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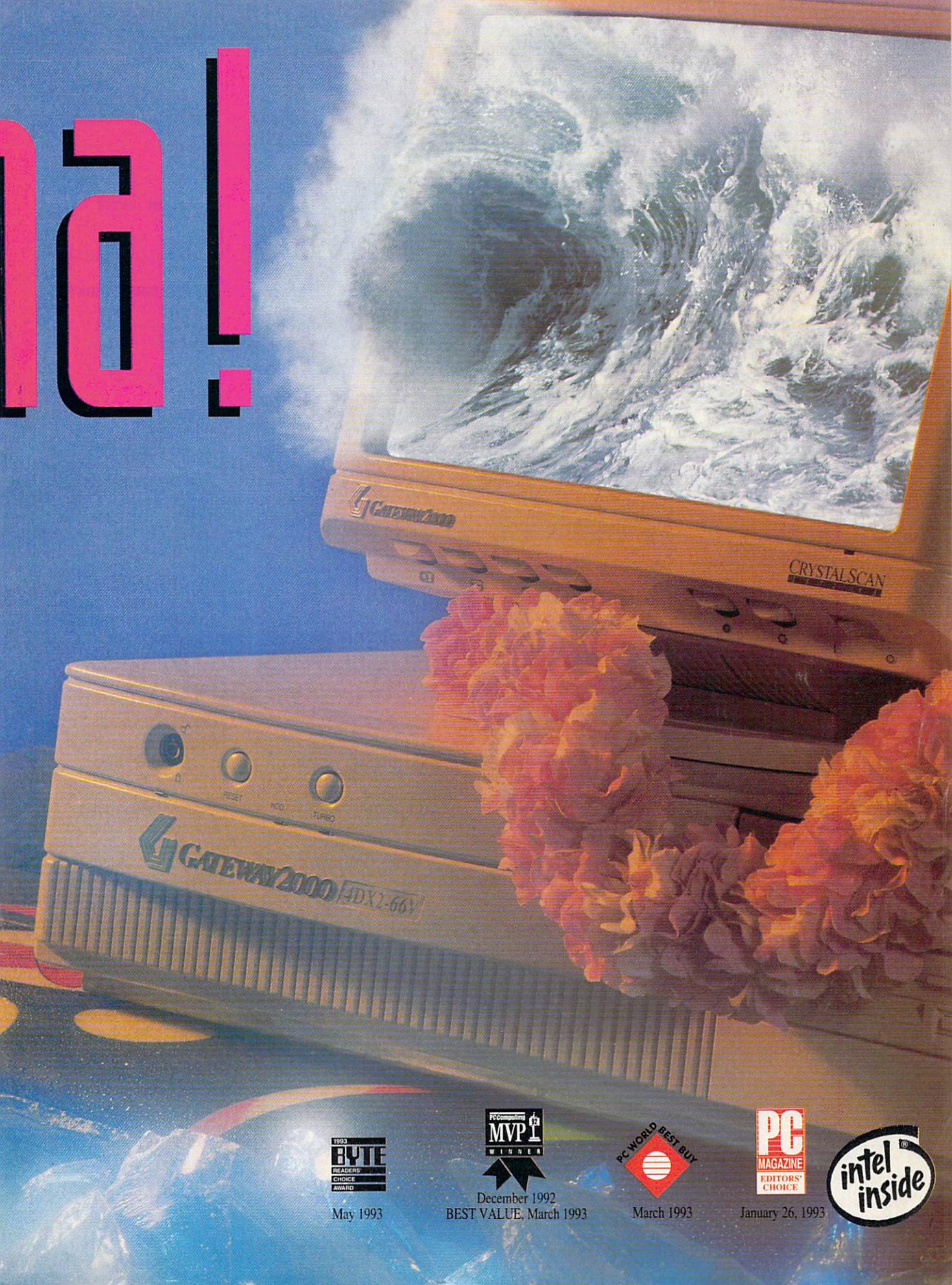
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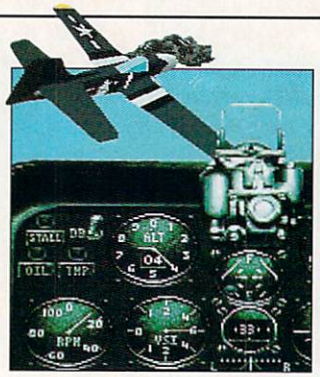

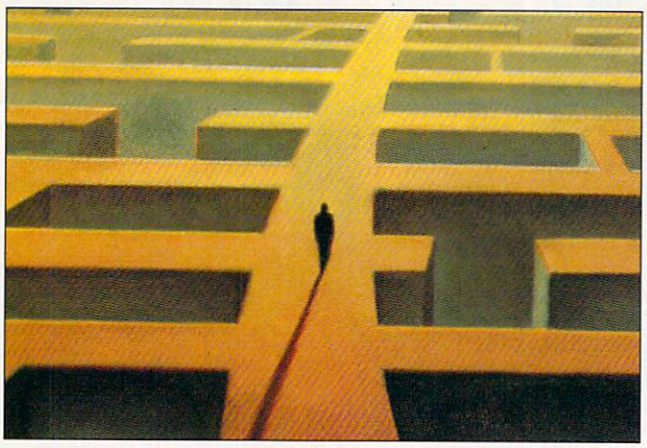

Cover photo by Mark Wagoner. Computer from Gateway 2000.

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COMPUTE (ISSN 0194-357X) is published monthly in the United States and Canada by COMPUTE Publications International Ltd., 1965 Broadway, New York, NY 10023-5965. Volume 15, Number 7, Issue 154.

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Distributed worldwide (except Australia and the UK) by Curtis Circulation Company, P.O. Box 9102, Pennsauken, NJ 08109. Distributed in Australia by The Horwitz Group, P.O. Box 306, Cammeray NSW 2062 Australia and in the UK by Northern and Shell Plc., P.O. Box 381, Millharbour, London E14 9TW. Second-class postage paid at New York, NY, and at additional mailing offices. **POSTMASTER: Send address changes to COMPUTE Magazine,** P.O. Box 3245, Harlan, IA 51537-3041. Tel. (800) 727-6937.

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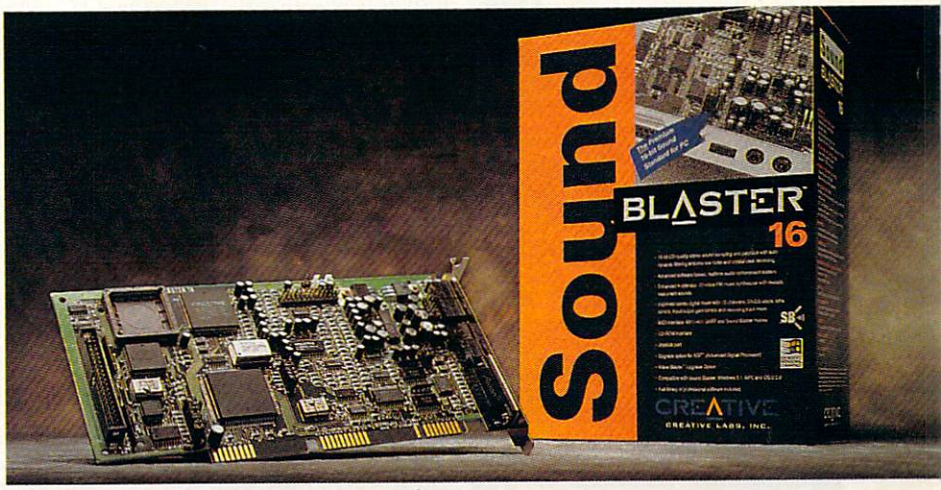

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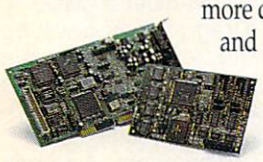

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Clifton Karnes

What's ahead for Windows and DOS? That's a question we all ask ourselves, and those of us in the business of following the PC industry ask it more often than anyone else. This past April, at the Windows Developers Conference in Boston, we received an answer.

At the conference, Microsoft made a presentation that focused on two things: OLE 2.0 and 32-bit Windows. However, the talk ranged over topics that included NT, Windows for TVs, and Chicago (Microsoft's newest hush-hush project).

It's clear that OLE is an extremely important technology to Windows' future.

First off, Microsoft sees three Windows families. The first family is Modular Windows, which includes Tandy's VIS (the only shipping product built on Modular Windows to date), the as-yet-to-be-developed WinPad operating system for PDAs (Personal Digital Assistants), Windows for TVs (a joint venture with Intel and General Instruments), and Windows Telephony (another joint venture with Intel). You could call this family consumer Windows, because that's clearly the market Microsoft is going after.

The next family is called personal Windows, and this group includes Windows 3.1, Windows for Workgroups, and the yet-to-be-announced Chicago project.

The last Windows family is Windows NT, which most of us have heard a lot about in the last year. NT, which stands for *New Technology,* is the corporate branch of the Windows family tree.

One thing that's worried some of us is the future of Windows 3.1. Will it be replaced by NT? From the evidence at the conference, it doesn't look as if it will be. Microsoft said that 89 percent of its future business is planned to come from its personal Windows products—Windows 3.1 and its successors—with the rest divided between Modular Windows and Windows NT.

So if personal Windows is so important, why the emphasis on 32-bit Windows? Most of us think of NT as the 32-bit version of Windows. Although that's true now, NT won't be the only 32-bit Windows around by 1994. Windows 4, planned for release next year, will be a full 32-bit operating system. Interestingly, DOS 7 will be part of Windows 4. And the Chicago project, mentioned above, consists of both Windows 4 and DOS 7. And what about Windows for Workgroups? Microsoft plans to include all the networking capability of WFWG in Windows 4, so WFWG will disappear as a separate product, just as Multimedia Windows did when 3.1 included multimedia support.

As you might expect, DOS 7 will be a full 32-bit operating system. It may even come close to the "DOS NT" columnist Mark Minasi talked about in his May "Hardware Clinic" column.

One thing's for sure: The difference between personal Windows and Windows NT won't be the difference between 16- and 32-bit operating systems. It will be the difference between an end-user version of Windows and a high-performance, security-intensive workstation version.

This is good news for all of us. It means that in order to move up to high-performance 32-bit computing, we can simply upgrade to Windows 4.

And what will Windows 4 be like? It's certain to be more object-oriented than its predecessors. And here, *object-oriented* means "easier to use." Drag and drop will be the primary vocabulary, and perhaps most important, the emphasis will switch from applications to documents.

As documents become more integrated (containing text, graphics, sound, and video), each document will be created by a suite of applications. The document, then, will become the focus of our attention, and the applications that create it will become more transparent.

This application transparency is one of the goals of OLE 2.0, which I discussed six months ago. With the new OLE, as you work in a compound document and as you move from application to application, your document stays the same, but the frame window changes (usually as little as possible) to reflect the proper editing environment for the current part of your document. This is a powerful tool, and something we can look forward to in the very near future.

Interestingly, this emphasis on OLE 2.0 doesn't come from some ivory tower philosophy cooked up at Microsoft's Redmond headquarters, but from user surveys. According to figures presented by Microsoft, end users have told the company that what they really want from Windows applications is better integration. And with Windows 4, DOS 7, and OLE 2.0, we'll all have it. ❐

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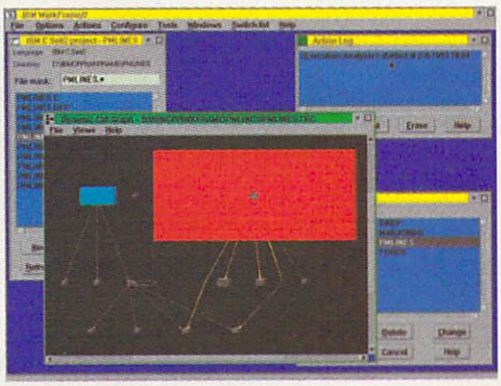

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Power users name the top Windows applications and tell how they put them to use.

By Kimberly Havlena

WIND

Looking for the Windows applications that offer the most in terms of tools, speed, and intuitiveness? Here are the experts' opinions to help you in your search for the programs that will best meet your needs.

The experts whose opinions we solicited have reviewed hundreds of programs and identified the ones that they like best. Whatever sparks your interest—word processing, spreadsheets, databases, or graphics—here are the Windows application programs that will provide the greatest ease, efficiency, and enjoyment.

Getting the Words on Paper

Word processing took a long time to come to Windows. Once it arrived, the word-processing arena suddenly filled with contenders. There is hardly a major word processor that doesn't have a Windows version available. With all that software to choose from, which programs are the most popular among users who spend hours a day making their living by writing?

Leslie Eiser has been writing in

TOP 10 DOWS TOOLS

COMPUTE and elsewhere about educational computing for ten years. Eiser says Microsoft Word for Windows is her pick as the best word processor. She likes it not only because it's powerful and easy to use, but also because it's helpful in a school environment. It has well-integrated tools, such as a style checker and thesaurus, that make it a great help to teachers. Another advantage is that it's a word processor equally powerful—and popular—in its PC and Macintosh versions. And in comparison to WordPerfect, Word for Windows is much easier to use, Eiser finds.

Tom Campbell owns and operates the South Bay Company, which develops software; he writes the "Programming Power" column for COMPUTE. Campbell uses Word for Windows because it's the best word processor he can find for large documents. He uses it for creating everything from brochures to 800-page manuals.

Desktop publishing expert William Harrel has written five books about publishing and hundreds of articles for COMPUTE and other magazines. When it comes to word processing, Harrel prefers Ami Pro. "As a reviewer, with my extensive knowledge of the three top Windows word processors, Ami Pro is the most sophisticated and the most useful," says Harrel. Ami Pro, a full-featured word processor, excels in its page layout features. While it can be used as a simple word processor for typing and creating documents, it can also handle "relatively sophisticated page layouts, such as newsletters," says Harrel. The advantage of using your word processor for layouts is that you don't have to do any extra work to transfer text between your word processor and your layout program.

George Campbell is a contributing editor for another computer magazine and a shareware author. Campbell is also a fan of Ami Pro; he thinks that it makes the best use of the Windows environment and offers outstanding tools for page design. Campbell feels that Ami Pro is easier to use than its competitors (specifically Word for Windows and WordPerfect for Windows). He uses Ami Pro for everything from basic correspondence to high-end desktop publishing.

Word processing is more than getting words down on paper, though. What kinds of word-processing add-ons do our experts rely on?

Regular COMPUTE contributor Richard Mann is a certified public accountant as well as a writer. Mann recommends Microsoft Bookshelf as an add-on for word processing. This electronic library comes with handy reference tools, including a dictionary and an encyclopedia. Bookshelf is a CD-ROM product. In fact, Microsoft Bookshelf now comes as a premium with Multimedia Word for Windows and Bookshelf. If you find a quotation in the dictionary or encyclopedia that you want to use in your text, you merely highlight it and, with the click of a button, it's inserted into your Word for Windows document. In addition to this, an automatic footnote is inserted to tell which reference book the material came from.

Steven Anzovin spends most of his time writing books, but he's also a freelance writer, an editor, a computer consultant, and a database programmer. Anzovin uses MacLinkPlus as his principal word-processing add-on. MacLinkPlus transfers files between the Macintosh and PC over a modem connection, automatically translating between various PC and Mac file formats.

Tony Roberts operates a desktop publishing business and is a COMPUTE contributing editor. To Roberts, helpfulness means OmniPage Direct. OmniPage Direct allows him to place a typewritten page on the scanner and read it into a word-processing file. With OmniPage Direct, you can do the scanning from within your own applications without having to exit to another program.

It's so easy to lose the cursor on your computer screen. ArrowSmith is a cursor enlargement program that will be sure to catch your eye and add some fun to computer input. Not only does it enlarge the cursor, but it allows you to choose what form you want the cursor to take. You could choose an ordinary arrow or opt for something with a little pizazz such as a syringe, a heart, a flag, or a magnifying glass. ArrowSmith also allows you to modify the wait symbol to a picture of a stop sign, a stoplight, a don't-walk sign, a snowflake, a smiley face, even a computer in jail. "I like ArrowSmith because it's the best cursor enlargement program I could find. Plus, it's lots of fun to use," says Tom Campbell.

Crunching Numbers

Spreadsheets were an early port to Windows. First and foremost was Microsoft Excel. Recently, publishers have been creating and porting spreadsheets to Windows in increasing numbers. Which are the cream of the crop?

Richard Mann says that Excel and Quattro Pro are both excellent spreadsheets for Windows. Because Quattro Pro has the newest version, it currently does a few more things than Excel. But the features race will continue.

Quattro Pro gives you a three-dimensional spreadsheet which allows you to work not only in rows and columns but also in stacks of pages. The 3-D metaphor resembles a three-ring binder with tabs at the bottom of each page that you can click on to move back and forth between all the pages in your spreadsheet. Quattro Pro also has graphic tools for drawing and making slides that give a professional touch. "It's not only a spreadsheet, but it's a little presentation-building package as well," says Mann.

George Campbell thinks that Excel is the best Windows application. With its intuitiveness, it simplifies complications, and the final output is easily made to look presentable.

The World of Publishing

Is ease of use your prime consideration when you're looking for a desktop publishing and layout program? William Harrel says that in his opinion, Aldus PageMaker is the easiest desktop publishing software to use. It has a pasteboard metaphor that Harrel likens to working on a layout table. Anybody familiar with laying out pages on a drafting table or a paste-up table would be more comfortable with PageMaker than with some of the frame-based programs. If price is more important than ease of use, Harrel recommends Microsoft Publisher or Express Publisher.

Tony Roberts uses PageMaker in his desktop publishing business to create newsletters, brochures, and books. He prefers it to other desktop publishing software because of its many options. Roberts says that he has never liked Aldus PageMaker's keenest competitor, Ventura Publisher, in any other incarnation (Macintosh and DOS) and that he is going to stay away from it in Windows.

Ever the contrarian, Robert Bixby, features editor of COMPUTE and author of "Art Works," COMPUTE's desktop publishing column, prefers Ventura Publisher because it keeps the text closer to its original condition, easily editable by a DOS or Windows word processor. He finds PageMaker unintuitive and difficult to use.

Using Data

When it comes to managing data, the options for Windows users have multiplied over the past few months with the introduction of Microsoft Access and Microsoft FoxPro for Windows. How does our panel of experts rate these packages?

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George Campbell uses Access to manage his data. In addition to being easy to use and having powerful output, "it uses a subset of the Visual Basic language for development, which . . . makes it easy to work with," Campbell says.

Tom Campbell uses Access for the databases to run his business. One reason he likes it is that it has a programming language similar to ones that he already knew. He warns, however, that Microsoft tries to market Access as a product that is supposedly so easy that even a beginner could start working with it right away. "I think Access is a tremendous program—I'm even writing a book on it—but it is not for beginners," says Campbell. "FileMaker Pro 2.0 from Claris is much better for beginners than Access or FoxPro for Windows. Instant Database from Asymmetrix is another easy and inexpensive alternative. FoxPro is great if you're already familiar with FoxPro for DOS or dBASE, but it doesn't do things in an intuitive way for a seasoned Windows user."

Why isn't Access Campbell's first choice for beginners? "When dBASE II came out, it was a lot easier than anything else available, but it took a lot of work to learn to use it. It's the same in the case of Access. I simply don't think it's as easy to use as FileMaker Pro when you first start using it. If you're willing to work to learn Access, though, your efforts will be richly repaid. If your time is limited, stick to FileMaker Pro or Instant Database."

Making Contact

Windows has always been an excellent environment for telecommunications. In these days of instant faxes and high-speed interchange of data, it makes even more sense to do your communicating in Windows. William Harrel stands by Procomm Plus for Windows because he's found it to be powerful and easy to use. He says that Procomm is the telecommunications product that has something for everybody.

George Campbell joins in the praise for Procomm. He says that it's easy to script for logging on and other functions. It also has a good dialing directory that's easy to set up and works well at high communication speeds.

Robert Bixby recommends WinFax Pro as the foremost product in the field of direct faxing. Sending a fax with Winfax is exactly like printing to a local printer. When you select Winfax as your printing device under Windows, it pauses to get the sending information (recipient, fax number, and cover page), then formats the page as a fax. It dials the remote fax machine and sends the file automatically. Many similar programs are appearing, including programs that receive faxes and convert their graphic information into ASCII text for easy editing and compact storage. Among these is Caere's FaxMaster.

Keith Ferrell, editor of *Omni* magazine, says, "RapidFAX for Windows [from The Complete PC] handles my fax material more efficiently than anything else I've tried. It certainly beats printing it out, walking to the fax machine, and transmitting it manually. Seriously, the program is almost effortless to use, resides nicely in the

Just for Fun

Fun and Windows don't seem to go together for most people. But the fact is that some of the most innovative educational and entertainment software is beginning to appear ready to run in the formerly all-business Windows environment.

Parents quickly learn the names of good children's stories and their authors. Brøderbund's Just Grandma and Me and Arthur's Teacher Trouble are two computer programs based on the popular children's stories of the same names. "These are well-known, well-respected children's stories, which makes them very appealing to the parents," says Leslie Eiser.

Just Grandma and Me, by Mercer Mayer, is designed for children who are learning to read. A page of the storybook comes up on the screen, and the computer reads the story in beautiful, accented voices. Behind the pictures on the screen, animated sequences are hiding. Once you think you know what to expect, the animated sequences change.

The animation of Just Grandma and Me resembles the author's illustrations and style. "For children, one doesn't use the same graphics [as in adult productivity software]. Children are not little adults . . . they need to be . . . talked to differently," says Eiser. These programs approach children in a completely different way from a lot of other children's software.

Arthur's Teacher Trouble, written by Marc Brown, is for older children. It focuses on human relationships rather than reading skills. The plot that moves the program is that Arthur is having problems with his teacher at school and is contemplating how to solve his dilemma without upsetting everyone.

THE ANIMALS!, developed by the San Diego Zoo, is another especially appealing children's program. It's an encyclopedic view of animals. Its interface uses the multimedia extensions that come with Windows to provide a colorful picture of the zoo. When you click your mouse on a certain section of the zoo, you are given information on the animals living in that habitat. THE ANIMALS! is meant to be used in a classroom situation with children who are either planning to visit the zoo or are putting together projects on animals. (THE ANIMALS! is reviewed elsewhere in this issue.)

Windows has always been aimed at productivity, but important Windows entertainment software for grownups has begun to appear. "A lot of [Windows] games are just rehashes of DOS games," says Paul Schuytema. But Microsoft Golf, a version of the Links golf games, utilizes the Windows format and comes complete with digitized sound and excellent graphics. Instead of cramming everything into one window, as a lot of the DOS games do, Microsoft Golf uses full windowing to show you such things as your power bar and information on how far your clubs can hit. (See "Hitting the Links" elsewhere in this issue.)

Maxis has recently released a Windows version of SimCity—The City Simulator. It's another game that follows the Windows format of opening and closing windows and being able to pile them on top of each other. By doing so, it gives a new perspective to SimCity. It's easy to switch back and forth between a world view and a city view, and graphs can also be brought up. "Once you've played SimCity on Windows, you can't go back to the DOS version because it's just so good," says Schuytema.

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background, and is something upon which I have grown quite dependent."

Out in Public

Presentation software is one of the fastest-growing areas in Windows. What do our Windows pros like when it comes to taking information to the people?

For presentations, William Harrel prefers Microsoft PowerPoint because it's both feature rich and easy to use. Harrel says that the approximately 20 Windows presentation programs available right now all work with basically the same idea. You create an outline, and from the outline the program automatically generates slides. PowerPoint, however, imports Word for Windows outlines. Linked to Excel and Lotus 1-2-3 spreadsheets, PowerPoint creates graphs and charts. "It's just all-around versatile," says Harrel.

Aldus Persuasion is Tony Roberts's choice among presentation programs. His desktop publishing business uses Persuasion extensively to create slides, overheads, and presentation material for speeches.

Every Picture Tells a Story

Creating graphics of all kinds was the earliest use of graphical environments. Windows and the Macintosh operating system made it easy to create a standard interface and a standard set of graphics tools, and the mouse—though not perfect—was still a very good drawing tool. While over the past couple of years Windows software has taken great strides beyond drawing and painting, and now includes virtually every kind of software, graphics remain the heart of the Windows experience and the principal attraction of the graphical user interface for many users. But which graphics programs are the best?

Steven Anzovin considers Adobe Illustrator the standard in the field of graphics: "It may not have every tool that you want, but it has the great advantage of being a standard that many other artists are familiar with and use." Adobe Illustrator is geared to the professional artist, and so is Fractal Design Painter, which Anzovin says is an excellent paint program. It gives you tools that don't exist in other programs, such as watercolor, oil paint, and charcoal. For the best effects in painting, Anzovin says Painter is the only choice. Anzovin also admires the program Arts & Letters Graphic Editor for its extensive typeface and clip art libraries.

When asked for his choice of the best graphics program, William Harrel comes out strongly in favor of CorelDRAW!. "The reason I use it is [that] I'm not a graphics artist, and it has a lot of features that make me look like one," says Harrel. CorelDRAW! is a vector drawing program that excels for nonillustrators because it has a lot of automatic features for creating 3-D objects, for mirroring objects, and for wrapping text along a path; it can also give an object perspective to make it look more three-dimensional. CorelDRAW! comes with about 250 typefaces and 14,000 pieces of clip art, along with a charting application, a bitmap application, a slide-show application, and other utilities. "So it's not only powerful—it's a great value," says Harrel.

Tom Campbell joins in the praise for CorelDRAW!, mostly for technical illustration. "I have to admit [that] it's kind of fun to play with, too," says Campbell. His reason for choosing CorelDRAW! is that it has the best combination of features and price.

Tony Roberts uses Aldus FreeHand and PhotoStyler in conjunction with PageMaker when he draws maps or diagrams or scans in photographs. The programs work hand in hand in production of Roberts's books and brochures.

You may have noticed that the programs Roberts uses are generally Aldus products. He says that that has something to do with why he has chosen to use these applications. PageMaker was the first Aldus application he owned, and he felt so comfortable with it that when he began to add drawing tools and tools for scanning and photo manipulation, he decided to go with the Aldus products as they came out. The programs are designed to work together. Roberts says, "I felt confident that if I was working in one program, I would be able to use the output of it in the other without too much trouble. And that's been fairly true."

"CorelDRAW! and Arts & Letters Graphic Editor are fine products," Robert Bixby says, "but if you're looking for a complete professional vector graphics package with a robust tracing program, Micrografx Designer is second to none. It has most of the tools of the other programs, plus that incredibly powerful trace that no one else can match. It suffers slightly from having an outdated interface, but those who use it swear by it."

Programming

COMPUTE was built on programming. When there were few commercial programs available, COMPUTE printed listings that would enable readers to create their own word processors, spreadsheets, databases, and graphics programs. Now that programming is largely the province of professionals, what tools do the pros like to use?

George Campbell chooses Visual Basic 2.0 for programming. According to Campbell, it's easy to use, powerful, and by far the best way to create Windows applications.

Tom Campbell uses Borland C++ to write programs. The reasoning behind his programming choice is that Borland C++ happens to be the only C compiler that currently has a Windows-integrated environment, which makes it easier and more pleasant to use. And when it comes time to test one of his Windows programs, he's already in Windows, so he doesn't have to take the time to start up the environment.

Windows Productivity Suite

Windows has come a long way. The environment that once utilized only applications designed for graphics and spreadsheets now supports software of virtually every variety. In fact, there are so many applications available today that it's sometimes difficult to decide which one to buy. That's why experts were called in to help narrow the selection.

The programs most recommended include Microsoft Word for Windows, Ami Pro, Microsoft Excel, Quattro Pro, Aldus PageMaker, Microsoft Access, Procomm Plus for Windows, Microsoft PowerPoint, Aldus Persuasion, and CorelDRAW!, with minority support for Microsoft Bookshelf, MacLinkPlus, OmniPage Direct, ArrowSmith, Ventura Publisher, Instant Database, FileMaker Pro, Microsoft FoxPro for Windows, Aldus FreeHand, Aldus PhotoStyler, FaxMaster, WinFax Pro, RapidFAX, Adobe Illustrator, Fractal Design Painter, Arts & Letters Graphic Editor, and Micrografx Designer. When it comes to programming languages, our experts like Visual Basic and Borland C++.

How can you choose between such powerful programs as Word for Windows and Ami Pro or between Excel and Quattro Pro? If you have some specific application in mind, look for the program with the feature set that most closely matches your needs. Word for Windows is better for writing, while Ami Pro is better suited to publishing (though it's also very good for general writing). If you choose any one of the best products in a category, you can't go wrong. ❑

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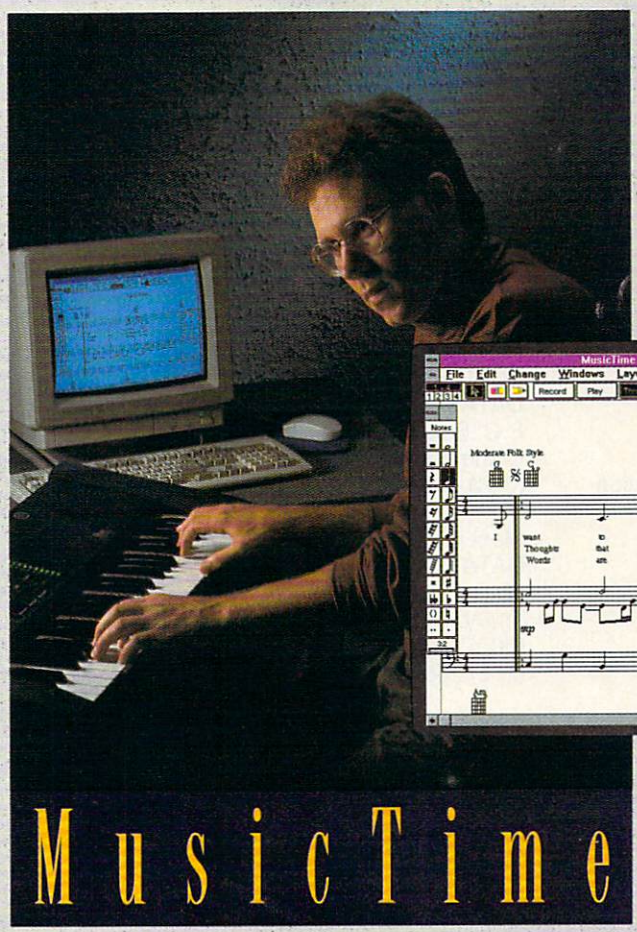

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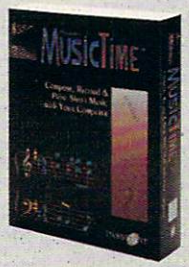

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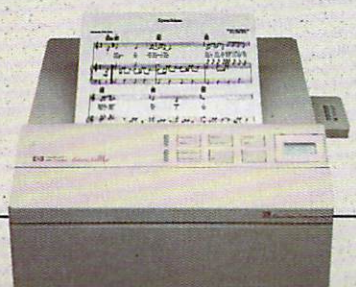

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TEST LAB

Edited by Mike Hudnall
Reviews by Tom Benford

Combine the blazing speed and colossal computing power of Intel's 486DX2/66 with the latest local-bus technology, and you've got a computer ready for the most demanding applications. Windows programs that seem sluggish on older computers are downright snappy on these systems, so you can spend less of your time waiting for the Windows hourglass and more of it taking care of business.

Not inexpensive by any means, these systems nevertheless deliver lots of value, especially when you consider what you could get for the same price a year ago, how much time you can save, and how expandable they are.

You may be asking yourself whether you really need this much power and speed right now—a fair question. Here at COMPUTE, we see today's cutting-edge technologies as tomorrow's consumer technologies, and with the current dizzying pace of change in the computer industry, tomorrow will probably be here sooner than you think. Already, Intel has announced its new Pentium chip, which by all accounts significantly outperforms the 486DX2/66 but is likely to cost significantly more, and I suspect that by the time this issue hits the stands, most computer companies will offer VESA local bus as a standard feature rather than as an option.

In setting up this month's lineup of systems, we asked for Industry Standard Architecture (ISA) because it's less expensive than Extended Industry Standard Architecture (EISA) and because most of our readers won't need EISA's performance benefits. We asked for 8MB of RAM because many of the systems include 8MB as the standard complement and because some of the more demanding applications that would benefit from the extra horsepower of 486DX2/66 chips also require more than 4MB. We also asked the manufacturers to install whatever cache was part of the standard configuration, since many COMPUTE readers will opt for standard packages. Because these high-powered computers are likely to handle high-powered applications and mountains of data, we requested hard drives of at least 200MB, not at all an unusual size for these machines.

All ten of the systems in this month's Test Lab come with Windows 3.1 and DOS, and they're all, of course, 486DX2/66 systems with local-bus video. Beyond those common elements, you'll find a variety of prices and features. While most of these computers, for example, use standard VESA local bus, some companies use proprietary local-bus video. At least a few include a local-bus drive controller along with the local-bus video adapter. And in some cases the video card is accelerated for optimized Windows performance.

For the specifics of configuration, expandability, and other features, you should find the features grid helpful. Whether or not you understand the differences among local-bus video standards, you'll appreciate the benchmark graphs, which provide not only Norton index data but also real-world performance data—how long a particular computer required to find and replace text in a word processor, index and sort a database, play back video, and so forth. These systems were so fast that our lab had to redesign the benchmark test suite to produce more statistically significant data. In fact, we had to drop a planned spreadsheet benchmark because even a Windows spreadsheet proved too small a challenge for these machines. Tom Benford's reviews home in on significant features of these computers, whether it's their strategies for handling the heat given off by their microprocessors, their memory expansion capabilities, their case designs, their use of caching, or their ability to accept upgrade chips.

Whether you're ready to buy one of these systems now or just want to see the kind of system you could be buying before long, Test Lab has information to help you understand the technology and make a more informed purchase.

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The CompuAdd Express 466/DX2 is the current top-of-the-line model in the company's series of "scalable" computer systems designed with upgradability in mind.

Scalable is, for all intents and purposes, another word for *modular* in that the Express lets you change the configuration by simply replacing the CPU and changing the jumper switch settings. The company offers six varieties of the machine, ranging from a 40-MHz 386DXL-based system to 486SX models and the 466/DX2 model reviewed here.

You'll find many of the essential system functions integrated right into the motherboard itself: the IDE controller, the floppy drive controller, the parallel and serial ports, the keyboard connection, and local-bus video for faster video performance.

The full-profile case occupies a baby-AT footprint and provides three bays accessible from the front: two half-height 5¼-inch bays and a vertical 3½-inch bay. A hidden 3½-inch bay is also available. To power any additional drives you might install, just use the three available connectors from the 200-watt power supply.

A Western Digital Caviar 2340 (333MB formatted) hard drive provides the mass storage for the system, while a combination 3½-inch/5¼-inch half-height unit occupies the uppermost bay and provides floppy disk I/O.

Because the Express integrates so much into the motherboard, all of its full-length 16-bit slots are available. A proprietary slot holds a proprietary video adapter card and is, apparently, the local-bus connection; Tseng Labs manufactures the video BIOS. I found no other local-bus slots.

The high-speed, high-powered 66-MHz i486DX2 CPU generates an enormous amount of heat, the archnemesis of electronic components. The CompuAdd folks, however, have taken some serious measures to ensure that heat won't be a problem with this system. A high-volume fan mounted at the front of the case less than six inches from the CPU pulls in outside air through the case vents. A deeply finned heat sink and a miniature fan mounted atop the CPU itself also help; under this arrangement, the heat sink dissipates the chip's heat and the fan keeps cool air circulating over the heat sink to further aid in keeping the interior case temperature "comfortable" for the components. The design apparently works well, as I didn't experience any problems or anomalies during the time I spent using this system for the review.

A three-button mouse supplied with the system has a switch that lets you select either a Microsoft (two-button) mode or a Mouse Systems (three-button) mode. While the mouse itself resembles a Microsoft mouse in style, feel, and shape, the clicking action could best be described as erratic; frequently, several rapid clicks were required to enter a Windows command or function.

I wasn't entirely satisfied with the keyboard (made by Lexmark here in the USA), either. I found the action quite stiff, there was no audible click, and it had a straight cable (which looked very similar to RJ-14 telephone cable) rather than the heavier, coiled cords usually found on keyboards.

Aside from the mouse and keyboard difficulties, the CompuAdd Express 466/DX2 local-bus system provides good performance, features, and expandability.

Circle Reader Service Number 371

DELL SYSTEM 466/M

Dell has built its reputation on high-quality, dependable PC systems that are popularly priced. Maintaining that reputation, the Dell System 466/M proves itself to be a sterling performer.

The baby-AT-sized desktop case provides a surprising amount of expansion room, thanks to large-scale integration of components on the system's motherboard. Components critical to the system, including the video adapter, input and output ports, and disk controllers, are all integrated rather than requiring separate expansion cards. As a result, you have five full-length 16-bit expansion slots available for user-installed peripherals, in addition to a single three-quarter-length 16-bit slot for shorter boards.

Looking for room to add drives? The system has two available exposed half-height bays and an internal 3½-inch bay. Dual floppy drives are provided as standard equipment on the system, but rather than being individual units that require separate bays, the two floppy drives are integrated into one half-height combination drive—a nice touch that conserves space and improves expansion capabilities.

A 240-watt power supply provides more than enough power for the system and sports three "pigtail" connectors available for powering any additional drive devices you might install in the system.

An extra-large finned heat sink on the 66-MHz Intel 486DX2 CPU helps dissipate the heat this fast chip generates. To aid the heat sink in its cooling functions, a high-volume fan mounted almost directly in front of the CPU provides excellent air flow inside the case.

Dell uses a proprietary local-bus standard which is not VESA compliant, and there is no local-bus slot available for user-installable cards, since the local-bus features are integrated into the motherboard's circuitry. Dell handles video through this local bus, using the popular S3 accelerated video chip set, which can generate 1024 × 768 noninterlaced resolution with a maximum color palette of over 32,000 colors.

The integrated IDE interface features a 32K cache buffer, which helps to keep things moving at a brisk pace in the system. You can also get an optional 128K internal system cache.

Knowing that users naturally upgrade their systems as their needs for power and speed grow, Dell offers a motherboard with a 238-pin (low insertion force press-pin) socket that can accommodate future upgrades, such as higher-speed 486 chips or the P24T (Pentium Overdrive) when they become available. The flash memory Phoenix/Dell BIOS is disk upgradable, another feature which ensures the system's longevity.

The review system contained 8MB of RAM, but you can upgrade the memory to a maximum of 64MB using 16MB SIMMs in the four sockets provided on the motherboard. Dell also included a Maxtor LXT-340A 320MB IDE hard drive and a Dell UltraScan 14C SVGA monitor as part of the standard equipment.

A Microsoft two-button mouse supplied with the system plugs into the built-in PS/2-style mouse port. MS-DOS 5.0, Windows 3.1, and an enhanced keyboard round out the system and ensure that it's ready to go to work as soon as you plug it in.

Dell has an excellent system here in the 466/M, and it deserves your serious consideration if you're in the market for a 486DX2/66 local-bus system.

Circle Reader Service Number 372

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DIAMOND 486DX2/66

Smart styling, good expansion potential, and snappy local-bus performance make the DT 486DX2/66 system from Diamond Technologies a pleasing package.

A full-height baby-AT case provides expandability while maintaining a reasonably small footprint for the desktop. For adding drives, this system includes two half-height bays accessible from the front of the machine. No additional unexposed bays are available, but since the Diamond comes equipped with dual floppies, two bays should suffice for the vast majority of users. The 200-watt power supply is also adequate for such expansion, although it comes with only one extra "pigtail" connector for powering another drive.

The i486DX2/66 CPU, mounted in a standard press-pin socket, has a deeply finned heat sink to minimize heat buildup and the problems associated with it. Since the AT-sized case affords plenty of internal "breathing" room for air to circulate, this arrangement works well, keeping the CPU and other components cool and thus contributing to system reliability.

The motherboard, a fairly compact unit manufactured by S&A Labs, uses an American Megatrends, Inc. (AMI) BIOS. Eight SIMM sockets on the motherboard accept either 1MB or 4MB SIMMs, yielding a maximum configuration of 32MB on the motherboard itself.

The system came with two local-bus slots on the motherboard, both occupied; a Diamond Viper SVGA card is installed in one, while the IDE caching disk controller resides in the other. Five of the six full-length 16-bit slots are available for adding expansion boards (the sixth slot contains the multi I/O card, which provides the parallel and serial ports).

At the front of the case, above two flush-mounted push-button switches for changing to and from turbo mode and resetting the system, you'll find three LEDs for signaling power on, hard drive activity, and turbo status. The 3½-inch high-density drive is vertically mounted next to the 1.2MB 5¼-inch drive which occupies the topmost bay in the case. Look for the power switch on the rear panel of the case at the right side.

A comfortable enhanced keyboard (no audible click) comes as part of the standard package, along with a three-button Microsoft-compatible serial mouse. While considerably larger and bulkier than a Microsoft unit, the mouse is still quite serviceable.

The system delivers excellent video performance, thanks to the combination of the Diamond Viper board equipped with 2MB of vid-

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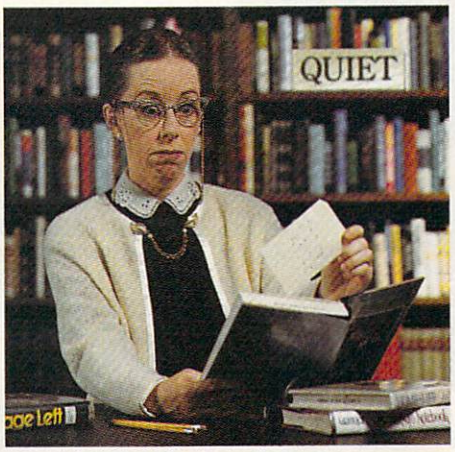

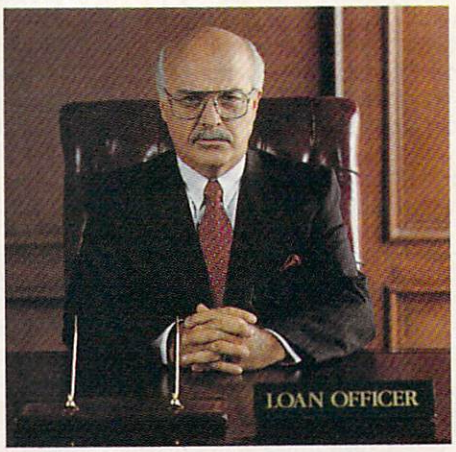

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eo RAM and the local-bus slot. If your eyes tire easily from staring at a screen, you'll appreciate the CTX CMS-1561 SVGA monitor that came with this review system; the monitor can display 1024 × 768 noninterlaced resolution with 256 colors. This combination of a high-powered SVGA card, a local bus, and an excellent monitor is hard to beat if you do lots of graphics-intensive work.

Word processing, desktop publishing, database operations, and spreadsheet work all benefit from the overall power of the DX2/66 CPU and the local-bus architecture, resulting in overall performance that is above average in all respects.

MS-DOS 5.0 and Windows 3.1 are supplied already loaded on the system, which enables you to get off to a productive start immediately. I found the system and software manuals thorough and well organized.

The Diamond DT 486DX2/66 puts lots of muscle into a baby-AT-sized case and certainly merits your serious consideration when shopping for a 486DX2 local-bus system.

Circle Reader Service Number 373

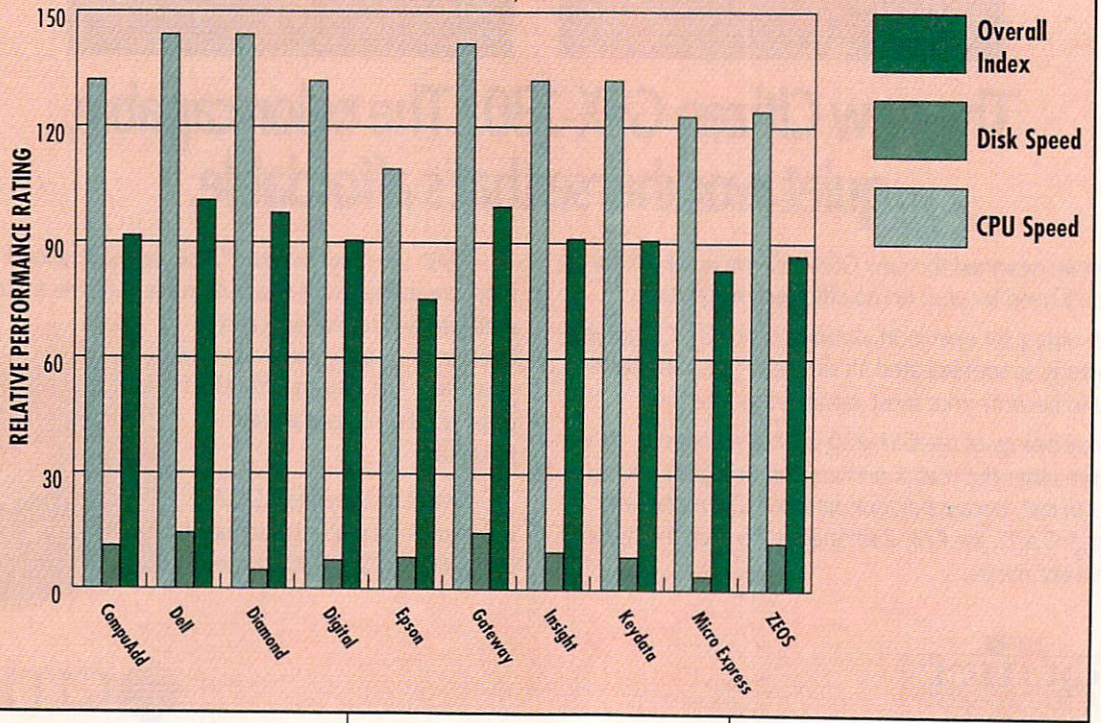
DECPC 466D2 LP

The design of Digital Equipment Corporation's DECpc 466d2 LP exemplifies how good expansion possibilities can be incorporated in a diminutive case.

The footprint of the PC approximates that of a baby AT, but the case has a much lower profile than that of a standard desktop,

THE NORTON OVERALL INDEX

The Norton Overall Index factors in microprocessor and disk performance, among other things, to indicate how well a computer performs when compared to a 4.77-MHz IBM XT. The greater the index value, the faster the computer.



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measuring less than four inches from the top of the desk to the top of the case. On the front of the machine, you'll find recessed LEDs for power, hard drive activity, and turbo status. The reset button and power switches, similarly unobtrusive, contribute to the streamlined appearance of the machine.

A single 3½-inch high-density drive comes installed as standard equipment on the DECpc 466d2 LP, but there's a front-accessible 5¼-inch half-height bay available underneath the drive for accepting another device of your choice. By virtue of its dual-sized plastic bay cover plate, this bay can also accommodate a 3½-inch drive. DEC has provided a hidden 3½-inch bay inside the machine, and two power connectors are available for powering any user-installed drives.

DEC has integrated the parallel, serial, mouse, and keyboard ports; the video adapter; and the floppy and hard drive controllers into the motherboard itself to keep the design compact and leave as many expansion slots free as possible. An extension card inserted vertically into the system board provides three full-length 16-bit expansion slots for any peripherals you choose to install. There are no 8-bit or local-bus slots provided in the system.

The 66-MHz 486DX2 CPU and related performance components reside on a separate board (referred to as a *CPU module* in DEC's manual) attached via an interlocking connector to the main system board. This module permits quickly changing the system's configuration, presumably allowing upgrades. The module's vacant 238-pin socket certainly seems to support such a conclusion. The CPU itself resides in a press-pin socket on the module board.

I was somewhat surprised to find that the only means of dissipating heat generated by the CPU was a deeply finned heat sink attached to the top of the chip. There was no cooling fan to circulate air within the case interior which, compared with the other systems reviewed, was much less spacious. However, heat buildup didn't seem to be a problem; the system performed as expected during the review period.

The system's integrated local-bus video adapter, based on the popular S3 accelerated chip set, comes with 512K of video RAM installed. Even though the review unit came with an additional 512K of video RAM installed (yielding 1MB total), I was unable to initiate or use Windows in 1024 × 768 256-color mode. Since running in 800 × 640 256-color mode wasn't a problem, that's the mode I used. DEC provided a Digital PC7XV-DE monitor with the review unit, and I suspect that the monitor, and not the video card, prevented accessing the 1024 × 768 mode successfully.

DOS 5.0 and Windows 3.1 come supplied with the system, as does a copy of Diagsoft's QAPlus software.

If your expansion requirements aren't too demanding and you like the idea of a slimline case, this DEC machine may be worth a closer look.

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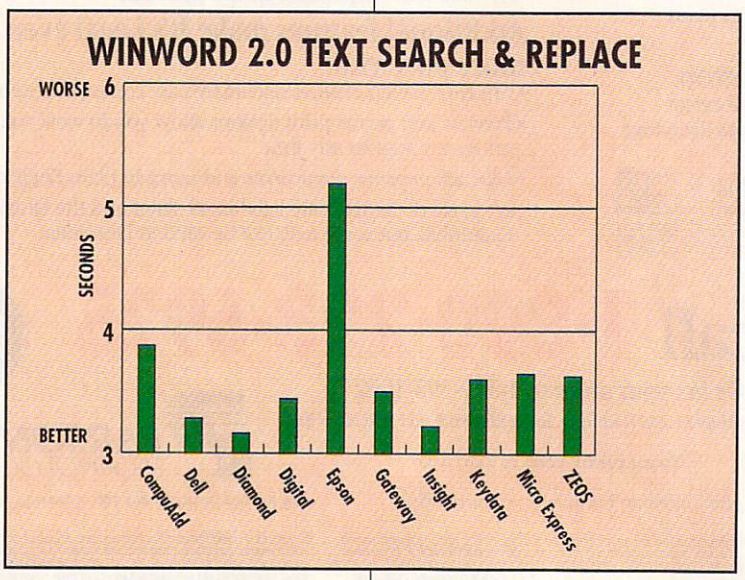


A NOTE ON PRICES

With computer products changing more rapidly than ever and with options more plentiful than ever, computer prices can be a tricky business, indeed.

It pays to keep the following points in mind:

Street and direct prices can be considerably lower than list prices. Shopping around helps you find the best price.

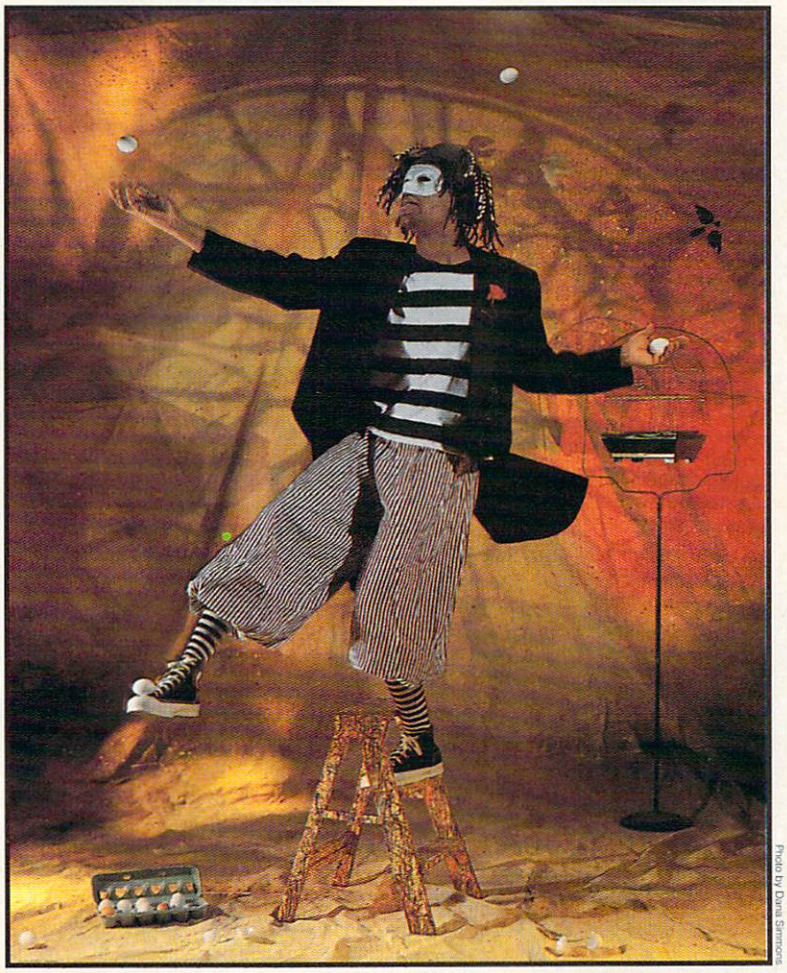
Because computer technology evolves rapidly, a product may have changed by the time our review sees print. A manufacturer may decide to change the video card or the hard drive, for example.

Because consumers are more sophisticated than ever about what they want in computer products and because manufacturers have responded with more options and configurations than ever, one computer model may be subject to dozens of variations, each with a slightly different price.

At COMPUTE, we make every effort to verify prices and differentiate between the price for a review configuration and the price for a standard configuration. It's still a good idea, however, to call the manufacturer or vendor to make sure that the configuration you want matches the price you have in mind.

—MIKE HUDNALL

If you think this is "juggling eggs,"



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EPSON PROGRESSION 486DX2/66 PC

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(310) 782-0770
Suggested retail price: $3,976 for review configuration with monitor and 12MB RAM ($3,353 estimated street price); $3,398 for standard configuration with monitor and 4MB RAM ($2,862 estimated street price)
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Epson has taken a modular approach with its Progression series of computers, and the Progression 486DX2/66 PC model is representative of this design trend.

The Progression's full-height baby-AT case provides room for expansion without requiring lots of desktop real estate. The review unit came with a single one-third-height high-density 5¼-inch drive, leaving three front-accessible bays (one one-third-height and two half-height bays) available for additional devices. Two half-height internal bays are also available for upgrading the system.

There's lots of room for expanding RAM beyond the system's standard complement of 4MB. With four SIMM sockets, you can expand up to a maximum of 128MB using 16MB SIMMs. The review unit came equipped with 12MB of RAM; the lab removed one 4MB SIMM so that this system could meet the 8MB configuration requirement for the benchmark testing. During the review, however, I used the full 12MB configuration and found performance to be respectable for all types of general computing work.

The i486DX2/66 CPU resides on a separate card which plugs into a special slot on the motherboard. Under this modular arrangement, someone with a Progression 486SX/25 or 486DX/33 machine could upgrade to a 486DX2/66 simply by replacing the CPU card rather than changing the chip itself. Future upgrades to more powerful CPUs as they become available will also be easy to perform under this design scheme.

The review system's CPU, installed in a low-force press-pin socket, has a deeply finned heat sink. A vacant ZIF (Zero Insertion Force) socket is located adjacent to the i486 chip on the CPU card itself, presumably for future upgrade options. The proprietary slot that accepts the CPU card looks like a local-bus slot, but it is not one; it is a slot designed to accept the modular Epson CPU cards only.

You'll find all of the I/O ports (parallel, single serial, mouse, video, keyboard) integrated into the motherboard. This leaves six full-length 16-bit slots open and available for use. A 200-watt power supply provides the essential operating voltages for the system.

Instead of the local-bus architecture found in other systems covered in this issue, the Progression uses its own Wingine Graphics Acceleration Technology for improved video performance. The heart of the Wingine is a CHIPS and Technologies display controller equipped with 1MB of video RAM (upgradable to 2MB) and a BrookTree RAMDAC. Rather than using an expansion card, Epson's Wingine integrates the video controller into the motherboard itself.

Another unusual aspect of Epson's Wingine technology is that the total amount of system RAM can also affect the video performance. For example, with only 8MB of RAM installed, the system could not support 1024 × 768 256-color noninterlaced resolution in Windows; 800 × 640 was the highest video mode that would operate with the monitor supplied for review, a 14-inch Epson T1183A extended VGA model. Curiously, Epson lists the 17-inch Professional Series monitor as the standard unit for this system.

A two-button mouse and a comfortable enhanced keyboard provide the means for inputting data and controlling system and application functions.

The Progression provides a workable alternative to the local-bus technology of this month's other systems, and it provides some appealing features that make it worthy of consideration.

Circle Reader Service Number 375

GATEWAY 4DX2-66V

Gateway 2000's 4DX2-66V is a local-bus PC in an attractive, standard-sized AT desktop case with reasonable expansion options. A vacant front-accessible half-height bay beneath the dual floppy drives is ready to accept a CD-ROM drive or tape backup unit, and two additional half-height bays are available at the front of the case adjacent to the drives, if you want to mount additional internal devices. *(Editor's note: A CD-ROM drive now comes standard.)*

In this system, Gateway uses a standard-sized, highly integrated motherboard that incorporates the floppy drive controller and a local-bus IDE hard disk interface. The motherboard can support up to 64MB of RAM direct-

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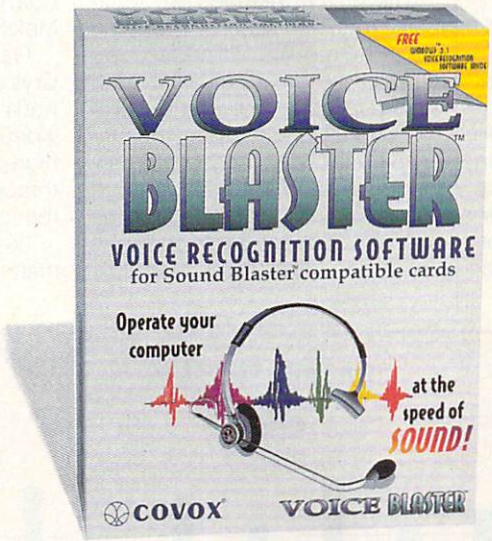
now you can *TALK* to your computer with THIS!



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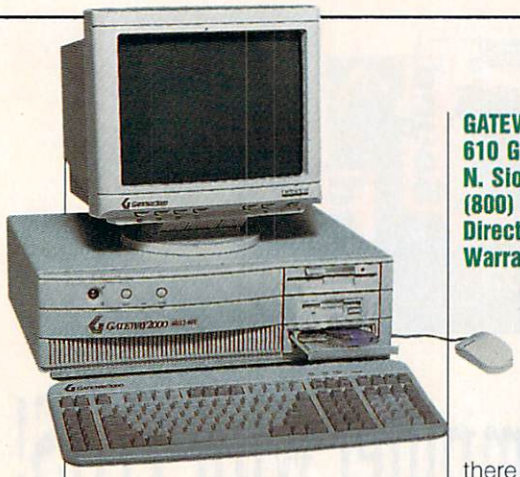


GATEWAY 2000
610 Gateway Dr.
N. Sioux City, SD 57049
(800) 846-2000
Direct price: $2,995
Warranty: one year, parts and labor

ly using 16MB modules in its four SIMM sockets.

The 66-MHz Intel 486DX2 CPU resides in a standard press-pin socket and is fitted with a heat sink with crosshatched fins to dissipate its heat. An upgrade socket next to the CPU lets you add an upgrade chip, such as the Intel Overdrive accelerator. However, since the 486DX2/66 is the fastest CPU currently available, there is no advantage or benefit to be derived by adding an Overdrive chip at this point in time.

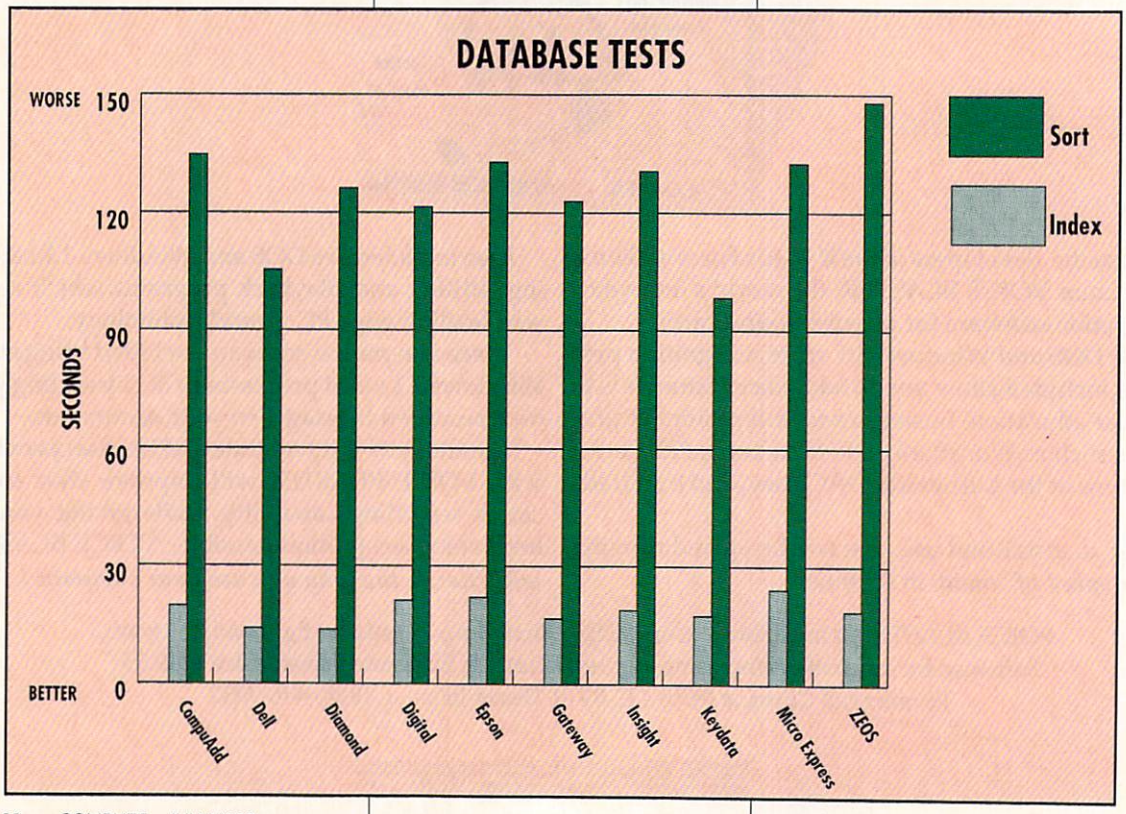
The system includes two local-bus expansion slots, one holding the ATI Graphics Ultra Pro video card. Of the five 16-bit expansion slots available, four can accommodate full-length cards; the other 16-bit slot can only accept a half-length card. Of course, you can use the remaining local-bus slot as a 16-bit slot for non-local-bus expansion cards if you need to.

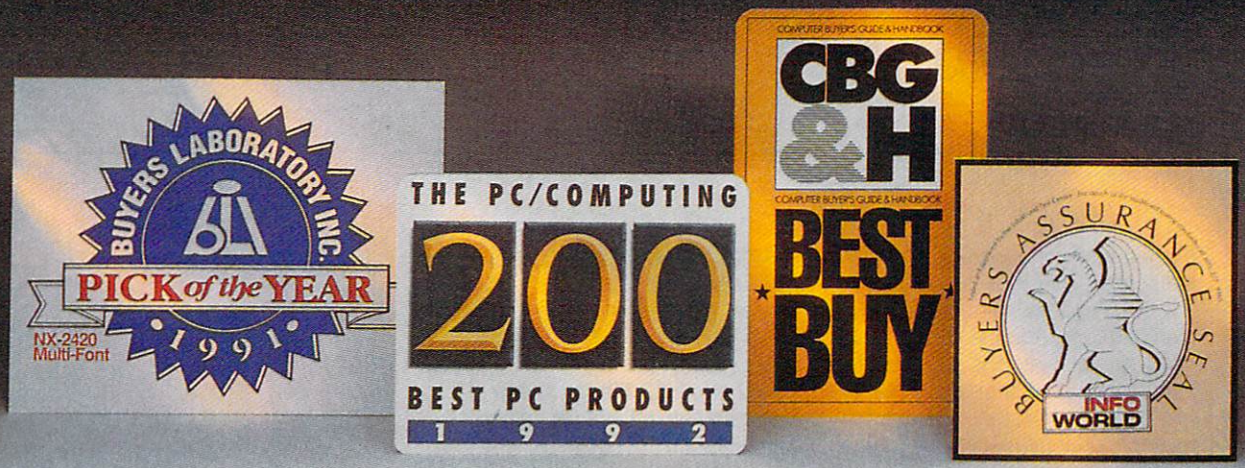
The reset and turbo selector switches, flush mounted on the front of the case, reside next to the key lock, just above the illuminated power, hard drive activity, and turbo LEDs. The power switch is located at the right rear corner of the machine.

The machine comes with a special 124-key keyboard, but you can order a traditional AT-standard 101-key keyboard if you prefer. The 124-key keyboard has an enhanced cursor-control station with extra keys, which I found confusing. I found that both keyboards, made for Gateway by MaxiSwitch, feel great.

Gateway's 1572 FS 15-inch CrystalScan SVGA monitor accompanied the system unit and provided an excellent display for the high-speed graphics processed through the ATI video card and the local bus.

Overall, the performance of this machine was excellent, especially





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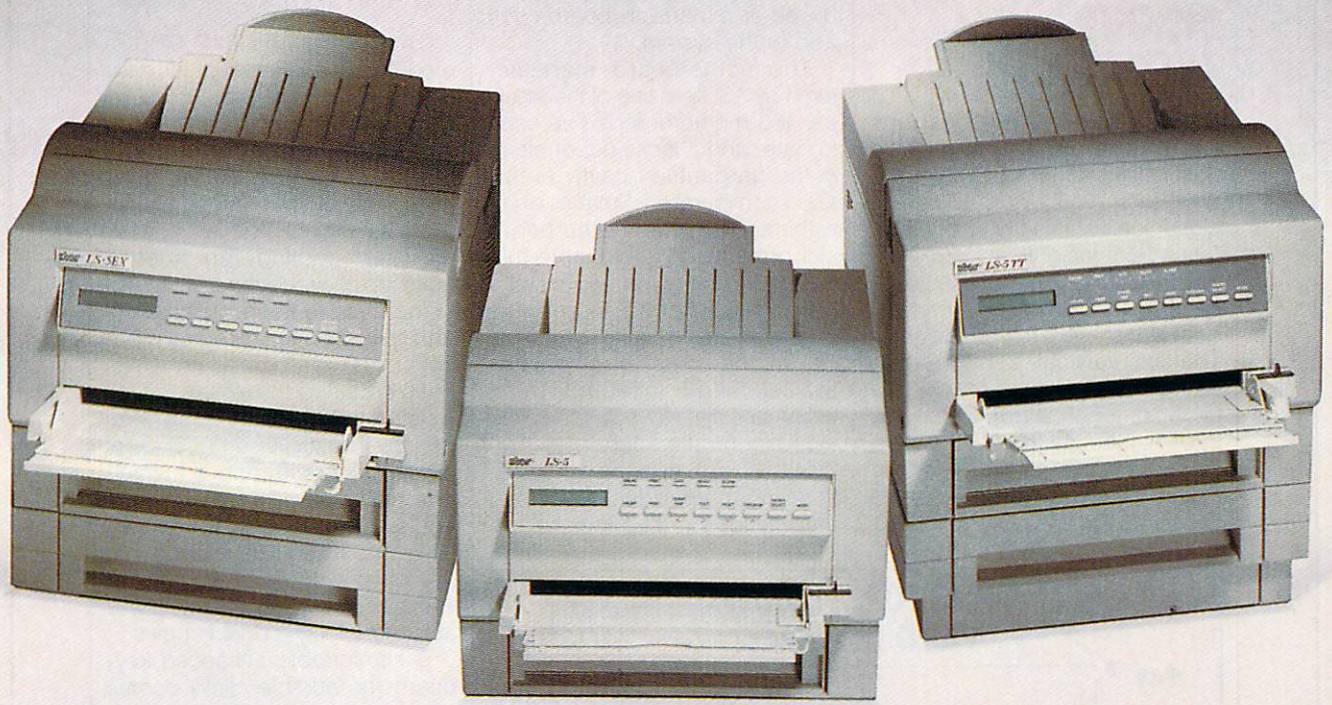

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Circle Reader Service Number 203

when running Windows. Even with a screen resolution of 1024 × 768 with 256 colors, Windows was fast and snappy. And the Mach32 control panel, which is a dedicated front end that manages the ATI local-bus controller, makes it very easy to change resolutions, colors, and system fonts.

All in all, the Gateway 4DX2-66V is a first-rate local-bus system in a well-designed package. It's definitely worth considering.

Circle Reader Service Number 376

INSIGHT 486DX2-66 VL

Need a 486DX2/66 local-bus system with plenty of expansion possibilities as your needs grow? Well, then, you'll want to take a closer look at this tower configuration from Insight.

The full-size tower case has a base that pulls out laterally, from both sides, to provide stability. The full vertical configuration affords lots of room for adding drives or tape backup units, with three half-height front-accessible bays still available even with the system's dual floppies and 210MB Western Digital hard drive installed. If you need additional mounting room, there's also a concealed full-height bay.

A beefy 250-watt power supply should adequately power any drives or expansion boards you add to the system.

The motherboard, manufactured by ASUS, is one of the smallest 486 motherboards I've seen to date, and it looks out of place in the gargantuan cavity of this tower configuration. Small size notwithstanding, the motherboard still provides five available full-length 16-bit expansion slots, which should prove to be more than adequate for most users. The motherboard also contains two full-length local-bus slots, which are already occupied; the video controller occupies one local-bus slot, and the combination multi I/O-drive controller card resides in the other.

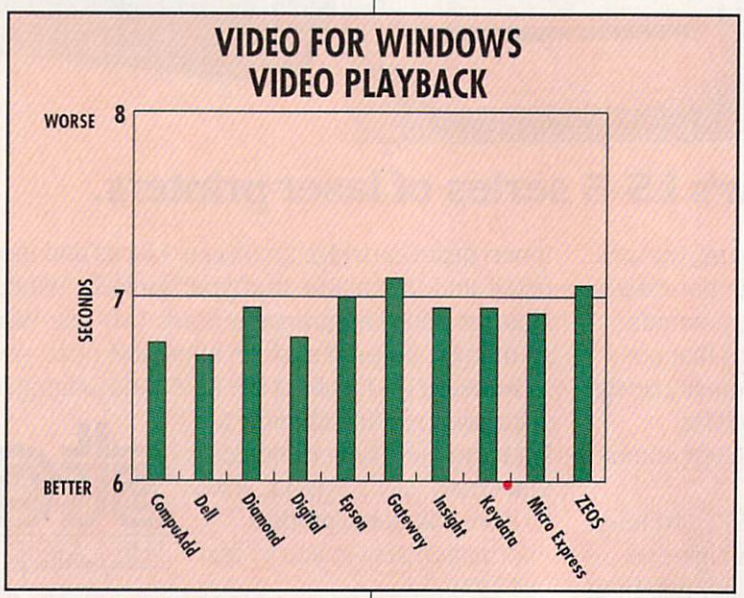
INSIGHT DISTRIBUTION NETWORK
1912 W. Fourth St.
Tempe, AZ 85281
(800) 927-7848
(602) 902-1176
Direct price: $2,779 for review configuration; $2,199 for standard configuration

The Intel 80486DX2 CPU is mounted in a ZIF socket for easy removal or upgrading. I found no heat sink on the chip (to help dissipate heat); however, owing to the spacious area of the tower case, heat buildup doesn't seem to be a problem. The large front-mounted cooling fan does a good job of circulating the air within the case to keep things cool, and I didn't experience any problems usually associated with overheating during my review.

The manufacturer integrates the drive controller and I/O ports all on a single board, which occupies one of the VESA local-bus slots. In addition to the parallel, game, and dual serial ports, this card also provides an IDE interface for the hard drive as well as control for the dual floppies.

A comfortable enhanced keyboard (no audible click) comes with the system, along with a Microsoft-compatible Insight three-button serial mouse. Software supplied with and installed on the system consists of MS-DOS 5.0, Windows 3.1, Dr. Solomon's Anti-Virus, and Stacker 2.0.

The Insight machine had a quality assurance sticker plainly affixed to the rear of the case, yet I was greeted with a *HDD controller failure* message when I first turned the machine on. I decided to remove the system cover to look for any obvious problems before calling Insight's tech support number, and as soon as the cov-



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er was removed I found the culprit: The ribbon cable coming from the hard drive had become disconnected from the pin connector on the I/O card. I reattached it and reinstalled the cover, and the system booted and performed perfectly, without incident, from that point on.

The machine proved to be quite a snappy performer for all types of applications—from word processing to spreadsheets and charting to 3-D modeling and other graphics-intensive tasks. The system came supplied with a 15-inch Viewsonic 6FS monitor, which provided excellent viewing and enabled the STB Powergraph video card (S3-based) with 1MB of RAM to show its stuff (aided in the express department by the system's 32-bit local bus).

Performance for today with room for expansion is what the Insight 486DX2-66 VL delivers.

Circle Reader Service Number 377

KEYDATA INTERNATIONAL
111 Corporate Blvd.
S. Plainfield, NJ 07080
(800) 486-7010
(908) 755-0350
Direct price: $2,675 (standard configuration)
Warranty: one year, parts and labor; on-site service; 30-day money-back guarantee

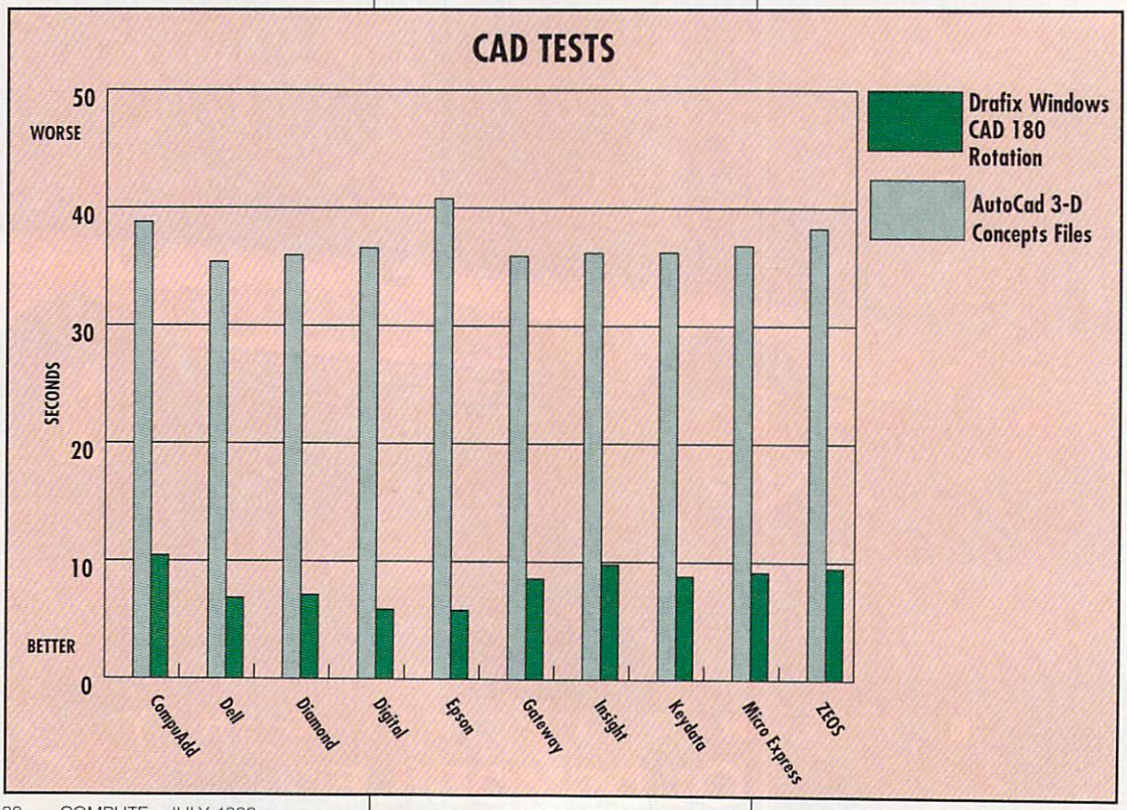
KEYDATA 486DX2-66 VL

If you're looking for 66 MHz of local-bus speed and power but prefer full-size tower computers, you'll be interested in Keydata's 486DX2-66 VL Bus WindowStation.

Like the Insight tower also covered here, the Keydata uses the Taiwan-manufactured ASUS local-bus motherboard. This compact motherboard provides two VESA-compliant local-bus slots.

In the first of the local-bus slots I found a Genoa Systems Windows VGA 24 video card (model 8500VL) with 1MB of RAM and a Cirrus Logic chip set. Keep in mind, however, that Keydata may furnish a different video adapter.

The second local-bus slot provides a home for the IDE disk controller card, which also includes the parallel port, two serial ports, and a game port. By



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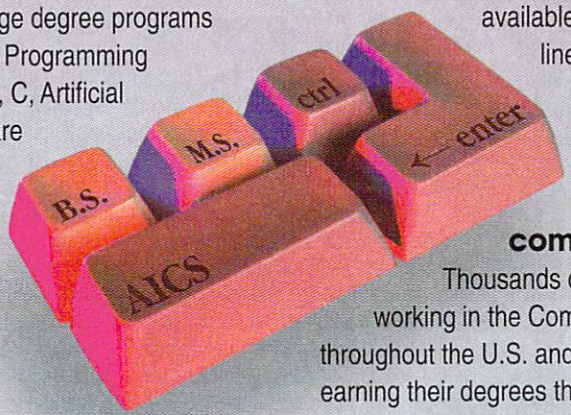

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using these two local-bus slots for the video, disk functions, and I/O, the manufacturer leaves five full-length 16-bit expansion slots free for adding expansion cards of your choice.

Four front-accessible half-height drive bays are available, as well as an additional hidden half-height bay. All of these available bays are located above the 3½-inch and 5¼-inch floppy drives and the 250MB Conner 30254 IDE hard drive. A particularly nice feature of the Keydata case is its use of a hinged door that conceals all of the drives and drive bays, giving the case an extra-clean, streamlined look.

The flush-mounted power, turbo, and reset switches, as well as their related LEDs and the three-place speed LED, are all mounted at the top of the case at an angle, which makes them easily accessible. I consider the Keydata case one of the best-looking tower units I've seen, with lots of eye appeal in addition to its functionality.

The i486DX2/66 CPU mounted in a ZIF socket is directly in the line of air flow coming from the front-mounted cooling fan. The manufacturer doesn't use a heat sink on the massive chip, and the chip apparently doesn't need one, thanks to the excellent circulation provided by the fan and the large open area of the case. I didn't experience any heat-related problems while using the machine for extended periods.

The CTX Model 1560 Proscan SVGA monitor I used with this system provided excellent color and definition. Other standard equipment includes an enhanced Chicony 5181KT keyboard with audible click and a three-button serial mouse. Keydata preinstalls MS-DOS 5.0 and Windows 3.1 on the system and supplies floppy backup copies.

If you expect to expand your system's capabilities as your requirements grow—perhaps adding a CD-ROM drive, a tape backup unit, a sound card, a digitizer, and so forth—it's comforting to know that the Keydata's 250-watt power supply has plenty of muscle and three available power connectors to service these additional devices. Clearly, this system delivers plenty of performance for today while affording great potential for tomorrow's expansion.

Circle Reader Service Number 378

MICRO EXPRESS
1801 Carnegie Ave.
Santa Ana, CA 92705
(800) 989-9900
(714) 852-1400
Suggested retail price: $2,375 (standard configuration)
Warranty: two years, parts and labor; 30-day money-back guarantee; optional on-site service

MICRO EXPRESS 486-VL/DX2/66

Building upon the success of its 486-Local Bus, which used a proprietary local-bus implementation for high-speed graphics processing, Micro Express now offers the 486-VL/DX2/66 for your purchasing consideration. This model features two VESA-compliant local-bus slots for accommodating a graphics processor and another local-bus expansion card, such as a disk controller.

The minitower configuration of the Micro Express case provides a nice compromise between standard desktop cases, which eat up lots of desktop space, and a full tower case, which sits on the floor. The minitower should work equally well either on a desktop or next to it.

You'll find flush-mounted power, turbo, and reset switches aligned vertically on the front of the case, just above the key lock. LEDs indicate power on, hard drive activity, and turbo status, and another LED display indicates the current CPU speed.

An ATI Graphics Ultra local-bus SVGA video card equipped with 2MB of video RAM ensures speedy graphics processing. The card resides in one of the 486-VL's two local-bus slots, leaving one vacant and available for a user-installable local-bus expansion card. This slot can also be pressed into service as a standard 16-bit slot if needed.

Of the six 16-bit expansion slots built into the motherboard, only four are available for accepting expansion cards. Of the available slots, two are full-length and the other two are three-quarter-length. One 16-bit slot has the IDE caching hard and floppy controller board inserted in it, and another 16-bit slot holds the I/O board with parallel, game, and serial ports.

The system includes dual floppy drives (a 3½-inch and a 5¼-inch), leaving two 5¼-inch bays and one 3½-inch bay available for adding drives. For mass storage, the system uses a Western Digital Caviar 2200 (210MB) hard drive. Micro Express installs Windows 3.1 and MS-DOS 5.0 on the drive for you, and you get floppy copies along with manuals.

The system comes with 8MB of RAM as the standard complement, but you can expand the memory up to a maximum of 32MB by replacing the 1MB

Benchmark/performance testing was conducted by Computer Product Testing Services Inc. CPTS is an independent testing and evaluation laboratory based in Manasquan, NJ. Every effort has been made to ensure the accuracy and completeness of this data as of the date of testing. Performance may vary among samples.

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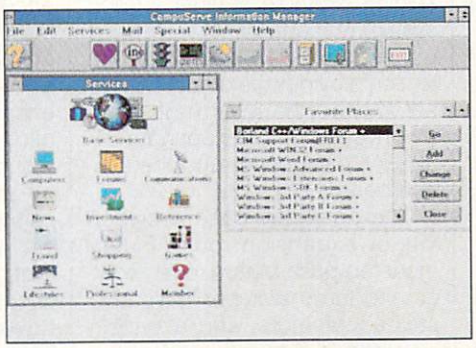

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SIMMs with 4MB units in the eight SIMM slots. The review unit came with 512K of cache memory, and this, too, can be upgraded to a full megabyte.

The manufacturer uses two methods of dissipating heat from the i486DX2/66 CPU: a deeply finned heat sink mounted atop the CPU chip and a miniature fan attached to the top of the heat sink. The fan serves two functions: It dissipates the heat which is transmitted through the heat sink's fins, and it also pulls cooler air through the fins to keep the chip's operating temperature within reasonable limits. Since heat buildup is the major cause of CPU and component failure, it's reassuring to see that the Micro Express folks have taken the bull by the horns, so to speak, with these preemptive measures.

I liked everything about this system except for the mouse. A three-button serial mouse from XOA, I found it to be a bit too bulky and stiff for my liking, but this is a minor point and purely one of taste. The enhanced keyboard supplied with the system is available in either audible-click or silent versions (a silent model came with the review machine), and it has a nice slope and comfortable action.

The minitower configuration provides lots of installation flexibility, and the 486-VL should prove to be adequate for the needs of most users. It certainly merits a closer look if you're interested in moving your data on the local bus.

Circle Reader Service Number 379

ZEOS 486DX2-66

When you unpack and set up as many computer systems as I do, you really appreciate it when the manufacturer has done a good job of preparing and testing the machine before it leaves the factory. The folks at ZEOS deserve some kind words in recognition of the exemplary job they do in making sure everything's right with a system before they ship it.

ZEOS INTERNATIONAL
1301 Industrial Blvd.
Minneapolis, MN 55413
(800) 423-5891
Direct price: $2,893 (review configuration)
Warranty: one year, parts and labor; 30-day money-back guarantee

In addition to a detailed packing slip with a complete inventory of the system components (both internal and external) and their associated part numbers, ZEOS also included a quality assurance checklist with the system. This checklist confirms that all aspects of system preparation and component quality assurance checking have been performed—not just once but twice—and that everything passed.

There's even a parts check section that ensures all required cables, manuals, power cords, and other required elements are also present and accounted for prior to sealing the box and shipping the system. Kudos to ZEOS for going the extra mile here.

Every computer system is the sum total of all its component parts, and ZEOS has supplied a shining example of what a good system is made of. The 200-watt power supply with built-in surge protection provides the operating voltage to power the system's dual floppy drives, its 245MB Seagate ST-3283AT hard drive, and the system board.

The spacious case provides lots of expansion room. Flush-mounted push-button reset, power, and turbo switches have LED status indicators, and a system key lock is also mounted at the front of the case. A snap-off plastic cover conceals the screws securing the case cover to the chassis and gives the rear of the machine a smooth and uncluttered appearance. As far as vacant bays go, you'll find a 5¼-inch bay and a vertical 3½-inch bay, both accessible from the front of the machine; inside the case there's room to add two additional 5¼-inch half-height drives.

ZEOS uses its own motherboard, which provides a total of seven full-length 16-bit expansion slots and a single three-quarter-length 8-bit slot. Two of the 16-bit slots have local-bus extensions on them as well. In the review unit, one of the local-bus slots was occupied by the Diamond Viper SVGA card, while all of the other slots were vacant and available. To dissipate the excess heat generated by the CPU, ZEOS installed a large heat sink about an inch longer than the 80486 chip itself. A ZIF socket makes removing the CPU for future upgrades an effortless procedure that consists of lifting the socket's locking lever, replacing the chip, and pushing the locking lever back down again.

I found the system's performance beyond reproach, handling both text- and graphics-based applications quickly and without a whimper. A comfortable enhanced keyboard with audible click and a Microsoft serial mouse make using the system a pleasure, and Lotus Organizer software, DOS 5.0, and Windows 3.1 all come standard. And if that's not enough, you can choose either Lotus 1-2-3 for Windows, Ami Pro, or Lotus Freelance as an additional included software package.

ZEOS builds a solid machine that should deliver excellent, trouble-free performance for many years to come. If you're thinking of purchasing a 486DX2/66 local-bus system, this one should be high on your list of potential candidates.

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SYSTEM FEATURES

	CompuAdd Express	Dell	Diamond Technologies	Digital	Epson
DIMENSIONS (in inches)					
Length	16.75	16.75	17.00	15.50	15.00
Width	17.00	24.40	16.25	16.00	17.00
Height	6.50	7.50	6.00	3.75	6.00
VIDEO					
Monitor	CompuAdd 51118	Dell UltraScan 14C	CTX 156NI	Digital PC7XV-de	Epson 17-inch Professional Series
Video adapter	Tseng W32	integrated S3 chip set	Diamond Viper	integrated S3 chip set	Wingine
Adapter max NI[1] res/colors	1024 × 768/256	1024 × 768/32,000	1280 × 1024/16.7 million	1024 × 768/256	1024 × 768/256
DRIVES					
Hard drive Make	Western Digital	Maxtor	Maxtor	Digital	Quantum
Model	Caviar 2340	LXT 340A	LXT 213A	Digital	ProDrive LPS
Formatted capacity	333MB	320MB	213MB	239MB	240MB
Controller	IDE	integrated IDE	IDE	integrated IDE	IDE
Controller cache	32K	32K	4K	NA	NA
Other drives 1.2MB	1	1	1	0	1
1.44MB	1	1	1	1	0
MOTHERBOARD					
Manufacturer	BCM Advanced Research	Dell	S&A Labs	Digital	Epson Portland
Standard RAM	4MB	8MB	8MB	4MB	4MB
Max RAM	32MB	64MB	32MB	64MB	128MB
No. of 8-bit slots	0	0	0	0	0
No. of 16-bit slots	6	6	6	3	6
No. of VESA local-bus slots	0	0	2	0	0
BIOS	AMI	Phoenix/Dell	AMI	Phoenix	Epson
External cache	128K	128K (optional)	256K	128K	yes[2]
Max cache	256K	128K	256K	256K	variable[2]
CPU socket	press-pin	press-pin	press-pin	press-pin	press-pin
Upgrade socket	yes	yes	no	yes	yes
Power supply	200 W	240 W	200 W	NA	200 W
INPUT/OUTPUT					
Parallel ports	1	1	1	1	1
Serial ports	2	2	2	2	1
PS/2 mouse port	0	1	0	1	1
Game port	0	0	0	0	0
Mouse supplied	yes	yes	yes	yes	yes
SUPPLIED SOFTWARE					
DOS	yes	yes	yes	yes	yes
Windows 3.1	yes	yes	yes	yes	yes
Floppy backups	yes	yes	no	yes	no
Other software	Close-up 4.0 and choice of one: Lotus Organizer, Lotus 1-2-3 for Home, Lotus Write, Lotus Works	NA	NA	QAPlus	NA

NA=not applicable or information about this feature not available
[1]noninterlaced
[2]Epson uses what it calls VirtualCache, a proprietary cache that can let you use all of your system memory as a virtual cache pool.

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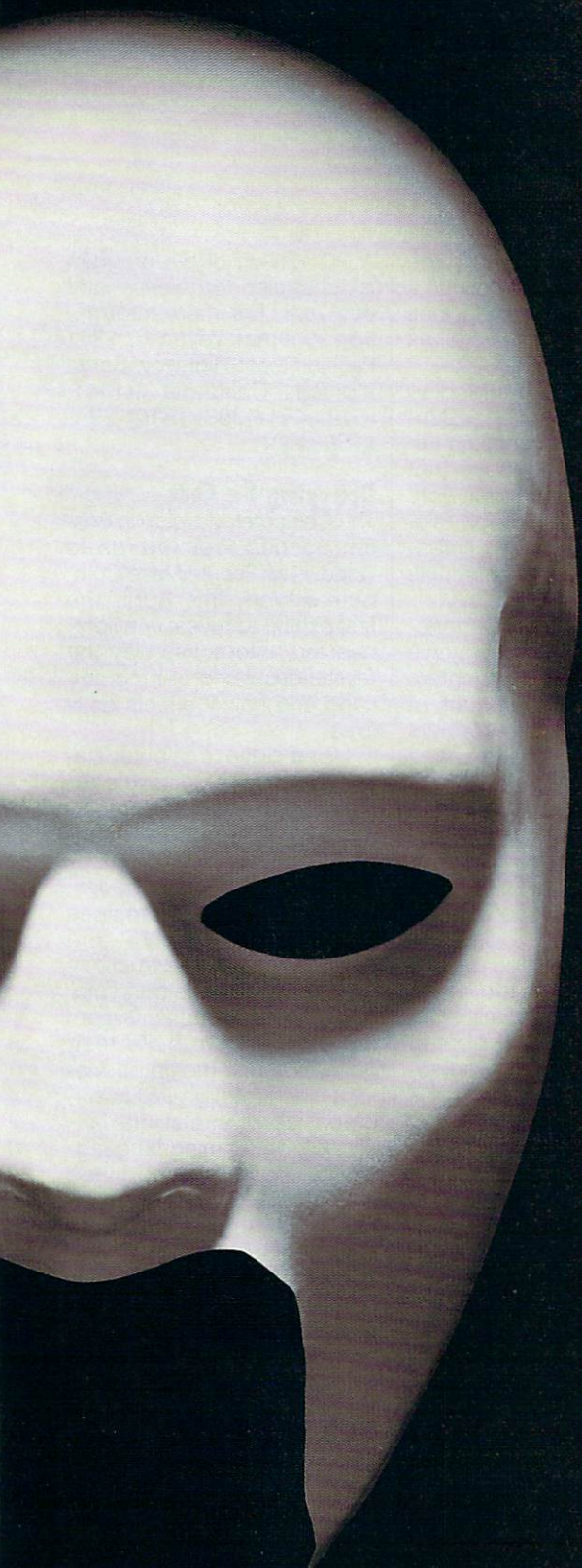
SYSTEM FEATURES

	Gateway	Insight	Keydata	Micro Express	ZEOS
DIMENSIONS (in inches)					
Length	16.00	17.50	17.00	16.50	18.25
Width	16.25	7.75	7.20	8.00	18.75
Height	4.25	25.25	24.80	24.80	6.25
VIDEO					
Monitor	CrystalScan 1572 FS	ViewSonic 6FS	CTX 1560	ME FM 360	ZEOS 14-inch SVGA
Video adapter	ATI Graphics Ultra Pro Local Bus	STB Power Graph	Genoa Windows VGA 24	ATI Graphics Ultra Local Bus	Diamond Viper VLB
Adapter max NI[1] res/colors	1024 x 768/256	1024 x 768/16.7 million	1024 x 768/16.7 million	800 x 600/32,768	1024 x 768/16.7 million
DRIVES					
Hard drive Make	Western Digital	Western Digital	Conner	Western Digital	Seagate
Model	Caviar	Caviar 2200	30254	Caviar 2200	ST 3283AT
Formatted capacity	333MB	210MB	250MB	210MB	245MB
Controller	integrated IDE	VL-bus IDE	VL-bus IDE	IDE	VL-bus IDE
Controller cache	128K	no	no	256K	no
Other drives 1.2MB	1	1	1	1	1
1.44MB	1	1	1	1	1
MOTHERBOARD					
Manufacturer	Gateway	ASUS	ASUS	Micro Express	ZEOS International
Standard RAM	8MB	8MB	8MB	8MB	4MB
Max RAM	64MB	32MB	32MB	32MB	64MB
No. of 8-bit slots	0	0	0	0	1
No. of 16-bit slots	6	5	5	6	5
No. of VESA local-bus slots	2	2	2	2	2
BIOS	Phoenix	AMI	AMI	AMI	Phoenix
External cache	256K	256K	256K	512K	128K
Max cache	256K	256K	256K	1MB	256K
CPU socket	press-pin	ZIF	ZIF	press-pin	ZIF
Upgrade socket	yes	yes	yes	no	yes
Power supply	200 W	250 W	250 W	200 W	200 W
INPUT/OUTPUT					
Parallel ports	1	1	1	1	2
Serial ports	2	2	2	2	1
PS/2 mouse port	0	0	0	0	0
Game port	0	1	1	1	0
Mouse supplied	yes	yes	yes	yes	yes
SUPPLIED SOFTWARE					
DOS	yes	yes	yes	yes	yes
Windows 3.1	yes	yes	yes	yes	yes
Floppy backups	yes	yes	yes	yes	yes
Other software	Cool Tools, PC Tools, QAPlus	Dr. Solomon's Anti-Virus, Stacker	Choice of one: Norton Desktop for Windows, Object Vision, Sidekick, Turbo C++, Paradox, dBASE IV	NA	Lotus Organizer and one: Ami Pro or Freelance

NA=not applicable or information about this feature not available
[1]noninterlaced



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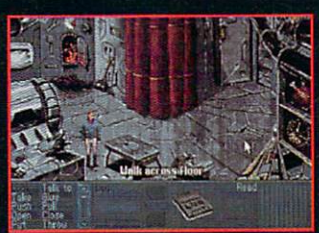

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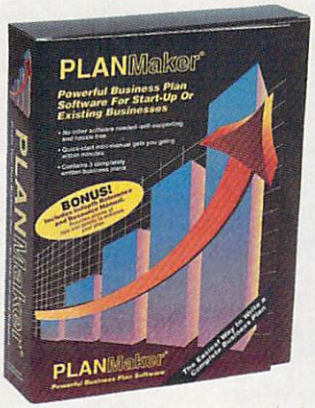
Circle Reader Service Number 174

NEWS & NOTES

Jill Champion

For Capital Seekers

There's nothing like gridlock. While small businesses hold the greatest potential for creating new jobs, they also have the hardest time obtaining venture capital. Add to that bleak picture, according to one study (by Coopers and Lybrand), the fact that only 1 in 100 business plans ever shows promise of being seriously considered because it is concise and well written, and you can see that hopefuls with poorly constructed plans are working against a huge disadvantage.



PLANMaker helps you put together a winning business plan.

A new software package called PLANMaker, not your ordinary fill-in-the-blanks business program, is designed to help overcome such odds. It combines all the ingredients necessary to formulate and publish a sophisticated business plan—one that conforms to the standards now demanded by bankers and investors. Its suggested retail price is $129. For more information, contact PowerSolutions for Business, 1920 South Broadway, St. Louis, Missouri 63104; (314) 421-0670, (314) 421-0668 (fax).

Future Teleconferencing

We all remember the classic line from "Star Trek": "Lieutenant, can you put that on-screen for me?" Even three decades ago, remote communications in sci-fi programs and flicks involved visual as well as audio contact.

Now, NCR is bringing to market NCR TeleMedia Connection. It's a combination of hardware and software that lets PC users communicate with each other through teleconferencing while they collaborate on files and documents in realtime.

"NCR TeleMedia Connection will change the way we work," says Neil Whittington, assistant vice president of NCR's Multimedia Products business unit.

The product consists of two 16-bit ISA bus plug-in cards to support video and graphics on 386- and 486-based PCs, as well as software that allows users to collaborate on Windows-based files. It also supports an optional video camera and audio unit. As a result of all this technology, a widely dispersed group of people can work together as if they were in the same room.

NCR plans to introduce products utilizing TeleMedia Connection technology later this year. For more information, contact NCR, 1700 South Patterson Boulevard, Dayton, Ohio 45479; (800) 225-5627 or (513) 445-5000.

Beatles Tour—30 Years Later

The Beatles have begun an ambitious worldwide tour on CD-ROM. Voyager is launching a new CD-ROM edition of *A Hard Day's Night*, an interactive program that includes the complete uncut movie, the entire script, a book's worth of text about the Beatles and the rise of rock 'n' roll, a Beatles photo gallery, and profiles of the songs and the film cast.

The suggested retail price is $39.95 for the Mac version. A PC version of the program is scheduled for release later this year. For more information, contact Voyager, 1351 Pacific Coast Highway, Santa Monica, California 94041; (310) 451-1383, (310) 394-2156 (fax).

Decrypting the Code

The Computer Museum in Boston opened From Words to Code: How People Make Computers Work this April, the first exhibit to reveal in a lighthearted, interactive way the mysterious world of programming and how it affects daily lives.

Using video, computer stations, and 3-D objects, the exhibit takes visitors on a journey into a "land of languages" to discover how programs, or sets of instructions, are all around—from recipes to lock combinations—and how these sets of instructions are turned into code using programming languages. Visitors are even able to build their own programs. The grand finale, a nine-foot-high 3-D tower, graphically illustrates the variety of programming languages that have evolved since the early 1950s. The exhibit is on display through September 6, 1993. For more information, contact The Computer Museum, 300 Congress Street, Boston, Massachusetts 02210; (617) 426-2800, (617) 426-2943 (fax).

Don't Dump That Old Laptop!

Why spend more money on a new laptop when you can have your current one upgraded? Laptop Solutions of Houston replaces the current hard drive with a brand-new, higher-speed, higher-capacity drive. "We have a rigorous quality-control program," says Ken Duckman, president of Laptop Solutions. "We pride ourselves on our 0-percent defect policy—every ma-

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PORT·ABLE Sound Plus is the first portable external sound peripheral to deliver 16 Bit CD quality music with stereo audio capabilities. And, since you just plug into your IBM PC or compatible, desktop or laptop parallel port, you do not need an engineering degree or even a screwdriver.

When you compare PORT·ABLE Sound Plus to any other external sound peripherals, you will see why anything else is just noise. PORT·ABLE Sound Plus is based on advanced Digital Signal Processing technology, so you will enjoy the greatest compression capability with the highest quality sounds. Here is something else that will be music to your ears. PORT·ABLE Sound Plus comes complete with everything you need including a high fidelity speaker and built-in microphone. There is an "Audio-in" for a CD or tape player and a "Line-out" for external powered stereo speakers. Even a built-in smart parallel port pass through so you can keep printing.

Whether you take your work across the hall or across the country, with PORT·ABLE Sound Plus, you have all the cards you need to play right in your hip pocket. The hinged design lets you flip up the unit if you are short on desk space or lap space. And, the power will always be with your whether you use rechargeable or non-rechargeable AA batteries. PORT·ABLE Sound Plus also comes equipped with an AC/DC power converter.

As a bonus, you will get all the software you need to communicate. Like Lotus Sound™ an OLE server for Windows 3.1. WinReader for Windows 3.1, a handy text-to-speech utility. Digispeech's DOSTalk and DOSReader text-to-speech applications. Show & Tell For Kids™ for Windows – an easy to use MultiMedia Authoring program. It is also Sound Blaster and AdLib compatible.

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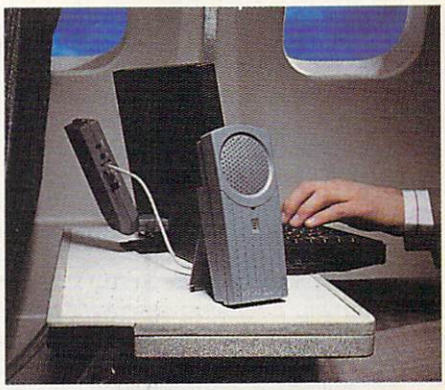

To order or obtain more information about PORT·ABLE Sound Plus, write or call Digispeech, or, contact your local dealer.

Sales Office: 550 Main Street, Suite J, Placerville, California 95667. Telephone: (916) 621-1787. Fax (916) 621-2093.

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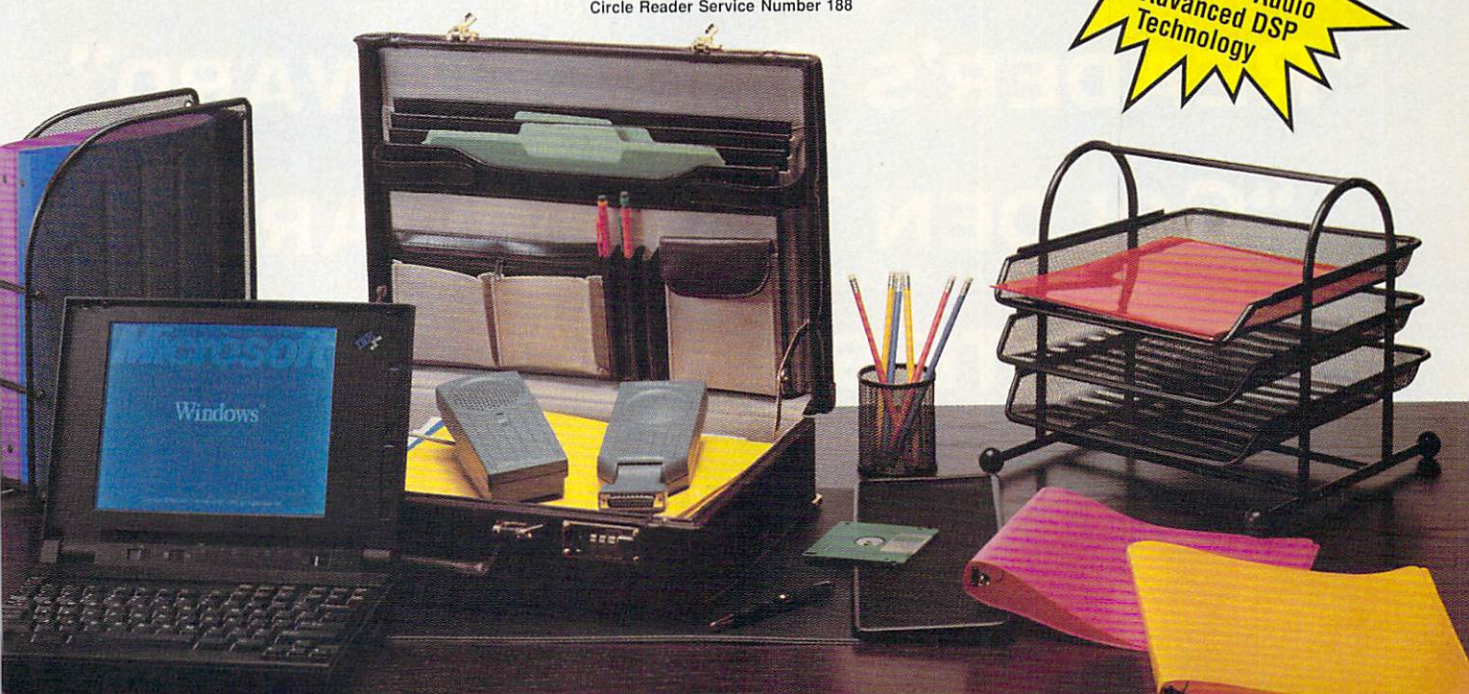

chine must go back to the client in better condition than when we received it."

The entire process takes 48 hours. During the second 24 hours, after components have been upgraded, the machine is put through an intense "burn-in and test" period in which the hard disk is exercised through a variety of software applications and environments. The new drive must perform perfectly before the company will release the machine. Such meticulousness has helped Laptop Solutions win licensing agreements with Toshiba and Compaq, but the company is also skilled in upgrades of many other manufacturers' designs, including Sanyo, ZEOS, TI, Tandy, CompuAdd, and AT&T.

For more information, contact Laptop Solutions, 10700 Richmond Avenue, Suite 114, Houston, Texas 77042; (800) 683-6839.

Finding Silicon

Do-it-yourselfers take note: JDR Microdevices has a new catalog designed specifically for engineers, technicians, hobbyists, and hackers that offers the company's largest selection ever of electronic components, prototyping products, and developer's tools. Featured are components for today's advanced designs. Readers will also find Hitachi oscilloscopes, solder accessories, and even hard-to-find reference books from National Semiconductor, Intel, Motorola, and other chip makers.

The catalog also features insightful information to make the buyer more productive. Derrick Moore, director of engineering at JDR, shares his development strategies in "Derrick's High-Tech Corner" columns, and numerous "Tech Tip" columns offer insightful tips. To order a free catalog, contact JDR Microdevices, 2233 Samaritan Drive, San Jose, California 95124; (408) 559-1200, (408) 559-0250 (fax).

Floppy Jukebox

Once you've tried the Disk Dispatcher, a "point-and-click floppy jukebox," you might never go back to conventional disk storage methods again. The Disk Dispatcher, from Select Products, organizes, indexes, and dispenses 3½-inch floppy disks or Flopticals.

Simply list up to 20 of your most-used disks or Flopticals on the reversible index and punch in your selection, and the patented selector-action mechanism on the box instantly hands you your disk.

The Disk Dispatcher also has the smallest operating footprint of any 20-disk holder currently on the market, so it will save desk space. Its suggested retail price is $21.95. For more information, contact Select Products, 520 First Street, Fillmore, California 93015; (805) 524-1747, (805) 524-1767 (fax).

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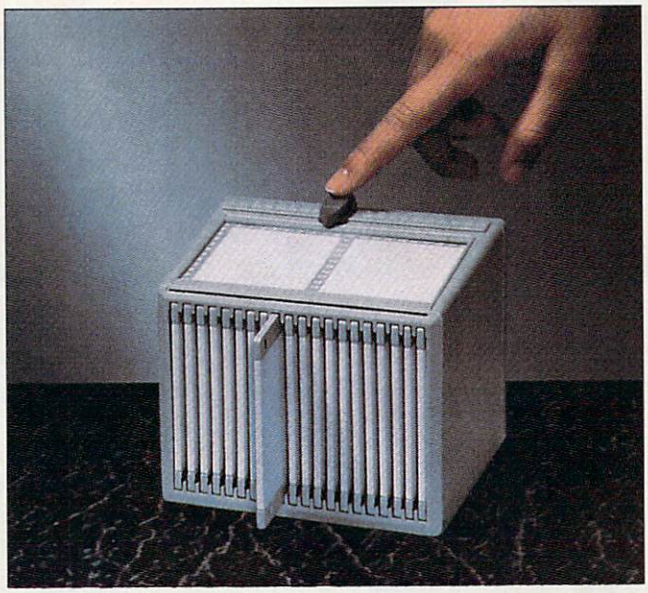
Businesses strapped for capital needed to purchase office computer equipment might want to try shopping with the LeaseCard—a credit card from Trans Leasing International that lets you finance purchases in the $1,000–$50,000 range. Rates are lower than with conventional credit cards, and applications are processed in one day. Trans Leasing's close relationship with major equipment manufacturers offers cardholders value pricing, eliminating the need for hours of comparison shopping. Says company founder Richard Grossman, "This is a service-driven business. The idea is to have credit available to customers immediately." And commenting on the success of his credit-card business, he says, "It pays off when satisfied customers purchase second and third pieces of equipment." For more information, contact Trans Leasing International, 3000 Dundee Road, Northbrook, Illinois 60062; (708) 272-1000, (708) 272-2174 (fax).

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



The Disk Dispatcher makes selecting a 3½-inch floppy disk or Floptical as easy as operating a jukebox.

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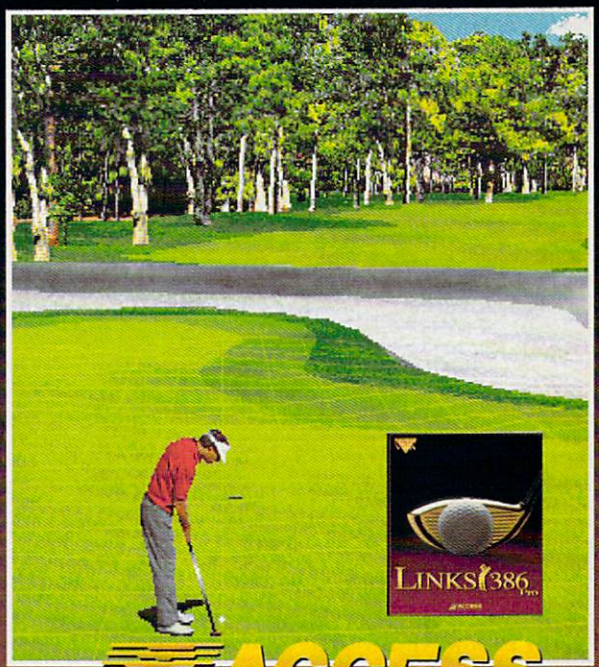
—PC RESEARCH (OCT.'92)



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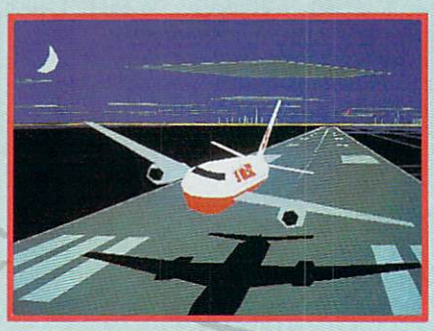

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Great Britain - White Cliffs of Dover

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FEEDBACK

Key depression, specialty viruses, virtual air traffic, high-flying memory, colorful forms, easy virus detection, and more.

Keyed Up

Some time ago, you showed how to set or reset the Caps Lock key and other control keys. But what about ordinary keys? Is there a way to tell which key has been pressed?

JOHN JACKSON
DETROIT, MI

This program might work for you. It's written in QBASIC.

```
CLS
DEF SEG = 0
top:
LOCATE 1, 1
FOR i = 1049 TO 1088
PRINT (PEEK(i));
a$ = INKEY$
NEXT
GOTO top
```

This program displays the keyboard buffer (bytes 1053 through 1085), a pointer that keeps track of the current character in the buffer (byte 1052), and a pointer that keeps track of the most recent character read (1050). When increasing the value of 1050 will make it equal to the value in 1052, your computer beeps to alert you that your keyboard buffer is full. To print onscreen the ASCII value of the most recent keypress, use this program. (The line that reads a$=INKEY$ *keeps the beginning and end pointers in the same position.)*

```
CLS
DEF SEG = 0
top:
q = (PEEK(1052) - 32)
IF q = -2 THEN q = 30
LOCATE 1, 1: PRINT PEEK(1054 +
 q)
a$ = INKEY$
NEXT
GOTO top
```

Viral Spiral

The article on viruses in your February 1993 issue answered quite a few questions for me, but can you answer these?

Is it theoretically possible for a compiler, if infected with any of the viruses the article described, to generate an infected EXE file?

Is it theoretically possible to write a virus that would infect a compiler and cause it to generate an infected EXE file?

If the answer is *no* to both questions, can a newly compiled and not yet executed EXE file be considered virus free, assuming the source code contains no viruses?

RICHARD M. SANDERS
BURNSVILLE, MN

Anything is possible. Some of the viruses described in the article install themselves as TSR files which constantly scan the hard disk for uninfected files. A new EXE file (one that was just created) would be vulnerable to the Dark Avenger, for example. As far as we have been able to determine, no virus currently in circulation specializes in infecting compilers in such a way that they would generate diseased EXE files (although now that you've raised the question, someone somewhere will probably try circulating one). Such a virus would be too specialized to spread and would quickly be isolated and destroyed. The answer to your final question is that no file can be assumed to be virus free.

Rights and Wrongs

In response to the "News Bits" item called Controlling the Infectious (December 1992), I believe that there should be controls both on weapons and virus construction kits. Nobody sets a loaded and cocked gun in a room and then says, "Be careful." Virus construction kits are loaded guns. They're all too easily put to use. Viruses, like guns, will not disappear under stricter controls, but by restricting their availability, fewer people will suffer.

JOSEPH LEWIS LOUTZENHISER
ASHLAND, OR

Taking Control

I wish to point out a misconception regarding virtual reality and aviation. In "Virtual Reality" (February 1993), Jeffrey Hsu suggests that "air-traffic controllers may one day take direct control of the planes on their radar scope through VR." In fact, it's more likely that pilots will one day replace the ground controllers. Technology currently exists (GPS navigation and data link transponders) which would allow pilots to provide their own separation and sequencing. It should be noted that these are the services currently offered by ground controllers.

C. SEBERG
MOUNTAIN VIEW, CA

Infection Control

I would like to take issue with one of Philip Chien's comments in "The Great Virus Scare" (February 1993). He states, "In all cases, viruses are programs that were written by an outlaw—a hacker who specifically sets out to damage other people's computers." In all deference to Mr. Chien, this is simply not true. Paul Mungo and Brian Clough, discussing Teodor Prevalsky, a Bulgarian engineer who was an early virus writer, state, ". . . for Teodor, destruction of data or programs was never the point. He wrote viruses as an intellectual challenge. None of his viruses had ever been intentionally damaging . . ." (from *Approaching Zero,* 1992).

SCOTT MOSER
DANVILLE, IN

New device lets you get twice as much done, in half the time!

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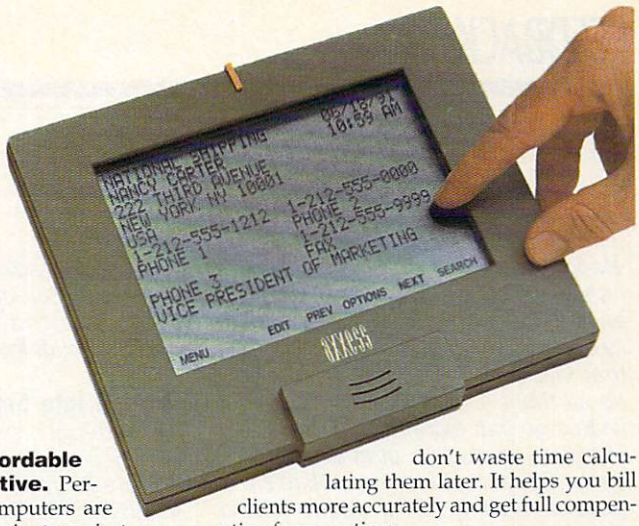
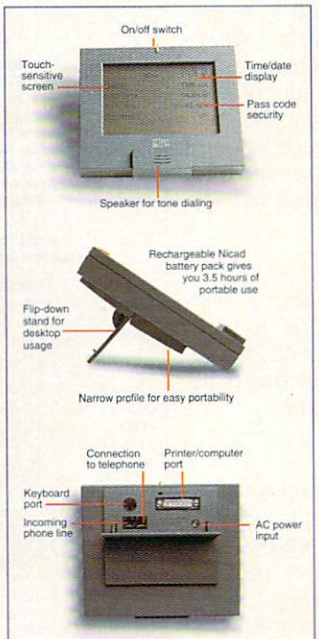


by Charles Anton

Do you ever get frustrated trying to locate the phone number or name of a client? Forget which piece of paper you wrote it down on? Well if you are like most people, your business depends on quick access to important phone numbers, appointment schedules or other messages that could make a difference in getting that "big job." With Axxess, the contact management solution from Oregon Scientific, you can immediately put an end to all these problems.

Touch screen. Just by touching a word or letter on the screen, Axxess displays or speed scrolls to find the right company or message. Help yourself remember the name of a person or company that plays a key role in your business. Since all the information is cross-referenced, you can type in one or two key facts to retrieve the desired information. Print out any message you want by connecting Axxess to your PC printer (with additional cable). Download data from your Mac or IBM compatible computer to give your Axxess an instant database. This working database can later be up-loaded to your computer to update your files (with optional software/cable package).



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No thick manuals. With Axxess, there are no thick manuals to read. It's completely menu-driven. Operation is easy and self-explanatory. Just touch the screen to indicate what type of information you're looking for, and that data is instantly available. There are no complicated connections. Just plug Axxess into an outlet or use the built-in rechargeable Nicad battery pack.

The affordable alternative. Personal computers are too expensive to use just for storing business records. But that's what most companies are using them for. The Axxess system from Oregon Scientific can store over 1,000 business records, including names, companies, phone and fax numbers, addresses and two-line memos. Just touch a number and it's dialed for you. It's great for small business owners who can't afford a secretary but still need an extra hand. Plus, with an optional cable, two or more Axxess units can share information!

Just a touch away. Simply touch the screen to access information... Keep accurate records of time spent on specific tasks... Speed search through the listings you want... Print this information directly to your printer... Schedule appointments--days, weeks or months in advance and let your alarm remind you... Never forget a phone number or be late for an appointment again.

Speed dialing. Axxess can be used with most phones for speed dialing. Just select your contact and touch the number on screen-- it's automatically dialed for you ... in seconds. Axxess can also be used as a tone dialer for phones that you cannot directly link to, like pay phones. Simply touch the number on the screen and then hold the phone's handset over Axxess' speaker. Axxess emits a series of electronic tones which dial the number for you.

Appointment scheduling. The Axxess personal organizer also has a 100-year calendar. Its built-in alarm reminds you of every appointment. There is a continuous time/date display to help you keep on schedule as you work, increasing your productivity.

Time log. The time log feature helps keep an accurate record of time spent on each project. Axxess tracks your hours as you go, so you don't waste time calculating them later. It helps you bill clients more accurately and get full compensation for your time.

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FEEDBACK

Good point. There's a bit of intellectual challenge in writing a virus virulent enough to plant itself unknown in heavily defended computers. If that were all that viruses did, no one would care about them. Unfortunately, most virus writers go that extra mile to make their creations destructive, or at least troublesome. Recall that some say Nero's purpose in torching Rome was to receive the inspiration for a poem. Should we forget the damage that resulted from his flight of fancy simply because he was seeking an intellectual challenge?

In retrospect, we probably should have changed the word all *to* most *in Mr. Chien's article. Many people believe in the doctrine "All absolute statements are false."*

Flying High

I have DOS 5.0. How can I load my TSRs into high memory?

JOSHUA NEWMAN
COOPER, TX

We get a lot of letters about this. DOS programs (particularly games) have become so memory hungry that you need every byte of conventional memory you can get your hands on.

You can save significant amounts of conventional memory by loading your TSRs high. You do this with Loadhigh. If you have a TSR called Nicholas, instead of simply putting its name on a line by itself in your AUTOEXEC.BAT, put Loadhigh Nicholas.

A couple of other ways to save memory are to use DOS=HIGH and to use Devicehigh for the drivers in your CONFIG.SYS file (as in DEVICEHIGH=SETVER.EXE). Make sure DEVICE=HIMEM.SYS comes first in your CONFIG.SYS file. You can't load HIMEM.SYS high.

Color Forms

Are there any form programs that can use PCX graphics and make color forms?

STEVEN KILIAN
APO, AP

FormWorx (Power Up Software, 2929 Campus Drive, San Mateo, California 94403) can import uncompressed black-and-white PCX files up to 64K and print text and fills in color. PerFORM Pro Plus (Delrina Technology, 6830 Via Del Oro, Suite 240, San Jose, California 95119) will import and print gray-scale PCX files and print text and fills in color.

Drafted into Service

I'm a deputy sheriff and editor of a small journal for an organization of traffic crash reconstructionists. We've found that MacDraft is a great program. But because most sheriffs' departments have PCs rather than Macintoshes, I'm looking for a PC product that's as good as MacDraft on the Mac for drawing crash sites for courtroom presentations.

WILT NELSON
HOWELL, MI

MacDraft is now available in a Windows version called MacDraft for Windows. Contact Innovative Data Design, 2280-A Bates Avenue, Concord, California 94520; (510) 680-6818.

Looking for Trouble

I wanted to alert your readers to the fact that you can often detect viruses that infect EXE and COM files because they change the size of the infected files. Also, there's a simple test for certain viruses, particularly Stoned and Michelangelo. These viruses decrease the amount of base memory DOS thinks it has. If you run Chkdsk, you should see 655360 total bytes of memory. If you see a value less than that, your computer may have an infection. Also, if you think you have an infection, you should turn your computer off immediately and seek professional help. There's a chance that the virus can be stopped before it does serious harm to your computer.

MARK ANDERSON
DEL NORTE, CA

Readers whose letters appear in "Feedback" will receive a free COMPUTE's PC clock radio while supplies last. 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. Write to COMPUTE's Feedback, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We regret that we cannot provide personal replies to technical questions. ❐

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☐	☐	80386, brand _____
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☐	☐	Game system, brand _____
☐	☐	Other _____

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☐	☐	Laser printer
☐	☐	MIDI device
☐	☐	Modem
☐	☐	Mouse
☐	☐	PostScript printer
☐	☐	Sound card
☐	☐	Speakers
☐	☐	Tape backup system

How much memory does your computer have?

- ☐ 640K or less
- ☐ 1MB
- ☐ 2MB
- ☐ 4MB
- ☐ 8MB
- ☐ 16MB

Which operating system(s)/environment(s) do you use?

- ☐ DR DOS version _____
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- ☐ Art Works
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- ☐ Multimedia
- ☐ New computer technologies
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- ☐ Less than two years
- ☐ Two years or more

If you have a modem, which online service(s) do you use?

- ☐ America Online
- ☐ BIX
- ☐ CompuServe
- ☐ DELPHI
- ☐ GEnie
- ☐ Internet
- ☐ Prodigy
- ☐ Other _____

Comments _____

WINDOWS WORKSHOP

Clifton Karnes

COMPILER WARS

Visual C++ is a superb development environment that has just about everything.

Back in January, I talked about Borland's C++ 3.1 and what a great Windows development environment it was. The quality of Borland's new entry in the compiler market wasn't lost on anyone, especially Microsoft. Now Microsoft has countered Borland's C++ 3.1 with Visual C++, a superb development environment that has just about everything.

There are lots of modules to Visual C++, and they all work together. The heart of the system is Visual Workbench, which is the Windows-based integrated environment. It boasts an interface much like QuickC for Windows but with many added features. There's a toolbar for quick access to common commands; a syntax highlighting editor; and a Tool menu, to which you can add your own commands.

The editor is not configurable (you can't remap the keyboard), but it's fairly powerful and has lots of useful commands such as one that lets you change the case of text and another that indents and unindents blocks.

Next on the list is App Studio, which you can use to edit all your resources, including dialog boxes, icons, cursors, menus, and bitmaps. You can also edit resources in EXEs, DRVs, and DLLs. App Studio is like Borland's pioneering Resource Workshop, but it's easier to use and more powerful. App Studio is written entirely in Visual C++, too, which brings us to this product's central theme: C++.

One of the reasons that Microsoft created Visual C++ was to make it easier for C programmers to move to C++, and two of Visual C++'s modules— AppWizard and ClassWizard—focus on that task.

If you've misspent your youth starting each new Windows' project by copying the canonical Generic, you'll really appreciate AppWizard. It's an application generator that lets you create a program's source files based on a series of options. You can create programs with an MDI interface, a toolbar, printing and print preview functions, custom VBX controls, context-sensitive help, and OLE client support. AppWizard can also create external makefiles, and it will generate source comments.

What language does AppWizard use? C++ and Visual C++'s new Microsoft Foundation Class 2.0 library. It's worth noting that you use AppWizard only once—when you create your program. It's not a CASE tool, like WindowsMAKER or Caseworks, that you can return to in the development process.

After creating your program skeleton, ClassWizard lets you make connections between user-interface elements, messages, and code by pointing and clicking.

When it comes to debugging, Visual C++ really packs the Raid. It boasts a Windows-hosted debugger that's integrated with the Visual Workbench editor. Just press F8 or click on the step button on the toolbar, and you're debugging. Find an error? Just start typing to correct it. This is the way Windows debugging ought to work!

The integrated debugger features normal and conditional breakpoints, watches, and register display. If you need more powerful debugging, there's CodeView for Windows, which, using technology from Nu-Mega, runs as a nonmovable Windows app in one corner of your screen. It's not as convenient as the integrated debugger, but it's a heck of a lot easier to use than Borland's full-screen debugger that makes you flip back and forth between the debugger and Windows.

Other debugging aids include HeapWalker, DDESpy, Spy, Stress, ZoomIn, and Hotspot Editor.

In addition to all this, Microsoft's online help, which has always been good, is even better now. The entire API reference is online, and you'll find tons of TechNotes—articles on programming problems.

The documentation is excellent, but all the 3.1 SDK docs aren't included. You can get the missing ones for an extra $99. I consider them a necessity, and they're a steal at $99.

Other useful features include a first-rate Browser and precompiled headers that are finally easy to use.

Visual C++ comes in two versions: a Standard Edition for $199 and a Professional Edition for $495. The Standard Edition has everything in the Professional Edition except for the Windows debugging applications, DOS program generation, and the optimizing compiler.

The Standard Edition replaces QuickC for Windows, and the Professional Edition replaces C 7.0 and the SDK.

The bottom line with a development environment is how fast it compiles and how small the executables are. With a few informal tests on medium-sized programs with 1000–4000 lines, I found Visual C++ to be slower at compiling than Borland C++, but the EXEs were considerably smaller (the in-memory images were the same as those generated by Borland's compiler).

One thing that has won me over to Visual C++ is the smaller executables. Another thing is the integrated debugger. This feature alone saves hours and hours with every project. Visual C++ is hard to beat, but I'm sure Borland's going to try. ❐

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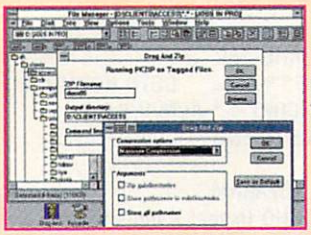

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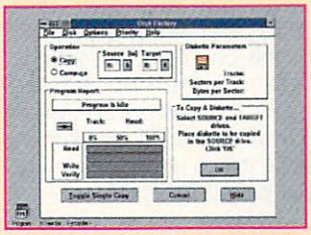

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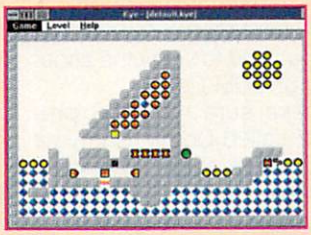

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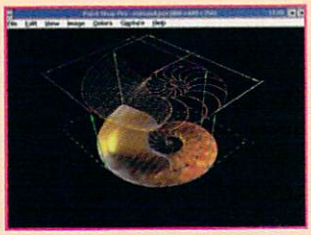

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TIPS & TOOLS

Edited by Richard C. Leinecker

Checking COM files with a new Checksum, finding files from any directory, and using the extended power of Xcopy and M.BAT

Checksum Redux

Here is a new Checksum Debug script. The original Checksum was published in the July 1992 "Tips & Tools" column in COMPUTE. In this column and in future columns, this is the Checksum program that will be used to verify the accuracy of COM files.

Make sure the DOS program called Debug is in your path or the current directory. In these examples, the italic text represents what the computer prints; the roman text represents what you should type. One way to be sure you get these programs exactly right is to have someone read the numbers to you as you type them in. Another way suggested by one of our readers is to read the numbers into a tape recorder and then play them back as you enter the program code.

```
debug checksum.com
File not found
-e 100 bd 70 01 be 80 00 ac 0a
-e 108 c0 74 61 ac 3c 0d 74 5c
-e 110 3c 20 74 f7 8b d6 4a ac
-e 118 3c 0d 74 04 3c 20 75 f7
-e 120 c6 44 ff 00 2b ff 8b f5
-e 128 b8 00 3d cd 21 72 3d 8b
-e 130 d8 b4 3f b1 01 8b d5 cd
-e 138 21 0a c0 74 06 8a 04 03
-e 140 f8 eb ee b4 3e cd 21 8b
-e 148 c7 bb 10 27 8b fd 2b d2
-e 150 f7 f3 04 30 aa 52 2b d2
-e 158 8b c3 bb 0a 00 f7 f3 8b
-e 160 d8 58 0b db 75 e8 8b d5
-e 168 b4 09 cd 21 b4 4c cd 21
-e 170 00 00 00 00 00 0d 0a 24
-RCX
CX 0000
:78
-W
Writing 0078 bytes
-Q
```

To use Checksum, type *checksum filename.com*. If you run Checksum on Checksum, you will see the number 13907 on your screen.

RICHARD C. LEINECKER
MIAMI, FL

No Scroll

In your December 1992 issue, you had a batch file called M.BAT that lists several different file specs in a directory. It also lists the volume name and free disk space after each file spec, and this can make the listings scroll off the top of the screen. I added the /b switch to Dir to eliminate these superfluous items. Here's my version, called DIRR.BAT.

```
ECHO OFF
IF "%1"=="" GOTO NOPARAM

:LOOP
DIR %1 /b
SHIFT
IF "%1"=="" GOTO END
GOTO LOOP

:NOPARAM
ECHO Parameter missing
ECHO Usage: DIRR file_spec_1
 file_spec_2. . . file_spec_9
:END
```

I also wrote a batch file that will find a file anywhere on a disk from any directory. You can add the /b switch to the directory to get rid of everything except the found files and their paths. I call it FF.BAT.

```
ECHO OFF
IF "%1"=="" GOTO NOPARAM
DIR \%1 /s
GOTO END

:NOPARAM
ECHO Parameter missing
ECHO Usage: FF filename

:END
```

JIM KROON
WALLINGFORD, CT

Even Easier Backups

In your December issue, you showed how to do easy backups. There's an easier way with Xcopy and the right switches. The following batch file backs up the current directory, but only files from the given date forward. The batch file is called X.BAT. For it to work, you must give it the date from which to start backups in the form mm/dd/yy.

```
ECHO OFF
IF "%1"=="" GOTO NOPARAM
XCOPY *.* A:/M/V/D:%1
GOTO END

:NOPARAM
ECHO Usage: X mm/dd/yy
ECHO Files from the given date
ECHO forward will be backed up to
ECHO the destination drive.
:END
```

You can modify this batch file to include subdirectories by adding a /s switch to the Xcopy line. Here's X.BAT reworked slightly to include subdirectories.

```
ECHO OFF
IF "%1"=="" GOTO NOPARAM
XCOPY *.* A:/M/V/S/D:%1
GOTO END

:NOPARAM
ECHO Usage: X mm/dd/yy
ECHO Files from the given date
ECHO forward will be backed up to
ECHO the destination drive.
:END
```

You can also do a selective backup and get prompted for each file by adding the /p switch. Here's X.BAT with the /p switch so that you're prompted for each file.

```
ECHO OFF
IF "%1"=="" GOTO NOPARAM
XCOPY *.* A:/M/V/P/D:%1
GOTO END

:NOPARAM
ECHO Usage: X mm/dd/yy
ECHO Files from the given date
ECHO forward will be backed up to
ECHO the destination drive.
:END
```

BARRY L. REHEARD SR.
LANCASTER, PA

Clearing Keys

I've used GETKEY.COM from the October 1991 issue many times in my batch files. Once in a while, users press keys before my screens are displayed. This can lead to the wrong input. The way I solved this problem was to write a short file called CLKEY.COM that clears the keyboard. Then, GETKEY.COM can wait for a key when the display appears.

You can type in Clkey using the DOS Debug command. You will type in the text in roman. The italic text is provided by Debug.

```
debug clkey.com
File not found
-e 100 b4 01 cd 16 74 06 2a e4
-e 108 cd 16 eb f4 b4 4c cd 21
-RCX
CX 0000
:10
-W
Writing 0010 bytes
-Q
```

If you run the new Checksum on this file, you will see the number 02000 appear on your screen.

In case you missed the October 1991 issue, here's GETKEY.COM. It returns the keypress as an errorlevel code; this code is the ASCII value of the key. If A was pressed, it would return 65. If you want it to capitalize all return values, pass it any command line parameter.

```
debug getkey.com
File not found
-e 100 be 80 00 2a e4 cd 16 80
-e 108 3c 00 74 0a 3c 61 7c 06
-e 110 3c 7a 7f 02 24 df b4 4c
-e 118 cd 21
-RCX
CX 0000
:1a
-W
Writing 001a bytes
-Q
```

If you run Checksum on this file, you will see the number 02480 on your screen.

You might want to clear the keyboard buffer and then wait for a key, all in one step. Here's a program that does just that. It returns the same values as GETKEY.COM.

```
debug clgetkey.com
File not found
-e 100 b4 01 cd 16 74 06 2a e4
-e 108 cd 16 eb f4 be 80 00 2a
-e 110 e4 cd 16 80 3c 00 74 0a
-e 118 3c 61 7c 06 3c 7a 7f 02
-e 120 24 df b4 4c cd 21
-RCX
CX 0000
:26
-W
Writing 0026 bytes
-Q
```

If you run Checksum on this file, you will see the number 03986 on your screen.

VINCENT D. O'CONNOR
BABBITT, MN

Safer File Moves

I've read a number of batch files that move files from one directory to another. Ultimately, the file is copied to the destination and then removed from the source.

Unfortunately, a few mistakes can cause a user to lose the file. That's why I wrote a batch file called COPYMOVE.BAT that makes several checks and tries to prevent accidents.

```
ECHO OFF
IF "%1"=="" GOTO NOPARAM
IF "%2"=="" GOTO NOPARAM
IF EXIST CHECK.DIR DEL
  CHECK.DIR
IF NOT EXIST %1 GOTO NOFILES
IF NOT EXIST %2\NUL GOTO
  NODIR

IF EXIST %2\CHECK.DIR DEL
  %2\CHECK.DIR
ECHO TESTING > CHECK.DIR
IF EXIST %2\CHECK.DIR GOTO
  SAMEDIR
GOTO COPYMOVE

:NOFILES
ECHO %1 file(s) not found
IF EXIST CHECK.DIR DEL
  CHECK.DIR
GOTO END

:NODIR
ECHO Directory of %2 not found
IF EXIST CHECK.DIR DEL
  CHECK.DIR
GOTO END

:SAMEDIR
ECHO Files cannot be
ECHO COPYMOVED into the
ECHO current directory.
ECHO Change to
ECHO any other directory
ECHO and try again.
IF EXIST CHECK.DIR DEL
  CHECK.DIR
GOTO END

:NOPARAM
ECHO Missing parameter
ECHO Usage:
ECHO COPYMOVE
ECHO filespec
ECHO destination_path
GOTO END

:COPYMOVE
IF EXIST CHECK.DIR DEL
  CHECK.DIR
COPY %1 %2
FOR %%F IN (%1) DO DEL %%F
ECHO %1 file(s) COPYMOVED
ECHO to the %2
ECHO directory

:END
```

DENNIS T. MILLER
DALLAS, TX

Three batch-file-enhancing COM files and a safer file moving program

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INTRODOS

Tony Roberts

GRASPING POWER

Overcoming fear of the DOS prompt just takes a little understanding.

Windows may get all the attention these days, but DOS-based computing is still alive and well. Just because a computer doesn't have the horsepower to run Windows applications doesn't mean it's a candidate for the landfill. Jay Atlas, a reader who is a professor of philosophy at Pomona College in Claremont, California, made this point to me recently during an exchange we had over Internet.

Atlas contends that most homeowners, small businesses, and students in particular can get by just fine without getting all wrapped up in Windows. I have to agree. Although the point-and-click environment makes a computer a little easier to use, there's a great deal of overhead (fast processor, fast hard disk, lots of RAM) involved in attaining that ease of use.

If you're into desktop publishing, multimedia, CAD, or graphics design, then you probably need Windows and Windows software. But if your computing needs are less lofty and you're willing to eschew the glitz and glamour that the latest machines offer, you'll discover that even an 80286 with 1MB of memory can be a powerful workhorse.

Let's look at what a DOS machine can do.

Word processing. Most people I know use their computers for writing, and as far as I'm concerned, no graphical application compares with DOS when it comes to word processing. I'm not talking about type styles and headlines; I'm talking about content. A student writing a term paper should be more concerned with what words say than how they look. The same can be said for a businessperson preparing a business plan. Parents will appreciate a plain and simple letter just as much as one gussied up with fancy fonts and dingbats.

Telecommunications. Even if you have the fastest computer on earth, your telecommunications progress is measured by the speed of your modem—1200, 2400, or 9600 bps. A modem and telecommunications software provide a gateway to vast quantities of information. Sign up for GEnie or CompuServe and tap into whatever field of data interests you there. For example, owners of small businesses can learn to avoid numerous stumbling blocks and pitfalls with information found on GEnie's Home Office/Small Business RoundTable. DOS computers telecommunicate so well that several Windows users I know have set up their older, slower computers as telecommunications stations.

Database applications. Today's newest database software has gone graphical, allowing you to include a digitized photo with each employee record, but most of us have database needs that are far less demanding. Mainly, we want to manage an address and phone list for a few friends, associates, and customers. There are numerous DOS applications that do this well—and fast.

So there's still plenty that can be done at the DOS prompt, but therein lies the problem: the *DOS prompt,* the C:\ with the bad reputation.

I won't deny that DOS can be cumbersome and difficult to use, but the same can be said for a sewing machine or a power saw. Using any tool properly requires an understanding of the process and the expected outcome. For example, a seamstress understands how to use a sewing machine to assemble a garment. The sewing machine is a great tool, but it can't be put on autopilot. The operator is required to use judgment, make decisions, and decide what steps will be completed in what order.

Computer users get in trouble with the DOS prompt when they try to engage the autopilot—they try to memorize commands rather than to understand processes. For example, I'm continually amazed at how troublesome the DOS subdirectory structure is for most computer users. Let's look at a simple example. On our disk, we have the root directory, C:\, and two subdirectories, DIR-1 and DIR-2.

Assume you're working in DIR-1 and you want to get to DIR-2. If you enter *cd dir-2,* all you'll get is the message *Invalid Directory* because there's no subdirectory named DIR-2 that branches off the current subdirectory (DIR-1). To avoid this frustration, you've learned that when changing directories, you must first go back to the root directory and then change to the target directory. So you type *cd* \ to get to the root directory and then *cd dir-2* to change to DIR-2.

Mission accomplished, but without full understanding of what's happening. What you really need to know is that the full name for DIR-2 is C:\DIR-2. The backslash is important; it represents your disk's root directory. When you know that DIR-2 is a branch of the root directory, you can easily switch to it from any subdirectory by typing *cd \dir-2.* In this case, the CD command uses the root directory (\) instead of the current directory as the starting point in looking for the DIR-2 subdirectory.

If you're computing at the DOS prompt and feeling blue, it's time to snap out of it. Commit yourself to understanding the processes, and you'll discover you have a most helpful tool at hand. ❐

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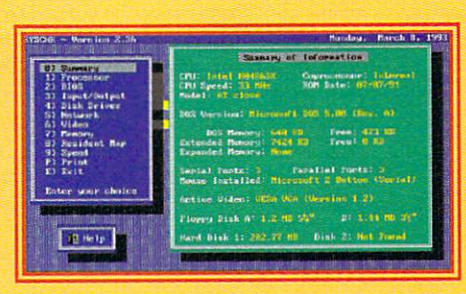

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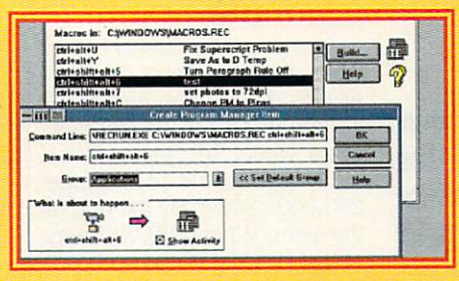

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HARDWARE CLINIC

Mark Minasi

PENTIUM POWER

Why is a Pentium faster than a 486, and how fast is it?

By now, you've heard a lot about Intel's new microprocessor, the Pentium. Wondering how much of the stuff that you're hearing is actually true? Well, the Pentium is a good chip in many ways, although not the amazing world-beater that some of the (ahem) competing computer magazines claim it to be. This month, let's take a very quick look at what's fact and what's not concerning Intel's newest engine.

I said you'd probably heard a lot about the Pentium; actually, hearing is about all you'll be doing about the Pentium for a while, as Intel will be lucky to be able to produce 200,000 of them by the end of the year. While 200,000 may sound like a lot of chips, it's only about 1 percent of Intel's production run for this year's 386 and 486 chips, and an even smaller percentage when you add in the folks like Cyrix, AMD, and IBM who make clones of those CPUs.

There are lots of things to like about the Pentium, and not a lot of space to describe them. Here's a whirlwind tour.

Greater raw speed. The Pentium comes in 60-MHz and 66-MHz flavors. If offering two speeds that are so close together seems odd, it is—usually. The Pentium is such a difficult chip to make, however, that the percentage of manufactured chips that can operate at the goal rate of 66 percent—the yield, in chip talk—is much lower than it is for, say, 386 or 486 chips. Lowering the bar of acceptability to 60 MHz allows Intel to sell the chips that almost made it. That means that the 60-MHz Pentiums failed the 66-MHz test but passed the 60-MHz test, whereas the 66-MHz Pentiums passed both tests. Personally, I'd look closely at a return and service policy before buying a PC based on a 60-MHz Pentium.

Why is the Pentium so difficult to make? For one thing, it's much bigger than the 486. The 486 contains 1.2 million transistors; the Pentium contains 3.1 million—over two-and-a-half times as many. (That's not the biggest jump we've seen, however. The 386 is only a quarter million transistors.) The Pentium is also a hot chip in the literal sense. The Pentium overview document from Intel says that the chip should be expected to run at up to 85 degrees Centigrade—that's 185 degrees Fahrenheit—prompting the inevitable observation that it'll not only crunch your numbers, but it'll also cook your dinner. Look for makers of Pentium-based computers to tout their unique cooling facilities.

The greater raw speed refers to the fact that the 66-MHz clock rate is a pure clock rate, unlike the 486DX2/66 chip, which runs at 66 MHz internally but interacts with the outside world at only 33 MHz. A 486DX2/66 is a relatively simple chip to design a PC around; that it communicates at 33 MHz externally means that all a designer needs to do is to mate a DX2/66 CPU chip with a run-of-the-mill 33-MHz motherboard, and it's an instant 66-MHz computer.

With a Pentium-66, on the other hand, both internal and external communication is at 66 MHz, requiring a motherboard that runs at 66 MHz. While it may seem that building a 66-MHz motherboard would be a small incremental change from the currently available 33-MHz and 50-MHz motherboards, it's not—the task gets harder as the speed gets greater. It turns out that 66 MHz is around the frequency of TV channel 4, so a Pentium-equipped PC has a serious potential noise problem. Run one without the proper shielding (with the cover off or with an inadequate cover), and you're, well, on the air. Currently, anyone can design a motherboard with a few chips and a processor. That won't be true with Pentium-based systems. Don't be surprised if the early 66-MHz Pentium-based PCs vary in usable speed by as much as 50 percent.

Smarter cache. Since the 20-MHz 80386DX's introduction, PC designers have been faced with a difficult choice—what kind of memory to use in their machines. The majority of PC RAM is called dynamic RAM (DRAM): It's relatively cheap, but it's not available in the kind of speeds needed to keep up with systems of 20+ MHz. You can't get DRAMs in 40, 25, 20, or 15 nanosecond access times, the times required by those systems. There's a different kind of RAM called static RAM (SRAM) that's available in those higher speeds, but SRAM is much more expensive than DRAM.

How do manufacturers build high-speed machines and still find RAM that won't drive the price of the PCs out of sight? By using a lot of DRAM and a little SRAM. The DRAM serves as main memory, and most systems have megabytes of it. But many motherboards have between 64K and 512K of SRAM called cache RAM. When the CPU needs the next item of data from the system RAM, it looks first in the fast SRAM cache to see if it's there. If the data is in the SRAM cache, then the CPU gets it from the SRAM without delay.

If, on the other hand, the required data isn't in the SRAM, the CPU must go to DRAM for the data, which slows the system down considerably. The whole idea of a cache is that some smart hardware called a cache controller (it's built into the 486, and it's an optional chip with the 386) must essentially look into the future, guess which data the CPU will

soon need, and go get that data before the CPU asks for it.

While many 386 motherboards incorporate some kind of cache memory and cache controller, the 486 actually builds a cache and cache controlling into the CPU. The 486 chip contains 8K of cache, and most 486 systems have additional cache on the motherboard.

The Pentium's cache system is better than the 486's in four ways. First, the Pentium has twice as much cache, with two 8K caches—one for data, one for program code. Second, the cache's method of organizing its cached data is more efficient, employing a write-back algorithm. The opposite of a write-back algorithm, a write-through algorithm, forces data written to the SRAM cache memory to be immediately written to the slower DRAM memory. That means that memory reads can come out of the cache quickly, but memory writes must always occur at the slower DRAM time. Because not every piece of information written to memory stays in memory very long, the Pentium's cache algorithm puts off writing data from SRAM to DRAM for as long as possible, unlike the 486, which uses a write-through cache.

Third, there's the time wasted by the cache controller in searching to see if an item is in the cache. The Pentium reduces that time by dividing the cache into smaller caches, each of which can be searched more quickly; that technique is called a two-way set associative cache.

To explain the fourth way in which the Pentium's cache is better than the 486's, I have to first make an important point about what a cache must do. Recall that a cache has to guess which data and program code the CPU will need soon, and then go get that data before the CPU asks for it.

Guessing what the CPU will need isn't a straightforward task, particularly when there are decisions to be made. Suppose the cache sees that the CPU is currently executing some instructions that mean: "Compare value A with value B. If A is greater than B, then set the value MAXIMUM to A; otherwise, set the value MAXIMUM to B." That simple statement boils down to a bunch of instructions that had better be in the cache if the Pentium is going to continue to run without delays. But since the cache controller can't know whether the CPU will take the "A is greater than B" or "B is greater than A" fork in the road, it doesn't know which result's code to go grab and put in the cache. For years, mainframe cache controllers have used a technique called branch prediction to guess which way the CPU will go, and now a PC chip—the Pentium—has a cache controller built into it with branch prediction capabilities.

Two processors in one. There are essentially two CPUs in this chip. The first one is a simple 386-like CPU: It does integer operations, not floating-point operations. The second is like the 486—a 386 with floating-point capabilities built right into it. That means that the Pentium is essentially a parallel-processing CPU, with the ability to do two things at once. Those two CPUs-within-a-CPU are called the U and V pipelines, and the fact that the Pentium has more than one pipeline makes it a superscalar CPU. Without special programming, only the 486 pipe (the U pipe) is active. New programs and operating systems, such as Windows NT and OS/2 3.0, will be required to make use of these multiple processors.

Fault tolerance. The Pentium is designed to be linked with another Pentium on the motherboard that's dedicated to fault tolerance. The second Pentium constantly monitors the first. If the main Pentium malfunctions, the other one jumps right in and takes up without skipping a beat.

Benchmarking the Pentium

How much faster is a Pentium, really? As I said, the actual speed of a Pentium-based PC will depend heavily on motherboard design, as the Pentium relies upon the motherboard to access both its DRAM and its external SRAM cache. If those respond slowly, the Pentium can only run slowly.

Simple small benchmarks, on the other hand, will run like greased lightning because they'll fit entirely into the Pentium's 16K cache. They'll return some great numbers, but those numbers will be of very little real-world value in judging system effectiveness. After all, how many applications do you run that will fit in 16K?

I should also mention that modern benchmarks don't exploit multiprocessor capabilities, so any benchmark values on the Pentium are values determined while it works with one hand tied behind its back—that is, while the V pipeline isn't doing anything. Using a common set of benchmarks, the Pentium-based PC built by Intel (who should, after all, know how to make a Pentium-based PC) turns in a performance 76 percent faster than a DX2/66 on basic processor operations, with memory throughput almost exactly the same as the fastest current DX2/66s.

This underscores my previous point: The CPU performs amazingly well in a vacuum, but hook it up to peripherals on a motherboard—such as RAM chips—and you'll see that while the Pentium is a very special chip, it will need some very special hardware surrounding it before it can soar to computing heaven. ❐

PROGRAMMING POWER

Tom Campbell

POWERBASIC 3.0

There's a sparkling "new" BASIC on the scene, one that might be familiar to old hands. PowerBASIC 3.0 from Spectra Publishing (1030-D East Duane Avenue, Sunnyvale, California 94086, 408-730-9616) has just been released, and it's very hot. If the name doesn't ring a bell, it used to be Borland's Turbo Basic two versions ago. PowerBASIC 2.0 was the first release from Spectra, and I loved it.

There's a sparkling "new" BASIC on the scene, one that might be familiar to old hands.

Uppermost in many people's minds is: How compatible is PowerBASIC with Microsoft's QuickBASIC? The answer is that they're fairly close. But any large program will probably require major rewriting.

PowerBASIC is a lightning-fast native code compiler, just like QuickBASIC's Make EXE file option. But this one always compiles, and it compiles insanely fast. For large projects, you can break programs up into precompiled versions called units, just like Turbo Pascal's. You can also use OBJ files, but they aren't as good as units.

PowerBASIC has a ton of new features. My favorite by a landslide is its ability to create any kind of TSR imaginable. TSRs can be triggered by hot keys, by interrupts, by timer ticks, and by a few less obvious methods. You can swap them out to EMS memory or a disk file, so that the executable can be 200K yet still consume only 4.5K of conventional memory. The TSRs are quite stable, working well under my rather strenuous test conditions. In all, this feature alone is worth buying the product if you need to develop TSRs. It's cheaper than many C libraries that offer the same feature, yet it offers the convenience of BASIC. Related to that is the new ASM statement (with the alias ! for brevity), which allows you to embed assembly language statements right into the BASIC code.

A less sexy feature (but perhaps a more important one) is the ability to create huge arrays, which may contain more than 64K of data. Unlike "the other BASIC," PowerBASIC lets you create these huge arrays in any size, not just a space-wasting power-of-two dimension. Hand in hand with huge arrays is the ability to create compound data types—not only the TYPE variety, but the UNION variety as well, which lets you overlap similar data structures, like the variant records of Pascal or the union of C. And anyone who writes directly to the screen or reads from the BIOS frequently will appreciate the ability to declare arrays at an absolute memory location. Ever since Turbo Pascal added this one, I've been champing at the bit for a better DEF SEG.

Last on the list of my favorite new features is the addition of a deceptively simple option that requires you to declare variables before using them. Although this seems like a cruel trick on BASIC programmers, I have found it absolutely essential on large projects. Until now I haven't been able to use BASIC for programs over a thousand lines or so because BASIC will simply initialize to zero any new variable it finds. Too many times, my development has ground to a halt at 2:00 in the morning while I read and reread my code, missing every time that an array called SymTable has quietly transmogrified into *SymbolTable*. That C and Pascal require variable declarations went from an onerous burden to a basic requirement. Now I can look forward to using PowerBASIC even in serious development.

Besides these major new additions that hit home with me, there are scores of other features you'll find it hard to resist, such as byte, word, and double-word types (all unsigned, at last!); ON ERROR LOCAL for intraroutine error trapping; an editor that can handle huge files and, finally, mice; reasonably good hypertext help; and a stand-alone debugger. But call for a brochure—there are even more.

This month's program is written in PowerBASIC and is available on CompuServe in the IBMPRO forum under the filename DBFDIR.BAS. If you have any trouble finding it, you can send me E-mail at 75530,3607. It both highlights and improves one of PowerBASIC's most useful features, the DIR$ function. DIR$ is meant to be called once with a file specification, such as "C:\DBF*.DBF", and after that in a loop without the file specification. The first time it's called, it returns the first file matching the specification; the second time, and on subsequent invocations without a parameter, it returns the remaining matches. The problem is that it only returns a filename and extension, not the drive and path. So, in the example of "C:\DBF*.DBF", it might return "TODO.DBF", "ACCTS.DBF", and so on, but not "C:\DBF\TODO.DBF", and so forth. DBFDIR.BAS, the PowerBASIC program I wrote, acts like dBASE's Dir command and lists database characteristics (last update and record size) of all the dBASE data files in the specified directory. I ported SplitFilename$ from an earlier column with no effort at all; it's used to reconstruct the matching filenames so they can be opened and the DBF header data read in. As usual, this is modular code, so you can easily hollow out the dBASE-specific portion and just use the framework for your own files. ❐

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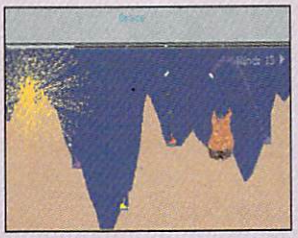

Annihilate the opposition in Scorched Earth.

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Scorched Earth 1.2

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HOW DOES YOUR HARDWARE COMMUNICATE WITH YOUR SOFTWARE? THE SOFTWARE HARD-WIRED INTO YOUR COMPUTER'S BIOS IS LIKE A BRAIN WITHIN A BRAIN.

WHERE HARDWARE MEETS SOFTWARE

By Richard C. Leinecker

Illustration by Bill Bruning

Today's computers think faster than mere mortals can comprehend. But without software—the instructions the processor performs—a computer is just a pile of scrap iron, wire, and silicon.

Application software has to run on virtually an infinite variety of hardware configurations. That's why each IBM-compatible computer has a liaison layer that acts as a compatibility-assurance arbitrator between the application software and the hardware. This layer is called the BIOS (Basic Input/Output System). It usually resides in two ROM chips on a computer's motherboard.

Imagine the difficulty software developers would face if they had to worry about whether their products were saving data to a 20MB or a 200MB hard drive. They'd need to treat each variation as a different case. Or worse yet, what if they had the additional difficulty of providing separate routines to deal with each drive type, whether it was an IDE, MFM, SCSI, or RLL drive? If not for the BIOS, applications would be many times larger than they are. The BIOS shields developers from these headaches by providing a standard way of talking to hard drives and other hardware.

There's a standard way of dealing with all peripherals, including floppy and hard drives, modems and serial ports, printers, video systems, and keyboards. DOS (the Disk Operating System) builds its own routines around the BIOS routines. That's why different versions of DOS run on all IBM-compatible systems.

Some peripherals, like video cards, have their own embedded BIOS. In most cases the specialty BIOSs add functions that extend the original BIOS. A good example is a VESA-compatible (Video Electronics Standards Association) Super VGA card. At runtime the video card patches the base BIOS so that new routines are available to application software. This is necessary because video standards change rapidly and many people upgrade their video systems many times before replacing their computers. The motherboard manufacturer couldn't possibly anticipate which of the hundreds of types of video boards users will install.

In addition to allowing the operating system to communicate with the hardware, the system BIOS also contains diagnostic programs that check out the computer each time it's turned on. This series of diagnostic tests is called the POST, or Power-On Self Test, and it involves checking the microprocessor, memory, video system, and other internals. Not all installed options are tested. For example, printers and modems are not tested.

The more comprehensive the POST, the better your computer can diagnose itself and alert you to problems. And the more memory you have installed, the longer the tests take to verify it all.

Power-On Self Test

Here's the sequence of tasks your computer performs when it starts up.

1. The microprocessor begins execution at address FFFF:0000, an area almost at the end of the ROM BIOS area.
2. The microprocessor is tested, usually with a self-test mode that's built into the microprocessor. The system board, the system buses, and the system memory containing the POST code are tested, too.
3. The system timers are tested.
4. The video display system is tested, usually the video memory and the signals that drive the display.
5. All memory is tested.
6. The keyboard is tested.
7. The disk drives are tested for their status.

BIOSs Aren't Created Equal

IBM was the creator of the first BIOS used in a PC, but it was the development of third-party BIOSs that made it possible for virtually anyone to build a PC. The three major companies that specialize in development and sales of compatible BIOS products are AMI (American Megatrends, Incorporated), Award Software, and Phoenix Technologies. Each one licenses its BIOS to hardware manufacturers. Selecting a BIOS for motherboards isn't easy. A list of questions has to be addressed in order to choose a BIOS that's already been designed or to custom-develop a BIOS.

The AMI BIOS has a built-in setup program activated by pressing the Delete key in the first few seconds after the boot procedure begins. In addition to the setup program, the AMI BIOS features a built-in, menu-driven diagnostics package.

The Award BIOS has a built-in setup program activated by pressing Ctrl-Alt-Esc. Award is unique among BIOS manufacturers in that it provides its code to hardware manufacturers and allows them to customize the BIOS themselves. Because of this customization, the hardware companies can fine-tune the BIOS to work best with their computers.

The Phoenix BIOS has been the standard by which others are judged. It was the first third-party BIOS on the market. One area of particular strength for the Phoenix is its POST. The BIOS outputs an extensive set of beep codes that help diagnose problems on the motherboard. It can even isolate a memory failure to an individual chip. This simplifies identifying system problems for the owner or the repairperson.

If you have a modem, you can get support from these BIOS manufacturers (or their distributors) or from their BBSs (see the "Support Reference" sidebar). All of these BIOSs have been on the market for years. Although they offer different kinds of diagnostics, all are extremely reliable and have proved themselves over time. But since they have to be updated every time a new piece of hardware is introduced, a few bugs have cropped up from time to time.

Support Reference

AMI
Distributed by Washburn & Company
3800 Monroe Ave.
Pittsford, NY 14534
(716) 248-3627
(404) 246-5825 (BBS)

Award Software
130 Knowles Dr.
Los Gatos, CA 95030
(408) 370-7979
(408) 370-3139 (BBS)

Phoenix Technologies
Distributed by Micro Firmware
1430 W. Lindsey St.
Norman, OK 73069
(405) 321-8333
(405) 321-3553 (BBS)

BIOS Bugs

Like all software, the ROM BIOS is not immune to bugs. If your BIOS is from one of the major manufacturers, you're probably safe. But even then, don't forget that BIOS manufacturers have had some minor problems.

How can you protect yourself from problems when you're buying new and used equipment? If you're considering the purchase of used equipment, you should install the applica-

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- (508) 368-7036:*2400-9600*
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Wolfenstein 3-D requires an IBM or 100% compatible computer with 640K RAM, a VGA graphics card, and a hard disk drive. Extended memory (XMS), expanded memory (EMS), joystick, and mouse are optional. IBM is a registered trademark of International Business Machines, Inc. Sound Blaster is a registered trademark of Creative Labs, Inc. AdLib is a registered trademark of AdLib, Inc.

tions you'll be using and make sure they perform the way you expect before laying your money down. For new equipment, you should install your applications and put them through their paces as soon as you can. If you find a problem, contact the source that sold you the computer.

BIOS Upgrading

You'll rarely be in the position of needing a BIOS upgrade. Here's a list of reasons why you might want to consider it.

- Adding support for 720K 3½-inch, 1.2MB 5¼-inch, and 1.44MB 3½-inch drives.
- Allowing a user-definable hard drive type that matches an MFM, RLL, IDE, or ESDI drive.
- Adding support for 101-key enhanced keyboards.
- Correcting known conflicts or bugs. It's best if you contact the hardware or software vendor's technical support to verify that there is a problem with your particular BIOS.
- Adding features and performance found in newer BIOS versions.

Before you go shopping, you'll need some information.

- Make and model of the system. For many popular systems this is all that's needed to find the right BIOS. For less common clones you'll need more information.
- The CPU type (286, 386SX, 386, 486SX, 486).
- The make and version of the existing BIOS. This is necessary because some revisions will require that the keyboard controller be replaced, too.
- The type and number of the existing BIOS ROMs. Locate the part number on one of the ROM chips. You may have to peel back a label. The part number will usually start with 27.
- Check for an integrated chip set. This will consist of square, flat, large-scale integration chips with pins around all four sides. They'll usually have a manufacturer's name or logo. Some examples are CHIPS, SUNTAC, VLSI, and OPTI. An integrated chip set performs the functions of hundreds of smaller chips. Even IBM uses third-party integrated chip sets on some models.

To get this information, open your computer's case and start taking notes. It only takes a few minutes. With this information you can accurately order BIOS upgrades.

There are some alternatives to upgrading your BIOS. Some companies (Washburn & Company, for example) supply accessory ROMs to augment the existing BIOS. They can fit in the two empty sockets that are found on most AT motherboards, or they can go on a card that fits in any 8- or 16-bit slot.

If you've identified a specific problem, some technicians are well versed at patching BIOSs. But it may be risky if the person doing it doesn't possess the skills. (I don't think I've ever heard a technician admit he or she couldn't do something until it was too late.) Unless you have complete confidence in a technician, leave this option out.

Don't Be Fooled by Imitations

Just because your computer boots and shows you the copyright of a major BIOS manufacturer doesn't mean you're home free. If you bought your system used, bought it from a cut-rate source, or have had it serviced by cut-rate technicians, there's a small chance you have an illegal BIOS copy. I've heard of more than one person who, having experienced system-level bugs and incompatibilities, inspected the motherboard and found a BIOS copy—not the real thing.

This is illegal and dilutes the BIOS manufacturer's ability to provide the best possible product for paying customers. Besides that, those BIOS copies may not be the best fit for the systems.

Flash BIOS

You've probably heard the term *Flash BIOS* at some point and wondered what it meant. It doesn't mean an ultrafast BIOS. It's just an alternate way of placing information in the BIOS. A BIOS is simply an EPROM (Erasable Programmable Read Only Memory). Flash BIOS is a special kind of EPROM that can be erased and rewritten while it's still on the motherboard. That allows manufacturers to make minor changes in the BIOS to conform to new computer designs. Don't think you can simply go into your Flash BIOS and start changing things, though. Altering the BIOS requires specialized equipment. The Award spokesperson told me that eventually the BIOS could be available in CMOS, which would allow you to upgrade your BIOS in place with a manufacturer-supplied utility.

—ROBERT BIXBY

Ending BIOS Fear

Compaq actually created the first BIOS clone, but it was only interested in providing BIOSs for its own machines. Only when Phoenix introduced its version of the PC BIOS did the clones and compatibles war really begin. Since then, many other makers have entered the market, notably the makers mentioned in the article. One additional BIOS maker, Quadtel, was recently purchased by Phoenix.

I called various BIOS makers and asked them about their products. I was surprised by their responses. The question Why is your product better than the competition? usually invites a fusillade of marketing squibs, but this time, most of the people I spoke with echoed the statement, "A BIOS is a BIOS." The principal differences among BIOS makers are their market niches and small utilities and improvements that are quickly incorporated by the competition.

For example, a spokesperson for Award stated that the Award BIOS is outfitted with a boot-sector virus detector which is expected to appear soon in new BIOSs from other manufacturers.

AMI sells primarily to motherboard makers while Phoenix sells primarily to OEMs (Original Equipment Manufacturers—companies that make the whole computer and some peripherals).

One irony of the modern BIOS has resulted from IBM's decision to market its BIOS to compatibles manufacturers (in the industry, this is called opening the kimono), which would allow non-IBM computer makers to advertise an even higher level of IBM compatibility. Since a system's design is such an integral factor in BIOS design (virtually all BIOSs are customized at least a little to match the system they serve) and since no OEM wants to provide detailed system design information to IBM, an avid competitor, IBM has decided to market its BIOS through Phoenix, the first company to release an IBM-compatible BIOS. This will allow Phoenix, a disinterested third party, to make the tweaks necessary to allow the IBM BIOS to work with an individual system.

—ROBERT BIXBY

Beep Beep

1Here's the scenario. Your computer won't boot, but you hear beeps. Interpreting those beeps might mean the difference between rectifying the situation yourself and calling a technician. Here's a list of the error beep codes for AMI, Award, IBM, and Phoenix BIOSs.

AMI

1 short	DRAM refresh failure
2 short	Parity circuit failure
3 short	Base 64K RAM failure
4 short	System timer failure
5 short	Processor failure
6 short	Keyboard controller gate A20 error
7 short	Virtual mode exception error
8 short	Display memory read/write test failure
9 short	ROM BIOS checksum failure
1 long, 3 short	Conventional/extended memory failure
1 long, 8 short	Display/retrace test failed

Award

All Processors

1 long, 2 short	Video error
2 short	Any nonfatal error
1 short	No error during POST

80286/80386/80486 Processors

1 long, 3 short	Keyboard controller error

IBM

1 short	Normal POST system OK
2 short	POST error—error code displayed on CRT
No beep	Power supply, system board
Continuous	Power supply, system board
Repeating short	Power supply, system board
1 long, 1 short	System board
1 long, 2 short	Display adapter (mono/CGA)
1 long, 3 short	Enhanced graphics adapter (EGA)
3 long	3270 keyboard card

Phoenix

The Phoenix BIOS beep codes are three groups of beep counts.

1-1-3	CMOS write/read failure
1-1-4	ROM BIOS checksum failure
1-2-1	Programmable interval timer failure
1-2-2	DMA initialization failure
1-2-3	DMA page register write/read failure
1-3-1	RAM refresh verification failure
1-3-3	First 64K RAM chip or data line failure, multibit
1-4-2	Parity failure first 64K RAM
1-4-3	Fail-safe timer feature (only EISA BIOS)
1-4-4	Software NMI port failure (only EISA BIOS)
2-1-1, 2-1-2, 2-1-3, 2-1-4, 2-2-1, 2-2-2, 2-2-3, 2-2-4, 2-3-1, 2-3-2, 2-3-3, 2-3-4, 2-4-1, 2-4-2, 2-4-3, 2-4-4	First 64K RAM chip or data line failure on bit 0–F
3-1-1	Slave DMA register test failure
3-1-2	Master DMA register test failure
3-1-3	Master interrupt mask register failure
3-1-4	Slave interrupt mask register failure
3-2-4	Keyboard controller failure
3-3-4	Screen memory failure
3-4-2	Screen retrace failure
4-2-1	Timer tick failure
4-2-2	Shutdown failure
4-2-3	Gate A20 failure
4-2-4	Unexpected interrupt in protected mode
4-3-1	RAM test of memory above 64K failed
4-3-2	Programmable interval timer channel 2 test failed
4-3-4	Realtime clock test failed
4-4-1	Serial port test failed
4-4-2	Parallel port test failed
4-4-3	Math coprocessor test failed

It's pretty easy to distinguish the real McCoy from a fake. Take a look at the ROM BIOS chips on the motherboard. You should clearly see the name of the manufacturer, along with a serial number, usually on a label. If you buy a new system with a fake, report the supplier to the manufacturer of the BIOS cloned on the fake chips, and return the system for a full refund. If you're looking at a used system with a copied BIOS, tell the seller you're not interested. Even if you buy it at a bargain price, you're in for trouble in the future.

Into the Sunset

Most people never consider the BIOS version and manufacturer when purchasing a computer. We take it for granted that such an integral component is carefully checked by the system manufacturer for correct operation, and it almost always is. But as a system ages and newer peripherals become available, you need to be thinking about a BIOS upgrade to support newer hardware. Generally, a BIOS upgrade is a step involved in some other kind of major equipment upgrade. If you install the hardware correctly and it still won't work, your BIOS automatically becomes the prime suspect.

The guidelines I've presented should help you make your purchase and upgrade decisions now and in the future. If you have any questions, though, a reputable technician will help you out. And if you're adventurous and want to upgrade, order the chips yourself and have at it. ❑

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PRODUCTIVITY CHOICE

The improvements to this development system keep it the preferred choice for Windows programmers who value ease of use and extendible power.

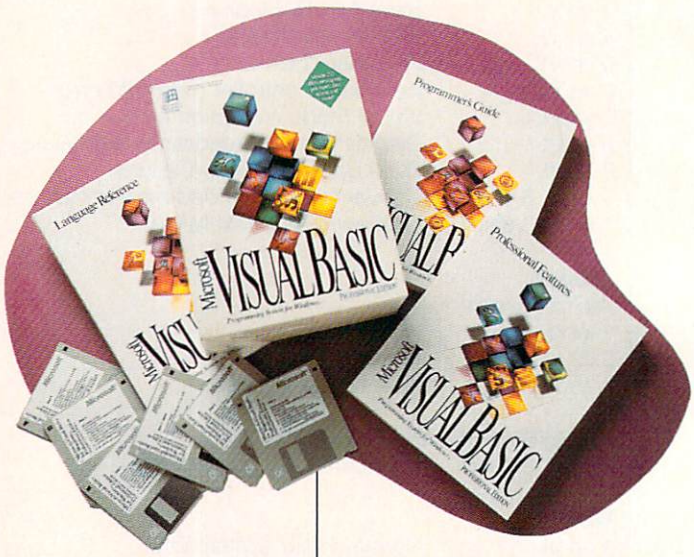
George Campbell

VISUAL BASIC 2.0

Microsoft brought about a revolution when it introduced Visual Basic 1.0, making Windows programming accessible to just about anyone with some BASIC programming experience. With the introduction of version 2.0, programmers get even more of a good thing.

Like version 1.0, VB 2.0 gives you a quick way to design the interface for your Windows programming project. Since interface design has always been the most difficult part of programming for Windows, using VB lets you get down to the business of the working part of your program with very little delay. You simply draw your interface on the screen, much like using an object-oriented paint program, and then write code to tell the program what to do when something happens. For example, if a user clicks on a command button in your program, you need only write the code for that button click. List boxes, text-editing windows, and all other interface objects work in the same way.

This event-oriented programming style is the key to VB's ease of use. Since you write less code to make your program work, you can concentrate on the important code, rather than on code that simply displays your program. Using language syntax familiar to all BASIC programmers, VB makes writing simple programs fast and easy. While Windows programming was once the province of dedicated C or C++ experts, anyone willing to learn some new rules can use VB 2.0 to create professional-quality Windows applications and utilities. Since you can also access most of the commands embedded in the Windows API, you can even extend VB far beyond its own internal statements.



There are two VB packages: Standard and Professional. The Standard Edition, designed for casual or personal use, lists for $199. The Professional Edition, listed at $495, includes enhancements more advanced programs need. You can begin with the Standard Edition and upgrade if you want. Both packages have good documentation and extensive online help. An online tutorial and plenty of sample code and applications also ease the transition from DOS programming.

Both editions offer improved performance over the original VB. Programs generally run about 20 percent faster. A program's EXE file is now smaller, although the VBRUN200.DLL runtime library needed for all programs has grown. The program design environment is also improved; you now get a separate window for setting the properties, like color, fonts, and size of objects (such as command buttons, list boxes). Since this window can always be onscreen, setting an object's properties is fast. An icon-based toolbar also makes programming easier—you click on an icon to carry out most functions in the development environment.

New graphics controls let you insert bitmapped images in your program or draw lines, boxes, and circles without using as much precious Windows memory as needed with version 1.0. The program also offers support for Windows OLE (Object Linking and Embedding) plus a spreadsheetlike grid control from the earlier Professional Toolkit. You also get support for the Multiple Document Interface (MDI), a huge array library for arrays larger than 64K, and tools to create automated installation systems for your applications.

Other programming tasks, too, get a boost, with improved debugging features like watch and break expressions. You can also select multiple controls and set common properties for all of them

in a single step. A new variable type, called Variant, can substitute for any variable type, such as Integer or String; and you can shift between variable types automatically when needed. Using Variant, you don't have to convert a numerical variable to a string variable to display it in a text area onscreen.

With the Professional Edition, you get additional tools, such as a communications module, a help compiler for creating full-scale hypertext help systems, support for the MAPI E-mail system, ODBC database libraries, and more. Custom controls available only in the Professional Edition include a group of 3-D controls like command buttons and check boxes, an animated command button, access to the Windows Common Dialog windows, multimedia controls, controls specific to pen-based computers, plus a handful of other useful additions. For programming professionals, the additional features are well worth the cost.

Overall, the additional features and improvements in both VB 2.0 editions are very welcome and help keep VB well ahead of competitors like GFA Basic and Turbo Pascal for Windows. It's still by far the easiest development system you can find for Windows, and it's a pleasure to work with.

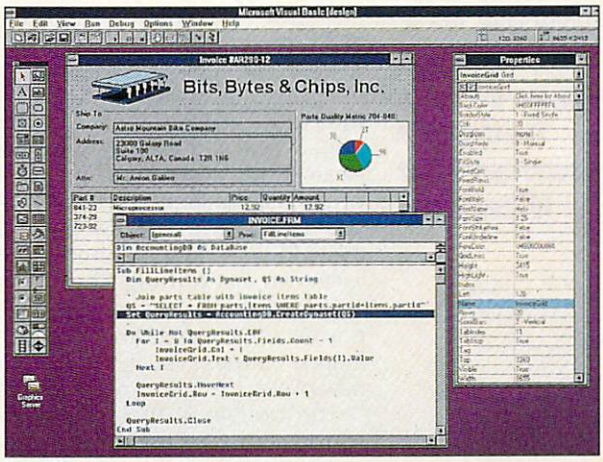
That said, however, VB is not the be-all and end-all for Windows programming. A number of limitations keep it from becoming the only language Windows programmers need. First, its inability to use Windows API functions that require callbacks keeps VB programmers from accessing some important Windows tools, such as setting printer options without user input. Further technical limitations include an inability to use pointers to memory locations and a requirement that a runtime library be included with each program. While VB can use Dynamic Link Libraries (DLL) to extend the language, it cannot create them—a particularly annoying limitation for advanced programmers, who must turn to other languages to create modular extensions to VB.

Then, too, while Microsoft fixed some bugs that plagued VB 1.0, it introduced some new problems in 2.0. Especially irritating is a bug which sometimes causes programs that run perfectly in the development environment to crash after being compiled. There's an easy way to work around this bug, but it's a bother. A bug in the Professional Edition's Common Dialog tools makes the Printer dialog difficult to use, requiring additional code to change the default printer from within a VB program. Microsoft acknowledges these problems and offers work-around solutions, but the company apparently has no plans to issue an interim version of the language.

A final limitation can cause problems for some users. While you can effortlessly display bitmapped graphics onscreen, it's very difficult to send them to the printer. Indeed, there's no direct method in VB itself to print graphics and text on the same page. Printing bitmaps means using a complicated set of Windows API commands and, even then, it's almost impossible to print graphics on a PostScript printer without purchasing an add-on library from another source.

Fortunately, an entire industry has already grown up around VB. Vendors like Crescent Software and MicroHelp offer extensive add-on libraries. These libraries, which become part of the VB development environment, extend the language and fill in the gaps Microsoft left. VB's popularity also means that support on forums such as MSBASIC on CompuServe is excellent, with many advanced users offering solutions for VB problems and even free add-on libraries. Microsoft, too, is active on the CompuServe support forum, offering solutions for many problems and answers to tough technical questions.

IBM PC or compatible (80286 compatible); 1MB RAM; Hercules, EGA, VGA, or better graphics; one high-density floppy drive and one hard drive with 18MB free; Windows 3.0 or higher; mouse



recommended—$199 (Standard Edition), $495 (Professional Edition)

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All in all, Visual Basic 2.0 is the ideal way to get started in Windows programming. Its ease of use and extendible power may make it the perfect platform for most programmers, especially for creating uncomplicated applications and utilities. If you have any desire to create personal or professional applications for Windows, definitely look into this development system. ❐

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PERSONAL PRODUCTIVITY

Rosalind Resnick

LEASING VERSUS BUYING

When it comes to financing your beast, take the time to crunch the numbers. You might be surprised at the hidden costs.

Flip through just about any newspaper or magazine these days, and you're sure to find ads for cut-rate computers. With computer prices in a virtual free fall, millions of computer users are finding it difficult to justify *not* upgrading to an 80386 or 80486 with the latest features. And no matter what computer you buy or where you make your purchase, it's hard to overpay.

Even so, there's more to shopping for computers than simply deciding how much RAM you want and how big a hard drive to get. To entice shoppers to part with their money, computer dealers nationwide are offering not only low prices but seductive lease deals, too. Let's face it: If you're just starting a business, you may not have enough money to buy a new computer with cash, but you might easily be able to afford a monthly payment that costs little more than a business lunch with a new client.

The trouble is that some computer leases are far more costly than they first appear. Recently, one national computer chain ran a newspaper ad offering a brand-new 25-MHz 386SX IBM-compatible computer for $1,150. It also offered buyers the option of financing their purchase with a three-year, $42.55-a-month lease—and buying the computer for $1.00 when the lease term was up.

The beauty of the lease, of course, is that you don't have to tie up that $1,150 right now (assuming that you have the money in the first place). And you don't have to tie up your credit cards, either, leaving you free to spend on other things.

So is leasing the better deal? Not really.

In preparing this story, I asked my accountant, Art Berkowitz of Mission Viejo, California, to crunch the numbers and compare the two options. What he found out amazed me. Leasing the computer for three years would cost $1,532.80 (including the $1.00 you'd pay at the end of the lease to buy it)—only $0.08 less than you'd pay to finance it with a credit card at the standard 21-percent interest rate! (In fact, Berkowitz says, what the chain bills as a lease is actually more like a financing arrangement than a true lease, in which you pay only for the use of the computer and not the retail cost.)

That's why, Berkowitz says, the most economical way to buy a new computer is with cash, unless your business is so hot that you can invest the money in your company and reap double-digit returns.

"For the person who has the funds available, cash is the best way to buy almost all of the time," Berkowitz says. "Only if you're making more from your business than you'd pay out in interest, [or] if you're squeezed for cash, does it make sense to finance your computer purchase."

Even if you don't have the money, Berkowitz says, there are some other options to consider. Your credit card, for one. Though many credit cards charge interest as high as 21 percent, some cards offer lower rates, occasionally as low as 10 to 15 percent, to customers who have good credit ratings. Many newspapers publish a list of low-rate credit cards in their business sections.

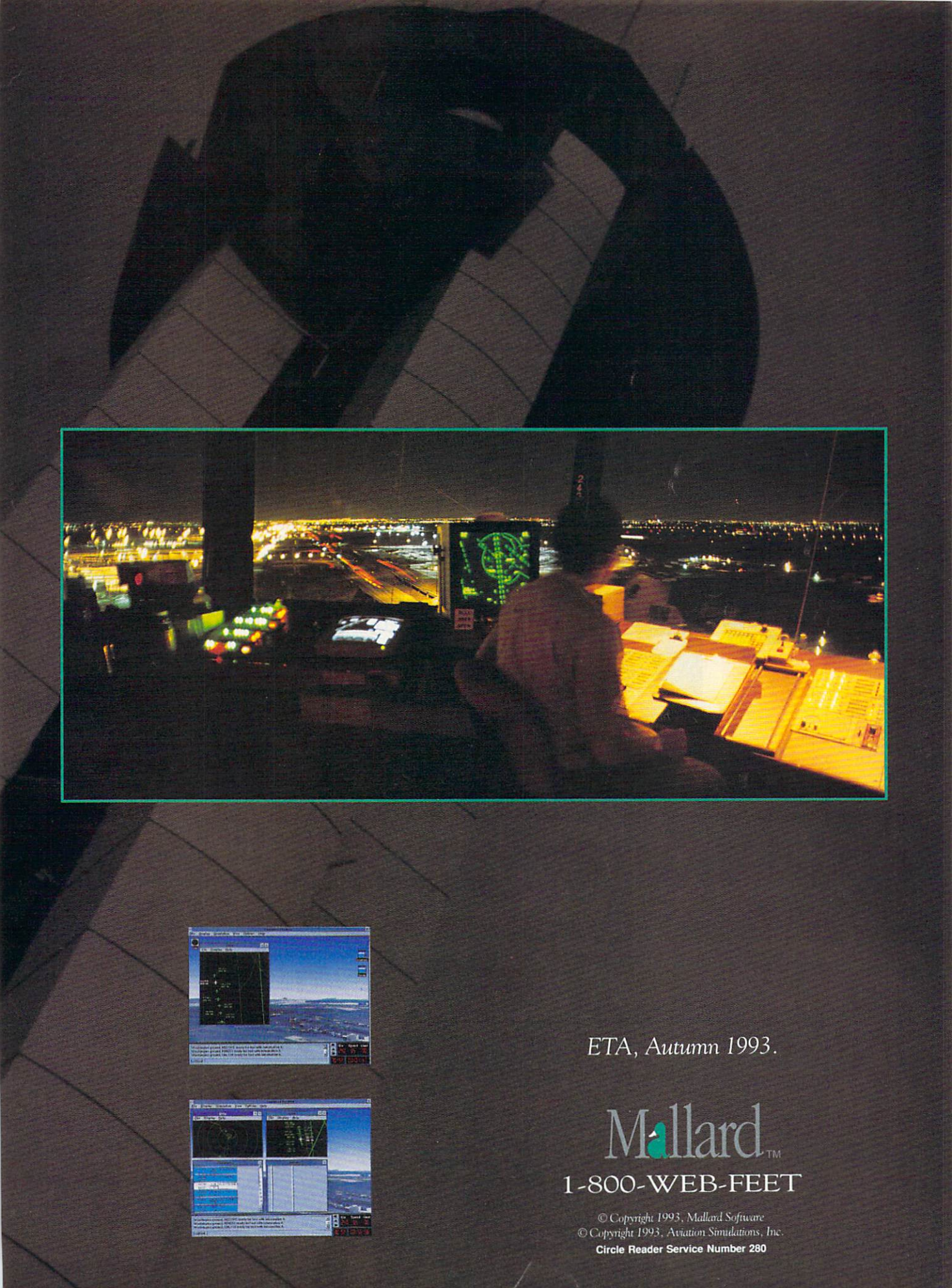
By charging the computer on your credit card, you can pay off your purchase as fast or as slowly as you like. If your business kicks into high gear sooner than you expected, for example, you can pay off the computer more quickly. If sales are sluggish for a while, you have the option of making only the minimum monthly payments until things get rolling. Under the terms of most leases, Berkowitz says, you're stuck making the same monthly payments until the lease term is up, forcing you to continue financing your purchase at high interest rates even when you can afford to pay it off completely.

Another option is a home equity line of credit. Because a home equity credit line is secured (that is, the equity in your house acts as collateral for the loan), banks are willing to lend you money at lower rates than you'd get with a credit card. In fact, many banks are so eager to lend you money that they'll waive all the fees and costs involved in doing the paperwork and assessing your home's value. While it doesn't make sense to mortgage your house just to buy a computer, a home equity credit line might make sense if you're starting a business and need, say, $10,000 in working capital.

"A home equity loan makes sense as long as you remember the biggest caveat of all, which is that you could lose your home," Berkowitz says. "And frankly, that scares me to death."

The bottom line: When shopping for a computer, it's just as important to check out the fine print on the financing contract as it is to read the reviews in the computer magazines. And if you're not so handy with a calculator, there are plenty of software programs (and accountants) that can crunch the numbers for you.

Remember: The old adage "Let the buyer beware" applies not just to shopping for computers but also to paying for them. ❐



ETA, Autumn 1993.

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Circle Reader Service Number 280

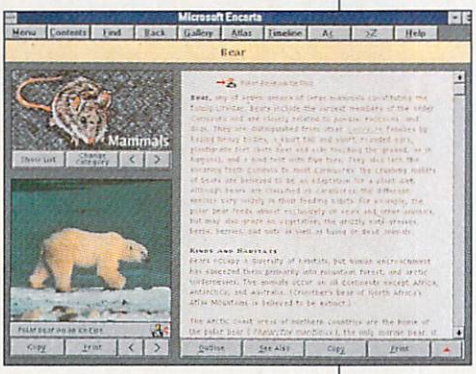
MULTIMEDIA PC

David English

THE WORLD ON A PLATTER

Until recently, you could sum up the major CD-ROM encyclopedias like this: One has better multimedia, while the other has better text. The better multimedia encyclopedia has been Compton's Interactive Encyclopedia (Compton's NewMedia, 2320 Camino Vida Roble, Carlsbad, California 92009; 619-929-2500; $395). Formerly called Compton's MultiMedia Encyclopedia, it has introduced several innovative techniques for gathering up electronic information.

Encarta is so good you no longer have an excuse for not owning a CD-ROM drive and sound card.



The better text encyclopedia has been The New Grolier Multimedia Encyclopedia (Grolier Electronic Publishing, Sherman Turnpike, Danbury, Connecticut 06816; 800-356-5590; $395). Its text is written on a higher grade level than Compton's, with many of its articles penned by experts in their respective fields.

During the last nine months, Grolier has worked hard to close the interface gap by finally introducing a Windows version of its encyclopedia. It's much easier to use than the earlier DOS version. Compton's has responded with its new Virtual Workspace technology that more closely approximates how we collect information in the real world (sort of a books-open-and-scattered-in-a-logical-order approach).

Just when things had settled into a predictable two-way competition, along comes Microsoft to shake everything up. Microsoft's entry in the world-on-a-platter sweepstakes is called Microsoft Encarta Multimedia Encyclopedia (Microsoft, One Microsoft Way, Redmond, Washington 98052; 800-426-9400; $395). Quite simply, it's one of the best multimedia applications I've seen. While the 25,000 articles that Microsoft has taken from the Funk & Wagnalls' Encyclopedia may not be as strong as the 33,000 articles contained in Grolier, Microsoft has added so much additional information and organized the material so well that Encarta is easily the most browsable and usable of the three products.

Like Compton's and Grolier, Encarta offers a time line for a chronological view of events, an atlas for a geographical view of events, and a knowledge tree for a conceptual view of events. All three CD-ROM encyclopedias let you get at their vast bodies of knowledge by letting you choose the most appropriate path. This multiple-path approach lets you follow from one fact to another until you've explored a series of connections guided by your own interests.

Encarta improves on the multiple-path approach by offering a more logical structure and building up the components that are best suited to multimedia. The overriding structure for Encarta is its 93 categories, which include 9 primary categories (Physical Science and Technology; Life Science; Geography; History; Social Science; Religion and Philosophy; Art, Language, and Literature; Performing Arts; and Sports, Games, Hobbies, and Pets) and 84 subcategories. For instance, the primary category of Performing Arts includes the subcategories of Music; Musical Instruments; Musicians and Composers; Dance; Theater; and Cinema, Television, and Broadcasting. Once in a subcategory, it's easy to view a list of each entry in that subcategory, browse each entry in alphabetical order, or switch to a new category or subcategory. By stressing a categorical organization, Microsoft has recognized how we learn best: by exploring a group of associated ideas and then jumping to a related group of associated ideas.

Wherever possible, Microsoft has added material to Funk & Wagnalls' Encyclopedia to exploit the new medium of multimedia. Fully half the CD-ROM is made up of images and audio, with another 10 percent devoted to animations and videos.

For example, the Gallery section, where you can quickly browse Encarta's 7000 photographs and seven hours of audio, includes a Special Lists button. Included among the special lists is a Foreign Language Samples list, which, when combined with the automatic slide show, lets you sample common words and phrases (spoken by native speakers) from 46 nations and cultures. A slide show of World and Folk Music offers a similar tour with a generous helping of musical examples and stunning pictures.

I could go on and on about the gems of wisdom you'll discover as you explore Encarta. Suffice it to say, if you're the type who can spend hours in a library moving from one reference book to another, this is the one product that will make it worth your while to buy a CD-ROM drive and sound card. It's that good. ❐

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Virgin GAMES

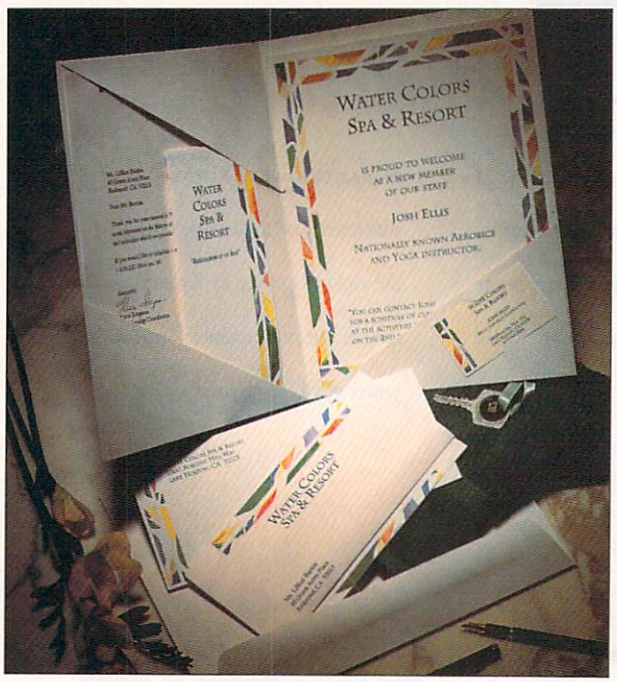
ART WORKS

Robert Bixby

WHO ARE YOU?

As the hit song by The Who says, "I really want to know." I'd be interested to know what software you're using and what you're using it for. If you have a moment to spare, drop me a letter or postcard to tip me off. Desktop publishing has become so widespread, and desktop publishers are engaged in such a broad array of activities, I feel the need to focus on the things that are of most benefit to you. I want to provide information that will directly assist you in the kinds of projects you are pursuing. If you have tips or ideas that make publishing easier or more rewarding, I'm interested in hearing those, too. If I use your tip in the column, I'll give you full credit (and maybe something extra besides).

A specialty paper supplier will make any desktop publishing project easier and more attractive.



Here's what I've been up to. Recently I've been involved in making my books more visually interesting by using different kinds of paper. In the beginning, I simply used a cardstock cover, usually in buff or gray because those were the most attractive cardstocks available from my printer.

What finally drove me to search for alternative sources of paper was a book I was putting together for a poet who used very long lines. I decided the easiest way to present her material was by using saddle-stitched legal-size paper to yield a 7- × 8½-inch page (as opposed to my standard 5½- × 8½-inch page. I could find legal-size paper in many different colors and textures, but I also needed cardstock in a precut 8½- × 14-inch size to make the cover. I couldn't find anyone who stocked it, and no one would provide it in the quantity needed (75 sheets).

Finally, serendipity took a hand in my quest when I received, unsolicited, the Paper Direct catalog (Paper Direct, 205 Chubb Avenue, Lyndhurst, New Jersey 07071; 800-272-7377). If you haven't seen this little collection of specialty papers, you're in for a treat. All you need to do is call to get a free catalog.

About half of the catalog is filled with specially printed paper for letterhead, invitations, presentations, and pamphlets. If you think you can't afford to print up a four-color pamphlet, buy a box of beautifully colored pamphlets from Paper Direct and fill them in with your information.

The other half of the catalog is a desktop publisher's dream. I won't say that every weight and color of paper is available (only three colors of cardstock were available in the size I wanted, for example—white, pale gray, and pale blue), but a wide enough variety is available to meet virtually any need. Paper Direct has many different kinds of recycled paper, textured paper, and even translucent vellum in many different styles.

Because its primary customers are desktop publishers, Paper Direct also provides tips on using its papers, maintenance supplies for Hewlett-Packard laser printers, and interesting, hard-to-find items like foil, a pamphlet folder, and a paper recycler you can use to make your own paper out of scrap. A minimum order is $30 (plus $6 for UPS shipping; the charge is slightly more for overnight delivery). With your first order, you can request a sampler containing a sheet of each type of paper offered by the company and a fan of paper strips to simplify ordering.

A couple of months ago, I mentioned the nVIEW line of video projectors. Since then a couple of other very interesting product announcements have crossed my desk. The Eiki (pronounced "achy" as in "achy, breaky wallet") LC-300 provides up to a 300-inch projection picture (diagonal measure) of any composite video image for $4,395. To use this with a computer, you would also need a VGA-to-composite converter. The LC-200 provides a 200-inch picture for $3,995. Expensive, yes. But a video display 15 × 20 feet in size (10 × 13.3 feet for the LC-200) is bound to impress. To find out more, write or call Eiki International at 26794 Vista Terrace Drive, Lake Forest, California 92630; (714) 457-0200.

Another product that will interest people making traveling presentations is the Cruiser notebook computer. This computer features a detachable translucent LCD screen that can be used with an overhead projector. It has a 25-MHz 386SL chip, built-in trackball, fax/data modem, removable hard disk, and an optional external 16-bit expansion bus. To learn more, contact Rever Computer at 8F, Number 2, Alley 6, Lane 235, Pao Chiao Road, Hsin Tien, Taipei, Taiwan, Republic of China. ❐

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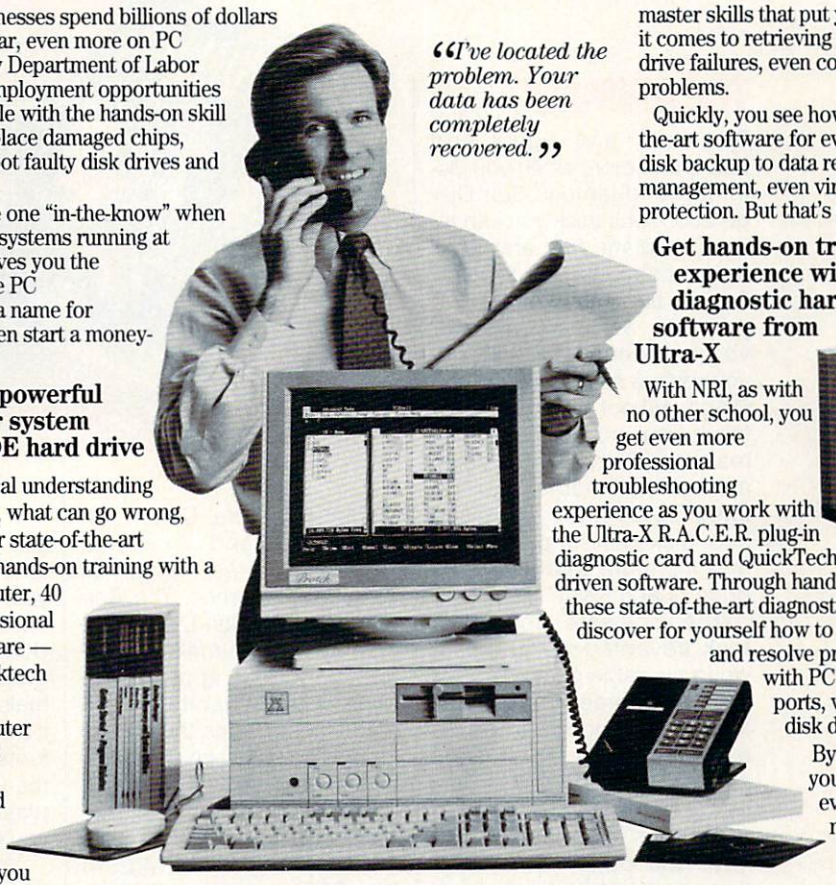

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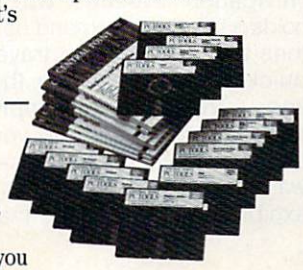
Then you move on to master vital PC system commands, using the MS-DOS software included in your course. You learn to resolve user error messages that commonly occur when working with spreadsheets, databases, word processors, and other PC applications. Then you take your skills further, discovering how to use DEBUG and assembly language programming to troubleshoot problems in PC operating systems and hardware. But that's not all...



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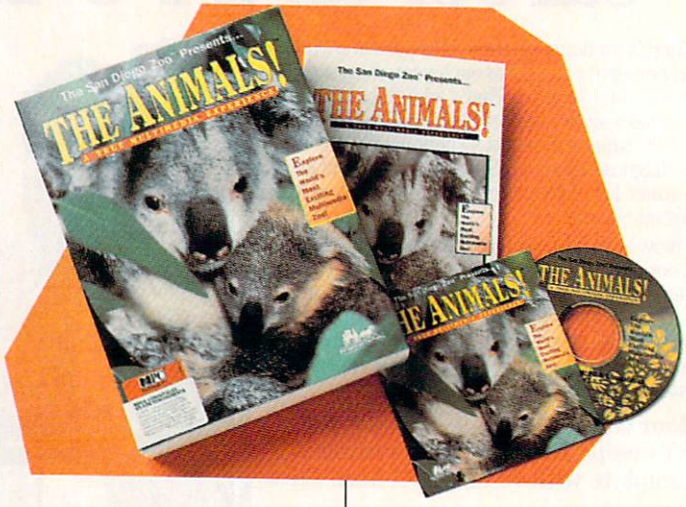
DISCOVERY CHOICE

See strange and exotic creatures from around the world when you visit the San Diego Zoo—in your own living room.

David Sears



THE ANIMALS!

See lions and tigers and bears and more when you visit the world-famous San Diego Zoo. Don't think you can afford the plane fare and hotel accomodations (not to mention the time off from work)? If you own a CD-ROM drive, you can send your favorite youngsters all the way to San Diego without their having to leave your home—for a very reasonable fee. The Animals!, a true multimedia tour de force featuring the San Diego Zoo, makes this trip possible, and it's more than worth its price of admission.

The Software Toolworks took advantage of the vast world available on a CD-ROM drive and made The Animals! almost as much fun and as easy to explore as the real zoo. After loading the program but before you even reach the Main menu, you have the option to browse through exhibits by looking up animals by name. You simply click on the appropriate icon on the title screen, and a windowful of animal names, all alphabetically listed, appears. Click on the name of any animal, and you'll see the animal beautifully and very sharply digitized before you. The Animals! creators did a fantastic job both collecting and transferring the visual data to disk. From the title screen, you can also click on the Sky Tram icon for an overview of the zoo's exhibits, or you can click on the Main Menu icon, which opens the Main Menu map. On to the zoo!

The Main Menu is essentially a large map divided into sections. These sections include Tropical Rain Forest, Montane, Tundra, Desert, Island, Grassland, Savanna, Temperate Forest, Taiga—all the earth's biomes. The Animals!, like the San Diego Zoo, displays its animals in surroundings that approximate their natural habitats. The map also includes the Center for the Reproduction of Endangered Species (CRES), a Kids section, a Storybook Theater, a Nursery, and a Tours booth, among other things. At the CRES, you can learn what the zoo does to repopulate dwindling species. At the Storybook Theater, you can watch films about the zoo and its inhabitants. The Kids section even contains a few quizzes. There are hours of fun and learning to be spent here.

Navigating The Animals! does not consume much of your time—it's faster than walking to exhibits at the actual San Diego Zoo. At the top of the Main Menu, you'll find the Navigation Palette, which holds a band of command buttons that allow you to travel quickly to any point in the zoo. These are simple enough to operate, and you can move forward or backward one exhibit, jump to any exhibit within the biome that you selected, and summon extensive online help related to your situation. A Copy to Disk option allows you to fill the Windows Clipboard with text or graphics data from The Animals!. If you ever seem lost, it's very easy to retrace your footsteps: You simply click on the Go Back icon (which displays a list of all the places you've visited so far).

You may also locate animals by searching for keywords such as *bird* or *tiger*. Clicking on the Media Library icon presents you with a list of all the pictures, video clips, and sounds found on the disc.

When you discover an interesting animal, you may read about it in the text window or view the snapshots and videos of it in the picture window. Just click on the necessary icons, and in a second or two, the show begins. Other icons include the Information Profile, which offers a summary of the exhibit; a Kid's Planet, which features a simplified overview for younger zoogoers; an Endangered Species section; and more.

Before any of this matters, though, you have to choose a section of the zoo to visit. To

do this, examine the Main Menu map, choose a biome, and click on it. The Animals! transports you to the first exhibit in that particular section. Now, the fun really begins. The San Diego Zoo is home to more than just lions and elephants, and finding these more unusual creatures can prove enlightening as well as entertaining as you use the Text and Audio/Visual options to explore links between one animal and another.

For instance, while I was visiting the grasslands, I came across the greater prairie chicken exhibit. This less popular animal had only a single color snapshot and a single sound on disc. The text window did little to liven up the display with its brief summary, but it did mention that the prairie chicken and the blue peacock are related. So, I explored the text-media link by first clicking on the A/V Links icon; this led me to the California quail. I went to the top of the screen to click on the Next Exhibit icon, passed by a number of exhibits that weren't particularly interesting to me—all still in the grasslands, of course—and stopped to stare at a peculiar bunch of animals, the meerkats.

Cute and ferretlike, they warranted a few minutes study and observation time. I clicked on the Facts and Figures icon to quickly read up on the little creatures. It turns out that they're related to the slender-tailed mongoose; are native to Angola, Namibia, Botswana, and South Africa; and love to eat eggs.

The Animals! let me down a bit at this point, however. The meerkats' "chitchat," which is mentioned in the text, wasn't used as a sampled sound in the A/V Links menu. The meerkats did get to star in their own short video, however, and their exhibit sported four additional snapshots besides.

The playback panel for the video clips appears after you click on a video clip's icon. It offers Play, Pause, Frame Advance, Frame Rewind, Rewind, and Fast Forward buttons—and all work exactly as you'd expect, though the Frame Forward and Frame Rewind do cause the otherwise smooth playback to jar and display some disorganized pixels for a moment.

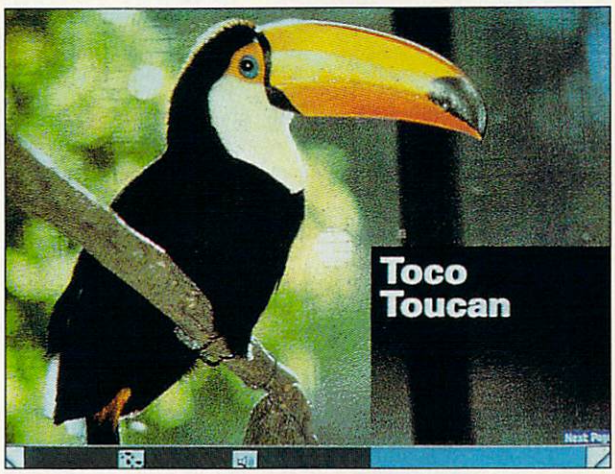
Also, the playback can be viewed in any of three modes: 160 × 120, 320 × 240, or full screen. The larger the display area, the blockier the images become. If you want the finest resolution, you should select the smallest display area option on the Customization menu. But if you want to view a reasonably sized movie, you should go with the 320 × 240 display mode. The fantastic, high-quality sounds remain synchronized with the images, no matter what image size you've selected.

The meerkat exhibit also contains a Kid's World icon labeled Crazy Ways. I clicked on this and read some of the more amusing and peculiar details of meerkat life. The text seems considerate of young readers and contains as much information as kids probably could retain from a visit to the zoo. This is, alas, also the major weakness of The Animals!: It provides as much information as a trip to the zoo and can show you pictures of the animals there, but it often doesn't include an overwhelming amount of factual detail.

Certainly the extensive online bibliography will aid anyone who is interested in researching meerkats or other of the less-famous zoo animals, but much more information could've gone onto this CD-ROM program than the amount that goes onto the exhibit placards at the actual zoo in San Diego.

Don't think The Animals! is run-of-the-mill, would-be multimedia PC (MPC) fare, though: The Software Toolworks did an outstanding job of packaging more than 82 short films on a single CD-ROM, along with 1300 256-color pictures, 2500 pages of text, and 2½ hours of sound data. The DOS (non-CD) version offers fewer options but retains all the educational value. But the real deal is the CD-ROM version. Its incredible images, animation, and sound will motivate you to learn about all the animals in the San Diego Zoo.

If The Animals! is any indication of the next wave of MPC products, an upgrade to CD-ROM would make a most worthy investment. ❐



Windows version: IBM PC or compatible (80386 compatible), 2MB RAM, SVGA, Windows 3.1, CD-ROM drive, MPC-compatible sound card, mouse—$119.95
DOS version: IBM PC or compatible (16-MHz 80286 or faster), 1MB RAM or higher with extended memory, VGA card with 256K, hard drive with 2MB free, CD-ROM drive with 135-Kbs transfer rate, Microsoft Extensions for CD-ROM 2.1 or higher—$119.95

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GAME INSIDER

Shay Addams

EVERYTHING'S COMING UP ACES

Following up on last year's hit, Aces of the Pacific, ace designer Damon Slye has turned in his latest tour de force with Aces over Europe. The P-51 Mustang, the Me 109 and Me 262 fighters, and many other war birds seen in World War II games are included. One novel addition is the German Arado, a light jet bomber. Surprisingly missing, though, is the Ju-87 Stuka, Nazi Germany's main dive bomber.

Aces incorporates more ground action as it moves from the Pacific to the European theater, but you'll still see plenty of stomach-churning dogfights.

The action, spanning events from D-day to the end of the war in Europe, unfolds across your screen in much the same manner as in Aces of the Pacific. You choose a side and the branch of service and then begin a series of missions based on the historical research of Dynamix's in-house war historian, John Bruning. Another part of the program allows you to practice specific mission types or dogfights on either side.

Aces over Europe employs new flight models and an enhanced version of Slye's 3-Space graphics system. Major differences in the new game are that it incorporates a greater and more detailed emphasis on ground attacks, reflecting the nature of the war in Europe, and that the dogfights are even more stomach churning than in the original Aces. Improved polygon graphics now show legible insignia on the planes, so you'll know which enemy squadron you're fighting. And each enemy plane in an engagement is now numbered, enabling you to know which pilot you're chasing—or which is about to shoot you out of the sky.

While most games released for CD-ROM have been minimally enhanced versions of the programs available first on floppy disks, Spectrum HoloByte's new Iron Helix was designed specifically for CD-ROM by Drew Pictures. It's an action adventure with a science-fiction scenario reminiscent of Suspended, Infocom's classic all-text adventure.

The goal in Iron Helix is to track down certain DNA samples on an abandoned spaceship. To explore the six-level ship, you must direct the actions of a remote-control probe as it travels throughout the corridors and rooms. The obstacle is the ship's security probe. The security probe detects your probe's every move and tries to blow it away. Graphics and animation look sharp on a screen divided into four quadrants. One quadrant depicts a television view of the probe's vicinity, the other quadrants show icon-based commands and other elements of the interface. Iron Helix is available for Macintosh as well as the PC.

With the recent release of a MiG-29 mission disk, Spectrum HoloByte has added yet more life to what remains the world's top jet flight sim. The new missions are set in the same theaters that appear in the original game. This time, however, you can fly one of the other side's craft—the MiG-29 Fulcrum, one of the few light fighters to employ Beyond Visual Range capability, a capability which the F-16 doesn't possess. What may prove even more fun than the new missions is the opportunity to choose either the F-16 or MiG-29 in a head-to-head game played via modem.

A pair of new mission disks for X-Wing offers more challenges for veterans who have already completed the first two Tours of Duty. LucasArts is calling the new mission disks Space Combat Tours. The first of these, which provides another series of missions set in the Star Wars universe, should be out by the time you read this. By early fall, look for another mission disk that will include a new craft—the B-Wing—in addition to a new Tour of Duty. And if they prove popular with the public, LucasArts will turn out at least one more X-Wing mission disk. (There is, however, no truth to the rumor that X-Wing designer Lawrence Holland and Wing Commander designer Chris Roberts are teaming up for a joint production called X-Wing Commander.)

For X-Wing and the super-realistic air combat sims of the 1990s, a new breed of joystick has emerged with lots more buttons for all the sophisticated flight commands. The latest entry is the Gravis Pro, distinguished by adjustable tension and a pair of extra buttons. The buttons correspond to the buttons on a second joystick (which many major flight sims support for various features). The tightest of the adjustable-tension settings makes it far easier to fly jets that require a light touch (like the Harrier in Domark's AV-8B Harrier Assault), especially if you tend to overcontrol and wind up like me: out of control. When set at one of the four looser positions, the Gravis Pro is at home in action games. ❐

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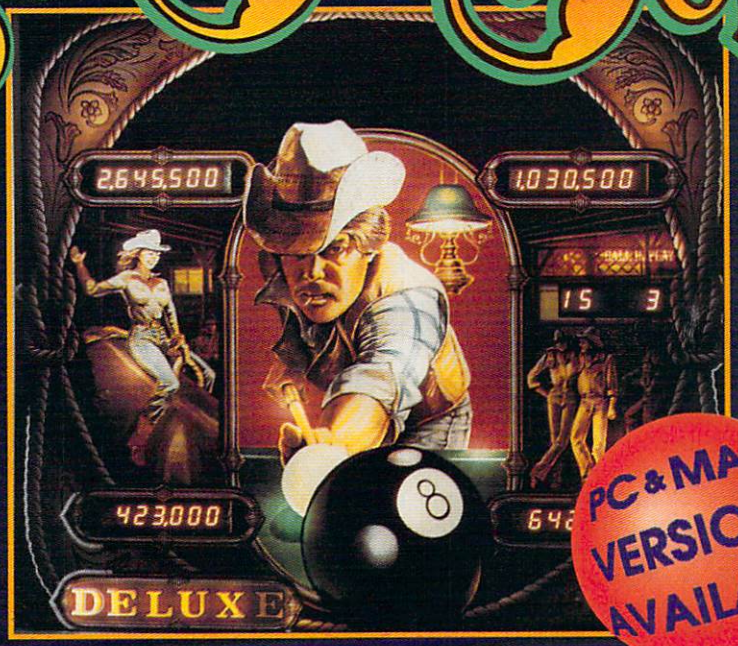

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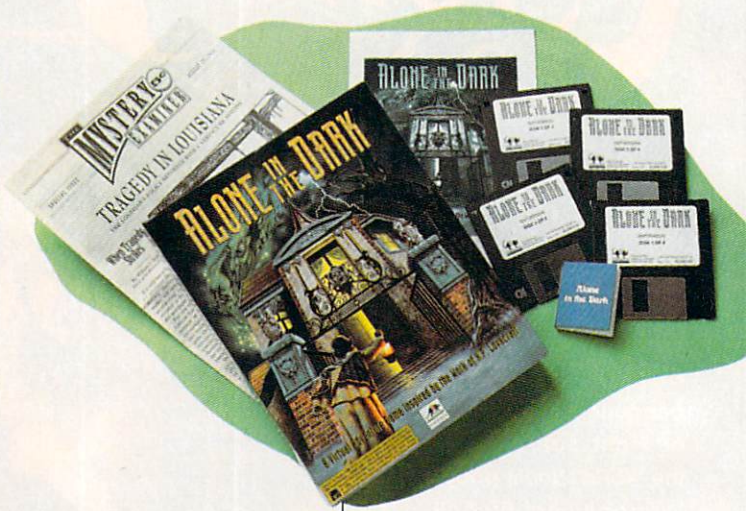
ENTERTAINMENT CHOICE

You'll want to sleep with a night-light on after playing this scary action-adventure game.

Peter Olafson



ALONE IN THE DARK

I sense that some line has been crossed; I can't leave now—even if I wish to. Even the most innocent volume on the bookshelf fills me with disquiet. A rocking horse seems to move on its own, and I don't like the look of that trapdoor.

I finally spot the piano in a distant, shadowed corner of the attic and am on my way toward it when I notice a suggestion of movement outside the window: something tattered and ungainly fluttering in the air. A wrecked flag, perhaps, I imagine, though I recall no flagpole. I look more closely. It's not a flag. The fluttering form looks back at me. It has teeth—many teeth. It's almost at the window. Help! The stairs! The stairs!

I wish a thousand blessings upon anyone trapped in the wonderful, terrifying place that is Alone in the Dark. This three-dimensional adventure game from the French company I * Motion is the first computer game I've seen that has fear running through it like an electric current. Raw emotion is a rare enough quality in real life, and its appearance in this virtual world definitely defines Alone as a breakthrough product.

A line has indeed been crossed: Alone is the first of a raft of fright bytes that were to hit the market in the first half of 1993. But it isn't the first of the breed, of course. We have Accolade's now-niter-encrusted role-playing game Don't Go Alone, and Horrorsoft's two Elviras and the quasi Elvira, Waxworks. But there's a delicate line between horror and terror: One is as easy as turning your eyelids inside out; the other is the art of setting you on pins and needles. The Elvira games may make you recoil at their carnage, but they aren't genuinely scary.

Alone is genuinely frightening without ever being grisly. When you run from its horrible creatures, you'll do so in shuddering terror. The first time you open a door and find something unspeakable waiting for you on the other side, something which proceeds to advance on you with arms outstretched, you'll feel a genuine shock.

The game blurs the line between actually being there and being at home, safely in front of a computer. Play it in the dark for maximum effect. Even writing about it two weeks after playing gives me the creeps. It's that good.

The adventure is based on the works of the author H. P. Lovecraft, who penned wonderful horror and fantasy stories back in the early part of the century. They aren't the best stories ever written, but they are responsible for creating the foundation for a wonderful cosmology called Cthulhu Mythos, which postulates an ancient monstrous race of creatures lying in wait, creatures who can be gated into this world, invariably with disastrous consequences for the gate opener.

As Alone opens, the gate is wide open and swinging. You're cast as either Edward Carnby, who is a private detective, or Emily Hartwood, who is the niece of the last tenant—who killed himself. You'll quickly find that the vague agendas found in the documentation have little bearing on the task at hand. In no time you'll be exploring, fighting for your life, solving puzzles, reading books, and enjoying a good deal of stimulating action-adventuring.

You get to explore the three-story house and its underpinnings, and they are a delightful hybrid of filled polygons and bitmaps. They're as solid and real a place as we've visited this side of Ultima Underworld. Actually, it is not all that dark in this world, and you're hardly alone. The house comes fully equipped with a staff of splendid terrors ranging from the mundane (like spiders and rats) to the completely outrageous (such

as a rabbit with a ferocious *Tyrannosaurus rex* head).

When you begin your adventure, you're armed with nothing more than your wits and a passing knowledge of karate. But if you're nosy enough, you'll eventually come across more conventional weapons. Combat is fun even when your weapon of choice doesn't quite do what you had hoped. The aiming is fun, and the enemy's recoil and the fine mist of blood are nice rewards when you do make contact. And your opponent's collapse and disintegration into a hail of polygon circles—to the distant crackle of thunder—are truly satisfying. (I prefer to play the game with the theme music turned off, but the sound effects and spot musical effects are quite superb.)

Quite different from that of any other game, the perspective in Alone is as if you're watching your character from a trapdoor just above and to the side. What's especially nice is that the view shifts, sometimes a number of times, depending on where you're standing. Finding the different views is fun and lends a sense of the house as an environment rather than as a series of snapshots. This haunted house really seems to occupy space, inside and out: Fights started in one room can spill through a doorway into another, and the program takes up over 5.5MB of hard disk space.

Alone is very easy to control. The keyboard interface is almost as transparent as the game's ethereal critters. Characters move around smoothly and realistically on a 33-MHz 80486. You simply hold the space bar to invoke your current mode (Fight, Open/Search, Close, or Push), and hit Enter to change it or inspect your inventory. The commands available are keyed to the designated object, and it's easy to change gears on the fly.

You'll quickly acquire a thorough sense of being a real character inhabiting a real place. It's a quality that seeps into the opening copy protection (picking the game's 3-D objects from a book) and is sustained into the save-game mechanism (each save is accompanied by miniature screen captures).

Alone is very much of a piece; it even possesses a properly apocalyptic, roof-coming-down Lovecraftian ending. And when the game's over, delightfully, it's not *quite* over. You'll still need to make your way back up to more civilized surroundings and out the front door. Since all the unearthly critters have been pacified, this is a perfect opportunity for unbridled exploration. As you play, you'll discover lots of books and documents that are useful but not exactly essential in the solution. It's easy to overlook them when you're running for your life. (Save your game anyway; a couple of books have decidedly nasty properties.) Now's your time to enjoy them.

At the same time, Alone's very consistency of tone makes doubly disconcerting the occasional hiccup in the program engine. For instance, while your character may be standing immediately in front of a cabinet, both of his arms extend to the left of it when you move to open it. Likewise, toward the end of the adventure, when you have to explore a decent-sized maze, the game suddenly abandons its multiple camera angles and adopts an overhead perspective similar to that used in games like LucasArts' Indiana Jones and the Last Crusade. It's a bit jarring, and it's unnecessary; the designers at I * Motion might have had a bit more respect for the purity of their otherwise impeccable creation. But these complaints are a small exception rather than the rule.

I truly had a fantastic time playing this game—so fantastic, in fact, that I not only finished the adventure but also went back a second time to see if I had missed anything. And the morning after I finished playing it, after a restless night of dark and unremembered dreams, I thought twice every time I had to open a door.

Alone in the Dark has been described as "a poor man's 7th Guest." We should all be so poor! This game is a triumph of the spirit—in more ways than one. ❐

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GAMEPLAY

Paul C. Schuytema

PANT YOUR WAY TO VICTORY

When I think of the Olympics, the sports that excite me are the individual ones like pole vaulting and the javelin throw.

On my PC, I have the opportunity to play superathlete, trained in a variety of Olympic sports and honed to take on the best. Summer Challenge (Accolade; 800-245-7744; $54.95) gives me the chance to be the track-and-field athlete I've always wanted to be. It encompasses a wide array of sports, including pole vaulting, throwing the javelin, kayaking, cycling, and hurdling. You can even try your abilities in archery, the high jump, and an equestrian jumping event. Control is simple—you use the joystick, mouse, or keyboard or a combination of the three. In cycling, for example, you can use your fingers to tap the Enter key for pedaling while steering with the joystick. For a high-speed sprint, you'll want to switch hands midpedal, since bashing the Enter key is remarkably exhausting.

Experience the rush of victory as you streak past the finish line or outshoot, outski, and outjump the best Olympic athletes.

In the kayaking event, you paddle by pushing the joystick forward and turn by moving the stick left and right. The graphics are smoothly scrolling 3-D polygons.

The Carl Lewis Challenge (Psygnosis; 617-731-3553; $49.99) is another take on the Summer Olympic events. In it, you control not only the actions of the athlete but also the rigorous prematch training. You play coach to a team of athletes, and training can vary from isometrics and circuit training to several methods of stretching. The individual training activities aren't controlled; instead, you assign workouts with varying levels of intensity and time spent on each method of training. The goal is to produce a team of perfectly trained athletes, either all generalists or specialists trained in specific events.

Once trained, the athletes compete in sprints, hurdles, javelin, high jump, and long jump. Performance depends not only on how well you control the athletes but also on how well you've trained them.

The graphics consist of a scrolling side view and feature fluidly animated competitors. As a departure from the typical stab-the-keys-as-fast-as-you-can approach, Psygnosis offers three control options. One is the typical key-bashing (which is nice since it simulates exhaustion so well); the others are rhythm control and gearing control. Rhythm control challenges you to tap the Ctrl key as a pendulum passes the center of its path. The more accurate your control, the faster the athlete. In gearing control, you tap the Ctrl key as the athlete reaches certain strides; hitting the strides right increases the speed.

When I long for the snows of winter, I dive into Winter Challenge (Accolade; $54.95), which is easily the most addictive of all the Olympic games I've played. Players compete in the luge, the downhill, cross-country, giant slalom, two-man bobsled, and the biathlon. You can also compete at speed skating and ski jumping. The wide array of wildly different sports makes play exciting, and there are so many different types of controls that my hands don't cramp up on me.

The downhill, with its breathtaking background and fast polygon graphics, conveys the illusion of superspeed. As I whip down the course, I have visions of Franz Klammer's brilliant, out-of-control gold-medal run in the 1976 Innsbruck games. Fortunately, Accolade's games feature a VCR which allows you to relive your brilliant runs.

Probably my favorite Winter Challenge event is the expertly modeled biathlon, that curious marriage of cross-country skiing and marksmanship. Smooth graphics give the illusion of skiing through the European countryside, and as you control every stroke, you must watch the stamina meter, which shows a combination of breath and heart rate. When your skier reaches the shooting range, the steadiness of the aim is determined by how exhausted your skier is; if your skier is frazzled, the aiming reticle bounces up and down with every labored breath.

These games are great for parties. Four players can compete in The Carl Lewis Challenge, while ten can go head-to-head in Accolade's games.

Sports games aren't limited to baseball, football, and golf. Go beyond the standard fare and see if you have what it takes to be an Olympian. ❐

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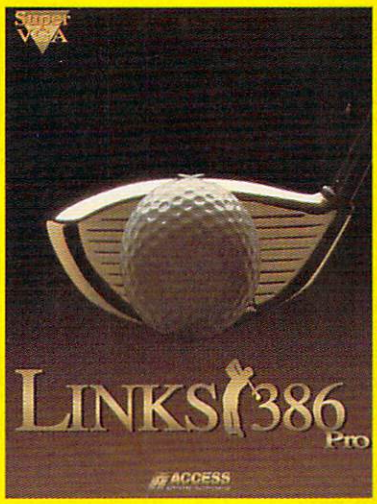

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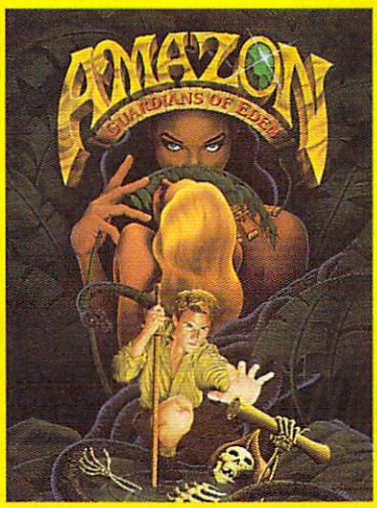

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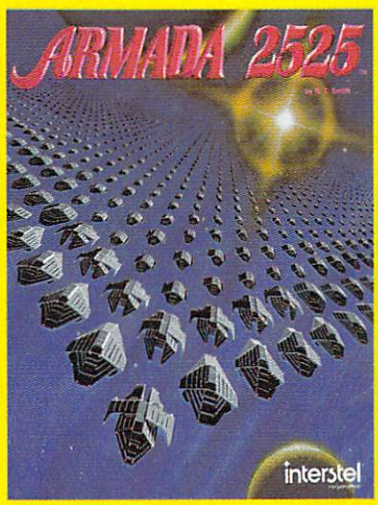

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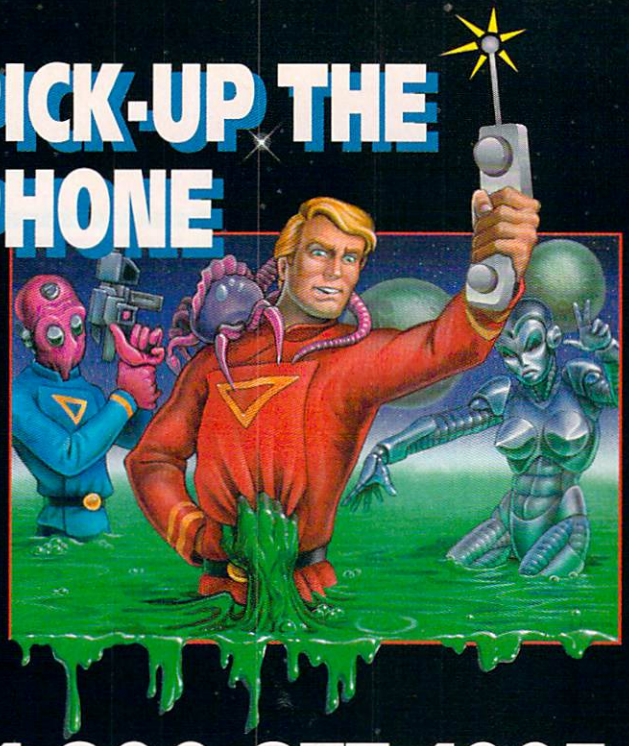

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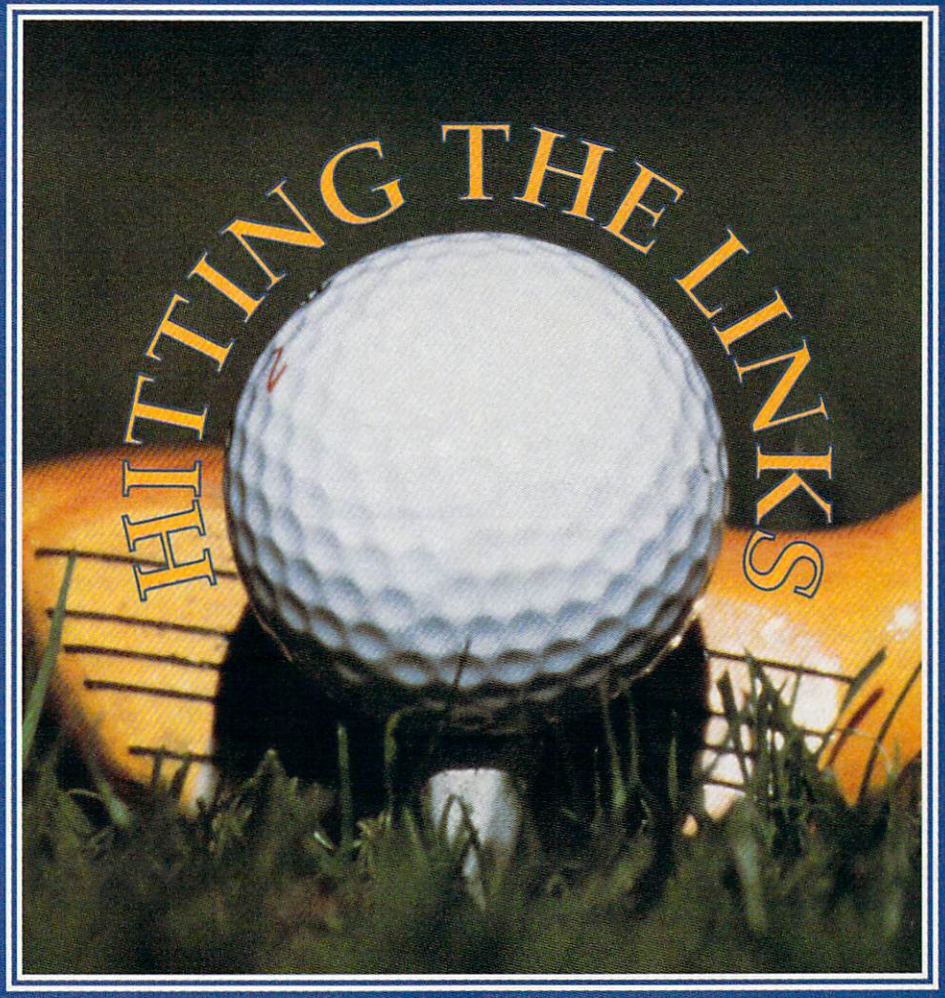


If golfers and caddies be not better neighbours
Than abbots and soldiers, with crosses and sabres,
Let such fancies remain with the fool who so thinks,
While we toast old St. Andrews, its Golfers, and Links.

—Andrew Carnegie, from a toast delivered in Chicago in 1874

BY PAUL C. SCHUYTEMA

Golf is a game with a long, rich heritage. Golf enjoys such popularity as to have become a staple of our popular culture and iconography. It's no wonder, then, that golf simulators have been chipping around computer screens as long as there have been CRTs.

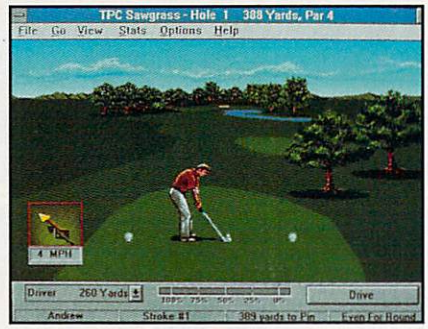
In the early days, aspiring computer golfers had to work with blocky, unrealistic graphics and limited play options. As computer technology evolved, so did golf simulations. Now, players enjoy stunningly realistic scenes, compensate for wind and the slope of the green, and choose from a variety of options. They can play against PGA pros in a tournament, play against other computer golfers over the phone, play a skins game for a million-dollar purse, shoot for par in Hawaii, or even design a golf course. Indeed, the modern computer golfer can play under the blustery, overcast skies of Scotland without even leaving home.

In addition, golf simulators have reached the level where they can actually assist players in their real-world golf games. Players who had never before picked up a real club are now hitting the links after discovering the fun of golf via a computer simulator, and computer users who don't play ordinary computer games discover that computer golf offers something different from the run of the mill and become hooked on the virtual country club on their hard disk.

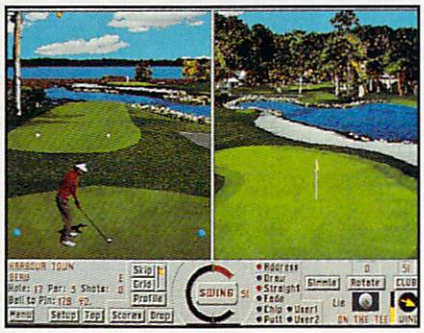
Different Strokes

There are a wide variety of golf simulations, each with a different spin on the game. Links 386 Pro strives for the ultimate in visual realism, while PGA Tour Golf lets players play in a PGA tournament and go head to head against the tour's best players. The Jack Nicklaus Signature Edition allows players to design a fantasy course and share it with people around the world. David Leadbetter's Greens is an expert-level tutorial that features dynamic camera tracking, which makes the experience seem more like televised coverage than a computer game.

Most of the games employ some type of power meter to judge the shot and generally require three actions from the player. In a drive, you might tap the space bar once to begin the swing. The power meter then moves to reflect your backswing. Then, you tap again at the power point—the top of the stroke—and the power meter begins to recede. You must time your third tap to fall at a precise moment to strike the ball straight on; any variance can lead to a hook or a slice.



PGA Tour Golf: fast and fun


Links 386 Pro: many views

David Leadbetter's Greens: dynamic

You may enjoy having such control over your strokes. Or you may prefer spending your time designing the perfect course or playing against the masters. Whatever simulation you choose, the addiction level is bound to be high. Each of the games discussed here will lead you to many late-night playing sessions and to true bragging rights for that one-in-a-million shot.

PGA Tour Golf

Electronic Arts' entry in the golfing competition, PGA Tour Golf for Windows, satisfies that deep need to go up against really expert competitors—the best the sport has to offer—and to beat them at their own game. In this simulation, the only PGA-licensed product, the pros are the real McCoy: Their abilities are modeled on PGA players' actual performances.

PGA Tour Golf uses stylized renderings of the players, courses, and objects, but the level of realism is quite acceptable. The natural scenery surrounding the course is a little on the sparse side, but there are enough trees to get in the way of nearly every golfer. The game features four courses: PGA West, Sterling Shores, the Tournament Player's Club at Avenel, and the Tournament Player's Club at Sawgrass.

This game's hallmarks are its speed, its challenge, and its playability. The courses may look easier than those in games with more visually complicated graphics, but the play is extremely demanding. One thing lacking, though, is the sense of rolling terrain: The fairways are flat and expansive, without either visual or play-affecting slope.

This changes when you reach the green, however. A window appears that models the green in 3-D with an imposed grid. You can rotate the picture to judge the break and adjust your aim accordingly. The view then shifts back to the playing screen to allow you to attempt the putt.

Far and away the most notable feature of PGA Tour Golf is the PGA tournament. The game proceeds in televised fashion, with an announcer commenting on each shot and giving reports from other holes. It's very tough to beat the pros, but it's extremely satisfying when you start to win.

Electronic Arts also sells a DOS version of PGA Tour Golf, which differs from the Windows version only in that it doesn't require Windows. PGA Tour Golf Limited Edition is a special packaging of the DOS version of PGA Tour Golf that includes the tournament course disk (normally sold separately), plus a VHS tape containing a documentary history of PGA tour golf, including interviews with players.

Links 386 Pro

The Links simulation has been with us for a while, but only recently has 386 Pro, the flagship of the Access Software line, made an appearance. A visually stunning achievement, 386 Pro requires Super VGA, at least an 80386 processor, and a whole lot of RAM (Access suggests 8MB, but 4MB seems to work just fine). With all of that computing power behind the game, the results are incredible.

The play window, a view from behind the golfer, approaches photo-realism, with varying textures in the grass, subtly rolling hills, and gently shaded sand bunkers. Access allows you to set up many viewing options, from a full-screen window of the course to a split screen featuring a

front view and a view from the pin. Other windows include a top view, a slope window, a stance window, and a scorecard.

To aim your shot, you use a unique "barber pole" that you move around the course with the mouse. When the shot is set, you use the mouse to control your swing. As in the other two Links products, the power bar is curved to simulate the arc of the golf swing, and there's a realistic time-lag from the moment you attempt to stop the swing until the club reacts. This takes getting used to, but it accurately reflects an actual swing.

There are no tournaments in 386 Pro, but you can play against several friends or a recorded player shot for shot for some heated competition.

If there are any weaknesses in 386 Pro, the foremost would be its speed. The game really needs an 80486 to play as fast as the other games. With an 80386SX, the redraw time can take quite a while. The other weaknesses are poor-quality sounds and no golfer animation when the shot is viewed from the green in reverse angle. It's a little odd to just see the ball leap from the fairway with no golfer in sight.

There's no course-design feature in 386 Pro, but Access is providing an ever-increasing array of courses, and original Links courses can be converted for play with 386 Pro (the resolution isn't as good as that of the 386 Pro courses, but the quality is still high). I had the opportunity to play golf in Hawaii (via the computer, of course) using the Mauna Kea course disk. The Championship disk contains files to play this course with Links 386 Pro, Links, or Microsoft Golf for Windows 1.0—and it's a gorgeous course. Playing the third hole in 386 Pro, a par-three iron shot over a volcanic Pacific inlet, is arguably reason enough to go out and buy a PC.

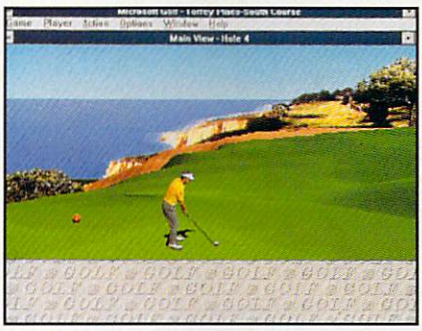
David Leadbetter's Greens

Greens takes two different approaches to simulating golf: It strives for real-world instruction, and it uses dynamic views of play.

The game is endorsed and heavily influenced by David Leadbetter, arguably the preeminent professional golfing instructor. The manual included with Greens consists of a richly detailed instructional course, featuring everything from club selection to stance and play strategies. MicroProse sets up the game as a vehicle for players to learn more and improve their regular game of golf, as well as for entertainment.

The second unique aspect of Greens is the view. There are a number of different camera angles, and if you select the intelligent camera, a shot is visualized more like television footage than a static view: The camera cuts, pans, and follows the ball in 12-frame-per-second animation. As a result, the quality of the graphics is a far cry from that of those in Links 386 Pro, but the way MicroProse executes the cuts makes up for the lack of resolution.

Greens also features an amazing amount of player control over the shots. Golfers can experiment with



Microsoft Golf: Links for Windows

Jack Nicklaus Signature Edition: solid

stance and tee placement beyond the usual club selection. The power meter in Greens is also different: As you twist into a backswing, the "sweet spot" where you must hit the ball shrinks, which corresponds with the increasing difficulty of hitting a power shot accurately.

On the green, Greens allows a golfer-to-hole view, a hole-to-ball view, and a perpendicular view. Using these different angles gives you a wealth of information about the lay of the green.

Greens features tournament and skins game options as well as modem or direct-connect play, allowing two players to battle against each other in realtime via phone.

Microsoft Golf for Windows 1.0

Microsoft, in an arrangement with Access, ported the original Links game to the Windows environment. More than just a quick fit, Microsoft Golf for Windows 1.0 is a true Windows program and takes full advantage of the operating system. Windows can be dragged and resized, and the game can wait in the background while you switch to a spreadsheet when your supervisor walks in.

Microsoft Golf also borrowed the golfer animation from Links 386 Pro, giving the swing animation greater depth than that of Links. All original Links courses are fully compatible with Microsoft Golf. The game can handle eight players simultaneously, but there are no options for tournament play or any of the other variations (such as a skins game, a recorded player, or an AI opponent).

As in the original Links and Links 386 Pro, you have complete control over your golfer's stance, swing plane, and ball position. As in Links 386 Pro, you have the option to step back from the ball and swing the club a few times before addressing the ball for a solid hit.

The game plays very smoothly, but aiming the ball is a little awkward, since your golfer disappears when the barber pole appears. Occasionally, the windows seem to get in the way of each other, and you have to make sure that the swing window is active before attempting a swing; otherwise, the delay as the window pops to the forefront will play havoc with any attempts at timing.

Microsoft Golf, like Links and Links 386 Pro, enables you to print out a scorecard (which must be signed and attested to be valid, of course).

Links

The most venerable of all the versions mentioned, the original Links is still a solid game that can be played adequately on an 80286, and up until the recent explosion of quality golf games, it was the king of the heap.

Links and Microsoft Golf have a library of over eight courses to choose from, including Troon North, set in the deserts of Arizona, and the Dorado Beach East Course in the heart of the Caribbean.

Jack Nicklaus Signature Edition

The Signature Edition is a significant rewrite of Accolade's Jack Nicklaus Ultimate Golf and is a youthful descendent of the old Mean 18 golf simulation.

Signature Edition is an extremely solid program and features 256-color graphics; while the resolution doesn't approach that of 386 Pro, the sense of

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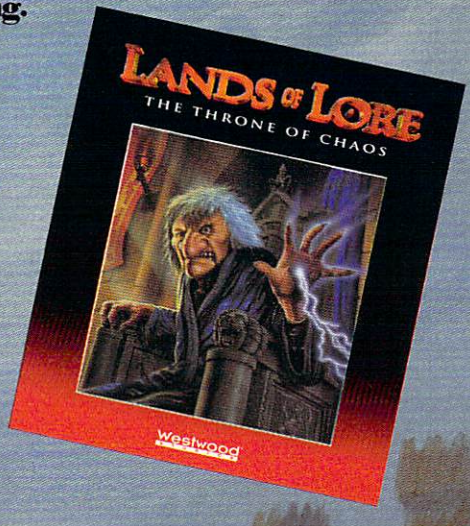

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rolling terrain is amazing. Also, Accolade chose to use a deep, rich palette of colors that seem to drip right off the screen.

The gameplay is solid, with most of the features you'd expect from a top-of-the-line golf simulator. One item it lacks, however, is player control of the golfer's stance or ball position.

You can choose stroke play, tournament mode, or a skins game, with a number of players competing at once. Signature Edition possesses a solid arsenal of AI golfers to battle against, and you can create computer players of matching ability (or inferior ability when you need a victory for psychological reasons). You can even compete against the Golden Bear himself. But if you do, it's a serious challenge: Nicklaus just doesn't seem to miss any shots.

The most striking feature of the Signature Edition simulation is its course-design program. With it, you can get your hands dirty and tackle the tedious, frustrating, and amazing task of terraforming a course. After you've designed a hole, you can play it through to examine its subtleties. The design program and the golf simulation do a credible job simulating the rolls and dips of terrain.

Course designers have control of the scrolling background, the pixel-by-pixel construction of the various objects that populate the course (such as trees, flowers, and the occasional caddie shack), and the type of terrain, from green to cart path. Utilizing a paint program type of interface, you draw terrain, select areas, and impose hills, dips, cliffs, and even railroad-tie shoring for a raised green.

Hundreds of user-designed courses, from Mark Willett's beautiful and fictional Alhambra course to Links set entirely on the surface of the moon, can be found on CompuServe and many other online services and BBSs. You can also join a tournament on Prodigy, download a course, and battle for position on the leader board, posting scores each week.

Wilson ProStaff Golf

Konami enters the world of computer golf with Wilson ProStaff Golf, a game that prides itself on the speed of its play. In a field of games battling for visual supremacy, Konami's entry takes a different approach. Instead of offering photorealistic graphics, Konami chose instead to make the screen redraws lightning fast.

In that area ProStaff Golf succeeds completely. The panoramic screens pop up almost instantly, and each shot is followed by a televisionlike gallery replay, focusing on where the ball lands. The graphics are well rendered and have something of the same flavor as the graphics in PGA Tour Golf and Greens.

ProStaff Golf features a very nice overhead view of each hole, showing where the ball will probably land if hit correctly. The overhead view breaks the shot distances into 25-percent intervals, making it easy to gauge how much force to put on a pitch or a choke shot. Konami has also rethought the basic power-bar approach to hitting the ball. The game features a circular bar for the power stroke, similar to the power bar in the Links games. But when a player selects the power for the stroke, the action then moves to the face of a stylized golf ball, where a red dot circles around the dimpled surface. To actually make the shot, the player must tap the selector key when the dot is exactly in the center of the ball. This approach accomplishes the same thing as the traditional power bar, with the added ability to purposely hit the ball either low or high, thereby controlling the spin.

ProStaff Golf features an impressive array of games, from stroke play to several skins games to a game called bingo-bango-bongo, in which points are awarded for being first on the green, closest to the hole, and first in the hole. The game also features an entire array of team games.

ProStaff Golf, for all of its features and fast gameplay, is somewhat limited. It only provides one course, which can get old fairly quickly. There are no facilities for playing against recorded players or computer players, so the game can get lonely during the early hours of the morning. Finally, putting is more difficult here than in any of the other games I've played. Some greens are so sloped that they appear to be located on the side of a mountain, and the aiming reticle is located at the top of the screen, a long way from the hole and the player's best line of sight.

Still, the play is fast and engaging, and the ease of the game, the short learning curve, and the ability to play teams makes it a great choice for a computer golf party after the links have been rained out.

Pro Shop

Links
$59.95
Links 386 Pro
$69.95
ACCESS SOFTWARE
4910 W. Amelia Earhart Dr.
Salt Lake City, UT 84116
(800) 800-4880
(801) 359-2900

Jack Nicklaus Signature Edition
$69.95
ACCOLADE
5300 Stevens Creek Blvd.
San Jose, CA 95129
(800) 245-7744
(303) 352-3183

PGA Tour Golf
$49.95
PGA Tour Golf for Windows
$59.95
PGA Tour Golf Limited Edition
$49.95
ELECTRONIC ARTS
1450 Fashion Island Blvd.
San Mateo, CA 94404
(800) 245-4525
(415) 513-7555

Wilson ProStaff Golf
$49.95
KONAMI
900 Deerfield Pkwy.
Buffalo Grove, IL 60089-4510
(708) 215-5111

David Leadbetter's Greens
$49.95
MICROPROSE
180 Lakefront Dr.
Hunt Valley, MD 21030-2245
(800) 879-7529
(410) 771-1151

Microsoft Golf for Windows 1.0
$64.95
MICROSOFT
One Microsoft Way
Redmond, WA 98052
(800) 426-9400

Grab Your Clubs

Golf is a rich and compelling game, and computer golf simulation has finally become nearly as challenging and enjoyable as the real thing. Whether you prefer head-to-head competition with a friend on a BBS, tournament play with the pros, creating a challenging course, or working on your golf game on a rainy day, you're sure to find a golf simulation that matches your style. And when you do, prepare to lose track of time. You won't want to quit until you've mastered your game—and then you'll want to challenge the world. ❑

64/128 VIEW

Gazette celebrates its tenth birthday with this issue—and launches a new column to help celebrate.

Tom Netsel

What were you doing ten years ago this month? If you happened to visit a newsstand, you may have picked up a new magazine called COMPUTE!'s Gazette.

I was working at the University of Central Florida in Orlando, and I had just bought a 64. I was wondering what to do with it when I spotted a Gazette at my local grocery store. I'll have to confess that I missed the first issue. I didn't see Gazette until the second issue hit the newsstand, but I've been hooked ever since.

Gazette was billed originally as being "for owners and users of Commodore VIC-20 and 64 personal computers." As time passed and Commodore introduced the Plus/4, the 16, and the 128, Gazette's coverage expanded to those machines. But when the smoke finally settled over the personal computer battlefield, the 64 and 128 emerged as the survivors, and Gazette narrowed its editorial focus to those Commodore veterans.

Speaking of veterans, as I browse through the masthead of that first issue, I see the names of four people who are still associated with the magazine. Regular readers will recognize columnists Jim Butterfield and Fred D'Ignazio, but two other veterans may not be as familiar. Terry Cash is now copy production manager, and De Potter is production manager. Without their valued assistance, there wouldn't be any magazine.

Editorial's staff has changed frequently, but Gazette's goal of providing its readers with the best of Commodore-related information and entertainment has not changed. In large measure, each Gazette editor has relied on 64 and 128 owners who are willing to share their knowledge with our readers. From that first issue through the one you read today, we've encouraged you to submit articles and programs for publication. That need is just as strong today as it was a decade ago. Some things don't change.

Change is inevitable, however, and you'll see it in this issue with the addition of a new column. Over the years we've published original programs and reviewed commercial software, but we've seldom covered public domain programs and shareware—until now. GEOS columnist Steve Vander Ark examines this vast source of programs in his new column, "PD Picks."

The programs Steve will review and recommend can be found on bulletin boards, commercial online services, user group libraries, and elsewhere. If you can't locate a convenient source for these programs, look for them on our monthly Gazette Disks. These programs—unlike the Gazette type-ins—are not copyrighted, and you may distribute them freely. All we ask is that you honor the fee requests of shareware authors if you use their programs.

In closing, I'd like to thank all of you devoted Commodore users for your support over the past ten years. Without your help, Gazette would have folded years ago. But with it, look for Gazette each month for years to come. ❐

GAZETTE

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By Tom Netsel.

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In 1982, dozens of home computers were struggling to pull ahead of the pack—then, along came the Commodore 64.
By Larry Cotton.

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11 YEARS IN 8-BIT HEAVEN

BY LARRY COTTON

THE YEAR WAS 1982.

The Vietnam War Memorial was dedicated in Washington, D.C.

England and Argentina fought over the Falkland Islands.

The Equal Rights Amendment lapsed without ratification.

The St. Louis Cardinals won the World Series.

Barney Clark became the first person to receive an artificial heart, the Jarvik-7.

And in the autumn of that year, the Commodore 64 personal computer was born.

Commodore International, a darling of Wall Street investors at that time, was known primarily for its calculators; the PET series of computers; and a successful, albeit memory-deficient older sibling of the 64, the VIC-20. The company was run by the inimitable Jack Tramiel and sons, a team famous for squeezing the most bang from a buck.

The personal computer market was in a frenzy at the time, and Tramiel brazenly introduced a new computer called the Commodore 64. This new machine was priced at $595, a ridiculously low price for that time. A disk drive or a monitor were extra.

The Field

The 64's major competitors were the Apple II+ ($1,530), Atari 800 ($899), IBM PC ($1,565), and TRS-80 Model III ($999). The 64 was exactly the machine the world had been holding its breath for, with a third more built-in memory than the Apple II+—four times more than the Atari 800—yet priced at two to three times less than the Apple and a third less than the Atari.

The 64 featured (as it does today) a breathtaking 16 colors; 40 characters per screen row; eight Movable Object Blocks (sprites); and, best of all, an unbelievable 64K of random access memory, 39K of which was available for BASIC programs. Even without a drive and color monitor, the 64 was still far and away the feature leader with outstanding color, graphics, and an integral three-voice music synthesizer. Its musical talents alone rivaled those of many dedicated keyboard synthesizers at the time.

I must confess that I was not one of the original personal computer enthusiasts. I hadn't assembled an Altair in my basement back in the 1970s. My computer-related background consisted of occasionally perusing Byte magazine and assembling a few Circuit Cellar projects. Later, my interest expanded into creating some original, but primitive, rats-nest circuits around various Radio Shack chips. One such device featured four toggle switches to input data to a tone-generating chip. It could play tunes stored in its minuscule 1K of memory! I began to see the need for a real computer.

Full List Price

After extensive comparative research, I decided to invest in a 64. I bought the shiny little machine (serial number 10917, with no colored bars in the logo) from a nearby dealer for full list price. I sold my prized 1959 Mercedes to raise the cash to finance it. In addition to the computer, I proudly took home a disk drive (instead of the more common Datassette tape drive), a printer, and a 13-inch color television to use as a monitor.My sons, David and Michael (then 13 and 10), and I cleared some working space and unpacked each component with loving care. With great anticipation and excitement, we connected the parts with cables, plugged them into the wall, and gingerly threw the power switches. Everything worked beautifully! We were thrilled!

As we tentatively put our new toy through its paces, we marveled at its wondrous capabilities. The only demonstration program our Commodore dealer supplied with the 64 (in anticipation of a wildly successful Christmas selling season) showed Santa Claus sailing around a chimney and surrounded by flurrying snow, all the while accompanied by background music playing "Jingle Bells."

Software Shortage

Our giddiness soon diminished with the slow dawning that, however wonderful the computer itself was, Commodore had introduced the 64 with virtually no available software. The company's first ads had vaguely promised a word processor; a database; a spreadsheet; and several games, including Gorf, Visible Solar System, Radar Rat Race, Mole Attack, Avenger, Ace of Aces, and Jupiter Lander.

With a dearth of software, we dutifully turned to the user's guide and began teaching ourselves to program in BASIC. My first program (beyond the sophisticated 10 PRINT "HELLO") was one I called Tunnels. This gem printed multicolored rectangles to the screen that overlapped in increasing and decreasing sizes. It was eventually published in a series of demos called "Baker's Dozen" that were published in the January and February 1985 issues of COMPUTE!'s Gazette. (That was back when COMPUTE had an exclamation point.)

Magazine Scene

After tiring of driving 45 miles every month to my dealer, I started a subscription to COMPUTE! in February 1983 and voraciously read every word written about the 64. That was when COMPUTE carried articles and type-in programs for all of the popular PCs of the day. Charles Brannon, Jim Butterfield, and Richard Mansfield became my gurus of the 64, educating me on every aspect and minutiae of video, inputs, outputs, machine language, and math. I snipped hundreds of articles from that magazine and from Gazette after it premiered in July 1983.

Articles in that first Gazette included a review of the strange Exatron Stringy Floppy, a mass storage device that's sort of halfway between a cassette recorder and a disk drive. There was a column by Fred D'Ignazio called "Computing for Kids," and tutorials on sound, reading paddles in BASIC, accelerated IF statements, and joysticks. I still have my volume 1, number 1 safely stashed away with other prized memorabilia.

Many other Commodore-specific magazines have appeared—and disappeared—during the past 11 years, among them Ahoy!, Commander, Transactor, Midnight Gazette, Commodore Magazine, Power Play, and RUN. Today, only the Gazette section of COMPUTE remains.

Software at Last

Commercial software soon started to catch up with 64 sales, and I could finally put my 64 to work. Among the first programs I bought for the 64 were

TUNNELS

Larry Cotton is the author of Gazette's popular and long-running "Beginner BASIC" column. The following program is the first one that he wrote for the 64 and was among the first that he sold to Gazette.

```
10 PRINT POKE 53280,0: POKE
   53281,0: PRINTCHR$(147)
20 A=1: B=-1: C=40: D=-40: N=1:
   P=54272: V=1984
30 FORZ=1TO12: GOSUB 110
40 V=V-39: N=N+1
50 NEXT
60 V=V+42: N=N-1
70 FORZ=1TO12: GOSUB 110
80 V=V+42: N=N-1
90 NEXT
100 END
110 Q=INT(15*RND(1))+1
120 FORX=1TON:POKEV+A,67:
    POKE V+A+P,Q: V=V+A: NEXT
130 POKEV,75: POKEV+P,Q
140 FORX=1TON: POKEV+D,66:
    POKEV+D+P,Q: V=V+D: NEXT
150 POKEV,73: POKEV+P,Q
160 FORX=1TON: POKEV+B,67:
    POKEV+B+P,Q: V=V+B: NEXT
170 POKEV,85: POKEV+P,Q
180 FORX=1TON: POKEV+C,66:
    POKEV+C+P,Q: V=V+C: NEXT
190 POKEV,74: POKEV+P,Q
200 RETURN
```

Since the Commodore 64's debut in 1982, worldwide sales of it and the 64C, shown here, have topped 10 million.

the Commodore Macro Assembler Development System, Editor Pak, Word Machine, Name Machine and, Totl Time Manager 2.6. Although it has long been excelled by other assemblers, I still use MADS for my feeble attempts at machine language programming. The first BASIC program I ever typed in was a sprite editor by Donald A. Pitts. It appeared in an article called "A Shape Generator for the Commodore 64" that was published in COMPUTE (November 1982).

SpeedScript

Perhaps the most famous type-in program ever published in any computer magazine is SpeedScript, the program that I'm using to write this article. It was written by Charles Brannon and first appeared for the VIC-20 and 64 in the January 1984 Gazette. Updated several times over the years, its latest version, SpeedScript 3.2, was published in May 1987. The program has been enhanced many times, allowing users to customize the program to their liking. Among these programs are SpeedScript-80, an 80-column version; SpeedCheck, a spelling checker; SpeedSearch, a fast utility for finding any phrase within a SpeedScript file on disk; SpeedCount, a word-counting enhancement; ScriptRead, a fast SpeedScript file reader; and Instant 80, a true WYSIWYG preview for SpeedScript. Some of these enhancements were published in Gazette and others appeared in COMPUTE when it still published type-in programs. (All of these programs are still available on the SpeedScript disk.)When I considered myself proficient in BASIC (I wasn't), I wrote a 92-block program called Muzic! which I attempted to package and sell. I think I sold a grand total of four disks—and these probably went to my 64-owning friends.

Meanwhile, back on the hardware front, finding the television hookup inadequate, I bought my one and only upgrade for the 64—a 1702 monitor. I'm staring at it still. What a wonderful improvement! No more zigzag lines and blurry characters.

Rabbits and Snails

Although it represented a quantum leap in data transfer speeds over the interminably slow tape cassette, the 1541 disk drive soon earned a reputation of its own for snail-like loading and saving (90 blocks—23K—in about a minute) and an easy-to-misalign read-write head.

To alleviate the first problem, I bought an Epyx Fastload cartridge. If there ever was a 64 accessory that's deserved to become a classic, it's this cartridge. Soon thereafter, I read an article on how to add an on-off switch to avoid plugging and unplugging the cartridge to accommodate programs which did or didn't use it. My Fastload's been sticking out of its port ever since.

The head alignment problem was much more frustrating. I read many articles, sent the 1541 to several repair shops, and drilled holes in the bottom housing to access the stepper motor's adjustment screws. Finally, someone managed to fix it, and it's been fine ever since.

Price Wars

As the years flew by, the 64's price plummeted. By June 1983, the 64's mail-order price was $395; a year later, it had slipped to $199; in May 1987, $169.95. Today you can buy one for about $150.

Part of the reason for its decreasing price was the onslaught of other low-priced competitive machines which vied for the computerphile's attention: APF Imagination Machine, the Apple-compatible Franklin Ace 1000 and 1200, Timex/Sinclair 1000 and 2000, Apple IIc, more Tandy machines, Texas Instruments 99/4A, Coleco Adam, Atari 520ST, and IBM PCjr (born November 1983 and died March 1985). When used 64s began to hit the want ads at rock-bottom prices, I bought a spare.

Meanwhile, Commodore wasn't resting on its laurels. While simultaneously boosting production and cutting the price of the 64, Commodore was trotting out the portable SX-64; the anomalous Plus/4 and 16; the 128 and 128D; the breakthrough Amiga family; and the IBM compatibles, variants of which became especially popular in Europe. None of those computers approached the sales of the 64, which is still being built and sold internationally today as the cosmetically enhanced 64C.

Software Bonanza

Within 18 months after its splashy introduction, more and more software companies had climbed aboard the lucrative 64 bandwagon. Ads for programs like EasyCalc, Sprite-Magic, Mail Mate, Choplifter, Sargon II, General Ledger, Busiwriter 64, Monopoly, Centropod, Software Automatic Mouth (an amazing voice-synthesis program known as SAM), Script 64, Typing Tutor, SuperTerm, and WordPro Plus/64 proliferated in Commodore-specific magazines.

Programmers who knew the 64 were in demand. Even Brøderbund Software was advertising for software authors in December 1983.

A New Operating System

In March 1986, Berkeley Softworks—now GeoWorks—introduced GEOS, the Graphic Environment Operating System. Although I'm not a GEOS fan (without an REU and extra drives, molasses is fast in comparison), I seem to be in the minority. Commodore quickly adopted GEOS as its "official operating system" for the 64, and many apparently excellent software products have greatly helped the 64 stay alive and kicking. Gazette's GEOS column first appeared in September 1987.

Applications

By November 1988, 64's were being pressed into service for almost everything but cleaning the kitchen sink. A radio station in Phoenix used one to

report activities on a call-in talk show. Many people, such as one avid user in Niceville, Florida, used their 64's to track stock market investments. One commercial application used 128s to monitor and control furnace settings in a large apartment complex.

Teachers calculated students' grades with them in Richmond, Virginia. A fireman in Tulare Country, California, used his for eliminating some of the paperwork involved in running a fire department. A preacher in Asheville, North Carolina, tracked the recreational activities of his church with his 64. A Union, Iowa, farmer used a spreadsheet running on a 64 to keep an eye on his farm's financial condition. At Bosch Power Tools, where I work, we used a 64 for years to calculate and generate graphs of motor-performance curves.

Hardware

While millions of owners were putting their 64s to creative uses, hardware manufacturers were busy as well. Here's a short list of peripherals that have made life easier and more interesting.

- Card? printer interface (Cardco)
- VIC-1520 plotter/printer (Commodore)
- Fastload cartridge (Epyx)
- Command Control Trackball (Wico)
- The Voice Box voice synthesizer (The Alien Group)
- Hearsay 1000 voice synthesizer/recognizer (Hearsay)
- Minimodem-C (Aprotek)
- Super Graphix printer interface (Xetec)
- SWL shortwave listener cartridge (Microlog)
- Flexidraw 170-C light pen (Inkwell Systems)
- Stringy Floppy storage device (Exatron)
- Ultimate Interface (Schnedler System)
- Lt. Kernal hard drive (Xetec)
- ComputerEyes video digitizer (Digital Vision)
- MW-302 printer interface (Micro World Electronix)
- Home Control Interface (X-10)
- Interpod interface between computer and various peripherals (Limbic Systems)
- VIC 1650 modem (300 bps, original ly $150) (Commodore)
- 1750 RAM expander (Commodore)
- Sonus MIDI interface (SOFTpacific)
- Video Byte II video digitizer (The Soft Group)
- 1351 mouse (Commodore)
- Ten Key Pad (Quality Computer)
- Super Expander 64 cartridge (Commodore)
- 1581 3½-inch drive (Commodore)
- Bodylink fitness system (Bodylog)

Perhaps the most bizarre peripheral of all was the heavily advertised Spartan adapter for interfacing the 64 to Apple II/II+ peripherals (Mimic Systems). I'm not sure it ever attained volume production.

Software

Here are some of my favorite programs and applications for the 64. Chances are you probably have some of these, too.

- SpeedScript 3.2 word processor (COMPUTE Publications)
- Instant 80 80-column preview (COMPUTE Publications)
- Print Shop card/sign maker (Brøderbund)
- Doodle drawing program (City Software)
- Flexidraw (Inkwell Systems)
- Generic Librarian MIDI software (The Music Software Exchange)
- Simon's BASIC cartridge (Commodore)
- PractiCalc spreadsheet (Computer Software Associates)
- CADPAK-64 drawing program (Abacus)
- Screen Graphics-64 graphics enhancement to BASIC (Abacus)
- Tax Master (Master Software)
- Datafile (RUN magazine)

How about a few games?

- Space Taxi (Muse)
- Summer Games II (Epyx)
- Impossible Mission ("Stay awhile; stay forever!") (Epyx)
- Raid on BungelingBay (Brøderbund)
- Tetris (Spectrum HoloByte)
- Advanced Dungeons & Dragons (Strategic Simulations)
- Bard's Tale (Electronic Arts)
- Pinball Construction Set (Electronic Arts)
- Zork series (Infocom)
- Dragonworld (Trillium)
- Flight Simulator II (subLOGIC)
- Choplifter (Brøderbund)[a] Where in the World Is Carmen Sandiego? (Brøderbund)

In a Babbage's one day, I ran across Light and Temperature Labs, scientific experiments from Hayden Software. They were on sale for $10 each. In case you missed these sadly underpromoted products, each one is a series of scientific experiments on disk, supported by great documentation, along with an interface box which connects to a joystick port. The box accepts either a photocell or an accurate temperature probe—also furnished! What a find!

Gadgets

Over the last decade-plus, I've whiled away quite a few hours building and writing supporting software for my own collection of miscellaneous gadgets that connect to the user, cartridge, or joystick ports. Some of these include the following.

- A numeric keypad
- A plotter (although plodder would be a better name), which could draw with four felt pens whatever appeared on the monitor screen
- A MIDI interface (I still use it almost daily with my spare 64)
- A relay interface which controls small electrical devices
- A room measurer which uses an old Wico trackball mechanism to roll around the periphery of a room, taking the room's measurements
- A model "drummer boy" which uses relay-switched solenoids to control drumsticks
- A device to synchronize taped music and kaleidoscopic images (works with a four-track tape deck)
- A talker, based on a Radio Shack voice synthesis chip

In Retrospect

I've spent literally thousands of pleasant hours with my 64 over the past 11 years. The computer is still perfect for the vast majority of my purposes. Back in May 1988, Rich McIntyre, then Commodore's senior vice president of sales and marketing said, "Eight-bit? Who cares? You're buying a machine for a specific reason. If it satisfies that need, it's never obsolete. Only your requirements become obsolete. . . . If the need continues to exist until the year 2000, that machine is still satisfactory."

Maybe Jim Hilty said it best in last December's issue of Gazette. "The 64 has always been kind of a barnstorming computer . . . just plug it in and fly by the seat of your pants. It's a fun computer, a truly personal computer, a computer that an individual can enjoy programming, a welcome friend."

Thank you, Commodore. Thanks also to everyone who builds the hardware, writes the software, and publishes information about this marvelous machine that is the Commodore 64. Here's to 11 more happy, productive, profitable, educational, and entertaining years in 8-bit heaven. ❑

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MATHBOOSTER

I don't think there's a kid left in the universe who doesn't respond to falling images on a computer screen with a desire to stop them, to be the good guy, the hero. Witness the fact that even kids who own videogames and whose parents won't give them quarters can't resist checking out the games in malls and stores.

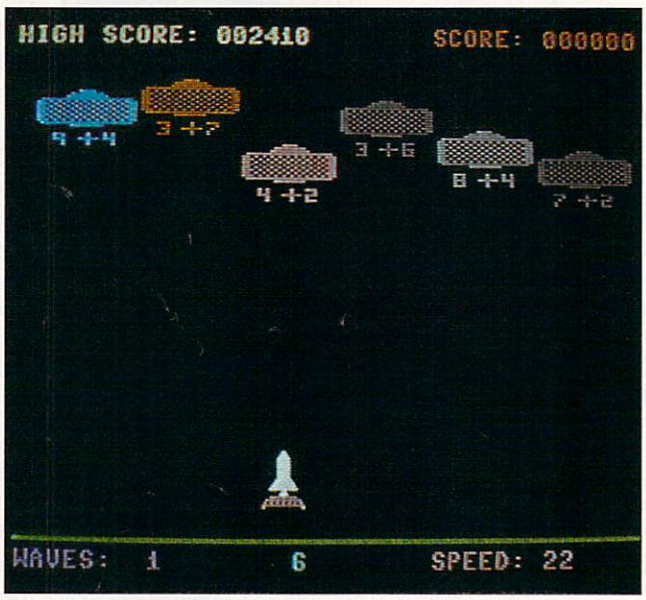
What does this have to do with an arithmetic drill-and-practice program for the 64? Boosting falling satellites back into space is the premise behind Mathbooster, a program imported from Australia.

To prevent these satellites from tumbling down and crashing into the earth, students must quickly and correctly solve math equations. This program provides a drill with positive reinforcement that's fun.

Mathbooster is not a teaching program. It's designed to reinforce through practice the math skills that the students have learned in class.

When the game starts, satellites are strung across the sky, and a booster rocket waits atop its launch pad. Below each satellite is an equation. This first wave of satellites begins to fall. Using the appropriate keys, you place the launch pad beneath a satellite and type in an answer to the equation. Pressing Return or the space bar launches the booster rocket—only if the answer is correct. If so, the booster rocket then pushes the satellite back into space. If the answer is incorrect, the satellite continues its fall toward earth. Once you've successfully propelled the first wave back into orbit, a second wave begins to fall—at a faster rate than the first!

The third wave consists not of satellites but the space shuttle! It's a very large space shuttle that needs a very large booster rocket to restore it to orbit. Points are accumulated for boosting satellites and the shuttle back into space. If a satellite or the shuttle reaches the ground, the game ends. As in arcade games, the program keeps track of current high scores.



Boost falling satellites back into space with Mathbooster, a program that combines arcade action with math drill.

Mathbooster comes with ten sample games already prepared. However, its power comes in the variations you can create by altering the type of problems. The main menu lists three options: Start the game, Load different problems, and Change problems. The first one is self-explanatory. The second option lets you load other files of problems already created and saved on disk. The third option lets your create these other math files.

The first menu under option 3 allows you to view the current problem type, change it, change the speed settings, load and save the problem type and settings, or return to the game. When you view a problem, the screen lists the type of operation that's being displayed: addition, subtraction, addition and subtraction, multiplication, division, or multiplication and division.

Next, it tells you what form the equation will take, such as A + B = C. Then, for each A, B, C, or other variable, the program sets the parameters. For example, if you're practicing addition where the sum, C, never exceeds 12, then A's parameters would be 1–6, and B's would be 1–6 also.

The next option is to change the problem type. The Operations List lets you do this. For each operation there's a screen that guides you through the steps of choosing the parameters for the variables. This requires care and thought, but it isn't difficult. The screen instructions and the manual enable you to create the exact drill you want for your student.

Speed Settings govern the actual game, controlling how fast the satellites and shuttle fall, how quickly that speed increases, when the first shuttle appears, how many times per wave it appears, and whether or not the sound effects are turned on. With these you can customize a game to best challenge students without overwhelming them.

The manual is thorough. Aside from a couple of typos, it provides helpful insight and guidance in devising games that will provide the kind of drill that will most benefit your children or students. Included are some appendices describing the ten sample games already on the disk and providing some examples of how to set up game formats. Mathbooster also carries its own copying program to allow you to make backups.

Mathbooster is the second Free Spirit import from Australia that we've reviewed. These two programs by Satchel Software are copyrighted by the Minister of Education and are used by the school systems in South Australia. (Mathbooster's manual even makes reference to the South Australian curriculum modules.) As with the first program, Dr. Spellingstein, we are impressed by the solid programming that provides the actual computer game yet allows you to create and modify within the program to make it fit your needs. It's powerful, flexible, and easy to operate.

Kids love computers and computer games. Most kids also love learning, although they'd deny it if you'd ask

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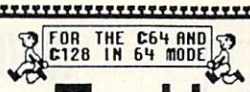

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REVIEWS

them. Computers and learning games can be an irresistible combination when blended properly. Mathbooster provides the perfect recipe for turning math practice into a real treat.

DAVID and ROBIN MINNICK

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JARA-TAVA

Want to take a trip to an exotic location; hunt for buried treasure; and fight crocodiles, sharks, and hungry snakes? Then Satchel Software's latest text adventure, Jara-Tava, is your ticket to adventure.

Jara-Tava begins, like many good adventures, with the inheritance of an ancient treasure map. A letter from your dear, departed Uncle Bartholomew suggests that Captain Kidd's treasure might be found on the island of Jara-Mau. It also warns of danger should you go to neighboring Jara-Tava, the Isle of Fire.

With no further urging, you're on your way. Of course, you learn early in the game that the treasure isn't on peaceful Jara-Mau but across the shark-invested strait on Jara-Tava.

Satchel Software designed this interactive text adventure with junior high students in mind. It has colorful graphics, easy-to-use text commands, and a challenging plot. Familiar elements from classic literature, skillfully woven into the game, are sure to please teacher, student, and parents alike. In addition to Kidd's treasure, you'll find Robinson Crusoe's tree house and Captain Nemo's submarine, *Nautilus*. Also, straight from an Indiana Jones adventure, there's a golden idol that's protected by a large boulder.

Teachers in Southern Australia have been using this text game in their classrooms since 1988. However, the game has only recently been licensed for distribution in the U.S. by Free Spirit Software. The package comes complete with three disks and a 134-page combination instruction and resource manual.

Teachers who decide to use this game as part of their classroom curriculum will be delighted with the hidden teacher's controls built into the program. Accessed by pressing Shift-T at the beginning of the game, teachers or parents can set options like help com-

mands, maps, and multiple moves. They can also encode messages on statues to increase the difficulty of the game and teach students about deciphering codes. But don't get the idea that the game is only useful in scholastic situations. It's a package that will provide hours of computer fun at home as well.

In fact, the game's design is perfect for the solitary player or for young players who want to do it themselves. Most popular text games require verb-and-noun commands such as *Climb Tree* in order to move through the game paths. This can be confusing to a young player. Jara-Tava's designers simplified the process by creating a program that analyzes individual words, not two-word sequences. Game players can type in whole sentences because the program searches for keywords and strips out unknown ones. This lets players use more natural language in the game.

Since the game was designed with the junior high player in mind, older, more experienced players may not find it challenging enough. However, it succeeds quite well with the targeted age group.

Maps are important in solving this and any text game. The Jara-Tava manual gives students and first-time text game players a brief lesson on how to keep a map. Teachers can build on this for other map-making exercises for their students. The section gives leisure-time players new ideas for ways to use their maps, too. All can benefit from it.

The game itself offers several choices at every point of play. Since most people learn more by their mistakes than their successes, experiment with the game. Try all the options—build a glider, ride the sub, feed the crocodiles. You can save your game on disk and go back to correct any mistakes you make. You'll learn something new with everything you do. At the conclusion of the game, the screen will display how many steps it took for you to solve the game. You can play it over and over again, trying to beat your previous best score.

But there's more to it than just the game. Like other software packages from Satchel, there's a resource disk included with this one. This disk has a simple database, an easy-to-use word processor, a disk copying program, and the Tree of Knowledge guessing game.

The word processing program is designed for the junior high student who is beginning to do research papers and reports that need to be typed. It's a program that students can continue

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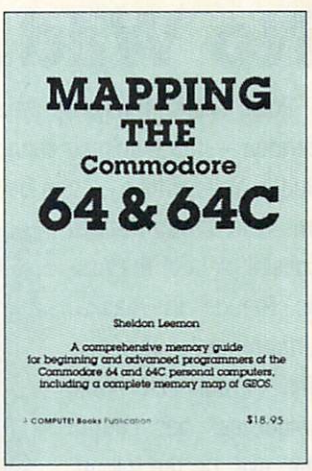

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REVIEWS

to use for simple reports as they enter high school. It's also useful for people who have never used word processing programs or have been intimidated by them in the past. Called Tell-a-Tale, the Jara-Tava word processor is a very simple-to-learn program that lets you write and then save your work to a disk. You can also center titles, change cases of words and letters, work with existing files, and print out reports. The program will not do more elaborate functions like footnotes and headers, but it's sufficient for most word processing needs.

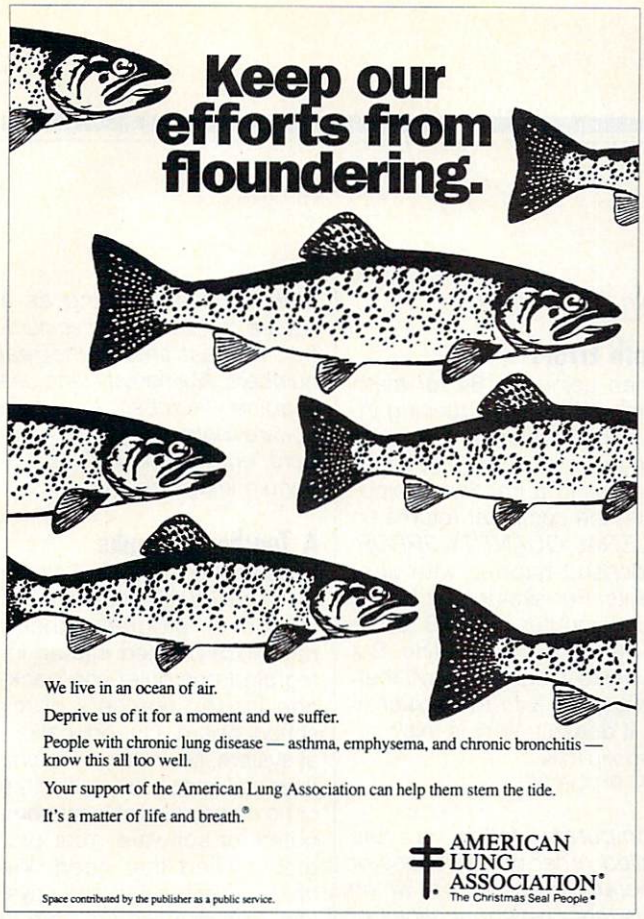
The database is useful for storing word lists and simple groups of information. The word lists can then be imported into the word processor to make spelling lists or to use in essays. Satchel has already begun five databases for the user. The names are Pirates, Islands, Volcanoes, Whales, and Sharks. You can build on this basic base by adding additional files. Each file may be up to 29 characters. Files may be deleted; however, the erase function has been restricted so no more than one file can be erased at a time. This safeguard keeps you from accidentally wiping out your entire database.

The Tree of Knowledge game pits the player against the computer's ability to guess. There are five trees on the disk that you can select: Animals, Pirates, Whales, Sharks, and Snakes. New information can be added to the existing trees to make a more complex guessing game. These can be saved and replayed again and again.

The resource disk takes the Jara-Tava package far beyond mere game software. In my opinion, this one disk is worth the modest price of the package all by itself.

And there's still more. Take a look at the extensive, spiral-bound instruction manual. Tucked in the center of the manual is a 68-page section that is filled with activities related to the themes found in the Jara-Tava game. There are word games, crossword puzzles, word searches, drawing activities, and group games. There are ideas for crafts, too. You can build your own model volcano, make beanbags shaped like whales, or do any of a variety of activities. All the instructions are included. As an added bonus, Satchel has given permission for teachers to copy any or all of the manual for use in their own classrooms.

All in all, Jara-Tava is an outstanding package that does more than merely entertain players. It stimulates and ed-



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FLYER

Flyer is a deceptively simple but maddening little arcade game for the 64. The idea is to guide a paper airplane through the rooms of a house, avoiding furniture and other obstacles.

Helping you in your fight against gravity and wind resistance are a number of air vents that provide lift and a series of rollers that give your glider extra speed and maneuverability. As your glider passes over a vent, push up on a joystick to gain altitude. Maintain a light touch, though. If you climb too high, you'll smack into the ceiling and crash.

As your plane glides from left to right across the screen, aim for the diamond-shaped rollers in the middle of the room. When you fly through one, push your stick hard to the right to pick up speed. Control is rather limited with this flyer, but you can lose altitude quickly by pulling back on the stick.

As in any house, furniture is a major obstacle for paper airplanes. Beds, lamps, stereos, and bookcases seem to suck the planes into them. When you crash, you start again in the first room which is filled with nothing but air vents and rollers. Since I crash so frequently, I'm glad that author Cameron Kaiser lets me keep the action moving. To restart, simply press the fire button.

The music playing in the background is a great rendition of "The Blue Danube." It puts the 64's SID chip to good use, but that tune just about drives me crazy! The volume control takes care of that, however.

That melodic but cursed background music is Flyer's only sound effect, but it's really not that bad. I just get annoyed when I can't master a game.

It took me quite some time to develop just the right touch with Flyer, guiding the plane through the house. Getting through the first room filled with rollers and vents was a breeze—pardon the pun—but I thought I'd never make it past that bed in the next room. I'd gain a little altitude, pick up some speed, fly over a vent, pull back to clear the bed, and then swish! Back to the beginning.

Flyer's graphics are pretty simple: Everything's in black, white, and gray. The rooms fill only a narrow portion of the 64's monitor. Each one is only about two inches high. That's why you have to be careful about not flying into the ceiling. I think a little more creativity could have been shown here to expand the playing screen, and the gray rooms could use a bit of color to give the game more visual appeal.

The documentation is clear and concise. It consists of a two-sided sheet of instructions and hints that's well written and easy to understand.

All in all, Flyer is a simple game, and that could be its biggest drawback. If you're the type who gets discouraged easily, you'll probably get bored with Flyer rather quickly. On the other hand, if you're the type who refuses to let a computer beat you, you'll probably get addicted to flying this little electronic paper airplane.

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FEEDBACK

Where to find chips and whether excessive poking can be hazardous to their health.

Character ROM Chip

Can you possibly tell me where I can get the 9011225-01 chip for my 64? I have been looking since 1991 but haven't been able to locate one in my country.

DAVID SANIEL SUAREZ LOPEZ
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The chip you want is the Character ROM chip, and you can order it from The Grapevine Group, 3 Chestnut Street, Suffern, New York 10901. The latest price is $9.50 plus $8.50 shipping costs to Mexico. Ask for part number C1225. You can order the chip by mail or by calling (914) 357-2424. Readers in the U.S. can order by calling (800) 292-7445. Ask for the free catalogue of Commodore and Amiga chips, too.

Poked to Death?

Question: After about a year of sustained use, the SID (Sound Interface Device) chip in my Commodore 64 has stopped functioning. Can this be caused by misusing the chip? For instance, is there such a thing as excessive poking?

DONALD DRAPER
RICHMOND, VA

The SID chip is designed to be poked. Such activity is considered normal use and will not damage it. In general, nothing any program does will ever damage any of a computer's internal hardware. Like all other electronic components, SID chips occasionally fail. The only cure is to replace the chip. Replacing the chip can be either simple or difficult, depending on whether the one in your computer is socketed or soldered. The SID chip, which has the numerical designation 6581, is located near the center of the circuit board in both the 64 and 128.

Math Errors

When using my 64 for math homework, I keep running into some problems. If I raise a variable containing a negative number to a fractional exponent, the computer returns an *ILLEGAL QUANTITY ERROR*. It doesn't happen with constants. For example, if I have the computer print –8 to the power of .5, it works fine. But if I make X equal –8 and then try to print X to the power of .5, it doesn't. Why is this?

TARQ WILLIAMS
LAKE GENEVA, WI

*Computers follow a rule called order of operations or operator precedence, which tells them which functions or operations to perform before others. For example, PRINT 3 + 2 * 7 will give you a result of 17, not 35, because multiplication has a higher precedence than addition. The result of 2 * 7 is calculated before the 3 is added in.*

The up-arrow (power) function has a higher precedence than the negation (–) function, as you'll see if you PRINT –4 ↑ 2. The 64 prints –16 as the answer. But squaring –4 should result in a positive 16, not a negative one. What happens is that the result of 4 to the power of 2 is calculated; then the minus sign is appended.

Although PRINT –8 ↑ .5 seems to work, you'll get an error message if you try PRINT (–8) ↑ .5. So it's not a matter of variables versus constants; it's strictly a problem with raising a negative number to a fractional power.

Raising to the .5 power is the same as finding the square root of a number. The square root of –8 would have to be a number that multiplied by itself yielded –8. But whenever you square a real number, the result is positive, so there's no such thing as a square root of a negative number, at least among the real numbers. Mathematicians use imaginary numbers to handle square roots of negative numbers, but your 64 isn't built to handle imaginary numbers.

A Teacher's Thanks

I would like to thank Gazette for providing me with a source of programs that I have incorporated into an integrated computer-use package for the teachers of my school board. Our educational system, like many, is facing financial cutbacks, with little or no money available for computers or software. Your programs filled that need. We have numerous 64s in our system, and now we are able to make much greater use of them.

I selected programs from Gazette that provided word processing, spreadsheet, database, graphics, and keyboarding skills. Other programs supplied language arts, programming suggestions, science, social studies, and telecommunications resources.

With the current wave of upgrading, many educators felt that the 64 had nothing to offer. In fact, it has much to offer if it is utilized to the fullest possible extent. The computers are already in the system, and the Gazette and well-written public domain programs offer a viable way to provide for integrated programming for our students. Thank you.

CAROL A. NAUSS
CHESTER, NS
CANADA

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A NEW COLUMN, VERSION 2

Explore the exciting world of public domain and shareware programming in this new Gazette column.

Yep, version 2. This is the second time I've written this column. If you feel as though you've just walked into the middle of a movie, let me explain. This is a new column that deals with public domain programs and shareware. I wrote the first version a few weeks ago, but when I reread the introduction, I just shook my head. It was boring.

Oh, it was OK. I might use it as part of an article somewhere along the line. It defines shareware and a few other related terms, chatters about how nice it is to be writing this new column, and warns everyone—in no uncertain terms—to pay their shareware fees. It ends with a flourish about how shareware is on the cutting edge of Commodore programming today.

I'm talking bold, new, and exciting programs that push the limits of Commodore's 8-bit wonder! I've got to be spitting a little flame. I don't want you to read this column once and then next time decide to save it until you've read the part again about how to type in the programs. I want you to turn to this column *first!*

I'll be covering programs that I hope will provide some of the old spark that made the 64 so exciting—and made its owners so gung-ho, so (let's face it) nuts about their machines. That spark is what keeps me coming back to this great little machine.

I've been rummaging in some of the stranger corners of QuantumLink's libraries, tracking down programs to throw at you. Feel free to download them. I've provided filenames and uploader names for easy downloading. If you're not on Q-Link and you can't find these files on local bulletin boards or at your user group, you'll find the programs mentioned here on the Gazette Disk. Now, let's take a look at this month's programs—a couple of fast and furious, arcade-style shoot-'em-ups.

Astra

By Chris Batchelor
QuantumLink filename: ASTRA3.SDA, uploaded by Chris-EMM.

OK, for you 128 users out there, here's an 80-column program that will cost you hours of sleep. The way I see it, Chris Batchelor, the sadist who created this arcade torture, must lie awake nights himself, chortling like the Wicked Witch of the West as he imagines poor joystick jockeys like me with crippled thumbs and glazed eyes, trying desperately to fight off these endless waves of death. After playing this fast-paced shoot-'em-up, I *know* I need a continuous fire button on my joystick, anything to save my left hand from being twisted into a permanent claw.

Astra starts innocently enough. It seems so easy to pour merciless fire into those little bugs that swoop into those little chutes. But then there are more and more of them. Before long, bugs are hurtling down in droves, piling up like spilled gummy bears. There just aren't enough blasts per second to clear them all out. Before long, they get you. And then you play it again, and again, and again.

You'll love this game, especially if you get a rush out of annihilating all those little bugs like I do. It works its horrors in 80 columns, which means that you won't be able to complain at all about the graphics. As far as speed goes, well, just try to keep up with it. I can't honestly say how great it is a higher levels (I never survive that long).

This is the third incarnation of this game. The fine-tuning has made it a real corker. So flex that thumb a bit, slam back Mountain Dews until your eyes bug out, and face the endless hordes in Astra.

Odin

By Frank Lindsey
QuantumLink filename: ODIN, uploaded by Mondain.

OK, all of you 64 users who've been reading this and growling nasty things about those 128 users and their fancy graphics, here's a game that will make a red-eyed, thumb-happy zombie out of you, too.

Odin is one of those games that put you in a spaceship at the bottom of the screen, armed with an endless supply of energy bolts or whatever. As usual, the details are unimportant. What is important is that all those crazed blobs plummeting toward you will turn your spaceship into pixel dust if you don't keep pounding that fire button. There's no continual fire here (the one major flaw in an otherwise outstanding game), so plan on some actual finger or thumb pain as you try to clear a path in the weaving mess.

Odin does Astra one better by hurling a nifty variety of nasties down the screen. They're all animated with blinking lights and flapping wings, making them nice to look at for that split second before you obliterate them or vice versa. Once you get past the first level, they fire back, lobbing little bombs your way.

Once again, I have to admit that I can't vouch for the higher levels. I count myself lucky to live past level 2.

Launch yourself into either of these games. Have fun and let me know how you make out! ❐

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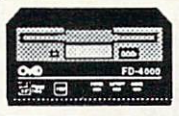

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MACHINE LANGUAGE

Jim Butterfield

FILE END CHECK

BASIC's INPUT# statement has limitations that can cause a program crash during a file read. The problem surfaces when two conditions are met. First, the program wants to read the whole file, using INPUT# to get the data and test the system variable ST (status) to detect the end of the file. The second condition occurs when the file ends with more than one Return character.

A quick pair of programs will show this effect. First, write a file as follows.

In order to read a file successfully, you have to know what's at its end.

```
100 OPEN 1,8,2,"0:BADFILE,S,W"
110 PRINT#1,"JINGLE"
120 PRINT#1,"JANGLE"
130 PRINT#1
140 CLOSE 1
```

Line 130 creates the problem by writing a blank line at the end of the file. In other words, there will be more than one Return character at the end. Now for the doomed reading program.

```
100 OPEN 1,8,2,"0:BADFILE"
110 INPUT#1,A$
120 PRINT A$
130 IF ST=0 GOTO 110
140 CLOSE 1
```

The program will read "regular" files without trouble. But on our bad file, the program will read *JINGLE* and *JANGLE* and then lock up.

Why does this happen? It's a conflict of two system rules. Rule 1: The INPUT# command always reads to the next Return character. If it finds a blank line, it immediately goes back for another read. Rule 2: If the file handler is asked to deliver data beyond the end of the file, it will supply a Return character. Combine these rules, and you'll see that if the last line of a file is blank, the INPUT# statement will continue to read blank lines—and it'll do so forever!

Our first project is to write a program that will scan a file quickly and find out what's at the end—a single Return, the normal condition; no Return, unusual but not fatal; or more than one Return, possibly a crash. So our program detects the danger. Another time, we'll add to the program so that it will fix the problem.

The BASIC part of our program will ask for the name of the data file and open it as logical file number 1. Then it calls the following machine language program at address 8704, hexadecimal 2200.

First, connect the input stream to logical file 1.

```
2200 LDX #$01
     JSR $FFC6
```

Our plan is to store the last character of the file at address $2101 and the previous character in $2100. As a precaution, we'll prepare to store 0 in this last address.

```
     LDA #$00
```

As we go around our loop, the A register will contain the last character received from the file. Store this, and read another character.

```
2207 STA $2100
```

To read a character from a file, we may use a subroutine call to either $FFCF (INPUT) or $FFE4 (GET). The result is the same either way.

```
     JSR $FFE4
```

The received character is in A. We may test for end-of-file by looking at our system status variable ST. That variable is located at hex address 90. In Commodore machines prior to the VIC-20, it's located at address $96.

```
     LDY $90
```

If ST has a value of 0, the file read is proceeding normally, and we have not reached the file's end. In this instance, BEQ takes us back around the loop.

```
     BEQ $2207
```

If we didn't take the BEQ branch, we may assume that we're at the end of the file. The final character, still in the A register, is stored at $2101.

```
     STA $2101
```

The last instruction in our program jumps to $FFCC, CLRCHN, which restores the input stream to its default path (screen/keyboard).

```
     JMP $FFCC
```

It's a small program, a fast program—and it will leave the last two bytes of the file in addresses $2100 and $2101 and 8448 and 8449 respectively. BASIC should now close the file and test these bytes. Here's the program in the format of a BASIC loader.

```
CJ 100 PRINT"FILE END CHECKER
       {SPACE}- JIM BUTTERFIEL
       D"
XR 110 DATA 162,1,32,198,255,1
       69,0,141,0,33,32,228,25
       5
GS 120 DATA 164,144,240,246,14
       1,1,33,76,204,255
PC 160 DATA 72,32,204,255,162,
       2,32,201,255,174,0,33
JF 200 FOR J=8704 TO 8726
EJ 210 READ X:T=T+X
BP 220 POKE J,X
AE 230 NEXT J
XS 240 IF T<>3010 THEN STOP
XF 300 INPUT "NAME OF FILE";F$
JQ 310 OPEN 15,8,15
FJ 320 OPEN 1,8,2,F$
GB 330 INPUT#15,E,E$:IF E<>0 T
       HEN PRINT E$:STOP
QH 340 SYS 8704
SB 350 CLOSE 1
SD 360 CLOSE 15
GC 370 IF PEEK(8449)<>13 THEN
       {SPACE}PRINT"FILE DOES
       {SPACE}NOT END WITH <RE
       TURN>.": END
SE 380 IF PEEK(8448)<>13 THEN
       {SPACE}PRINT"FILE ENDS
       {SPACE}WITH A SINGLE <R
       ETURN>.": END
XS 390 PRINT"FILE ENDS WITH MU
       LTIPLE <RETURN> CHARS."
```

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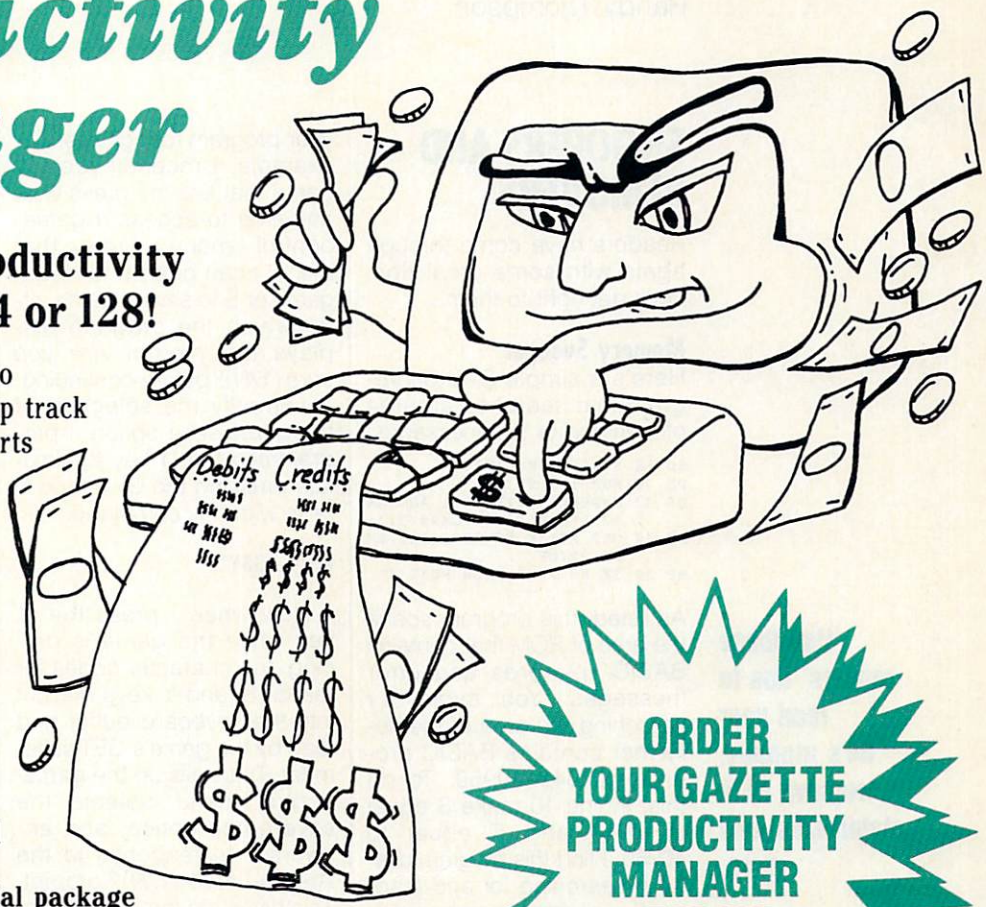

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PROGRAMMER'S PAGE

Randy Thompson

SNOOPERS AND REMOVERS

Readers have come through again with some great tips. Let's get right to them.

Memory Snooper

Here's a simple BASIC program that searches an area of memory for text messages.

```
SD 10 S=41118:E=41865
PF 20 FOR I=S TO E
HS 30 C=PEEK(I):IF C>31 AND C<
      123 THEN PRINT CHR$(C);
EX 40 GET K$:IF K$=CHR$(13) TH
      EN PRINT
MP 50 IF K$<>"<" THEN NEXT I
```

Use these readers' tips to read your 64's memory, remove REM statements, and more.

As listed, this program scans the area of ROM that contains BASIC keywords and error messages. You might try searching the area of memory that contains BASIC programs: 2049–40959. To do this, in line 10 make S equal to 2049 and E equal to 40959. I find this program useful in searching for and reading E-mail that I have neglected to read completely before logging off QuantumLink.

You can make the text easier to read as it prints to the screen by pressing Return. This forces the program to print a carriage return. To stop the program before it finishes searching memory, press the back arrow key.

BRIAN KISSINGER
EVANSVILLE, IN

Function Keys 128

When programming in BASIC on the 128, the GET statement doesn't return the Commodore 64 character codes for function keys (133–140) unless you execute a POKE 828,183 first, thus disabling the keys' preprogrammed definitions. (POKE 828,173 returns the 128's function keys to normal.)

Rather than disabling the 128's function key definitions, you can use them to simulate a string of keypresses that your program recognizes. For example, I recently wrote a game that lets me press G at any time to access a game-control menu. From that menu, I can press L to load a game or S to save a game, after which the program displays the prompt *Are you sure (Y/N)?* before continuing. To simplify the selection of the game-save option, I programmed the f1 key to simulate pressing the G, S, and Y keys with this command:

```
KEY1,"GSY"
```

Now when I press the f1 key while the game is running, the character codes for the G, S, and Y keys are put into the keyboard buffer and read by the game's GET statement. This calls up the game-control menu, selects the save-game option, and answers Y in response to the *Are you sure (Y/N)?* prompt. This gives me three keypresses in one!

RICHARD R. HARVEL
FORT WORTH, TX

REMover

The following program removes all REM statements from 64 BASIC programs. To use this handy utility, load and run the program shown below. Then load the BASIC program containing the unwanted REM statements, and type *SYS 49152*.

```
SH 100 REMOVER
AJ 110 FOR I=49152 TO 49392:RE
       AD D:POKE I,D:C=C+D:NEX
       T I
JF 120 IF C<>33534 THEN PRINT
       {SPACE}"ERROR IN DATA S
       TATEMENTS"
CA 130 DATA 24,165,43,105,2,13
       3,253,165,44,105,0,133
JP 140 DATA 254,32,204,192,176
       ,60,24,165,253,105,2
MK 150 DATA 133,253,165,254,10
       5,0,133,254,160,0,140,2
       40,192,177,253
XK 160 DATA 240,8,201,143,240,
       37,200,76,33,192
FX 170 DATA 152,24,105,3,32,21
       9,192,32,204,192,176,18
GS 180 DATA 24,165,253,105,2,1
       33,253,165,254,105,0,13
       3
GD 190 DATA 254,160,0,76,33,19
       2,76,51,165,192,0,240
PP 200 DATA 1,136,152,32,219,1
       92,160,0,177,253,240,4
KK 210 DATA 200,76,92,192,152,
       141,239,192,173,240,192
       ,201
BK 220 DATA 0,208,22,24,173,23
       9,192,105,5,141,239,192
GB 230 DATA 56,165,253,233,5,1
       33,253,165,254,233,0
PX 240 DATA 133,254,24,165,253
       ,72,109,239,192,133,251
       ,165,254
GH 250 DATA 72,105,0,133,252,1
       60,0,177,251,145,253,32
PA 260 DATA 191,192,32,204,192
       ,176,3,76,151,192,104
AH 270 DATA 133,254,104,133,25
       3,56,165,45,237,239,192
       ,133,45,165,46
GR 280 DATA 233,0,133,46,160,0
       ,76,48,192,230
BB 290 DATA 251,208,2,230,252,
       230,253,208,2,230,254,9
       6
MQ 300 DATA 24,165,254,197,46,
       208,7,165,253,197,45
DC 310 DATA 208,1,56,96,141,23
       9,192,24,165,253,109,23
       9,192
GF 320 DATA 133,253,165,254,10
       5,0,133,254,096,0,0,0,0
```

Besides making a program smaller, removing REM statements can make a program run faster because the computer no longer has to skip over those descriptive but nonfunctional lines of code.

At first glance, line 100 may appear to be missing a REM statement before the program's name. Of course, when the program runs, BASIC will interpret the first three letters of the word as REM and pass on to the next line. This means you can test the program on itself.

Be careful not to run this utility on programs that have GOTO or GOSUB commands that jump to lines that begin with a remark. Those lines will also be deleted.

VINCE TAGLE
GRANADA HILLS, CA

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BEGINNER BASIC

Larry Cotton

USER PORT CLOCK (PART 2)

Here's how to activate your 64's user port at any time of day.

The 64 is blessed with four ports to connect with the outside world. Two of them are quite well known: joystick ports 1 and 2, which are located on the right side of the computer next to the power switch. As we learned some time back, those ports can be used for output as well as for normal joystick input.

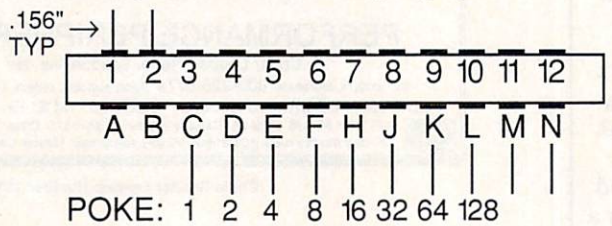
The other two ports may not be quite as familiar to you. Facing the computer as you normally do, the port at the extreme right rear is the cartridge port. It normally accepts game and other types of cartridges, such as the common fastload cartridge. The port on the extreme left rear is the user port, to which I referred last month. When you want to make a connection to the outside world, that's the one to think of first. This port is easy to program in BASIC. I'll show you how to turn on and off each of its pins.

In fact, the programming is easier than wiring the hardware. As I warned you last month, I won't go into a lot of detail about user-port connections. If you decide on a project, you'll need a card-edge connector with .156-inch terminal-to-terminal spacings, available at Radio Shack or Mouser Electronics. You should also have a basic knowledge of digital electronics or know someone who does.

Please remember two things: that all ports are connected to the innards of your computer and that their outputs are rather feeble and sensitive to abuse. Avoid static electric charges like the plague, and always connect ports to low-voltage circuits by means of properly matched opto-isolators, transistors, and/or relays.

The figure below shows the user port as you face the rear of the computer. The pins which we can control easily are those on the bottom row lettered C through L (skipping G and I).

USER PORTS LOOKING AT REAR OF COMPUTER (GROUNDS AT PINS 1, 12, A, N)



Here's a very simple program that looks at the keyboard to see if C, D, E, or F is pressed.

```
10 P=56577: REM USER PORT
20 POKEP+2,255: REM ALL PINS
   OUTPUT
30 POKEP,0: REM ALL PINS OFF
40 GETA$: IFA$=""THEN40
50 IFA$="C"THEN POKEP,1
60 IFA$="D"THEN POKEP,2
70 IFA$="E"THEN POKEP,4
80 IFA$="F"THEN POKEP,8
90 GOTO40
```

Line 20 sets up the user port so that all subsequent POKEs are interpreted as outputs, line 30 turns all pins off, and line 40 waits for a key to be pressed.

When you run this, pressing C, for instance, turns pin C on. (In the jargon of electronics, the voltage on pin C goes high or jumps from 0 to +5 volts DC.) This voltage is enough to power a Light Emitting Diode (LED) or trigger a sensitive transistor or relay, which must be connected between the controlled pin and a ground (pin 1, 12, A, or N).

Now let's finish last month's program. Add lines 10–30 from the above program, change line 420, and add lines 430–470.

```
420 PRINT"[CLR][DOWN]USER
    PORT PIN C ON.
430 PRINT"[DOWN]PRESS ANY
    KEY TO TURN OFF.
440 POKEP,1
450 GETA$:IFA$=""THEN450
460 POKEP,0
470 PRINT"[DOWN]USER PORT
    PIN C OFF.
```

Now when you run the program, enter the times as you did last month. When the "alarm" goes off, pin C in the user port is turned on. Poking other values to P in line 440 activates other pins as follows.

Poking	Turns On
1	C
2	D
4	E
8	F
16	H
32	J
64	K
128	L

Combinations of pins can be activated by adding the values in the left column corresponding to the pins you want to turn on. For instance, to turn on pins C and H, poke 17 (1 + 16) to P (56577). To turn on pins J, K, and L, poke 224.

I've just about run out of space for this month, but I'll mention some of the program's highlights.

The subroutine in lines 290–410 gathers user input in hours, minutes, and seconds to set the clock and the alarm. Line 90 pokes values based on this user-supplied information to three clock registers 56329–56331. Line 130 forms a variable B which is calculated from these values. B is the number of seconds from midnight to when the clock's alarm is set—when the user port is to be activated. For example, B would have a value of 25,200 for 7:00 a.m. Line 160 starts the clock by poking a 0 to the tenths-of-seconds register 56328.

The clock is updated and printed to the screen in a loop in lines 170–280. The same registers we poked are continually peeked in line 170, from which printable values are derived in lines 180–220. A in line 230 is the actual time of day in seconds from midnight. Line 240 continually compares A to B. When they're equal, the alarm goes off; control zips to line 420 which turns on pin C in the user port. Here's the entire listing in case you missed last month's column. Remember, always set the user port to activate within 24 hours of starting the clock.

```
BM 10  P=56577:REM USER P
       ORT
BF 20  POKEP+2,255:REM AL
       L PINS OUTPUT
CC 30  POKEP,0:REM ALL PI
       NS LOW
DS 40  PRINTCHR$(147):POK
       E53281,14:POKE646,
       6
KR 50  PRINT"SET CLOCK AT
       :{DOWN}"
PK 60  R=8:GOSUB290:K=432
       00:REM 43200 SECON
       DS IN 12 HOURS
GX 70  IFI$="PM"THENX=K
ER 80  FORI=1TO3:H=INT(T(
       I)/10):L=T(I)-10*H
       :T(I)=16*H+L:NEXT
MC 90  C=56331:POKEC,T(1)
       :POKEC-1,T(2):POKE
       C-2,T(3)
FA 100 PRINT"{DOWN}ACTIV
       ATE USER PORT AT:
       {DOWN}"
FD 110 R=18:GOSUB290
HS 120 IFI$="PM"THENY=K
JB 130 B=Y+T(1)*3600+T(2
       )*60+T(3)
SK 140 PRINT"{DOWN}PRESS
        ANY KEY TO START
        CLOCK.{DOWN}
RE 150 GETA$:IFA$=""THEN
       150
SB 160 POKEC-3,0
PH 170 H=PEEK(C):M=PEEK(
       C-1):S=PEEK(C-2):
       T=PEEK(C-3)
XG 180 C1$=CHR$((16ANDH)
       /16+48)+CHR$((15A
       NDH)+48)
XM 190 H=VAL(C1$)*3600
GJ 200 IFC1$="00"THENC1$
       ="12"
HD 210 C2$=CHR$((240ANDM
       )/16+48)+CHR$((15
       ANDM)+48):M=VAL(C
       2$)*60
FD 220 C3$=CHR$((240ANDS
       )/16+48)+CHR$((15
       ANDS)+48):S=VAL(C
       3$)
HA 230 A=X+H+M+S:IFA=2*K
       THENPOKEC,0:POKEC
       -3,0:X=0
SG 240 IFA=BTHEN420
BJ 250 IFA<KTHENJ$="AM":
       GOTO270
XX 260 J$="PM"
MD 270 PRINT"{WHT}TIME I
       S "C1$+":"+C2$+":
       "+C3$+":"T;J$+"
       {UP}"
HG 280 GOTO170
DE 290 H$="":INPUT"HOURS
       ";H$:IFH$<"0"ORH$
       >"9"THENPRINT"
       {2 UP}":GOTO290
KE 300 T(1)=VAL(H$):IFT(
       1)<0ORT(1)>12THEN
       PRINT"{2 UP}":GOT
       O290
RA 310 IFT(1)=12THENT(1)
       =0
HP 320 M$="":INPUT"
       {DOWN}MINUTES";M$
       :IFM$<"0"ORM$>"9"
       THENPRINT"{3 UP}"
       :GOTO320
PG 330 T(2)=VAL(M$):IFT(
       2)<0ORT(2)>59THEN
       PRINT"{3 UP}":GOT
       O320
CE 340 S$="":INPUT"
       {DOWN}SECONDS";S$
       :IFS$<"0"ORS$>"9"
       THENPRINT"{3 UP}"
       :GOTO340
GG 350 T(3)=VAL(S$):IFT(
       3)<0ORT(3)>59THEN
       PRINT"{3 UP}":GOT
       O340
DC 360 PRINT"{DOWN}AM OR
        PM (PRESS A OR P
       )"
HD 370 GETI$:IFI$<>"A"TH
       ENIFI$<>"P"THEN37
       0
EE 380 IFI$="A"THENI$="A
       M":GOTO400
FH 390 I$="PM"
JD 400 POKE214,R:PRINT:P
       OKE211,24:PRINTI$
EX 410 RETURN
AQ 420 PRINT"{CLR}{DOWN}
       USER PORT PIN C O
       N."
XK 430 PRINT"{DOWN}PRESS
        ANY KEY TO TURN
       {SPACE}OFF.
GS 440 POKEP,1:REM TURNS
        ON PIN C
MD 450 GETA$:IFA$=""THEN
       450
HF 460 POKEP,0
HB 470 PRINT"{DOWN}USER
       {SPACE}PORT PIN C
        OFF."
```


ATTENTION WRITERS, PROGRAMMERS

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D'IVERSIONS

Fred D'Ignazio

TODDLER'S CHOICE

For a recent Public Broadcasting Service show, "Learning Matters," we videotaped my segment, Technology Corner, in my family's study. We reviewed the newest multimedia CD-ROM titles for toddlers, including Just Grandma and Me (Brøderbund); Mother Goose (Sierra On-Line); Silly, Noisy House (Voyager); and Millie's Math House (Edmark). Our reviewers were my three-year-old daughter Laura and her one-year-old buddy Alex.

A 64 can be an ideal first computer for toddlers—as well as a great teaching tool.

At the end of the segment, the show's producer, John Merrow, noted that the equipment and software we used was "expensive and possibly out of reach" for many families. He wanted to know if there was another toddler we could interview who had a more down-to-earth computer setup.

I thought of Tommy Kurek, Laura's next-door neighbor, and we called Tommy's parents and scheduled a visit.

Tommy's computer, it turned out, was a perfect toddler configuration: a second-hand Commodore 64. Most of the software titles and extra equipment were purchased at yard sales or flea markets. The price of Tommy's entire setup was well under $400—the price of a single CD-ROM drive.

The computer station was on a small table in the corner of the family living room surrounded by books, Tommy's toys, and two or three lounging cats. When the family did their computing, Tommy sat in his chair, and his mom and dad sat on each side of him on the floor. This made them all about the same size.

To begin the interview, we asked Tommy's daddy, Keith, if Tommy had suffered from not having the latest multimedia computer equipment.

"I don't think so," said Keith. "Tommy just turned three. While he was still two, using the Commodore 64, he learned how to write his own name, his friend Laura's name, my name, his mommy's name (Leanne), and the names of all four family cats.

"Also, while he was two, Tommy used the computer to learn how to count to 39, count objects on the computer screen and press the correct number on the keyboard, and recognize and find every number from 0 to 9 and every letter in the alphabet."

"Do you have any advice for fellow parents who have toddlers?" we asked Keith.

"Tell them to find or buy a Commodore 64," said Keith. "If the parents buy an expensive computer, they'll be so worried about its safety they'll never be relaxed around it with their two-year-old, and they'll be afraid to turn their child loose on the computer. The great thing about this computer is it's 100 percent Tommy's computer. He can do anything he wants, and the Commodore can take it.

"The other good thing about the 64," Keith continued, "is that lots of Tommy's educational programs come on cartridges. When we go visit Grandma on weekends, we just throw the computer into the car along with a couple of Tommy's favorite cartridges. At Grandma's we plug into her television set, and Tommy is busy for hours working on his number, shape, and letter games. When it comes time to go home, it takes about ten seconds to unplug the computer and toss it back into the car."

We asked Tommy to pick out his favorite 64 programs to recommend to other toddlers who are just starting to computey. Here's his list:

- KinderComp (Spinnaker Software). A set of shape-, number-, and letter-recognition programs perfectly suited for your toddler computer whiz.
- Astro Grover (CTW-Sesame Street). Same as above, featuring the lovable Sesame Street muppet Grover.
- Ernie's Magic Shapes (CTW-Sesame Street). Shape-recognition program featuring Ernie.
- Big Bird's Special Delivery (CTW-Sesame Street). More early learning programs featuring Big Bird. All three programs (Grover, Ernie, and Big Bird) can be found in a single package entitled The Sesame Street Learning Library.
- Kids on Keys (Spinnaker Software). Helps with keyboard recognition.
- Alphabet Zoo (Spinnaker Software). Letter recognition.
- Learning with Leeper (Sierra On-Line). Fun, educational games hosted by cute little onscreen characters such as Leeper.
- Design-a-Saurus (Britannica Software). Dinosaur recognition and naming program. (Tommy is a dinosaur nut. He carries a Tyrannosaurus Rex doll to bed with him instead of a blanket.)
- Dinosaurs Are Forever (Polarware). More reptiles for young dinosaur enthusiasts.
- Kermit's Electronic Story Maker (Simon & Schuster). You and your children can cook up your own online picture books.

The cost of these programs? "At worst, under a hundred dollars," Keith says. "The important thing is to watch for yard sales where you can pick up children's software for just a couple of dollars. Also, sign onto local bulletin boards where you can pick up lots of freeware educational programs. Join a 64 user group, and you're sure to run into other young parents who are eager to share with you and your kids." ❐

ULTIMATE ML MONITOR

By Ted Green and Ed Balchick

Examining and debugging troublesome machine language (ML) routines or trying to see how well machine code actually works is usually a struggle. ML programs run so quickly that it's difficult to determine exactly what happens and when it happens without altering the program. A standard monitor's breakpoint returns are not much help because the display is corrupted and the program halts.

Now, with the Ultimate ML Monitor, you can execute any piece of ML code in slow motion or single step through it one command at a time! A special user interface lets you interact directly with the ML program. You can view and control the actual operation of the program in text or hires mode as it runs; examine and modify the program, data, or register values; and allow the Kernal serial bus to access routines while in the single-step mode. These and many other features, such as full implementation of 6502 quasi-opcodes, make the Ultimate ML Monitor a powerful programming utility that you'll wonder how you did without.

Getting Started

Ultimate ML Monitor consists of three programs: two small programs that make up the loader system and the main program. These three files must all be saved to the same disk, but the program that you wish to monitor can be on any disk, even another drive.

The setup portion of the loader system is written in BASIC. To avoid typing errors, use The Automatic Proofreader to enter the program. See "Typing Aids" elsewhere in this section. When you finish typing this portion in, save it to disk with the filename ULTIMON.B.

Next, the smart portion of the loader system is written in machine language, and you will need MLX, our machine language entry program. Again, see "Typing Aids." When MLX prompts, respond with the following values.

Starting address: CC13
Ending address: CFFE

After you type in the loader program, be sure to save a copy to disk with the filename ULTIMON.L.

The monitor portion of the program is written entirely in machine language for speed and compactness. You must enter this program with MLX. When MLX prompts you, respond with the following values.

Starting address: 8000
Ending address: 8EBF

Be sure to save a copy to disk with the filename ULTIMON.O.

Loading the Program

Ultimate is very easy to use. Load and run Ultimon.B as you would any BASIC program. Before you run it, however, you should have the program available that contains the ML code that you wish to examine. This program should be copied onto the same disk as the Ultimate system if you are using a single drive. If you are using Ultimate with a two-drive system, have each disk in a drive before running Ultimate.

As for what kind of program to look at, the possibilities are almost limitless. You aren't limited to looking at a pure ML program, the kind you load with the ,8,1 extension and start with a SYS command that you often forget. Ultimate will examine an ML program that loads like BASIC or even a BASIC program that reads the ML from data statements and pokes them to memory and then calls them with a SYS command.

In the latter two cases, Ultimate can catch the ML portion just as BASIC tries to execute it (if you start in single step). This means that for BASIC programs in general, all of the BASIC is actually run by the interpreter. However, once you are in the ML routine, you cannot go back to the BASIC program.

When you have selected the program that you wish to examine, load the drive(s) and run Ultimon.B. The screen will clear and display the following prompt.

ADDRESS TO LOAD MONITOR:

The address must be entered as a decimal value. The Ultimate program can be put at any unused area from 2048 ($0800) up to and including 36864 ($9000). It can also be put at 49152 ($C000). If you try to place it above 49152, you will get an error message. Placing the monitor in the RAM under ROM (BASIC or Kernal) is possible, but not recommended, except for advanced users. The most important factor in choosing the load address is determining where there will be 4K of memory that won't be used by the program to be monitored.

Don't forget about BASIC variables. If they are a problem, protect 4K for Ultimate first. Ultimate will protect itself from any memory access commands while in any mode except full speed. This protective feature will cause the monitored program not to execute those commands, possibly causing an infinite loop in the monitored program. If this happens, it's best to start over and choose a new load address.

You'll then be prompted for a program to monitor and a drive number from which to load. If you enter the same drive as the current drive, you must copy your program to the disk with the Ultimate system on it because there is no time to switch disks.

You'll then be asked whether you want to run the program in single-step mode or at full speed. Enter *S* for single step or *F* for full speed. You'll usually want to start in single-step mode for most small programs or anytime you want complete control over the whole monitored program. Full-speed mode is a good choice when you want to monitor a large program, and the piece of code that you're interested in is executed sometime after the program begins.

If you select full speed, hitting the Restore key at anytime will break into the program in the single-step mode (unless the program changes the NMI vector at $0318 while in full speed). When the single-step mode is activated, the status line will be displayed at the bottom of the screen.

Using the Program

Once you enter the single-step mode of Ultimate, the main program interface is the interactive status line. Note that all numbers on the status line are shown in hex. The main features of the status line are the following: PC (which shows the contents of the emulated program counter of the program you are examining) and A, X, Y, and SR (which are the current contents of the emulated accumulator and the X,

Y, and status [flag] registers).

To the left of PC is the space for the full-speed Kernal routine indicator, an asterisk (*). More about that later.

The most important feature of the status line is the command display field. This contains the opcode mnemonic of the current instruction and the operand field. The operand field can be toggled between two different types of displays for some commands. The secondary mode is like a standard disassembler listing of the command.

The main display mode is what gives Ultimate its powerful debugging features. It has the ability to convert the addressing mode into the actual memory location used by the CPU and to display it on the status line. For example, if locations 0E = 75, 0F = 10, and Y = AF, then the command above would display as LDA $1124. You can toggle between these two modes at anytime with the asterisk key, even view the two modes of the same command without stepping. There are some commands that will show an address (branches, RTS, JSR, and so on) that look identical. The command field also indicates the address of the destination if a branch is taken. An RTS will display the actual address of the command after the JSR, not the address 1 that it pulls off the stack. There are some other features used in the status display, but these will be discussed in the appropriate key description below.

Key Functions

A single keystroke activates many of Ultimate's key features.

F7

Pressing f7 executes the next program instruction and displays the results on the status line.

S

Press S to enter slow motion program emulation from single-step mode. The approximate execution speed of this mode varies greatly, but generally takes about 150 times longer than real execution speed. If there are a lot of Kernal routines, the Kernal mode can speed up the program considerably.

←

The back arrow exits the monitor and runs the monitored program in full speed (real execution). Ultimate may be corrupted if set at a bad address. This key is good for running through a large piece of code to get to a particular point. It also sets up the Restore key to go to single-step mode.

Restore

Restore triggers Ultimate from full-speed mode, breaks into the program, and enters single-step mode at the current command.

*

The asterisk toggles the operand field display between disassembly mode and address-calculation mode.

f1

This function key toggles the status line on and off without running the program. It's used to view the current video display area under the status line. Single step (f7) and slow motion (S) are the only valid keys while the status line is off.

H

Hunt allows you to enter an address that is the actual computed address operand of a command. The program runs in slow motion until it finds a command that uses that address. This is useful for seeing when a particular memory location is accessed in a program. If the hunt is successful and the status line displays the command line and PC, you can toggle the display mode (*) or look at the source code listing. Hunt can also be exited at anytime with the @ (At) key.

R

The R key will let the program run until an address is reached. Enter the PC of any command in the code and then the program will run in slow motion until the command is ready to be executed. This means that when the single-step mode display comes on, the command before the one you selected will be on the display line. That is because when a command is shown, it has already been executed and the new PC has been calculated. This is useful to get the program to the beginning of a specific subroutine or section of code that you are interested in without having to try to stop it by hand at the right spot. This mode can be canceled at anytime by pressing the @ (At) key.

J

Use the J key to run through a subroutine in slow motion until the corresponding RTS is encountered. This means that all nested subroutines will be executed and normally the program will display the RTS command when it returns to single-step mode. Since this command triggers off the emulated stack level, the program could also drop back into single-step mode if two values are pulled from the stack or the stack pointer is incremented by 2 before an RTS is encountered. This is useful in allowing you to see if the routine pulls its return address off the stack so it can jump somewhere else. It's safe to enter J-mode anytime after a JSR. If it's used outside of a subroutine, it may never drop back into single-step mode on its own, but you can exit at anytime with the @ (At) key.

P

P sets the emulated PC to a new address; the beginning of a program; or the end of a loop, subroutine, or wherever. The new address is entered in the PC space on the status line. After the address has been entered, the value will reverse to show that you have to make a decision. You must either press Return or f3. Return resets the emulated stack pointer to the top of the stack, $FF. This is useful when restarting the monitored program so that stack doesn't wrap around. Pressing f3 will not change the current stack pointer. This is useful for going to the beginning of a loop or jumping over some code where you may need the values that are on the program's stack. Nothing changes but the location of where the monitor reads the next command.

D

Dump has the same usage as Hunt except that all occurrences of the desired address usage (PC) are sent to the printer. This will not stop until the @ (At) key is pressed to cancel the mode.

K

This key toggles Kernal mode, the desired execution mode of calls to Kernal

subroutines listed in the Kernal jump table ($FF81–$FFF3). The default mode is step-by-step emulation (in single-step or slow mode). The special mode is full-speed execution, which is designated by an asterisk to the left of PC on the status line.

This mode is useful for speeding up programs with heavy Kernal usage where you are only concerned with the routine's net effect on the program. It also allows serial bus I/O routines such as disk access even in single-step mode. Most Kernal routines that use the serial bus cannot be successfully single stepped. Note that if the Kernal LOAD is used, the monitor program could be corrupted because the self-protection feature is temporarily disabled.

If the Kernal mode is off, single-step mode will still let you choose how to execute each Kernal call. When you get to a Kernal call, the address of the routine will reverse. Return will execute the routine in full speed, and f3 will take it out of reverse mode and allow you to continue to single step through the routine.

If you press Return, the routine will execute, and the next command shown will be the RTS of the routine. Also, the PC will show the address of the routine itself and will be reversed to show that you just executed that Kernal routine. The RTS shows where the program is returning to. If Kernal mode is on, then all Kernal routines will be executed in full speed with results as mentioned above.

F

Fill lets you change the contents of any memory location. Note that the monitor will not protect itself, so use caution when altering any monitor parameters given in the article.

M

Memory will let you examine the contents of a memory location. For areas that have layers of memory such as $D000 (character ROM and I/O device RAM), the memory configuration used by the monitored program determines where the value comes from. To view a different area, alter the offset value, START + $0055, with the Fill command. START is equal to the address you loaded the monitor to at the beginning of the session. If you do this, you must change it back before you continue, or the monitored program may crash.

A, X, or Y

Enter a new value into a CPU register. After a value is entered, it will reverse to show that you have to make a decision. Return will modify the emulated status register like an LDA command, while f3 will leave the flags unchanged. These features may be useful for altering loop indexes or putting a keycode into A to be checked when letting the program go to the routine that handles the key.

W

W redisplays the status line in the current screen configuration. This is useful in single-step mode when stepping through code that alters VIC parameters and the screen changes so you can't see the status line anymore. Pressing W will recover it without stepping.

C

C cycles the color of the status line text for text mode and hi-res mode status line displays independently. All 16 colors are available. A separate color can be locked in for each mode and will stay the same even if you toggle between monitor and full-speed modes. You won't have to change it after switching modes.

In hi-res mode, the foreground and background colors are changed. Since the background color changes only after all 16 foreground colors have changed, it may take a while to get the desired color combination. If you know the color codes that you want for the foreground and background, you can put the proper value into START + $052D. (See F key above.) The value should be in the following format: High nybble equals background; low nybble equals foreground. See any 64 reference book for more details. To actually implement the color after changing the memory value, hit f1 twice.

V

V toggles multicolor mode. This key will have effects in both text and hi-res modes. You may find it useful to turn off multicolor mode to read the status line clearly and then turn it back on.

G

G toggles hi-res display between text mode and hi-res mode. This is for seeing the status line should the display mode change while single stepping (like W key). Note that the proper mode will be selected automatically when changing between single-step, slow, and full-speed modes.

Del

The Delete key has two functions. It reprints the current status line with the command after using M or F keys, and cancels data-entry modes of any keys requiring hex input, such as H or P.

@

The @ (At) key cancels any slow-motion mode (from S, J, R, H, or D) back to single-step mode.

Operational Notes

Not only are the regular 56 commands of the 6502 interpreted, but also the 14 quasi-opcodes as defined by Raeto Collin West in "Programming the 64" by COMPUTE books. Most of these opcodes have reproducible results, although many don't seem to lend themselves to most programming tasks.

The new mnemonics that you may encounter while experimenting are ASO, RLA, LSE, RRA, AXS, LAX, DCM, INS, ALR, ARR, OAL, SAX, SKB, and SKW. While there isn't enough space to discuss quasi-ops at length, most of them essentially decode in a way that is similar to the LDA-type commands. SKB branches over (skips) one byte, and SKW skips two.

These codes are included here when most other monitors ignore them because some software may use them to hide codes.

Another debugging feature is that Ultimate stops automatically at a BRK or any invalid commands. BRK commands can be continued normally, but invalid opcodes will display three back arrows (←←←) and the hex value of the invalid opcode that has been encountered. At this point, reset the PC to a new piece of code to continue.

Ultimate executes quasi-ops like it ex-

ecutes all other commands. They are executed by the 6502 after any addresses are decoded.

The program works by emulating major features of the 6502 and 64. The real stack and CPU registers are copied to a protected area of memory within the monitor, and all memory activity is monitored in protected mode so that the monitored program behaves as if it were running in real mode. Also, window space is maintained and protected for the text screen line, color memory line, and one hi-res line so that the status line may be displayed while any program access to the real memory area is sent to the window. All of this windowing is generally transparent to the user and the monitored program.

For example, an access to the first location of the status line LDA $07C0, in default area, is shown as such, although the real load comes from the screen window maintained by the monitor. If a command tries to access the monitor's protected memory, the command will not be executed. In single-step mode the operand field will be reversed to alert you of this condition.

Advanced Uses

The Ultimon.O program is a standalone program. It contains the routine that actually performs the absolute address conversions necessary to relocate the program to the new address. This makes it very useful to load and run after another program has already been loaded.

During the first call, Ultimon.O modifies itself so that later calls to the start address enter the monitor mode. This feature may be useful when a program that you wish to monitor is so large that it would overwrite Ultimate. Usually programs using some hi-res graphics are like this. The solution would be to load the monitor over a 4K section of a bitmap that may not be needed while you are trying to figure out some portion of the program. The loading could be performed by replacing a small piece of code with a JSR to the following routine (WEDGE). Then, the wedge routine would have to be piggybacked onto another piece of the monitored program.

```
SETLFS  = $FFBA
SETNAM  = $FFBD
LOAD    = $FFD5
DEVICE  = $BA

WEDGE   LDA #1
        LDX #<NAME+1 ;lo byte
        LDY #>NAME+1 ;hi byte! JSR SET-
        NAM

NAME    LDA #69 ;decimal
        LDX DEVICE
        LDY #0 ;relocate
        JSR SETLFS

        LDA #0 ;load
        TAX
        LDY #>BEGIN! JSR LOAD
        JMP BEGIN
```

This loader will load, relocate, and kick start into single-step mode any ML program as long as Ultimon.O is saved as filename E, BEGIN = safe area (bitmap). Just find free memory for WEDGE and insert JSR WEDGE into code. Another technique is to load Ultimate ML Monitor with a standard monitor that can perform a relocatable load to any address. Then run Ultimate so that it initializes itself to the new address. The initialization routine ends with an RTS. Now Ultimate is ready to use or can be resaved from the new address with a length of 4K. To call it, just use JSR or SYS to go to the new address.

ULTIMON.B

```
HG 5 REM COPYRIGHT 1993 - COMP
     UTE PUBLICATIONS - ALL RI
     GHTS RESERVED
MP 10 IFATHENSYS52243
KD 20 D=PEEK(186):A=-1:LOAD"UL
      TIMON.L",D,1
```

ULTIMON.L

```
CC13:A9 93 20 D2 FF A9 00 8D CB
CC1B:21 D0 8D 3E CD A9 06 8D BD
CC23:20 D0 A9 0D 8D 86 02 A2 34
CC2B:02 38 A9 13 ED 3E CD A8 E6
CC33:18 20 F0 FF 38 A9 26 ED A1
CC3B:3E CD CD 3E CD 90 22 A8 A2
CC43:A2 00 BD FA CC 20 D2 FF 22
CC4B:E8 EC 3E CD 90 F4 B9 FA FF
CC53:CC 20 D2 FF C8 C0 26 90 DB
CC5B:F5 20 EF CC EE 3E CD D0 9F
CC63:C6 A2 04 A0 13 18 20 F0 BD
CC6B:FF A2 01 BD 20 CD 20 D2 F4
CC73:FF CA 10 F7 A9 00 8D 3E E7
CC7B:CD A9 01 8D 86 02 A2 06 E6
CC83:38 A9 14 ED 3E CD A8 18 97
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CCBB:C0 0E 90 F5 A2 08 38 A9 F9
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CD1B:4E 49 54 4F 52 59 42 45 71
CD23:2E 20 4A 2E 20 42 41 4C E2
CD2B:43 48 49 43 4B 20 20 54 47
CD33:2E 20 4A 2E 20 47 52 45 22
CD3B:45 4E 20 00 20 60 A5 A9 88
CD43:00 85 7A A9 02 85 7B 20 67
CD4B:79 00 20 F3 BC 4C 9B BC F1
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CD5B:49 4D 4F 4E 2E 4F 9F 41 EC
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CD8B:42 45 20 4D 4F 4E 49 54 0D
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CDAB:9F 53 49 4E 47 4C 45 20 10
CDB3:53 54 45 50 20 4F 52 20 BE
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CDC3:45 44 20 00 05 45 52 52 4B
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CE7B:A2 0F 20 C6 FF 20 CF FF BE
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CEBB:FB 20 CF FF 85 FC A9 45 12
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CEF3:B9 34 CF 99 33 03 88 D0 96
CEFB:F7 A9 09 A2 58 A0 CD 20 4C
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CF0B:00 20 BA FF A2 00 AC 19 91
CF13:03 8A 20 D5 FF 20 44 FE 40
CF1B:4C 34 03 A9 45 AE 32 CF 02
CF23:A0 45 20 BA FF AD 34 CF 03
CF2B:A2 0B A0 01 4C BD FF 00 5C
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CF6B:A5 FC C9 08 D0 7B A0 03 8F
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CF7B:B1 FB 85 15 20 60 A6 20 E4
CF83:A3 A8 4C AE A7 20 73 00 38
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CF93:A5 7B 48 A5 7A 48 E6 7A 85
CF9B:D0 02 E6 7B 20 EB B7 38 11
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CFE3:BC A5 64 85 FC A5 65 85 FE
CFEB:FB 46 02 B0 03 6C FB 00 28
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82B8:AD D1 82 48 20 20 83 08 6E
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82C8:80 8D 86 85 8D 67 83 60 0C
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8318:8D AD D1 82 8D 45 8D 60 B0
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83A8:83 BD 9F 8A 49 80 4C 21 83
83B0:87 20 B7 83 20 B7 83 20 B9
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83C0:21 87 B9 D8 8A 20 21 87 9D
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83D0:B9 44 8D BE 3E 8D 20 BE 8A
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83E0:00 BD ED 8B 8D DC 82 BD 70
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83F8:90 F7 9D AB 89 E8 D0 EF 36
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8468:0B 4A B0 32 20 81 84 AD 80
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8838:A1 87 4C 0C 88 AE 47 8D 61
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8A70:82 20 13 83 20 EC 82 99 BC
8A78:4A 8D 88 AD D1 82 99 4A 18
8A80:8D 88 AD 49 8D 09 14 99 1B
8A88:4A 8D 88 8C B2 82 AD FE F9
8A90:FF 8D D1 82 AD FF FF 8D 66
8A98:D2 82 20 C1 82 F0 C6 20 5D
8AA0:10 03 3D 20 20 20 20 20 0A
8AA8:20 20 20 20 20 20 20 20 BD
8AB0:20 20 20 01 3D 20 20 20 BC
8AB8:18 3D 20 20 20 19 3D 20 2F
8AC0:20 20 13 12 3D 20 20 48 64
8AC8:55 4E 54 49 4E 47 20 46 51
8AD0:4F 52 20 24 FF 3A 0D FF 6B
8AD8:28 20 20 2C 18 29 28 20 A6
8AE0:20 29 2C 19 20 20 20 20 49
8AE8:20 20 2C 18 20 1E 66 AB 0F
8AF0:B1 AE 66 06 B1 6C 66 06 C9
8AF8:B1 A8 66 06 B1 1B 66 AB B0
8B00:B1 AE 66 06 B1 27 66 63 23
8B08:B1 A8 66 06 B1 54 03 AB DF
8B10:B4 12 03 75 B4 72 03 75 A8
8B18:B4 12 03 75 B4 15 03 AB 71
8B20:B4 AE 03 75 B4 84 03 63 16
8B28:B4 A8 03 75 B4 7B 45 AB 45
8B30:B7 AE 45 60 B7 69 45 60 CB
8B38:C9 51 45 60 B7 21 45 AB AF
8B40:B7 AE 45 60 B7 2D 45 63 ED
8B48:B7 A8 45 60 B7 7E 00 AB 77
8B50:BA AE 00 78 BA 6F 00 78 04
8B58:CC 51 00 78 BA 24 00 AB C3
8B60:BA AE 00 78 BA 8A 00 63 6B
8B68:BA A8 00 78 BA AE 8D AE E8
8B70:BD 93 8D 90 BD 42 AB 9F F3
8B78:AB 93 8D 90 BD 09 8D AB DD
8B80:AB 93 8D 90 D8 A5 8D A2 28
8B88:AB AB 8D AB AB 5D 57 5A A8
8B90:C0 5D 57 5A C0 99 57 96 A1
8B98:CF 5D 57 5A C0 0C 57 AB 10
8BA0:C0 5D 57 5A C0 30 57 9C 12
8BA8:AB 5D 57 5A D5 39 33 AE 26
8BB0:C3 39 33 3C C3 4E 33 3F 1F
8BB8:D2 39 33 3C C3 18 33 AB 42
8BC0:C3 AE 33 3C C3 2A 33 63 20
8BC8:C3 A8 33 3C C3 36 81 AE BE
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8BD0:C6 36 81 48 C6 4B 81 63 57
8BD8:AB 36 81 48 C6 0F 81 AB 29
8BE0:C6 AE 81 48 C6 87 81 63 76
8BE8:C6 A8 81 48 C6 09 06 00 A8
8BF0:0B 88 00 0C D8 02 10 C6 26
8BF8:06 10 E6 06 11 62 06 12 84
8C00:68 00 13 52 06 13 8A 06 6C
8C08:14 18 06 14 96 10 15 86 D8
8C10:06 15 A6 06 1B 06 08 1B C2
8C18:08 08 1B 12 08 1B 2C 08 C8
8C20:1B 60 00 1C 30 02 1C 32 94
8C28:02 21 46 02 21 70 08 21 6F
8C30:72 08 2B E4 00 4B 86 02 74
8C38:4B B0 08 4B B2 08 53 60 95
8C40:04 54 E4 04 61 02 00 61 C1
8C48:30 02 61 32 02 64 E4 02 B6
8C50:73 E0 08 7C 82 00 82 02 3F
8C58:0A 82 20 0A 83 02 0A 83 77
8C60:20 0A 93 D8 02 93 E4 02 36
8C68:95 12 0E 95 26 0E 98 86 0D
8C70:00 99 46 08 99 48 08 99 D0
8C78:52 08 9D 02 00 9D 30 02 69
8C80:9D 32 02 A0 70 08 A0 72 96
8C88:08 A4 F0 0C A6 02 08 A6 A1
8C90:26 0C A6 42 08 9A EF 12 55
8C98:FF FE 14 9A C5 16 0C DF 1C
8CA0:00 93 03 00 64 CB 00 94 E5
8CA8:83 00 0E 27 00 60 71 00 1C
8CB0:20 DB 00 4B A7 00 0B 25 FD
8CB8:00 0C A5 00 78 59 00 98 4B
8CC0:71 00 60 71 02 0E 27 02 4E
8CC8:DA 87 45 88 65 89 A3 88 83
8CD0:84 88 09 89 42 89 34 8A 33
8CD8:6E 8A E9 82 DF 82 EC 82 96
8CE0:C0 07 E8 07 C0 DB E8 DB CC
8CE8:00 00 40 00 00 01 00 02 10
8CF0:00 80 DA 8F 0D DC 0E DC 53
8CF8:1A D0 1B D0 81 FF FA FF C5
8D00:4A 8E 72 8E 9A 8E 4A 8D 4C
8D08:00 00 71 86 73 86 23 38 ED
8D10:3B 08 0B 10 13 18 1B 20 7C
8D18:0A 1C 14 12 0E 15 30 31 39
8D20:32 33 34 35 36 37 38 39 33
8D28:01 02 03 04 05 06 02 02 2B
8D30:02 03 02 02 03 03 00 0C 9D
8D38:0C 0C 06 0F 06 0E 04 06 84
8D40:16 1B 20 26 A5 FE 48 A5 F2
8D48:FD 48 A5 FC 48 A5 FB 48 12
8D50:A5 23 48 A5 22 48 A5 25 0D
8D58:48 A5 24 48 A5 27 48 A5 0A
8D60:26 48 A5 02 48 A5 04 48 9E
8D68:A5 28 48 A9 00 85 FD A6 BC
8D70:03 86 FE A9 9E 85 FB A9 D5
8D78:17 8D 18 03 8D 16 03 18 98
8D80:8A 8D 19 03 8D 16 03 69 CB
8D88:0A 85 FC A9 ED 85 22 18 26
8D90:8A 69 0A 85 23 A9 EF 85 0A
8D98:24 18 8A 69 0B 85 25 A9 16
8DA0:2E 85 26 18 8A 69 0D 85 14
8DA8:27 38 A5 FB E5 FD A5 FC 49
8DB0:E5 FE 90 5F A0 00 B1 FD EC
8DB8:85 28 A8 B1 22 A8 B1 24 0C
8DC0:C9 04 90 14 C9 05 B0 04 DC
8DC8:A9 03 D0 20 C9 07 90 03 24
8DD0:A9 01 2C A9 02 AA D0 14 91
8DD8:AA A5 28 29 1C 4A 4A 85 6E
8DE0:28 A8 B1 26 C0 02 D0 04 86
8DE8:E0 02 F0 E4 85 04 C9 03 34
8DF0:D0 14 A0 02 B1 FD C9 80 47
8DF8:90 0C C9 90 B0 08 38 E9 A1
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8E00:80 18 65 03 91 FD 18 A5 9A
8E08:FD 65 04 85 FD 90 9A E6 A4
8E10:FE B0 96 A9 8B 85 FD 18 CC
8E18:A5 03 69 0E 85 FE A2 19 5D
8E20:8A 0A A8 B1 FD 85 FB C8 FB
8E28:B1 FD 18 65 03 85 FC A0 BF
8E30:00 B1 FB 38 E9 80 18 65 A3
8E38:03 91 FB CA 10 E2 A0 16 CA
8E40:B9 74 8E 99 00 80 88 10 E5
8E48:F7 68 85 28 68 85 04 68 78
8E50:85 02 68 85 26 68 85 27 1B
8E58:68 85 24 68 85 25 68 85 2D
8E60:22 68 85 23 68 85 FB 68 45
8E68:85 FC 68 85 FD 68 85 FE 88
8E70:68 85 03 60 EA EA EA 08 6A
8E78:48 8A 48 BA FE 04 01 D0 EB
8E80:03 FE 05 01 68 AA 68 EA 39
8E88:EA EA EA 2C 00 AA 02 37 DB
8E90:05 9D 06 F1 0C F3 0C 01 C0
8E98:0D 03 0D 05 0D 07 0D 0B 98
8EA0:0D 0D 0D C9 0C CB 0C CD 3B
8EA8:0C CF 0C D1 0C D3 0C D5 FB
8EB0:0C D7 0C D9 0C DB 0C DD AE
8EB8:0C DF 0C 42 0E 45 0E 00 1B
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Ed Balchick is an electrical engineer from Pittsburgh, Pennsylvania, who enjoys programming in machine language and in C. Ted Green is an unemployed painter from Cleveland, Ohio, who also enjoys programming. They both enjoy modifying other people's games so they (Ed and Ted) can win them.

RASCALS

By Bob Broderick

Just before dozing off during another boring haul of galactic space animals in your freighter, you notice a red light on the control panel. Uh-oh! That warning light means there's been a power failure in the cargo hold, and all of the animals have escaped from their electric holding cells. They are a wild and dangerous bunch, but you've got to get them corralled. Without a moment's hesitation, you suit up and set out to recapture those intergalactic rascals!

Rascals combines arcade action with strategy in a fast-paced game for the 64 that is written entirely in machine language. To enter it, you'll have to use MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts for starting and ending addresses, respond with the following.

Starting address: 0801
Ending address: 10B8

Be sure to save a copy of the program before you exit MLX. Although Rascals is written in machine language, it loads and runs like a BASIC program.

Playing the Game

As the brave freighter captain, you control the figure in the lower right-hand corner of the screen. Use keys I, J, L, and K to move it up, left, right, and down, respectively. The object is to trap all the moving creatures on the screen. To do this, you must push crates that are scattered around the screen to form a corral, surrounding a rascal. The rascal mustn't be able to move in any direction, including diagonally, or it will escape. You can move as many crates at one time as you like.

Warning! This is a serious game. You have one life and can lose it by coming in contact with a rascal. If all the rascals have been boxed in, you've won the game. After each game, type *Y* to play again or *N* to end.

A Few Questions

However, before you can begin play, you must answer the questions on the opening screen. The first question will ask you how many rascals you want loose in the hold. Enter a number from 1 to 7. Remember, the fewer rascals there are, the faster they'll go!

The next question regards the number of crates available to you. A higher number will give you more boxes, making the game easier. A setting of 1 will give you the least amount of crates.

The third question regulates the speed at which the rascals move. A setting of 1 is the fastest, while 9 is the slowest. Finally, you will need to confirm your answers to begin play.

A timer at the top of the screen counts the number of moves the rascals have made, so you can compete against your best efforts. Enjoy—and get those rascals!

RASCALS

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0801:0C 08 0A 00 9E 20 32 30 64
0809:36 34 00 00 00 00 FF A2 E3
0811:00 BD 49 08 9D EB 1F E8 FD
0819:D0 F7 EE 14 08 EE 17 08 E0
0821:AD 17 08 C9 29 D0 E8 A9 73
0829:38 A2 31 A0 39 8D 07 08 44
0831:8E 08 08 8C 09 08 E8 8E 1D
0839:0A 08 4C 00 20 00 00 00 DA
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0841:00 00 00 00 00 00 00 6F C0
0849:A9 07 8D 86 02 8D 21 D0 63
0851:A9 93 20 D2 FF A9 00 8D 80
0859:21 D0 60 00 FF A9 00 8D 6E
0861:21 D0 A9 0E 8D 20 D0 78 53
0869:A5 01 29 FB 85 01 A2 00 E6
0871:BD 00 D8 9D 00 38 BD 00 B1
0879:D9 9D 00 39 BD 00 DA 9D B2
0881:00 3A BD 00 DB 9D 00 3B 68
0889:BD E1 27 9D 00 3C BD 00 1C
0891:DD 9D 00 3D BD 00 DE 9D 15
0899:00 3E CA D0 D3 A5 01 09 DF
08A1:04 85 01 58 A2 00 BD AA F5
08A9:21 9D 54 28 E8 D0 F7 20 59
08B1:72 24 20 5E 20 20 CB 21 28
08B9:4C 52 20 78 A9 01 8D 1A 96
08C1:D0 8D 12 D0 A9 7F 8D 0D 60
08C9:DC A9 1B 8D 11 D0 A9 83 91
08D1:A2 20 8D 14 03 8E 15 03 AD
08D9:AD D9 25 8D A9 21 58 60 97
08E1:EE 19 D0 CE A9 21 D0 09 33
08E9:AD D9 25 8D A9 21 20 9A 71
08F1:20 AD 0D DC 4C 31 EA AE 98
08F9:9E 21 BD AA 21 38 E9 29 EA
0901:85 FC BD AB 21 E9 00 85 BD
0909:FD A0 00 A2 00 20 6F 21 EC
0911:A0 28 20 6F 21 A0 50 20 C4
0919:6F 21 E0 00 D0 06 EE 6A 2E
0921:21 4C 15 21 8E 6C 21 AD A1
0929:1B D4 CD 6C 21 B0 F8 AA E6
0931:BD A0 21 AA A0 29 B1 FC 23
0939:48 A9 20 91 FC 8A A8 B1 0C
0941:FC 8D 6B 21 68 91 FC 48 80
0949:AE 9E 21 8C 6C 21 A5 FC 77
0951:18 6D 6C 21 9D AA 21 A5 E9
0959:FD 69 00 9D AB 21 A5 FD C9
0961:18 69 D4 85 FD 68 91 FC 7E
0969:AD 6B 21 C9 87 D0 03 EE 62
0971:BA 21 EE 9E 21 EE 9E 21 14
0979:EE 6E 21 AD 6E 21 CD D7 09
0981:25 F0 01 60 AD 6A 21 CD AF
0989:D7 25 D0 03 EE 6D 21 A9 34
0991:00 8D 9E 21 8D 6E 21 8D E2
0999:6A 21 8D 9F 21 A2 30 EE B7
09A1:97 04 AD 97 04 C9 3A D0 3C
09A9:1D 8E 97 04 EE 96 04 AD A8
09B1:96 04 C9 3A D0 10 8E 96 67
09B9:04 EE 95 04 AD 95 04 C9 12
09C1:3A D0 03 8E 95 04 60 00 EB
09C9:00 00 00 00 20 90 21 B0 12
09D1:03 20 8A 21 C8 20 90 21 D9
09D9:B0 03 20 8A 21 C8 20 90 AE
09E1:21 B0 03 20 8A 21 60 98 45
09E9:9D A0 21 E8 60 B1 FC C9 33
09F1:87 F0 04 C9 20 D0 02 18 81
09F9:60 38 60 00 00 00 00 00 56
0A01:00 00 00 00 00 00 00 ED 03
0A09:04 0D 05 2A 05 6B 05 D3 59
0A11:05 11 06 A1 06 BE 07 00 FF
0A19:A9 00 8D BA 21 4C 72 23 A1
0A21:A9 00 8D 6D 21 4C 48 23 80
0A29:AD BA 21 D0 EB AD 6D 21 06
0A31:D0 EE 20 E4 FF F0 F1 C9 2D
0A39:49 D0 03 4C F6 21 C9 4A 65
0A41:D0 03 4C FA 23 C9 4B D0 5F
0A49:03 4C BE 23 C9 4C D0 D8 F5
0A51:4C 34 24 AD B8 21 38 E9 9C
0A59:28 85 FE AD B9 21 E9 00 C3
0A61:85 FF A9 A8 8D BA 23 A0 36
0A69:00 B1 FE 30 22 A9 87 91 25
0A71:FE A9 20 A0 28 91 FE A5 A8
0A79:FE 8D B8 21 A5 FF 8D B9 9B
0A81:21 18 69 D4 85 FF A0 00 14
0A89:A9 04 91 FE 4C CB 21 C9 33
0A91:89 D0 03 4C CB 21 C9 88 C2
0A99:F0 06 4C 72 23 4C CB 21 5B
0AA1:AD BA 23 10 03 4C C9 22 9F
0AA9:A2 01 A5 FE 18 6D BA 23 03
0AB1:85 FE A5 FF 69 00 85 FF 53
0AB9:A0 00 B1 FE C9 20 F0 0C 01
0AC1:C9 89 F0 CB C9 88 D0 D5 DF
0AC9:E8 4C 4D 22 A5 FE 85 39 9E
0AD1:A5 FF 18 69 D4 85 3A A9 2D
0AD9:0F A0 00 91 39 A5 FE 38 4D
0AE1:ED BA 23 85 FE A5 FF E9 D0
0AE9:00 85 FF A0 00 B1 FE AC DA
0AF1:BA 23 91 FE CA D0 E6 A9 5F
0AF9:20 A0 00 91 FE AD B8 21 A0
0B01:18 6D BA 23 8D B8 21 AD 47
0B09:B9 21 69 00 8D B9 21 A5 AC
0B11:FF 18 69 D4 85 FF A9 04 2B
0B19:AC BA 23 91 FE 4C CB 21 93
0B21:4C 32 22 4C CB 21 38 E9 30
0B29:80 8D BA 23 A2 02 A5 FE D3
0B31:38 ED BA 23 85 FE A5 FF DB
0B39:E9 00 85 FF A0 00 B1 FE 5C
0B41:C9 20 F0 0C C9 89 F0 D8 52
0B49:C9 88 D0 D7 E8 4C D1 22 3C
0B51:A5 FE 85 39 A5 FF 18 69 05
0B59:D4 85 3A A9 0F 91 39 AC FA
0B61:BA 23 B1 FE A0 00 91 FE EA
0B69:CA F0 11 A5 FE 18 6D BA 8B
0B71:23 85 FE A5 FF 69 00 85 DF
0B79:FF 4C 02 23 A9 20 AC BA F6
0B81:23 91 FE AD B8 21 38 ED F0
0B89:BA 23 8D B8 21 AD B9 21 57
0B91:E9 00 8D B9 21 A5 FF 18 A1
0B99:69 D4 85 FF A9 04 A0 00 E8
0BA1:91 FE 4C CB 21 20 5E 23 EF
0BA9:A2 08 BD 4B 28 9D D0 04 DC
0BB1:A9 01 9D DA D8 CA D0 F2 C4
0BB9:4C 75 23 A2 00 BD 31 28 63
0BC1:F0 0C 9D D0 04 A9 01 9D 7A
0BC9:D0 D8 E8 4C 60 23 60 20 D0
0BD1:5E 23 78 A9 31 A2 EA 8D 01
0BD9:14 03 8E 15 03 A9 78 8D 1B
0BE1:19 D0 A9 F0 8D 1A D0 A9 1D
0BE9:FF 8D 0D DC A2 00 BD 54 B7
0BF1:28 9D AA 21 CA D0 F7 58 CC
0BF9:A2 00 20 E4 FF CA D0 FA 7B
0C01:20 E4 FF F0 FB C9 4E F0 06
0C09:0B C9 59 D0 F3 EA A9 00 EF
0C11:8D 21 D0 60 4C E2 FC 00 40
0C19:4C 32 22 AD B8 21 85 FE 57
0C21:AD B9 21 85 FF A0 28 8C 5A
0C29:BA 23 B1 FE 30 EA A9 87 95
0C31:91 FE A9 20 A0 00 91 FE 30
0C39:A5 FE 18 69 28 8D B8 21 87
0C41:A5 FF 69 00 8D B9 21 A5 94
0C49:FF 18 69 D4 85 FF A0 28 77
0C51:A9 04 91 FE 4C CB 21 AD E2
0C59:B8 21 38 E9 01 85 FE AD 85
0C61:B9 21 E9 00 85 FF A0 00 49
0C69:A9 81 8D BA 23 B1 FE 30 22
0C71:5B A9 87 91 FE A9 20 C8 53
0C79:91 FE A5 FE 8D B8 21 A5 F5
0C81:FF 8D B9 21 18 69 D4 85 DB
0C89:FF 88 A9 04 91 FE 4C CB 26
0C91:21 AD B8 21 85 FE AD B9 0C
0C99:21 85 FF A0 01 8C BA 23 80
0CA1:B1 FE 30 28 A9 87 91 FE 68
0CA9:A9 20 88 91 FE A5 FE 8D E2
0CB1:B8 21 A5 FF 8D B9 21 EE A7
0CB9:B8 21 D0 03 EE B9 21 18 79
0CC1:69 D4 85 FF C8 A9 04 91 FA
0CC9:FE 4C CB 21 4C 32 22 20 8F
0CD1:61 25 20 DF 24 20 2A 25 01
0CD9:20 8D 24 A2 00 BD 41 27 B4
0CE1:F0 07 9D 00 04 E8 4C 80 C4
0CE9:24 60 AC D7 25 A2 80 8E 82
0CF1:ED 04 8E ED D8 88 F0 39 B6
0CF9:E8 8E 0D 05 8E 0D D9 88 01
0D01:F0 2F E8 8E 2A 05 8E 2A 12
0D09:D9 88 F0 25 E8 8E 6B 05 FF
0D11:8E 6B D9 88 F0 1B E8 8E 65
0D19:D3 05 8E D3 D9 88 F0 11 51
0D21:E8 8E 11 06 8E 11 DA 88 CC
0D29:F0 07 E8 8E A1 06 8E A1 67
0D31:DA A2 87 8E BE 07 A9 14 B4
0D39:8D BE DB 60 A9 FF 8D 0F C2
0D41:D4 A9 0F 8D 86 02 8D 21 63
0D49:D0 A9 93 20 D2 FF A9 0C A0
0D51:8D 21 D0 A9 81 8D 12 D4 6A
0D59:A9 00 A2 04 85 FC 86 FD 08
0D61:A2 09 AD 1B D4 CD D8 25 2B
0D69:90 13 E6 FC D0 02 E6 FD 97
0D71:A5 FC C9 E7 D0 EA A5 FD D0
0D79:C9 07 D0 E4 60 A9 88 A0 FD
0D81:00 91 FC 4C 0D 25 00 A2 04
0D89:28 A9 89 9D 9F 04 9D BF 35
0D91:07 CA D0 F7 A2 27 A0 04 72
0D99:86 FC 84 FD A2 17 A9 89 F4
0DA1:8D BF 07 A0 00 91 FC C8 66
0DA9:91 FC CA F0 10 A5 FC 18 5D
0DB1:69 28 85 FC A5 FD 69 00 03
0DB9:85 FD 4C 41 25 60 A9 93 45
0DC1:20 EB 1F A9 1E 8D 18 D0 8D
0DC9:A2 00 BD DA 25 9D 00 04 3E
0DD1:BD 41 26 9D 67 04 E8 D0 A7
0DD9:F1 A9 38 8D D3 25 20 C3 6E
0DE1:25 8D B7 04 38 E9 30 8D 80
0DE9:D7 25 A9 B6 8D DF 04 A9 77
0DF1:3A 8D D3 25 20 C3 25 8D 41
0DF9:DF 04 38 E9 0B 8D D8 25 10
0E01:A9 B5 8D 07 05 20 C3 25 D6
0E09:8D 07 05 18 E9 2F 8D D9 D0
0E11:25 A9 A0 8D 2F 05 20 E4 C9
0E19:FF F0 FB C9 4E F0 9F 60 63
0E21:20 E4 FF CA D0 FA 20 E4 CA
0E29:FF F0 FB C9 31 90 F7 C9 23
0E31:38 B0 F3 60 00 02 00 88 AA
0E39:88 88 88 88 88 88 88 88 55
0E41:88 88 88 88 88 88 88 88 5D
0E49:88 88 88 88 88 88 88 88 65
0E51:88 88 88 88 88 88 88 88 6D
0E59:88 88 88 88 88 88 88 88 75
0E61:20 80 20 20 20 20 20 52 C7
0E69:20 20 20 41 20 20 20 53 CA
0E71:20 20 20 43 20 20 20 41 E0
0E79:20 20 20 4C 20 20 20 53 8B
0E81:20 20 20 20 80 20 88 88 D9
0E89:20 20 20 20 20 20 20 20 A5
0E91:20 20 20 42 19 20 42 0F CA
0E99:02 20 42 12 0F 04 05 12 CC
0EA1:09 03 0B 20 20 20 20 20 48
0EA9:20 20 20 20 20 20 88 88 FE
0EB1:88 88 88 88 88 88 88 88 CD
0EB9:88 88 88 88 88 88 88 88 D5
0EC1:88 88 88 88 88 88 88 88 DD
0EC9:88 88 88 88 88 88 88 88 E5
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0ED1:88 88 88 88 88 88 88 20 85
0ED9:20 20 20 20 20 20 20 20 F5
0EE1:23 20 0F 06 20 52 01 13 39
0EE9:03 01 0C 13 3F 20 B7 20 84
0EF1:20 28 31 2D 37 29 20 20 DF
0EF9:20 20 20 20 20 20 20 20 16
0F01:20 20 20 20 20 20 20 43 42
0F09:12 01 14 05 20 44 05 0E 6D
0F11:13 09 14 19 3F 20 36 20 16
0F19:20 28 31 2D 39 29 20 20 19
0F21:20 20 20 20 20 20 20 20 3F
0F29:20 20 20 20 20 20 20 52 79
0F31:01 13 03 01 0C 13 20 53 45
0F39:10 05 05 04 3F 20 35 20 86
0F41:20 28 31 2D 39 29 20 20 41
0F49:20 20 20 20 20 20 20 20 67
0F51:20 20 20 20 20 20 20 41 90
0F59:02 0F 16 05 20 43 0F 12 8D
0F61:12 05 03 14 3F 20 20 20 46
0F69:20 28 59 2F 4E 29 20 20 37
0F71:20 20 20 20 20 20 20 20 8F
0F79:4B 05 19 13 3A 20 49 2D E4
0F81:55 10 20 20 20 4A 2D 52 2B
0F89:09 07 08 14 20 20 20 4B 3D
0F91:2D 44 0F 17 0E 20 20 20 FB
0F99:4C 2D 4C 05 06 14 89 89 20
0FA1:89 89 89 89 89 89 89 89 BF
0FA9:89 89 89 89 89 89 89 89 C7
0FB1:89 89 89 89 89 89 89 89 CF
0FB9:89 89 89 89 89 89 89 89 D7
0FC1:89 89 89 89 89 89 89 20 76
0FC9:70 40 6E 70 40 6E 70 40 E1
0FD1:40 72 40 6E 70 40 6E 6E 6B
0FD9:20 70 40 40 40 40 40 40 F3
0FE1:40 40 40 40 40 40 40 40 FF
0FE9:40 40 40 40 40 89 89 20 9F
0FF1:6B 72 7D 6B 40 73 6D 40 B3
0FF9:6E 5D 20 20 6B 40 73 5D 4D
1001:20 6D 40 6E 20 02 19 20 D6
1009:42 0F 02 20 42 12 0F 04 CC
1011:05 12 09 03 0B 89 89 20 3B
1019:7D 6D 40 7D 20 6D 40 40 AA
1021:7D 6D 40 71 7D 20 6D 71 33
1029:40 40 40 7D 20 54 09 0D CA
1031:05 3A 20 30 30 30 20 20 0C
1039:20 20 20 20 20 00 18 3C E4
1041:5A 66 3C 66 3C 18 18 3C C4
1049:7E 5A 7E 56 6A 7E 66 7E 0D
1051:5A 7E 66 7E 3C 18 18 3C A1
1059:76 D5 F7 66 3C 18 18 3C 3E
1061:24 3C 18 0C 18 0C 0E 4A BD
1069:4E 7E 7C 7C 24 24 3E 3A 10
1071:3E 18 18 3C 64 46 3C 24 56
1079:3C 3C 5A 3C 66 66 1F 23 04
1081:7D 7D 7D 7E 7C 00 1F 23 9C
1089:7D 7D 7D 7E 7C 00 D9 CF C6
1091:D5 A0 C4 C9 C5 C4 AE A0 39
1099:D0 CC C1 D9 A0 C1 C7 C1 88
10A1:C9 CE BF A0 D9 AF CE 00 87
10A9:D9 CF D5 A0 D7 CF CE A1 AC
10B1:A1 00 00 00 00 00 00 00 A2
```

Bob Broderick is a student at California High School and has been programming for about five years. He wrote Rascals because he wanted a small arcade-style game that he could play with relative ease and few rules. He lives in San Ramon, California.

SCUD

By William F. Snow

There has been a lot of discussion over the past few years about how little people know about world geography. For example, do you know the names of all of the countries in the Americas? Can you at least venture a guess as to how many there are in North, Central, and South America? Give up? There are 35! Despite its military-sounding name, Scud will help you learn the names and capitals of these 35 countries.

Entering the Program

Scud is an entertaining and fun way to learn something about the countries of the Americas. It's written entirely in BASIC. To help avoid typing errors, enter it with The Automatic Proofreader. See "Typing Aids" elsewhere in this section. Be sure to save a copy of the program before you try to run it.

Playing Scud isn't difficult. Plug a joystick into port 2 and then load and run Scud. The opening screen will give brief instructions for playing the game. After a short pause, you will be presented with the name of a country and asked to choose the capital from a list of three. If you choose incorrectly, you are given the correct answer in a special bulletin.

Defend the City

If you choose correctly, the city will be displayed, sirens will wail, and missiles will be launched at the city. It will then be your responsibility to use your Scud missiles to try to shoot down any enemy rockets before they reach the city. Use the joystick to aim your Scud. A total of three missiles will be launched from different positions during each attack. If you shoot down all three, you will have saved the city.

Modifications

Scud was written to help teach the names and capitals of the countries of the Americas. Since Scud is written entirely in BASIC, it should be very easy to modify the game so that the capitals of any other group of countries or states could be taught. The names of the countries, followed by their capitals, are in data statements in lines 1200–1300.

In order to modify the game, change this data to whatever group you wish to work with. Then, the following code should be changed to reflect the number of countries or states you have entered into the data statements: the dimension statements in line 40; the FOR in line 80; the number of countries in lines 150, 160, 170 (the scramble routine); and the end-of-game routine in line 200.

Scud is fun to play and will quickly teach the names and capitals of the countries of the Americas to anyone who wants to learn them.

SCUD

```
BH 10  REM COPYRIGHT 1993 - COM
       PUTE PUBLICATIONS - ALL
       {SPACE}RIGHTS RESERVED
QD 20  REM BY WM. F. SNOW
GG 30  GOSUB1020
XJ 40  CLR:DIM Q$(35),A$(35),CO
       $(35),CA$(35),Y(35):V=53
       248:SN=54272:POKESN+24,1
       5
GS 50  POKE53280,7:POKE53281,7:
       POKEV+31,0
QD 60  POKESN+4,0:PRINT"{CLR}
       {8 DOWN}"SPC(14)"{BLU}PL
       EASE WAIT":PRINT"
       {3 DOWN}{3 SPACES}OUR SP
       IES ARE";
CD 70  PRINT" CHECKING ON THE E
       NEMY"
DE 80  FOR QA=1TO35:READQ$(QA),
       A$(QA):NEXT
BE 90  FOR S=12288 TO 12351:REA
       DSP:POKES,SP:NEXT
AB 100 FORS=12352TO 12415:READ
       SP:POKES,SP:NEXT
QD 110 FORS=12416 TO 12479:REA
       D SP:POKES,SP:NEXT
BM 120 FORS=12480TO12543:READS
       P:POKES,SP:NEXT
AK 130 FORS=12544 TO 12607:REA
       D SP:POKES,SP:NEXT
JE 140 FORS=12608 TO 12671:REA
       DSP:POKES,SP:NEXT
FM 150 FOR I=1 TO 35
KC 160 X=INT(RND(.)*35)+1
FC 170 FOR CK=1 TO35:IF X=Y(CK
       )THEN160
SM 180 NEXTCK:Y(I)=X
BD 190 CO$(X)=Q$(I):CA$(X)=A$(
       I):NEXTI
GS 200 SC=0:FORI=1TO4:POKEV+I,
       0:NEXT:POKEV+21,0:P=P+1
       :IF P>35THENP=35:GOTO11
       40
AS 210 POKE53280,13:POKE53281,
       1
MD 220 JR=INT(RND(.)*10)+2
RC 230 PRINT"{CLR}{10 DOWN}
       {4 SPACES}SCUDS HAVE BE
```

```
      EN LAUNCHED AT THE
PB 240 PRINTSPC(9)"CAPITAL OF
      {SPACE}{BLK}"CO$(P)
SF 250 PRINT:PRINTSPC(12)"
      {BLU}SHOULD YOU GO TO"
BK 260 Q=INT(RND(.)*10)+1:IF Q
      =P THEN260
GJ 270 R=INT(RND(.)*10)+1:IF R
      =P OR R=Q THEN270
RF 280 POKE2040,192:POKEV+29,1
      :POKEV+40,1
MP 290 S=INT(RND(.)*3)+1:ON S
      {SPACE}GOTO300,340,380
JD 300 PRINT:PRINTSPC(9)"{BLK}
      A){BLU}"CA$(P):PRINT:PR
      INTSPC(9)"{BLK}B){BLU}"
      CA$(Q)
HD 310 PRINT:PRINTSPC(9)"{BLK}
      C){BLU}"CA$(R):PRINTSPC
      (9)"{3 DOWN}{CYN}HIT Q
      {SPACE}TO END GAME"
MX 320 GOSUB680:IF B$="A"THEN4
      20
SB 330 GOSUB820:GOTO200
GC 340 PRINT:PRINTSPC(9)"{BLK}
      A){BLU}"CA$(Q):PRINT:PR
      INTSPC(9)"{BLK}B){BLU}"
      CA$(P)
HG 350 PRINT:PRINTSPC(9)"{BLK}
      C){BLU}"CA$(R):PRINTSPC
      (9)"{3 DOWN}{CYN}HIT Q
      {SPACE}TO END GAME"
XP 360 GOSUB680:IF B$="B"THEN4
      20
SG 370 GOSUB820:GOTO200
FG 380 PRINT:PRINTSPC(9)"{BLK}
      A){BLU}"CA$(R):PRINT:PR
      INTSPC(9)"{BLK}B){BLU}"
      CA$(Q)
KG 390 PRINT:PRINTSPC(9)"{BLK}
      C){BLU}"CA$(P):PRINTSPC
      (9)"{3 DOWN}{CYN}HIT Q
      {SPACE}TO END GAME"
QE 400 GOSUB680:IF B$="C"THEN4
      20
PE 410 GOSUB820:GOTO200
AK 420 PRINT"{CLR}":POKE53280,
      13:POKE53281,13
JG 430 PRINT"{HOME}{18 DOWN}"S
      PC(8)"{BLK}B":PRINTSPC(
      7)"{PUR}NP{2 SPACES}
      {RVS} {OFF}"
ME 440 PRINT"{3 SPACES}{BLK}
      {H}{A}IOP* OP":PRINT"
      {4 SPACES}{PUR}OP{T}
      {RVS} {OFF}{N}BP{@}NP"
CR 450 PRINT"{3 SPACES}{BLK}O
      {SPACE}{N} {RVS} {OFF}
      {N}B{PUR}M M{N}":GOSUB1
      120
HX 460 POKEV+21,3:XA=75:YA=200
      :POKE2041,194:POKEV+39,
      11:POKEV+40,6
AB 470 SC=SC+1:IFSC>3 THEN GOS
      UB970:GOTO200
HC 480 PS=INT(RND(.)*3)+1:ON P
      S GOTO490,720,770
SQ 490 POKE2040,192:POKEV+39,1
      1:X=60:XX=255:FORA=1TO2
      5:XX=XX-3:POKEV,XX
XX 500 POKEV+1,X:GOSUB570
QA 510 POKEV+2,XA:POKEV+3,YA:N
      EXT
EH 520 POKEV+30,0
SX 530 POKE2040,193:FORA=1TO50
      :XX=XX-3:X=X+3:POKEV,XX
      :POKEV+1,X:GOSUB570
KE 540 IFFB=0ANDPEEK(V+30)AND2
      =2THEN GOSUB630:GOTO470
BF 550 POKEV+2,XA:POKEV+3,YA:I
      F(PEEK(V+31)AND1)=1THEN
      910
RR 560 NEXT:GOTO200
MP 570 JY=PEEK(56320)AND15:FB=
      PEEK(56320)AND16:REM RE
      AD STICK AND BUTTON
FA 580 IFJY=7THENXA=XA+JR:IF X
      A>255THEN XA=255
BB 590 IFJY=11THENXA=XA-JR:IFX
      A<1 THEN XA=1
JD 600 IFJY=13THENYA=YA+JR:IF
      {SPACE}YA>250 THEN YA=2
      50
SS 610 IFJY=14THENYA=YA-JR:IF
      {SPACE}YA<1 THEN YA=1
XR 620 RETURN
MQ 630 POKE2040,195:POKEV+39,2
      :GOSUB1100:POKEV+23,1:P
      OKEV+29,1
DM 640 FOREC=1TO8:POKEV+39,EC:
      FORDE=1TO70:NEXT:NEXT:P
      OKEV,0:POKEV+1,0
MS 650 POKEV+31,0:POKEV+23,0:R
      ETURN
GS 660 GET B$:IF B$="" THEN660
QB 670 RETURN
MM 680 GET B$:IFB$=""THEN680
KB 690 IF B$="A"ORB$="C"ORB$="
      B"THENRETURN
SA 700 IF B$="Q"THEN1140
XC 710 GOTO680
XF 720 POKE2040,196:POKEV+39,1
      1:POKEV,60:FORVS=0TO200
      STEP5:GOSUB570
EG 730 POKEV+1,VS:POKEV+30,0:P
      OKEV+2,XA
EG 740 POKEV+3,YA:IFFB=0ANDPEE
      K(V+30)AND2=2THENGOSUB6
      30:GOTO470
JR 750 IF (PEEK(V+31)AND1)=1 T
      HEN910
GS 760 NEXT:GOTO200
DG 770 POKE2040,197:POKEV+39,1
      1:POKEV,255:POKEV+1,220
DC 780 FORX=255TO0STEP-3:GOSUB
      570:POKEV,X:POKEV+30,0
HJ 790 POKEV+2,XA:POKEV+3,YA:I
      FFB=0ANDPEEK(V+30)AND2=
      2THENGOSUB630:GOTO470
BM 800 IF (PEEK(V+31)AND1)=1 T
      HEN910
BR 810 NEXT:GOTO200
AP 820 PRINT"{CLR}{4 DOWN}
      {6 RIGHT}{RED}OM {H}
      {N}{2 SPACES}{H}
      {2 SPACES}{H}{2 SPACES}
      O{Y} {Y}P{2 Y} B {N}M
      {2 SPACES}{H}"
DB 830 PRINT"{6 RIGHT}LN {H}
      {N}{2 SPACES}{H}
      {2 SPACES}{H}{2 SPACES}
      L{P}{2 SPACES}{N}
      {3 SPACES}B {N} M {H}"
KR 840 PRINT"{6 RIGHT}{H}M {H}
      {N}{2 SPACES}{H}
      {2 SPACES}{H}{2 SPACES}
      {H}{3 SPACES}{N}
      {3 SPACES}B {N}
      {2 SPACES}M{H}"
FB 850 PRINT"{6 RIGHT}LN M{P}N
      {2 SPACES}L{P} L{P} L
      {P}{2 SPACES}{N}
      {3 SPACES}B {N}
      {3 SPACES}{H}"
MA 860 PRINT "{3 DOWN}{BLK}"SP
      C(4)CA$(P):PRINT"{BLU}
      {SPACE}THE CAPITAL OF
      {BLK}":PRINTSPC(4)CO$(P
      )
CQ 870 PRINT"{BLU}{2 SPACES}HA
      S BEEN DESTROYED ";
RP 880 PRINT"BY SCUD MISSLES.
      {3 SPACES}THE PERSON WH
      O COULD HAVE SAVED THE
      {SPACE}CITYDID";
BA 890 PRINT" NOT HAVE ENOUGH
      {SPACE}INFORMATION TO G
      ET{2 SPACES}TO THE RIGH
      T CITY IN TIME."
XS 900 PRINT"{3 DOWN}{8 RIGHT}
      {6}HIT ANY KEY TO CONTI
      NUE{BLU}":GOSUB660:RETU
      RN
MP 910 POKEV+21,0:PRINT"{HOME}
      {20 DOWN}"SPC(4)"{RED}M
      {F}{5 SPACES}N N":GOSU
      B1100
AR 920 PRINTSPC(4)"N M
      {4 SPACES}N NNM N"
QP 930 PRINTSPC(3)"TM M{Q}IBBN
      {+}P{2 £}Q":POKESN+4,0
MC 940 FORDE=1 TO500:NEXT:FORC
      L=1704TO1903:POKECL,32:
      NEXT
FJ 950 PRINTSPC(3)"{UP}{BLK}
      {D}{O} {K}{£}{2 I}R{R}
      L{£}@{+}{7}":FORDE=1T
      O1000:NEXT
QF 960 POKEV,0:POKEV+1,0:POKEV
      +31,0:GOTO200
PC 970 POKEV+21,0
RH 980 PRINT"{CLR}{5 DOWN}
      {4 RIGHT}{BLK}THANK YOU
      !!":PRINT:PRINT"{BLU}YO
      UR KNOWLEDGE AND MARKSM
      ANSHIP";
AM 990 PRINT" HAVE{4 SPACES}SA
      VED{BLK}":PRINT:PRINTCA
      $(P):PRINT:PRINT"{BLU}T
      HE CAPITAL OF{BLK}"
HR 1000 PRINT:PRINT CO$(P):PRI
```

```
        NT"{BLU}"
DB 1010 PRINT"{5 DOWN}{WHT}HIT
         ANY KEY TO CONTINUE
        {BLU}":GOSUB660:SS=SS+
        1:RETURN
JA 1020 POKE53280,10:POKE53281
        ,10
PG 1030 PRINT"{CLR}{3 DOWN}
        {BLK}"SPC(12)"N{2 T}
        {2 SPACES}N{2 T}
        {2 SPACES}{G} {M}
        {2 SPACES}OM":PRINTSPC
        (12)"M{@}{3 SPACES}{G}
        {4 SPACES}{G} {M}
        {2 SPACES}{G}{M}"
QA 1040 PRINTSPC(14)"M
        {2 SPACES}{G}
        {4 SPACES}{G} {M}
        {2 SPACES}{G}{M}":PRIN
        TSPC(12)"{2 @}N
        {2 SPACES}M{2 @}
        {2 SPACES}M{@}N
        {2 SPACES}LN"
JD 1050 PRINT"{3 DOWN}{BLU}
        {3 SPACES}THE ENEMY IS
         LAUNCHING SCUD MISSIL
        ES AT NATIONAL CAPITAL
        S";
KM 1060 PRINT" IN THE AMERICAS
        .{3 SPACES}YOUR JOB IS
         TO GET TO THE CAPITAL
         UNDER ATTACK";
KG 1070 PRINT" AND DESTROY THE
         MISSILES. USE A
        {2 SPACES}JOYSTICK IN
        {SPACE}PORT TWO,";
RP 1080 PRINT" BUT BE CAREFUL,
        {3 SPACES}EQUIPMENT IN
         DIFFERENT CITIES DOES
         NOT ";
DF 1090 PRINT" ALWAYS RESPOND
        {SPACE}WITH THE SAME S
        PEED.":GOSUB900:RETURN
KG 1100 POKESN+4,129:POKESN+5,
        92:POKESN+1,1:POKESN,1
        00:FORF=1TO999:NEXT:PO
        KESN+4,0
CE 1110 RETURN
PD 1120 POKESN+14,5:POKESN+18,
        16:POKESN+3,1:POKESN+6
        ,240:POKESN+4,65
CJ 1130 POKESN,240:POKESN+1,20
        :POKEV+30,0:RETURN
QD 1140 PRINT"{CLR}{5 DOWN}
        {7 RIGHT}YOU SAVED "SS
        " OUT OF THE "P
SG 1150 PRINT:PRINT"{8 RIGHT}C
        ITIES THAT WERE ATTACK
        ED"
AA 1160 PRINT"{5 DOWN}
        {5 RIGHT}WOULD YOU LIK
        E TO TRY AGAIN (Y/N)":
        GOSUB660
FA 1170 IF B$="N"THEN END
AX 1180 IFB$="Y"THEN RUN 40
CR 1190 GOTO1140
SJ 1200 DATAANTIGUA & BARBUDA,
        ST. JOHNS,BAHAMAS,NASS
        AU,BELIZE,BELMOPAN
EK 1210 DATACANADA,OTTAWA,COST
        A RICA,SAN JOSE,CUBA,H
        AVANA,DOMINICA,ROSEAU
PB 1220 DATADOMINICAN REPUBLIC
        ,SANTO DOMINGO,EL SALV
        ADOR,SAN SALVADOR,GREN
        ADA
FS 1230 DATAST. GEORGE'S,GUATE
        MALA,GUATEMALA,HAITI,P
        ORT-AU-PRINCE,HONDURAS
XC 1240 DATATEGUCIGALPA,JAMAIC
        A,KINGSTON,MEXICO,MEXI
        CO CITY,NICARAGUA,MANA
        GUA
KG 1250 DATAPANAMA,PANAMA CITY
        ,SAINT LUCIA,CASTRIES,
        SAINT VINCENT & THE GR
        ENADINES
HJ 1260 DATAKINGSTOWN,TRINIDAD
         & TOBAGO,PORT OF SPAI
        N,UNITED STATES,WASHIN
        GTON D.C.
BP 1270 DATAARGENTINA,BUENOS A
        IRES,BOLIVIA,LA PAZ,BR
        AZIL,BRASILIA,CHILE,SA
        NTIAGO
MX 1280 DATACOLOMBIA,BOGOTA,EC
        UADOR,QUITO,GUYANA,GEO
        RGETOWN,PARAGUAY,ASUNC
        ION
KE 1290 DATAPERU,LIMA,SURINAME
        ,PARAMARIBO,URUGUAY,MO
        NTIVIDEO,VENEZUELA,CAR
        ACAS
FS 1300 DATABARBADOS,BRIDGETOW
        N,ST. KITTS & NEVIS,BA
        SSETERRE
FE 1310 DATA000,000,000,000,00
        0,000,000,000,000,000,
        000,000,000,000,000,00
        0,000
GG 1320 DATA001,000,000,003,00
        0,000,007,000,024,015,
        000,104,127,000,143,25
        5,000
EB 1330 DATA143,255,000,104,12
        7,000,024,015,000,000,
        007,000,000,003,000,00
        0,001
SG 1340 DATA000,000,000,000,00
        0,000,000,000,000,000,
        000,000,000,000,000,00
        0,000
CJ 1350 DATA000,000,000,000,00
        0,000,000,000,000,000,
        000,000,000,000,004,00
        0,000
FR 1360 DATA006,000,000,007,00
        0,000,007,128,000,007,
        192,000,007,224,000,00
        7,240
PX 1370 DATA000,007,248,000,00
        7,252,000,015,254,000,
        028,000,000,120,000,00
        0,144
RF 1380 DATA000,000,144,000,00
        0,224,000,000,000,000,
        000,000,000,000,000,00
        0,000
KK 1390 DATA000,000,000,000,00
        0,000,000,000,000,000,
        000,008,000,000,008,00
        0,000
GK 1400 DATA008,000,000,008,00
        0,000,255,128,000,008,
        000,000,008,000,000,00
        8,000
AC 1410 DATA000,008,000,000,00
        0,000,000,000,000,000,
        000,000,000,000,000,00
        0,000
MA 1420 DATA000,000,000,000,00
        0,000,032,000,008,032,
        032,004,032,000,000,03
        2,000
KF 1430 DATA001,002,000,000,13
        2,000,000,072,000,128,
        048,000,064,120,002,09
        2,252
FH 1440 DATA248,128,120,002,00
        0,048,000,000,072,000,
        000,132,000,001,002,00
        0,000
CS 1450 DATA016,000,000,016,00
        0,008,016,032,016,016,
        032,000,000,000,000,00
        0,000
BK 1460 DATA000,003,255,128,00
        1,215,000,000,214,000,
        000,124,000,000,056,00
        0,000
RR 1470 DATA040,000,000,040,00
        0,000,040,000,000,040,
        000,000,040,000,000,04
        0,000
EC 1480 DATA000,040,000,000,04
        0,000,000,040,000,000,
        056,000,000,016,000,00
        0,016
QP 1490 DATA000,000,016,000,00
        0,000,000,000,000,000,
        000,000,000,000,000,00
        0,000
BA 1500 DATA000,000,000,000,00
        0,000,000,000,000,000,
        000,000,000,000,000,00
        0,000
FK 1510 DATA003,000,000,007,00
        0,000,025,015,255,241,
        000,000,025,000,000,00
        7,000
JE 1520 DATA000,003,000,000,00
        0,000,000,000,000,000,
        000,000,000,000,000,00
        0,000
PD 1530 DATA000,000,000,000,00
        0,000,000,000,000,000
```

William Snow, a teacher for more than 27 years, is vice president of the McHenry County Commodore Computer Club in McHenry, Illinois.

CRYPTARITHM SOLVER

By David Pankhurst

When I first bought my Commodore, I used it often to solve math problems. I liked the brute-force approach the computer allowed. I'd just have a series of FOR-NEXT loops go through the possible answers until a solution would appear.

That was fine most of the time, but eventually I came across a type of math problem the computer couldn't help me with, the cryptarithm. You've no doubt seen this type of problem before.

```
  HELP
+ THE
---------
YOUNG
```

Each letter represents a different digit, 0–9. In this example, there are ten different letters, so all ten digits are used. The words *HELP* and *THE* each make numbers that, when added together, match the result in *YOUNG*. There are no restrictions, except that 0 can't be the first digit in any number.

Clearly, this isn't a simple loop problem. Let's say the *H* above was assigned 1; the *E*, 2; the *L*, 3; and so on throughout the puzzle. A sample addition could then be tried, and the result checked.

So how many times does this need to be done? To completely check the puzzle, *H* has to be tried out for each of the 9 digits (leaving out 0), *E* by each of the remaining 9, the *L* by the remaining 8, and so on. This gives approximately 9 × 9 × 8 × 7 × 6 × 5 × 4 × 3 × 2 × 1 choices, or 3,265,920 different combinations. That's a lot of loops in BASIC! If the 64 managed one calculation per second, it would take more than 35 days to complete.

To the Rescue

Enter machine language. Cryptarithm Solver brings ML brute force to these puzzles. In a matter of hours, it can solve most cryptarithms. A puzzle is first broken up into combinations, and the computer tries different substitutions for each letter.

If the result is correct (totals on both sides of the equal sign match) the puzzle is solved. The program then goes on to see if there are other solutions.

Typing It In

Cryptarithm Solver is written in BASIC, but it pokes machine language routines into memory to speed calculations. To help avoid typing errors, enter the program with The Automatic Proofreader; see "Typing Aids" elsewhere in this section. Be sure to save a copy of the program before you try to run it.

Solving Equations

When you run Cryptarithm Solver, the program will prompt you for a puzzle. To solve the above problem, enter it in the following format. (You may use lowercase letters.)

```
HELP+THE=YOUNG
```

After you press Return, the program displays a constantly changing sum in the bottom of the screen. This is a window into the processing of the program. The display is the test result produced by each combination. Usually, the result is wrong, and the next combination is then tried. However, when the result is true, the solution is displayed, along with the time it took to find. Processing then continues with the next combination.

No Key Words

You need to watch out for one thing when you're preparing input for Cryptarithm Solver. If you typed *SEND + MORE = MONEY,* the program would display an error message informing you that the words contained an embedded BASIC function or command. This is because the BASIC commands END, OR, and ON are embedded in the formula, and the computer tries to encode these as commands. To avoid this problem, insert spaces between the letters. *S E N D + M O R E = M O N E Y* would work fine.

Cryptarithm Solver works well with all sorts of mathematical operations, not just addition. One example is the following multiplication.

```
ABCDE*9=FGHIJ
```

Entering it this way fixes the 9; only letters are changed in the puzzle. By the way, there are two solutions to this puzzle. As with other computer math operations, be sure to enter an asterisk for multiplication.

Cryptarithm Solver works at ML speeds, but even that isn't fast enough for instantaneous results. Depending on the formula, the program can perform as many as 60 tests a second, so it would still take half a day to solve some puzzles.

Even Faster

One way to shorten the time is to put the result first on the line. As an example, look at *MONEY=SEND+MORE*. Cryptarithm Solver starts by assigning 1 to *M;* usually, that is the correct digit for the first place in the sum. So, you can save testing for the other eight digits, and this can mean solving most puzzles in less than an hour. The examples here ranged from 40 seconds to three hours, using these tips.

Other Languages

Cryptarithm Solver is not restricted to English. It also works in French.

```
ELEVE+LECON=DEVOIR
```

This translates loosely to become *STUDENT+LESSONS=HOMEWORK*. If we entered the words into Cryptarithm Solver as *ELEVE+LECON=DEVOIR*, the *D* (which logically is 1), would be assigned 7, and it would have to go through the whole cycle to solve. By reversing the order, *D* is assigned 1 immediately, and the solution is that much quicker. It took me 64 minutes. (I'll give you this one. The answer is 69656 + 96078 = 165734.)

When the program finds a solution, leave it running to search for other answers. When all reasonable solutions have been tried, however, you'll want to stop it. To quit, hold down the Q key. You'll be asked if you wish to continue. Press Y to continue or N to stop. To slow the action, hold down the Ctrl key. But be warned; the solutions take much longer.

I hope you enjoy Cryptarithm Solver, yet one more way the brute-force methods of computing can yield practical results and eliminate all that difficult thinking for us humans. To end, here are two more puzzles:

```
PETER+PETER+PETER+PETER=REPEAT
```

MARS+VENUS+SATURN+URANUS=NEPTUNE

CRYPTARITHM SOLVER

```
PH 100 REM COPYRIGHT 1993 - CO
       MPUTE PUBLICATIONS INTL
        LTD - ALL RIGHTS RESER
       VED
RH 105 POKE 53280,0:POKE 53281
       ,0:PRINT"{CLR}{YEL}{H}
       {N}"
XK 110 PRINT"{8 SPACES}CRYPTAR
       ITHMS{2 SPACES}SOLVER
AQ 120 PRINT"{11 SPACES}BY D.P
       ANKHURST
BX 130 PRINT
RE 140 INPUT "CODE STRING";X$
XB 150 DIM L(20):L=0:GOSUB350:
       PP=P:Y$="1023456789"
EM 160 FOR I=1 TO LEN(Y$):POKE
        C-1+I,ASC(MID$(Y$,I,1)
       ):NEXT:POKE CM,LEN(Y$)-
       1
AR 170 FOR I=1 TO LEN(X$):POKE
        511+I,ASC(MID$(X$,I,1)
       ):NEXT:POKE I,0:SYS 491
       55
SD 174 FOR J=1 TO I-1:IF PEEK(
       511+J)THEN 178
AM 176 PRINT"{RVS} EMBEDDED BA
       SIC FUNCTION OR COMMAND
        {OFF}":END
GE 178 NEXT:Y=1
JX 180 IF PEEK(511+Y)<>0 THEN
       {SPACE}Y=Y+1:GOTO 180
QQ 190 FOR K=1 TO Y-1:C=PEEK(5
       11+K):C$=CHR$(C):IF C$<
       "A" OR C$>"Z" THEN250
PX 200 IF L=0 THEN230
CR 210 Y=-1:FOR I=0 TO L-1:IF
       {SPACE}L(I)=C THEN Y=I
CG 220 NEXT:IF Y<>-1 THEN240
PA 230 L(L)=C:Y=L:L=L+1
SA 240 POKE PP,K:POKE PP+1,Y:P
       P=PP+2
HC 250 NEXT:POKE PC,PP-P:FOR I
       =0 TO L-1:POKE X+I,I:NE
       XT:POKE MX,L-1
DC 260 PRINT"{CLR}";:F=0
CS 270 PRINT"{HOME}{24 DOWN} "
       X$;:SYS 49152
MS 280 POKE 198,0:Y=PEEK(781)
EB 290 IF Y=255 AND F=0 THEN P
       RINT:PRINT"{UP}{RVS} SO
       RRY-NO MATCH {OFF}":GOT
       O340
SC 300 IF Y=255 THEN PRINT:PRI
       NT"{UP}{RVS} END OF LIS
       TS {OFF}":GOTO340
PP 310 IF Y<>1 THEN330
DK 320 F=F+1:PRINT"{2 SPACES}"
       INT(TI/6)/10"SECONDS";:
       PRINT:PRINT" "X$;:SYS 4
       9158:GOTO280
QH 330 IF Y=0 THEN PRINT"
       {2 SPACES}CONTINUE?";:W
       AIT 198,255:GET Y$:IF Y
       $="Y"THEN270
EF 340 PRINT:PRINT" FINISHED A
       T"INT(TI/6)/10 "SECONDS
       ":END
DD 350 TI$="000000":DS=1984:IF
        PEEK(44)<>18 THEN GOSU
       B 400
RC 360 DX=50432:NX=DX+1:MX=NX+
       1:X=MX+1:T=X+80:CM=T+80
       :C=CM+1:PC=C+80:P=PC+1:
       R=P+80
DR 370 RETURN
RS 400 RESTORE:FOR I=0 TO-1 ST
       EP-1:READ Y$:I=VAL(Y$)=
       -1:NEXT:X= 49152:DATA -
       1
HQ 410 READ Y:IF Y<>-2 THEN PO
       KE X,Y:X=X+1:GOTO 410
KA 420 RETURN
HP 430 DATA{2 SPACES}24,144, 3
       0, 76,{2 SPACES}9,192,
       {SPACE}56
AQ 440 DATA 176, 24,165,122, 7
       2,165,123
FC 450 DATA{2 SPACES}72,169,
       {2 SPACES}2,133,123,169
       ,{2 SPACES}0
SH 460 DATA 133,122, 32,124,16
       5,104,133
SE 470 DATA 123,104,133,122, 9
       6,173,{2 SPACES}2
FK 480 DATA 197,141,{2 SPACES}
       0,197,165,122, 72
XH 490 DATA 165,123, 72,176,
       {2 SPACES}6, 32, 63
KR 500 DATA 192, 76, 56,192, 3
       2,137,192
ER 510 DATA 104,133,123,104,13
       3,122, 96
FB 520 DATA 174,244,197,142, 6
       9,198,206
JD 530 DATA{2 SPACES}69,198,17
       4, 69,198,188,245
KM 540 DATA 197,190,{2 SPACES}
       3,197,189,164,197
JE 550 DATA 206, 69,198,174, 6
       9,198, 48
PA 560 DATA{2 SPACES}15,188,24
       5,197,153,192,
       {2 SPACES}7
HF 570 DATA 153,255,{2 SPACES}
       1,174, 69,198, 76
SC 580 DATA{2 SPACES}69,192,16
       9,255,162,{2 SPACES}1,1
       33
HB 590 DATA 122,134,123, 32,11
       5,{2 SPACES}0, 32
RS 600 DATA 158,173,165, 97,24
       0,{2 SPACES}3,162
HQ 610 DATA{3 SPACES}1, 96,165
       ,197,201, 62,208
JJ 620 DATA{3 SPACES}3,162,
       {2 SPACES}0, 96,173,141
       ,{2 SPACES}2
HD 630 DATA 201,{2 SPACES}4,20
       8, 17,169,{2 SPACES}5,1
       60
DS 640 DATA 255,162,255,202,20
       8,253,136
KC 650 DATA 208,248,170,202,13
       8,208,241
XM 660 DATA 174,{2 SPACES}0,19
       7,188,{2 SPACES}3,197,2
       00
HQ 670 DATA 140,{2 SPACES}1,19
       7,174,163,197,169
AD 680 DATA{3 SPACES}0,157, 83
       ,197,202, 16,250
JS 690 DATA 174,{2 SPACES}0,19
       7,169,255,202, 48
AX 700 DATA{3 SPACES}9,188,
       {2 SPACES}3,197,153, 83
       ,197
JM 710 DATA 202, 16,247,173,
       {2 SPACES}1,197,205
HB 720 DATA 163,197,240,
       {2 SPACES}2,176, 48,172
KQ 730 DATA{3 SPACES}1,197,185
       , 83,197,208, 12
RP 740 DATA 174,{2 SPACES}0,19
       7,173,{2 SPACES}1,197,1
       57
QQ 750 DATA{3 SPACES}3,197, 76
       ,235,192,238,{2 SPACES}
       1
RX 760 DATA 197, 76,199,192,17
       3,{2 SPACES}0,197
QF 770 DATA 205,{2 SPACES}2,19
       7,208,{2 SPACES}3, 76,
       {SPACE}63
RF 780 DATA 192,238,{2 SPACES}
       0,197,169,{2 SPACES}0,1
       41
HM 790 DATA{3 SPACES}1,197, 76
       ,171,192,206,{2 SPACES}
       0
EM 800 DATA 197, 16,155,162,25
       5, 96
XK 810 DATA -2
```

David Pankhurst, the author of the Calc II spreadsheet, lives in Montreal, Quebec, Canada.

FLASHER 64

By Henry Sopko

Focus attention to where you want it on-screen with Flasher 64. You can make words or graphic characters flash, scroll the screen while they flash, and have as many characters flashing as you want.

Flasher 64 is a short machine language program. To enter it, use MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following addresses.

Starting address: CC00
Ending address: CDF7

Be sure to save a copy of the program before you exit MLX.

With just two commands, you can make a word or a graphic character flash anywhere on the screen. As with the 128 in 80 columns, you can use the command CHR$(15) to turn on the flashing and use CHR$(143) to turn it off. All characters can be made to flash with the exception of characters 254 and 255. These two characters are used in a special way in the program. However, they can be used in the non-flashing mode.

You can also use your own custom characters as long as the screen memory stays at $0400 (default). Flasher 64 commands can be entered in both direct and program modes. Since Flasher runs in the background using the IRQ routine, your BASIC or machine language programs will continue to execute as normal without slowing down.

How It Works

A second screen was necessary to accomplish this flashing technique. The second screen, located at $C800, is filled with the byte value of $FF. Then, when the command CHR$(15) is used, the character(s) are redirected to the second screen. The command CHR$(143) or a carriage return will cancel the printing of the character(s) to the second screen and resume printing them to the main screen. While this is happening, the IRQ routine is scanning for characters on the second screen. Any character other than 255 will be printed to the main screen located at $0400 (1024).

Two phases are required to make characters flash. The first phase puts the characters on the screen, while the second fills them with blank spaces giving the effect of flashing characters.

Also, it was necessary to copy the BASIC ROM and the Kernal ROM to the underlying RAM to support the scrolling of the flashing characters. A few changes were made to the Kernal so that the two screens would be in sync with each other when the screen is scrolled.

To use Flasher 64 in your program, you must first execute the program with SYS 52224. Do this only at the beginning of your program. After you have issued this SYS command, use the commands CHR$(15) and CHR$(143) to turn on and off the flashing sequence.

For example, after you've entered the SYS command, enter the following line in immediate mode.

```
PRINTCHR$(15)"FLASH ON"CHR$(143)
" FLASH OFF"
```

It's also possible to turn off all or just part of a flashing word. Simply send the character 255 to the second screen in the area that you wish to have the flashing stopped. In order to send the character 255, you must first use the PRINTCHR$(15) and then in quotes press the Ctrl-Rvs keys simultaneously. While you're still in quote mode, hold down the Commodore logo key along with the B key. This produces a character value of 255.

A Demonstration

For a demonstration of how these commands are used, enter the demo program and study its commands. The demo is written in BASIC. To help you avoid typing errors, enter it with The Automatic Proofreader. Again, see "Typing Aids." Since the demo loads and runs Flasher 64, make sure both programs are on the same disk. After you've studied the demo, you should easily be able to use Flasher 64 in your own programs.

Some cartridges may interfere with Flasher 64. To use the program with Super SnapShot v5, use the cartridge's >Q command to quit the wedge since Flasher 64 changes the IBSOUT vectors to point to its own routine. This problem occurs only in the direct mode.

FLASHER 64

```
CC00:20 B6 CD A2 75 86 01 20 23
CC08:96 CC A9 20 78 A2 C6 A0 D3
CC10:CC 8E 14 03 8C 15 03 58 7D
CC18:A2 00 86 92 A2 26 A0 CC B8
CC20:8E 26 03 8C 27 03 8E 94 AA
CC28:CC AE 95 CC F0 06 20 7B AE
CC30:CC 20 60 CC C9 93 F0 22 B1
CC38:C9 0F D0 03 20 60 CC C9 AA
CC40:8F D0 03 20 7B CC C9 0D E7
CC48:D0 0A AE 88 02 E0 08 90 5F
CC50:03 20 7B CC AE 94 CC 4C 5D
CC58:CA F1 20 96 CC 4C 38 CC 16
CC60:8D 91 CC A5 D2 8D 92 CC D7
CC68:18 69 C4 85 D2 A9 C8 8D B5
CC70:88 02 A9 01 8D 95 CC AD 1E
CC78:91 CC 60 8D 91 CC AD 92 A0
CC80:CC 85 D2 A9 04 8D 88 02 40
CC88:A9 00 8D 95 CC AD 91 CC 0F
CC90:60 00 00 00 00 00 8E 91 09
CC98:CC 8C 92 CC A2 00 A9 FF 43
CCA0:A2 00 A0 C8 86 FB 84 FC 56
CCA8:A0 00 91 FB C8 C0 00 D0 9E
CCB0:F9 E8 E0 04 F0 05 E6 FC 44
CCB8:4C AA CC A9 FE 8D E8 CB 23
CCC0:A9 93 AE 91 CC 60 08 48 43
CCC8:8A 48 98 48 E6 02 A6 02 DF
CCD0:E0 14 F0 03 4C 21 CD A2 53
CCD8:00 86 02 A2 00 A0 C8 86 19
CCE0:FB 84 FC A2 00 A0 04 86 74
CCE8:FD 84 FE A0 00 B1 FB C9 15
CCF0:FE F0 28 C9 FF D0 08 C8 04
CCF8:C0 00 F0 18 4C ED CC A6 EC
CD00:92 E0 01 F0 0A 91 FD C8 A7
CD08:C0 00 F0 08 4C ED CC A9 FF
CD10:20 4C 05 CD E6 FC E6 FE 44
CD18:4C ED CC A5 92 49 01 85 8A
CD20:92 68 A8 68 AA 68 28 4C 4E
CD28:31 EA A9 C8 A0 28 8D 46 DF
CD30:CD 8C 45 CD A9 C8 A0 00 0D
CD38:8D 4D CD 8C 4C CD A2 00 4F
CD40:A0 00 84 FE B9 00 00 C9 44
CD48:FE F0 28 99 00 00 C8 C0 90
CD50:28 D0 F1 18 AD 45 CD 69 7B
CD58:28 B0 25 8D 45 CD 18 AD F0
CD60:4C CD 69 28 B0 27 8D 4C CE
CD68:CD A0 00 A6 FE E6 FE E0 EF
CD70:1A D0 D1 A0 00 A9 FF 99 D1
CD78:C0 CB C8 C0 28 D0 F8 60 63
CD80:8D 45 CD EE 46 CD E6 FE 13
CD88:A0 00 4C 5E CD 8D 4C CD EE
CD90:EE 4D CD E6 FE A0 00 4C E5
CD98:44 CD 78 8E 91 CC A2 04 CA
CDA0:8E 88 02 AE 91 CC 4C C8 F1
CDA8:E9 8E 91 CC 20 2A CD AE CF
CDB0:91 CC 58 4C FF E9 A0 00 01
CDB8:84 02 A2 A0 84 FB 86 FC 93
CDC0:A2 00 B1 FB 91 FB C8 D0 82
CDC8:F9 E8 E0 20 F0 05 E6 FC 20
CDD0:4C C2 CD E6 02 A5 02 C9 DF
CDD8:02 F0 07 A2 E0 86 FC 4C 24
CDE0:C0 CD A2 9A A0 CD 8E 0F B6
CDE8:E9 8C 10 E9 A2 A9 A0 CD 08
CDF0:8E 14 E9 8C 15 E9 60 00 EF
```

FLASHER DEMO

```
HG 5 REM COPYRIGHT 1993 - COMP
     UTE PUBLICATIONS - ALL RI
     GHTS RESERVED
DR 10 REM FLASHER 64 DEMO
KG 20 POKE53280,0:POKE53281,0
KQ 30 IFL=0THENL=1:LOAD"FLASHE
     R 64.ML",8,1
DE 40 SYS52224:REM TURN ON FLA
     SHER 64
EH 50 :
CD 60 PRINTCHR$(147);:REM CLEA
     RS SCREENS
AH 70 PRINT"{11 SPACES}{RVS}
     {YEL}DEMO OF FLASHER 64"
FM 80 PRINT
KC 90 PRINT"{WHT}USE THE COMMA
     ND: {RED}PRINTCHR$(15)
     {2 SPACES}TO TURN ON FLA
     SHING"
KR 100 PRINT"{RVS}{CYN}EG:
```

```
        {OFF}{2 SPACES}PRINTCHR
        $(15)"CHR$(34)"FLASHER
        {SPACE}NOW ON"CHR$(34)
PR 110  PRINTCHR$(15)"FLASHER N
        OW ON":REM COMMAND TO T
        URN ON FLASHING
KE 120  FORD=1TO6000:NEXT
QA 130  PRINT:PRINT"{WHT}USE TH
        E COMMAND: {RED}PRINTCH
        R$(143){2 SPACES}TO TUR
        N OFF FLASHING."
DH 140  PRINT"{RVS}{CYN}EG:
        {OFF}{2 SPACES}PRINTCHR
        $(15)"CHR$(34)"FLASH ON
        "CHR$(34)"CHR$(143)"CHR
        $(34);
BS 150  PRINT" FLASH OFF"CHR$(3
        4)"
EF 160  PRINTCHR$(15)"FLASH ON"
        CHR$(143)" FLASH OFF"
KS 170  FORD=1TO6000:NEXT:REM D
        ELAY LOOP
KB 180  PRINT:PRINT"{WHT}USE TH
        E COMMAND: {RED}PRINTCH
        R$(15)"CHR$(34)"{RVS}
        {7 B}"CHR$(34);
AP 190  PRINT"TO TURN OFF A FLA
        SHING WORD."
CP 200  PRINT:PRINT"{RVS}{CYN}E
        G:{OFF}{2 SPACES}PRINTC
        HR$(15)"CHR$(34)"FLASH
        {SPACE}ON"CHR$(34):PRIN
        T
RB 210  PRINTCHR$(15)"FLASH ON"
CS 220  FORD=1TO3000:NEXT:REM D
        ELAY LOOP
CM 230  PRINT:PRINT"{CYN}{RVS}E
        G:{OFF}{2 SPACES}PRINTC
        HR$(15)"CHR$(34)"{RVS}
        {7 B}"CHR$(34);
KJ 240  PRINT"TO TURN OFF A FLA
        SHING WORD."
CE 250  REM IFPEEK(146)<>1THEN1
        40:PEEK THIS LOCATION F
        OR ON OR OFF CYCLE
EK 260  REM IF PEEK(146)=1 THEN
         CHARACTERS ARE ON SCRE
        EN
EK 270  REM IF PEEK(146)=0 THEN
         CHARACTERS ARE OFF SCR
        EEN
BD 280  :
CG 290  IFPEEK(146)<>1THEN250:R
        EM ↑
BE 300  PRINT"{4 UP}";:REM MOVE
         UP TO WORD
MH 310  PRINTCHR$(15)"{RVS}
        {8 B}"
MK 320  FORD=1TO6000:NEXT:REM D
        ELAY LOOP
QX 330  PRINT:PRINT:PRINT
CG 340  PRINT"SCROLL FLASHING C
        HARACTERS OFF SCREEN"
HK 350  FORX=1TO24:FORD=1TO25:N
        EXTD:PRINT:NEXTX
GF 360  PRINT"{WHT}**********"
        CHR$(15)" {PUR}{RVS}THA
        TS ALL FOLKS!{OFF} "CHR
        $(143)"{WHT}**********
        {CYN}"
```

Henry Sopko lives in Hamilton, Ontario, Canada.

TYPE-SIM

By Donald G. Klich

This program was designed to let you use your 64 or 128 as a typewriter for filling in the blanks on preprinted forms, addressing envelopes, typing labels, and other such tasks. Preprinted forms are usually designed with vertical spacing of six lines to the inch, the same as most printers. Therefore Type-Sim allows you to set your printer on the first entry line and move down the form as necessary. With Type-Sim you can set a left or right margin to orient your entries.

Typing It In

The program is written in BASIC 2.0 and will run on either the 64 or 128. Use The Automatic Proofreader to avoid typing errors. See "Typing Aids" elsewhere in this section. Be sure to save your program before using it. To take advantage of Type-Sim's upper- and lowercase printing, be sure your printer is in the ASCII conversion mode or an equivalent mode.

Operation Menu

When you run Type-Sim, you'll see a menu that offers four data-entry operations (options) and an exit option. Option 1 allows you to set up a form in the printer so that your text will print in the desired location. You must first supply a column position, perhaps along the edge of the form, where you can test-print an *X*. When the *X* prints, the computer sends a backspace and a reverse linefeed. You should adjust the form to make sure the printing is in the desired location. You can repeat the option by pressing the space bar. When the form is correctly positioned, press Return to go back to the menu.

Option 2 allows you to select whether the following entries will be left (L) or right (R) justified. For instance, a business address would be left oriented while entries on an income tax form would be right oriented. See the next option for setting margin settings.

Option 3 is where you enter your text. Before you start, however, you must indicate the left or right margin setting from which your entries will print. The program will pack data to the right of a left margin or immediately to the left of a right margin.

After you've entered the margin setting for this particular entry and pressed Return, you'll be prompted to enter the phrase or line of text to be printed. Press Return to print. If you need linefeeds to move the print head, you'll have that option after you print each entry. To return to the menu, press the up-arrow (↑) key.

Option 4 permits you to select any additional linefeeds you may require to move down the form.

Option 5 exits the program.

TYPE-SIM

```
HH 10  REM COPYRIGHT 1993 COMPU
       TE PUBLICATIONS INTL LTD
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GS 20  REM TYPEWRITER SIMULATOR
GB 30  POKE53281,0:POKE53280,0:
       OPEN1,4:PRINT"{CLR}"SPC(
       8)"{2 DOWN}{BLU}UCCCCCCC
       CCCCCCCCCCCCCCI"
XH 40  PRINT"{BLU}{8 SPACES}B
       {1}TYPEWRITER SIMULATOR
       {BLU}B":PRINTSPC(8)"JCCC
       CCCCCCCCCCCCCCCCCK"
AK 50  PRINT"{DOWN}{CYN}
       {10 SPACES}MENU OF OPERA
       TIONS:"
AF 60  PRINT"{DOWN}{7 SPACES}
       {RVS}{YEL}1{OFF}{WHT} SE
       T UP FORM IN PRINTER"
RB 70  PRINT"{7 SPACES}{RVS}
       {YEL}2{OFF}{WHT} SET UP
       {SPACE}L-R POINTER"
DA 80  PRINT"{7 SPACES}{RVS}
       {YEL}3{OFF}{WHT} INPUT T
       YPING ROUTINE"
RR 90  PRINT"{7 SPACES}{RVS}
       {YEL}4{OFF}{WHT} EXTRA L
       INE FEEDS"
JH 100 PRINT"{7 SPACES}{RVS}
       {YEL}5{OFF}{WHT} QUIT P
       ROGRAM"
FP 110 GOSUB440:ONVAL(A$)GOTO1
       20,190,250,410,430:GOTO
       110
SA 120 PRINT"{3 DOWN}{GRN}TO A
       LIGN THE FORM, ENTER TH
       E HORIZONTAL"
BX 130 PRINT"COLUMN WHERE A RE
       PEATED {1}X{GRN} CAN BE
        PRINTED"
SC 140 PRINT"{DOWN}USE SPACE T
       O REPEAT THE {1}X{GRN}
       {SPACE}AND RETURN TO EX
```

```
        IT";
FD 150  PRINT".{2 SPACES}ENTER
        {SPACE}COLUMN NUMBER:";
        :INPUTN
PR 160  PRINT#1,SPC(N)"X":PRINT
        #1,CHR$(27);CHR$(106);C
        HR$(0):PRINT#1,CHR$(27)
        ;"@";
EH 170  GOSUB440:IFA$=CHR$(32)T
        HEN160
CX 180  IFA$=CHR$(13)THEN50
FG 190  PRINT"{2 DOWN}{GRN}ENTE
        R AN {YEL}L{GRN} IF YOU
         ARE PLANNING TO"
QK 200  PRINT"ORIENT YOUR ENTRI
        ES TO THE LEFT":PRINT
HK 210  PRINT"ENTER AN {YEL}R
        {GRN} IF YOU ARE PLANNI
        NG TO"
FG 220  PRINT"ORIENT YPUR ENTRI
        ES TO THE RIGHT":PRINT"
        L/R?{2 SPACES}";:GOSUB4
        40:M$=A$
CQ 230  PRINTM$:IFM$<>"L"ANDM$<
        >"R"THEN190
GD 240  GOTO50
PA 250  PRINTCHR$(14)
GP 260  IFM$<>"L"ANDM$<>"R"THEN
        PRINT"{2 DOWN}{1}
        {4 SPACES}L OR R LOCATO
        R ?":PRINTCHR$(142):GOT
        O190
FR 270  PRINT"{CLR}{GRN}
        {2 DOWN}{5 SPACES}ENTER
         AN UP ARROW ({YEL}↑
        {GRN}) TO QUIT"
EK 280  LO$="LEFT":IFM$="R"THEN
        LO$="RIGHT"
SA 290  A$="":PRINT"{GRN} ENTER
         THE PRINT POSITION FOR
         YOUR ";LO$;:INPUT" MAR
        GIN";A$
DS 300  IFA$=CHR$(94)THENPRINT"
        {CLR}"CHR$(142):GOTO50
QG 310  IFVAL(A$)>80ORA$=""THEN
        250
PM 320  P=VAL(A$):A$="":PRINT"
        {5 SPACES}ENTER PHRASE
        {SPACE}TO BE PRINTED
        {WHT}":INPUTA$
HQ 330  IFA$=CHR$(94)THENPRINT"
        {CLR}"CHR$(142):GOTO50
XK 340  IFM$="L"THENN=P:IFN+LEN
        (A$)>80THENPRINT"NO
        {SHIFT-SPACE}ROOM
        {SHIFT-SPACE}TO
        {SHIFT-SPACE}PRINT":GOT
        O290
DM 350  IFM$="R"THENN=P-LEN(A$)
        +1:IFN<0THENPRINT"NO
        {SHIFT-SPACE}ROOM
        {SHIFT-SPACE}TO
        {SHIFT-SPACE}PRINT":GOT
        O290
PR 360  PRINT#1,SPC(N);A$:PRINT
        #1,CHR$(27);CHR$(106);C
        HR$(0):PRINT#1,CHR$(27)
        ;"@";
HX 370  PRINT"{GRN}{5 SPACES}LI
        NE FEED? Y/N{3 SPACES}"
        ;:GOSUB440:PRINTA$
DJ 380  IFA$=CHR$(94)THENPRINT"
        {CLR}"CHR$(142):GOTO50
DF 390  IFA$="Y"THENPRINT#1,"":
        GOTO250
HQ 400  GOTO250
PD 410  PRINT"{GRN}{2 DOWN}
        {5 SPACES}ENTER NUMBER
        {SPACE}OF LINE FEEDS";:
        INPUTA$:IFVAL(A$)=0THEN
        50
FC 420  FORI=1TOVAL(A$):PRINT#1
        :NEXT:GOTO50
SM 430  CLOSE1:END
RJ 440  A$="":GETA$:IFA$=""THEN
        440
FC 450  RETURN
```

Donald Klich is a frequent contributor. His most recent program, CrossRef 128, appeared in the May 1993 issue. He lives in Mount Prospect, Illinois. ❐

TYPING AIDS

MLX, our machine language entry program for the 64 and 128, and The Automatic Proofreader are utilities that help you type in Gazette programs without making mistakes. To make room for more programs, we no longer include these labor-saving utilities in every issue, but they can be found on each Gazette Disk and are printed in all issues of *Gazette* through June 1990.

If you don't have access to a back issue or to one of our disks, write to us, and we'll send you free printed copies of both of these handy programs for you to type in. We'll also include instructions on how to type in Gazette programs. Please enclose a self-addressed, stamped envelope. Send a self-addressed disk mailer with appropriate postage to receive these programs on disk.

Write to Typing Aids, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

ONLY ON DISK

In addition to the type-in programs found in each issue of the magazine, Gazette Disk offers bonus programs. Here's a special program that you'll find only on this month's disk.

Mergee
By Robert Quinn
Kooringall, Waga Waga
NSW, Australia

This month's bonus program is a tough, thinking-person's game for the 64 that can be played from the keyboard or joystick. The game begins with a playing field that's filled with single-digit numbers, random boxes, squares, and open spaces. The object of Mergee is to move the numbers around so that they merge with other numbers and disappear from play. Only like digits can merge, however, and when all of the numbers are gone, the game is over. The rules are simple, but there are a few surprises waiting for you that'll make Mergee almost as frustrating to play as it is entertaining.

Public Domain Programs

Don't forget that Gazette Disk now contains the best of public domain programs and shareware. For a complete rundown of the programs on this disk, see Steve Vander Ark's "Share This" column, which makes its debut in this issue of Gazette.

You can have these programs and all of the type-in programs found in this issue—ready to load and run—by ordering the July Gazette Disk. The price is $9.95 plus $2.00 shipping and handling. Send your order to Gazette Disk, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. You can order by credit card by calling (919) 275-9809, extension 283.

SONY DESKTOP LIBRARY

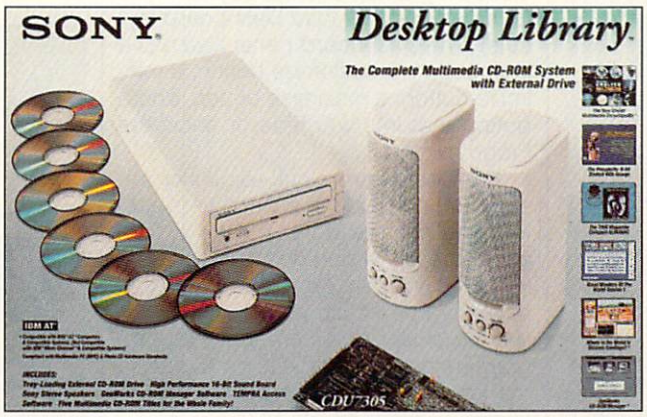
Here's your chance to enter the world of multimedia. With the Sony Desktop Library, you get everything you need: a CD-ROM drive, a sound card, and a collection of real multimedia software. This next-generation product goes beyond early CD-ROM products, giving consumers more of what they want and need: plenty of software and an easy-to-use front end to the CD-ROM titles and hardware.

My evaluation package had an external drive. Two other packages are available (at a reduced price, too) with internal drives. The data-retrieval speed of 150K per second was right in line with multimedia standards.

Right now these multimedia products ship with a Spectrum 16 sound card. It's Ad Lib, Sound Blaster, and Real Sound compatible. Software that supports the card in native mode sounds superb, even better than Sound Blaster emulation. A nice set of desktop speakers provides an alternative to running wires to your stereo.

Six full-blown multimedia software titles will get you started. There's so much material, it'll take several weeks before you'll have enough time for more than a brief sampling.

In addition to solid, reliable hardware, the Sony Desktop Library includes the GeoWorks CD-ROM Manager as part of the package. It's a front end to all of the CD-ROM software that's included. All you do to run a program is click on its icon. The package includes even more than front-end software, though—it's a graphical environment. Many of the GeoWorks niceties that make DOS easier are there as a bonus.



With the Sony Desktop Library you get all sorts of stuff, including a CD-ROM drive, CD-ROM titles, and speakers.

With Dashboard for Windows 1.0, a new Windows utility from Hewlett-Packard, you can drive your computer more effectively.

You can create icons for other CD-ROM titles as your library grows. That way, you'll always have the same easy interface when you access your CD-ROM titles.

I wasn't sure I could run CD-ROM programs from DOS until I called Sony. I didn't find any mention of running from DOS in the Sony literature, but I'm not a good manual reader, so I could have missed it. After talking to the company, I was able to install an icon and a group in Windows. I ended up spending more time running GeoWorks from Windows than DOS and had no problems.

The bundled software varied in quality, but my two favorites were Where in the World Is Carmen Sandiego? and The New Grolier Multimedia Encyclopedia. My kids loved them, too. If you have children, the accompanying software will provide entertainment and edification for them as well.

Some of the programs did the unthinkable and copied a large portion of themselves to my hard drive. Thinking I had plenty of available space, I tried installing an application and was taken aback when I discovered the intrusion.

The GeoWorks installation was a two-stage process requiring a Ctrl-Alt-Delete boot between stages. I wish it had done what many other installations do and rebooted itself, followed by automatic spawning of the second half of the procedure.

In spite of several small complaints, I think highly of the package. If you're seriously thinking about getting a CD-ROM drive, take a good look at this package. It may be just what you need. And Sony, one of the leaders in CD-ROM technology, will probably be in the business for a long time.

RICHARD C. LEINECKER

Sony
(800) 352-7669
$1,069.95 (external package)
Circle Reader Service Number 434

DASHBOARD FOR WINDOWS 1.0

It's compact, neat, convenient, and fast. In fact, I like Dashboard so well that I regularly use it in place of Windows' own standard Program Manager.

Like the dashboard in today's high-tech cars, this Windows utility presents an impressive collection of highly visible gauges and easily accessible controls. The resource gauge, for example, resembles an analog fuel gauge and allows you to monitor your Windows system resources. The memory meter below it looks like an odometer and lets you monitor available system memory. If you run too low on resources or memory, a gas-pump icon blinks to alert you.

In Dashboard's printer manager, you choose from available printers by clicking on a printer's icon button; a light at the bottom of the button shows the default printer or, if you have a fax board, the fax software to which you "print." To print or fax a file with ease, just drag and drop it from Windows' File Manager to the appropriate icon.

Forget double-clicking when you use the Quick Launch buttons. A single click launches your most-used apps, identified by icons and, with enough room, the names of the programs. To launch less-used apps, click on one of the group buttons in the Pro-

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gram menu bar; when the group window pops up, click on the app you want.

You also have buttons for the System menu (like the one in Windows), the Task menu (to switch, run, and close programs), and the Layout menu (to create, edit, or load Dashboard layouts). The Dashboard panel also has a help button, a customize button, a minimize button, a maximize button, and a button that lets you hide or show the Program menu.

The Dashboard clock (digital or analog and available in several versions) lets you set the date, the time, and alarms. And Dashboard's mini program windows visually represent what you have on a particular screen. If you dislike the clutter on a screen with a program running, an uncluttered screen to the left or the right can be just a click away.

Don't let its compactness fool you: Dashboard is highly customizable and offers much more depth of utility than meets the eye. If you enjoy using wallpaper to add variety to Windows computing, you'll love the way Dashboard takes no more room than necessary. Most important, however, Dashboard steers you through Windows with minimal clutter and maximum speed and efficiency.

MIKE HUDNALL

Hewlett-Packard
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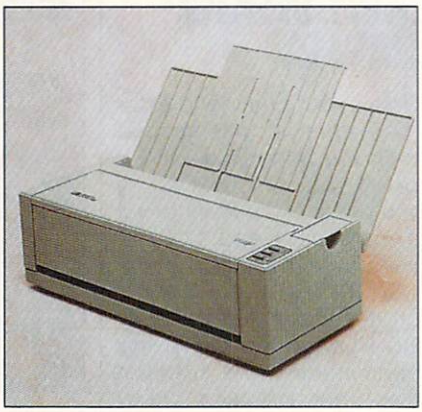
SMITH CORONA CORONAJET 200J

With laser-quality output, 20 resident fonts, and a compact form factor only slightly larger than a loaf of bread, the Smith Corona Coronajet 200j ink-jet printer is going to be as popular as . . . well, sliced bread.

If you add its optional automatic sheet feeder, the 200j takes up only about as much desktop space as a loaf of bread spread crossways on an average-sized manila folder. This should be welcome news to people who would want to use it at home or in a small business (the target market for this printer), who often need all the extra space they can get.

You can make each of the 20 resident fonts bold, italic, or underlined, including Courier, Times Nordic, and Letter Gothic. For even more variety, you can use the 14 optional font cards. The 200j prints in portrait and landscape modes, and its easily installed ink-jet cartridge is replaceable.

Smith Corona claims laser-resolution-quality printing—300 × 300 dpi for text and graphics—and my experience confirms the claim. Everything I printed was crisp and dark—I just had to be careful not to smear freshly printed pages by touching them before



The Coronajet 200j packs laser-quality printing power into a little package.

they were dry. The printer proved equally adept at printing spreadsheets, documents in XyWrite and Microsoft Word, OnTime calendar sheets, and BMP files in black-and-white from Windows' Paintbrush program. It handled multiple fonts and a variety of files with no hesitation.

The 200j owner's manual proved essentially adequate, with clear setup instructions and a helpful troubleshooting section but, unfortunately, no index. The automatic sheet feeder comes with its own skimpy booklet, which is helpful but confusingly organized, with entries in multiple languages for each section.

To be honest, after I inserted the 200j's print cartridge, I barely glanced at the manuals unless it was to consult the troubleshooting section. It's easy enough simply to open the box, connect the printer to your computer, set your software to the common HP DeskJet Plus emulation, and go to work. To install the 70-sheet-capacity feeder, you simply push the 200j on top of it until it locks into place.

The 200j doesn't present you with a host of LEDs and switches to set, though its front panel does conceal more than 50 easily accessible switches to make adjustments for different fonts, manual or automatic paper loading, and other commands. The graphs that show how to set the switches proved somewhat confusing, so I was relieved that the only change I needed to make came when I added the automatic sheet feeder. The 200j's pow-

er switch is on the back of the printer, a location I found mildly inconvenient.

Besides its size, printing quality, and ease of use, the 200j also impressed me with its quiet operation. If my dot-matrix printer provides no smearing problems, it does provide plenty of noise pollution. Compared to it, the 200j—rated at less than 45 dB—was virtually inaudible, even in my cramped 10- × 10-foot home office. I can't imagine anyone being bothered by its noise level.

The only real problems I encountered using the 200j involved loading paper. It wouldn't accept envelopes loaded longways, a necessity for the HP DeskJet Plus emulation in Nvelope Plus. It also gave trouble when I tried loading it with recycled office paper—the backs of old press releases, errant printouts, and the like—sometimes feeding two sheets at once at odd intervals. Using fresh paper, though, I had no trouble using the 200j.

At worst, the problems I had using the Smith Corona Coronajet 200j were minor quirks. Anything this small that prints this well without making any appreciable noise deserves an unreserved recommendation.

EDDIE HUFFMAN

Smith Corona
(800) 448-1018
(203) 972-1471
Coronajet 200j—$499
Optional sheet feeder—$89

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DEC 433DX LP

Deciding which computer system to buy can be difficult. In most cases, once a business commits itself to a specific product, it must stick with it. That's one reason DEC (Digital Equipment Corporation) has targeted businesses for its new family of PCs. The upgradable DEC 433DX LP, based on Intel's 33-MHz 486DX processor, can be used for demanding desktop business as well as for technical applications.

How difficult is it to set up the DEC 433DX? The system comes with DOS 5.0 and Windows installed. First, I checked the user's guide for anything unusual. Then, I plugged in the appropriate cables and power cord and turned on the system.

The easy-to-understand Getting Started handbook provides all the necessary information, as well as helpful illustrations for inexperienced users. You also get the DEC 300/400 LP Series User's Guide, the MS-DOS 5.0 User's Guide and Reference, and an operations manual for QAPlus, an advanced system diagnostics software package.

I ran a variety of applications to check the system's compatibility, including Microsoft Word, Excel, PowerPoint for Windows, Picture Wizard, the Windows and DOS versions of Express Publisher, a couple of DOS shareware programs, and several other commercial programs. I found no incompatibilities.

To remove the system cover, I had to unlock the safety lock on the back of the unit with the key provided. The cover is easy to remove. I found it hard to reach the system battery, but it seldom needs replacement, fortunately.

This 33-MHz system includes a DEC two-button mouse, one parallel and two serial ports, two floppy and two hard drive controllers, a Super VGA video adapter integrated with the system board, and three open expansion slots.

Vents along one side of the unit should be adequate to keep the system's power supply from overheating. You'll probably find the fan noise barely noticeable.

Easy access to reset and on/off buttons is essential. You can find both of these buttons on the front of the DEC 433DX.

You can get a 66-MHz upgrade for the DEC 433DX, and it's easily installed thanks to DEC's ZIF (Zero Insertion Force) slot. The 486DX includes a coprocessor in the CPU chip, but DEC accommodates a separate coprocessor to aid the computer in CAD-CAM operations.

It's easy to access the unit's 4MB of SIMM RAM chips. The standard amount of DRAM can be increased to 64MB using the four SIMM sockets. The DEC 433DX requires SIMMs with an access time of 70 ns or faster.

The price of the DEC 433DX doesn't include a monitor. Several are available, including monochrome or color VGA ranging from the basic 640 × 480 to a multisync 1024 × 768 noninterlaced model.

No surprises come with the DEC 433DX keyboard. It features a standard layout with soft-click keys and function keys along the top.

The one-year on-site warranty is comparable to those found with a lot of other systems and is better than some. The company offers a toll-free customer and technical support hot line and a consulting center.

I found the DEC 433DX to be a solid, dependable, easy-to-use system. Businesses looking for an upgradable, modular (80 percent of the components are common to the other DEC PC family members), and network-ready system would be advised to check this one out.

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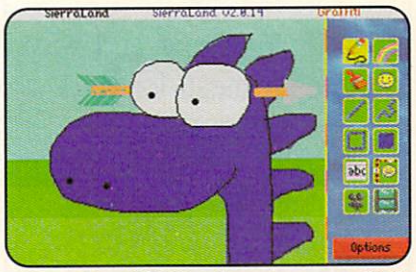

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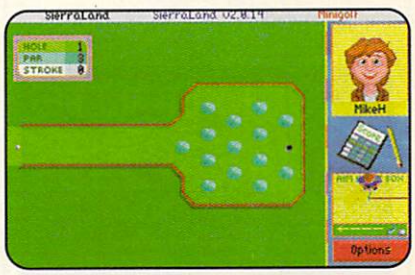

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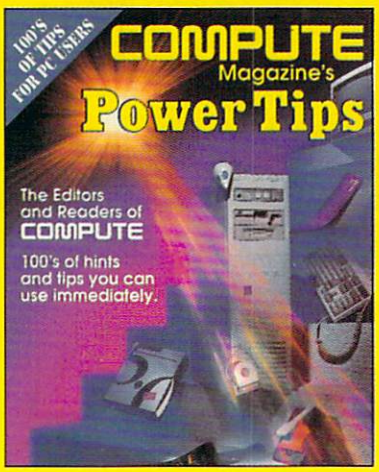

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AUTOCAD RELEASE 12

AutoCAD Release 12 is an upgrade wish list for casual users, as well as for hardcore programming hackers and third-party developers. While more powerful and advanced than any other CAD program, previous versions of this premier drawing program foundered in the aspects of speed and ease of use. They required regenerations for all but the slightest size changes, and operators had to memorize and enter archaic commands for even the simplest tasks. As a teacher with more than 20 students, I had to program a command sequence in the early evening and let it run overnight because the equipment and software were so antiquated.

With Release 12, the program's new speed and flexibility take full advantage of 32-bit computing capability, evolving networks, and advanced plotting technology. The difference from previous versions is immediately apparent. AutoCAD has emerged from dweebware into the trendy—and time-saving—arena of graphical user interfaces, with pull-down cascading menus, cursor menus, programmable dialog boxes, TIFF and EPSI raster image inputs and outputs, and internal rendering capability.

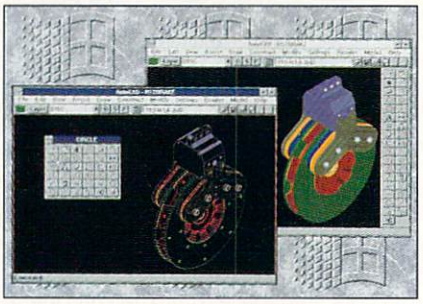
Eminently user-friendly, Release 12's pull-down menus also remember your last input choice. Expert users who type commands at the prompt line will find all suboptions of the commands on the side menu, which can be turned off to provide a wider screen. The 3-D capabilities of cameras and lighting angles that distinguish CAD from paper-and-pencil drawings now appear within AutoCAD inside the pull-down Render menu, so you no longer need to enter AutoShade.

The 25 new dialog boxes replace cumbersome line commands in starting and opening drawings (no more hunting around the hard drive), plotting (with a brand-new paper-saving preview option), and customizing.

You can enter the command and quickly change any of the settings without having to scroll through needless text questions. And you can correct mistakes if you catch them before pressing the OK button, or you can simply cancel and start again.

Programmable dialog boxes constitute a veritable revolution for AutoCAD users, allowing a new dialog box to be defined by the programmer rather than by the limitations of the program. The Dialog Control Language (DCL) is incorporated with LISP.

Release 12 brings plotting into the nineties. The plot dialog box allows multiple plotter configurations for both



AutoCAD Release 12 boasts 174 enhancements over the previous version.

plotters and printers. The plot preview function displays the plot image in partial or full format, superimposing the paper extent over the image. Zoom and Pan ensure that your plot is correct prior to sending it to your output device. I found one error in which a plot set to ⅛ inch = 1 foot 0 inches did not plot to the correct scale and had to be reset to 1 = 96, but Autodesk has apparently compiled a new plotter driver to counteract this oversight.

With the program's ability to output raster files from EPS, FITS, TIFF, GIF, and TGA formats; image resolution as high as 1024 × 768; up to 256 colors; and programmable layers, linetypes, and line widths, perhaps Autodesk should be targeting the desktop publishing crowd. RASTERIN.EXP, a Release 12 AutoLISP Xload function, pulls in the raster image similar to a block.

Even network users have a productivity feature, with the ACAD-P option allowing them to plot from outside AutoCAD without requiring an additional license.

Taking a cue from the Macintosh, Release 12 now lets you alter the verb/noun technique in up to 14 commands using the Pickfirst variable. No more choosing commands and selecting objects—you simply click and drag! And a new Grips feature, the Dgrips dialog box, lets you stretch, move, copy, rotate, and mirror entities as edit functions without going into a command. Entities can be arcs, lines, circles, blocks, plines, or text. The grip, basically an attachment, is a small colored square that appears at definition points of an entity, changing color as it becomes hot (activated). The grips also let the operator grab the end-

point, center, midpoint, and quadrant of an entity without using OSNAP (Object Snap.)

Long, slow regen or hide commands are a thing of the past with the introduction of algorithms that accelerate graphics from 50 percent to 500 percent. In fact, a performance enhancement practically eliminates regenerations for zooms and pans!

Graphics acceleration for Zoom with the old 16-bit display space is finally gone, and in its place a 32-bit vector space now provides an extremely efficient Zoom. I did a Zoom Extent followed by a Zoom Vmax to force a drawing out as far as possible without a drawing regen, and even a Zoom 5000000x (yes, six 0s) did not entail a regen—undreamt of in previous releases. The dynamic range of the Zoom command is increased from 50 : 1 up to 5,000,000 : 1 before a regen is issued.

Advanced users and third-party developers will appreciate Release 12's new organizing tools. A means of creating a "tree structure," oct-tree spatial index divides drawing entities into logical groups or sort order.

Release 12 achieves graphic acceleration for faster entity selection and redraws (spatial index) through the new variables of Treedepth and Treestat. Treedepth fine-tunes the oct-tree index. Treestat files report values in both the model and paper space branches of the spatial index.

The AutoCAD Sequel Extension (ASE) enables operators to pass information directly from AutoCAD to a database system without requiring shells. Since nongraphical information can be stored outside the drawing and linked with entities inside a drawing, you can reduce a drawing's size without losing useful data.

New conversion functions convert text strings into decimal values, and a geometry calculator allows you to calculate geometry using command line expression and interaction with existing AutoCAD entities. (For instant insider access to undocumented advantages, you may want to check out the new Release 12 edition of *1,000 AutoCAD Tips and Tricks,* a book I edited published by Ventana Press.)

I don't have enough space to include all 174 enhancements in the new AutoCAD Release 12, but you obviously get your money's worth when you upgrade to this version.

BRIAN MATTHEWS

Autodesk
(800) 964-6432
$37.50

Circle Reader Service Number 438

GOBLIIINS

Imagine the Three Stooges cast in a graphic adventure, and you've got Gobliiins, a puzzle quest with a delightfully twisted sense of humor.

Developed by European publisher Coktel Vision, the game is typical of those by the new wave of innovative French designers, including Delphine

Pair your brain with the three Gobliiins' half a brain for a successful quest.

(Out of This World) and Sensible Software (Mega Lo Mania). Graphic artist Pierre Gilhodes created the game's distinctive look, from the lush 256-color backdrops to the title characters' often hilarious animation.

The game consists of 22 full-screen, interactive puzzles strung together in storybook fashion. The tale involves a king who's suddenly gone stark, raving mad—the victim of an evil wizard's voodoo doll. To the rescue come Hooter, Dwayne, and BoBo, three well-meaning goblins with only half a brain among them. You provide the missing link, directing the goblins on their perilous journey to find a cure for the ailing king.

Because each goblin performs only one special task, they must work together to solve puzzles. Hooter, the magician, casts spells on objects, often with unpredictable results. Dwayne is the technician, able to pick up and use one object at a time. BoBo is the warrior, whose only talents are the abilities to climb and punch things. Use the keyboard or mouse to select the goblin you wish to control.

Game mechanics are kept simple, focusing attention on your powers of observation and deductive reasoning. To advance through a screen, you must find and manipulate a series of items, often in a specific sequence, utilizing each of the goblins. The ultimate goal of one puzzle might be to secure an object to be used in the next, more difficult screen. Experimenting is an essential and entertaining aspect of the game, yet you should be careful not to dally with the wrong items. Negative actions such as falls, frights, or losing important items result in the loss of energy. Although no time limits are im-

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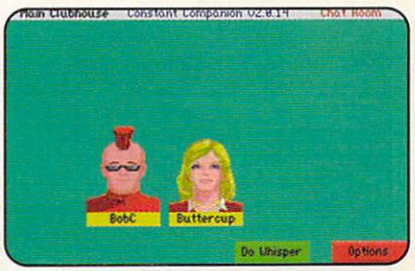

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REVIEWS

posed, when all energy has been depleted, the game ends. Energy power-ups are available midway through your quest; passwords are also awarded upon completion of each screen.

The game's few faults are only minor quibbles. Although many puzzle solutions require multiple-character input, only one goblin can be active at once. A multitasking feature for assignments would speed up many tedious chores and lend the game a welcome sense of urgency. Another possibility might be puzzles solved only through simultaneous character actions. Harsh, sporadic sound effects belie the game's warm and fuzzy demeanor. More expressive voice samples and background effects are needed to fully convey goblin gibberish. Finally, unlike the clever introductory screen, the game's victory screen is quite anticlimactic.

Most puzzles are surprisingly intricate and might prove too difficult for younger players. Unlike the ones in Sierra's similar Castle of Dr. Brain, the puzzles here rely less on logic than on arbitrary cause and effect. A multitude of red herrings ensures plenty of wrong guesses, often with hilarious, game-ending outcomes. The trick is to think with slightly bent logic, placing yourself in the goofy shoes of these three little knuckleheads.

Brainteasing fun with a sly comic flare, Gobliiins could be one of the year's sleeper hits.

SCOTT A. MAY

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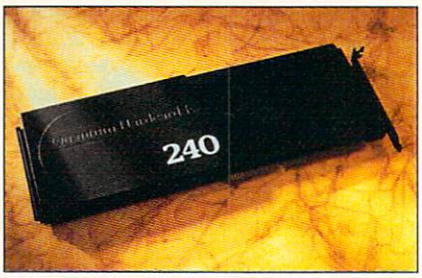
QUANTUM HARDCARD EZ 240

Need more hard drive space? Got an extra slot in your PC? Don't want to get involved in major PC surgery? If you answered yes to all these questions, you're in luck.

Quantum offers a quick and easy way to add 42MB, 85MB, 127MB, or even 240MB to your PC. All you need is a Hardcard EZ 42, Hardcard EZ 85, Hardcard EZ 127, or Hardcard EZ 240. Each is essentially a hard drive on a PC card, so installation should take ten minutes or less. And Quantum guarantees that any Hardcard EZ will work with your 286, 386, or 486 system, or you'll receive a full refund.

These days, you don't have to pay a performance penalty for the convenience of a hard drive on a card. Average seek time is rated at 19 ms for the EZ 42, 17 ms for the EZ 85 and EZ 127, and 16 ms for the EZ 240. That's in line with the faster internal hard drives. The Hardcard prices are also in line with those of standard hard drives: $269 for the EZ 42, $319 for the EZ 85, $419 for the EZ 127, and $689 for the EZ 240.



It's easier to install the Quantum Hardcard EZ 240 than a conventional hard drive.

Unfortunately, I wasn't able to use the EZ 240 with an older ZEOS 386 computer. The manual explains that the Hardcard EZ drives may not work in systems with older SCSI adapter boards (in many cases, you can resolve the problem by changing the SCSI adapter's memory address), some 16-bit VGA adapters (you may have to switch from 16-bit to 8-bit transfers), and NEC's version of DOS 3.3 (Quantum includes a work-around). The ZEOS's early SCSI adapter, it turns out, is incompatible with the EZ 240 (that's where Quantum's money-back guarantee would have come in handy), but the Hardcard worked fine in the two other systems I tried.

The Hardcard EZs from Quantum are fast, inexpensive, easy to install, and guaranteed to work. With their field-tested life of 250,000 hours before failure, you'd be hard-pressed to find a better hard drive.

DAVID ENGLISH

Quantum
(800) 624-5545
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Circle Reader Service Number 440

WYSE DECISION 486SI

Wyse Technology knows how to make a quality product. The company's designers take the time, and spare little expense, to add conveniences and features not often found on other systems. But these extras and conveniences come with a price—namely, a higher price tag for Wyse computers.

I tried a Wyse Decision 486si, which includes an Intel 486DX/33 CPU with 4MB of RAM, a 200MB IDE hard drive, and a VGA color monitor. The sys-

tem I tried, which costs about $2,159, also came with two floppy drives and 256K of external cache and a local-bus video with 1MB RAM. Wyse describes this unit as a high-performance graphics workstation, since its video is much faster than standard VGA and it's easily upgradable.

Using its own local-bus video, Hyper 16 VGA, Wyse can boast the fastest high-resolution graphics performance available, with more than 300-percent improvement over conventional VGA systems. And indeed, I did find the graphics to be fast and of high quality.

The CPU in this system is Intel's latest 80486, the easily upgradable 486si. In addition, the memory is expandable to 64MB. And since many of the system's features are integrated on the motherboard, all six ISA bus slots are available. The system includes up to five mass-storage bays that support both 5¼- and 3½-inch floppy drives.

Other conveniences include the placement of the on-off switch on the front of the system, as well as a front-panel door that covers all the floppy disk drive bays. This door helps keep dust out of the drives, as well as giving a sleeker appearance to the unit. The keyboard is a 102-key enhanced PC-style keyboard, and its quality is higher than that of many keyboards I've seen.

Setup of the system is simple and fast. Everything you need is included, and all the ports are clearly marked. The setup manual is one of the best I've seen. Its illustrations and explanations are easy to follow. The only DOS manual included is The MS-DOS Version 5.0 User's Guide and Reference, Concise Edition. And, although it gives an excellent introduction to computers and MS-DOS, it's not a complete DOS manual. It would've been better for Wyse to have included the full MS-DOS manual, too. The system also comes with Windows 3.1 and a mouse.

I put the system through its paces using Windows 3.1 and running Word for Windows, Quattro Pro for Windows, and PageMaker 4 employing the standard VGA display. In addition, I tried some graphic-adventure games and flight simulation programs. I was satisfied with the Decision 486si's performance and was especially impressed with the general quality of the system.

But, as mentioned above, this quality comes with a higher price tag. If you're willing to pay for it, you'll probably be quite happy with this system. If you need a high-performance, top-of-the-line graphics workstation, I can certainly recommend the Wyse Decision 486si.

STEPHEN LEVY

Wyse Technology
(800) 438-9973
$2,159
Circle Reader Service Number 441

PACIFIC ISLANDS

War gamers who like to get their hands dirty on the front line rather than view a battlefield as icons scattered around a strategic map will get a real bang out of Pacific Islands. It's a tactical level tank simulation from the makers of the popular Team Yankee. In Pacific Islands, you control up to 16 tanks as you try to retake the islands of the Yama Yama atoll. The action is hot, realistic, and as addictive as a war game can get.

In Pacific Islands, the makers of Team Yankee offer more excitement.

You start your campaign by buying the tanks and equipment you need for your mission. Four types of tanks are available: the M1 Abrams, the M113, the M2 Bradley, and the ITV. To arm these iron-clad vehicles, you can choose from heat shells, SABOT shells, TOW missiles, and smoke shells. If you like to get into the action fast, though, you can skip over all of the purchasing screens, and choose the default setup, which instantly supplies you with vehicles and equipment, subtracting the cost from your cash.

Once equipped, it's off to the briefing room, where a map of the battle area and an accompanying notebook appraise you of your mission's details. The notebook outlines your objectives, while their approximate locations are marked on the map. Occasionally, military intelligence has helpful clues about what surprises might greet you in the pending confrontation. In addition, before entering the fray, you can request artillery support and smoke bombing for specific locations at given times.

When the battle commences, you control four platoons of four tanks each. ReadySoft recommends using a mouse to play. Although you have 16 vehicles under your control, each platoon receives commands as a group, so you don't have to command each tank individually. Plus, you can select several screen views for each platoon,

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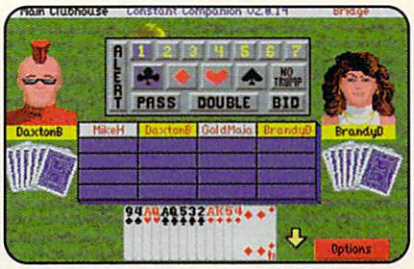

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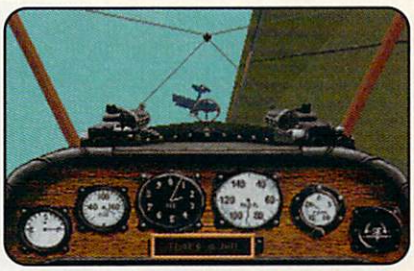

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the most important of which are the 3-D view, which offers a first-person perspective from the tank, and the map view, which shows an overhead shot of the area. You can zoom in and out in either view, which is especially helpful on the map screen. Using the zoom, you can look at the entire map, focus on individual vehicles, or view the area at several different intermediate magnifications.

You also can have all four platoon views onscreen simultaneously, each platoon showing a different map or area of the battlefield. Or if you'd like, a single platoon's screen quadrant can be magnified to full-screen size, a view from which tank controls are more accessible. These controls include a weapons firing panel, turret-rotation compass, laser range finder, infrared view, zoom, and more.

On the map screen, you can access even more tank and screen controls. You can set a platoon's formation, speed, and direction; and you can zoom in or out on the map display. Targeting enemy units on this map is a breeze: You just mark the unit with the map cross hairs and then return to the 3-D view, where the compass icon will swivel your turret toward the marked target. You also use the map cursor to set your platoon's next destination by clicking on the map. You can set your targets and mark your destinations at any zoom setting.

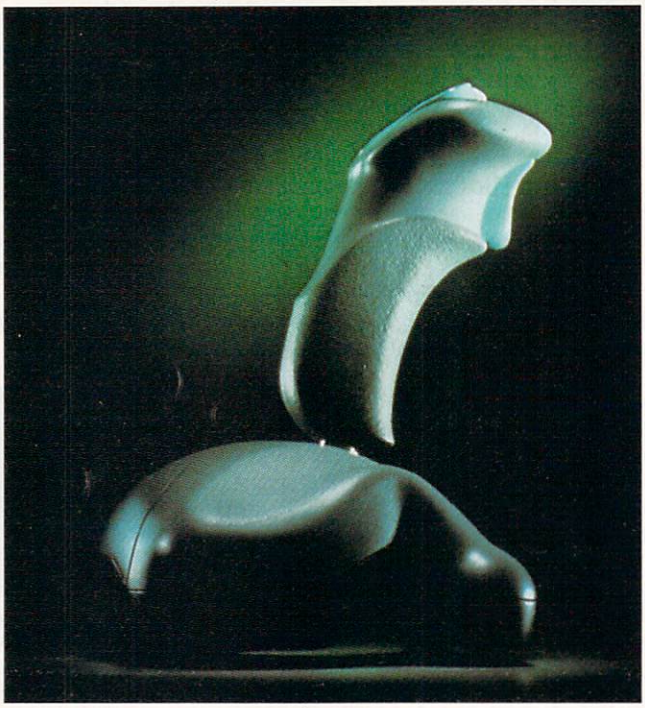
All in all, with its well-rendered 3-D graphics, realistic battle scenarios, easy-to-master controls, and blistering hot action, Pacific Islands is a delight. I highly recommend it.

CLAYTON WALNUM

ReadySoft
(416) 731-4175
$49.95
Circle Reader Service Number 442

SUNCOM FX 2000

Ergonomics and aesthetics can make strange bedfellows, especially when applied to joysticks. What's pleasing to the touch is often peculiar to the eye, and vice versa. Suncom's FX 2000 is one such duck, a flight control stick resembling an errant prop from a Roger Corman sci-fi flick. First impressions, however, can be deceiving. Despite its odd, anamorphic shape, Suncom's latest offering is a marvel of user-friendly, functional design.



You'll want the solid Suncom FX 2000 handy when you're playing games, though you may want it hidden otherwise.

The pistol-grip controller is 8 inches high and 4½ inches wide at the base, with a cord that's 5 feet, 9 inches long. Symmetrical design allows identical handling and performance capabilities for both left- and right-handed players. Twin fire controls—front trigger finger and top-mounted thumb button—can be manually switched between A and B settings, as designated by the software. The V-shaped top button is particularly well suited for ambidextrous play. Both buttons can be set to autofire by controls concealed in the base or to fire on demand with a top-mounted switch. Sliding *x*- and *y*-axis trimmers are located on the bottom, recessed to prevent accidental adjustments. Finally, a throttle wheel is located at the front of the unit—a handy option utilized by a growing number of flight simulators.

The stick performs best when firmly anchored, via built-in suction cups, to a table or desktop. The stability of this arrangement depends on surface texture, cup moisture, and how vigorously the device is handled. If the seal is too dry, the rubber cups will not maintain the suction. The little-known Murphy's Law of Joystick Suction dictates that if a seal can break, it will, and at the worst possible moment. Few things are more frustrating than having the front end of the stick pop off the desk in the midst of an intense aerial battle. Try using a small, damp sponge to lightly moisten the cups before securing them to the table, and pause the simulation and reapply pressure to the base before the action heats up.

If you prefer to hold the stick, you're in for a pleasant surprise. Unlike square-based controllers, the FX 2000 features smooth, rounded curves, molded on the top and bottom to fit your grip. Another unique feature is the ability to lift and lock the joystick handle at a 45-degree angle to the left or right. In theory, this dramatic shift creates a more natural line between your wrist and forearm. The results are less fatigue and potential pain, allowing you to play longer and, hopefully, score higher. Although awkward at first, prolonged tests in both positions favored this new twist on an old technology.

The controller tested well in such diverse and demanding environments as Aces of the Pacific, Chuck Yeager's Air Combat, Wing Commander, and Falcon 3.0. The pistol grip's short-throw and stiff, tactile feel account for its quick and steady response—a pleasant change from commonly loose and sloppy analog sticks. Primarily intended for flight simulations, the

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stick also performs reasonably well with driving, sports, and arcade games. Its only drawback is its size, which may prove too bulky for smaller hands.

Though not the ultimate flight control stick, as touted by Suncom, the FX 2000 succeeds on three key points: response, comfort, and price. That's enough to send most armchair pilots soaring with delight.

SCOTT A. MAY

Suncom Technologies
(708) 647-4040
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INSIGHT

A blue-tinted closeup of a human eye shows through a jagged tear on the white cover of the Insight box, just above the full program title: Insight to Greater Personal and Professional Success—A Kahler Process Model. What have we here? New Age software? Palm reading by your PC? Something mystical . . . yet practical?

None of the above, actually, though you'd be forgiven for making any of those guesses after a casual glance at Insight's packaging. Unless you're already familiar with the Kahler Process Model, it's hard to tell that Insight is actually a detailed personality inventory, or psychological profile, presented in software form.

Using Insight means answering a series of questions that allows the program to issue reports with details on topics such as Your Personality Structure, Your Success Factors, and Your Distress Warning Signals. It's based on the Kahler Process Model (KPM), developed by Dr. Taibi Kahler in the mid 1970s. The package and documentation include endorsements from businesspeople from around the country as well as from Dr. Terence McGuire, a longtime psychiatric consultant for NASA who has used the KPM in selecting astronauts.

According to Insight's documentation—which focuses on background information and details of the profiles, since Insight is about as easy to use as computer programs get—Kahler's model classifies you as one of six personality types, none good or bad. The program goes out of its way to establish itself as a tool for self-discovery and self-improvement, not something that will "teach you to manipulate others or use this information in harmful ways." Scoundrels needn't apply.

If you're looking for a psychological quick fix, Insight's not for you, either. Although you can copy it onto your hard drive in a few minutes via a standard batch file, once you start Insight, you have a lot of reading to do. You move through the program using nothing but your cursor keys, with a long, colorful series of introductory screens offering background on the KPM, profiles of Kahler and other KPM developers, and amateurish graphic portraits of those people. The picture of the KPM that emerges from Insight's long introductory screens is one that spices basic psychological models with a pinch of humanistic philosophy: "We believe that people are OK, although their behavior is sometimes negative."

When you finally make it to the inventory, you're asked a series of 22 questions with six possible answers each. You can choose up to five answers that fit you, ranking them in order of importance. A short example is "I prefer: people, ideas, values, fun things, excitement, privacy." It takes 15–30 minutes to complete the inventory, after which the program issues a copy of Your Personal Insight Summary. It's presented onscreen with detailed descriptions of each basic personality type—Reactor, Workaholic, Persister, Dreamer, Rebel, or Promoter—along with other information to accompany suggestions of how you can maximize your success and contentment and minimize your stress. You can also get a printout of your inventory results with a couple of simple keystrokes.

As the bit about "professional success" in Insight's full title tells you, it's designed with businesspeople in mind. Though some of the blurbs on the box come from people who used Insight to help them communicate better with family members, many of the questions and subsequent suggestions relate to business situations. (I work alone at home, so I had some difficulty answering the questions about my colleagues.)

Whatever you do, don't rush through the Insight inventory with plans to answer more thoroughly another time: The Insight package comes with a Profiles disk that limits you to two personality profiles. Additional Profiles disks have to be ordered at a cost of $69.95 apiece. (You are given a chance to back out before the program completes a profile.)

I won't reveal the results of my profile, though I will say it seemed reasonably accurate, with information that looks helpful but not really surprising. If you'd like more, well, insight into your own personality, however, or if you're looking for suggestions on improving your life at home or at work, Insight wouldn't be a bad place to start. It comes with good credentials, it thoroughly explains every conclusion and recommendation, and it's an easy-to-use program.

EDDIE HUFFMAN

Three-Sixty Pacific
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GRANDMASTER CHESS

Capstone makes big claims for Grandmaster Chess, calling it the most powerful chess program in the world. It backs up that claim by inviting comparison to other programs, including a unique guarantee on the front of the box: If another chess program defeats Grandmaster Chess using identical computers under tournament conditions, you get your money back.

It takes approximately ten minutes to install the program, and installation includes options to support advanced video and sound features. You can choose from three chess sets: standard, human, or monster. The board can be viewed in either a two- or a three-dimensional position. The entire display fits on one screen and includes the board, move lists, options buttons, and menu buttons while in two-dimensional mode. You can choose to play with black or white pieces, and the board can be rotated accordingly.

New chess players will find the program less than

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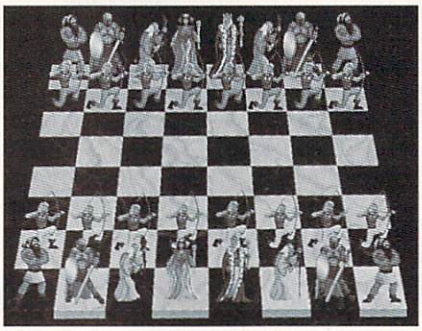
REVIEWS

adequate for teaching the game. Included with the documentation is a brief flier, published by the United States Chess Federation (USCF), that explains the rules of chess. But nothing within the program teaches the beginner about piece movement.



Grandmaster Chess will suit experienced players better than novices.

The chess player with some experience will find the program both entertaining and helpful. When you push the hint button, the computer displays its analysis, which includes point values for each possible move and its continued line of play, and then animates the best possible move. You may also turn on or off the computer's opening library of moves, which includes approximately 12,000 positions in 4500 standard openings. When you press the book button, all legal moves are listed, and those in the opening book are rated and ranked.

The intermediate club player will also find the program a solid chess partner. You can choose from a variety of playing strengths and styles for the computer, and you can select time controls, from 5-minute speed chess matches (best played with the computer's opening library turned off) to 120-minute tournament matches. The program includes a rating estimate that approximates your USCF ranking, and games can be saved, imported, or printed. It's easy to edit the board and to set the computer to quickly solve puzzle positions. When set at Grandmaster tournament level, the program is quite formidable. If you defeat the Grandmaster, the program prints a certificate.

While Grandmaster Chess is powerful and entertaining, it does have flaws. It wouldn't run as a DOS application under Windows, crashing every time I attempted it. In fact, the program crashed on one occasion while running under DOS. The hand cursor also tended to stamp itself on various parts of the screen regularly. Although the program includes synthesized speech, it's limited to a few trite expressions such as "Gotcha" and "Bad move." I found the speech feature little more than annoying.

The program does have several strong, unique features. Its options buttons make play fast and easy. It's very nice to be able to turn the computer's opening book on or off, as well as to change its strength and play variability. The program plays chess well at a variety of levels, and it's particularly nice for the player with limited experience.

Grandmaster Chess would make a good addition to any software library, but I'd advise waiting until a Windows version becomes available.

JIM SMITH

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Air Force Commander is a strategic game of modern air warfare set in the Middle East. The game features 14 scenarios of varying difficulty and complexity involving the United States and several Middle Eastern countries, including Iran, Iraq, Syria, Jordan, Israel, Saudi Arabia, Sudan, Kuwait, Qatar, Lebanon, Egypt, and the United Arab Emirates. Some of these scenarios are loosely based on historical conflicts such as the Iran-Iraq War of 1973, the Yom Kippur War, and the Persian Gulf War, while others are based solely on hypothetical situations.

As the name implies, Air Force Commander puts you in control of an entire air force, not just a single fighter plane or bomber. Thus, your view of the action is from a radar map in a war room rather than from the sky. Here, all aircraft are represented by vertical dotted lines that travel across the map in accelerated realtime. The length of each line indicates the altitude of the plane it represents—the longer the line, the higher the plane.

Although you can direct your fighter squadrons to intercept specific enemy aircraft, your fighters are used more efficiently if you simply set up patrols

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around the areas you wish to protect. In addition, bombers are available for high-altitude bombing and ground strike missions against specific targets in enemy territory. To extend your radar coverage, it's important to provide air cover for your bombers as well as for AWACs planes performing circular sweeps.

Squadrons can be placed on autolaunch so that after a mission they'll automatically return to base, refuel, and head back out. It's important, however, to monitor the efficiency of your squadrons and rest and repair them as necessary to make sure they perform at peak efficiency.

While the real objective of Air Force Commander is to achieve air superiority, the game can also be won by turning public opinion in the opposing country against the war. You do this by attacking its power stations and sources of food and water.

As for Air Force Commander's sound capabilities, the digitized voice (with a Sound Blaster) is a nice touch, but the loud explosions that accompany air combat and bombing raids are more of a distraction than an enhancement to the action.

The various maps are nicely drawn and seem to be fairly accurate, but in general the graphics remind you that you're playing a computer game rather than participating in a realistic simulation. Air Force Commander is an enjoyable game, but not one that's likely to win any awards.

BOB GUERRA

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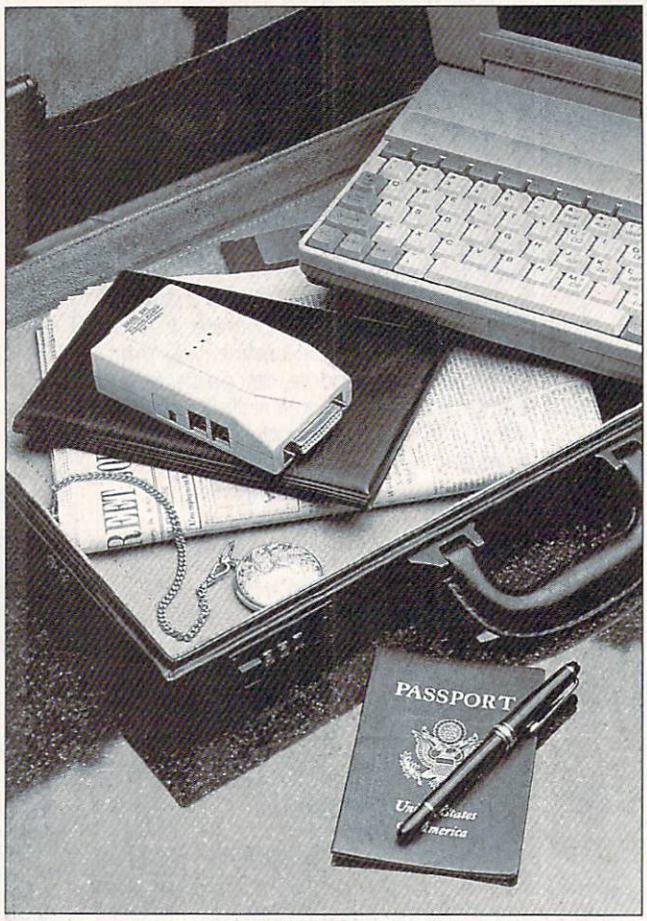
ever having to pick up the receiver.

The 9624 FP takes up only about as much space as a walkabout cassette player trailing a cord or three. You hook it up to your computer directly through a 25-pin port or via cable through a 9-pin port and then plug in a phone line and a power cord (or, if you prefer, you can power up the 9624 FP with a nine-volt battery). Red indicator lights tell you whether the battery's low, if the modem's operating at 2400 bps or faster, whether a connection has been established, and if the modem is ready for communications to begin. Unlike some portable fax/data modems, the 9624 FP connects directly to the phone line rather than strapping onto the receiver, so don't buy it expecting to use it easily from public phones or in office buildings with odd-sized plugs for their phone systems. Also, the modem has a slightly clunky feel because of loose nuts and a power-cord receptacle that gives slightly when you plug the cord in. Those are essentially cosmetic concerns, however, and they have no bearing on the performance of the 9624 FP.

Anyone who has ever removed a desktop PC's cover to install a fax/data modem board will appreciate the convenience of the 9624 FP's external connections. Best Data has even adapted for use by the general public a Velcro strip used by the company's employees to attach the 9624 FP directly to a monitor, out of the way. I had the modem hooked up and its accompanying software installed within about ten minutes of opening the box. The user's manual provided relatively clear instructions, though without illustrations, an index, or the kind of literary spark that can make phrases like *retractable locking screws* come alive.

The software accompanying the 9624 FP—WinFax Lite and Quick Link II—makes communications an intuitive breeze. Both programs allow you to send and receive faxes, as well as view them onscreen or print them on your printer. If you run Windows, I'd advise sticking with WinFax Lite, though. Quick Link II gets the job done, but it has an interface on a level with an average shareware program, and when you're viewing a fax that you're sending or you've received, it offers no helpful onscreen guidelines telling you how to move around the page or pages. I used both programs for successful fax communications, however, and their inclusion with a portable modem that can transmit at 9600 bps makes the 9624 FP a bargain at $199 suggested retail. (WinFax Lite isn't available as a stand-alone product, but WinFax Pro retails at $119.)



The Best Data Smart One 9624 FP Traveler Fax/Modem is even smaller than its name, making faxing easy and convenient.

The bargain looks even better when you consider the error correction and data compression technologies built into the 9624 FP. It incorporates V.42bis and MNP 2–5 technologies, which are imposing-looking monikers for the intelligence that makes the modem fast and its transmissions clean. Using data compression, V.42bis allows for a transmission throughput up to four times the bps rate of the modem itself, which allows the 2400-bps 9624 FP to send in your lunch order at 9600 bps. (*V.42* covers the error correction, while *bis* covers the data compression.) MNP 2–5 is a subset of V.42, and, in a nutshell, it means the 9624 FP can communicate with other MNP modems, a standard protocol.

If you're simply looking for a way to get that memo you needed yesterday here today, at least, don't let all those weird letter and number combinations confuse you. The Best Data Smart One 9624 FP Traveler Fax/Modem packs a lot of power into a small package, fulfilling your fax needs without crowding you at all.

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paced action, and out-of-this-world cast will keep newcomers to math engrossed in the computative environmental challenge the game presents.

After loading the program, kids enter the year 2020, when Earth has exhausted its landfills and begun to send its solid waste into outer space. Smart-mouthed aliens who don't want the useless junk threaten revenge by dumping glop on the planet. Prime minister Monitron, a kind of futuristic Monty Hall, persuades the aliens to settle their dispute in a contest of math abilities. The games take place in the Cubix Cantina, which Legacy calls "the restaurant of choice for solar slimeballs."

The program features a single-page quick-start guide that lets kids or teachers get into the game immediately. The 58-page player's guide is imaginatively illustrated, and notes on installation, instruction, game tips, and troubleshooting are presented in a story-telling fashion that sticks with the theme of the game and won't turn off those kids who take the time to read them. Legacy recently added support for sound boards, and the new musical accompaniment greatly enhances the PC speaker sound found in the previous version.

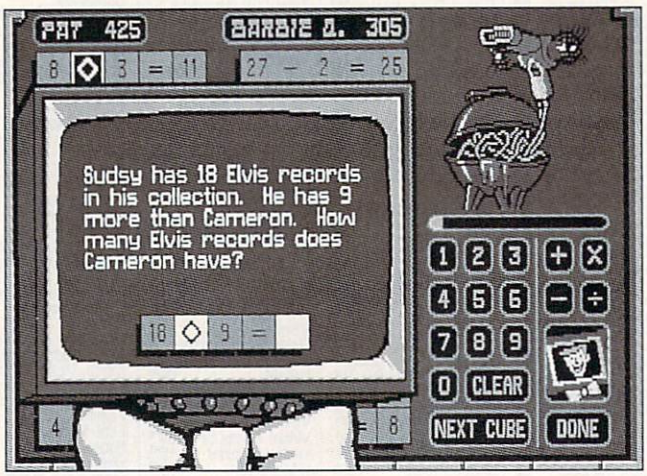
The game is copy-protected by documentation. To get past Vectra, the security guard, players must match a number Vectra gives them to a planet name printed on the corresponding page in the manual. Up to 40 players can play, and multiplayer competitions make it ideal for classroom activities as well as group play at home.

Parents, teachers, or kids themselves can customize levels of difficulty to make the game easier, eliminating multiplication tables, division, or cube equations. Kids select their Mutanoid challengers from a cast of ooky-looking characters with appropriately juvenile names like Barbie Q., I.M. Tall, and Lotta B. Hinds. The game board presents problems in crossword-style grids, where players fill in elements of the equations, and as word problems. Kids enter the answers by selecting numbers on an onscreen calculator pad. From time to time, green mutant "gelatoid" creatures zip across the screen, and a player who can direct them to diamond squares earns extra points. Scores are kept in a Hall of Fame, so kids can check to see how their scores compare with those of the Mutanoid (the computer) or other players.

The game employs somewhat unconventional key assignments: To quit, you hit F8 instead of Esc, for example. But kids don't seem to mind. The game does have mouse support.

Legacy's arcade-game approach to instruction, complete with sound and animation, brings routine drill-and-practice exercises alive. Mutanoid Math Challenge will entertain any kid who plays it individually, but its contest approach to teaching makes it perfect for groups. Kids love competition, and this game's support for multiple players makes it one of those educational games that can turn a computer into an activity center in a classroom or family den.

CAROL ELLISON



Mutanoid Math Challenge makes learning math concepts fun, and it's ideal for use either at home or in the classroom.

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Circle Reader Service Number 448

SPACE ACE II: BORF'S REVENGE

Step into the world of Saturday-morning superheroes with Space Ace II: Borf's Revenge, a nonstop arcade battle of good versus evil.

In the previous episode, the villainous Borf unleashed the terrible Infanto Ray—a weapon capable of turning anyone into a helpless infant with a single blast. The big, blue fiend had hoped to turn the Earth into one big day care center. But Space Ace turned the tables and saved the day, zapping Borf into a harmless peewee.

As the new game begins, Borf's tenacious Goon squad has restored its pint-sized leader to his larger-than-life evilness. An enraged Borf then kidnaps Ace's girlfriend, Kimberly, and attempts a getaway. You must race to her defense, battling a relentless series of monsters, robots, and other deadly threats.

The game's look and feel is inspired by Don Bluth, a former Disney animator who pioneered the first laser disc coin-op game, Dragon's Lair. The theater-quality cartoon graphics and digitized sound are nearly seamless on a hard drive. This type of game begs for a CD-ROM treatment.

Though beautifully drawn and smoothly animated, the design suffers from serious structural flaws. Simply put, the story doesn't flow, it lunges forward at breakneck speed. Transitions between scenes are usually clipped, and often missing entirely. The results are disjointed and confusing, with no sense of plot progression.

Another problem is a complete lack of strategy. Player input is limited to simple knee-jerk reactions—pressing one of five keys in response to the onscreen action. The game's linear story line allows absolutely no digression from the prescribed course of action. False moves are rewarded not with an alternate direction, but with instant death. Even the fastest, cruelest arcade games offer more

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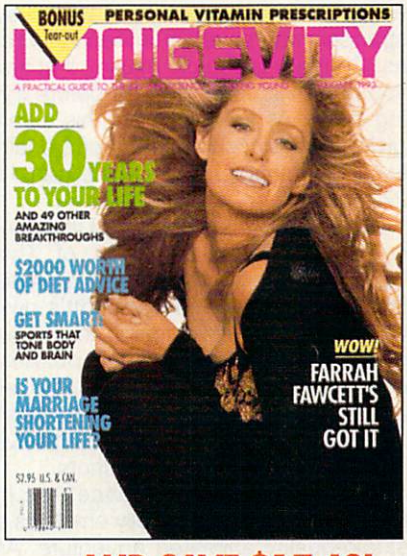

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than one path to success or failure. This game is a bullet train with no stops and only one destination. Fail to switch tracks at the precise moment and the whole thing derails.

Average games last under a minute for experienced players and mere seconds for arcade rookies. Having only three tries to complete the adventure adds to your frustration; luckily, a save option lets you start the game at the beginning of the last unfinished scene. Unfortunately, once invoked, this save feature is automatic: If you fail once or twice and then succeed, the game overwrites your last position, leaving you stranded with severely limited resources. Contrary to the old maxim, if at first you don't succeed, give up before trying again. As if admitting to this unforgiving difficulty, the manual offers fairly explicit hints for each of the game's 27 scenes.

More satisfying examples of this genre include Interplay's Out of This World, Dynamix's Adventures of Willie Beamish, and even ReadySoft's own Guy Spy series. In addition to a solid mix of arcade action and logic puzzles, each of those games takes time to tell a viable story, using such "camera" techniques as panning, noninteractive segues, and long tracking shots.

Technically brilliant, Space Ace II: Borf's Revenge successfully emulates a studio-quality animated adventure. As an interactive game, however, most of the fun seems to have been left on the cutting room floor.

SCOTT A. MAY

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COFFEE BREAK GAMBLING

As new game designs begin to stretch the limits of time and space—your time and hard drive space, that is—Villa Crespo heads in the opposite direction with its Coffee Break Series. These compact, budget-priced games deliver instantly accessible quality entertainment that's playable from floppy or hard disk.

Villa Crespo is best known for casino-style gambling simulations, so it's not surprising that the top picks in this burgeoning series are games of strategy and chance. Dr. Wong's Jacks & Video Poker is an abridged version of one of the company's biggest-selling titles. Where the original offers five variations of video poker, the condensed version contains only Jacks or Better, by far the most popular style.

Features include an adjustable bankroll, online tutorial and advice, hand analysis, and calculated returns. The only feature sorely missing from the original is simultaneous two-player tournament mode. Bells and whistles include somewhat garish—albeit realistic—low-resolution graphics and digitized sound effects.

Dr. Thorp's Mini Blackjack is the abbreviated version of another full-fledged simulation. Up to six players can compete against the dealer, utilizing such standard casino options as double down, split, surrender, push, and insurance. Advanced features include two levels of house rules, each fully adjustable and surprisingly detailed. In addition to online strategy tables and a basic blackjack tutorial, the game also teaches three methods of card counting.

Casino Craps is a delightful re-creation of the fast-paced dice game. High-resolution graphics and much-improved mouse controls embellish this dynamic one-player simulation. Extensive onscreen help thoroughly explains the nuances of odds and wagers, field bets, hard numbers, and center-table bets. Highlights include three levels of statistical analysis and player histories. Animated onscreen characters and digitized sound samples give this game a distinctive personality. Casino Craps is easily one of the best in the series.

Last, but far from least, is Amarillo Slim's 7 Card Stud, a condensed version of Villa Crespo's outstanding poker simulation. Better than a heated match in a smoke-filled back room, the game pits one player against 2–7 computer opponents. Online help screens and tutorial advice guide greenhorns through the rules and strategies of building a winning hand. Choose from the 15 available players, each with a digitized voice and unique style of play, who are divided among the game's three skill levels. You can also customize the house rules—maximum bets, raise limits, blind bets, and so on—to make every session unique. More than any game in the series, this one beckons players to seek out the full-blown version, Dealer's Choice, featuring 28 poker variations.

Short and sweet, the Coffee Break Series from Villa Crespo proves that bigger isn't necessarily better.

SCOTT A. MAY

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THE OPERATION: FIGHTING TIGER

The apple doesn't fall far from the tree, as they say, and The Operation: Fighting Tiger expansion kit for Falcon 3.0 from Spectrum HoloByte is an enhancement of its rich, dense parent game. Falcon plus OFT equals fighter-plane heaven. This is the only way to fly.

Disk 1 of OFT patches the parent program all the way up to the current version (3.01); this should make happy all those who expected Falcon 3.0 to fly in full trim right out of the box and weren't prepared for the open-house gamma test—with a consequent stream of fixes and tweaks—that was the sad reality. OFT adds three huge and varied (and alliterative) new theaters of operations—Korea, Kashmir, and the Kurile Islands—which should please pilots who found that the game's scope didn't match its size.

And OFT improves the game engine with a wide variety of pleasant new wrinkles: new commands to issue to wing men, the ability to set difficulty levels for campaigns, an overcast sky (which looks great), more night flying, and too many lesser refinements to mention. It's also more stable and reliable, and hence more satisfying—and not just in the new theaters. The original theaters, which are not overwritten by OFT, enjoy all the benefits of the new features. And, of course, all the best features of the original game—from the masterful terrain to the involving campaigns—are in full force here. (Indeed, the campaigns here seem tougher, if anything.)

OFT is a bit more demanding of memory—now requiring a touch over 616,000 bytes (and another 3MB on your hard drive, for a total of 14MB)—and even that extra 2K RAM meant I had to jigger my four-meg system a bit in order to load a mouse driver *and* get the digitized voice in radio broadcasts.

And, unfortunately, OFT also inherited a touch of the original sim's . . . shall we say, *unfinished* quality? The installation program in the initial release couldn't find the correctly named FALCON3 directory on my C drive and, once I identified the directory for it, wouldn't install the files. (That's about the worst possible place for a bug to appear. Imagine buying a toaster oven and finding the power cord cut in half.) Mercifully, Spectrum has been quick off the line with a fix, and a new installation program—followed by a full-blown upgrade of the upgrade (to 3.01.1)—was issued in October.

However, my criticism isn't of OFT so much as of Falcon 3.0. I do wish it'd been closer to this condition when it was originally released. In a sense, this set of data disks isn't so much an add-on as the final upgrade. I suppose that in a competitive market exploiting new technology, the phenomenon of games like Falcon and Darklands growing up in public shouldn't be such a surprise. But we wouldn't settle for it in any other type of consumer product, and I don't see why we should here. (Other developers—notably Sir-Tech with Crusaders of the Dark Savant—have opted to keep long-awaited games under wraps until they were ready.)

I don't mean to minimize the achievement here, however. This is a brilliant piece of work, and I can't imagine any devoted Falcon 3.0 flyer not loving it. Some things are worth waiting for. This is one of them.

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PRACTICAL FAXME

First, there was Long Distance Xerography; then came the first desktop fax, the Telecopier I. Soon after, improvements in fax technology developed to the point where today we have automatic, plain-paper fax machines and computer software and hardware that can turn your system into a fax machine. Recently, Practical Peripherals introduced the new Practical FaxMe cartridge. This device turns any Hewlett-Packard LaserJet series II or III printer with at least 1MB of expansion memory into a plain-paper fax machine for receiving faxes.

Unlike adding a fax board to a computer, the FaxMe is easy to install. You simply insert the cartridge into the slot of the LaserJet and attach the phone connector—and you're all set. If you do nothing else, as long as your printer is on and the phone line is connected, the FaxMe changes your LaserJet printer into a plain-paper fax receiver.

Most people, though, won't want to simply turn their printer into a fax machine; they'll also want to use the LaserJet for its original purpose. Don't worry, you still can. The FaxMe cartridge is designed with a full range of settings and options, the most important being the three operations modes: fax receiving only, printer only, and automatic switching. You can also set the FaxMe with the date, day of the week, time, speed, and other usual settings you'd expect to set on a fax machine. As when you make changes to the settings on the LaserJet, setting or changing the settings of the FaxMe involves pushing a series of buttons on the printer's control panel in the correct order.

I tested the FaxMe on the LaserJet II and IIP by sending faxes that varied in length and density of type and graphics. All faxes were received in acceptable quality on plain paper. I also sent the same faxes to my office's regular fax machine, which uses standard rolled fax paper. As you'd expect, plain-paper faxes are much easier to handle, not to mention more convenient. There wasn't much difference in the quality of the graphics on the LaserJet/FaxMe combo compared to the regular fax machine with rolled paper. The text, though—including the entire TrueType Wingdings font—printed more clearly with the FaxMe.

Who needs the FaxMe? It doesn't replace a regular fax machine or a fax board in a computer, since it doesn't send faxes. The FaxMe is priced lower than most plain-paper fax machines, though. Therefore, if you have a LaserJet with enough memory and only need a fax-receiving device, this may

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be just what you need. You also might find the built-in battery an important option to consider. Once you've set the cartridge, you don't have to keep resetting it.

The FaxMe operates as advertised and comes with a lifetime limited warranty. But it's not for everyone. Those who need to both receive and send faxes might want to consider another option. But if you only intend to receive faxes or if you're considering replacing your fax machine because you're tired of rolled-up faxes, you might consider the Practical FaxMe cartridge as an effective alternative.

STEPHEN LEVY

Practical Peripherals
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Circle Reader Service Number 452

MIXED-UP FAIRY TALES

Have you seen this child? Not if the child's been playing Mixed-Up Fairy Tales, a new educational adventure game from Sierra On-Line. It teaches children to disappear with threatening-looking strangers.

Of course, in Mixed-Up Fairy Tales the stranger is a benign, bespectacled dragon called Bookwyrm who appears to the child in a library, materializing from a book. Bookwyrm encourages the child to follow him to a magical land where water tastes like grape soda and every action plays against a synthesized soundtrack provided by Bach and Mozart. And while Bookwyrm may be a stranger in the beginning, his land has characters as familiar as Snow White and the seven dwarves, Jack (of beanstalk fame), and Cinderella.

All is not well in Bookwyrm's fairy tale sphere, though. An aptly named little hairball called Bookend has—you guessed it—mixed up all the fairy tales. It's the child's job to put them together again. Thanks to the well-designed, mouse-oriented interface of Mixed-Up Fairy Tales, doing so becomes an entertaining, educational challenge loaded with enough difficulties to be interesting but not enough to become frustrating.

The package comes with a concise, helpful manual; a book with bowdlerized versions of the real fairy tales; and a Mixed-Up Fairy Tales coloring book complete with crayons. The disks come with a self-explanatory installation program, which takes even novice computer users by the hand and walks them painlessly through the process. My biggest problem was finding enough memory to run the program—you need about 535K RAM free to load Mixed-Up Fairy Tales.

Another problem I encountered was a virus Norton AntiVirus discovered in the sound drivers for Mixed-Up Fairy Tales. Repeated attempts to call Sierra's technical-support line yielded only busy signals. Later, Norton AntiVirus reported the same virus in a sound driver for an unrelated program, making me wonder whether the virus report was accurate. I still don't know, since I never was able to get through to Sierra and find out.

Mixed-Up Fairy Tales is intended for children ages 7 and up. There's a fair amount of reading required, but no typing. Every action comes as the result of a simple mouse click (or a much less intuitive keyboard command; you really need a mouse). Whether you're looking at an object, moving to a new screen, or talking to a fairy-tale character, manipulating your character quickly becomes second nature.

If the classical music never sounds quite as good as in the concert hall—at best it's a synthesized approximation, at worst a bad imitation of funeral-home organ music—Mixed-Up Fairy Tales comes with a better-than-average soundtrack and a good mix of sound effects. You can hear water streaming down a waterfall and listen to Cinderella disappear in her pumpkin coach in a dizzying flourish, although a frog's hops sound more like a series of barely audible violin squawks. The better your sound capabilities, the better the sound, of course.

After a brief introduction from each character you encounter, you must guess which of five fairy tales the character belongs to. It takes two or three actions to help each character complete his or her story, all of which end with a reassuring "And they lived happily ever after." The fairy tale territory looks like a pleasant enough place to run out the clock, although visually it leaves a few things to be desired. I played the 256-color VGA version, which features a nice array of backdrops but rather choppy characters. The land bears an unsurprising resemblance to Sierra's companion game, Mixed-Up Mother Goose.

As with Mixed-Up Mother Goose, most of the action in Mixed-Up Fairy Tales takes place at a gentle pace, but there are a couple of moments of high drama. At one point you get to chase Bookend cross-country to retrieve an object, and another time you get to watch the giant crash to the ground from Jack's beanstalk, leaving a giant-shaped hole in the ground.

Don't worry about a child disappearing into the game, though: It's actually a nice place to get lost in, and an educational way for modern technology to bring to life some vintage stories.

EDDIE HUFFMAN

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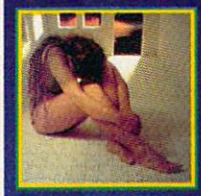

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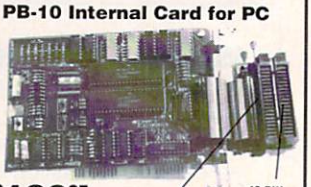

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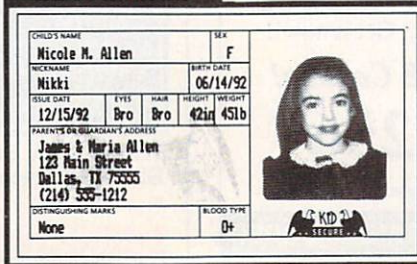

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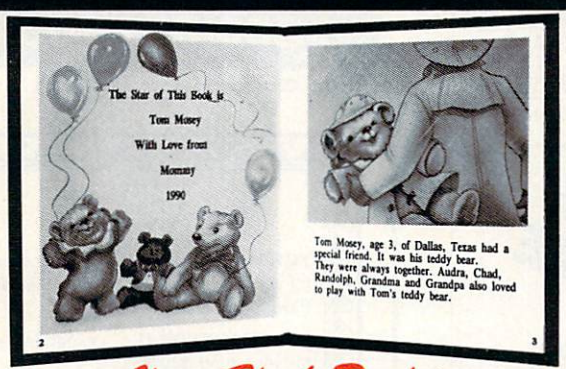

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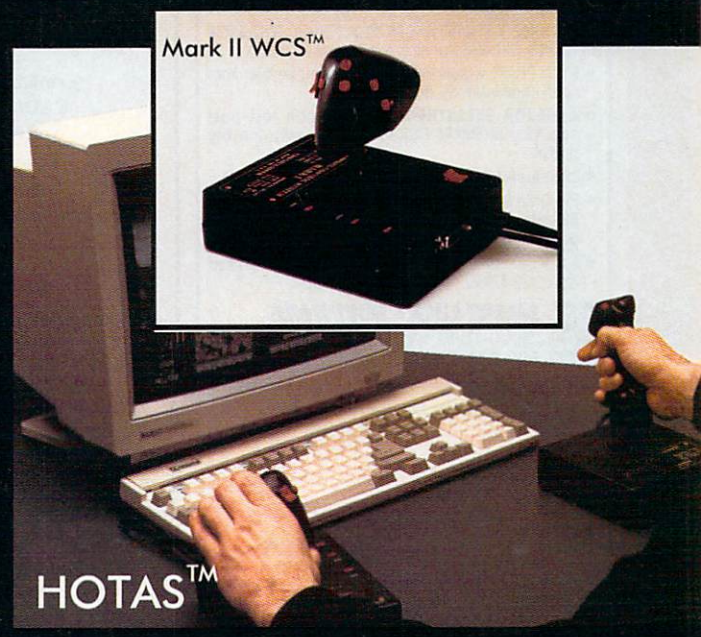

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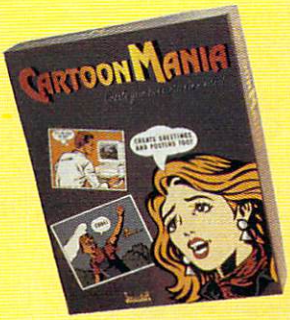

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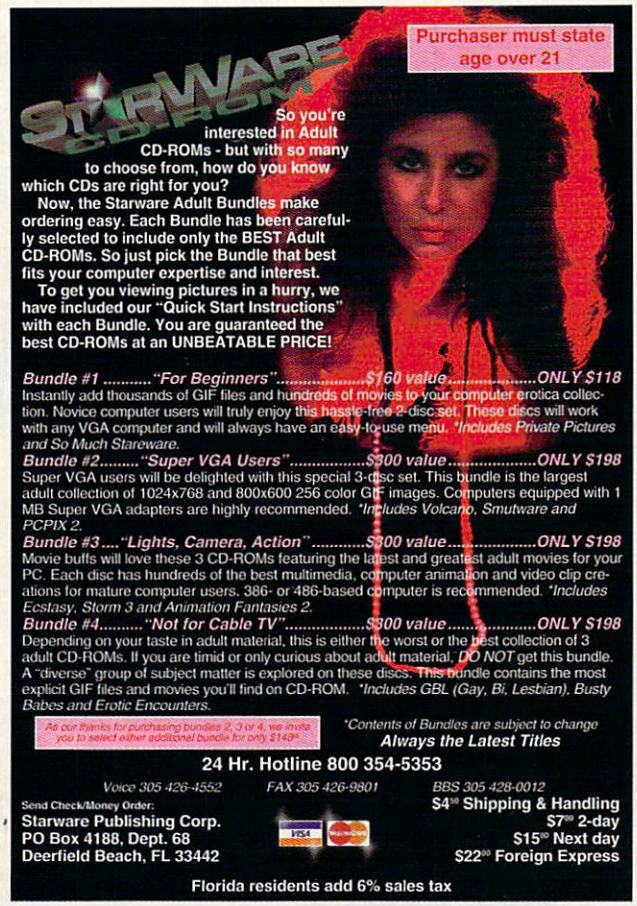

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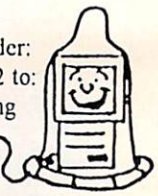

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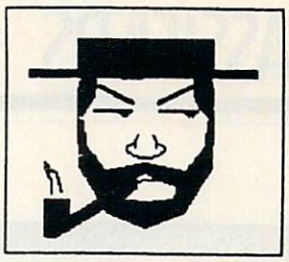

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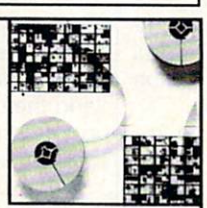

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NEWS BITS

Jill Champion

Bringing ethics to Justice, sending mice into space, packaging TSN for the masses, winning big money with software, and more

The Right Stuff

Product design gave Microsoft's BallPoint mouse the edge when it was chosen for NASA's shuttle mission last April. The BallPoint mouse was launched with the *Discovery* crew, attached to the Payload and General Support Computer that ran the shuttle's primary scientific project, the Atmospheric Laboratory for Science and Applications (ATLAS 2).

Historically, NASA has encountered problems working with computer mice in space, as zero gravity tends to send the user floating in the opposite direction of the mouse.

Microsoft's BallPoint mouse design, particularly its breakaway mounting, made it acceptable to the crew and safe for other equipment. "However," said Patrick O. Wilson, project engineer at Johnson Space Center, "the main advantage was that we didn't need to modify the mouse to keep the trackball from floating in zero-g."

Score Your Own Video

Binary Zoo, a Brøderbund affiliate, is sponsoring a Rock and Bach Studio Best Video Contest, in which contestants create their own music videos using Binary Zoo's new Rock and Bach Studio software program. Entries must be submitted on PC disks, and all entries must be created using Rock and Bach Studio tools.

The Best Video Production winner will receive $100 in Brøderbund software, the Best Music winner will receive $200 in software, and the Best Overall Video winner will receive $300 in products. Each winner will also receive his or her choice of a Binary Zoo product.

The deadline for entries is September 30, 1993. If you would like to have further information about the contest, contact Binary Zoo, P.O. Box 3210, Champlain, New York 12919; (514) 846-4059.

Game Modem

Best Data Products and The Sierra Network (TSN) recently announced a new bundled product, Game Modem, that includes TSN's multiplayer game software and Best Data Products' internal 2400-bps modem.

"Our goal is to work with TSN to position the modem as a standard game-playing peripheral, just like a joystick or sound card," says Tony Esfandiari, Best Data Products' executive vice president of strategic alliance. "At less than $50 for the modem and more than seven megabytes of game software in the package, Game Modem is already competitive with other products on the computer game shelf priced $10 to $15 more." Plus, the TSN Membership Kit that's included gives members three free hours of evening or weekend access to the entire interactive network and a $30 credit toward TSN membership and usage.

The Sierra Network is already low-priced at its flat-rate fee of $12.95 per month.

Look for Game Modem in the games software section of your favorite retailer.

Inoculate Your PC

Avoid viral infection for less. Virex for the PC, the popular antivirus software, is now available in a newly released version and at a newly suggested retail price that's been cut in half. Version 2.7 will retail for around $49.95; previous versions sold for $99.95.

"The price reduction reflects Datawatch's commitment to be the industry leader in antiviral solutions," says Andrew W. Mathews, general manager of Datawatch's Triangle Software Division, (3700-B Lyckan Parkway, Durham, North Carolina 27707; 919-490-1277, 919-490-6672 fax). Along with the price slash, Datawatch also offers *free* upgrades via BBS.

Display Your Best

Dust off that screen saver you've been working on. Berkeley Systems announced its After Dark Display Contest for 1993. This year's contest includes categories for both Windows and Macintosh environments and a category for computer artists.

A $10,000 grand prize will be awarded for Best Entry Overall. Other prizes include a Fujitsu 2.0 GB M2652SA hard drive, a Compaq Contura 3/25c Model 84 PC, and an Epson ES800C color scanner with interface kit.

Winning displays may be included in future releases of After Dark products, and all winners will receive an engraved Flying Toaster trophy.

The deadline for submissions is midnight, July 15, 1993. To obtain entry forms, contact Berkeley Systems at (510) 540-5535, (510) 540-5115 (fax).

You Can't Cheat on This One

Legend Entertainment, known for its sci-fi and adventure games, has a contract to develop an interactive ethics-training program for Justice Department employees.

In the game, Justice Department employees will learn to do well by doing good. They will choose career goals and then make choices that will bring them "career, happiness, and ethics points—or land them in trouble," according to Legend's president, Bob Bates.

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☐ Other IBM/PC Compatible (5) ☐ Laptop/Notebook (6)

B. At home, do you use your computer mostly for ☐ Personal Finance (7) ☐ Work/Home Business (8)
☐ Entertainment (9) ☐ All of the Above (10)

C. Would you classify yourself as a(n) ☐ Entrepreneur (11) ☐ Telecommuter (12) ☐ Moonlighter (13)
☐ Corporate Employee who brings work home (14)

D. Which online service(s) do you use? ☐ CompuServe (15) ☐ GEnie (16) ☐ America Online (17) ☐ Prodigy (18)

E. What other computer magazines do you subscribe to? ☐ PC/Computing (19) ☐ MPC World (20)
☐ Computer Gaming World (21) ☐ Home Office Computing (22) ☐ PC Magazine (23) ☐ PC World (24)

F. Which Graphical User Interface do you use? ☐ Windows (25) ☐ GeoWorks (26) ☐ Other (27) ☐ None (28)

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K. What is your age? ☐ 18–24 (41) ☐ 25–34 (42) ☐ 35–49 (43) ☐ 50+ (44)

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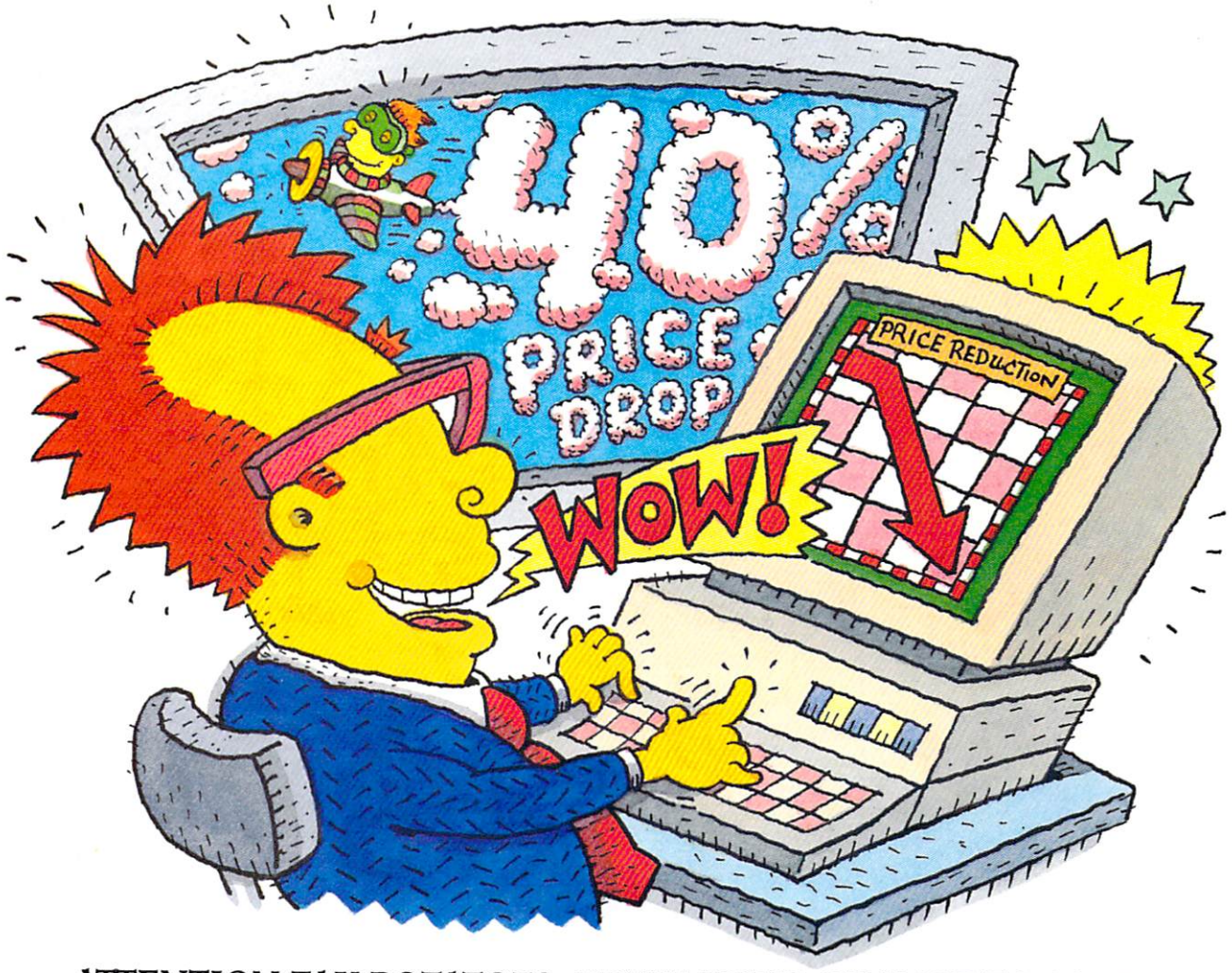

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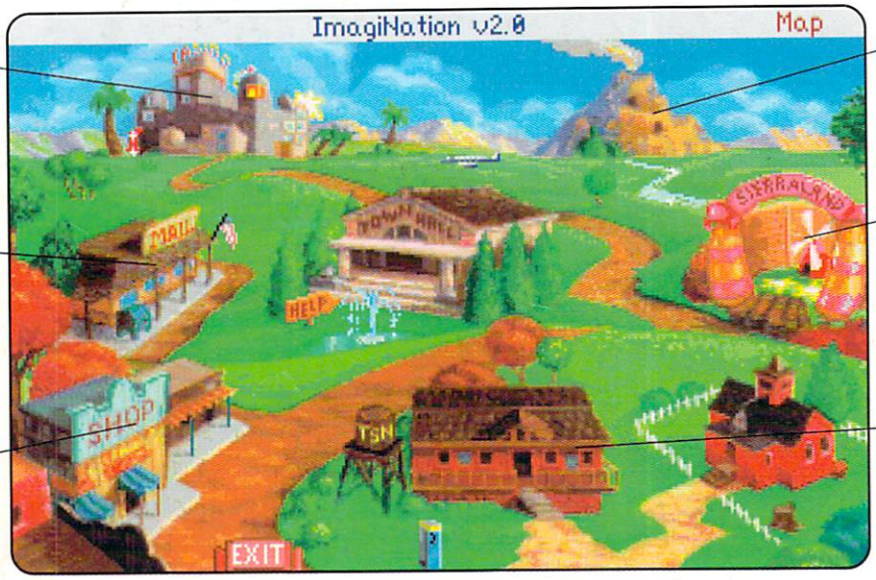

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