "Multimedia Spotlight," which tells you how to turn your multimedia PC into a Karaoke machine. So buckle your seat belts, turn to the Multimedia PC section, and crank up the volume on your PC.

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Clifton Karnes

OMPUTE's been a pioneer in multimedia since day one. In fact, way back in July 1991, we started the first monthly computer magazine column we know of devoted to multimedia. Since then we've regularly covered multimedia in features. Test Labs, and reviews.

This month marks another milestone in our multimedia coverage. Starting with this issue, we're including a special section called Multimedia PC in each issue. In this section. you'll find "Fast Forward." a column written by COM-PUTE's multimedia expert. David English: a feature: a new-products section; and an in-depth review we're calling "Multimedia Spotlight."

Each Multimedia PC section will kick off with the "Fast

networking are in our future and yours.

Multimedia and



Forward" column, which will take a hard look at what's new and what's just around the corner in multimedia technology. If you want to get the scoop on the leading edge, look here. In this issue, David's column focuses on the new MPC Level 2 specification and why it's the way to go. Don't buy a new multimedia PC or upgrade kit until you've read about the latest standard.

cover everything from handson help to buyer's guides. This issue's feature. "Open Windows to Sound," tells you what to look for in a sound card and speakers, with details about the best equipment, including both MIDI and highend studio applications.

"New Multimedia Products" will cover the latest available hardware and software—the stuff you'll probably have read about a few months before in "Fast Forward." For details about what's new and noteworthy, turn here.

The last article in our multimedia section will be "Multimedia Spotlight," a review of the coolest MPC product we've seen for the month. The first "Spotlight" takes a look at PC Karaoke. If you sing "New York, New York" in the shower but dream of bigger things, your multimedia PC may help you.

This is just the beginning. We have lots of exciting things planned. Taking just one peek ahead, if there's a multimedia aficionado on your gift list this year, don't miss our next issue's feature on great multimedia gift ideas.

Multimedia isn't the only new thing happening this month at COMPUTE. Last month, I talked a little about COMPUTE going live on America Online. I couldn't say too much about our forum then because lots of details were still up in the air; now, everything's finalized, working, and pretty nifty.

Before talking about COM-PUTE's AOL edition, it might be worthwhile to touch a little on COMPUTE's history. As many of you know, COM-PUTE's been publishing for 15 years, giving home and business PC users all the latest information about hardware, as well as productivity, education, and entertainment software, in a form that's easy to understand and easy to use.

Our online edition of COM-PUTE will offer some of the best from our regular edition. including hints and tips about everything from DOS batch files to database programming, the latest scoops on hot Windows apps and cool multimedia titles, and indepth reviews and head-tohead Test Labs.

You can get to the COM-PUTE forum on AOL with the keyword COMPUTE. When you arrive, you'll see the COM-PUTE logo in a window with several buttons and a list box filled with places to visit. The two big buttons in the upper right are for what's new in the forum. These buttons will change every few days, so check them out regularly. Other buttons let vou move quickly to popular areas in the forum: Message Boards, Tips & Tools, Software, and Text Search.

The list box contains the topics for our online articles: Windows Workshop, News & Notes, Windows Workshop, Multimedia PC, Games, Getting Started With, Test Lab. COMPUTE Ordering, and

Computer Lingo.

Perhaps the most important section in the COMPUTE forum hosts our message boards. We want COMPUTE Online to be more that just an online edition of the magazine. We want it to be an interactive magazine, too. With the message boards, you'll be able to talk with COM-PUTE's editors. You can ask us and your fellow online travelers questions directly, and generally make yourself more a part of the magazine. We're looking forward to more contact with you; I hope you'll take advantage of this opportunity to let us hear what's on your mind. So link up, log on, and leave us a note.

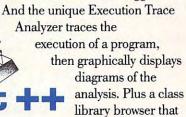
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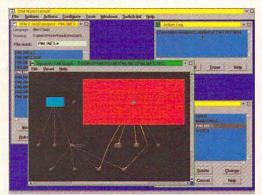
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starts here.



BUILT-IN WINDOW

hatrack. You can break down a door with it. It even makes a fair percussion instrument. Oh, and it comes with a brain inside. You can use your brain to make work simpler, or you can ignore it and use your head for a hatrack. It's the same way with Windows. Too many of us are using Windows as if it were only a brainless task switcher, good for keeping those mysterious Windows programs under some kind of control, but otherwise a memory-wasting nuisance.

Windows has so much more to offer than a shell and a task switcher, yet many of us never venture into that no man's land of advanced Windows features. Fear not! If you step off the beaten path, you'll discover that Windows has features that will make your work easier and more intuitive, your output more attractive, and your computer an even abler assistant than it was before.

This article will talk about TrueType, the Recorder, the Clipboard, and OLE and DDE. You'll find out what they are and how to use them.

Řemember, though, that not all Windows applications use all of these features. Therefore, before trying any of the options discussed here, you should check your applications' documentation to make sure they support these advanced Windows features. The examples we'll use involve Windows Paintbrush and Windows Write, since everyone who has Windows has these applications. Microsoft was kind enough to make sure that both of these so-called accessories take full advantage of the advanced features.

Font of Wisdom

TrueType was developed in a cooperative effort between Microsoft and Apple Computer to establish a font technology that could be used across computer platforms (read that could be used on the Mac and the PC) and that wasn't dependent on PostScript, which is a product of Adobe. TrueType is part of a larger page description language called TrueImage, which is available in place of the PostScript language on many "PostScript-compatible" printers. The advantage of TrueType fonts over PostScript fonts for the casual user is that, without additional software (such as FaceLift or Adobe Type Manager), TrueType fonts can be printed on any printer that has a Windows dri-

ver, and they appear onscreen pretty much as they will appear on the page. This provides high-quality outline fonts for use with PCL laser printers (also known as Hewlett-Packard-compatible printers) as well as ink-jet printers, thermal transfer printers, and even dot-matrix printers and fax machines.

There's nothing new to learn about using TrueType fonts. All you have to do is make sure they're installed and active under Windows. To do this, open the Main program group, double-click on Control Panel, and then double-click on Fonts. A dialog box will open up, and one of the buttons on the right side of the box should be marked TrueType. Click on that button, and you'll see a dialog box with two options: Enable TrueType Fonts and Show Only TrueType Fonts in Applications. Make sure the check box next to Enable TrueType Fonts is checked. The available fonts will appear in the font lists of programs that support TrueType (which includes most programs released since Windows 3.1 appeared on the market).

The TrueType fonts are attractive, well designed, and easy to use, but their greatest effect has been in the area of marketing. Before TrueType, purchasing a font meant laying out major bucks. A single font could cost \$100 or more, and people who found good-looking fonts for as little as \$20 or \$30 considered themselves lucky.

Since the appearance of TrueType, the cost of fonts has diminished to the point that you can purchase professionally designed fonts for as little as \$2 apiece in packages. Many drawing programs are packed with dozens of free fonts as a premium (CorelDRAW! 4.0 alone was shipped with 750 TrueType fonts in its CD-ROM version), and you can find dozens of excellent fonts on bulletin boards and online services for the cost of downloading them (CorelDRAW! is the major reason for this; its font design capabilities are awesome).

Bear in mind that TrueType has not yet made its way into professional circles. Many typesetters require Adobe PostScript fonts and cannot yet use TrueType fonts. If you're preparing something for typesetting, be sure to find out from your typesetter what kinds of fonts to use before you start laying out your publication. Otherwise, you might be in for an unpleasant surprise—and a lot of extra work.

By Robert Bixby

IS POWER TOOLS



An alphabet soup of extraordinary features comes packaged with Windows.

Instant Replay

Windows' Recorder is a much-maligned macro facility. Its shortcomings were among the main reasons for Hewlett-Packard's NewWave product, which features prominent among its advantages a fully scripted macro language. The Recorder may be limited, but within its small domain, it's very powerful.

The key to using the Recorder with the mouse is that you must settle on specific positions for all the objects on your Windows desktop. The reason for this is that the Recorder understands only keypresses, mouse clicks, and mickeys. What's a mickey? It's a unit of measure for mouse movement across your desktop. The implications of this are that when you record a mouse click at a given location on the desktop, the Recorder script will remember only the click and the location of the mouse pointer. If you move the icon that was in that position when you clicked or place another icon on top of it, the Recorder macro will be useless (and potentially dangerous).

Therefore, the first step in successful Recorder use is either to construct a comfortable arrangement of items on your desktop and keep the items in that arrangement as long as you use your library of Recorder macros or to record only keypresses (this is one of the options as you begin recording a macro). Veteran Recorder users recommend recording keypresses because they're completely independent of arrangement of objects on the screen and they're much less ambiguous.

To use the Recorder, double-click on its icon in the Accessories program group. The Recorder window will appear. Pull down the Macro menu and select Record. The options in this dialog box allow you to record mouse movement and clicks, ignore mouse (record keyboard entry only), or to record everything (mouse and keyboard). You can select a key combination to assign the macro to, such as Ctrl-Z. You can tell the macro to play fast or at the same speed it was recorded, and you can make the mouse movements relative to the full screen or the window.

You can't edit a macro, but you can call another macro within a macro (to do this, you must have Enable Shortcut Keys checked in the Record dialog box; to run another macro within a macro, just press the shortcut key for that macro while recording a macro).

Let's try recording a macro. The Recorder works with any application, so let's use Write for the example.

Start up Write.

Bring the Program Manager to the

foreground and double-click on the Recorder icon in the Accessories program group.

Pull down the Macro menu and select Record.

In the resulting dialog box, type z in the Shortcut Key text box and select Everything in the Record Mouse list box. Make sure that Playback To is set to Same Application, that Playback Speed is set to Fast, that the Continuous Loop check box is not checked, and that the Enable Shortcut Keys check box is checked.

Click on Start to begin recording. The Recorder will be minimized.

Type some text in Write. A good use for a macro is to record your letterhead information so you don't have to type it out each time you write a letter. Enter your name, address, and telephone number; drag through all the text; and press Alt-P, C to center it on the page. That's enough for your first macro. Let's turn off the Recorder.

Double-click on the minimized Recorder icon. Macro recording will be suspended, and a dialog box will open, giving you the options of Save Macro, Cancel Recording, and Resume Recording. If you want, you can now take other actions that will not be recorded and then resume recording at a later time by just selecting Resume Recording. However, at this time we will save the macro for later use.

Click on Save Macro. The macro will not be saved to its own file but rather to a collection of macros. You can have as many collections of macros as you want, and each collection of macros can contain dozens of individual commands.

To save your current collection of recorded macros, pull down the File menu in the Recorder dialog box and select Save. The familiar Save dialog box will open, and you can save your macro collection with any name you choose, although the default extension for recorded macro collections is REC.

You can't edit a recorded macro (you have to rerecord the macro from beginning to end), but you can change the properties of a macro by clicking on the macro in the Recorder dialog box, pulling down the Macro menu, and selecting Properties.

Since you can't edit macros, a good strategy is to atomize them. Break a single task into several short tasks, giving each of these tasks its own shortcut key combination. Then, when it comes time to put all the short macros together into a larger macro, record a macro in which all you do is press the shortcut key combinations for the shorter macros. That way, if some aspect of your macro changes,

you need rerecord only the one or two parts of your macro that have changed, not the whole thing. Recording a long, detailed macro can be an exercise in frustration. Each time you make some small mistake, you'll have to start over again. By breaking your macro down, you can deal with it in manageable chunks.

Cutting and Pasting

The Clipboard is hardly an advanced feature. It's been around since the very beginning in Windows, and most people have used it, whether they were aware of it or not. If you cut or copy something from a document and then paste it back into that or another document, you've used the Clipboard. But there are more ways to use it. For example, did you know that Windows has a built-in screen capture facility? Anytime you have something on the screen that you want to capture for posterity, all you have to do is press your Print Screen key. The entire screen will instantly be placed on the Clipboard. From there, you can save the image to disk, or you can paste it into any application that can handle a bitmap image. The only drawback of saving the Clipboard image is that you can save it only in CLP formatthe native format of the Clipboard. There are utilities (FreezeFrame by Delta Point, for example) that can convert the Clipboard file to a BMP or other bitmapped format. If you don't want to save the entire screen, press Alt-Print Screen to save an image of the active window to the Clipboard.

If you've captured a screen image to the Clipboard, you can paste it into Windows Paintbrush. Once the image is in Paintbrush, you can save it as a BMP or PCX graphic. You may have tried pasting a full-screen image into Paintbrush and been frustrated because pasting the full-screen image results in a truncated image only as large as the window in Paintbrush. There's a technique for getting the whole image in (and thanks to Clifton Karnes's 101 Essential Windows Tips for this solution): Zoom out before pasting. That way, you can paste the whole image into the reduced-size screen. Pull down the View menu within Paintbrush and select Zoom Out. Pull down the Edit menu and select Paste. The Paintbrush window will appear to be filled with a grid. Pull down the Edit menu and select Paste again. The full-screen image will appear. Pull down the View menu and select Zoom In. You can scroll all over the screen and edit it; then you can save the result to disk as a BMP or PCX file.

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a screen that's typical of your Windows working desktop, paste it into Paintbrush, save it as a BMP file, and then use that file as your Windows wallpaper. That way, you'll look busy even when you don't have a single window open on your screen.

To see what's on the Clipboard and to save or load an image, you need to use the Clipboard Viewer, which is one of the applications in the Main program group. Double-click on the Clipboard Viewer icon, and you'll see the current contents of the Clipboard. Just for fun, when the Clipboard Viewer is visible, press Print Screen and then Alt-Print Screen to see what happens to the contents of the Clipboard.

You can use the Clipboard to store information from DOS applications running under Windows. In 386 enhanced mode, you can drag the mouse pointer through a DOS application to select data to be transferred to the Clipboard. In real or standard mode, you can transfer only an entire screenful of data to the Clipboard from the DOS application.

If you're running a DOS application full screen under Windows and you press Alt-Print Screen, you'll save the entire DOS screen to the Clipboard as text. This can come in very handy.

If you're running the DOS application in a window (press Alt-space bar to switch between running the application full screen and running the application in a window), you'll see a Control menu in the upper left corner of the window. This is similar to the Control menu in Windows applications, but it has a couple of enhancements. First, it allows you to select the size of the type in the window (and therefore the size of the window itself) under Fonts. Second, it gives you an Edit option.

Pull down the Control menu and select Edit; then select Mark from the resulting submenu. Drag the mouse through some text in the DOS application to select it. Then press Enter, and the data you've selected will be copied to the Clipboard. If there is data in the Clipboard, you can paste it into your DOS application. This facility brings many of the advantages of Windows to DOS.

The only thing you can't do is make OLE or DDE links with a DOS application (not yet, anyway) or cut data from your DOS application.

Another use for the Clipboard, as you'll read shortly, is as a bridge to establish DDE and OLE links.

Linking Documents

OLE is the latest linking option in Windows. The acronym (usually pronounced like the Spanish interjection olé but sometimes spelled out, O-L-E) stands for Object Linking and Embedding. OLE goes beyond its precursors, DDE and pasting from the Clipboard, in that instead of simply pasting a value in a document, it pastes the entire application in the document. That's a lot to comprehend, so take a moment to consider the possibility of having all of Quattro Pro as part of an Ami Pro document, or all of Paintbrush as part of a Write document. Now that you've considered it, let's do it.

Start up Paintbrush and Write. In Paintbrush, draw an image. It doesn't have to be anything fancy-just a rectangle or two of different colors would

Save your drawing (saving the file containing the linked object is crucial to the process).

Drag a selection rectangle that encloses the drawing you just created. Pull down the Edit menu in Paintbrush and select Copy to place a copy of the image on the Clipboard.

Click on Write. Pull down the Edit menu and select Paste Special and



then Paintbrush Picture Object. The contents of the Clipboard will be pasted into your Write document. But there's more.

Close down Paintbrush so that all you have running is Write with the linked object in it.

Double-click on the linked object. If all goes well, Paintbrush should have started up, with the linked object in its window, ready for editing.

How could you use a property like that? Imagine that you're designing a letterhead. Part of the design is the logo for your company. The logo committee is driving you nuts by changing the logo constantly. By having the logo and the drawing program inside the letterhead itself, you can save time when changes come through by making them right in the document itself instead of making them in some separate document and then going through the steps to update the changes in the final document.

DDE is an earlier version of OLE. It's not as well supported as it used to be and may be fading from use, but enough software still uses DDE that it's worth mentioning.

Although it sounds like the latest insecticide or mind-altering chemical, DDE was actually the first serious advance associated with Windows. It appeared with Windows/286 and Windows/386, and it allowed specially designed Windows applications to communicate with each other.

DDE stands for Dynamic Data Exchange. When it's used, it allows you to move information from one application into a document created by another application. Sounds like cutting and pasting, doesn't it? Well, it goes a step beyond that. The information pasted into the new document is permanently linked to its origins. When data in the original application changes, the document into which it has been pasted is also updated. Is that clear? Maybe an example will help.

Suppose you're preparing a 50-page annual report. Deadlines are tight, and the data in the spreadsheet keeps changing as information is being fed in from your many branch offices around the world. How will you know that the final information is in place when the document is sent to the typesetters? If you guess DDE, give yourself a star. When you link the bottom line in your spreadsheet to the gross earnings line in your text document, you'll know that when the final figures are in place, they'll also be completely up-to-date in your annual report.

Let's use DDE to see how it works. Once again, we'll use Windows Paintbrush and Windows Write to demonstrate the principles, but you could use most DDE-compliant software to create an example of your own.

Start up Windows Paintbrush. Draw a circle of one color and then a rectangle of another color. Save the painting to disk.

Drag a selection rectangle that encloses the entire drawing and select Copy from the File menu. The drawing is now on the Clipboard.

Start up Windows Write. Pull down the Edit menu and select Paste Link. Now when there are changes in the graphic in Paintbrush, they will be instantly reflected in the document in Write.

Use Your Head

Now that you know a little about what can happen in the background, you should never mistake Windows for a mere task switcher again. Windows is capable of even more now—with its multimedia add-ons that can make use of animation and sound.

Windows has become a deep enough product that it will repay you handsomely for any time you spend learning how the pieces fit together. Remember: Use your head for something besides a hatrack—and put Windows to work every chance you get.

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Edited by Mike Hudnall Reviews by Richard C. Leinecker

oes your present computer setup allow you to be as productive as you can be? With each new generation of hardware and software, this is a question you've got to ask if you want to maintain a competitive edge. The arrival of stand-alone fax machines provided a tremendous productivity boost. Then computer fax cards entered the work scene, offering ease of use. even more convenience, and even greater productivity benefits. Now these cards are faster. less expensive, and more capable than ever; and a number of companies are ready to take advantage of this market by offering fax packages, many of which have OCR capabilities.

The benefits of computer faxing were clear to me from the first day I used one of these packages. For months I wrote messages in Microsoft Word, printed them on my LaserJet, faxed them from the machine, and then threw them in the garbage. After my garbage can filled up enough times. after my LaserJet needed a new toner cartridge, and after I forgot to resend enough faxes after busy signals, I looked for a better way. The complete solution to all of these problems was my fax board and fax software. This month's Test Lab covers ten of

BILDEN PART BELLEVE DELLEVE DE

the best Windows-based fax software packages on the market.

Using this technology begins the transition to a paperless office. Instead of printing to my LaserJet from Word, I now print to the fax board. I select the fax board from the Windows printer setup. Then, every time I print, the document routes to the fax board. No more full garbage cans and depleted toner cartridges from faxing!

Getting busy fax machines doesn't bother me. I simply schedule outgoing faxes and let the software worry about trying again later. No more irate phone calls asking where the fax is!

These fax packages do a lot more than I need. But some of you are probably looking for just such capabilities. You can set up software to send documents on a regular basis. Let's say, for example, that you have a sales staff that needs current inventory and pricing information daily. Every day at 5:00 a.m., your fax software can dial them all with the correct information based on a file on your hard drive.

If you have several people onsite who all get faxes, you'll find this feature helpful: Fax software gives you the ability to set up separate incoming boxes. This makes it possible for each person to print out his or her own faxes. That's good because you don't have to worry about a fax's going to the wrong desk and lying there for weeks. Another advantage is the security that's provided to each person. Sensitive faxes aren't open to unwanted eyes.

If you do have something on paper that you need to fax, you'll need a scanner, too. Most of the packages easily import from scanners. Here again, the fax-card-

BitFax Easy-\$89

BIT SOFTWARE 47987 Fremont Blvd. Fremont, CA 94538 (510) 490-2928 and-software solution is better than the old way. Once you have a document scanned in, you can load it into your favorite paint program or work with it using the fax software's built-in graphics tools. If necessary, you can use optical character recognition to convert a fax to editable text.

I still have my dedicated fax machine. For the types of incoming faxes I get, it's ideal. But for my outgoing faxes, you won't catch me using it. Once you take a close look at the packages in this month's Test Lab, you may decide that they can solve many of your communication problems, too.

RICHARD C. LEINECKER

BITFAX EASY

Many of you grew up on BitCom, the terminal program that at one time seemed to come with most of the modems sold. The same folks who developed BitCom applied their telecommunications skills to the next logical step—fax software. If you're accustomed to BitCom, you might learn to use BitFax without much difficulty. It occupies a middle point between older DOS-based software and hardcore Windows technology.

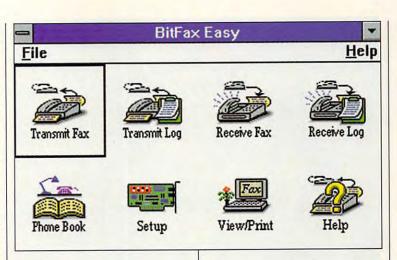
I know people who won't touch Windows software unless it follows every standard Windows interface technique in existence. I also know people who're used to DOS software and need the chance to ease into Windows. Bit-Fax bridges the two extremes. It doesn't completely follow the Windows interface standards, using a smaller-than-usual screen and 2-D, rather than 3-D, buttons, for example. On the other hand, the program doesn't stay strictly with old DOS-style techniques. This is neither good nor bad; just be sure that this is what you want before you consider BitFax.

This version of BitFax includes an advanced OCR technology called Caere AnyFax technology. In the three programs I tested that use it, this OCR technology produced admirable results. The scores for these programs were about as good as the scores for any others. In my benchmark test, BitFax scored 77 percent. That's outstanding, especially considering that the benchmark test has some built-in procedures that lower the scores. You won't have any trouble using the files it saves as long as you're willing to spend a few minutes editing the few characters that go awry.

BitFax's fax viewer didn't have many features, but of the viewers covered in this roundup, this one was probably the easiest to use. Buttons and pull-down menus let you easily rotate, scale, and page through the fax document. For most people, this is enough—and the viewer is truly easy to use.

With most of the fax packages, you have to identify the card you're using. With BitFax, I didn't have to. Some of the features I looked for were missing from this package. I couldn't find a way for incoming faxes to automatically print, nor could I find any scanner support. Also, there didn't appear to be any way to import and export phone book lists—a capability you'd really miss if you already have your phone numbers and addresses in electronic





format. However, even these omissions don't prevent BitFax from being a good choice for a number of people. And this latest version of the software installs more easily than the previous version, has improved documentation, and now comes with BitCom, a terminal program.

If you want software that sends faxes, receives faxes, and does OCR conversion, and if you don't need your fax software to do anything else, this could be a good choice for you. Particularly if you still feel more comfortable with DOS-based software, give BitFax a look.

Circle Reader Service Number 371

DATAFAX 4.01

This is no ordinary fax software. The designers at Trio made sure DataFAX went beyond other fax software by including extras that most people don't even think of. Besides working on my standalone system, it's network ready. Cover pages can be converted to

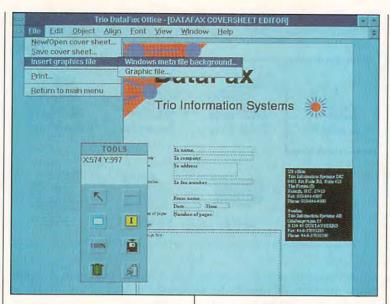
DataFAX 4.01—\$129

TRIO INFORMATION SYSTEMS 8601 Six Forks Rd., Ste. 615 Raleigh, NC 27615 (800) 880-4400 (919) 846-4990 28 different languages. A slightly different fax protocol needed when communicating with German fax machines can be turned on. And the OCR conversion process exports to a number of popular word processor formats.

All of the features you'd expect are there. You get background sending and receiving, OCR conversion, graphical editing tools, and scheduled transmissions. They're all admirably implemented; just click on a button or menu selection. DataFAX uses more buttons with icons than the other fax software. Although it took me a bit longer to learn what each one represented, once I did, the interface was very easy to use.

In examining DataFAX, I received the impression that the designers didn't look at other fax software during the design process. They seemed to start from scratch as they created their idea of the perfect fax software.

During the installation, as DataFAX copies each file to the hard drive, a message tells you exactly what the file does. I've never seen an install program do that, but it sure was a nice change. Also, that the software which runs on my system is network ready distinguishes this product from other fax packages. Most companies charge plenty for their network versions. The international sup-



port, something else not found in the other fax software, may find favor with you if you do much overseas faxing. Sending a cover sheet to Paris with French titles is pretty impressive.

Here's another feature you might like. DataFAX has the regular front-end program like all the others, but there's a special smaller version called Captive that can be loaded and always stays on the screen as a small window, ready to be called upon when needed. Clicking on the button activates it and gives you several other choices that let you do quick operations such as sending a fax note or capturing part of the screen to fax. You can even drag files from the File Manager to it, and it will send them as faxes!

The OCR conversion of faxes to text worked adequately. The nicest part was the ability to save the files in ASCII, Excel, Word, Lotus, WordPerfect, and Ami Pro formats.

Changing program configuration is easy. Menu entries take you right to dialog boxes that let you change any part of the program's setup. That's important because it can be hard to match the setup to your fax/data modem card the first time. For most of the fax software, I needed at least two or three tries. You'll be glad you can change the program configuration if things don't work the first time around.

DataFAX is a fine piece of software. It performed well for me on a stand-alone PC. If you need network capabilities or do a lot of international faxing, that might tip the scales for you in the direction of DataFAX.

Circle Reader Service Number 372

DELRINA WINFAX PRO 3.0

After spending time with Delrina WinFax Pro, I could just imagine the planners and developers sitting around thinking about what they could possibly include in this latest version so that it would top the previous version. The resulting package, if not the absolute best, is pretty close. During

Delrina WinFax Pro 3.0-\$129

DELRINA 6830 Via del Oro, Ste. 240 San Jose, CA 95119 (800) 268-6082 the testing, I opened the manual for a total of 2 minutes. After that, I read for 20 minutes to make an assessment for my rating. When something this complex doesn't need a manual, it says a lot about the software.

All of the standard features are there: background sending and receiving, scheduled transmissions to individuals or groups from one of the phone lists, OCR conversion to text files, and graphical editing tools. These features deserve more than casual mention, because they're the result of years of hard work. But in this day and age, we expect outstanding software—so I'll go on to mention the exceptional points.

WinFax Pro uses a third-party technology called Caere AnyFax technology. The three programs in our roundup that use it performed OCR conversion about as well as any of the other fax programs. Bear in mind that the comparison program I used had some built-in procedures that tend to lower the score from 100 percent, even for perfectly matched files. Yet WinFax Pro came up with a 68-percent rate of conversion, more than adequate to convert faxes to usable text files.

If you'd rather skip the frills, the next part won't interest you. But most of us will appreciate that Win-



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Fax Pro's cover sheets transform boring and easily lost faxes into experiences that people can't ignore. I counted 105 different cover sheets, all customizable. The next time I can't get results from some company's tech support. I'm going to send the cover sheet with Shakespeare saying "It would be a tragedy if the following went unread." And for collecting past due invoices, I'll use the one with a guy on a ledge saying "We're getting desperate! Please drop us a check!" In all seriousness, cover sheets like these aet results.

Another feature I liked was the ability to show thumbnails of all pages of a document. This can be a great help if you want to make sure your presentation has the right overall effect.

Most fax software defaults to automatic answer and reception. WinFax Pro is different. When it's installed, it doesn't automatically answer calls. This small touch might seem insignificant, but wait until your phone line is doubling as a fax and you lose several calls because a caller gets a carrier signal. All of the programs can turn automatic answering off. WinFax Pro's choice of defaults demonstrates a real understand-

File Edit View Insert Format Tools Table Window Pages 5-6 WinFax PRO Send Fax To: Ryan Lou Phonebook >> 1 Fax - 1 408 363 2340 Recipient List Add to List Ryan, Lou Now Remove Schedule.. Make Group... Cover Page Attachments ✓ Send V Add Refreshing Idea Options >> Send Cancel Use Prefix 9 Subject ✓ Use Credit Card Resolution : Fine Preview/Annotate Secure Send. Delete Pages After Send

ing of how the software is used.

The install program does its best to identify your fax/data modem board and its COM port. For mine, it guessed Class 1, but then I couldn't send without transmission errors on the remote end. I had to reinstall the software to make the change. In the next version of WinFax Pro, I'd like to see the ability to make such a change without reinstalling the software.

As for background operations,

I noticed only slight hiccups. There weren't any of the delays I experienced with many of the other packages. I had no trouble running other applications while Win-Fax Pro was in operation.

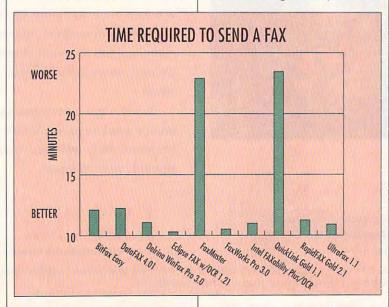
When I evaluate software, usually there are dozens of features I'd like to see added. Not so with WinFax Pro. If you're looking for power in a fax program, this is definitely one to consider.

Circle Reader Service Number 373

ECLIPSE FAX WITH OCR 1.21

Eclipse FAX with OCR 1.21 takes a straightforward approach to faxing. If you aren't interested in a lot of fancy buttons and cute touches, this package could be the one you're looking for. While the developers didn't waste effort on frills, neither did they skip any important features. Everything you need to do your faxing is included.

The package sends and receives faxes manually or in the background, and it is also capable of scheduled transmissions. It lets you keep multiple phone books, use your scanner for input,



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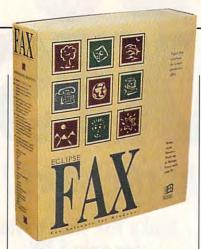
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and view and edit faxes. I found the program's well-planned features clear and easy to use.

I frequently use faxes to contact people who haven't answered voice mail. All I need to do is to write them a note of several lines, letting them know what I need. Even the most die-hard voice-mail avoiders, it seems, respond to a fax. Eclipse FAX's Quick Note feature takes you through the simple process of selecting a name from your phone list with a double click, then typing a short note. This is consistent with the package's simple approach. Even with several other software packages installed on my computer, I came back to Eclipse FAX when I needed to send a one- or two-line fax.

Another handy Eclipse FAX feature is its ability to index a collection of faxes. With this feature, browsing or searching through your faxes is a snap. To find a particular fax, just enter a keyword that matches a keyword you typed in when the document was saved. The program also facilitates searches by offering a variety of ways of sorting information.

Eclipse FAX occasionally takes control of Windows for several seconds, most notably in the period of 15–20 seconds when it first connects to a remote fax. During transmission, there are also periods of 2–3 seconds between pages when the program takes control of Windows. It's easy to start clicking the mouse and pressing keys during these periods, but that can be trouble. Each

Eclipse FAX with OCR 1.21-\$129

PHOENIX TECHNOLOGIES Eclipse Division 846 University Ave. Norwood, MA 02062 (800) 452-0120

time you click or press, Windows remembers; and once the active application regains control, your clicks and keypresses will all be executed in rapid succession. I spent plenty of time restoring my icons to where they used to be, after numerous pent-up mouse clicks were released.

On one occasion, I used the program to convert a fax to a text file with the OCR feature. This required a great deal of processor time and involved large numbers of disk accesses. During a background send, the conversion caused an unexpected delay for the remote fax device because the remote device terminated the connection and reported a communication error. Since it happened only once, and that was during unusually heavy system use, I don't think it's a problem. My standalone fax machine occasionally can't complete a transmission for one reason or another.

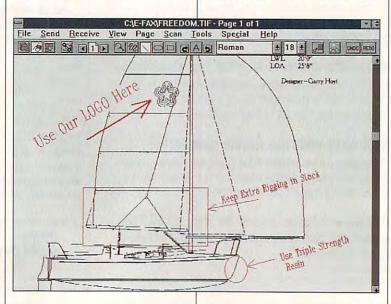
If you're the type who gets right to business and would rather forgo frills, this might be your package. I like it because it doesn't take up much disk space and it's easy to use to send a quick note.

Circle Reader Service Number 374

FAXMASTER

Caere, the company that developed the AnyFax OCR technology, licensed by several other companies, has also developed its own fax software. With such a significant part of the fax technology mastered and at Caere's disposal, it's no wonder. FaxMaster is an easy-to-use alternative to the other packages. Though not as full-featured as some other fax packages, this product boasts a look and feel that may make it your first choice.

All of the important features are there and are professionally implemented. Sending or receiving faxes is simple and effortless. Scanner support, scheduled transmissions, a viewer, and a phone list provide the tools to maximize productivity. Missing are less-important features, such as graphical editing tools, the ability to import and export phone lists, and the abil-



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ity to change screen colors.

Making a complex piece of software easy to use is no small feat, but Caere has managed to do it. At the top of the screen is the pulldown menu and, below that, six icons representing the major program functions. The remainder of the screen contains either thumbnail documents from which you can select or a full view of a selected document. I like being able to select from thumbnails: it's much easier and more enjoyable to select from these miniaturized representations of faxes than from a list of faxes (usually with dates and times as their only identifiers).

Of course, Caere's OCR technology is state-of-the-art. The AnyFax technology is easily recognizable during the conversion process; you see an image of the fax page and watch the text become highlighted as the program processes it. You can also see a small window with an expanded piece of text while it's operating. FaxMaster scored a 64 percent—not the best score of the lot, but pretty good. Two factors that can affect my comparison of the OCR-produced document to the original document are pagination marks and inserted form feeds. While pagination and form feeds are useful features, they accounted for FaxMaster's lower-than-expected score in the comparison; if the pagination marks are important to you, or you need form feeds for easy printing, don't let the score diminish your appreciation of this pack-

FaxMaster-\$109

CAERE 100 Cooper Ct. Los Gatos, CA 95030 (800) 535-SCAN

age's OCR capabilities.

The computer industry has its share of jargon and buzzwords. I easily added some of these words to the program's user dictionary so that it would have an easier time recognizing them during OCR conversion. This was helpful, since my test document had words like dBASE, Excel, and ASCII. Adding words to the user dictionary that commonly appear in faxes will improve accuracy.

Most people don't adequately appreciate the value of easy access to a program's setup. After spending a large block of time with this month's fax software packages, I think I appreciate the value of this easy access more than ever. Thankfully, FaxMaster makes its setup parameters readily available from several pull-down menu entries.

I particularly enjoyed using FaxMaster, largely as a result of its easy-to-use interface and easy feature presentation. I didn't

WHAT IS OCR AND WHY DO YOU NEED IT?

When a fax comes in, regardless of what was used to create it, it's really a picture rather than a text file.

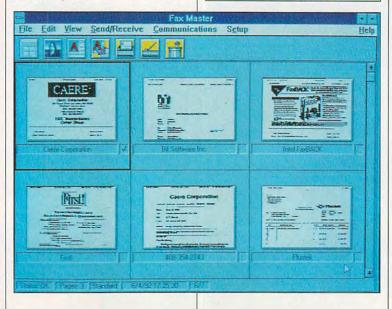
This picture can't be loaded into a word processor for editing. So, if you received a fax from someone with information that had to be faxed to someone else, you couldn't just load it into WordPerfect, make some changes, and send it on. You'd have to manually retype it, edit it, and then send it.

One other disadvantage to these picture files is that they take up far more room on your hard drive than text files. That might be a problem for you if you're anything like me. My hard drive is constantly full!

Optical character recognition (OCR) has been developed to the point that it can solve these problems by converting a picture file to an AS-CII or word processor file. Many of the fax packages have this capability built in, and it adds a powerful tool to your fax manipulation arsenal. Now you can convert the incoming data to text files and use your word processor to edit them.

OCR isn't perfect. You'll be disappointed if you expect 100-percent accuracy. But correcting a few errors is surely better than retyping an entire document.

-RICHARD C. LEINECKER







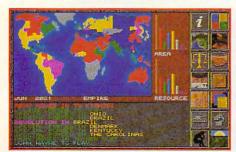




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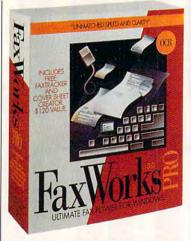


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open the manual until it was time to rate it. There were no setup problems, so I was up and running in less than five minutes. Take a serious look at FaxMaster. Its strong points might make it just what you need.

Circle Reader Service Number 375

FAXWORKS PRO 3.0

The programmers at SofNet really know fax technology. Their install program found out practically everything about my fax/data modem card. I learned things about it that weren't in the manual, including the chip type and revision number.

FaxWorks Pro 3.0—\$129.99; \$64.99 for lower-end version without OCR and advanced fax management and annotation tools

SOFNET 380 Interstate North Pkwy., Ste. 150 Atlanta, GA 30339 (800) 4-FaxWorks (404) 984-8088

This mastery of the technology translated into worry-free fax sending and receiving.

The features you'd expect are there: sending and receiving, OCR conversion to text files, phone lists, scanner support, and an easy-to-use viewer. You'll also find one of the best cover page creation utilities, which includes hundreds of clip art images.

If you don't want to waste time trying to correctly configure your fax software, or if you're afraid you'll never figure it out and might really mess something up, FaxWorks Pro's easy installation makes it a good choice. By contrast, I spent several days configuring, reconfiguring, and reinstalling some of the other software to get everything working. That's a lot of time for someone who's competent and computer-literate.

There's one feature in this package that I've never seen in any other software, and that's a quick way to access system configuration files. Using a pull-down menu, you can view and edit your WIN.INI and WORKS.INI, among others. If I'd experienced trouble getting things to work, this might have been a valuable ability. I guess the folks at SofNet wanted to make sure their tech support people could easily help customers in case there was a problem.

The main screen in FaxWorks Pro isn't fancy, but the six icons are enough to help you navigate without much need to pull down menus. One icon calls up what SofNet calls a FaxTracker, which is a general fax maintenance window. What I liked best about this screen was the array of radio buttons at the top that change it from a send log to a receive log to the file access dialog box to the file cabinet. When you click on these buttons, the function of the FaxTracker changes, but you

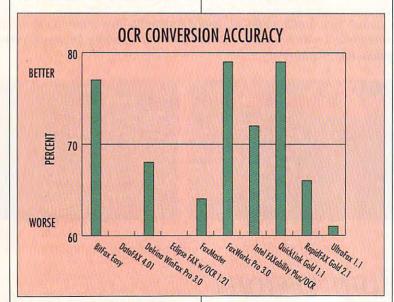
OCR CONVERSION ACCURACY

Each of the fax packages received a ten-page document with nothing but straight ASCII text. There were no lines or other marks that couldn't be converted to text. The faxes were then converted to text files and compared with the original document from which the faxed printout was made.

The program that I used to compare the files employs some procedures that make it impossible for any of these fax products to score 100 percent. Files that are identical to the original document score 92 percent, so any score close to that is pretty good. The best score was 79 percent—good enough that some quick editing gave me a usable file.

For my own curiosity, I tried a handwritten note as well. None of the OCR technologies in these fax packages scored better than 1 percent. I guess we're still at least a few years away from OCR technology that does well with handwritten files.

-RICHARD C. LEINECKER





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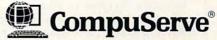


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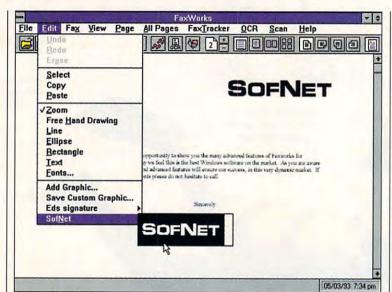
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don't have a different dialog box. That means you don't have to learn four different windows or dialog box styles for these four different program segments. Consequently, the interface reduces the learning curve immensely.

One attractive feature that Windows newcomers in particular will appreciate is FaxWorks Pro's great system of context-sensitive help. There are two levels: one that simply gives you a single line of text and another that gives you large cue card-style blocks of help. In either case, you'll get plenty of help while you're learning the software. I found the comprehensive help that's accessed from the Help menu very complete and well written.

The OCR technology performed admirably. It scored 79 percent, making it one of the best I tested. It wasn't fast, and there wasn't a snazzy display while it operated, but with results like that, who cares? With a few minutes of editing, my conversions were perfectly usable.

FaxWorks Pro gave me troublefree service. It doesn't have a lot of fancy features, but it has everything you'll probably need.

Circle Reader Service Number 376

INTEL FAXABILITY PLUS/OCR

Intel FAXability Plus/OCR is a solid piece of software from a company famous for world-class microprocessors. It has a moderately long feature list, and I found the interface workable, but the installation involved more effort than I had planned on. Probably its most distinctive feature, and the one that may sell you on the product, is its ability to convert faxes to popular word-processing formats.

The major features are there—background receive and send, OCR conversion to text files, scanner support, phone lists, and custom cover pages. Some lessimportant features are missing, such as automatic printing of incoming faxes, automatic fax cleanup, graphic editing tools, and the ability to change screen

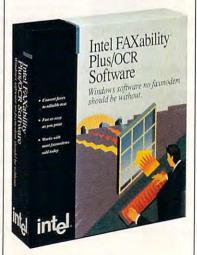
Intel FAXability Plus/OCR—\$129; \$79 for version without OCR

INTEL P.O. Box 14070 Portland, OR 97214 (800) 538-3373 colors. Of these missing features, the automatic fax cleanup is the only feature I use occasionally in the other fax packages. FAXability does include some features not found in the others. You can print faxes in landscape or portrait mode and load different printer fonts, for example.

The OCR conversion performed well. My benchmark test measured OCR accuracy at 72 percent. Other measures of OCR accuracy would probably be better than 80 percent. The benefits of OCR here, as in other packages covered this month, are clear. You can use the text files created from the faxes as you would any other documents, or you can use them as records of the faxes from which they derive.

The amazing thing about the FAXability OCR conversion process is the enormous variety of formats it outputs to. You can convert faxes not only to straight ASCII files but to compatible files for most major word processors, including Microsoft Word, Microsoft Write, Ami Pro, PFS Professional Write, WordPerfect, WordStar, and XyWrite. And that's a small part of the list. It also converts to dBASE, Microsoft Excel, and Lotus files.

I had a tough time getting the software to work on my system. After I had sent a fax, my mouse became erratic and Windows lock-



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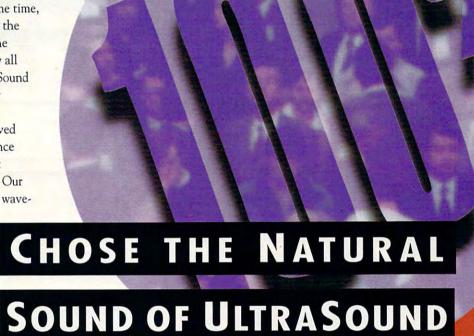
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Circle Reader Service Number 204





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ed up. I tried a multitude of reconfigurations, and this took quite a long time, since a complete system restart is necessary with each new configuration.

I finally called an Intel technical support representative, who solved my problem. My COM ports in Windows were set up in such a way that a conflict was created between COM 3 and COM 4. I never understood this entirely, since I don't have a serial port on COM 3 (my communications card was COM 4). I spent about five minutes explaining to the technician why the problem wasn't my mouse driver. He eventually checked with someone else and told me how to change my Windows port settings. This did the trick.

I should have stopped there. The technician recommended I download a newer version of the program's CAS driver. I did, and things stopped working. To get my system working properly again, I had to delete the directory and reinstall the software. Granted, fax software is difficult to support, but no other fax packages reviewed here had problems with my Windows port settings.

Some of the features FAXability has might be important to you. You might need to save faxes in

File Edit	Trans <u>m</u> it	FAXability Man			7
58		Reschedule Save A		Pelete Pelete	
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your word processor or spreadsheet format. Once configured properly, the software worked well. Just keep in mind that you may have to spend some time getting it to work the way you want it to work.

Circle Reader Service Number 377

QUICKLINK GOLD 1.1

When this program first ran, I did a double take. It looked like a DOS-style terminal program with some Windows-like icons at the top. Looks can be deceiving, though, and I quickly grew attached to this software. More than just fax software, QuickLink Gold 1.1 is a complete telecommunications package.

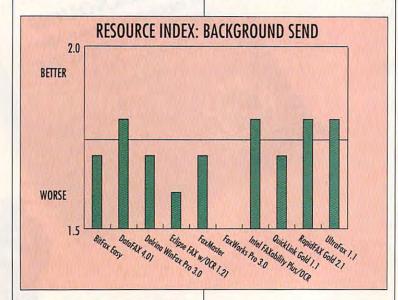
The designers and developers deserve special mention for their

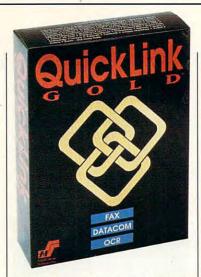
RESOURCE INDEX: BACKGROUND SEND

This test was performed by selecting a fax board as the default printer and then printing the first ten pages of a document from Microsoft Word. The fax software prepared the documents, then dialed out and sent them. The test started when the dial-out was initiated and ended when the remote fax signaled an end to the transmission.

In this test, the number recorded is an index of the amount of processor time available for applications other than the fax program running in the background. A perfect score would be 2.0; however, even with the background fax software idle, only a score of 1.9 is achievable, since Windows performs a number of background functions. The best score any of the fax software products achieved was 1.8.

The columns in the accompanying chart reflect the relative performance of the ten fax software products covered in this Test Lab. A high score means that you won't constantly experience slowdowns during background sends.





willingness to go against the grain. In several noticeable places, the interface deviated from what you'll find in every other Windows program in this roundup. The main screen is black with green text, in contrast to the normal Windows look and feel. After my initial surprise, I was thankful. When returning from the program's other windows with the typical Windows look, such as the fax viewer and setup dialog boxes, I always knew when I was home at the main screen. Other very nice touches were 3-D text and a modem LED simulation in the status box on the screen.

QuickLink did especially well converting faxes to text files. In my benchmark test, it scored 79 percent. However, QuickLink keeps track of its own success rate and registered a score of 92 percent. These two scores are different because the program counts only the unrecognizable characters, not the ones it gets completely wrong. The reality of QuickLink's success with OCR lies somewhere between my score and the program's—which is pretty remarkable.

Hats off to QuickLink for determining my exact hardware configuration on the first try. It worked perfectly from the start, and I never gave it a second thought after that. I don't guarantee you'll have the same success rate; I do, however, think that my experience

QuickLink Gold 1.1-\$99.95

SMITH MICRO SOFTWARE 51 Columbia Aliso Viejo, CA 92656 (800) 964-SMSI

with QuickLink speaks very well for the product, especially in contrast to the difficulties I had with other installations.

I was surprised by the amount of time the program required to send a ten-page document: It took 23 minutes and 28 seconds to send a simple ten-page document from Microsoft Word. That's double the time required by most of the other packages. There's probably a technical explanation for this, but I don't know what it is. You might not care, though. Since the send procedure goes on in the background, it won't stop you from working. If you're not constantly sending faxes, this probably won't be an issue.

I know this isn't a review of telecommunications software, but I'm dying to tell you just a little about that part of the program. Besides, some of you might want to get this program because it can serve all of your communications needs, not just your faxing needs. There's a built-in host mode. You can leave it running and dial in to access any file on

your computer. All of the major file transfer protocols, such as XMODEM, YMODEM, and ZMODEM, are built-in. And you can define macro keys to skip some of the steps when you log on to BBSs and online services.

QuickLink is a fine piece of software. It'll fill most of your telecommunications needs. On my system, it worked well, without any fuss—and that's worth a great deal to me.

Circle Reader Service Number 378

RAPIDFAX GOLD 2.10 FOR WINDOWS

As soon as you run it, you can tell that RapidFAX is strictly business. Greeting you as the program opens are its three most important sections: the send log, the receive log, and the phone books. It was quite a while before I found it necessary to pull down any menus, since the icons and information in the windows are enough to help you do just about anything you might need to do with this program.

All the features you need for productive faxing are there—scheduling transmissions, OCR conversion, phone lists, scanner support, and cover sheets. RapidFAX lacks some infrequently used features, such as fax-editing tools,



TEST LAB



automatic fax cleanup, and the ability to import and export your phone lists. For most small businesses, there's more than enough to meet communications needs.

The OCR conversion utility was up to snuff. It scored a 66 percent, more than adequate for reading and understanding later. With a little time and effort, the text files could easily be edited and reused or resent later.

Another plus is the ability to import and export different types of file formats. You can load any BMP, PCX, or TIF file and send it as a fax. That's really great, because you can capture just about anything in Windows and save it as PCX and BMP files. You can easily send presentation pages that include graphs and charts.

There's a built-in memo function that quickly allows you to send a memo to a destination fax without having to load a word processor. I use this feature about as much as any other and am grate-

RESOURCE INDEX: BACKGROUND RECEIVE

As with the background send, an index was calculated demonstrating the processor time available for other applications. The closer the number is to 2.0, the better. The time elapsed during the receiving of the ten pages was not recorded, since the sending fax device determined how much time was needed.

RapidFAX Gold 2.10 for Windows— \$129; \$79 for version without OCR or modem software

THE COMPLETE PC 1983 Concourse Dr. San Jose, CA 95131 (800) 229-1753

ful for its inclusion. There's also a function that checks the integrity of files. I never found any inconsistencies in mine, but if I were having problems, this might be at the top of my list of favorite features.

Most computers come with the first two COM ports occupied by a serial port and a mouse. This is the case with my system and most systems I've used in the last three years. (The bad part is that my manuals that explain how to reconfigure those serial ports are always lost.) This configuration is a problem with RapidFAX, since it installs only to COM 1 or COM 2. And to further aggravate the situation, I didn't know any of this until after I installed it and tried to reboot. The memory-resident software that loads from AU-TOEXEC locked up, since I didn't have a fax/data modem card on COM 1 or COM 2.

To make a long story short, I

HOW FAXES WORK

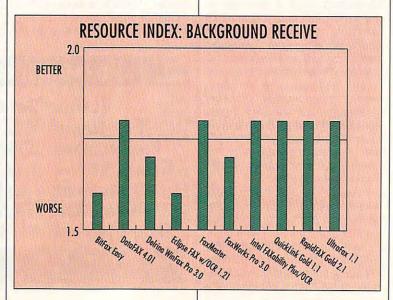
Fax communications tend to be pretty one-sided, as one fax device transfers information to the other. Here's a brief description of how two fax devices observing standard protocols talk

The sending device dials another fax device, which automatically answers and sends a 2100-Hz tone back. For the musically inclined, that's a slightly sharp C three octaves above middle C. This tone confirms that a fax machine has been reached and not a voice line or another machine type.

The called fax device sends an identification packet at 300 baud. This packet contains all of the fax device's capabilities. The calling device sends a packet with the capabilities it selects for the exchange. Then the calling device sends a high-speed training signal, and the called device sends a message indicating that it's ready.

All of the information is sent from the calling device, punctuated by short training messages. After all pages have been sent, the calling device sends a message indicating the end of transmission. The called device sends a confirmation. Finally, the calling device sends a disconnect signal, and both units disconnect from the phone line.

-RICHARD C. LEINECKER





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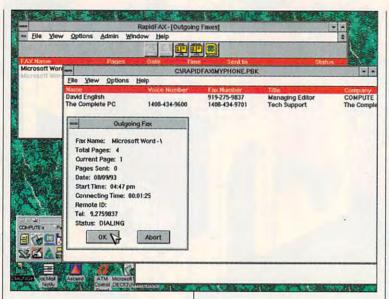
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Circle Reader Service Number 106

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TEST LAB



spent six hours changing the jumpers in my computer, reinstalling the software, and fixing the problems the process created. If you're considering RapidFAX, make sure that your fax/data modem card can easily be configured for COM 1 or COM 2.

Another battle that I faced was finding the right fax/data modem type so that there wouldn't be any transmission errors. Generic Class 1 and Generic Class 2 didn't work, so I resorted to trial and error. It wouldn't have been so bad if the changes went into effect right away, instead of after the next time the system booted. After a number of tries, I determined that the BOCA 14.4 setting worked well (for my TwinComm fax/data modem.)

If you have a fax/data modem card that's been around for some time, chances are that it'll be on the list. That means you won't encounter the same problems I did. And if your device is on COM 1 or COM 2, you won't have any problems with RapidFAX. Since there are a number of features to recommend this program, take a look. It might be just right for you.

Circle Reader Service Number 379

ULTRAFAX 1.1 FOR WINDOWS

When the UltraFax window first appears, you'll know at a glance what UltraFax has to offer and how the program is organized. Five descriptive icons with labels such as In Box and Out Box line up along the bottom, giving you access to the main program areas with a double click. At the top of the screen is a row of buttons. When the windows associated with these buttons are open, a single mouse click gives you access to choices such as Send, View, and Print. And the pull-down menus offer complete control over navigation through any part of the program.

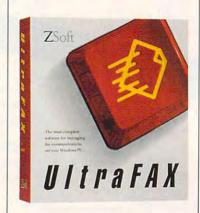
UltraFax has all the features you'd expect. Among them are scanner support, OCR conversion, multiple phone lists, and a viewer with graphical editing.

UltraFax 1.1 for Windows—\$49.95

ZSOFT 450 Franklin Rd., Ste. 100 Marietta, Georgia 30067 (404) 428-0008 There isn't room to talk about all of these, but they reveal craftsmanship and high quality. There are, however, several things which differentiate UltraFax from the other fax programs, and these differences may make this package just what you're looking for.

While working with ten fax packages, I learned to appreciate what others might call "the little things." Being able to change every part of the hardware setup without reinstalling the software became something I looked for right away. Since my fax/data modem card was new on the market at the time of testing, I had to search for just the right settings through trial and error. Several of the packages without this ability (to change the hardware settings without reinstalling the software) cost me at least an hour. And if you're a computer neophyte, an installation with one of these other packages might chew up an entire day. My thanks to the manufacturer for making sure this often-overlooked capability was included.

UltraFax also impressed me with its terrific graphical editing tools. ZSoft has long been one of the leaders in graphics programs. Most of us, at one time or another, have used PC Paintbrush, one of the first commercial-quality paint programs for IBM compatibles. UltraFax has more than enough power to add a few nice touches to an outgoing fax or cover letter or to create some



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ath Blaster:[®] In Search of Spot launches the world's best-selling math program to a whole new level of learning and fun! Kids will join Blasternaut on an all-new action-packed adventure to rescue his robot pal Spot. As they search the universe, they'll boost their mental math and problemsolving skills into the stratosphere!

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Rob Bixbv Compute Magazine



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Davidson.

Teaching Tools From Teachers Circle Reader Service Number 151



TEST LAB

nice artwork.

All the usual tools, such as lines, boxes, and circles, are there—even a magnifying tool! The ability to rotate your fax might be just what you need if you'd like to send the information in landscape mode instead of por-

trait. You can also view multiple pages to get a sense of what the entire fax looks like.

Several of the packages in this month's roundup had an irritating habit of taking control for seconds at a time, and UltraFax was no exception. A number of times, I'd start clicking in other windows; when nothing happened, I couldn't resist the compulsion to click some more. By the time Windows regained control, there were enough mouse events in the queue to really mess things up. Many times the result was a com-

COMPUTE'S Fax Software Test Lab	BitFax Easy	DataFAX 4.01	Delrina WinFax Pro 3.0	Eclipse FAX with OCR 1.21	FaxMaster	FaxWorks Pro 3.0	Intel FAXability Plus/OCR	QuickLink Gold 1.1	RapidFAX Gold 2.10	UltraFax 1.1
Background receiving	•	•	•	•	•	•	•	•	•	•
Background sending	•	•	•		•		•	•	•	
Receive directly to printer	0	•	•	•	•	•	0	•	•	•
Class 1 compatible	•	•	•	•	•	•	•	•	•	
Class 2 compatible	•	•	•	•	•	•	•	•	•	•
Driver for application printing to fax	•	•	•	•	•	•	•	•	•	•
Custom cover pages	0	•	•	•	0	0	•	•	•	•
Scheduling delayed fax transmissions	•	•	•	•	•	•	•	•	•	•
OCR	•	•	•	•	•	•	•	•	•	•
Scanner support	0	•	•	•	•		•	0	•	•
Built-in phone list	•	•	•	•	•	•	•	•	•	•
Import/export phone list	0	•	•	•	0	•/0	0	0	0	•
Automatic fax cleanup	0	0	•	0	0	0	0	0	0	•
Change window colors	0	0	0	0	0	0	0	•	0	•
Fax viewer	•	•	•	•	•	•	•	•	•	•
Automatic reception	•	•	•	•	•	•	•	•	•	•
Manual reception	•	•	•	•	•	•	•	•	•	•
Transmission of attached files	•	0	•	0	•	0	0	0	•	•
Graphical fax-editing tools	0	•	•	•	0	0	0	0	0	•
•= yes O= no							THE PARTY	FUELER		

SPEAK UP!

Is there a group of hard-ware or software products you'd like to see covered in an upcoming Test Lab?
Let us know by calling (900) 884-8681,
extension 7010102
(sponsored by Pure Entertainment,
P.O. Box 186, Hollywood,
California 90078). The call will cost 95 cents per minute, you must be 18 or older, and you must use a touch-tone phone.

pletely rearranged desktop. After I figured out what had happened, it wasn't much of a problem. But during background operations, you'll have to watch out so that inadvertent clicks and keypresses don't do something you hadn't intended.

As you probably know, Windows applications all compete for

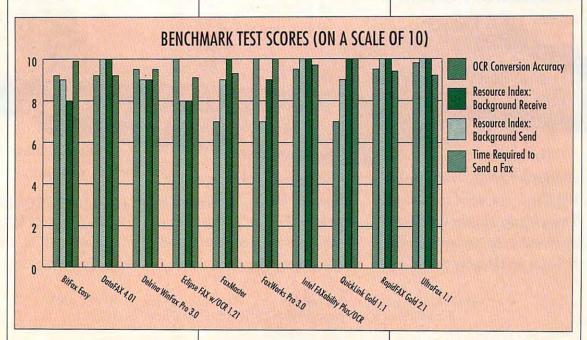
7 0 Layout Options Sgan Delete Info 0 View Entr F=' Send Description Watch Bands Phone Number 805-976-4462 Name Plastic Supply Amy Jenkins Andy Wilkins Jennifer Westwood | Crystal Electronics | 505-7229 | Westwood Enterpris | 404-427-5588 | Avionics | 454-8875 | Batteries and Crystals Public relations firm Personal pilot at Peach Phillip Moore | Perol Systems | 615-464-7293 | | Motosushi supply | 011-78-327-6754 | | Genesis Photograph | 203-456-8769 | Campaign donation digital displays Catalog shots Tess Fremont Document Storage Description Pages Created Document AVA2 Shipping cost quote Flight plan for vacation AVIONICS
BLANK
BUDGET92 Sat May 20 1922 11:28 am
Sun Jun 11 1922 7:34 pm
Sit May 20 1922 11:28 am
Sun Jun 11 1922 7:34 pm
Licensing deal for the German ge CONTRACT 1 Thu May 25 1922 4:49 pm Layout for the new catalog
Sat May 20 1922 12:10 pm Mailing list for Fall issue
Sun Jun 11 1922 9:10 pm Development schedule for the d
Mon Jun 12 1922 8:07 am Revised schedule with leveling ONTIME Thu Jul 9 1992 9.47 am Document Storage: 1 selected out of 14 total items

processor time. For this reason, I had to be careful while using other applications during background sends to avoid stealing too much processor time. On rare occasions, the remote fax machine interpreted a delay as a transmission error and hung up. The problem was worst when I had so many applications loaded that Win-

dows did a lot of swapping to disk. Except for those rare occasions, though, UltraFax sent and received without a hitch.

Overall, this is a fine piece of software. A well thought-out interface makes this capable program easy to use and worthy of your consideration.

Circle Reader Service Number 380



.95 MACH, NINETY FEET ABOVE THE GROUND, BOTH SIDES TRYING TO SHOOT HIM DOWN. WOUNDED IN THE ARM, KAPITAN ALEXANDER ZUYEV GUIDED HIS MIG-29 TO FREEDOM LEFT-HANDED. COULD YOU?

On May 20, 1989 MiG-29 pilot

Alexander Zuyev began a desperate plan to steal the Soviet The pilot who wrote the book on the MiG-29, Alexander Zwyev, tells his harrowing story (including authentic Soviet doglighting tactics in Fulcrum from Warner Books.

Union's most advanced combat aircraft and fly it to political asylum.

177 -

Turkish air defenses to land safely on a civilian airfield in Turkey.

THE FINEST TECHNOLOGY RUBLES CAN BUY

The plane he flew is the MiG-29 Fulcrum, the crowning achievement of Soviet aeronautics.

Now, with

NOTHING WAS LOST IN THE TRANSLATION

The flight model was patterned after actual Mikoyan-Gurevich (MiG) design specs.

So you can be every system control is ingly all

sure that and every painstakaccurate, the way

-315

Shot in a life

and death struggle with the sentry, Zuyev managed to take off. Then, flying dangerously low to avoid radar, he eluded pursuing fighters and deadly Soviet and MiG-29: Deadly Adversary of Falcon 3.0,™ Spectrum HoloByte's add-on to Falcon® 3.0, you can climb into the cockpit of the F-16's nemesis.

down to the Russian-accented cockpit warnings.

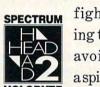
IT'LL TEST YOUR SKILL AND YOUR PATRIOTISM

Unlike the F-16, the MiG-29 isn't a fly-by-wire aircraft, so a

For Visa/MasterCard orders call 24 hours a day, 7 days a week: (800) 695-GAME. For technical questions call (510) 522-1164 (M-F: 9AM-5PM Pacific Time).

computer never limits your control inputs, whether inspired or foolish. Its twin Isotov RD-33 engines produce 36,600 lbs. of thrust, to the F-16's 25,000. And superb aerodynamics make it controllable at low speeds and high angles of attack that would have enemy pilots

The most fearsome opponent is a human one. With EBS, up to six players can go head-to-head.



fighting to avoid aspin.

THEY WON'T EVEN KNOW WHAT HIT THEM

Your MiG's IRST (Infrared Search and Track) system can track an F-16 without revealing your presence on his threat display. So you can get on his six o'clock before he even knows you're there. Once in range, you'll be able to lock on to the Falcon just by turning to look at him with the MiG-29's helmet mounted sight. Then call "pusk" (launch) as you fire missiles or "ogon" (firing) as you ventilate him with your computer-accurate 30mm gun. Either way, his plane will make a satisfying crunch when it hits the ground.

Next time you have an F-16 glued to your tail, try the MiG-29's "Cobra" maneuver. 1) You pull up past a 90 2) Your airspeed alpha drops rapidly; climb. the F-16 zooms past.

THE ELECTRONIC BATTLEFIELD SERIES: THE ULTIMATE CYBER-BATTLEFIELD

EBS is the first series of interconnecting simulations. Each title works with the others to bring you closer to the real thing.

Now you can choose from multiple aircraft, multiple theaters, even which side of the conflict to fight on. And you can 3) You abruptly

go head-to-head over a modem or with up to six

pitch the nose back to level flight. Now you're on his six, with a little score to settle.

players over a network. It all begins when you add on MiG-29 to Falcon 3.0.

Anything more realistic wouldn't be a simulation.

INTRODUCING MiG-2



Choose your weapon. The Falcon is lethal at long distances. The Fulcrum, deadly closein. Now you can fly for either side.



MiG-29 add-on requires Falcon® 3.0. Available on IBM compatibles.

Spectrum HoloByte









C BATTLEFIELD SERIES

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Circle Reader Service Number 201

NEWS & NOTES

Jill Champion Booth

VR for Kids

If you happen to be near a family amusement center sometime soon, look for an In-Video system and give your kids a chance to experience a touch of virtual reality. InVideo is the first peripheralfree VR system for the entertainment industry-and it's specifically for kids. Forgoing the standard helmet which creates a 3-D effect that immerses you in the environment, In-Video is more like a mirror world in 2-D, where the player's live video image is captured by a camera, transferred digitally, and projected

fairly basic compared to virtual reality as portraved in science-fiction movies and on TV. Friedman expects an In-Video upgrade once a year. A haunted-house version is in the works.

InVideo systems are also featured in numerous museums around the world, including the Brooklyn Children's Museum in Brooklyn, New York: the Franklin Institute in Philadelphia, Pennsylvania: the Laredo Children's Museum in Laredo, Texas: the North Carolina Museum of Life and Science in Durham. North Carolina: and the Eureka! Children's Museum in Halifax. England.

Cool Sound

Speakers for your PC don't have to take up a lot of room and add miles of wire to your already-tangled cable web. The MM-1, part of IBM's new Plug 'n Run series of modules and monitors, is a slim, lowprofile sound unit that fits neatly under your monitor. Inside the compact case are two five-watt speakers that deliver sound to please even the most demanding ears.

The MM-1 works with all audio cards and features industry-standard RCA connectors. so there's no clutter, no desk space wasted, no mixed-up cable connections, and no compatibility confusion. Set the MM-1 under your monitor, plug it in, and enjoy.

Other features include a built-in microphone and input and output jacks for accessories (stereo headphones, auxiliary microphone, video, and

Controls for volume, tone, and balance are located on a pop-up panel in the front of the unit

The 9.2-pound MM-1 supports monitors weighing up to 90 pounds. Suggested retail

Kids watch themselves interact with virtually real surroundings when playing the InVideo system at amusement centers and museums.



into the game on a 120-inch TV screen. Choosing a game is as simple as pointing to and "pressing" the image of a button. Kids can opt to pop balloons while flying over treetops, tickle fish while swimming underwater, juggle planets and asteroids while soaring through outer space, or dodge raining cats and dogs. Every move a player makes interacts with the graphics onscreen.

show "Nick Arcade."

And although this system is

Setting the Tone

If the idea of buying a laser printer cartridge that's discounted 15 to 20 percent below discount-store prices and contains 20 percent more toner than standard cartridges appeals to you-and it shouldthen you'll also like the idea of getting back \$5 plus your shipping costs when you return your cartridges to the company for recycling.

Remanufactured is the keyword here, and Laser-Pro, an Illinois company, has developed a technique to remanufacture laser cartridges without toner leakage. The company can package the cartridges and ship them to customers

nationwide. Although recycling laser printer cartridges is nothing new, traditionally there have been problems with the toner leaking, confining remanufacturers to selling only locallywhere they can hand-deliver the product. According to Laser-Pro, although the cartridge-remanufacturing industry comprises some 3000 small companies, about 95 percent of the firms do business within a 25- to 30-mile radius of their home bases. Not so for Laser-Pro and its cross-

If you prefer to buy new, you can still buy new cartridges from Laser-Pro at 5 to 10 percent less than imported brands. But considering the environmental advantagesnot to mention the savingsof buying the remanufactured ones, why would you want to? For more information and pricing, contact Laser-Pro, 675 East Irving Park Road, Roselle, Illinois 60172; (800) 377-0551, (708) 893-2362 (fax).

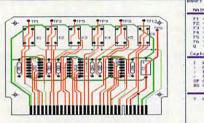
country business.

Big-Screen Game Playing

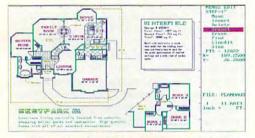
Guaranteed to turn your living room into a game room, Game Blaster from Advanced Digital Systems is a new PC-

WHAT DO THESE PEOPLE HAVE IN COMMON?

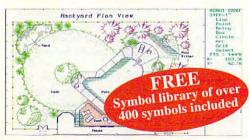




DRAFT & PRINT is an excellent choice for all but the most complicated projects. — PC Home Journal September 1992



"I just purchased your program. It does a great job. I'm doing a building remodeling and design plan, and it works well." —Nicholas Spagnola York, PA



DRAFT & PRINT... isn't limited to any particular category of projects.

—LA Times July 16, 1992

THE STATE OF THE S

DRAFT & PRINT

THE DESIGN-IT-YOURSELF SOFTWARE FOR THE DO-IT-YOURSELFER

SIMPLE TO INSTALL

Draft & Print was created so that you spend more time designing than figuring out where to begin. You can create, edit, and print scaled drawings of: floor plans, landscaping, elevations, woodworking, architecture, mechanical, electronic schematics, printed circuit boards and more. It even imports and exports to other graphic programs such as AutoCAD!

SIMPLE TO USE

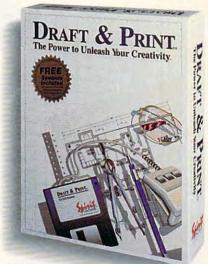
Completely voice-assisted. Draft & Print comes with 5 tutorials and onscreen help. It includes full scaling, editing, rotation, full color control, layering, area calculations and autodimensioning.

SIMPLY TERRIFIC

Draft & Print is the perfect design tool for CAD users at any level of expertise. Whether you're designing a landscaping plan, a new dream home or a TV entertainment center for your living room, you'll find Draft & Print is the ultimate design tool.

SIMPLY THE ONE TO BUY

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Circle Reader Service Number 154



A publishing partnership

NEWS & NOTES

to-video converter that allows you to play your favorite PC games on TV. Bundled with three popular game titles to get you started—Prince of Persia from Brøderbund and Jet Fighter II and Spectre Challenger from Velocity—Game Blaster is a great value at \$169 (the suggested price).

In addition to giving you the option of using your bigscreen TV for favorite PC games, it's great for those already using online services, such as America Online, Prodigy, or CompuServe. (COM-PUTE and Omni Magazine Online would look great on the TV.) Game Blaster is compat-

Sound for even the most discerning ears comes from the neat, compact MM-1, part of IBM's Plug 'n Run series of PC peripherals.



ible with all DOS applications, supports 640 × 480 VGA resolution in 256 colors, and outputs NTSC video in RCA composite and Super VHS supervideo standards. For more information, contact Advanced Digital Systems, 20204 State Road, Cerritos, California 90701; (800) 888-5244, (310) 809-6144 (fax).

Your World Series

Keith Hernandez, Ty Cobb, Willie Mays, and Shoeless Joe Jackson—all on the same team? What a lineup—and what a game that would have been—and can be with Baseball for Windows from Miller Associates. Using the most complete and accurate baseball statistics, Baseball

for Windows allows you to manage any team you want and see what could have been some remarkable moments in playing history.

Bringing the all-time greatest teams, fields, and plays to life, Baseball for Windows features a storehouse of play results, stunning reproductions of actual ballparks, an iconbased interface, easy-to-understand displays, built-in micromanagers, and special features-such as Advanced Injury Management (AIM), which provides more-realistic electronic playing conditions by tracking the status of players and determining if they're rested, tired, bushed, worn out, itchy, or benched.

The program's four modules (Baseball, League Manager, Advanced Draft, and Stat-Master) give you instant access to every aspect of baseball. Click on the picture of the guy stealing, and he'll go: click on a player's name, and his past and current game performance will be displayed. Special bench and bullpen reports provide key information so you can make informed playing decisions. For more information, contact Miller Associates, 11 Burtis Avenue, Suite 200, New Canaan, Connecticut 06840; (203) 972-0777, (203) 966-7547 (fax).

Future Standards

The framework of today's computing world encourages what has become quite a paradox: Developers are under constant pressure to add more features to their products; and as applications become more powerful, they also become more difficult to use, and consequently, less useful to people.

Apple Computer hopes to change all of that next year when it introduces a new computer architecture, called OpenDoc, that will integrate

software and enable sharing across multiple platforms and distributed networks. In fact, if all goes as planned, the desktop computer as we know it today will become obsolete.

What will this mean for you? Easy creation of multimedia documents, for one thing. You'll be able to place any kind of data into an OpenDoc document and edit it at will, without having to cut and paste between different application windows. You won't manually assemble the various pieces; instead, your OpenDoc document will hold all of them.

OpenDoc parts will behave much like current applications, enabling you to upgrade without having to go through a new learning process. Apple's stated intent is to make this technology not only cross-platform but also truly open—with both systems vendors and independent software vendors able to obtain the source code easily.

When the company introduces it in the second half of 1994, OpenDoc architecture will be available for the Apple Macintosh. WordPerfect and Novell plan to implement the architecture on the Microsoft Windows platform, and since it's designed to be highly portable, OpenDoc will probably become available on other desktop systems such as UNIX, according to Apple. IBM and Borland have also announced their support. Look for more on this in 1994.

Companies or public relations firms with items suitable for "News & Notes" should send information along with a color slide or transparency to News & Notes, Attention: Jill Champion Booth, COMPUTE, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

Take the Cache

Your answer to Fred Bell (May 1993) was wrong concerning cache memory. You said it cached information from the hard disk, but the cache associated with CPUs is processor cache, not disk cache. Processor cache is a bank of external high-speed memory-typically 15- to 20ns. This bank stores the most recent of the most often accessed areas of RAM, determined by a set of algorithms and the way the cache is designed. Additionally, every Intel 486 CPU has an 8K internal processor cache built into the chip. When a system is advertised with 8K of cache, it's this internal cache that's being referenced. It doesn't represent added value.

A processor cache makes a huge difference in CPU performance just as a disk cache makes a huge difference in disk performance. DOS-based 386 and 486 computers would see this performance increase with just 64K of external cache memory, while these same computers based on 32-bit operating systems such as OS/2 or Windows NT should have 256K of external processor cache to see the biggest performance boost.

You should also clarify to readers that 256K would be a rather small disk cache. My experience has shown that a disk cache between 1MB and 2MB provides the largest increase in disk performance. A cache larger than 2MB is more or less a waste of memory.

One more point: Some game programs that use expanded memory assume that you don't have a disk cache on your system and set up their own disk cache. Running two active disk caches at the same time can severely degrade the performance

of your entire system. In these cases, I recommend that you disable your system's disk cache and let the game program do the work. JOSEPH G. SAWAYA

Thank you for your correction, your clarification, and your

Continuing Series

SLIPPERY ROCK, PA

Could you please explain to me the difference between a parallel and serial port for printers and other devices? Is there an advantage in using a serial connector rather than a parallel connector?

RANDY BRAZEAU RIDGEVILLE, ON

A serial connector sends one bit at a time down a single wire. A parallel connector can send whole bytes at a time. The serial connector is more appropriately used in applications where the output will be traveling down a single pair of wires, such as a telephone wire, or where the receiving device handles your data very slowly, such as a printer.

Serial cables have more than one pair of wires, though, which allows a manufacturer to transmit important information quickly back and forth between the computer and the peripheral. That's why, when you're working with a Mac and a LaserWriter and the LaserWriter encounters a problem, the Mac can tell you the exact nature of the problem.

Until recently, parallel cables were one-way. They sent information relatively quickly, but when there was a problem at the other end of the cable, all your computer could tell you was that the output device was no longer accepting data. On the far end of the cable, the printer might be out of paper, jammed, or on fire; your computer wouldn't have a clue. A new parallel cable specification changes all of that, granting intelligence to the connector. A collection of codes can keep the computer (and you) informed about the progress on the other end of the cable.

In summary, you'll find approximately equivalent printer performance with either a parallel or a serial printer because the printer is the bottleneck, not the interface. A serial printer has the slight advantage of offering two-way communication, but parallel printers will soon share that advantage. A parallel interface has the advantage of being by far the most common used by printers. And, finally, with serial mice and modems becoming more and more common, most people can't afford to sacrifice one of their two precious serial ports to a printer cable.

Choosing a cache, picking a printer port, acknowledging the Amiga, licking the lottery, and mailing to Maxtor

Amiga Notes

I read with interest the special section on PCMCIA slots in the May 1993 issue (not available in all editions). Despite the depth of the article, there was not a single word about the fact that the Amiga 600, 1200, and 4000 all come equipped with standard PCMCIA slots.

ERIC NIXON FOREST, ON

Just about every time we showcase a bit of new technology for the PC, we receive a handful of letters from Amiga owners with the general theme of "You talk about this new technology of (fill in the blank), but it's not new. It's been available for almost a decade on the Amiga." So, as a service to our readers, we will pause now to praise the Amiga. Virtually every advance that you read about for the PC was built into the Amiga: sound, an-

FEEDBACK

imation, multitasking, and so forth. Commodore has a team of very forwardlooking engineers, and it builds one of the most capable desktop machines in the world. COMPUTE has long admired the Amiga (and the pioneer spirit of Amiga owners) and has prided itself on being the mainstream computer magazine that has paid the most attention to the Amiga over the years. If this sounds a bit like a eulogy, it is because, after several years of publishing first a quarterly magazine, then a bimonthly magazine, and later a monthly section of COMPUTE devoted to the Amiga, we have ceased our regular coverage of the machine as of October 1993.

The Lottery

I have written a small program to pick a group of six numbers ten times for the state lottery. The program doesn't seem to work.

LARRY RAY ALICE, TX

In the interest of scientific inquiry, we will overlook our moral objections to gambling. Sometimes it helps to state in specific terms what you want a program to do before you write it. You want to draw six random numbers from among the numbers 1-50. The six numbers all have to be different from one another. If you select a number once, it shouldn't be selected again in any group of six. And you want to generate ten of these groups of six. Although you could accomplish this in several different ways, the following program demonstrates what is probably the most efficient way. We'll create a collection of numbers (1-50), scramble them, draw the first six numbers, scramble them again, draw six more, and so forth. Here's the program. Remember that in order to get a winning number, you have to avoid thinking about an elephant when the program completes its operation.

DIM A(50) RANDOMIZE TIMER FOR I = 1 TO 50 A(I) = INEXT FOR J = 0 TO 9 **GOSUB SCRAMBLE GOSUB DRAWSIX**

PRINT "Don't think about an elephant." END

SCRAMBLE: SCRAMBLE = RND * 1000 + 100 FOR I = 0 TO SCRAMBLE RESCRAMBLE: A = INT(RND * 50) + 1: B =INT(RND * 50) + 1: IF A = BTHEN GOTO RESCRAMBLE A1 = A(A): A(A) = A(B): A(B) = A1NEXT RETURN

DRAWSIX: FOR I = 1 TO 6 PRINT USING "## "; A(I); PRINT RETURN

To the Max

I have a question concerning my Maxtor 200MB IDE hard disk. Do you have the address for Maxtor?

DON SHAW LUSBY, MD

The address for Maxtor Colorado is 2190 Miller Drive, Longmont, Colorado 80501. Its telephone number is (303) 651-6000, or (800) 262-9867 outside of Colorado. Though it's a separate company, Maxtor supports Miniscribe drives. Incidentally, our source for many names and addresses is the 1993 Computer Marketplace, an unusually complete reference, published by Random House Electronic Publishing.

Do you have a question about hardware or software? Or have you discovered something that could help other PC users? If so, we want to hear from you. Call our special "Feedback" line: (900) 884-8681, extension 7010201 (sponsored by Pure Entertainment, P.O. Box 186, Hollywood, California 90078). The call will cost 95 cents per minute, you must be 18 or older, and you must use a touch-tone phone. Or write to "Feedback" in care of this magazine. Readers whose letters or calls appear in "Feedback" will receive a free COMPUTE baseball cap while supplies last. We regret that we cannot provide personal replies to technical questions.

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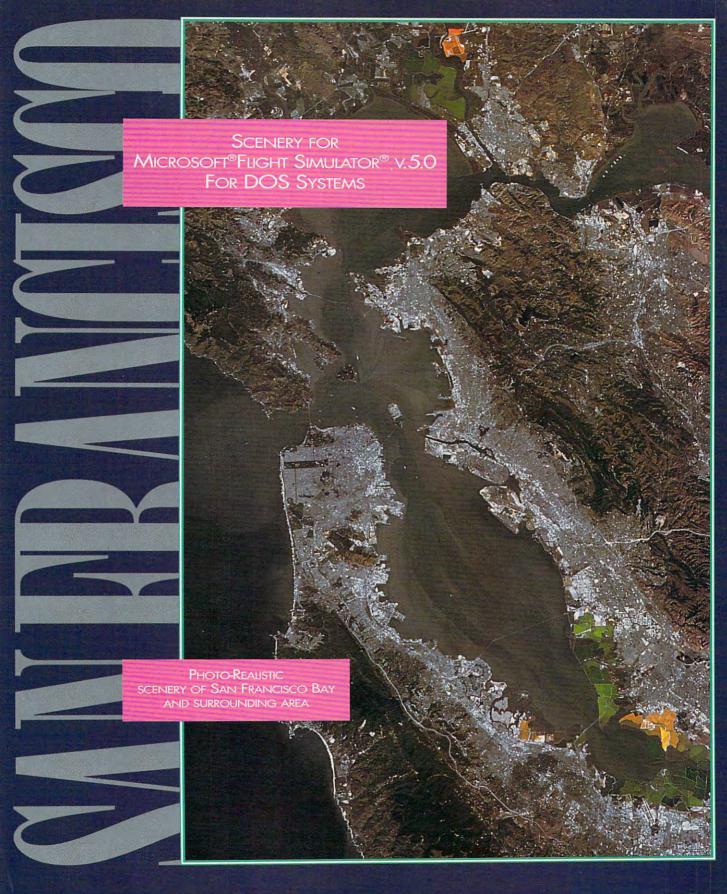
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INTRODOS

Tony Roberts

DEFRAGMENTING YOUR HARD DISK

One of the new utilities provided with Microsoft's DOS 6 is Defrag. This program helps keep your hard disk in order, resulting in faster file access and an improved success rate should you ever need to undelete a file.

Why is such a utility necessary? What causes the fragmentation that Defrag was created to cure?

The culprit is DOS itself and, more specifically, the way it stores your files.

When you first begin storing files on a newly formatted disk, DOS places the files one after another, starting on the disk's first track. It also keeps information about where each file is stored in the FAT (File Allocation Table). As long as you only add files, your disk will be neatly organized with contiguous files stored one after the other.

However, as soon as you delete or make changes to a file, you open the door to fragmentation. DOS stores files in units called clusters, the size of which depends on the size of your disk partition. Let's say you delete a two-cluster file from your disk. DOS updates the FAT to indicate that the two clusters once occupied by that file are now available for other use.

Since DOS stores data as close to the front of the disk as possible, the next time you save a file, DOS will store it in the space left by the deleted file

But what if the file you're storing is larger than two clusters? DOS fills the two-cluster vacancy with the beginning of the file and stores the remainder in the next available empty spaces on the disk. It keeps track of the various parts of a file through entries in the FAT.

When you open a file, DOS checks the FAT to get instructions on where to find all of the file's parts and then reassembles it for you.

DOS's ability to fragment files is a good thing. Otherwise, you could face a situation in which you had 10MB remaining on your hard disk but couldn't store a 2MB file because there were no contiguous spaces larger than 1MB.

On the downside, a badly fragmented hard disk degrades system performance by bogging down file access as the drive head travels all across the disk, rounding up the scattered clusters. File fragmentation also makes it more difficult to recover deleted files using DOS's Undelete command. Undelete normally can recover an unfragmented file in a snap, but if the file is fragmented, it has to do some guesswork to reassemble the file because the road map to the file that was stored in the FAT is no longer available.

Now that we've discussed fragmentation and discovered how it happens, let's look at what to do about it. If you have DOS 6, you can use the Defrag command. If you use an earlier version of DOS, you can get a defragmentation program either separately or as part of a disk utilities package. (In fact, the defragmentation program that comes with DOS 6 is a version of a program created by Symantec, which produces the Norton Utilities.) Defrag may not have all the bells and whistles of other software. but it gets the job done.

Defrag works on one of two levels. First, it can identify all of the fragmented files on your disk and move them to areas where they will fit contiguously. Or it can rearrange the files on your hard disk so that none is fragmented and all are packed together at the front of the disk. This latter option es-

sentially rewrites every file on your disk.

Today's defraggers have come a long way since the earliest versions, but because defragmenting involves your entire database, it's wise to take a few precautions: Have a current backup in case something goes wrong, run Chkdsk to make sure your disk has no lost clusters or file allocation errors, and disable any networks and multitasking software such as Windows or task switchers.

DOS 6's Defrag requires a lot of memory. If you receive Insufficient Memory messages, try to free up as much memory as possible by eliminating all TSRs. If memory remains a problem, borrow some memory from your graphics adapter using the following procedure: Add the parameters I=A000-BFFF and NOEMS to the CON-FIG.SYS command that loads EMM386, restart the computer, and then run the defragmentation program by typing defrag /g0.

After Defrag has finished its work, remove the parameters you added to the EMM386 line in CONFIG.SYS.

The A000-BFFF memory range is commonly used by video cards to display graphics screens. This procedure borrows that block of memory for use by the operating system. The /g0 switch used when starting Defrag instructs the program to run in text mode rather than graphics mode, avoiding a conflict over that block of memory.

Once you get the hang of using Defrag, you can automate the process by using DOS 6's multiple configuration feature to create a setup that runs Defrag. When you do this, you can use the /b switch on the Defrag command line to cause your system to reboot itself after Defrag has finished doing its work.

A badly fragmented hard disk degrades system performance by bogging down file access.

The

Before you sink a penny into MS-DOS* 6, consider a better way to maximize the return on your PCs—the new PC DOS 6.1 from IBM.

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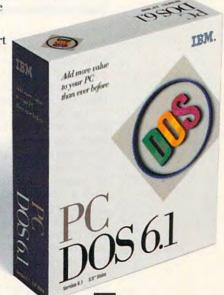
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Enhanced editor	×		
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market.



WINDOWS WORKSHOP

Clifton Karnes

ROBOHELP 2.0

Last issue, I talked about how to get the most from Windows Help from a user's point of view. This month, I'm going to talk about creating your own Help files.

Theoretically, the only tools you need to create a Windows Help file are the Help compiler (HC30.EXE or HC31.EXE) and a text editor that can produce ASCII text files, which the Help compiler reads and compiles. The Help compiler comes with most development systems, including the Win-

With RoboHELP 2.0, creating Windows Help files is a snap.



dows SDK, Visual C++, and Borland C++. You also get the Help compiler with most Helpauthoring tools.

Although you can create Help source files with an AS-CII text editor, the Help compiler's native format is RTF (Rich Text Format), which is a little frightening to work with in its raw form. It's much easier to create Help source files with a word processor that can export RTF. Word for Windows has excellent RTF support (Microsoft invented RTF), and it has become the standard for Help authors.

Information on creating Help is sparse, but one excellent source is the Microsoft Help Authoring Guide, a Help file itself that explains Help file creation. It's available on the Windows SDK forum on CompuServe and on the Microsoft Developers Network CD. I haven't mentioned the MSDN CD before, but it's an indispensable tool for all Windows developers and professionals. It's

a quarterly CD-ROM that boasts the entire hypertext documentation of the SDK, Visual C++, Petzold's Windows 3.1, and scores of other references. It also has lots of programs and useful information, including the Help Authoring Guide and other Help-authoring aids.

Back to creating Help, Using a word processor like Word for Windows instead of a text editor makes creating Help files easier, but it's still hard work. You have to put in the codes for topics, jumps, and graphics all by hand. And after you've saved your file, you have to compile it with the Help compiler, which, amazingly, is DOS based.

After you've gotten your feet wet with creating a few simple Help files, you'll begin to realize that this should be easier than it is.

Coming to the rescue is Blue Sky Software with Robo-HELP 2.0 (619-459-6365. \$495). This program is a superb tool that turns Word for Windows into a Windows-based integrated development environment for Help, much the way Visual C++ and Visual Basic are integrated development environments for programs.

Everything that has to do with Help file creation and maintenance is automated with RoboHELP. The program installs a floating toolbox in Word and adds several items to Word's menus. To build a topic, you simply click on the Topic button. The program prompts you for titles and keywords. Creating a jump is just as easy. You click on the Jump button, and RoboHELP asks you where you want to jump. Creating pop-ups is a snap, too.

RoboHELP also has excellent support for embedded graphics, so managing BMP and MRB files is easy. In fact, you can do just about everything you'll ever need to do | doesn't get any easier.

with a Help project from Robo-HELP without ever having to write a line of code. If you're familiar with creating Help files. you'll know all about the Help project file, which has an HPJ extension. With RoboHELP. you'll probably never have to edit this file by hand.

One area in which Robo-HELP really shines is Help macros. As you may know, the Help engine provides a set of macros that you can use yourself. (These macros should really be called functions. The macro name probably comes from the fact that Windows Help was developed by the Excel group.) These macros do things like print the current topic, set bookmarks, and the like. When you tell RoboHELP you want to embed a macro. it automatically supplies a list of all the available macros. You simply click on one, and RoboHELP puts the code in your Help document.

When it's time to compile. you just click on the Compile button. RoboHELP runs the DOSbased compiler engine in the background, gathers any error messages, and displays them in a window for you. You never have to see a DOS screen. In fact, unless you knew otherwise, you'd probably never guess that the Help compiler is a DOS program.

When you compile, if you find errors, RoboHELP will display the error messages and offer you a short explanation of what each error message means. If you've tried to decipher Help compiler error messages before, you know what a boon this is.

After you've successfully compiled your program, you can run it from Word by clicking on another button on Robo-HELP's toolbox. If you're getting the impression that this program is wonderful, you're right. Creating Help just

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PROGRAMMING POWER

Tom Campbell

DI-OGIX: BETTER THAN I THOUGHT

One of the great pleasures of being a columnist is that I get to see software I'd otherwise miss. A perfect example is diogix from On Top Systems (P.O. Box 676, Northbrook, IIlinois 60065-0676; (708) 291-0214). It's billed as application development software with a spreadsheet, support for multiple printers, Btree database manager with support for dBASE and ASCII files, portability to UNIX systems, and an advanced report writer. It's a character-based environment without mouse support, and it looks and feels like a spreadsheet all the way through. With its \$99.95 price for a single-user DOS version up through \$249.95 per UNIX user, I figured that each person who used di-ogix applications (as opposed to the developer, who wrote them) had to buy a copy. If programmers had to sell all the applications they developed using di-ogix with what was effectively a \$100.00 runtime charge per copy, it seemed overpriced despite the low single-user cost. I didn't notice this clear statement on the brochure: "Applications may be distributed with di-ogix runtime royaltyfree."

This is an interesting product because in 1993, it will probably appear to pundits as a good five years behind the times. Without Windows support or its own GUI or graphical print preview or requirement of 75 megabytes of disk space (would you settle for 2 megs plus change?), di-ogix would seem to be a product out of a distant era. Yet its usefulness was immediately clear to me. The phenomenal appeal of spreadsheets has produced a vast army of people who are programmers but I

who don't think of themselves that way. Spreadsheets aren't terribly difficult to learn. Typically, they're in a matrix layout, with columns given the names of successive letters across the top (the first column is A. the second is B, and so on). Rows are given numbers starting with 1. Spreadsheets think most naturally in numbers, so to enter a number, you just move the highlight (a cursor that normally fills one cell at a time) and start typing. To apply a subroutine called an @function (pronounced "at function") to those cells, you use the name of the formula, which normally starts with an @ sign. For example, to add up all the numbers in the first three cells of the first column (A1, A2, and A3), you'd type in, say, cell A4 the @function @SUM(A1..A3). You can combine normal math operators such as + and - and @functions into formulas. You can enter text in cells and use formulas that act on text. There are built-in @functions for just about everything, and the spreadsheet also lets you display numbers using different formatting. Dates, for example, are normally stored as numbers but are formatted for display via a date formula as dates.

Last but not least, spreadsheets have a seductive immediacy about them. Because they show the results of formulas instantly, they allow you a lot more experimental latitude than pencil and paper, promoting insane bouts of fiddling with mortgage payments, project schedules, and even small database applications.

While the @function approach isn't elegant, millions of people know it by now. Once you've learned spreadsheet basics, there's little else to trip you up. This product capitalizes on spreadsheet strengths and goes the spread- ogix before you give up.

sheet one further by giving the user all the tools necessary to create stand-alone applications for anything from a protected-mode 386 to an 8088 dinosaur. There are @functions for advanced data entry (long a spreadsheet bugaboo), menus, relational database work far beyond what spreadsheet users are accustomed to, file and disk access-everything a developer needs. (Almost. The debugger costs extra, but you can get by without it if you're underbudgeted.) Even if you don't know spreadsheets or if you've found BA-SIC or C too hard, you'll find diogix capable of producing significant works with only a few weeks of study. If you know spreadsheets, that time estimate will drop to a few days. This program has the best tutorials I've ever seen on a commercially released product; they make up an entire training manual and provide step-by-step examples of all its major features. If you find learning software difficult because manuals take too much for granted, the di-ogix training manual will be a revelation. The reference isn't quite as close to the mark. It's underindexed and lacking in some information (such as details on file formats, which the tech people happily provided), and it's sprinkled with gaseous "inspirational" epigrams that did nothing to improve my reading experience, Ironically, the sample applications are OK but not nearly up to the product's

This product is up to just about any small business, charitable organization, or club task, and you can give away or sell your programs with a free runtime version that's included in the price. If you've found traditional programming languages too complex or slow, take a long, hard look at di-

Spreadsheets have a seductive immediacy about them because they show results instantly.

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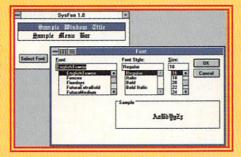


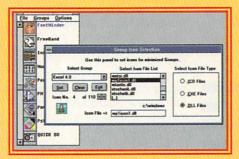
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TIPS & TOOLS

Edited by Richard C. Leinecker

Windows One-Liners

Windows is great for doing almost everything. But there are plenty of times I know a DOS shortcut that could save some steps. Or often, I just feel more comfortable doing something from DOS. But using these options usually means running the DOS prompt, doing what I need to do, and then typing exit to return to Windows.

I've devised an easier way. I use QBASIC to perform the DOS function and use the nice features Windows has to

make it easy to call.

Start by running QBASIC, typing in the program I've written called DODOS.BAS, and saving it. Just for your own reference, I saved it to my C:\DOS directory. You don't have to do exactly this, but in my instructions later, I explicitly name this as the place where I saved it. If you save it to a different directory, make the substitution when following the directions to set up the Windows icon.

PRINT "Enter your one-line DOS command (or Enter to abort)"
INPUT A\$
IF A\$ = "" GOTO OUTOFHERE SHELL A\$
PRINT "Press any key to return to Windows . . ."

GETKEY:

A\$ = INKEY\$

IF A\$ = "" GOTO GETKEY

OUTOFHERE:

SYSTEM

With the BASIC program saved, go to Windows. Pick the window in which you want the DOS command icon to appear. I used the Accessories window. Click in this window, and go to the Program Manager's File menu and select New. Make sure the Program Item button is selected when the dialog appears. Click on the OK button.

For my description I typed in Single DOS Command. For my command line I typed in qbasic /run c:\dos\dodos.bas. For my working directory I typed in c:\dos. It's important to note here that the BASIC code and the QBASIC program are both in my C:\DOS directory. If either is different, change the command line entry accordingly.

The last thing I did was to make the BASIC program easy to use by entering in a shortcut key. I pressed Shift-Ctrl-D. Anytime I want to run a single-line DOS command, all I do is press Shift-Ctrl-D, and it runs the BASIC program.

When the program runs, it tells me to type in the line I want to execute (or I can press Enter to skip it). The command is executed, and then I press a key to return to Windows. It's all much easier than using the DOS prompt.

ELMER W. ALLISON
APO

Graphic Boxes

WordPerfect 5.1's cross-references feature (Alt-F5, 1) gives you a great way to cite page numbers of specific points in a long document. You do have to be careful where you put a cross reference. You cannot, for example, put a cross reference in the text area of a graphic box. But you can reference graphic boxes by placing a page-number Target reference (Alt-F5, 1, 2) in the graphic box caption.

If page space forces the graphic box to bump to a following page, the page-number reference will still be generated correctly.

WILLIAM WOLFE CHAMPAIGN, IL

More Typewriting

In the June 1993 issue you have a tip that makes your key-

board into a typewriter. It works pretty well, but there's another way that works well, too.

At the DOS prompt type copy con prn and press Enter. From that point on, what you type will be sent to the printer. Once you're done, press F6 and Enter.

EDGAR F. GARWOOD HUDSON, FL

Path Additions

Sometimes I want to add a directory to my path for a short while. I used to simply retype my path statement with the addition. After doing that far too many times, I discovered a better way in the form of two batch files. The first one, called ADDPATH.BAT, adds a single directory to your path statement. The second one, called RESTPATH.BAT, restores the path to whatever it was before you ran ADD-PATH.BAT the last time.

This only works correctly if you add and restore in pairs. Make sure your path in AUTOEXEC ends with a semicolon. Any semicolon you type when adding to your path will be ignored. Here is the listing for ADDPATH.BAT.

@ECHO OFF SET OLDPATH=%PATH% SET PATH=%1%PATH%

Here is the listing for REST-PATH.BAT.

@ECHO OFF SET PATH=%OLDPATH%

THOMAS E. HINES III KANSAS CITY, MO

Personal Backups

Running complete backups is very time-consuming. I've written a batch file called QBACK.BAT to back up only my personal data files. It's quick, and the backups fit on a single high-density floppy

Running a one-line BASIC program from Windows and using your keyboard as a typewriter

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disk. Modify it to suit your own needs.

@ECHO OFF ECHO Place backup disk ECHO in drive A. PAUSE PKZIP -BC -U A:\ROOT C:*.* PKZIP -BC -U A:\WININI C:\WINDOWS*.INI PKZIP -BC -U A:\WORKS C:\MSWORKS*.W?? PKZIP -BC -U A:\GRAFFIX C:\GRAPHICS*.c??

You must have the program PKZIP located somewhere in your path. The -U switch processes only new or modified files. The -BC switch makes PKZIP use drive C for its temporary files so that the entire space of the floppy can be used

The result is a floppy with ZIP files containing the files I need to save. They're only the latest versions of the files on my hard drive.

ALEX FREIBERG SOUTH YARRA, AUSTRALIA

Finding Your Roots

Here is a little tip that I have found useful. Some programs that I run either change directories or need them changed before running. I wanted a good way to return to the same directory I started from.

I have seen several tips in the past that suggested saving the directory using the CD command and then using Debug to shorten the outputs, thus creating a batch file containing one line that had the current drive and one line that had the current directory with CD \ before it.

So with that idea in mind. I wrote SAVEDIR.

debug savedir.com File not found

-e 100 b4 19 cd 21 00 06 30 01 -e 108 b4 47 b2 00 be 38 01 cd -e 110 21 bb 38 01 43 80 3f 00 -e 118 7f fa c6 07 0d 43 c6 07 -e 120 0a 43 c6 07 24 b4 09 ba -e 128 30 01 cd 21 b4 4c cd 21 -e 130 41 3a 0d 0a 43 44 20 5c

CX 0000

:38

Writing 0038 bytes

When you run Checksum on

this program, you should see the number 04660 on your screen. (The latest Checksum program can be found in the July 1993 "Tips & Tools.")

Here is a sample batch file that might use it.

@ECHO OFF SAVEDIR > C:\BAT\RESTDIR.BAT

CD \WP51\DOCS\AR\MAR93 WP REPORT.WP RESTDIR

When I exit WordPerfect, I am returned to the directory that I started in on the drive that I started from. The batch file above assumes that I have a directory named BAT that is in my





path. It creates a batch file with DOS redirection that later it invokes to return to that exact place.

BRADLEY M. SMALL GREENSBORO, NC

One-Line Time

I get tired of having my computer stop for a new time entry each time I type time at the command line. Usually, I don't want to set the time. I just want to know what time it is.

Here's a QBASIC program I use in place of my Time command. It's called TIME.BAS.

PRINT TIME\$ SYSTEM

Then I created a batch file

called T.BAT, which I placed in my DOS directory.

QBASIC /RUN TIME.BAS

Whenever I want the time, I just type t and press Enter.

Since QBASIC also has a DATE\$ function, you can easily adapt this tip to print the date without DOS pausing for input afterward.

ROBERT BIXBY GREENSBORO, NC

Even Less Time

Not satisfied with the previous tip, which causes the QBASIC screen to flash before the time is displayed, I came up with the following set of batch files that display the time and date without going through BASIC.

The first set is for MS-DOS, and the second set works with 4DOS.

Here is TDOS.BAT, which displays the time if you are using MS-DOS.

@SET OP=%PROMPT%

@SET PROMPT=\$T\$_

@SET PROMPT=%OP%

Here is DDOS.BAT, which displays the date in MS-DOS.

@SET OP=%PROMPT% @SET PROMPT=\$D\$_ @SET PROMPT=%OP%

Here is T4DOS.BAT, which displays the time in 4DOS.

@echo % time

And finally, the following pro-

gram is D4DOS.BAT, which can be used to display the date in 4DOS.

@echo %_date

BRADLEY M. SMALL GREENSBORO, NC

If you have an interesting tip that you think would help other PC users, send it along with your name, address, and Social Security number to COMPUTE's Tips & Tools, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. For each tip we publish, we'll pay you \$25-\$50. All tips submitted become the property of General Media International.





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HARDWARE CLINIC

Mark Minasi

CMOS FAILURE

I got a letter from a reader in Sioux City, a fellow named Chuck Rearden. Chuck had a common problem: Something had blown away his system's setup information, and he didn't know where to get the information to restore it.

The best solution to this sort of problem, as it turns out, is fairly simple (but not obvious), so I thought I'd share it

with you.

"I did something dumb, and now I'm paying for it,' Chuck told me in his letter. "In the cold of our dry South Dakota winter, I walked into my office and touched the case of my PC. I felt the shock of a static zap jump from my finger to the PC's case, and when I turned my PC on, my worst fears were confirmed.

"I got a message saying CMOS memory checksum failure, press F1 to continue. I didn't know what that meant. but it didn't look good. So I pressed F1, but then all I got was a message saying disk boot failure.'

By the time I got Chuck on the phone, it was three weeks after the date of his letter. He'd progressed a bit. In three weeks. Chuck had learned what a CMOS memory checksum failure is.

"I've found out that I've got to fix the CMOS information with a program called Setup, which is built into my computer," he explained. "I can only get into it when booting the system; if I press the Delete key. the Setup program appears.

"It needs to know a bunch of information about the computer, but most of it's pretty simple. It wants to know the date and time, and that I can handle, and even filling in the type of floppy drives isn't too hard—the dealer helped me out with that. I didn't touch the display type, as it said VGA/ PGA/EGA. I left it untouched. even though I've got Super VGA, because there wasn't an option for Super VGA, and the dealer told me to leave it as is.

"What stumps me, and the dealer too, is the drive type. Setup needs to know the number of cylinders, sectors, and heads, and the write precompensation—whatever that is for the hard drive. I don't know the information, and the dealer. . .doesn't, either. So we're stuck until I can find out how the drive's laid out.'

One of the more annoying events in any PC support person's life (or any PC owner's life) is dealing with a four- or five-year-old computer that's lost its setup information (also known as its CMOS data). The CMOS includes data that is, in general, easy to retrievewhat kinds of floppy drives you've got and how much memory is in the system.

But losing the CMOS does cause one major problem: You lose the drive type information. Setting up the CMOS again for a hard drive requires that you know four things about a drive: how many read/ write heads in the drive, how many cylinders on the drive, how many sectors on each hard disk track, and which cvlinder to start doing write precompensation on (don't worry about write precomp).

Sometimes you'll lose your setup information by overwriting it or by some electrical or mechanical mishap, but most commonly the CMOS is lost because the battery that maintains the CMOS information runs out of power-usually about three to five years after you've purchased the computer. If the CMOS's battery loses power, then the CMOS forgets what it knows about your system. When you power it up, the computer detects that the CMOS's battery is dead and

what kind of equipment is in me-what kind of floppies, display, hard drive, or even the date or time. If you press F1, then I'll take the best guess that I can." Unfortunately, its best guess about hard drive type is that there's no hard drive at all. Since the system thinks that there's no hard drive present, it only tries to boot from the floppy. The floppy drive, however, probably doesn't contain a bootable floppy, so the boot-failure message appears.

Many people find that when the battery gets low, the date and time are fine, but the other CMOS information is gone. That's fairly common. The clock is maintained by a simple clock circuit, but the other information is maintained by a memory circuit. Memory circuits draw more power than clock circuits, so it's quite reasonable for the clock to continue to keep fairly accurate time despite the loss of the CMOS memory.

Anyway, back to solving the problem. As the computer is about four or five years old (which is, again, the life expectancy of the average CMOS battery), you've probably mislaid the documentation (if you ever got it in the first place) about the hard disk. How are you to find out the disk's geometry? (For geometry, read the number of heads, cylinders, and sectors.)

One surefire approach is to take the cover off the computer, remove the hard disk, and look for a model and serial number, like XTOR-TECH model E425523-SW. You'd then find the number for the hard disk maker, call, and ask what the geometry of the hard disk is. There are, however, two problems with this method. The first problem is that it's a pain in the neck to have to remove the drive, find a phone numsays, in effect, "I have no idea | ber for the vendor, and try to

How can you find out vour hard drive type when you lose your setup? Use **Norton's Diskedit to** find that hardto-trace information. Upon purchase of a

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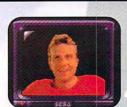
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trademark of LucasArts Entertainment Company. STAR WARS is a registered trademark of Lucasfilm, Ltd. Used under authorization. ©1593 SEGA, 3335 Arden Road, Hayward, CA 94545. All rights reserved. Sega CD unit made in Japan. Software made in the U.S.A. get through to the tech support department. The second problem is that many manufacturers have gone out of business in the past five years, so you may not find anyone to talk to anyway.

Fortunately, there is a better way. The vital statistics for most disks are sitting right on the disks themselves.

Every hard disk that's ever been used in a PC has been partitioned, a process usually performed by the Fdisk program. Partitioning was originally created to allow multiple operating systems to coexist on a single hard disk, but you (or the person who sets up your computer) must partition the disk even if that means allocating the whole disk to just one partition. The information that describes how a disk is partitioned is stored in an area called the partition table. which is part of the master boot record, or MBR, which is on every PC disk.

Partition information describes each partition by including both its starting address—which cylinder, head, and sector it starts on—and also its ending address—which cylinder, head, and sector it ends on. Assuming that whoever set up the disk used all of it, the coordinates of the last cylinder, head, and sector on the partition should also be the coordinates of the last cylinder, head, and sector on the disk.

The MBR is always located at cylinder 0, head 0, sector 1. Cylinder 0/0/1 is readable from drive type 1 (a 10MB drive description), and drive type 1 will make any hard disk's MBR readable. It won't make it bootable, but it'll make it readable. So you can boot from a floppy and use a disk utility to read 0/0/1.

Putting this all together, you can find out the vital statistics on any mystery disk by following these steps.

Step 1: Create a bootable floppy disk, and put the Norton program DISKEDIT.EXE on it. It's part of the Norton Utilities (and has been since version 2.0). My explicit instructions will be for version 7.0.

Step 2: Boot from the floppy containing Diskedit.

Step 3: Run your PC's Setup program. Under hard disk drive type number, you'll see that it probably says drive type 0 or no hard disk. Change it to drive type number 1.

Step 4: Run Diskedit by typing diskedit c: at the command line. If you see a message box warning you that Diskedit is in read-only mode and that no changes that you make to the disk with Diskedit will be actually written, that's fine because you don't want to accidentally make things worse by overwriting information on your hard disk. Just press Enter to clear the message box.

Step 5: Diskedit may complain about your hard disk not making sense; that's to be expected, so just tell Diskedit to ignore any problems. Don't let Diskedit make any changes to your system.

Step 6: You'll see a menu across the top of the screen with these options: Object, Edit, Link, View, Info, Tools, and Help. You pull down a menu by pressing the Alt key and the first letter of the menu option, so press Alt-O to pull down the Object menu. The Object menu starts off with the options Drive and Directory. Look for an option that says Partition Table Alt+A. If this option is grayed out, you'll have to choose the Drive menu selection. (If Partition Table Alt+A isn't grayed out, just skip to the next step.)

You'll see a dialog box asking which drive to edit and whether the drive is a logical or physical disk. Select the radio button for Physical disks,

and select Hard Disk 1.

Step 7: Now tell Diskedit to get the MBR and show you the partition table inside it. Just press Alt-A to tell Diskedit to load the MBR into memory. and then press F6 to tell Diskedit to show you the partition table within the MBR. You'll probably see one or two partitions; look at the partition whose ending location contains the larger numbers. For example, the disk that I'm looking at reports an ending location of side 15, cylinder 993, sector 63 (what Setup calls heads, Diskedit calls sides). Write down the side, cylinder, and sector numbers.

Step 8: Exit Diskedit (press Esc and then confirm that you want to exit the program).

Step 9: Assuming that whoever originally partitioned this disk used up all the cylinders, that would mean that the last sector on my particular disk was the sector at cylinder 993. head 15, sector 63. That implies that there were 994 cylinders on this disk, because the first cylinder's number is 0. not 1. It also implies that the number of heads is 16, because the first head's number is also 0. For some reason, sectors are numbered starting with 1, not 0 (don't ask me why; I have no idea), so if the last sector is 63, the number of sectors is also 63. So add 1 to the cylinders and sides to get total numbers of cylinders and heads, and don't do anything to the sectors to get total numbers of sectors.

Armed with this knowledge, you can then match these values to your system's drive table to find out which drive type the disk is. On more modern systems, you wouldn't find a drive type; instead, you'd pick drive type 47, the user-definable type, and directly punch in 994 for the cylinders, 16 for the heads, and 63 for the sectors.

The information that describes how a disk is partitioned is stored in an area called the partition table, which is part of the master boot record.

SUMO HEAD BUTTS, SONIC BOOMS, WHIRLWIND KICKS, DRAGON PUNCHES, BUTT CRUSHES, FIREBALLS, SPINNING PILEDRIVERS

















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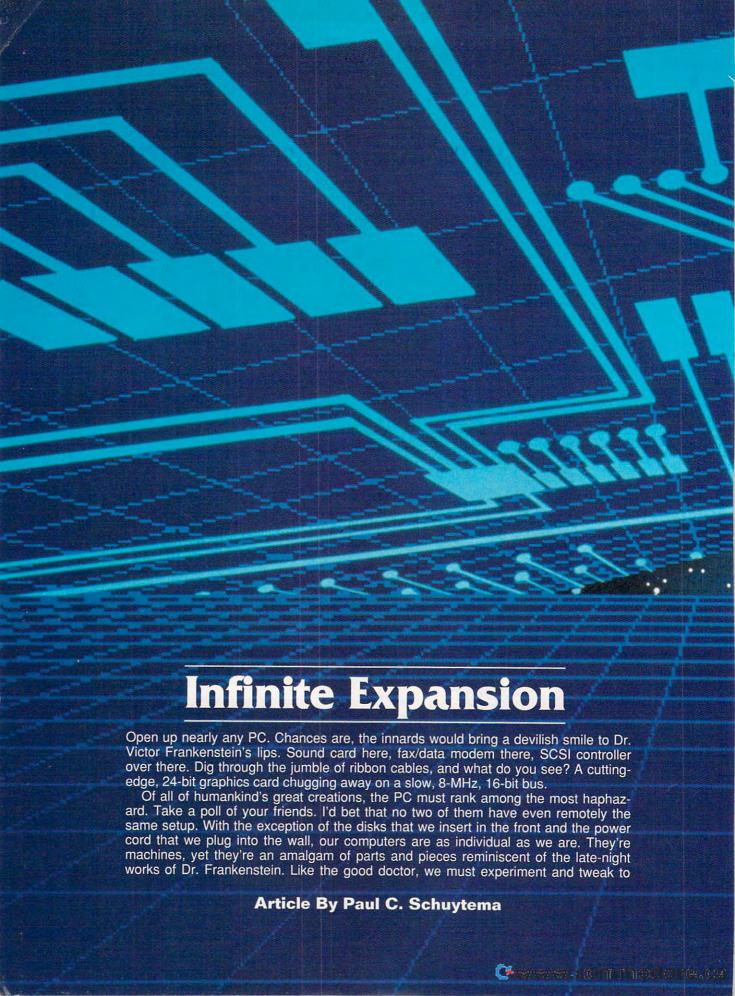


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nectability first became an issue and standardization had only begun to be a concern.

S-100

The first bus standard was known as the S-100, short for Standard 100 (so designated because it was the de facto standard and was based on a clip that had 100 pins). Back in 1975, when Popular Electronics and MITS (originally a model-rocketry company) decided that it would be a good idea to produce a kit for building a computer, they came up with the Altair 8800, a rather ignoble beast which sold beyond anyone's wildest expectations. Yet this primordial PC was nothing more than a glorified box, an energy leach which communicated through front-panel switches and lights.

To work, it needed connections. The designers thought that making these connections modular—in a bus—would be more efficient than having the connectors on the computer board itself. A bus would also allow third-party manufacturers to produce enhancements for the Altair that the user could simply plug in. So the S-

100 bus was born.

Not much planning went into the S-100. In fact, it featured 100 pins simply because MITS happened to get a good deal on a surplus of 100-pin connector clips. Now, planning and forethought dominate the world of PC buses. Committees and manufacturing groups are constantly working on creating new bus standards. Yet, what, really, is a bus? In the simplest terms, a bus is a physical channel (wires, pins, or circuit board paths) between the CPU (Central Processing Unit) and the other components of a computer, such as a disk drive controller or video board.

The ISA Bus

While the S-100 remained the de facto standard for a number of years, and the IEEE (Institute of Electrical and Electronics Engineers) attempted to improve and refine it in 1983, the S-100 had the unfortunate luck to exist in the calm before the revolution. Not until IBM released the PC did the personal computer industry take off. The old PC (and the XT that followed) featured 62line expansion slots which provided an 8-bit, 4-MHz data path to the CPU. This bus is commonly known as the 8-bit ISA (Industry Standard Architecture; pronounced "eye-sah") bus. It wasn't long before IBM upped the ante and introduced the 286-powered AT.

The 286 was a 16-bit CPU, and so the engineers at IBM developed a 16bit expansion bus. Yet they didn't want to leave the PC users, or that established base of expansion boards, in the dust. So the new bus was an extension rather than a reworking of the old bus. An additional connector was added in line with the old connectors, so a user could plug in an XT board, or a newer AT board. The 16-bit ISA bus was born.

This bus was the data highway between the CPU and the peripheral components, and it provided a 16-bitwide path that operated at 8 MHz. In the early days of the AT and clones, a speed of 8 MHz wasn't such a bad deal, since it was the speed of most processors. It's difficult to remember in this day and age that the 286 CPU of the original AT-for Advanced Technology—was an 8-MHz chip. Later, as CPUs gained speed, some manufacturers attempted to match the bus speed with the CPU, with unpredictable, even dangerous, results. Eventually, 8 MHz became the standard speed for the ISA bus. This speed is not much of a disadvantage for such things as modem boards. which operate at slow speeds anyway. Instead, the limitation is felt when a memory, video, or SCSI board. which has the potential to keep up with the processor, must be reined down to 8 MHz.

Darwinian Revolution

Currently, the ISA bus is the industry standard, based on sheer numbers

alone. Yet this bus's limitations proved to be a turning point in the evolution of the PC.

Most 486 PCs still communicate with their components through an ISA bus. As a result, most boards will work on most computers, offering a myriad of choices for the user. Yet this standard forces a 50-MHz, or even 66-MHz, 486 to communicate with its expansion cards at 8 MHz. If Dr. Frankenstein were to look over our creation, he'd be shocked to see the equivalent of his giant's cardiopulmonary system fitted with the smallest of capillaries and nothing else.

The ISA bus is far from being ready for the charnel house, however, Recently, Microsoft and Intel announced a plug-and-play modification for the ISA bus specification. While not changing the speed of the bus, this enhancement will mean easier installation of components. When it comes time to install a new board, you won't have to fiddle with DIP switches, trying to find that combination of addresses that makes the card work in concert with other peripheral devices. Instead, you'll plug in a board and let software set it up. This type of autosensing is a key element of the more advanced expansion buses and has been employed for several years in the NuBus on Apple's Macintosh computers. These new plug-and-play boards should start popping up near the end of 1993.

Glossary

bus. Most basically, a physical pathway between the various hardware devices that make up a computer. A computer can have several buses, such as the CPU's data bus, a memory bus, a local bus, and an expansion bus.

bus master. An expansion device which temporarily takes charge of the bus, controlling data transfers in and out of memory without help from the CPU.

data throughput. The actual amount of real information that is either transmitted through a bus or processed by a device. Not all information that leaves a bus necessarily counts as real information; some information might be redundant or be part of some error-checking system.

intermediate bus. A bus connected to the CPU's data bus through a buffering controller which is responsible for the speed and timing of the data operations. The PCI bus is an example of an intermediate bus.

local bus. A hard-wired expansion bus between a connector and the CPU data lines. A local bus allows a device, such as a video controller, to operate at the same speed as the CPU.

megahertz (MHz). A unit of frequency representing one million cycles per second, often used to describe a computer's clock rate or its raw, internal speed.

plug-and-play card. An expansion card that configures itself, either with an installation program or during boot-up.

SCSI. Small Computer System Interface. SCSI could be considered another bus standard, but one that requires a controller to fit into a computer's standard bus socket. A SCSI interface is often used to control hard drives or CD-ROM drives.

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The MCA Bus

IBM took notice of ISA's shortcomings. When the first of the 32-bit Intel CPUs—the 386—appeared, IBM incorporated a new 32-bit bus architecture into its PS/2 line of computers: the MCA (Micro Channel Architecture) bus.

The MCA bus is software-compatible with the ISA bus, but that's where the similarities end. IBM attempted to make a bus that would grow with the advances in hardware, featuring a tight bundle of specifications and the ability to perform bus mastering (an operation in which a component actually supersedes the CPU and has free rein of the bus for a time, greatly speeding up operations). The MCA bus also allows components to enjoy direct memory access instead of putting in requests for memory access via the CPU.

Yet for all its technological advancement, the MCA bus is already on its way out, atrophying in the highspeed world of computer advancements. The MCA bus is not physically compatible with any other bus; a board must be specifically designed for use with the bus. The MCA design specs are the property of IBM, which is not providing board manufacturers with easy access to the information. Basically, any third-party vendors who wish to manufacture MCA boards must re-create the bus themselves. spending precious R & D dollars, and then pay IBM a percentage of the gross sales of the board for the privilege of using the bus. As anyone who watches the PC market can tell vou. that procedure is unlikely to gain the MCA bus any champions.

EISA Bus

The MCA bus was developed by IBM to speed up expansion bus operation and to bind developers to Big Blue (as IBM is known in the industry). But it caused resentment among other computer makers who objected to its nonstandard design and were rankled by the notion of paying IBM a premium. As a reaction to the MCA bus, a group of makers of PC clones and compatibles got together and developed a competing standard, one which was both hardware- and software-compatible with the ISA bus. They dubbed the new standard the EISA (Extended Industry Standard Architecture) bus.

Physically, an EISA (pronounced "ee-sah") expansion slot looks the same as an ISA slot, except that it's deeper. An ISA card will fit into the slot, connecting with one set of pins, while an EISA card will fit further into the slot, connecting with the EISA

When Is a Bus?

Two other interesting bus alternatives deserve mention. One is the SCSI (Small Computer System Interface) which allows up to seven peripherals to be daisy-chained (linked device-to-device)—in theory, though most SCSI devices for PCs have a somewhat proprietary standard that prevents daisy-chaining, requiring that you use a dedicated ISA card for each SCSI device. Emerging solutions like CorelSCSI and SCSIWorks make it possible to daisychain even these recalcitrant SCSI devices, however.

The parallel interface is emerging as a sort of bus. The mother of this invention was the necessity to link peripherals to pre-PCMCIA laptops. Most of these computers had parallel interfaces, most of which were wired in such a way as to provide enough control to drive a sound card or a CD-ROM drive (for example).

Although SCSI is a brilliant idea for linking peripherals to a very small computer (one without room for an internal bus), its implementation in the PC has made it a minor pawn in the bus game. And although the parallel interface was the focus of a lot of inventive design for a year or so, it lost its spotlight when the PCMCIA standard emerged and was instantly embraced.

-ROBERT BIXBY

pins. The bus will allow quite a number of expansion cards to run concurrently on a system, like the ISA bus. The EISA bus is a 32-bit bus, meaning that it can transfer information in 32-bit chunks, matching the input/output (I/O) of the 386DX and 486 processors. The EISA standard, like MCA, also supports bus mastering.

EISA does have two inherent problems, however. To insure ISA compatibility, the bus must operate at 8 MHz. Also, since an EISA board fits into deeper slots, an EISA system cannot easily see differences between ISA and EISA boards on the same system—setting the user up for some potential addressing conflicts.

Local Bus

A local bus is a data path which is connected directly to the CPU's own data bus and operates at the speed of the CPU. When computer evolution was in its earliest stages, most buses were of the local variety. The data channels were purely proprietary in

nature, designed for a particular version of a particular machine. As computers became more commonplace, and many manufacturers were creating all types of devices for them, this nonstandardized method fell by the wayside as manufacturers adopted buses such as the S-100 bus.

Recently, as the boom in graphical user interface (GUI) computing hit the industry, a performance bottleneck became increasingly apparent. The ISA bus's 8-MHz speed was simply too slow to handle the video demands of Windows, with its monstrously large, constantly changing bitmaps. The local bus seemed once again to be an answer.

Motherboard manufacturers developed proprietary buses designed to fit their own graphics accelerators, and local-bus video was born. Take a look at the mail-order computer ads from the summer of 1992. You'll find that ads for local-bus video systems abounded. (If you look very carefully, you'll find that perhaps one in ten of these systems—the most expensive ones—were touted as VESA local-bus systems. But more about this later.)

Basically, these local-bus systems were task-specific buses connected directly to the CPU's data bus before any of the other hard-wired connections or the ISA bus, thus improving performance.

While one problem was solved, however, another more serious problem surfaced. This bus had no true, binding standard. Local-bus cards bought from one company would not work on another company's computer. And in the fly-by-night world of PC clones, if a company went out of business, the consumer was out of luck in finding updated drivers to make the most of the high-speed video. I purchased a computer during that summer; it wasn't advertised as a local-bus system, but the motherboard does feature two local-bus slots. Unfortunately, the OEM company is now out of business, and the motherboard was manufactured in a faraway country, so the local bus is now only a vestigial organ on my machine, an appendix that does neither harm nor good.

VL-Bus

Fortunately, the local-bus concept met with enough support to necessitate the development of a standard bus configuration. Enter VESA (Video Electronics Standards Association), an organization which represents the interests of more than 60 computer and component manufacturers, and which is developing an industrywide implementation of the local bus.

Physically, the 112-pin connectors

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for the VL-Bus are placed in line with the EISA/ISA slots. The VL-Bus is a 32-bit bus which will run at the speed of the processor. Currently, the VL-Bus is optimized for 486 systems up to 66 MHz, but the standard will soon be expanded to support Pentium processors. By operating at the speed of the CPU, the VL-Bus can transfer information at a rate of over 100MB per second. The bus, like MCA, EISA, and PCI (see below), supports bus mastering.

The VL-Bus is designed primarily to provide a rabbit-quick connection for video cards, but it can also be used for other high-speed applications such as SCSI controllers or ultrafast ISDN devices. Only three components may use the VL-Bus on one computer—which is just as well, since running three devices will slow the system down considerably. This probably won't be much of a problem for single-station computers for several years, but it might be more limiting for a file server.

PCI Bus

The latest evolution of the PC bus is Intel's PCI (Peripheral Component Interconnect) bus. Like the VL-Bus, the PCI is a standard created by a group representing the computer industry, this time the PCI Special Interest Group, headed up by Intel.

PCI is an attempt to move bus technology forward in one large step. Instead of being a local bus, connected directly to the CPU's data bus (and being tied to the processor's generation), it's an intermediate bus, which is controlled by a dedicated buffering chip. The bus is still a full-featured 32-bit data path which can operate at 33 MHz and claims (on paper, as of this writing) a data throughput speed in excess of 130MB per second.

The bus is designed to connect a wide array of components and has been forward-engineered to take advantage of 64-bit processors (read *Pentium*), cranking the speed up to 264MB per second. The bus is also engineered to work at the 3.3-volt power level of today's power-savvy processors and notebooks. The PCI version of bus mastering allows a device to utilize the bus while the processor is still processing other data.

The PCI bus is designed for plugand-play installation, meaning that no PCI board, whether video, HDTV, or SCSI, will have on-board jumpers to be set and reset. Everything is configured through software. The PCI bus will also allow shared slots, meaning that the PCI connector is placed in line with the ISA/EISA connectors, but it will not disable them. It is possible, then (for example), for a single board

PCMCIA

In the world of buses, there's another standard which is rapidly growing in prominence but which isn't necessarily a bus, in the true sense of the word. I'm talking about the PC Card standard, sometimes called the PCMCIA, after the standards organization (the Personal Computer Memory Card International Association) that developed it.

The PC Card is designed primarily as an expansion system for subnotebook computers, but the flexibility of the bus means that PC Card devices will start popping up everywhere, from camcorders to desktop PCs.

The PCMCIA 2.0 Standard, formalized in September 1990, is more than just a physical bus technology; it's a standard that describes file formats, data structures, software links, and standards for accessing the card's hardware features, regardless of the type of system in which the card resides. The specification even allows for program code to execute directly from the card, independent of any system memory.

As a bus, the PCMCIA standard is a relatively primitive 16-bit pathway, but the PC Card can access up to 64 megabytes of memory, and a system could, in theory, have over 4000 cards connected to it (think of the potential for building surveillance systems!).

The PC Card is another plug-andplay card that will configure itself, but it's also more robustly designed than any of the standards mentioned in the article, meaning that unexpected power-downs, or even putting the card in its slot upside down, won't hurt either the card or the system.

The area of a PC Card is roughly the same as that of a credit card, but the card comes in three thicknesses. The thinnest, 3.3 mm, is for memory cards and nonvolatile storage systems (which keep their contents even when the computer's power is turned off). The 5-mm thickness is for such devices as modems, and the thickest, at 10.5 mm, can house miniaturized hard drives and other components that require more room.

to contain a PCI video controller and an ISA sound device.

The PCI bus is designed to handle both motherboard-mounted devices (such as a single-chip VGA system) and expansion cards; a typical PCI bus could handle three cards and four motherboard-mounted devices before becoming overloaded.

Not only has PCI has made headway into the future of the PC, but Apple has committed to the PCI bus and has joined the Special Interest Group. Soon, Apple's Macintoshes will be featuring both NuBus and PCI capabilities. It's just another sign of the evolution toward a completely modular, standardized PC architecture.

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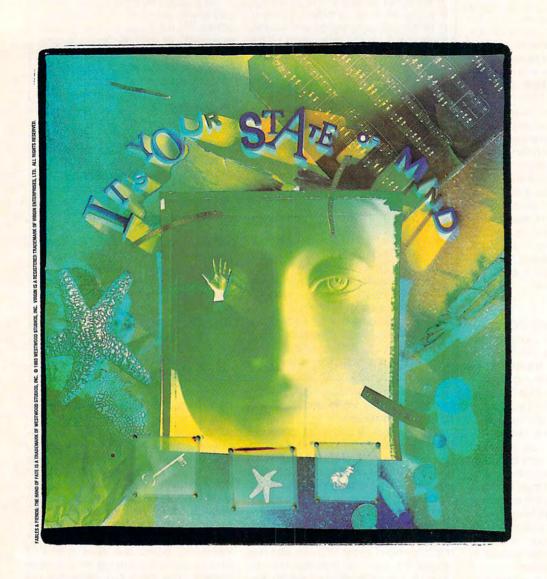
On the one hand, computer expansion buses are abstract concepts; on the other, they are horrendously technical conglomerations of voltage specifications and data paths. For an educated PC user, a knowledge of the basic differences and design concepts of the various buses can make that next board or computer purchase less of a mystery tour.

So, which bus is best? That's as loaded a question as you're likely to find. One thing is certain: You should stay away from proprietary local-bus systems. Their life expectancy is just too unpredictable. Is ISA dead? Not

by a long shot-and the new plugand-play standard should help it remain the de facto standard for several years to come. Even though the 8-MHz speed may seem ponderously slow when compared to VL-Bus or PCI performance, the ISA bus is a data highway that's more than wide enough for 90 percent of your computing needs. If you do a lot of graphics work, or if you're like me and live in Windows, either the VL-Bus or PCI bus would be a smart bet on your next system. The EISA bus probably fits into the smallest useful niche, as the bus of choice for LAN file servers. The 8-MHz speed is more than adequate, and the 32-bit-wide pathway will prevent bottlenecks.

As for the future of PCs, the onesystem/one-bus approach will probably no longer hold. According to Mike Bailey, chairman of the PCI Special Interest Group steering committee, computers four to five years down the road will probably feature a mixture of three buses: an ISA or EISA bus for standard devices, a local or intermediate high-performance bus (either PCI or VL-Bus) for such things as display and SCSI controllers, and a PCMCIA bus for multisystem connections. For the moment, it might be best to wait and watch, and see which bus garners the most support in terms of products being produced.

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WHAT MAKES A **MULTIMEDIA PC?**

BY DAVID ENGLISH

Just when you thought it was safe to buy an MPC (Multimedia PC), they introduce MPC Level 2. What's going on here? What do you really need to put together a decent multimedia PC?

First, a bit of multimedia history. When Microsoft, Tandy, AT & T. NEC, Creative Labs, Media Vision, and a bunch of other companies announced the multimedia PC in November 1990, they set the standard low so that they could sell a lot of MPCs at a reasonable price. The initial MPC standard called for a 10-MHz 286 or faster processor. At the time, there was a lot of talk about a 286 not being up to the task, but Microsoft's official line was that if a 286 could run Windows, it should

also be able to run Multimedia Windows. (Microsoft tried to discourage the name Multimedia Windows for the version of Windows that shipped with the new MPCs. Fearing that people would be confused by different versions of Windowsclearly no longer a concern-the company tried to push the more politically correct Microsoft Windows graphical environment 3.0 + Multimedia extensions 1.0.) By September 1991, MPCs and MPC upgrade kits were shipping, and

the MPC standard was off

to a slow-but-steady start.

The year 1992 brought three important changes. First, the Multimedia PC Marketing Council, the body that was given authority over the MPC standard, quietly increased the minimum required processor to a 16-MHz 386SX. Second, Windows 3.1 brought the multimedia extensions (most importantly, the sound-card and CD-ROM drivers) into mainstream Windows. And finally, we saw a gradual growth in the number of innovative CD-ROM titles, with such standouts as Just Grandma and Me, Compton's Interactive Encyclopedia, and Microsoft Cinemania.

In 1993, the titles have expanded to include such luminaries as The 7th Guest, The Animals!, and Microsoft Encarta. The year has also brought us the MPC Level 2 specification, which promises to raise our multimedia applications to a whole new level.

Briefly, the MPC Level 1 standard calls for at least a 16-MHz 386SX with 2MB of RAM, VGA display (640 x 480 with 16 colors), a 30MB hard drive, a sound card capable of 8-bit digital sound, and a CD-ROM drive that can move data at a sustained rate of 150K per second with a maximum average seek time of 1000 milliseconds. The two weakest links of the Level 1 chain are the processor (these days, you need at least a fast 386DX) and VGA display (many MPC titles either don't run in 16 colors or look pretty awful when they do; you really need 640 x 480 with 256 colors).

The new MPC Level 2 specs are designed to better accommodate the MPC titles that include photorealistic graphics and full-motion video clips (usually Video for Windows or QuickTime for Windows). The standard

calls for at least a 25-MHz 486SX with 4MB of RAM, a Super VGA display (640 x 480 with 65,536 colors), a 160MB hard drive, a sound card capable of 16bit digital sound (CD quality), and a CD-ROM drive that can move

data at a sustained rate of 300K per second, has a maximum average seek time of 400 milliseconds. and is CD-ROM XA ready and multisession capable (for use with Kodak's

Photo CDs). Level 1 machines will still be available as lowend starter MPCs, but you should consider buying a Level 2 machine if you're looking to buy a multimedia PC. Given today's low prices, you should be able to find Level 2 MPCs for as little as \$2,500. Creative Labs (408-428-6600) and Media Vision (800-348-7116) have already announced Level 2 upgrade kits that include a 16-bit sound card and double-speed CD-ROM drive. Creative Labs' Sound Blaster DigitalEdge CD package costs \$999, while Media Vision's Fusion Double CD-16 and Pro 16 Multimedia System cost \$799 and \$1,199, respectively. All three packages include a bundle of CD-ROM-based multimedia applications. Currently, Level 1

If your multimedia PC meets the Level 2 standard in some respects but falls back to Level 1 in other respects, don't worry that you won't be able to run MPC software. Most titles won't be written exclusively for Level 2, but will simply support the higherstandard components where available.

upgrade packages are available for as little as \$400.



MULTIMEDIA PC

BY DAVID ENGLISH

You wouldn't watch TV with the sound turned off, yet most of us have the sound turned off in Windows. Granted, Windows isn't vet an all-talking, all-dancing, all-singing kind of operating system, but there's a lot you can do with Windows and a half-decent sound card. Over the next few pages, we'll explore what kind of hardware you'll need in order to add sound to Windows, which kinds of audio Windows can work with, and which software lets you create and manipulate this audio.

All in the Cards

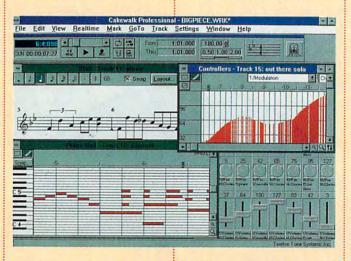
Before we talk about the wonderful things you can do with Windows and sound, we need to discuss what kind of hardware you'll need. The quick answer is a sound card and a pair of speakers. The sound card can be either an 8-bit or a 16-bit card (or one of the inbetween 12-bit cards), though 16-bit cards are inexpensive enough that I wouldn't recommend anything else these days.

When you hear people talk about 8-bit and 16-bit sound cards, they're not talking about cards that require an 8-bit or 16-bit bus. They're talking about the sampling rate of the card. A 16-bit card can theoretically sound as good as an audio-CD player (theoretically, because electrical interference from the motherboard

and adjacent cards can degrade the sound). With its lower sampling rate, an 8-bit card will have more inherent noise and won't be capable of reproducing the high frequencies that a 16-bit card can handle. In other words, a 16-bit card can sound as good as the CD player in your home stereo system, while an 8-bit card can

Yamaha's OPL2 or OPL3) for Ad Lib compatibility. This allows a sound card to play back the computer-sounding music and sound effects that DOS games have been using since the middle 1980s.

Microsoft's specifications for Windows audio include the 8-bit DAC and ADC of the Sound Blaster and the



sound only as good as an inexpensive FM radio.

The sampling portion of a sound card uses a DAC (Digital-to-Analog Converter) and an ADC (Analog-to-Digital Converter). This provides the Sound Blaster compatibility. Most cards include Sound Blaster compatibility so you can play the wide variety of DOS games that use it for realistic music, voice, and sound effects. Most cards also include an FM-synthesis chip (usually

FM synthesis of the Ad Lib card as a minimum standard. Most sound cards designed specifically for Windows also support the Sound Blaster and Ad Lib standards for DOS games, though some don't. A few cards, such as Turtle Beach's MultiSound and Microsoft's Windows Sound System, will soon offer DOS game compatibility through a small TSR program that you'll load when you boot your system.

Five-Star General

Many sound cards significantly improve on the FM synthesis portion of the card by offering General MIDI, either built in or as an optional chip set. General MIDI uses the actual sounds, usually stored in ROM, to re-create musical instruments. When an FM chip creates a trumpet, it approximates the sound mathematically. When a General MIDI device creates a trumpet, it calls up the actual wave information based on the recording of a real trumpet. Most of today's professional synthesizers use this same technology to create musical instruments that are virtually indistinguishable from the originals.

General MIDI brings this highly realistic sound to inexpensive consumer products, such as computer sound cards. By 1994, the majority of sound cards should have General MIDI built in. Yamaha has even announced a new version of the FM chip, called the OPL4, that includes General MIDI.

For a preview of just how good General MIDI can sound in a computer program, check out the best-selling CD-ROM game, The 7th Guest. When installed with a General MIDI device, its music sounds like a fully orchestrated movie score.

If your present sound card doesn't have General MIDI or offer it as an add-on,

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don't worry. Most sound cards offer a MIDI interface that can hook up to an external General MIDI device, such as Roland's Sound Canvas (\$399-\$895), Yamaha's TG100 (\$449), and Yamaha's Hello Music! (\$449).

Weakest Link

So you've bought a greatsounding 16-bit sound card and maybe even have General MIDI. Now what? If you're like most of us, you'll scrimp on the speakers. possibly hooking up an old pair lying around the house. You can do that, of course, but you should consider investing in a pair of powered speakers that are magnetically shielded. You'll want powered speakers because the two- to four-watt amplifier on most sound cards just doesn't give you much volume. In fact, you can barely hear your sound card with many small speakers. Some cards also provide a separate output that completely bypasses the often-inferior built-in amplifier. You'll want magnetically shielded speakers because the magnets in your speakers can permanently scramble the data on disks you place on or even near them, as well as temporarily distort the image on your monitor if you place your speakers beside it.

How much should you pay for a pair of powered

speakers that are magnetically shielded? They start at about \$40 for the least expensive pairs from companies such as Koss and Labtech. Yamaha (714-522-9011) makes an excellent pair for \$149, called the YST-M10. For top-of-the-line sound, check out the Altec Lansing Multimedia ACS-300 (Altec Lansing Con-

sound Windows can produce. Windows 3.1 supports two major categories of sound: waveform audio and MIDI audio. Waveform audio is recorded sound that's usually stored in files with the WAV extension. Once you associate these files with a program that can play WAV files, such as Windows' Media Player



sumer Products, 800-258-3280, \$400 a pair) and the Power Partner 570 (Acoustic Research, 800-969-2748, \$475 a pair). The Yamaha, Altec, and Acoustic Research speakers sound so good that you may also want to use them with your CD player or Walkman.

The Sound and the Fury

Now that you have an idea of the hardware you'll need, let's look at the kinds of

(MPLAYER.EXE) or Sound Recorder (SOUNDREC-EXE), you can simply load up Windows' File Manager, double-click on a WAV file, and hear the sound. Many Windows games and multimedia CD-ROMs use WAV files, so you can give them a listen, copy the ones you like, and alter the sounds using one of the sound-editing programs that we'll look at later in this article.

While MIDI files can play music, much like WAV files,

they have a radically different structure-which gives them both advantages and disadvantages. Instead of storing the actual sound, MIDI files contain the control commands for a MIDIcontrolled musical instrument. These control commands consist mainly of note-on, note-off, pitchchange, instrumentchange, and volume information. Because a MIDI file stores only the bare essentials of a musical performance, the music in a MIDI file can take as little as 1/100 the space on your hard drive that music of the same quality would take in a WAV file. On the other hand, because a MIDI file contains only control commands, it's highly dependent on the quality and availability of a MIDI device. WAV files sound essentially the same with any sound card, while MIDI files can vary dramatically according to the quality of the MIDIbased musical instrument. In addition, WAV files can store any kind of sound, whether it's instrumental music, narration, or sound effects (essentially whatever you can record with a microphone). MIDI files can reproduce only the kinds of sounds that the accompanying MIDI device is capable of reproducing (usually 128 or more specific instrument sounds).

As if that weren't confusing enough, Windows

VSTO SOUND

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MILITIMEDIA PC

Home Recording Studio

So you bought a 16-bit sound card, high-quality microphone, and powerful sound-editing program, such as Sound Forge 2.0 or Wave for Windows 2.0. You've put together a firstclass digital home recording studio, right?

Assuming your sound card is properly shielded to protect itself from electrical interference from your computer's motherboard and other cards, you really can record audio that sounds as good or nearly as good as an audio CD.

Keep one thing in mind, though. At audio-CD quality (16-bit stereo sampling at 44 kHz), each minute you record will take up approximately 10MB on your hard drive. Before you mix down that new album you're working on, you might want to order an extra-large and extra-fast hard drive (can you say the word gigabyte without fainting dead away into your chair?). You'll also need a fast processor to handle the huge amounts of data that will be moving through your machine.

Another solution is to purchase a dedicated recording system such as Yamaha's CBX-D5 Digital Recording Processor. It's controlled by your PC's software, but it uses its own set of SCSI-based hard drives. The CBX-D5 includes a built-in DSP (Digital Signal Processor), has DEQ (Digital EQualization), provides four-track 16-bit recording, and works with any Windows 3.1-compatible PC. Of course, you'll have to fork over \$2,995 for the CBX-D5 and another \$400-\$2,000 for a SCSI hard drive. but you did you say wanted first-class home recording studio,

manipulate sound files. In fact, with a capable 16-bit

THE STATE OF

Jazz: A Multimedia History. The New Grolier Multimedia Ency-clopedia, and hundreds of other Win-dowsbased multimedia applications. You'll be ab-le to capture and play back softwarebased video files using Video for Windows and QuickTime for Windows. And you'll be able to add audio to your presentations.

Altec Lansing Multimedia ACS-300 speaker system

with programs such as Action! and Compel.

Second, you can add sounds to your various Windows system events. While it's true that this isn't really a serious use of sound, that's the point-to have some fun. It's a way to personalize your computing environment. For instance, I use the computer sound effects

from "Star Trek: The Next Generation" for my system sounds. They're short and unobtrusive, and they create a high-tech mood. In the past, I've used HAL 9000 recordings from the movie 2001: A Space Odyssey ("Human error" for an error message and "I'm completely operational, and all my circuits are functioning perfectly" for a Windows startup sound). Sound

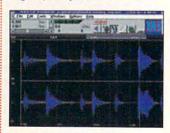
didn't you?

Source Unlimited (800-877-4778) sells collections of sounds from both the original "Star Trek" and "Next Generation", as well as a collection of sounds from 2001 (\$59.95 each). Micro-soft (206-882-8080) offers similar col-

lections of movie, cartoon, and musical instrument sounds, called Sound-Bits (\$39.95 each).

The third thing you can do with Windows audio is to

sound card and sound-editing program, you'll have the makings of a near-studioquality digital editing system. I'm not exaggerating, either; we're talking about high-quality stereo record-



Wave for Window 2.0

ing direct to your hard drive, with cut-and-paste editing and nondestructive digital effects, such as echo, reverb, flange, fade, reverse, volume, and pan. Sound-editing packages such as Wave for Windows 2.0 (Turtle Beach, 717-843-6916, \$149) and Sound Forge 2.0 (Sonic Foundry, 608-256-3133, \$179) let you alter sounds in ways that

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IULTIMEDIA PC

Top Windows Sound Downloads

What are people downloading these days in audio software? Here's a list of some of the most popular audio downloads from CompuServe's Windows Fun Forum (type winfun). It's a good indication of what people are doing these days with Windows audio.

Speakr. An alternative to Microsoft's PC speaker driver. Hear WAV files through your PC's internal speaker without a sound card. 5245 downloads.

Wave After Wave 2.5. A WAV file, MIDI file, and audio-CD player for Windows that includes drag and drop, file deleting, and command line playing. 3428 downloads.

Wave Editor. Includes filtering and transform capabilities, as well as FFT transforms. 2619 downloads.

WinWay. Lets you attach WAV files to many Windows system events. Includes quarterly and hourly chimes. 2350 downloads.

WavConv. Converts sound files among the popular sound file formats. 2173 downloads.

CD Player 2.0. Lets you catalog your audio CDs by title, artist, track times, record label, and musical category, as well as play up to 30 selected tracks of your CD from Windows, 2067 downloads.

Whoop It Up!. Attach WAV and MIDI files to Windows applications, message box icons, and system events, 1989 downloads.

Sound Blaster Pro Win 3.1 Drivers. The latest Sound Blaster Pro drivers for Windows, 1888 downloads.

EXCUSE.WAV. A WAV file from "Star Trek: The Next Generation" with Data saying "Excuse me." 1857 downloads.

WinMOD Pro. A MOD file sequence player for Windows. Lets you play MOD format sound files (popular with Amiga computers) on your PC. 1127 downloads.

PC Sound Glossary

ADC. Short for Analog-to-Digital Converter. A circuit that converts an analog audio signal into a digital audio signal. See also analog, digital, and DAC.

analog. An audio signal whose fluctuating voltage pattern reflects the structure of the original sound. See also digital.

CD-DA. Short for Compact Disc-Digital Audio. Also known as Red Book audio. The CD-quality audio that comes directly from a coventional audio CD or CD-ROM.

DAC. Short for Digital-to-Analog Converter. A circuit that converts a digital audio signal into an analog audio signal. See also analog, digital, and ADC.

digital. An audio signal that has been converted into

numbers that no longer directly reflect the structure of the original sound. See also analog.

General MIDI. An extension of MIDI that establishes a standard set of 128 instrument sounds that are grouped in a standard order. See also MIDI.

Hz. Short for hertz. A unit used to measure the frequency of a vibrating object, such as a violin string or the cone in a speaker. Also known as cycles per second. The human ear can hear from approximately 20 Hz to 20 kHz (20 to 20,000 Hz).

MIDI. Short for Musical Instrument Digital Interface. Pronounced "middy." A digital communications protocol that allows electronic musical instruments and computers to communicate with each other. Because

MIDI sends performance information (such as note on, note off, pitch change, instrument change, and volume) rather than actual musical sounds, it's a highly efficient way to store and transmit musical data.

MIDI interface. A serial hardware device that allows a computer to send and receive MIDI data.

MPC. Short for Multimedia PC. Any computer, upgrade product, or software title that conforms to the standards set by the Multimedia PC Marketing Council.

multimedia. The combination of graphics, sound, animation, and video in a single software program. Sometimes only two or three of these elements are needed in order for a program to be called a multimedia program. Also, any PC, upgrade product, or software title that conforms to the MPC standard.

sound card. Also known as a sound board. An expansion board you place inside a PC that improves the quality of the PC's sound output. A program must support the sound board before it can benefit from the board's improved sound quality.

synthesizer. An electronic musical instrument that can generate simple or complex sounds. Most synthesizers include a MIDI interface and a keyboard, though synthesizers without a builtin keyboard are becoming more common.

waveform audio. A technique for re-creating voice and sound effects using digital audio samples. Under Windows, waveform audio is generally stored with the WAV extension.

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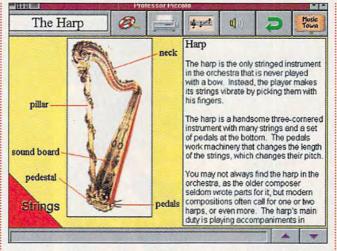
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MULTIMEDIA **PC**

completely operational, and all my circuits are functioning perfectly" for a Windows startup sound). Sound Source Unlimited (800-877-4778) sells collections of sounds from both the original "Star Trek" and "Next Generation", as well as a collection of sounds from 2001 (\$59.95 each). Microsoft (206-882-8080) offers similar collections of movie, cartoon, and musical instrument sounds, called Sound-Bits (\$39.95 each).

The third thing you can do with Windows audio is to manipulate sound files. In fact, with a capable 16-bit sound card and sound-editing program, you'll have the makings of a near-studio-quality digital editing system. I'm not exaggerating, either; we're talking about high-quality stereo recording direct to your hard



Opcode Interactive's The Musical World of Professor Piccolo

drive, with cut-and-paste editing and nondestructive digital effects, such as echo, reverb, flange, fade, reverse, volume, and pan. Sound-editing packages such as Wave for Windows 2.0 (Turtle Beach, 717-843-

right? Not exactly. There

are several ways you can

add sound to your Win-

dows-based laptop.

6916, \$149) and Sound Forge 2.0 (Sonic Foundry, 608-256-3133, \$179) let you alter sounds in ways that recording studios would have killed for just 10 or 15 years ago. Turtle Beach also offers an excellent introductory sound package for Windows, called Turtle Tools (\$89). It includes a relatively powerful wave editor, several useful MIDI utilities, and a CD-ROM with over 300 sound effects and musical pieces.

Sound Off

I've only skimmed the surface of what you can do with Windows and sound. With a sound card becoming a necessary component of any new PC and talk of adding audio circuitry to many new motherboards, expect to see some exciting new audio technologiessuch as voice recognition and video conferencingbeing integrated into your everyday computing environment. With all this new audio technology, you won't be able to keep Windows quiet any longer.

How to Add Sound to Your Laptop

Laptops run on batteries and can't use sound cards, so you can't have sound on a laptop,

Buy a parallel-port sound device. These small boxes plug into your parallel port and offer sound that varies from adequate (when using the device's built-in speaker) to excellent (when connected to high-quality speakers). Most work well with Windows programs, with

full support for WAV files and limited support for MIDI files (using FM synthesis). DOS support is also limited, varying from no DOS support (Logitech's AudioMan) to support for most DOS programs only when they run under Windows (Media Vision's Audioport) to support for most DOS programs running under DOS (DSP Solutions PORTI•ABLE These Sound Plus). devices run on batteries, so they won't directly drain your laptop's own batteries, though you may encounter some slight drain from the additional use of the parallel port.

Buy a PCMCIA sound card. If you have a laptop with a Type II PCMCIA slot, you can use the MediaShare Tempo (MediaShare, 619-931-7171,

\$295). It's a PCMCIA sound card that can play WAV and MIDI files in Windows and is compatible with DOS software that supports the Ad Lib and Sound Blaster standards. It even has provisions for a MIDI interface.

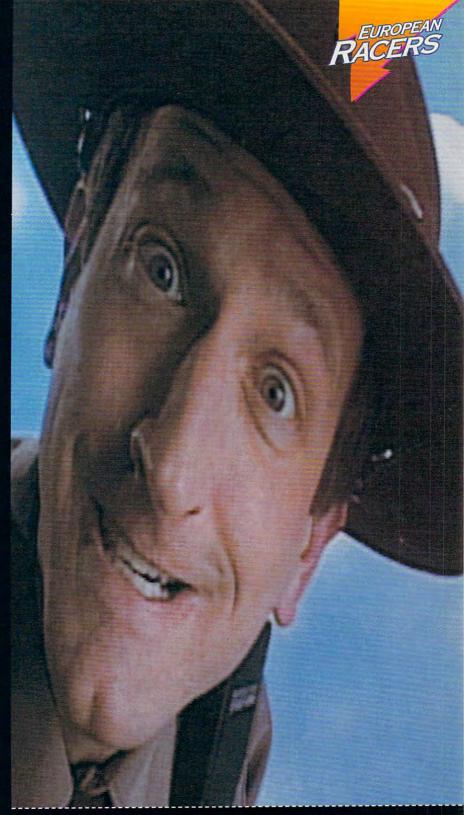
Try a PC speaker sound driver. Microsoft has developed a driver that lets your PC speaker play back WAV files. With some PCs, you can barely hear the sounds; with others, you may have interrupt problems in Windows. You can often find it online (on CompuServe, type go msl and download SPEAK-.EXE), and it's included in Sound Source Unlimited's WAV file collections. Even if you do get it to work, you'll find it doesn't work well with all kinds of sounds. Still, it's worth a try.

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Build an insanely sports ca as Tast as possible And laugh in the face of authority.



{Just don't cry when you're sharing a cell with a big fat guy who picks his nose.}



The game has tons of cool video clips just like this one. Only different



Break all kinds of laws in one of four European Racers. Integrated video clips give tips on equipment and weather conditions while you try to outrun the cops and race on four different tracks. 3-D animated instructions help you build a model of your car so you can remember what it looks like after you wrap it around a guard rail. Available for IBM on CD-ROM and Sega CD.



The model makes the game better. The game racks when he are the left ereal



NEW MULTIMEDIA PRODUCTS

Edited by Lisa Young and Phillip Morgan

OPEN WINDOWS TO FUN

Daily computer chores can get monotonous, but Moon Valley Software has developed a new multimedia product that will open your Windows to fun by replacing standard screen graphics with animated icons, cursors, and backdrops.

ROMaterial uses sight and sound as a weapon against boredom. Replacing ordinary wallpaper, ROMaterial's backdrops are color images that come to life as moving pictures. Fifty of the most popular icons in Icon Hear-It and Icon Do-It.



Moon Valley's ROMaterial

including the familiar happy face and oversize arrow cursors, are also featured with Moon Valley's new creations.

As you sift through the Windows menus and dialog boxes, you can hear any combination of impressions, languages, and sounds. ROMaterial features many of the sounds found on the original Icon Hear-It along with new vocal effects, including the voice of Ross Perot, the calls of animals, and the sounds of musical instruments.

ROMaterial requires Windows 3.1 and a CD-ROM drive.

Moon Valley Software (800) 473-5509 \$29.95

Circle Reader Service Number 530

MORPH TRANSFORMS WINDOWS

With Gryphon software's Morph for Windows, you can create the same special effects on your home computer that were used to transform objects in movies such as *Terminator II* and *Jurassic Park* and on recent television commercials.

Morphing is a twodimensional special effect that smoothly transforms one still image into another. Time used this technology when promoting its "Agony in Africa" issue. The magazine's commercial began with the image of a young child, which transformed into a skull and then became an image of the African continent. Crest also used morphing to advertise its baking soda toothpaste in a commercial. It began with a box of baking soda, which changed into a tube of toothpaste.

You can save each morph as a Video for Windows movie, or an FLI or FLC animation, and place it on videotape or film for commercial-quality output.



Morph for Windows

You can also save a single still image or series of images in a variety of common file formats including TIFF, GIF, and Targa.

Gryphon Software (619) 536-8815 \$169

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FlexCam from VideoLab

MULTIMEDIA COMES HOME

Now you can generate complete multimedia productions on your home computer with VideoLabs' FlexCam, the first integrated color camera and microphone system designed for desktop video and communications.

The FlexCam incorporates a high-resolution, color CCD camera and two microphones. It outputs color NTSC video and industry-standard, line-level audio to VCRs, video conferencing systems, and any other product that accepts NTSC or PAL video. Mounted on an 18-inch flexible wand for precise campositioning, the FlexCam is compatible with all popular video digitizing boards offered for Microsoft Video for Windows.

Because of its unique design, you can position the FlexCam directly in front of the screen for true eye-to-eye contact. With other systems, the camera is located to the side or on top of the computer, and you can only see the profile of the user. The flexible neck is also ideal for document capture and other desktop video uses.

VideoLabs (612) 897-1995 \$595 (in the U.S.) \$695 (elsewhere) Circle Reader Service Number 532

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Northwest, combines video
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notebook computers. The
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a computer-generated document.

Compatible with all DOS and Windows applications, the Presenter Video Capture can scan full-color video images with as many as 32,768 colors. You can use it with video recorders, digital cameras, camcorders, and any NTSC input device.

Weighing only 5.35 ounces, the Presenter Video Capture can be conveniently carried with your laptop or notebook computer, though it can also be used with any desktop. The unit simply plugs into a parallel port. All the required hardware and software are included in the package.

Consumer Technology Northwest (800) 356-3983 \$319

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MULTIMEDIA BY SUBSCRIPTION

Newsweek InterActive, a multimedia CD-ROM magazine created by the editors of Newsweek, is now available quarterly by subscription or by single issues at leading retail stores.

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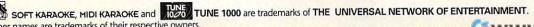


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Newsweek (800) 634-6850 \$129.95 (per year) \$49.95 (per issue)

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CHECK IT OUT

Your next visit to the local library could bring a few surprises. On the shelves next to the books, you may find an assortment of CD-ROM titles that you can check out and enjoy in your own home.

Compton's NewMedia, a publisher and distributor of CD-ROM titles, is offering libraries a specially marked series of reference, music, travel, business, and children's titles. Packages are available in assortments of 10, 20, and 40 titles and include display holders that make it easy for libraries to promote their new CD-ROM collections.

The library lending program is based on a similar program for video rental stores launched by Compton's NewMedia earlier this year. Following multiple reorders from the video stores, Compton's NewMedia has increased both the number of titles and the number of participating stores.

Under current law, software rental is illegal without approval from the software publisher. In this case, Compton's NewMedia has obtained the rights and will provide special discs and packaging earmarked for lending only to the participating libraries and video rental stores.

Compton's NewMedia (800) 344-2621 \$1,700 to \$3,800

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MULTIMEDIA GOES MULTIMARKET

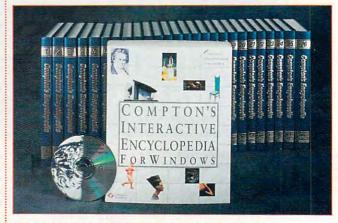
It may be some time before pixels supplant the printed word and bookstores become disc stores, but CD encyclopedias have already made their way onto booksellers' shelves. Compton's Learning Company and Compton's New-Media have put together The Compton's Combo, a true multimedia package to market through bookstores and software stores alike. It includes both the printed and CD-ROM versions of the 9-million-word Compton's Encyclopedia.

The package you buy in the store includes the first volume of the printed encyclopedia, as well as Compton's Interactive Encyclopedia for Windows on CD-ROM. The CD-ROM version includes the complete text of the printed version; sound, animation, and full-motion video; and Smar-Trieve, for natural-language text search. A mail-in coupon is included for the other 25 printed volumes, which will be shipped to you at no additional charge.

Compton's NewMedia hopes the Combo will encourage booksellers to add addi-

already available.

The system has an active vocabulary of 1000 words taken from a base vocabulary of 20,000. Developers can extend the vocabulary to include industry-specific terminology. Unlike many speech systems, ICSS doesn't require a pause between words or special training for users. According to IBM, number recognition will be highly accurate, so entering long lists of numbers into a spreadsheet won't be as tedious as it is



The Compton's Combo from Compton's NewMedia

tional CD-ROM titles to their shelves as CD-ROM drives become more common.

Compton's NewMedia (619) 929-2500 \$498

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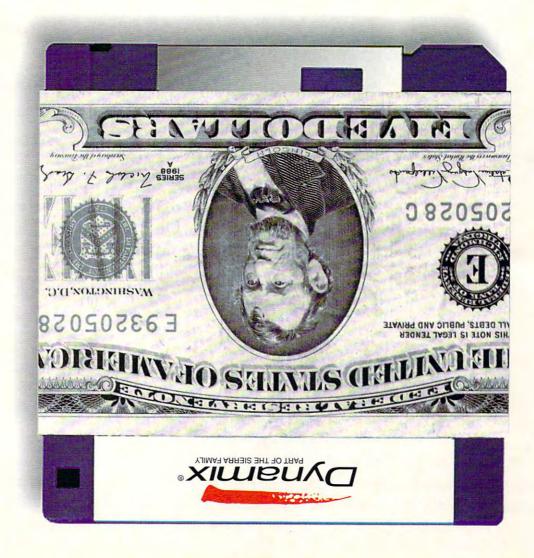
CAN YOU SAY "SUI"?

Talking to your computer might not be as futuristic as you think. IBM has announced a developer's toolkit that will allow software makers to produce Speech User Interfaces (SUI) for their Windows applications.

The IBM Continuous Speech Series (ICSS) for Windows is scheduled for release by the end of 1993. OS/2 and AIX versions are with a keyboard. Typos and transpositions could be virtually eliminated.

Lotus displayed a demo program of 1-2-3 using ICSS for OS/2 in IBM's booth at the recent PC Expo in New York WordPerfect showed its demo based on IBM's Speech Server Series (ISSS), a related technology. Neither company has committed to IBM, but it's apparently a strong contender. Future applications from these and other companies will likely use voice recognition for both navigation and dictation.

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