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April 1987

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Eureka: The Solver™

Anyone and everyone who routinely works with equations needs Eureka: The Solver

It solves the most complex equations in seconds. Whether you're a scientist, engineer, financial analyst, student, teacher, or some other professional, you need Eureka: The Solver!

Any problem that can be expressed as a linear or non-linear equation can be solved with Eureka. Algebra, Trigonometry and Calculus problems are a snap.

Eureka: The Solver also handles maximization and minimization problems, does plot functions, generates reports, and saves you an incredible amount of time.

$X + \exp(X) = 10$ solved instantly instead of eventually!

Imagine you have to "solve for X," where $X + \exp(X) = 10$, and you don't have Eureka: The Solver. What you do have is a problem, because it's going to take a lot of time guessing at "X." Maybe your guesses get closer and closer to the right answer, but it's also getting closer and closer to midnight and you're doing it the hard way.

With Eureka: The Solver, there's no guessing, no dancing in the dark—you get the right answer, right now. (PS: $X = 2.0705799$, and Eureka solved that one in .4 of a second!)

How to use Eureka: The Solver

It's easy.

1. Enter your equation into the full-screen editor
2. Select the "Solve" command
3. Look at the answer
4. You're done

You can then tell Eureka to

- Evaluate your solution
- Plot a graph
- Generate a report, then send the output to your printer, disk file or screen
- Or all of the above

Eureka: The Solver includes

- ✓ A full-screen editor
- ✓ Pull-down menus
- ✓ Context-sensitive Help
- ✓ On-screen calculator
- ✓ Automatic 8087 math co-processor chip support
- ✓ Powerful financial functions
- ✓ Built-in and user-defined math and financial functions
- ✓ Ability to generate reports complete with plots and lists
- ✓ Polynomial finder
- ✓ Inequality solutions

*Introductory price—good through July 1, 1987

Some of Eureka's key features

You can key in:

- ✓ A formula or formulas
- ✓ A series of equations—and solve for all variables
- ✓ Constraints (like X has to be < or = 2)
- ✓ A function to plot
- ✓ Unit conversions
- ✓ Maximization and minimization problems
- ✓ Interest Rate/Present Value calculations
- ✓ Variables we call "What happens?," like "What happens if I change this variable to 21 and that variable to 27?"

All this power for only \$99.95!

Equation-solving used to be a mainframe problem, but we've solved that problem.

Eureka: The Solver is all you need—and it's yours for only \$99.95!

That kind of savings you can calculate with your fingers!

System requirements

IBM PC, AT, XT, Portable, 3270 or true compatibles. PC-DOS IMS-DOS) 2.0 and later. 384K.

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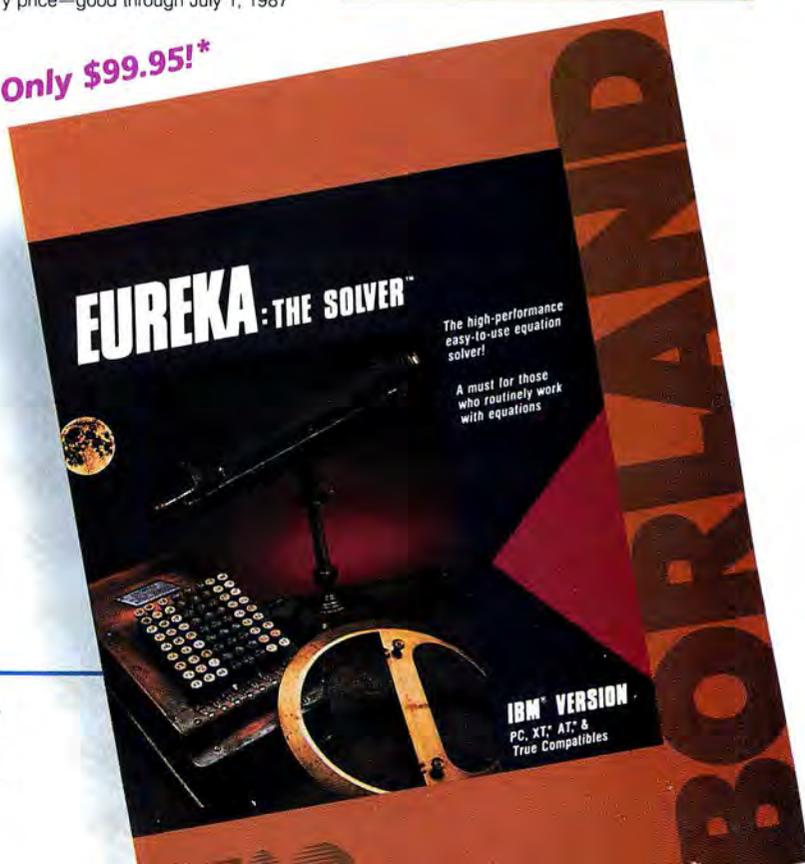
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Turbo Basic is a complete development environment; it includes a lightning-fast compiler, an interactive editor, and a trace debugging system.

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“ Borland has succeeded in stretching the language without weighing us down with unnecessary details . . . Turbo Basic is the answer to my wish for a simple yet blindingly fast recreational utility language . . . The one language you can't forget how to use, Turbo Basic is a computer language for the missus, the masters, the masses, and me.

Steve Gibson, InfoWorld

Borland's Turbo Basic has advantages over the Microsoft product, including support of the high-speed 8087 math chip.

John C. Dvorak ♣

Turbo Basic ends the basic confusion

There's now one standard: Turbo Basic.

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Free spreadsheet included, complete with source code!

Yes, we've included MicroCalc, our sample spreadsheet, complete with source code, so that you can get started right away with a "real program." You can compile and run it "as is," or modify it.

A technical look at Turbo Basic

- ✓ Full recursion supported
- ✓ Standard IEEE floating-point format
- ✓ Floating-point support, with full 8087 (math co-processor) integration. Software emulation if no 8087 present
- ✓ Program size limited only by available memory (no 64K limitation)
- ✓ EGA and CGA support
- ✓ Access to local, static, and global variables
- ✓ Full integration of the compiler, editor, and executable program, with separate windows for editing, messages, tracing, and execution
- ✓ Compile, run-time, and I/O errors place you in the source code where error occurred
- ✓ New long integer (32-bit) data type
- ✓ Full 80-bit precision
- ✓ Pull-down menus
- ✓ Full window management

System requirements

IBM PC, XT, AT and true compatibles, PC-DOS (MS-DOS) 2.0 or later. One floppy drive, 256K.

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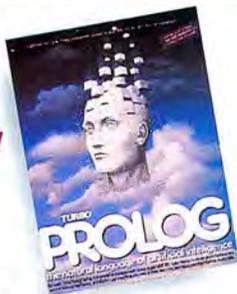


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“ If you're at all interested in artificial intelligence, databases, expert systems, or new ways of thinking about programming, by all means plunk down your \$100 and buy a copy of Turbo Prolog.

Bruce Webster, BYTE ¶¶

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Turbo Prolog, the natural language of Artificial Intelligence, is the most popular AI package in the world with more than 100,000 users. It's the 5th-generation computer programming language that brings supercomputer power to your IBM PC and compatibles. You can join the AI revolution with Turbo Prolog for only \$99.95. Step-by-step tutorials, demo programs and source code included.

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New Turbo Prolog Toolbox features include:

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- ☑ Complete communications package
- ☑ File transfers from Reflex, dBASE III, 1-2-3, Symphony
- ☑ A unique parser generator
- ☑ Sophisticated user-interface design tools

System requirements

Turbo Prolog: IBM PC, XT, AT or true compatibles. PC-DOS (MS-DOS) 2.0 or later. 384K. Turbo Prolog Toolbox requires Turbo Prolog 1.10 or higher. Dual-floppy disk drive or hard disk. 512K.

It's the complete developer's toolbox and a major addition to Turbo Prolog. You get a wide variety of menus—pull-down, pop-up, line, tree and box—so you can choose the one that suits your application best. You'll quickly and easily learn how to produce graphics; set up communications with remote devices; read information from Reflex, dBASE III, Lotus 1-2-3 and Symphony files; generate parsers and design user interfaces. All of this for only \$99.95.

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Jeff Duntemann, PC Magazine ¶¶

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5. 5-term Polynomial

They're all ready to compile and run.

All this for only \$99.95!

System requirements

IBM PC, XT, AT or true compatibles. PC-DOS (MS-DOS) 2.0 or later. Turbo Pascal 2.0 or later. Graphics module requires graphics monitor with IBM CGA, IBM EGA, or Hercules compatible adapter card, and requires Turbo Graphix Toolbox. 8087 or 80287 numeric coprocessor not required, but recommended for optimal performance. 256K.

Turbo Pascal 3.0

Includes 8087 & BCD features for 16-bit MS-DOS and CP/M-86 systems. CP/M-80 version minimum memory: 48K; 8087 and BCD features not available. 128K.



Turbo C[®]

Turbo C: The fastest, most efficient and easy-to-use C compiler at any price

Compilation speed is more than 7000 lines a minute, which makes anything less than Turbo C an exercise in slow motion. Expect what only Borland delivers: Quality, Speed, Power and Price.

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If you're already programming in C, switching to Turbo C will considerably increase your productivity and help make your programs both smaller and faster. Actually, writing in Turbo C is a highly productive and effective method—and we speak from experience. Eureka: The Solver and our new generation of software have been developed using Turbo C.

Turbo C: a complete interactive development environment

Free MicroCalc spreadsheet with source code

Like Turbo Pascal and Turbo Prolog, Turbo C comes

with an interactive editor that will show you syntax errors right in your source code. Developing, debugging, and running a Turbo C program is a snap.

Turbo C: The C compiler everybody's been waiting for. Everybody but the competition

Borland's "Quality, Speed, Power and Price" commitment isn't idle corporate chatter. The \$99.95 price tag on Turbo C isn't a "typo," it's real. So if you'd like to learn C in a hurry, pick up the phone. If you're already using C, switch to Turbo C and see the difference for yourself.

System requirements

IBM PC, XT, AT and true compatibles. PC-DOS (MS-DOS) 2.0 or later. One floppy drive. 320K.

Technical Specifications

- ✓ **Compiler:** One-pass compiler generating linkable object modules and inline assembler. Included is Borland's high performance "Turbo Linker." The object module is compatible with the PC-DOS linker. Supports tiny, small, compact, medium, large, and huge memory model libraries. Can mix models with near and far pointers. Includes floating point emulator (utilizes 8087/80287 if installed).
- ✓ **Interactive Editor:** The system includes a powerful, interactive full-screen text editor. If the compiler detects an error, the editor automatically positions the cursor appropriately in the source code.
- ✓ **Development Environment:** A powerful "Make" is included so that managing Turbo C program development is highly efficient. Also includes pull-down menus and windows.
- ✓ **Links with relocatable object modules** created using Borland's Turbo Prolog into a single program.
- ✓ **ANSI C compatible.**
- ✓ **Start-up routine source code included.**
- ✓ **Both command line and integrated environment versions included.**

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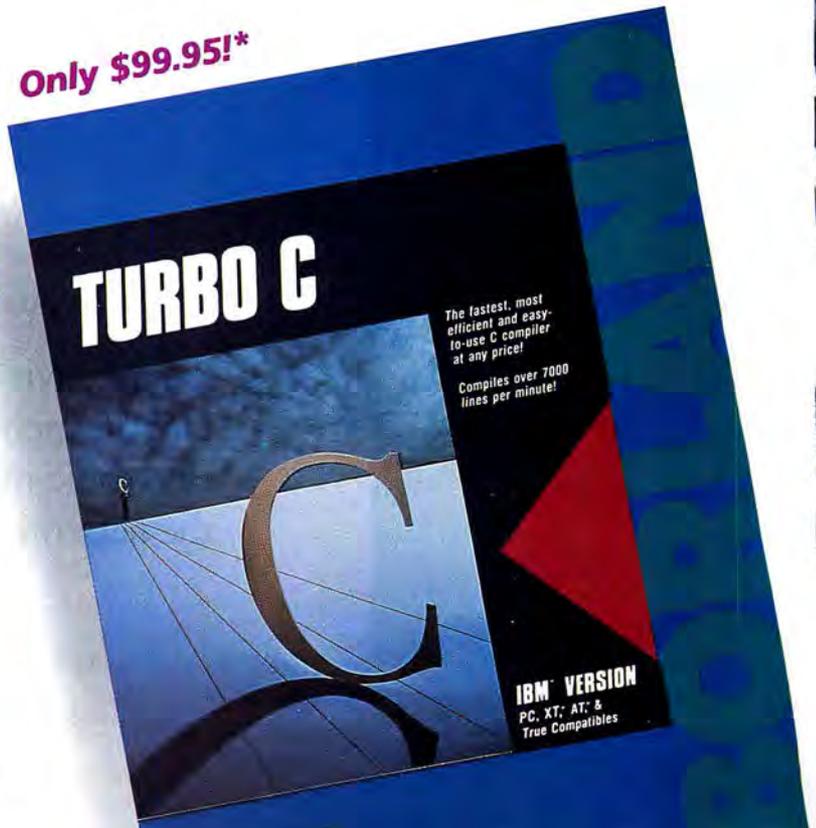
Sieve benchmark (25 iterations)

	Turbo C	Microsoft® C	Lattice C
Compile time	3.89	16.37	13.90
Compile and link time	9.94	29.06	27.79
Execution time	5.77	9.51	13.79
Object code size	274	297	301
Price	\$99.95	\$450.00	\$500.00

Benchmark run on a 6 Mhz IBM AT using Turbo C version 1.0 and the Turbo Linker version 1.0; Microsoft C version 4.0 and the MS overlay linker version 3.51; Lattice C version 3.1 and the MS object linker version 3.05.

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PC WORLD

The Comprehensive Guide to IBM Personal Computers and Compatibles
April 1987



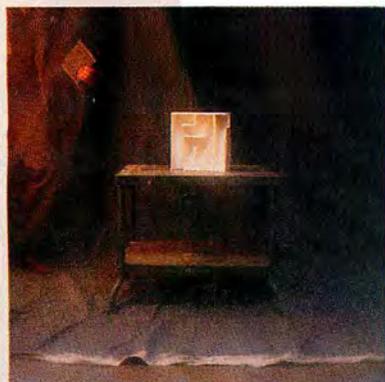
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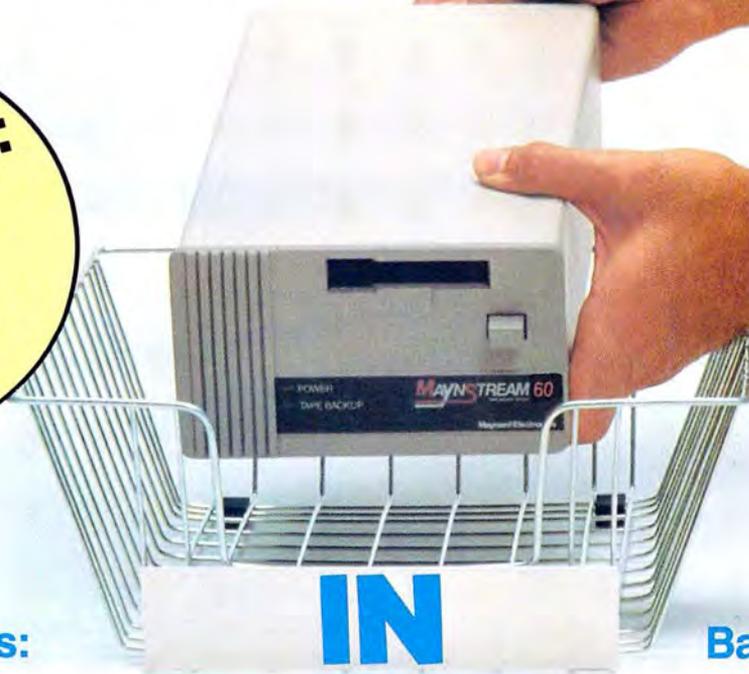
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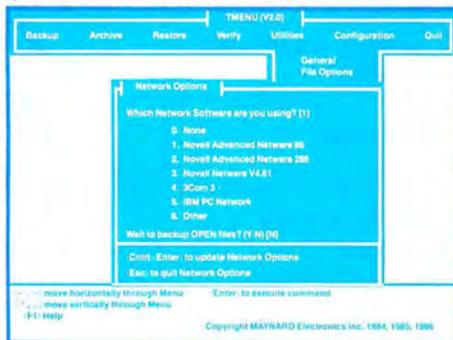
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That's why Master Piece contains a unique two-stage surge suppression circuit incorporating a high-speed silicon semiconductor for the quick reaction necessary and a heavy-duty metal oxide varistor for the brute force required to keep even the largest surges from penetrating into your system.



Master Piece and Master Piece Plus

Meets IEEE 587-1980 Category A	✓
Meets IEEE 587-1980 Category B	✓
UL Listed	✓

The right surge suppressor passes all the tests.

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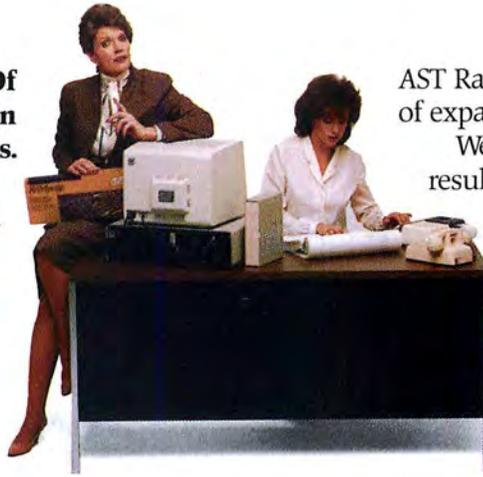
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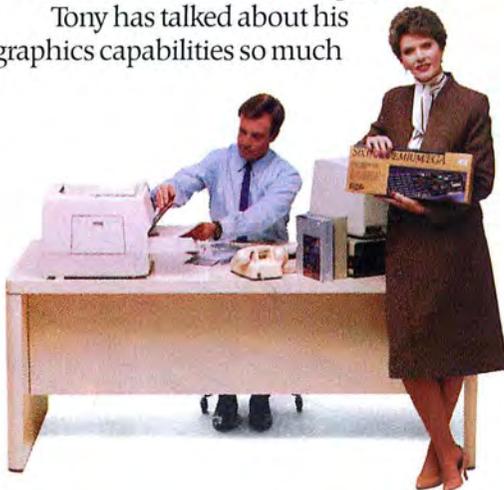
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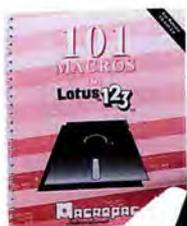


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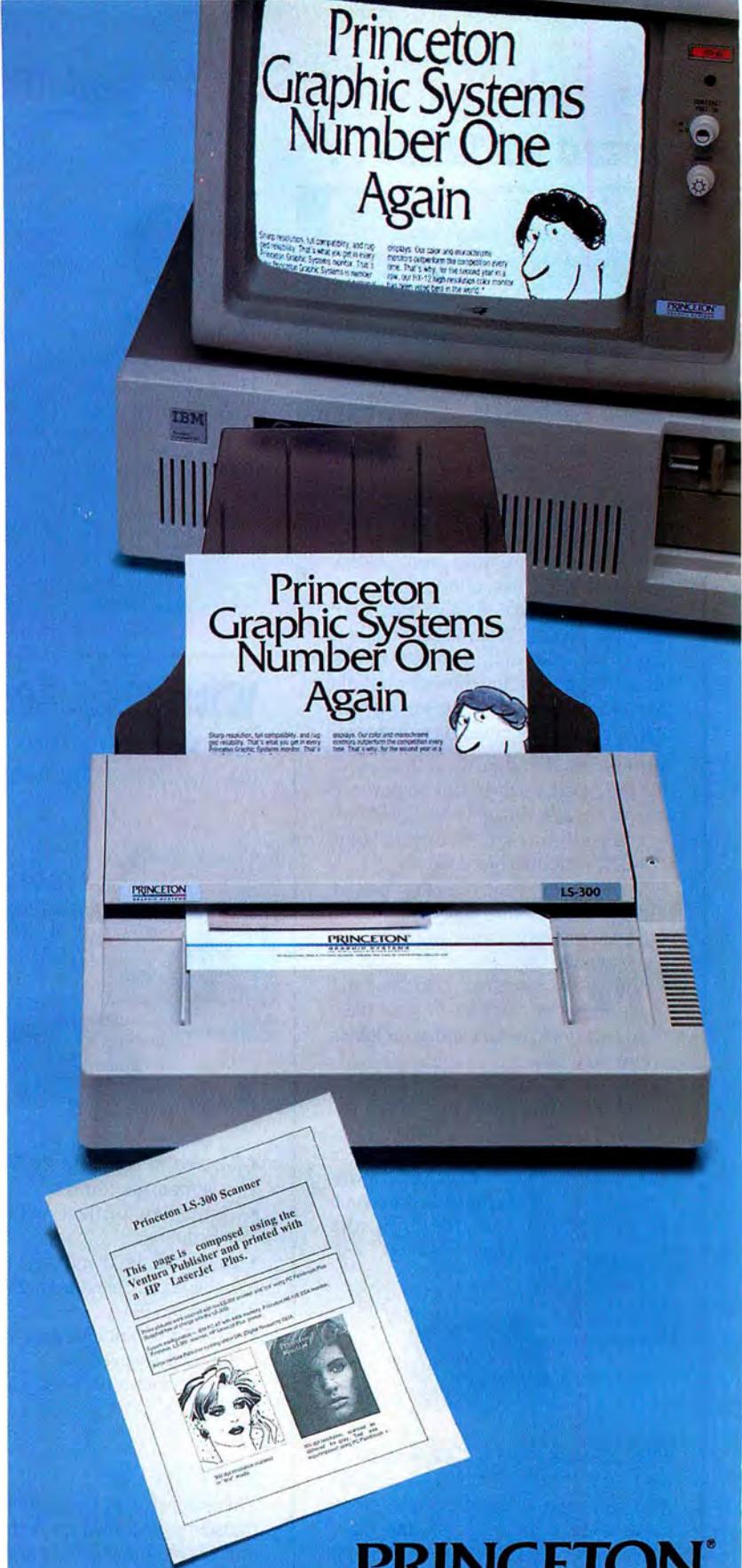
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David Bunnell

Guess what happens when the hackers grow up and the AI combines take over? Meet Cyberpunk, the Neurohacker of the future.

Neuromancing the PC

Last fall, I happened to bump into Dr. Timothy Leary at the Hackers 2.0 conference in the wooded hills of Saratoga, California. There, in that pastoral scene, I asked Leary what he was up to. He replied that he had started his own software company called Futique (the opposite of *antique*, get it?), and that he was under contract with the software game company Activision to make three “mind movies” based on the William Gibson cult novel *Neuromancer*, which is also being produced as a film.

First the book, then the mind movie, and then the movie movie? I must admit, I wasn’t inclined to take Leary seriously at first because of his reputation as the acid king of the sixties.

I had never met the good doctor before, and I hadn’t yet read Gibson’s *Neuromancer*, but as I listened to Leary explain his mind movie concept, I became more and more impressed.

It’s apparent that his game represents a radical departure in the genre of interactive software enter-

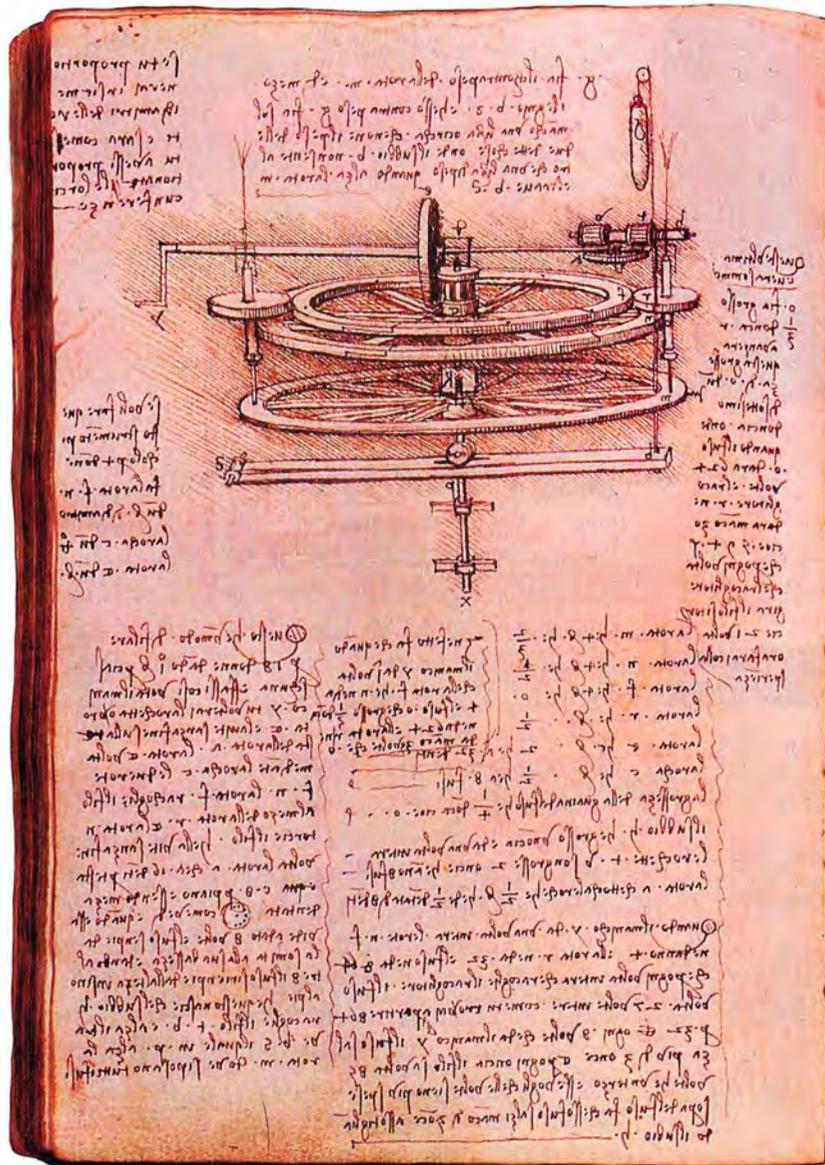
tainment. The central idea is that you, the player, become the producer and director of your own film—or mind movie—based on the *Neuromancer* book.

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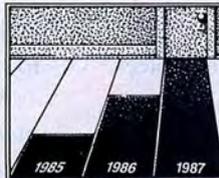
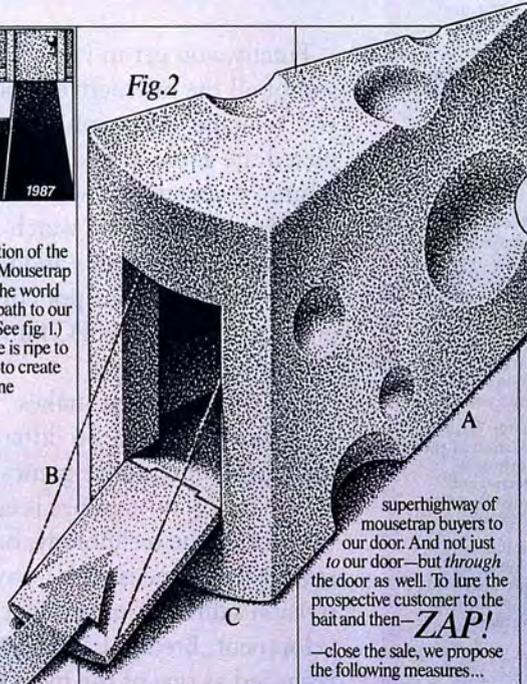


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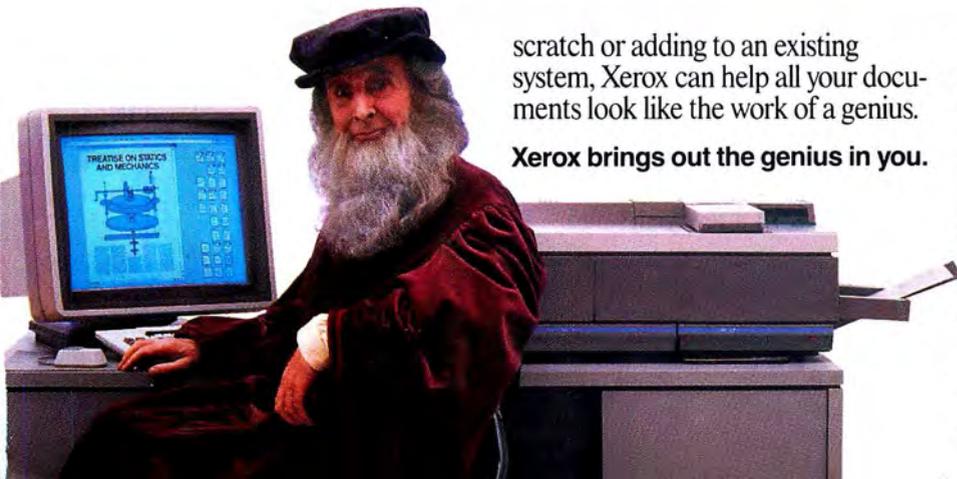
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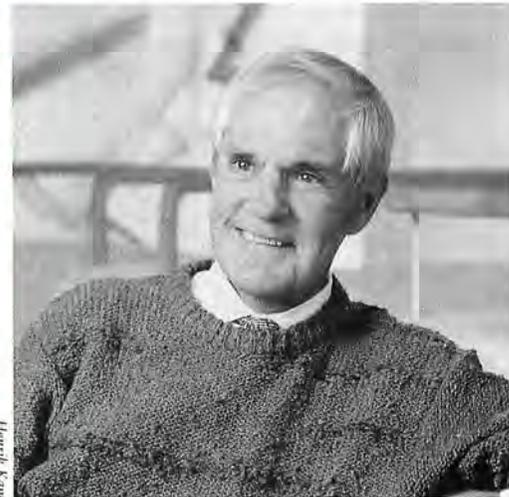
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Henrik Kam

A new-age Timothy Leary described his "mind movies" to David Bunnell: With this new software game, the star of the film you produce and direct is style, not technology or plot.

Finally, you get to view the result of all the interactive choices you've made. After you've completed the game (it takes 2 to 10 hours), you can hit a screen mode and then sit back and watch 5 to 15 minutes of graphics and text scenes. Dig into your popcorn and enjoy your very own PC film noir or software slapstick.

But what is it that makes Leary's mind movie so different from other interactive games? "The star of most games is either the plot or the technology, but the star of this game is style," says Activision's director of product development, Brenda Laurel, widely regarded as one of the most scholarly and sophisticated producers for the home market. "In the last couple of years, the American public has come a long way toward understanding what style is. A trivial example of this is 'Miami Vice.' MTV has done a lot, too. Suddenly, style is a tangible thing to people who would never have used the word a few years ago.

Culturally, this is the right game to be doing at this time."

As if to underscore this commitment to high style, Leary's *Neuromancer* software was a major production in itself. It involved the work of four writers, including prominent literary figure William S. Burroughs, as well as several technical experts—among them Kevin Piette, coauthor of *Multi-Mate*, Jojo Jansen, one of the programmers for *NFL Challenge*, and Mickey Wozniak, director of project management at Ashton-Tate.

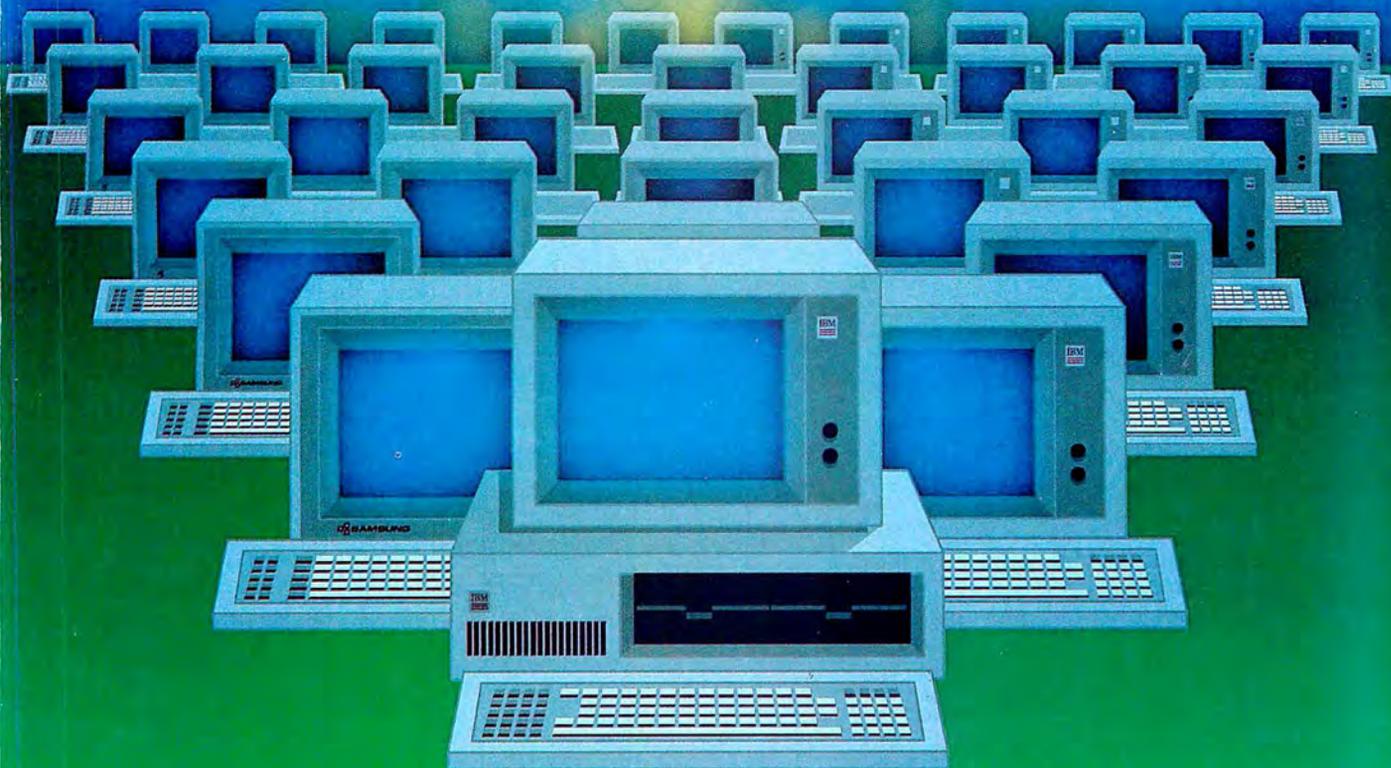
Leary also brought in artists Keith Haring and Peter Max, as well as noted fashion and portrait photographer Helmut Newton, to contribute graphics. And for the first time in computer game history, there will be a musical soundtrack by the original hacker group, Devo.

Neuromancer, the mind movie, will be coming to your local PC

(continues)

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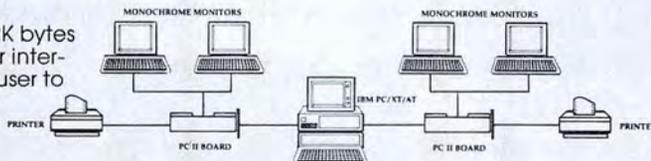
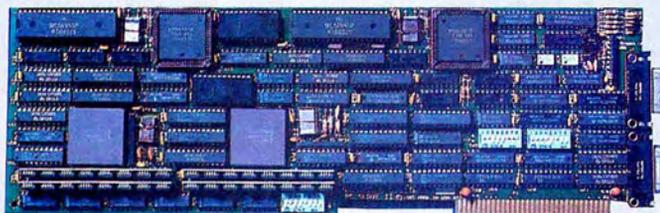
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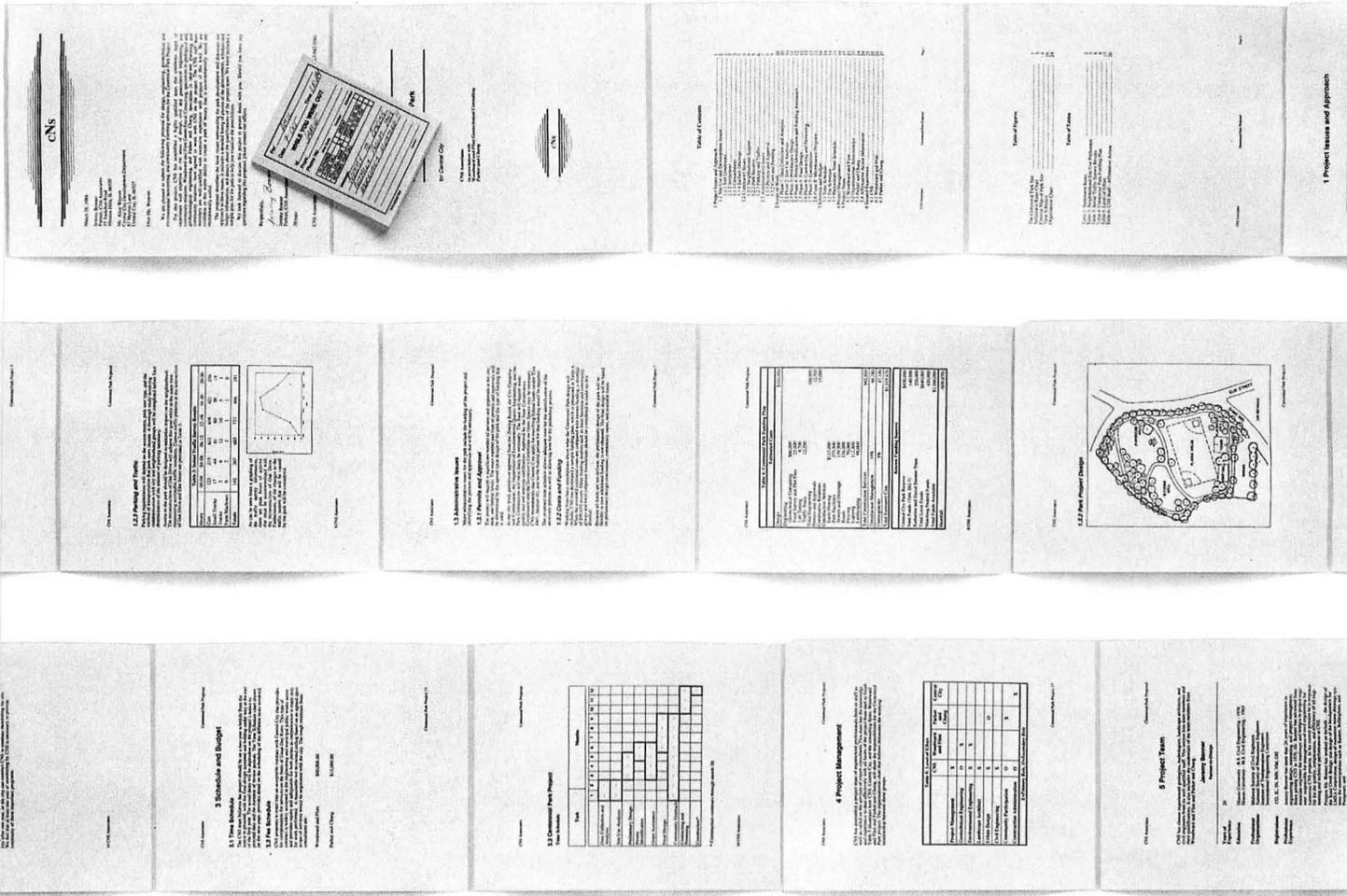
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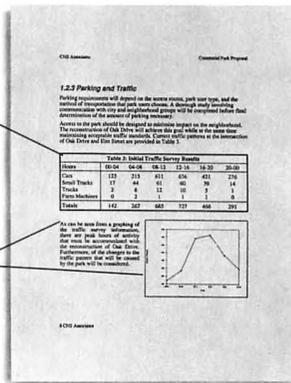
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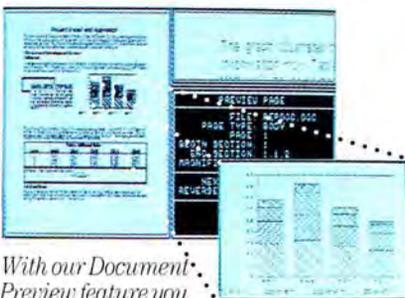
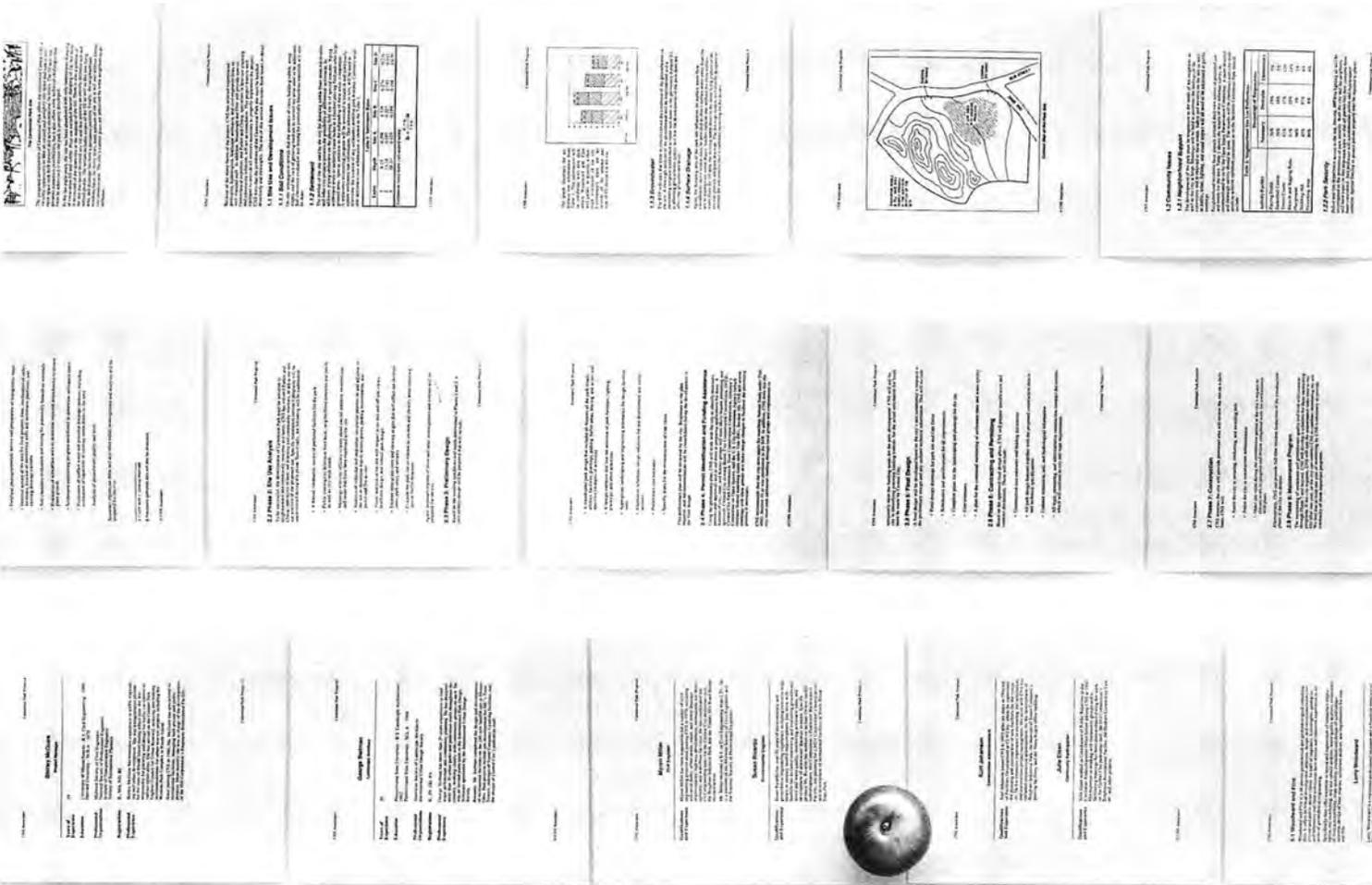
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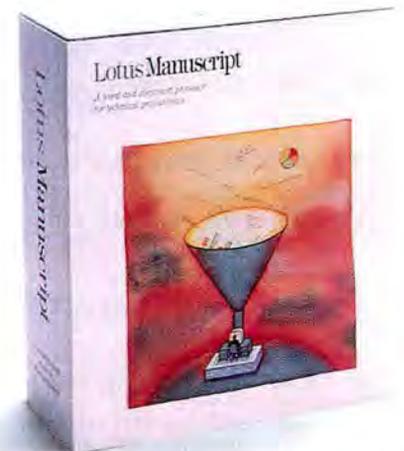
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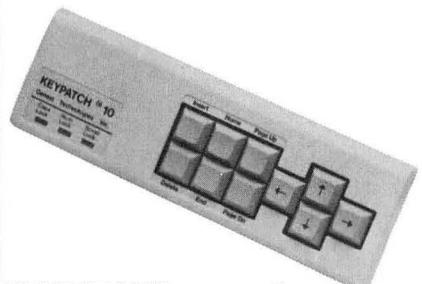
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some time this summer or early fall. Initially, the game will appear in versions for the enhanced Apple IIGS, the IBM PC and compatibles, the Amiga, the Atari ST; then there will be a low-end version for the Commodore, and eventually, a Macintosh mind movie.

Since Tim Leary was so enthusiastic about William Gibson's book, I naturally became curious about it. I had also heard about *Neuromancer* from a few friends in the personal computer industry who assured me it was a marvelous book. Unfortunately, it wasn't easy to find in bookstores. Either the cultists are grabbing copies off shelves, or it hasn't hit the mainstream market yet. I finally found a copy and snatched it up eagerly. I wasn't disappointed. In fact, I didn't get much sleep that night, as I couldn't put the book down.

First published as an Ace Science Fiction paperback in 1983, *Neuromancer* quickly won the three top prizes in the sci-fi field—the Hugo, Nebula, and Philip K. Dick awards. It also ushered in a new genre of science fiction writing that's come to be known as *Cyberpunk*.

To my mind, Cyberpunk echoes a kind of gritty techno-aesthetic. In a sense, it's a hard-edged vision of the future of microcomputing. It's a world in which the ultimate interface between human and machine has finally been achieved, through biotech implants and sensory links with universal data bases.

At the last Macworld Expo in San Francisco, personal computer pioneer and Apple Fellow Alan Kay said he thought the portable computer will have "finally arrived when you can wear it on your T-shirt."

In *Neuromancer*, it's embedded in your skin. As Tim Leary commented to me, "In the future the individual will have access to all this high technology for his or her pleasure. You'll be able to have face-lifts, muscle grafts, rejuvenation implants—your brain will bristle with implants.

"It's the ultimate techno-pagan society, where each individual's brain and body are controlled by that individual. Instead of amplifying and enhancing your machine, you'll be amplifying and enhancing your own software, your own *tissueware*."

Gibson calls the implants *microsofts*—data strips inserted into bio-sockets, like an organic disk drive in your neck. For example, you could insert a Spanish-language *microsoft*, a language template complete with a working vocabulary and grammatical structure, that would slip transparently over your verbal mind.

Gibson admitted that he'd had no hands-on experience with PCs when he wrote *Neuromancer*. "I don't think I could have written it if I had," he confessed. He wrote

(continues)

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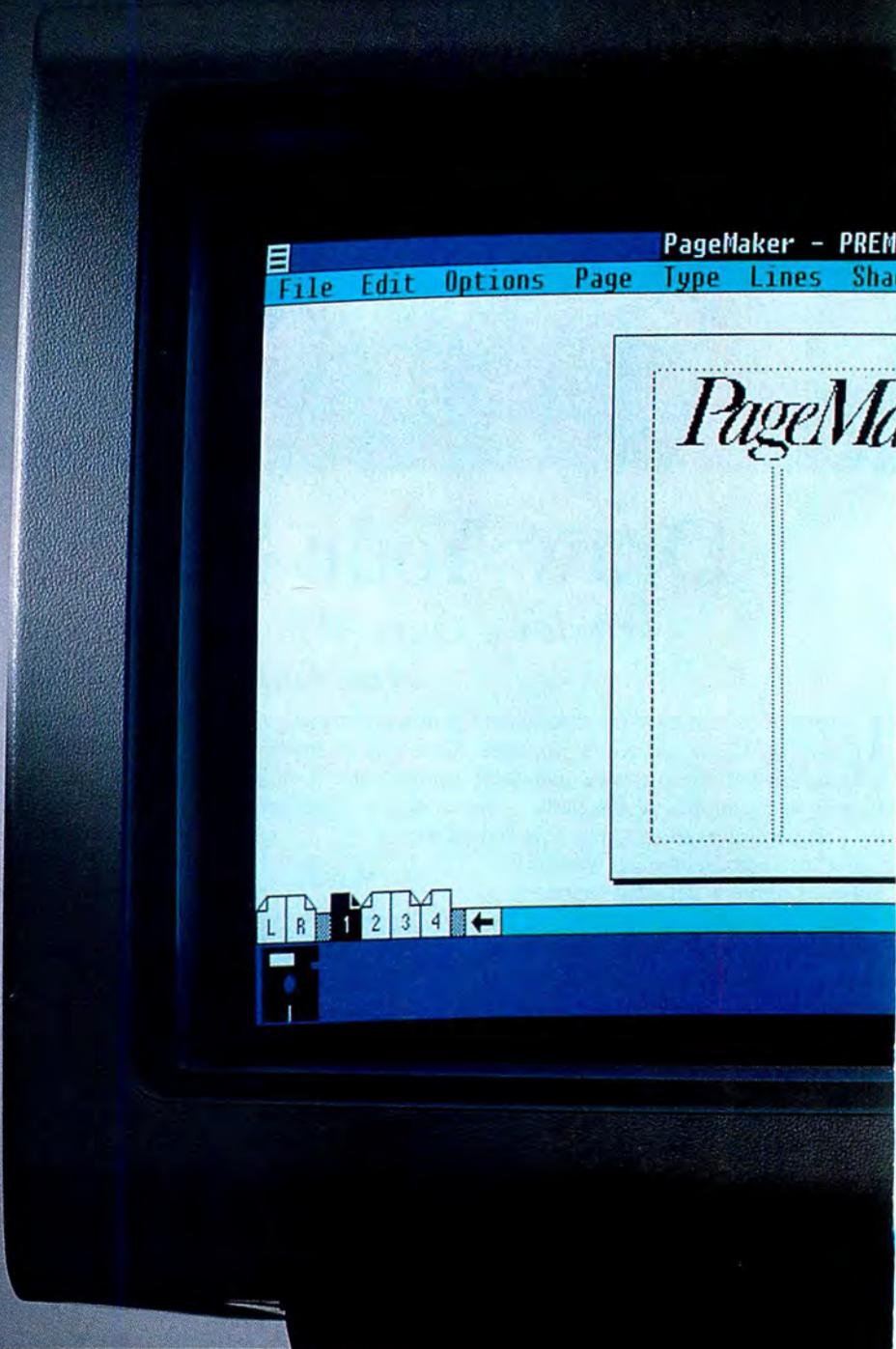
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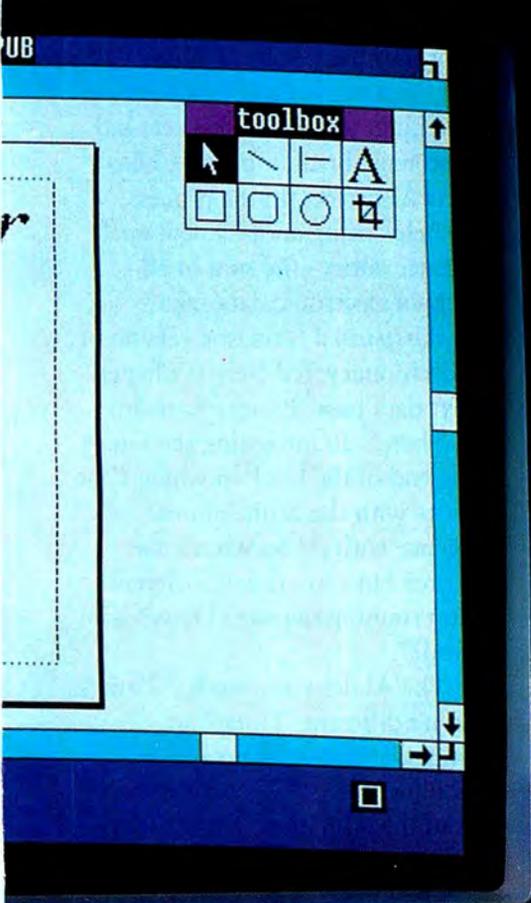
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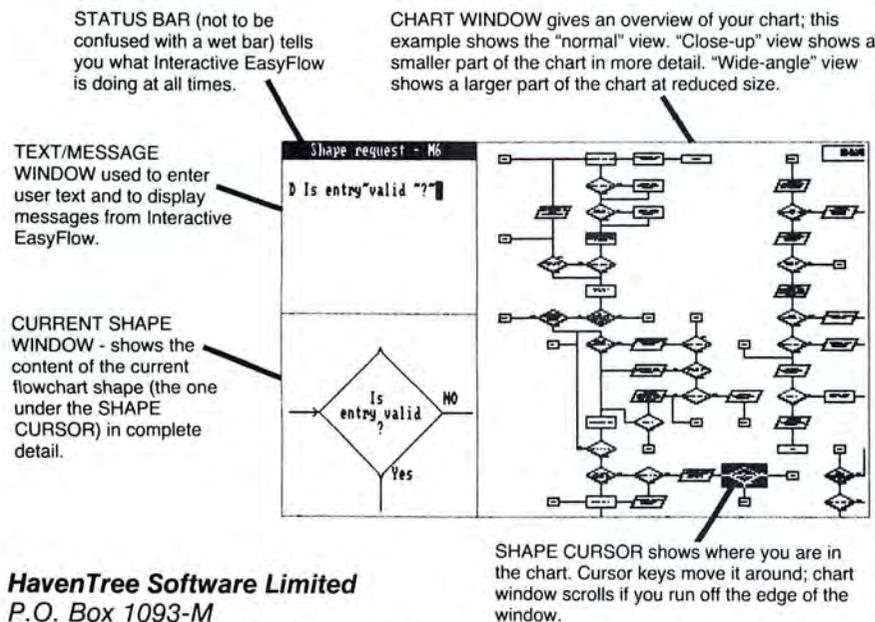
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the book on a 1927 Hermes manual portable typewriter, although he now does word processing on an Apple IIc.

It stunned me to learn that Gibson could create *Neuromancer*, which I regard as almost a blueprint of future information technology, in a state of virtual computer illiteracy. I guess visionaries don't need to know code. The only baud rate they need is their own imagination.

As with all good yarns, there is a basic conflict in *Neuromancer* that must be resolved. The hero, whose name is Case, is a code-cracking, techno-punk street kid who must break into a big-business AI matrix. In the process, he helps bring about a new intelligence entity—the sum of all known electronic data (aka *Cyberspace*, a futuristic version of PC visionary Ted Nelson's hypertext data base, Project Xanadu).

There's an intriguing section at the end of the book in which Case chats with the artificial intelligence entity: "So what's the score? How are things different? You running the world now? You God?"

The AI deity responds, "Things aren't different. Things are things." "But what do you do? You just there?" Case persists. And the AI replies, "I talk to my own kind."

Of course, by now there are other AI matrixes in the universe that communicate with each other. "From where?" asks Case. "Centauri system." "Yeah? No shit?" says Case, impressed.

(continues)

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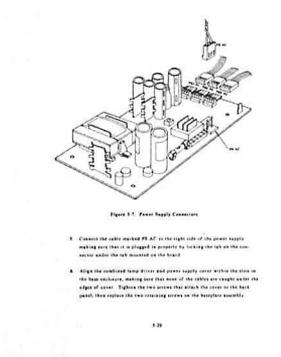
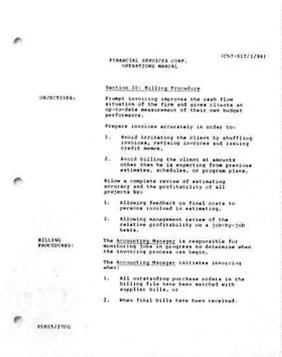
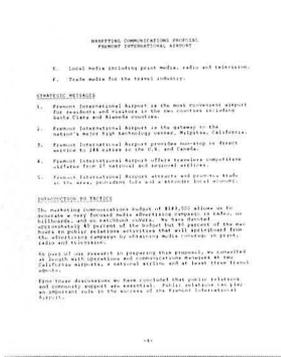
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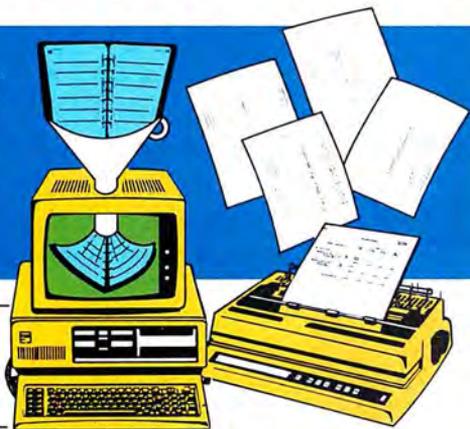
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And God answers (this must be a first for God in written literature): “No shit.”

Leary's years of playing the high priest of mind expansion back in the sixties stand him in good stead as he strives to define this new electronic entity that has sprung from our rapidly escalating information revolution: “It's the living matrix of all the electronic facts we've been putting up there [in the earth's atmosphere] since Marconi invented the radio in 1897,” he told me.

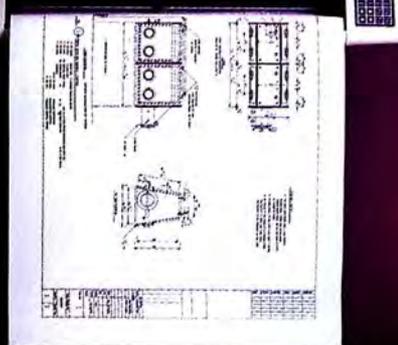
“We've been sending electronic signals—the ‘Amos and Andy’ radio shows, Hitler's speech in Nuremberg, all the television shows, all the military stuff. It's almost like an atmosphere around the world,” Leary pointed out. “It's called the *infosphere*—and this infosphere is there, and it can be colonized, explored, and used by humans. And just as France, Spain, and England competed to colonize the New World, the big AI combines—the multinational corporations—will try to control the infosphere.

“Heroes like Case, representing the true human spirit of individuality, will be dealing with this higher level of intelligence once it's formed.”

The *Neuromancer* concept, of course, is based on quantum physics. Everything is information—all the universe is data. Sunlight, starlight, the galaxies. You can even describe the sun as a temporary collection of information.

(continues)

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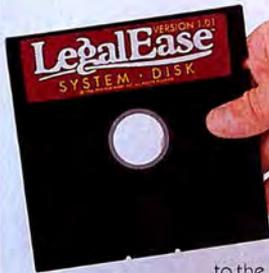
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It is the role of the artist—and for that matter, of the PC visionary—to help the human species adapt to the notion that reality exists not just in heavy stone materials, in physical reality, but in clusters of off-on probability signals defined as the quantum mechanism.

In my opinion, and it's one I happen to share with Leary, that's what all jazz, modern literature, expressionism, cubism, pointillism, all the movies ever made, and all the software that's ever been written—the whole incredible heap of twentieth-century data—is all about.

Now, I'm not advocating any kind of electronic voodoo, nor am I promoting PC paganism here. My fascination with the ideas behind *Neuromancer*, the book, and *Neuromancer*, the software, is simply that they're useful, funny, and liberating concepts to play around with.

If it takes a book or a mind movie to make us think about where we are heading—not only in terms of technology and personal computing, but collectively, as a human race evolving into a new and unknown electronic form—then all the more power to Gibson and Leary and all the other mind artists of Cyberspace.

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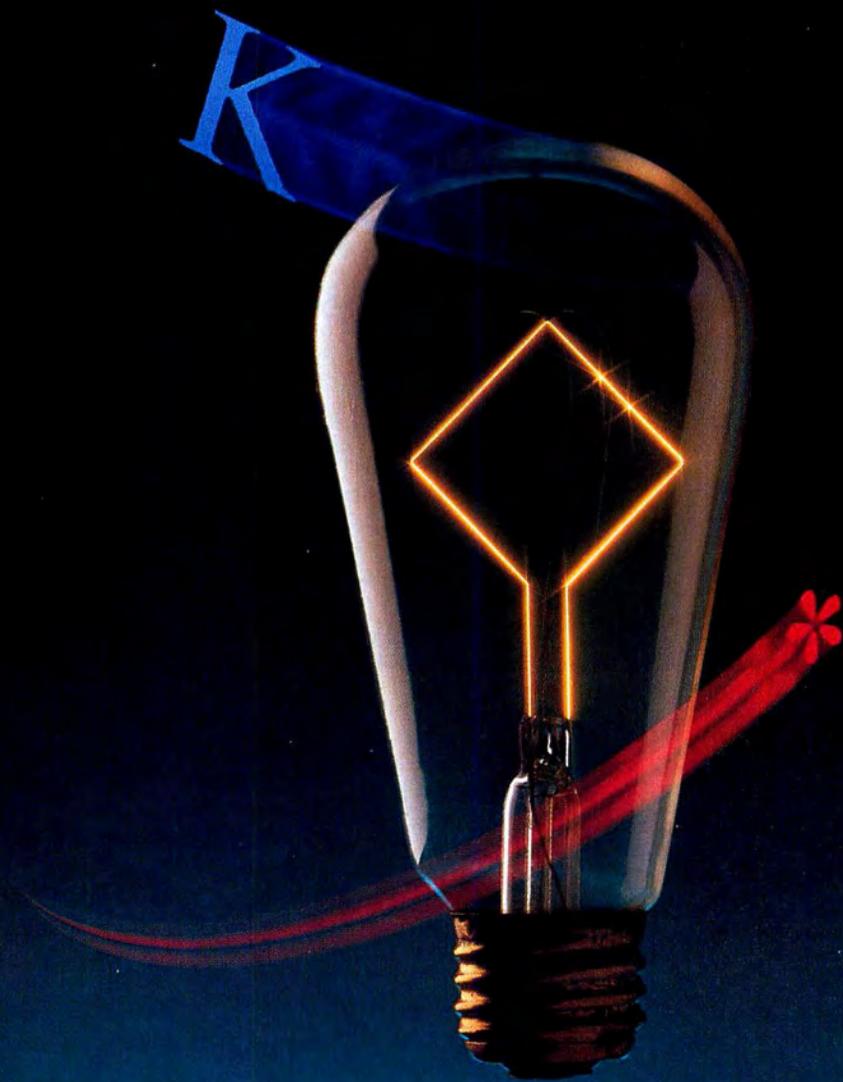
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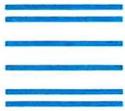
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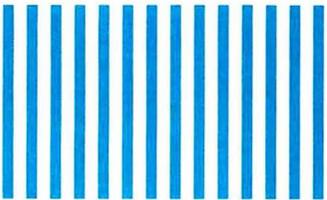
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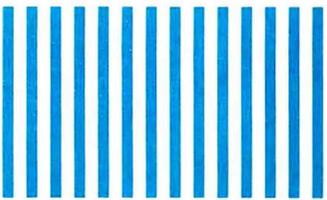
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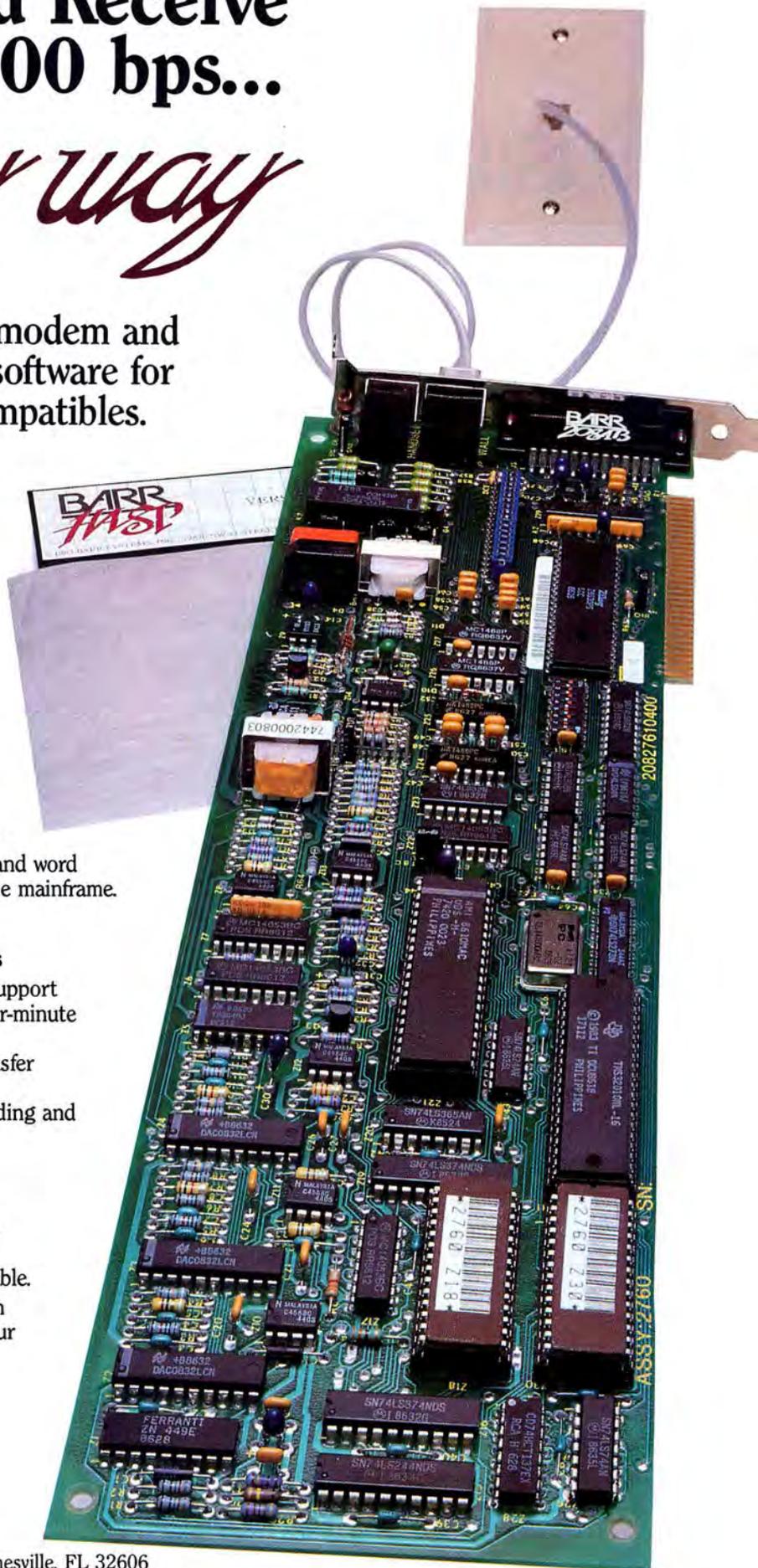
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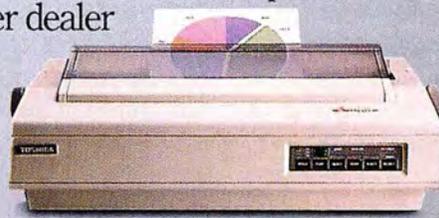
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Letters

Reactions and responses from the PC World community



PCs to the People

Brian Jeffery laments IBM's abandonment of the PC in "REMark: Exit Entry Systems" [PCW, December 1986], but I think "Getting to the Point" in *PC World View* of that same issue is more to the point.

PCs are now standard issue at West Point Academy and in many MBA programs and may soon be standard issue to most people. Wasn't this IBM's intention all along?

Big Blue designed the PC's open architecture to spark a personal computing industry and to sell products. Their game plan apparently succeeded. The PC market took off and left IBM in its wake.

Compatibles, clones, and PCs themselves are now affordable for the average person. Sears, Macy's, and other retail stores sell them. The PC established a worldwide standard and created an ever-growing installed base that hardware and software manufacturers must acknowledge now and in the future. Ironically, IBM actually had the "computer for the rest of us" all along. The PC is dead; long live the PC.

*Janice Oniguchi
Los Angeles, California*

In Search of Documentation

An uncle's death put me in the position to inherit his PC, a powerful machine with a 20MB hard disk chock-full of application programs. Unfortunately, all of the receipts, manuals, and master disks were packed away in a warehouse.

My uncle abhorred software license agreements. In protest, he never sent in registration cards for any of his programs. Now the software publishers I've contacted

are somewhat loath to send me duplicate documentation, suspecting software piracy is afoot—I'm guilty until proven innocent.

Running PC software without printed documentation is next to impossible. I've found manuals in bookstores, but these tend to be short on good examples and often refer to the original documentation for further explanation. At this point, however, I'm ready to concede that even poorly written documentation is better than no documentation at all.

*Bill Dawson
San Antonio, Texas*

A Big Boo for Big Blue

"The Self-Made PC" [PCW, December 1986] depicts the intricate planning IBM put into designing its Automated Logistics and Production System to manufacture the Convertible. Just as much care should have gone into developing support for the laptop's 3½-inch format.

Don't get me wrong. I really like the Convertible. I can use it anywhere—at the office, at home, or in the library. I know it isn't the state of the art, but my software needs are relatively simple. Lotus 1-2-3 and *Microsoft Word* are available in 3½-inch format, but little else is. Several vendors have told me that they're still "thinking about" supporting the smaller format. You'd expect that IBM, with its experience in marketing computers, would sponsor proper support for a new product line.

*Charles Bingman
Washington, D.C.*

(continues)

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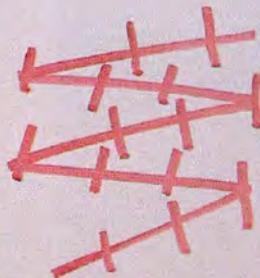
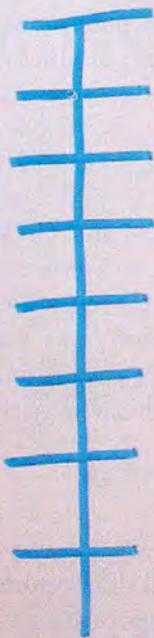
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Let's Stay Morally Straight
Robert Lookabaugh criticized your Garland to AT&T and Microsoft for withdrawing from the Republic of South Africa [*Letters*, PCW, January 1987]. Your response suggests that this is the only politically and morally acceptable decision for companies doing business in a country that restricts the freedom of its citizens. According to your masthead, however, CW Communications, Inc., owns publications in several countries not noted as human rights advocates—such as Chile, Hungary, the People's Republic of China, and South Korea. Shouldn't CWCI withdraw from those countries? I also think IBM and Commodore deserve a Glitch for doing business in Czechoslovakia (see Michael Cakrt's letter in the same issue). Wash your pot before calling the kettle black.

Marc Bond
Anchorage, Alaska

Regression and the Bottom Line
You've done your readers a disservice by extolling Lotus's 1-2-3 for regression analysis in "Straight Line to the Bottom Line" [*PCW*, December 1986]. Like author Andrew Williams, I applaud Lotus for attempting to provide this useful tool to its users. Lotus's implementation of regression, however, has limitations that your readers would do well to investigate. Experienced businesspeople wouldn't use an accounting package that produces "close to" the correct balances. They should demand no less from an analytic

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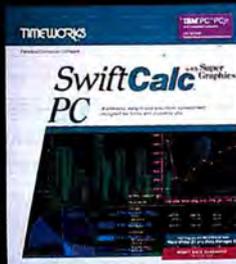
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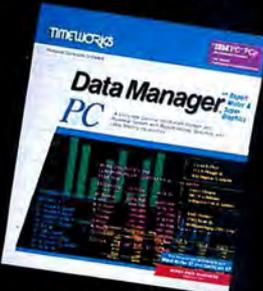
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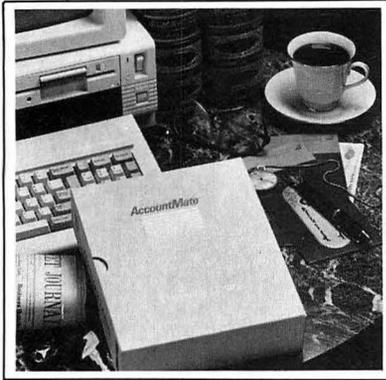
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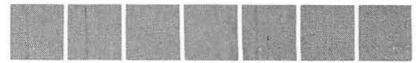
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package. A statistics package that tests the assumptions underlying regression and locates influential data points would be much more reliable. Without these tests and analyses, the outcome of a regression analysis can be highly misleading.

*David Koepke
Evanston, Illinois*

PCs Have No Soul

The union of philosophy and computer theory described in "Thinking About Thinking PCs" [PCW, December 1986] has already occurred. The Aristotelian philosopher Mortimer Adler examined the human mind in *The Angels and Us* [Macmillan, New York, 1982]. He believes the mind possesses both body and soul. Perception, memory, and imagination are functions of the mind's "body"; understanding and will are functions of its "soul."

Using Adler's model, a computer can be seen as a physical device that possesses perception through a keyboard and a modem, memory in RAM, and imagination as displayed through the monitor and printers. But it has no soul. Thus Aristotelian philosophy joins three decades of artificial intelligence research to postulate that a computer will never understand natural language, nor will it ever truly "think."

The challenge is on! May the best philosophy win.

*J. L. Dautremont, Jr.
Simi Valley, California*

(continues)

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THANKS FOR THE MEMORIES

Have you ever noticed how time seems to change everything? Fashions change. Technology changes. Even the microcomputers we use change. Maybe that's why so many of our customers are saying goodbye to IBM in favor of a "good buy" from Wells American.

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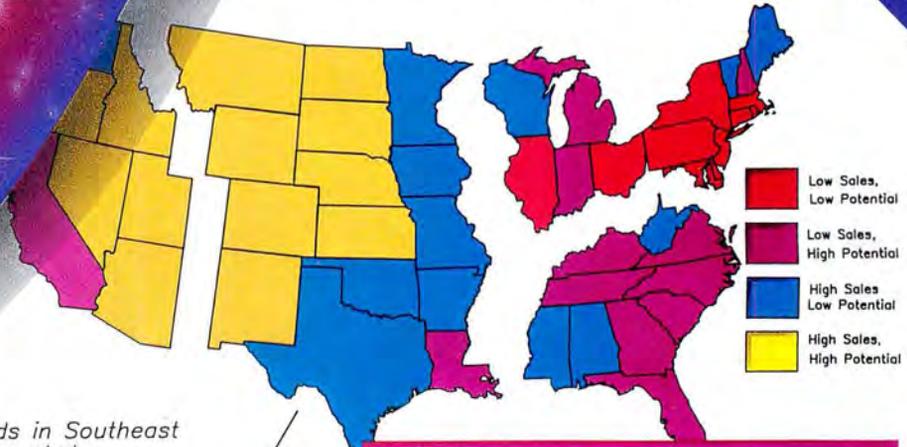
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STATE	1988 Sales	Potential
AL	50,777	3,894
AR	52,038	2,286
AZ	3,538	2,718
CA	103,595	4,890
CO	4,872	3,108
DC	63	638
DE	1,932	594
FL	54,193	9,744
GA	58,056	5,466
IA	55,965	2,911
ID	82,412	944
IL	55,665	11,422
IN	35,932	5,466
KS	81,778	2,411
KY	39,669	3,894
LA	44,521	4,211
MA	7,624	1,932
MD	9,837	1,932
ME	30,995	3,894
MI	56,954	7,624
MN	79,548	7,624
MO	54,932	9,177
NC	1,521	787
ND	882	653
OH	1,570	927
OK	7,366	1,308
OR	1,308	3,894
PA	1,834	17,422
RI	1,377	1,932
SC	30,203	10,917
SD	75,954	1,932
TN	41,932	1,932
TX	2,411	1,932

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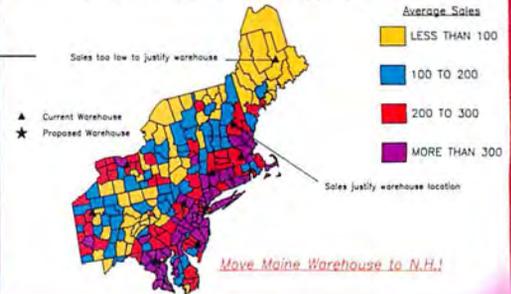
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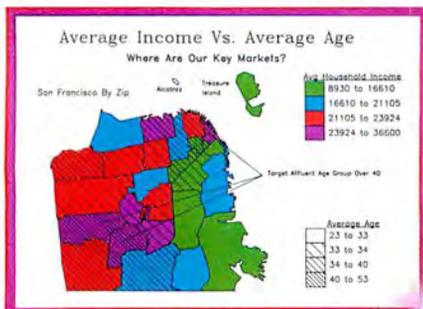
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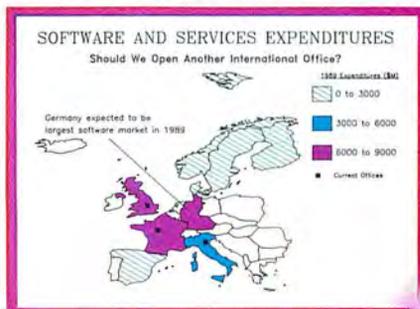
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What's Best for What's Best
Your review of *What's Best* in the November 1986 issue of *PC World* explained the complexities of that program extremely well. There are, however, a few things in the article that should be clarified.

The Alex's Restaurant example seems to imply that *What's Best* can simultaneously vary both the number of dishes produced and the ingredients in those dishes. This would actually result in a nonlinear expression, which is unacceptable in the current version of *What's Best*.

The article states that *What's Best* is "essentially performing a multitude of 'what if's—until it finds the best solution.'" This implies that the program investigates every possible answer. If this were true, even a problem as small as Alex's Restaurant's would require hours of computation. Instead, *What's Best* uses an algorithm called the simplex method of linear programming to quickly narrow down the best possible solutions.

Finally, the price of the PC version is \$149.

Sam Savage
President
General Optimization, Inc.
Chicago, Illinois

Let the Chips Fall
I support David Bunnell's stand in "Fighting PC Protectionism" [*PCW*, December 1986]. American and Japanese semiconductor vendors are trying to pull the wool over our eyes.

(continues)

Buy The AT Compatible *PC Magazine* Called "The Most Judicious Choice" At Mail-Order Prices. From Over 500 Dealers That Give You Local Service And Support.

Why No Dealer Is No Deal.

Lots of mail-order salesmen would have you believe that they can put everything you need for AT-compatible computing in a box. And when you ask them about service and support, you'd think the UPS man was a computer expert.

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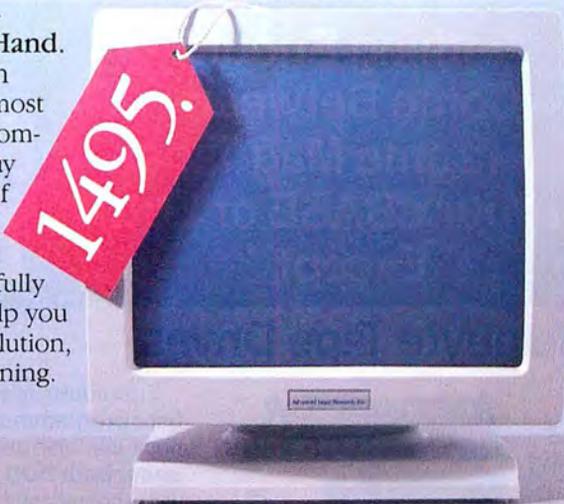
\$1495 buys you an AT compatible more than 30% faster than

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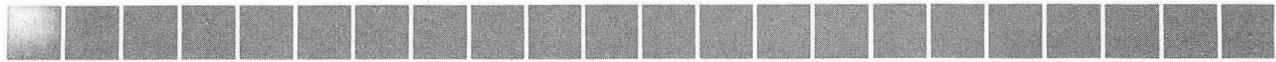
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American semiconductor companies complain of unfair trade practices by the Japanese even though Motorola has agreed to form a joint venture with Toshiba to manufacture semiconductors, National Semiconductor and NMB Semiconductor plan to make and sell chips in Japan, and Fujitsu intends to buy Fairchild Semiconductor. The international scope of American semiconductor companies makes their lamentations sound ridiculous.

I agree with Mr. Bunnell that there ought to be a consumer

computer association to protect us from this conspiracy to drive up worldwide chip prices.

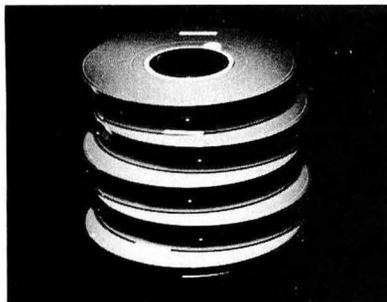
*William Watson
Santa Monica, California*

Credit Due

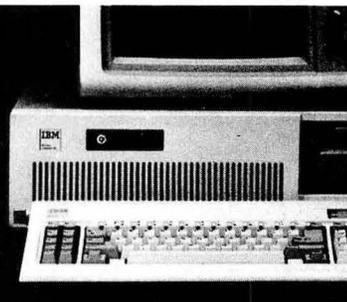
Credit for the video-imagery work at the University of Nebraska described in "PCs Into Plowshares" [PCW, October 1986] should go to Dr. George Meyer rather than to me. I simply provided the information to the authors in Dr. Meyer's absence.

*Dennis Schulte
University of Nebraska
Lincoln, Nebraska*

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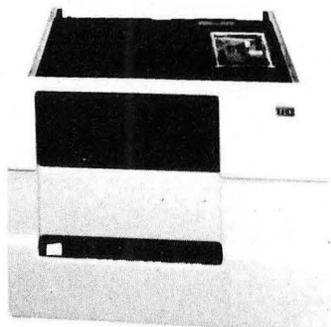
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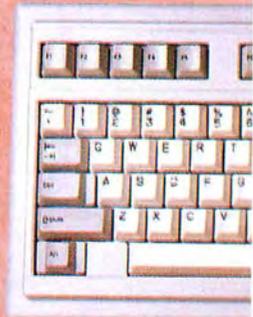
most demanding users. It comes with 640 Kbytes standard and is expandable to 6.6 Megabytes without touching one of its two attachable full-size expansion slots. Plus it offers an optional 20- or 40-Megabyte high-speed internal fixed disk drive. So now you don't have to resort to external add-on drives that make portability difficult.

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Not one of our competitors can rival our memory and stor-

It feels like the others

They did.

age capacity. The most RAM others offer is 2.6 Megabytes, which looks very small next to our 6.6 Megabytes. Storage is another story. The internal storage capacity of all our major competitors put together can't equal the storage capacity of a single COMPAQ PORTABLE III. We even offer an attachable, portable expansion unit, with

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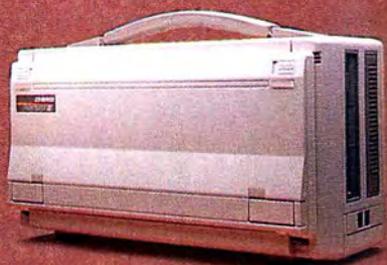


less wait, with less weight.

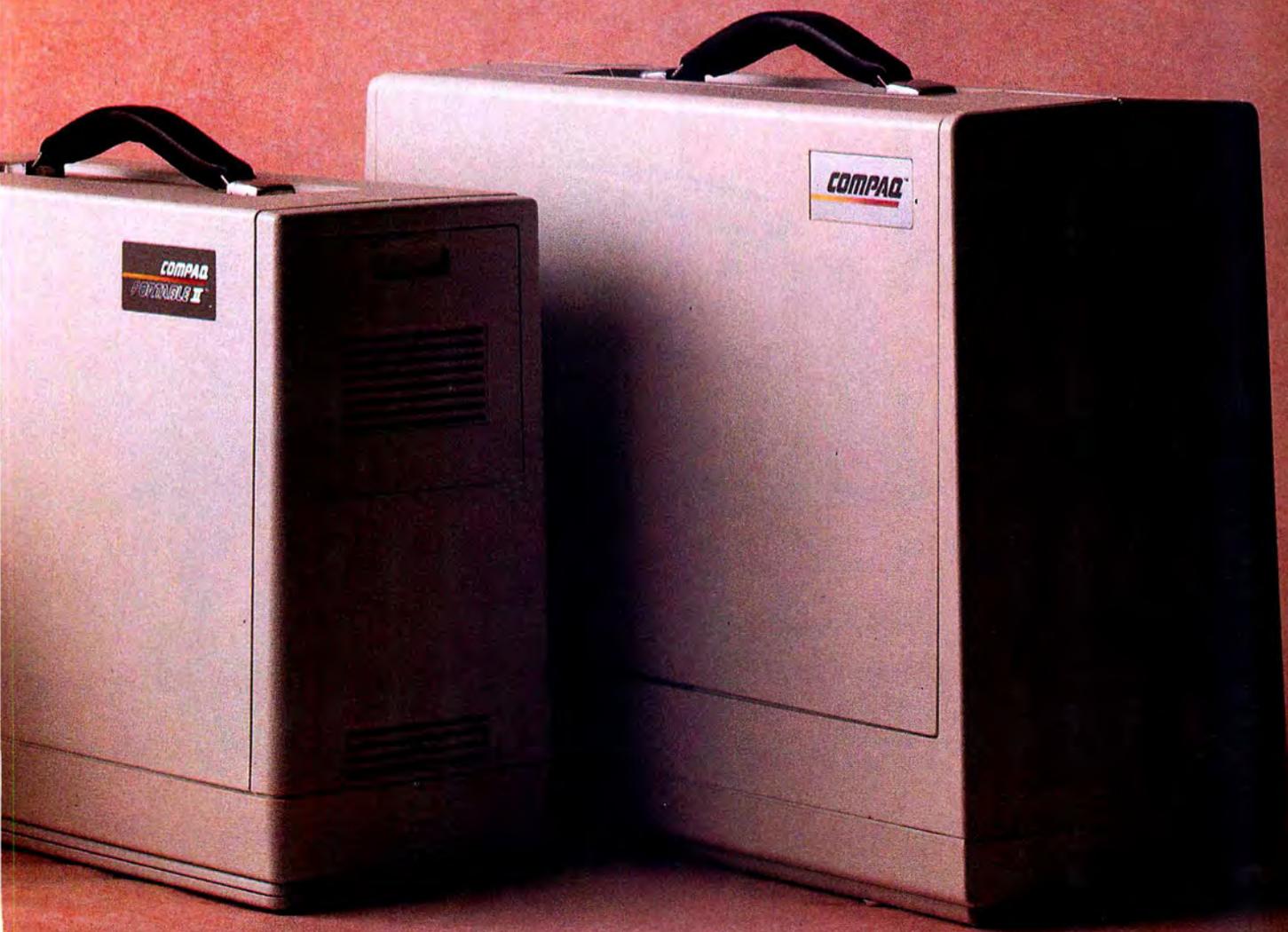
The COMPAQ PORTABLE III is the most advanced portable in the world and offers the sophisticated user features normally associated with desktops. As with any computer we design, we make your needs our blueprint. Compaq gives you more function-

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So perhaps it's *not* surprising that the COMPAQ PORTABLE III, like all of our portables, isn't just for people who are going places. It's also for those who appreciate a footprint that's nearly 50% smaller than the average desktop computer. This built-in versatility proves Compaq always has a better handle on personal computing.

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This COMPAQ PORTABLE III
is so busy in the office,
it doesn't get out much.



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Harry Miller

As the rules of the software game change, the entrepreneurs once again set the pace of innovation

The Future Through Windows

We admire entrepreneurs. We like their courage, their devotion to excellence, their quest for innovation. But in trying to predict future market directions, we fall into an old trap: We look to the big companies for guidance.

Comforting though it may be, this approach may not survive the long term. Look to Big Blue and Compaq or the Big Three (Lotus, Microsoft, Ashton-Tate—four if you want to count Borland) to set the pace of innovation, and you miss the lessons that underlie the success of the personal computer.

Historically, innovation has come from small companies. Granted, most of the companies mentioned started out as attic or garage (or pie shop) innovators. But when a company gets large, its inertia (and, often, its responsibility to stockholders) discourages innovation. The R&D investment is weighed against other opportunities—other ways the money can be used to make more money.

But for every such giant, there are hundreds of new garage-size innovators hoping to be thus spoiled by success. It's really these

new companies we should be both looking to for new directions and encouraging to persevere. They will likely be the most important harbingers of computing trends.

Such innovations take one of two forms: strokes of genius that ignore current standards and revolutionize the way something is done (such as *VisiCalc* or the Macintosh); or creative adaptations within a standard. While there may not be much we can do to spur on the first type, the latter can certainly benefit from our support.

As *Microsoft Windows* begins to take hold as a new standard, smaller companies are pushing its limits to provide innovative products. Because *Windows* takes care of device support and obviates the need for many user interface decisions, it frees small software developers to focus their efforts on creating software that solves business problems better. Creating non-*Windows* applications could mean double the programming

(continues)

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effort just to support the current multitude of graphics adapters, monitors, and printers.

It's the small, innovative companies we should watch as *Windows* technology develops; they will determine how securely *Windows* or any other standard will take hold. The very nature of cooperative multitasking in *Windows* suggests that small but effective applications that work well together are the key to the standard's success. *Windows* is thus a perfect platform for the efforts of those nascent innovators.

We at *PC World* are excited by the potential of this business development as well as by the other benefits that *Windows* will bring. By now you may have heard that we are starting a new magazine to meet the specific information needs of *Windows* users. The preview issue of *Windows—The Solutions Magazine* will be available on the newsstand in August; *PC World* subscribers will receive a copy with their September issue. You'll find subscription forms for our new publication beginning in the June issue of *PC World*.

The magazine will focus on new *Windows* products and how they can be combined to provide a new level of quality and performance. We look forward to providing the same kind of useful, solutions-oriented coverage for this exciting new user community that we have for the whole PC community in *PC World*. ☉

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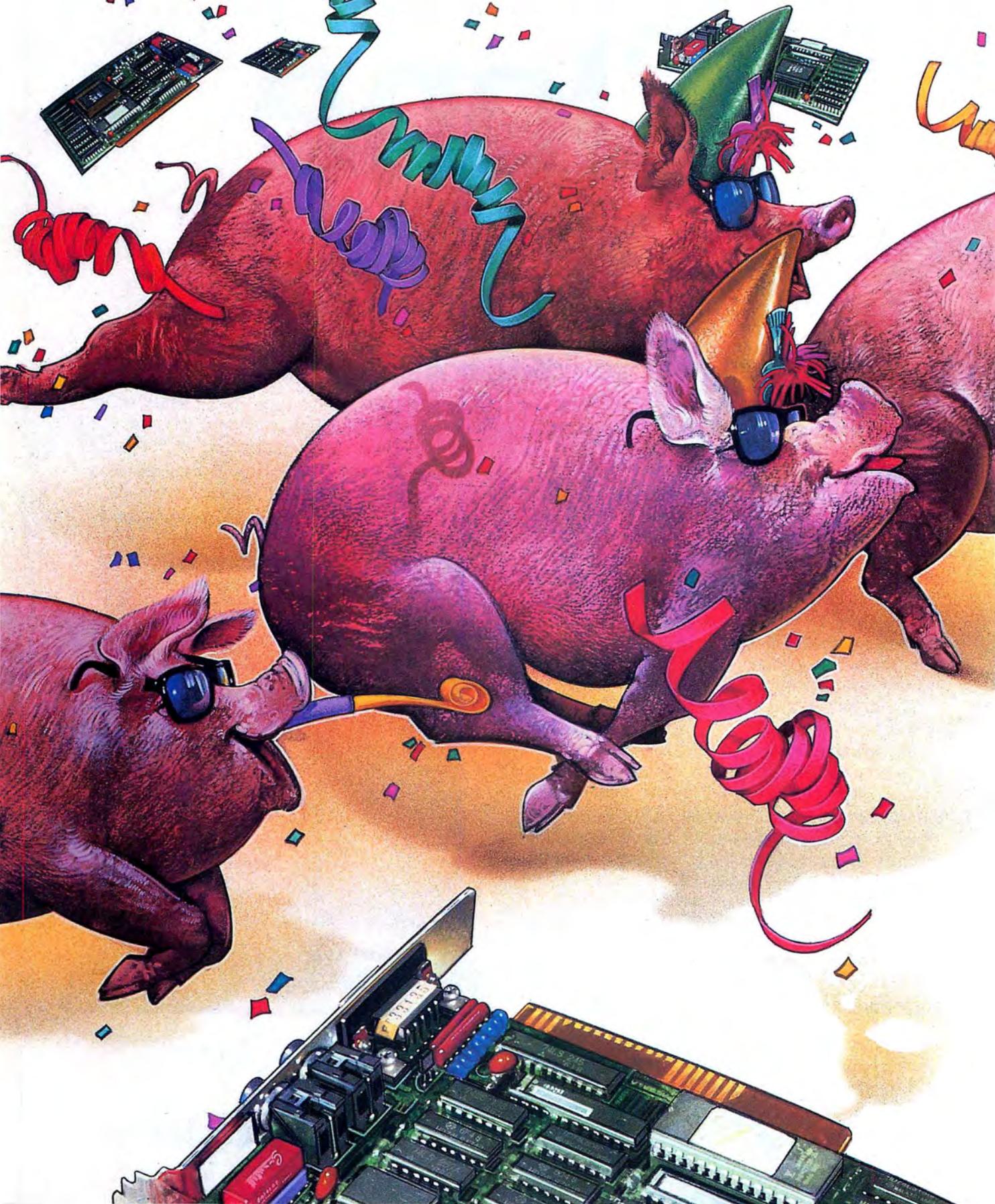


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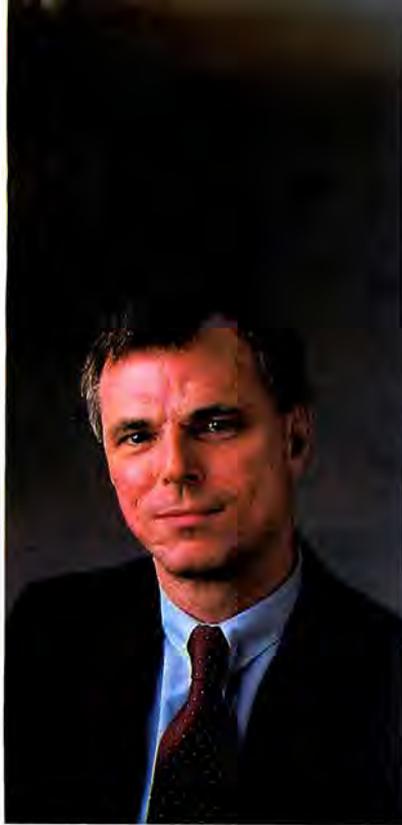
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Dan E. Burns

REMark: Beyond Expert Systems

For computers to ever truly emulate human intelligence, they may have to imitate human intuition.

It was late at night. I was tired and bleary-eyed but programming, it seemed, at the speed of light. I had constructed a sentence-generating program that fed its output back through a word-substitution loop. Since the program only had 41 words to work with, including the names of my wife, children, and pet, I wasn't expecting anything profound.

Suddenly, the sentences took on a dark, Delphic dimension. Words poured onto the page like a disembodied voice attempting to communicate from beyond time and space.

He destroys. Fire. Susan destroys Hannah's mother. He loves. Water. Susan dies Superdog's ground. Pete hates burning mother. He hates ground. Pete reaches fire. He likes terrible desire. Superdog dies. Sand.

This brooding monologue continued for a few minutes; then—as suddenly as it appeared—the flicker of apparent intelligence vanished, and the program began to churn out drivel.

Will there ever be real artificial intelligence, and if so, will we recognize it when we see it? By intelligence, I don't mean the ability of

computers to reason and perform chaining operations. Expert systems do that already; they are the bright, rational, daylight side of computer intelligence. But thinking is not an entirely rational process. It's also intuitive.

A recent study of executives at General Motors, Chrysler, Burroughs, and the Ford Foundation concluded that high-level managers had the ability to use intuition to guide key decisions. That study suggests that true artificial intelligence must extend beyond expert systems to the other side of AI—the dark side, if you will, that draws on the unconscious, intuitive resources of the human mind.

Professor Joseph Weizenbaum, of the Massachusetts Institute of Technology, explored this dark side of AI with his famous *Eliza* program (see "Thinking About Thinking PCs," *PCW*, December 1986), which emulates the responses of a Rogerian therapist. Weizenbaum was distressed at what he called the "*Eliza effect*": the tendency of some people to converse with the computer "as if

(continues)

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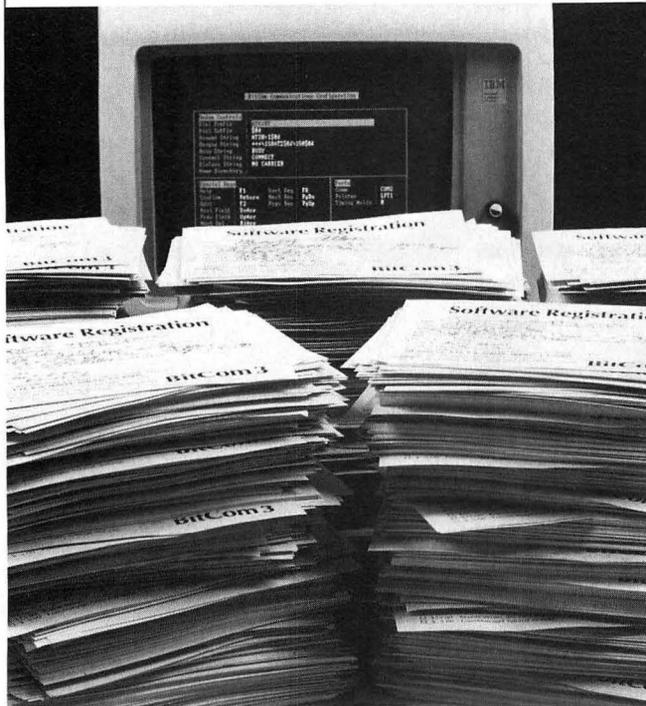
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it were a person who could be appropriately and usefully addressed in intimate terms." He argued that computers should not substitute for people in tasks requiring judgment, understanding, wisdom, and empathy because they aren't really intelligent like people. Detached from human experience, they are essentially alien.

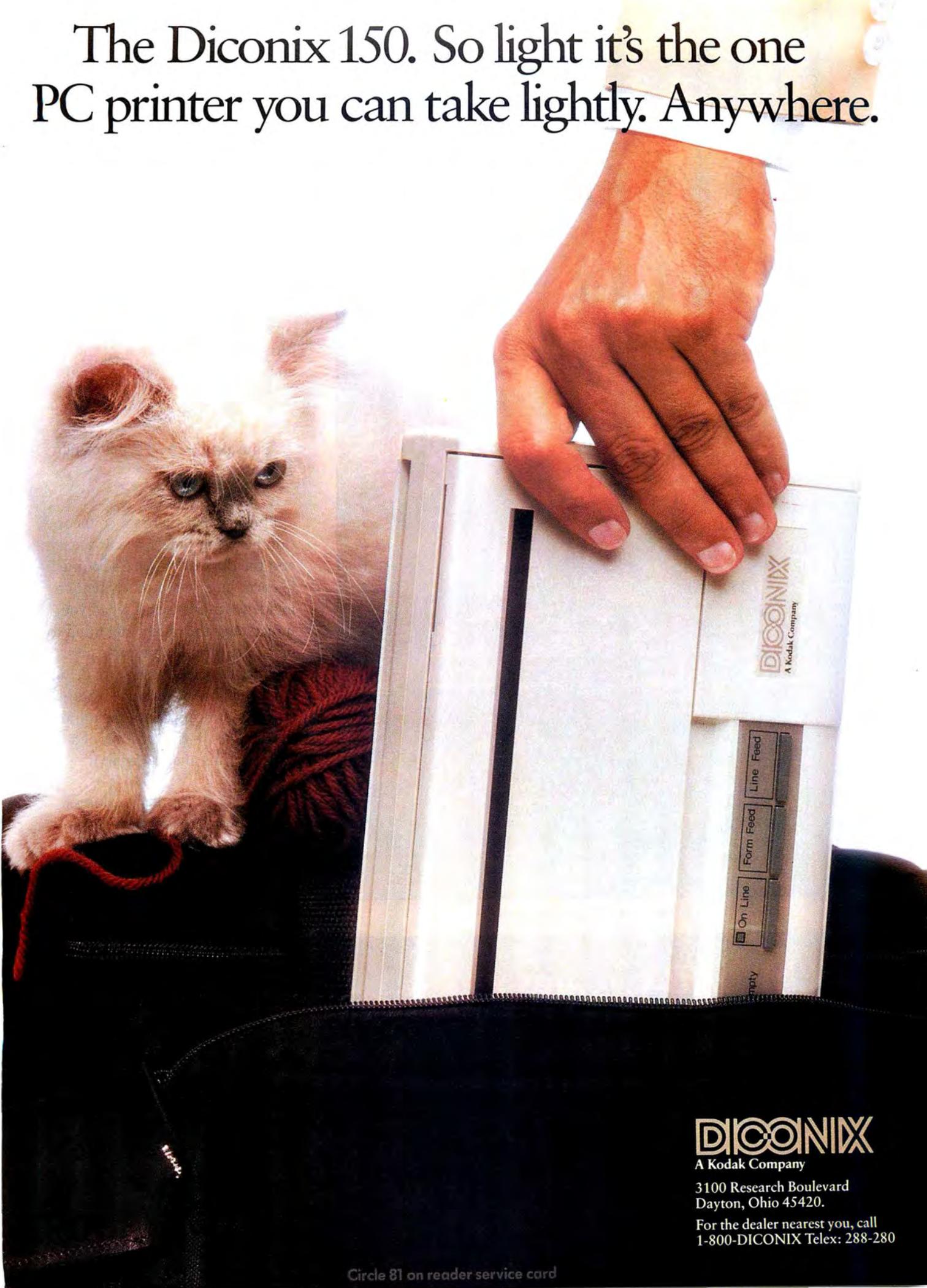
But perhaps Weizenbaum's view is too narrow. It's possible to create a model of intelligence that joins humans and computers in a single perspective that takes into account coincidence, random events, and what Pulitzer Prize-winning author Douglas Hofstadter has called "strange loops."

Everyone has experienced coincidence—random events that seem meaningful parts of a pattern. As a child, say, you were frightened by a horde of monarch butterflies at your grandmother's farm. Then one day years later as you're driving home, your spouse calls on the cellular phone to tell you that your grandmother has died. Just as you hang up, a monarch butterfly spatters against the windshield. At your grandmother's funeral, you notice, printed above her name on the program, the funeral home's trademark—a monarch butterfly.

Carl Jung explored the nature of such coincidences in *The Structure and Dynamics of the Psyche, Collected Works of C. G. Jung, Vol. 8* (Princeton University Press, Princeton, 1969). He called it *synchronicity*. "Synchronicity," wrote Jung, "takes the coincidence of events in space and time as meaning something more than mere

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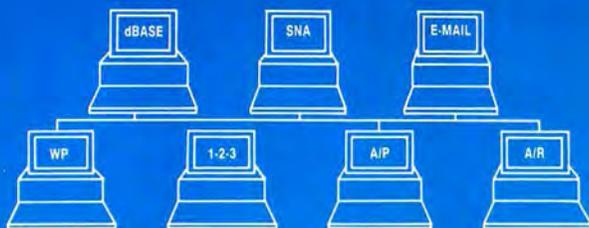
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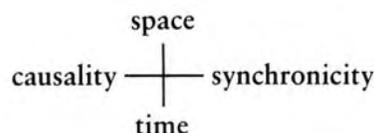
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chance, namely, a peculiar interdependence of objective events among themselves as well as with the subjective (psychic) state of the observer or observers." He proposed that synchronicity be added to the triad of classical physics (space, time, and causality) to form an integrated view of the universe:



I believe that there's a connection between Jung's synchronicity and the dark side of artificial intelligence. Jung seems to say that coincidence makes sense when you understand the perceiving mind to be a part of the system it is perceiving. By selecting certain details from the flow of sensory experience and linking them, the mind participates in the creation of a pattern, thus altering what it perceives.

Douglas Hofstadter explores a related phenomenon in *Gödel, Escher, Bach* (Basic Books, New York, 1979). Intelligence, Hofstadter argues, is intimately connected with strange loops. Patterned after the Möbius strip, strange loops refers to the phenomenon that occurs when, by moving upwards or downwards through the levels of some hierarchical system, we unexpectedly find ourselves back where we started. "My belief," writes Hofstadter, "is that consciousness and free will . . . are based on a kind of strange loop, an interaction between levels in which the

(continues)

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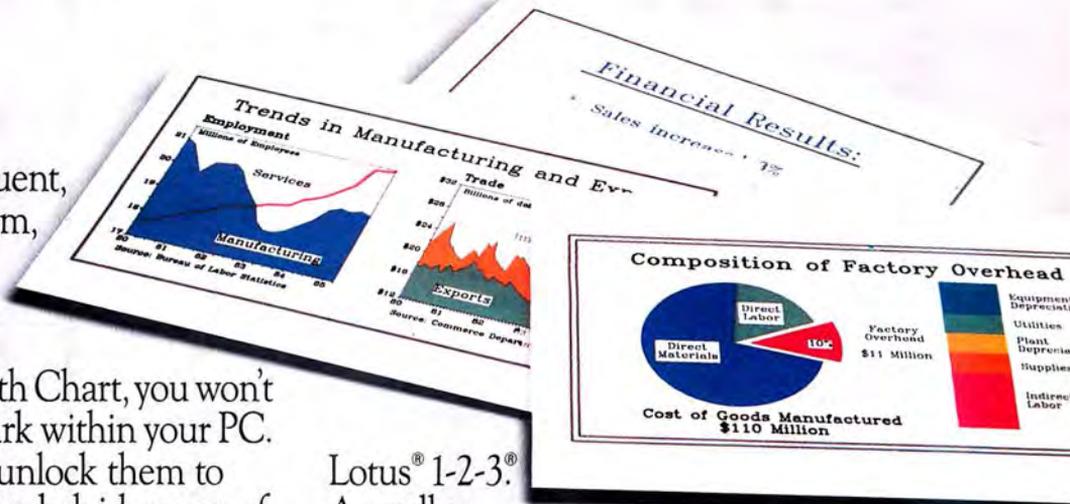


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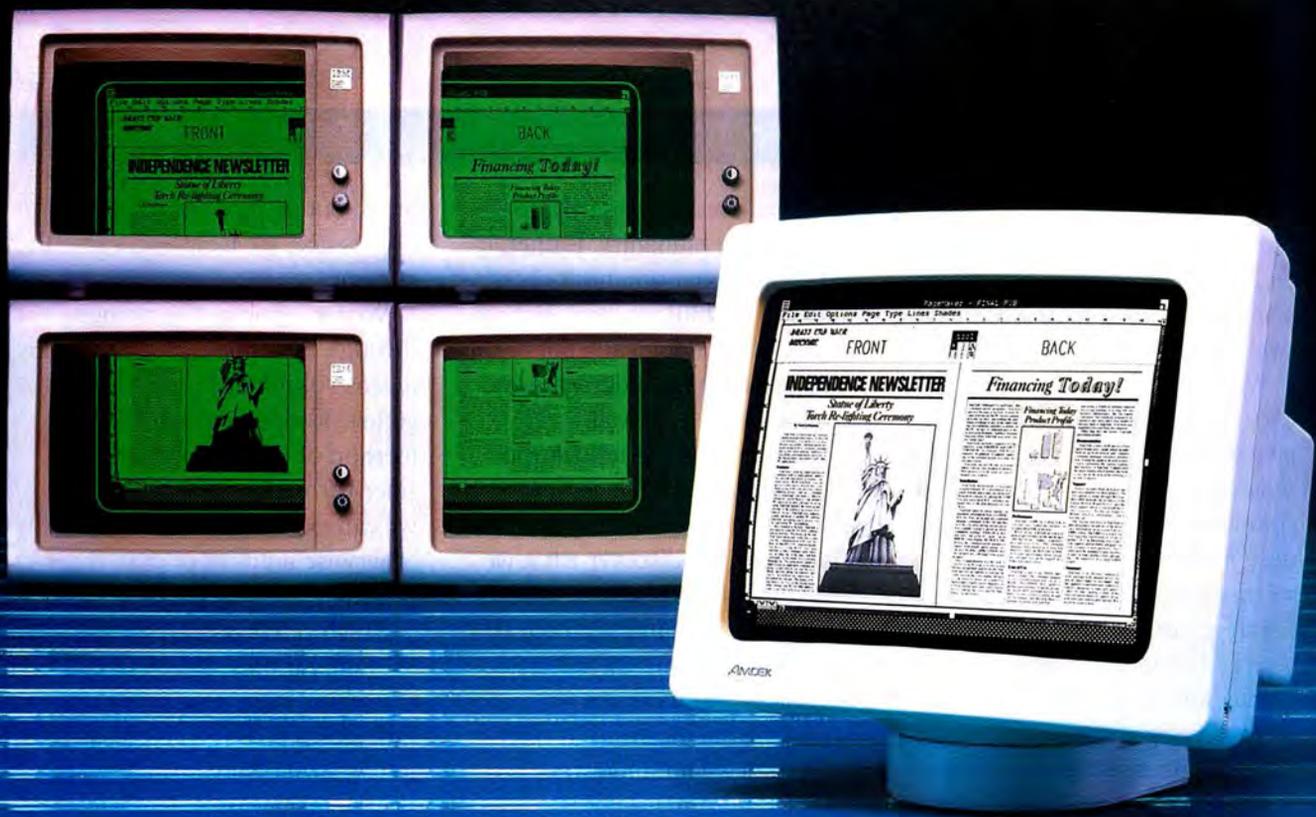
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It takes four of theirs to display the same text and graphics as one Amdek 1280.

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top level reaches back down towards the bottom level and influences it, while at the same time being determined by the bottom level."

Whatever else all that means, it's a fair description of what happened to me when those Delphic sentences came pouring out of my computer. Somehow, my perception of a pattern was part of a strange loop created by the randomly generated sentences that emerged from the printer.

Jung and Hofstadter may well be describing different aspects of the same phenomenon—the interdependence of man, mind, and machine. If so, it's possible that the computer is not, as Weizen-

baum believed, necessarily detached from humanity. Rather, it may be an extension not only of the human ability to reason mathematically and logically but of our capacity to make judgments and think creatively as well.

Randomness can unlock the creative power of the computer to generate conceptual "nuggets." Ordinarily, we discover what we think about the world by inspecting and rearranging what we already know. Similarly, we create new ideas and works of art by rearranging the materials available to us in new and interesting patterns.

The limits of judgment and creativity, then, are implicitly within the limits of experience. To

break out of those limits, to enrich experience, we must encounter the strange.

Writers explore the strange through metaphor. Essentially this means yoking disparate ideas together. Randomness is a useful method of creating metaphors, since through random couplings we can expose ourselves to what is otherwise unlikely or even inconceivable.

Much of what is generated through random combinations is nonsense. But a significant fraction seems to be meaningful—in Jung's terms "synchronous." These are the nuggets we seek.

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The Epson Equity III+, shown here with optional expansion boards and monitor.

My own computer program *Thoughtline*, an organizational tool for writers, is a practical example of how synchronicity works. The program is driven by a pattern matcher coupled to a random number generator that in effect yokes disparate concepts together, challenging the writer to see new relationships and draw new conclusions.

Significantly, *Thoughtline* evolved heuristically. It grew through a series of patches and fixes as I expanded the program to satisfy the needs of family, friends, students, university professors, and business executives. Eventually I lost track of *Thoughtline's* in-

ternal workings and began to view it as an individual whose range of behavior was both interesting and unpredictable.

Some psychology is implicit in the structure of the program. It "knows" what people want, what they expect, what is important to them, and what is interesting. This implicit knowledge acts as a filter that tends to block the nonsense and pass along the nuggets. The results are often surprising and occasionally insightful.

But is this real computer intelligence? I believe it's on the right track. Jung's research led him to a startling conclusion: "Either the psyche cannot be localized in space, or space is relative to the

psyche." That is, the brain may be less a generator of mind than an expression of it. Couldn't the human/machine symbiosis be viewed as an expression of the same mind? If so, the questions What is computer intelligence? and What is human intelligence? become, at their root, the same question. We'll find the answer, I suspect, on the other side of AI. ●

Dan Burns is Chief Executive Officer of Xpercom, an artificial intelligence software firm in Carrollton, Texas.

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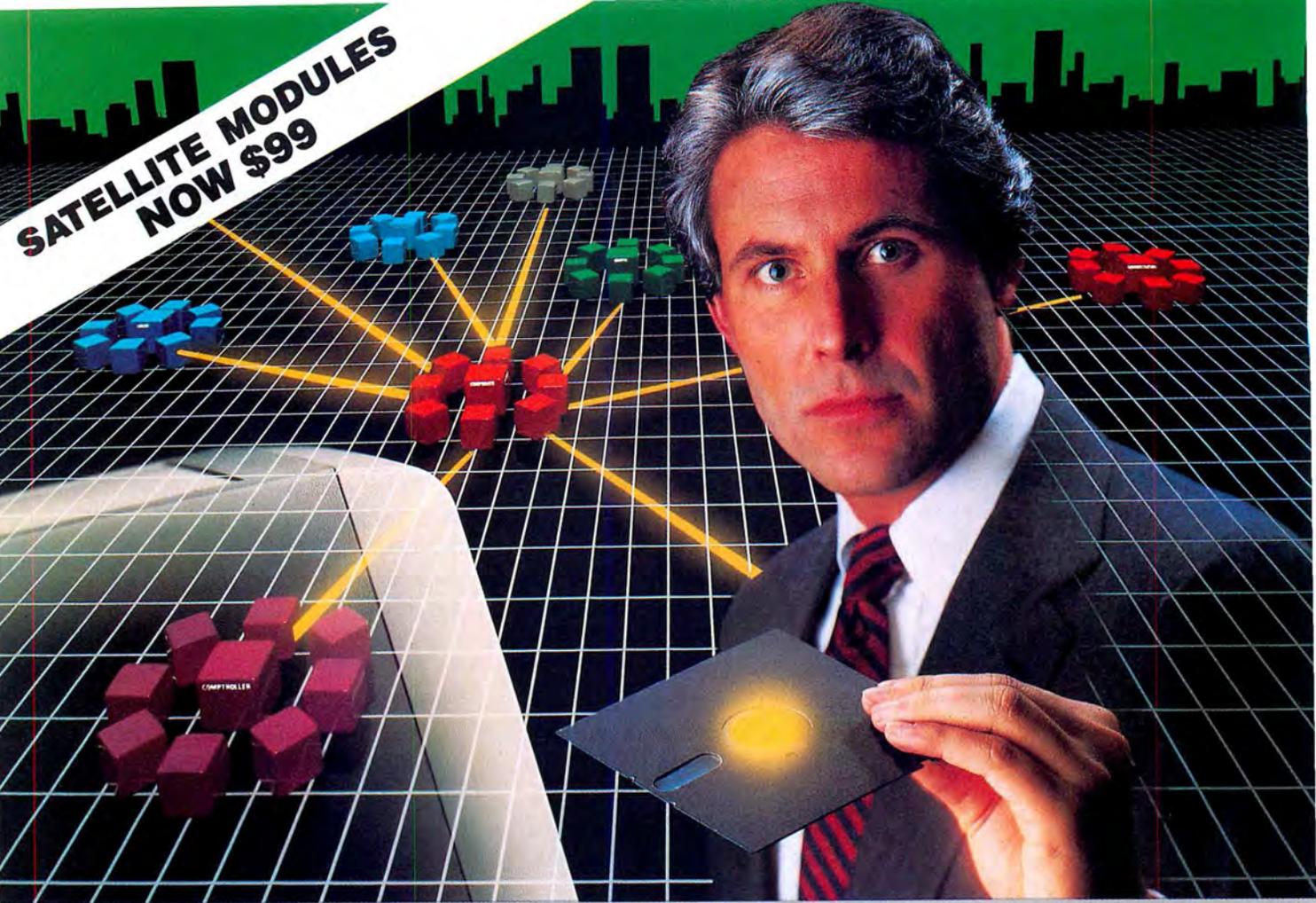
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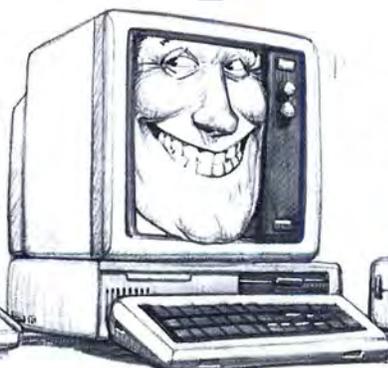
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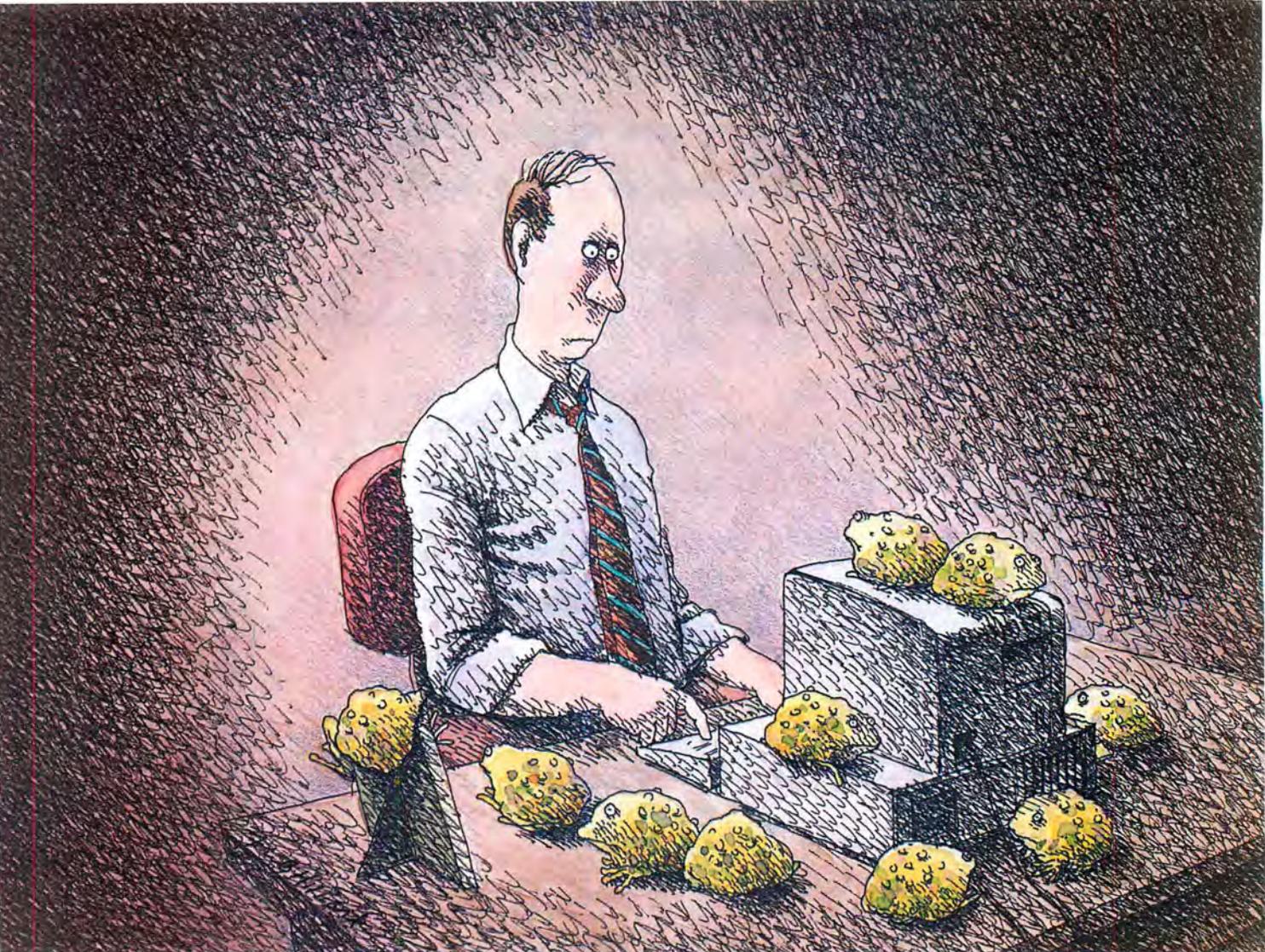
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Product Outlook

News you can use about recent PC product announcements and upcoming releases



WordStar's newfound youth, Spotlight's successor, a languageless data base application generator, and much more

Ken Greenberg



WordStar, We Hardly Knew Ye

With each passing upgrade of *Microsoft Word* and *WordPerfect*, you've wondered how long you could hold out before retraining your *WordStar*-weary digits.

Your wait is over. It took MicroPro four years to move 0.7 steps along the upgrade path to ♦*WordStar Professional* release 4.0, but if you're among the millions who'd rather write than switch, your patience has been rewarded (see *Kevin Strehlo* in this issue).

MicroPro's facelift of *WordStar* 3.3 is anything but cosmetic, despite its retention of most of the program's familiar control-key combinations. *WordStar 4.0* represents a sweeping expansion of the program, from freshly confected commands to more attractive menus. Requests inscribed on the *WordStar* wish list have been summarily granted: path support; an undo command; Microlytics' 220,000-word *WordFinder* thesaurus; local area network and EGA support; keyboard macros; box drawing; built-in math capability and a 14-function calculator; on-screen italics, boldface, and underlining; a go-to-page feature; and a hundred other modifications large and small. The new release naturally reads existing *WordStar* files.

The \$495 program is now more capable of tackling big jobs with ease. It checks spelling in real time and benefits from a beefier, 87,000-entry dictionary; you can add other job-specific dictionaries if you like. When you need to generate an index, *WordStar 4.0* will reference every word.

In its reprise of the old standard, MicroPro is particularly attuned to output. *WordStar 4.0* is on better behavior with laser printers and can now handle proportional spacing, multiline headers and footers, and full-page displays. A new preview mode renders dot commands invisible—a definite step in the right direction. Current *WordStar* users can obtain release 4.0 for \$89 (plus shipping) by furnishing MicroPro with a serial number; the program is free to anyone who purchased version 3.31 after December 1, 1986. MicroPro Int'l, 33 San Pablo Ave., San Rafael, CA 94903; 415/499-7676.



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Metro is decidedly not *Spotlight*—which Lotus acquired when it swallowed Software Arts—by another name. (Even so, *Spotlight* owners can upgrade for \$40, less

(continues)

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List Manager / Version 1.08		4-15-87	11:58a
LAURA			
Immediate Attention			
<input type="checkbox"/> Call Jim Ewing re: oil wells	10-Apr	10-Apr	
Draft preliminary contract for office space	10-Apr	10-Apr	
Get contractor's bids for build-out	today	15-Apr	
Department travel plans for May	mon	15-Apr	
Tasks To Do Soon			
Meeting with Virginia re: new format	12-Apr	01-Apr	
Call accountant	02-Apr	01-Apr	
<input type="checkbox"/> Call Mrs. Robinson re: swimming pool	05-Apr	01-Apr	
Meet with Mr. Graziano re: rematch	14-Apr	10-Apr	
Done			
Change bank account	01-Apr	01-Apr	
<input type="checkbox"/> Open IRA account	03-Apr	01-Apr	
Personal			
Call body shop re: when will car be done?	10-Apr	10-Apr	
<input type="checkbox"/> PAY TAXES TONIGHT!!!	today	01-Apr	
Take Riff to the eye doctor	today	15-Apr	
Pick up Suzie from ballet	today	15-Apr	
<input type="checkbox"/> Call lawyer about divorce	today	01-Apr	
Hire housekeeper	tomorrow	15-Apr	

Using the Metro List Manager, you can split tasks between business and pleasure, set priorities, and visually note milestones you've met.

than half of Metro's \$85 list price.) The interface is pure Lotus. Metro's memory-resident core requires 80K; beyond that, any accessory that you no longer need can be removed from RAM.

The macro generator's learn mode records keystrokes as entered. Its command language can be pressed into service to automatically cut and paste data between applications, via the Metro Clipboard. You can just as easily use the macro capability to prepare menus and templates or even design a tutorial to be played back at any speed you desire.

The program's reach doesn't end there. The Text Editor provides basic word processing from within 1-2-3 or Symphony. The Metro List Manager is in fact a pint-size project organizer, making room for daily task priorities and to-do lists as well as flagging

deadlines. The Notepad can directly annotate worksheet cells. The Appointment Book organizes individual and group schedules on a daily, weekly, or monthly basis. Slicker still is The Watch, which includes a timer you can set in 100 ways, a stopwatch, and a mini time-and-billing program that's good for billings on as many as 100 cases. The Calculator is built to handle financial functions. Also in Metro's neighborhood: an ASCII table, a Phone Book with an auto-dialer, a Kaleidoscope that sets colors for all components, a DOS File Manager, and a system configuration accessory.

Urban sprawl has virtually no limit: Lotus has begun encouraging third parties to develop Metro

(continues)

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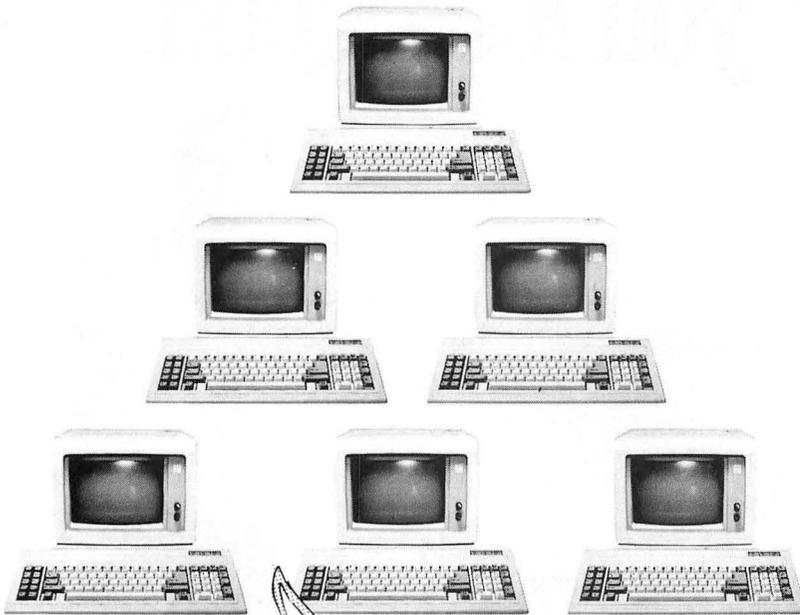
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add-ons by setting an example. *Express*, the Lotus electronic mail package, takes advantage of *Metro* components; conversely, *Metro* users can treat *Express* as an accessory. For the product's initial six months, AST has teamed up with Lotus to offer *Metro* at half price with selected AST expansion boards. Lotus Development, 55 Cambridge Pkwy., Cambridge, MA 02142; 617/577-8500.



1-2-3 Minces Words

If you need more than a notepad in 1-2-3 but aren't interested in erecting your own text editor on an edifice of macros, Turner Hall has made worksheet space safe for word processing with **4Word**.

The full name is a mouthful—*4Word: The Add-In Word Processor for 1-2-3*—but it drives home the point that this product is neither a RAM-resident utility nor a 1-2-3 template. *4Word* weaves itself into the very fabric of 1-2-3 release 2. The \$99.95 program is the first of what's certain to be a barrage of release 2 "bind-ins": products, built with Lotus's 1-2-3 *Developer Tools*, that use 1-2-3 commands directly and whose menu selections fit snugly into 1-2-3 macros.

4Word's litany of features is more than adequate to draft and print a modest report that illuminates your calculations: word

(continues)

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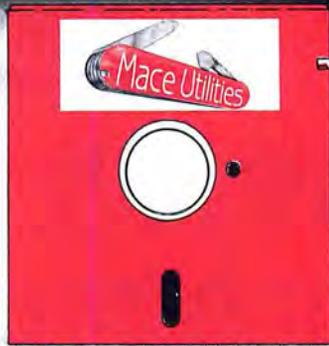
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wrap, block move, copy, search and replace, and automatic justification, plus on-screen boldface, underlining, and italics. (Even if you're not drafting an opus, you can finally boldface your labels.) Documents can extend 25 pages before performance falls off.

Better still, worksheet data placed in text remains live and automatically reflects any subsequent tinkering with the spreadsheet. Because *4Word* piggybacks on 1-2-3 code, the program remains a trim 40K. *4Word* is just as adept at borrowing commands from Lotus's *HAL*—including Undo—and you can effectively add a mail merge capability by using it with *1-2-3 Report Writer*. Like 1-2-3 itself, *4Word* supports expanded memory and release 2's sparse matrix orientation. Turner Hall, 10201 Torre Ave., Cupertino, CA 95014; 408/253-9607.



Presto: No Language

Relational data managers and application generators that offer power without programming are a bit like perpetual motion machines—very rare. Into that vacuum comes ♦*Magic PC*, a data management tool—without language—that may be ideal for managers who need turnkey applications but don't want to ante up for custom programming.

Magic PC, from Aker Corporation, is aimed squarely at DP consultants, value-added resellers,

(continues)



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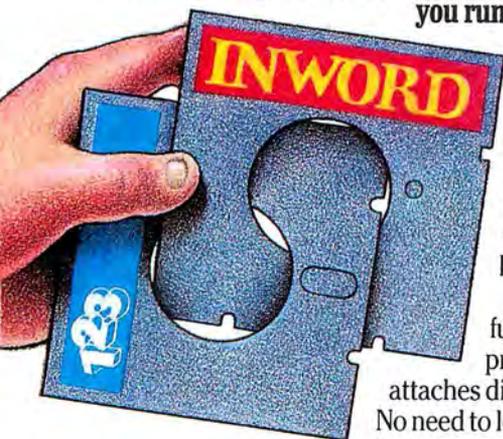
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Plus you can print bold, underlined and italic text, and mix typefaces and pitch to your heart's content.

InWord gives you instant spreadsheet integration, plus powerful formatting and typestyle controls.

It's great to be connected with Lotus.

It's no coincidence that InWord gets along so beautifully with 1-2-3. In fact, InWord was developed especially for 1-2-3 Version 2 using software tools supplied by Lotus® themselves.

That means InWord is truly integrated with 1-2-3. So it's a breeze to transfer data directly from a spreadsheet to a document, or the other way around. And a snap to do lightning-like mailmerge operations straight from your 1-2-3 spreadsheet database.

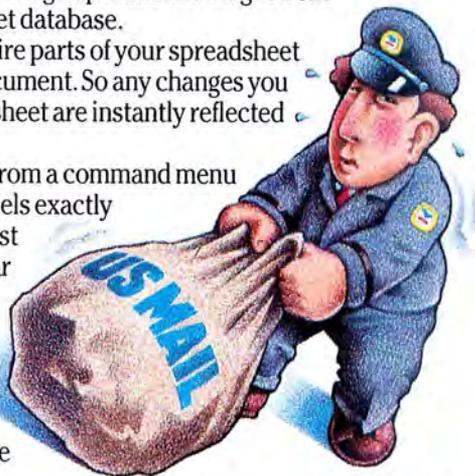
You can even hotwire parts of your spreadsheet directly into your document. So any changes you make to your spreadsheet are instantly reflected in your document.

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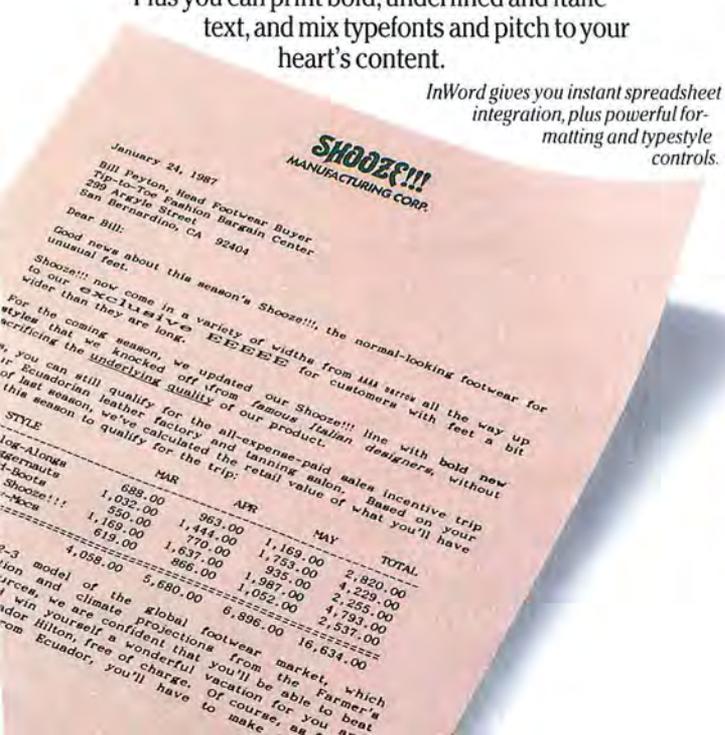
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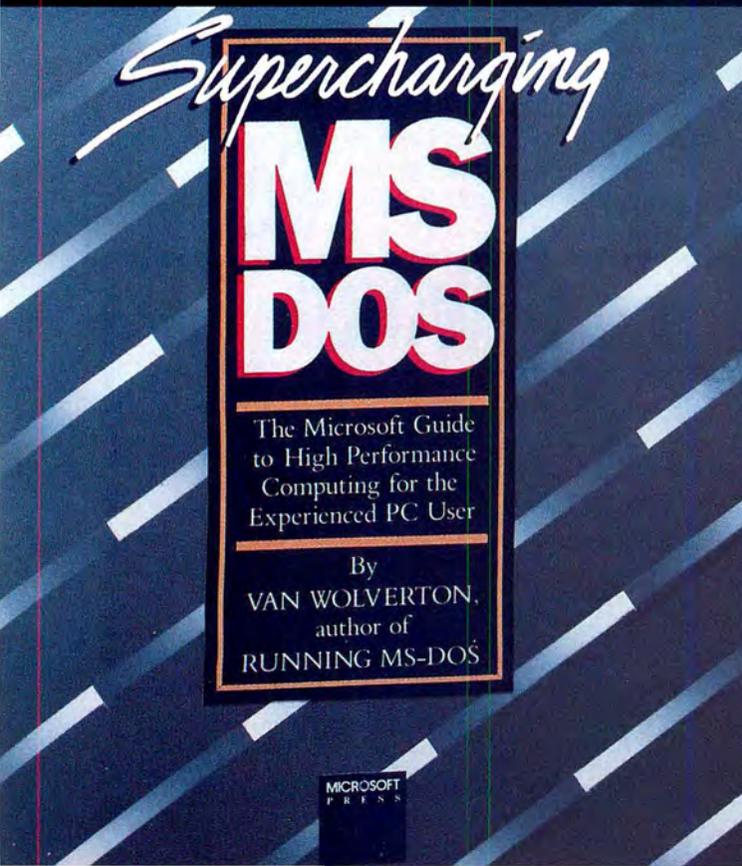
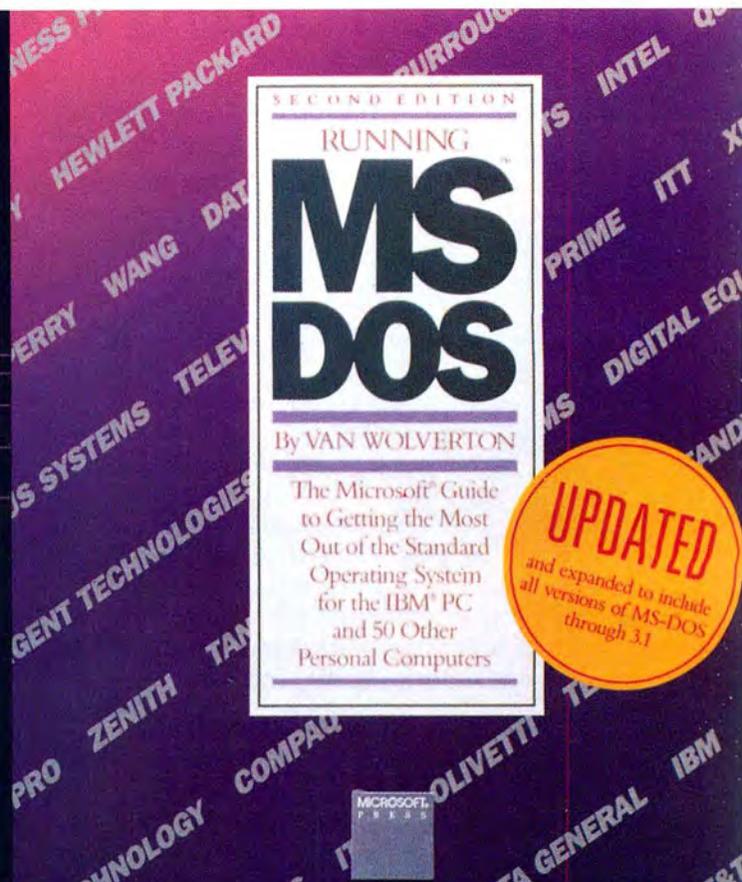
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Mode:
 1) Modify
 2) Create
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Operation:
 4) Locate
 5) Range
 6) Key
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Select : 3

1 2 3 4 5 6 7 8 9)End 10)Help []

Magic PC consolidates data base housekeeping options in a discrete window, invoked with a single function key.

MIS folk, and systems analysts. Nonetheless, the program's non-procedural philosophy of point-and-shoot application creation is well suited to everyday users, power or otherwise.

Aker has wrapped its application generator and data manager in one svelte package. Task creation—from initial data base design to screen painting to report generation—is a visual exercise, a matter of completing menu-driven tables or interacting with on-screen windows. Applications are fashioned from just 13 built-in program operators (create files, establish relational links, run a task or a program, add conditional logic, and so on). The program's inference engine takes it from there.

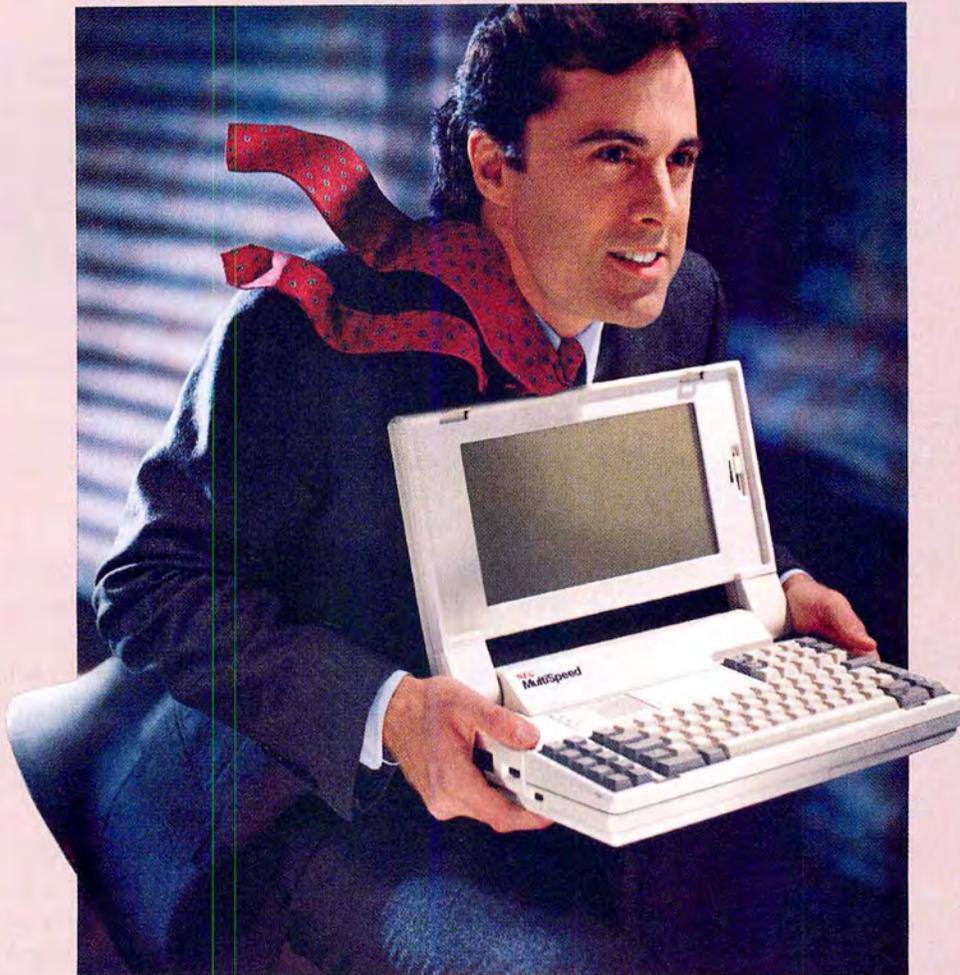
Even where syntax matters (as in *Magic PC's* support for sub-routines and nesting), a rundown of choices is just a window away.

Without the strictures of a language, Aker maintains, program elements—whether file relationships, user-crafted help screens or error messages, or the data base itself—can be defined and altered dynamically and almost effortlessly.

As a data manager, *Magic PC* carries respectable credentials. The program sorts on up to 24 keys, supports virtual fields, permits records of up to 2K in length, includes undo and zoom capabilities, and runs under Novell's *Advanced Netware*. For other programs, the door into *Magic PC* is simply ASCII format. The program can serve as a capable DOS shell—you can execute any program from within it. It's an even better prototyping tool, since a

(continues)

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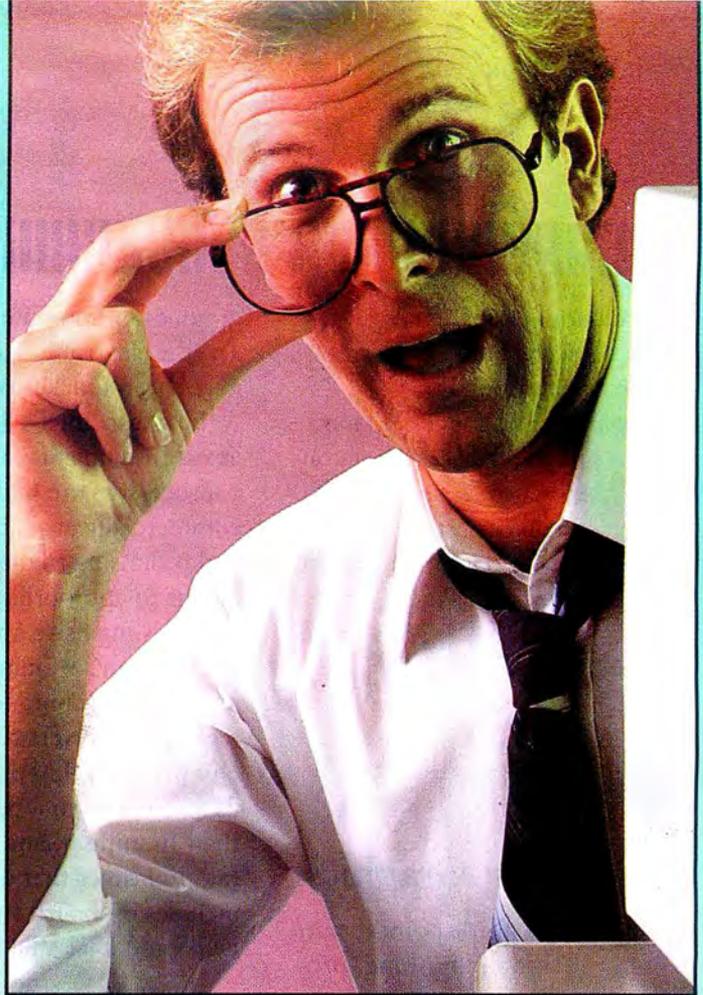
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skeleton application can eventually be fleshed out within the *Magic PC* environment.

Magic PC lists for \$695, and Aker is selling a run-time version to OEMs for \$95. A separate \$20 trial offer includes an application generator and a data manager limited to 100 records. Aker Corp., 18007 Skypark Circle #B2, Irvine, CA 92714; 714/250-1718.



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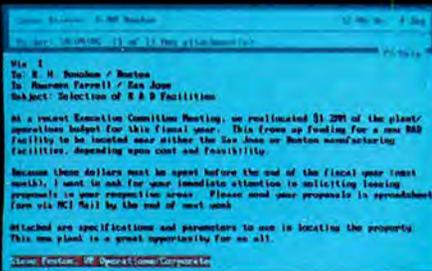
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Number Nine's ♦**Pepper II**, which also sports a 786 coprocessor, offers modes compatible with the IBM monochrome display adapter, the CGA, and the EGA and offers modes equivalent to the

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QuadHPG's. In addition, Pepper II delivers a 1280-pixel-by-700-pixel monochrome mode for desktop publishing and CAD packages. Users can switch easily from 16 colors to 256 on the same multi-synchronous monitor. The company's NNIOS interface enables *Microsoft Windows* and *GEM* applications to benefit from the board's potent powers right now. With 1MB of RAM, the Pepper II lists for \$1000; the board can be upgraded to 4MB. Number Nine Computer Corp., 725 Concord Ave., Cambridge, MA 02138; 617/492-0999.

The TI chip is the brains behind the ♦Image Manager 640 from

Vermont Microsystems (VMI), the company that built the Professional Graphics Adapter for IBM. The \$1695 Image Manager 640 is a designer's delight and retains compatibility with both the CGA and the PGA. The VMI board supports the company's Professional Graphics Language (PGL), which includes 2-D and 3-D graphics primitives. Thanks to PGL, the Image Manager 640 can work with *AutoCAD 2* and *VersaCAD* right out of the box. Vermont Microsystems, 11 Tigan St., Winooski, VT 05404; 802/655-3800.



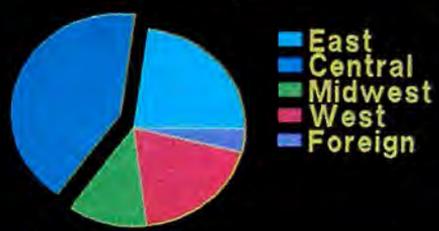
Briefly Noted

Determined to become the Chuck Yeager of personal computing? PC's Limited, the Austin mail-order upstart, is offering an 80386-based system it claims will easily make you the fastest power user on the block. The PC's Limited 386¹⁶ is said to eclipse its official 16-MHz clock rate—and that of the Deskpro 386—via a unique design incorporating zero-wait-state static RAM. As always at PC's Limited, speed is a moving target; the company is already

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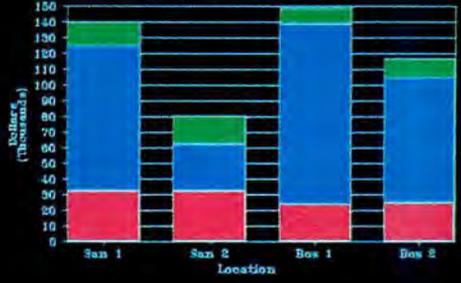


THIS LEASE, made this 10th day of December, 1989, by and between Anne Management Company herein called "Landlord," and Realgor Associates herein called "Tenant":

WITNESSETH, that Landlord hereby rents to Tenant the premises known and designated as Suite 401, located on the 4th floor, in Commerce Square One, San Jose, California, for a term of 5 years commencing on the first day of January, 1997, and ending on the 31st day of December, 1999, at and for the term rent of \$623,760, payable in monthly installments of \$10,396, in advance on the 10th day of each and every month during the term of this lease, at the place designated by Landlord, wherever located. Tenant is taking possession of said premises on January 2, 1997, and thereafter the monthly installment of rent will be due and payable on the 10th day of each month, commencing on February 10, 1987, as hereinabove provided.

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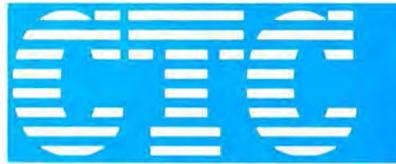
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talking 24 MHz, Intel permitting. The PC's Limited offering comes in sizes that can accept three and five mass storage devices. Standard equipment includes 1MB of RAM, a 1.2MB floppy drive, a 200-watt power supply, eight expansion slots, and a multifunction board that features EGA- and Hercules-compatible graphics, a mouse port, two serial ports, one parallel port, and a floppy disk controller. Options include a 1.4MB 3½-inch floppy drive and a 150MB hard disk drive rated at 16 milliseconds (ms). Less exotic 40MB and 80MB drives offer average access times of 28 ms. At press time, the 20MB system was priced at less than \$4000. PC's Limited, 1611 Headway Circle, Bldg. 3, Austin, TX 78754; 512/339-6800.



It used to be that the shortest distance between a PC and a printer was an A-B switch. That was particularly true for offices that were a jumble of serial and parallel printers. But switches do nothing to resolve the what-paper-are-we-using-now? conundrum. Server Technology may have an answer in *Easyprint*, a low-cost means of linking as many as 14 PCs or ATs with up to four printers. The program's Advanced Forms Support feature lets you define four independent buffers; the contents of each can be sent to a specific printer or held until you have loaded the appropriate paper. *Easyprint* does not require a dedicated print server, and stations can be as much as 1000 feet apart. A

(continues)

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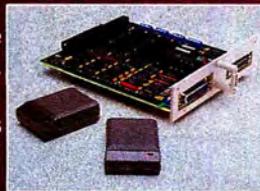
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two-PC kit costs \$159 and includes a 30-foot cable; additional connections cost less than \$80 each. Server Technology, 1095 E. Duane #103, Sunnyvale, CA 94086; 408/738-8377.



Surely one of the more exasperating challenges of the era is trying to procure a succession of long-distance phone numbers. Mindful that telephone books and directory assistance will take you just so far, General Information has released *Hotline*, a \$29.95 electronic phone book and auto-dialer. The *Hotline* disk yields 2000 of the most frequently called

numbers culled from its *National Directory of Addresses and Telephone Numbers* (General Information, Inc., Kirkland, WA, 1987)—a listing of 75,000 organizations and firms. For many customers, the directory may be only the beginning: The program includes room for an additional 65,000 numbers. In concert with a modem, *Hotline* offers a speed dialer and can maintain an extensive phone log. Calling the West Coast at 9 a.m. Eastern? *Hotline* will remind you of local time at that end. General Information promises regular updates of the base directory. General Information, 401 Park Pl. #305, Kirkland, WA 98033; 206/828-4777.



Any card-carrying program these days promises some form of file translation, but shuttling data between applications isn't invariably a reliable or an elegant process. SoftLogic's *Magic Mirror* offers do-it-yourself integration and strives to dismiss differences in file formats. This \$89.95 RAM-resident utility enables you to snip data from just about any application and pop it into any other, rendering tedious rekeying obsolete. Siphoning data from video memory, *Magic Mirror* offers "paste style controls" that edit or dress

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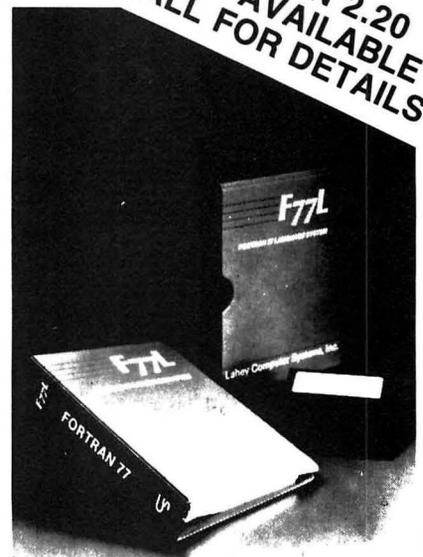


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Editor's Choice
- PC Magazine

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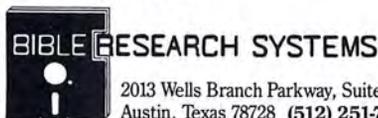
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up captured data. You can also assign those controls to keys, automating repetitive operations. Soft-Logic Solutions, 530 Chestnut St., Manchester, NH 03101; 800/272-9900.



You were a trailblazer back in 1984 when you acquired an HP LaserJet, but you've watched laser printers wearing other nameplates vault over the market leader, delivering more goodies for fewer bucks. Hewlett-Packard's answer is the **LaserJet Publisher Kit**, an expansion board for XT and AT compatibles that significantly boosts printer performance and printing flexibility. The board endows the LaserJet (and LaserJet Plus) with support for Imagen's DDL page description language and includes a Motorola 68000 microprocessor with 2MB of RAM—good for full-page graphics at 300 dots per inch. This bumps the printer's rated speed up to 8 pages per minute. The board, which lists for less than \$2500, also adds 16 fonts in ROM and a series of disk-based fonts. Hewlett-Packard, 11311 Chinden Blvd., Boise, ID 83714; 208/323-6000.



Now that IBM's Token-Ring Network is finally shipping, you can call an end to the drought in multi-user data management software that gives the LAN something productive to do—particularly if you use either of the two leading PC data managers. Ashton-Tate has tweaked **dBASE III Plus** version 1.1 and its accompanying

(continues)

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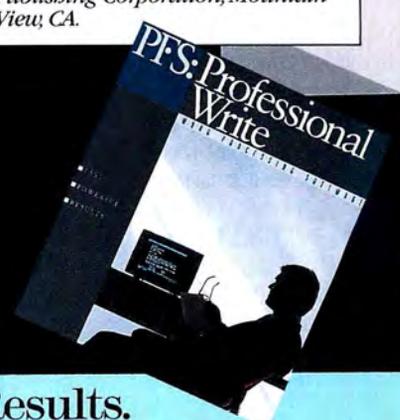
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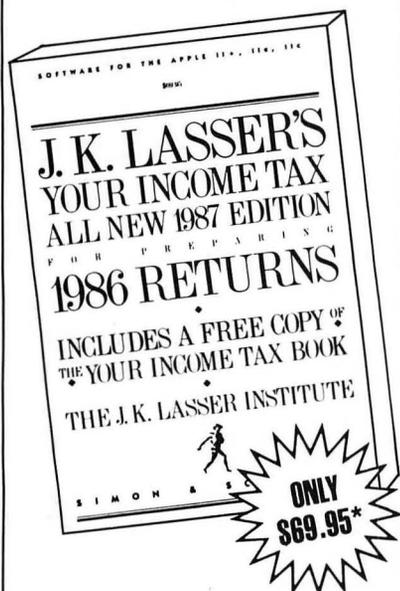
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LAN Pack to run on IBM's once and future network. Microrim has likewise certified that its *R:base System V* and *R:base 5000* packages are compatible with the Token-Ring. For all four of these programs, the badge of compatibility signifies cooperation with network locking conventions, password security, and the Token-Ring NETBIOS. The data managers from both firms also work with 3Com's 3+ system, the IBM PC Network, and Novell's *Advanced Netware*. *R:base* additionally runs on the Ungermann-Bass Net/One; *dBASE* supports AT&T's Starlan. Ashton-Tate, 20101 Hamilton Ave., Torrance, CA 90520-1319; 213/329-8000; Microrim, 3925 159th Ave. NE, Redmond, WA 98073-9722; 206/885-2000.



For *Smartcom II* users linked via the Token-Ring, modems and serial ports have been silent—until now. Hayes has added Token-Ring support to its *Smartcom II* version originally tailored to the IBM PC Network. The \$599 package features a Modem Server component that runs as a background application and converses with the network. LAN users can dial up via a shared modem as if it were tethered to their PC. *Smartcom II* features terminal emulation, NETBIOS compatibility, multiple error-checking protocols, and, of course, DOS 3.20 support. Hayes Microcomputer Products, 705 Westech Dr., Norcross, GA 30092; 404/441-1617.



Find your Dialog bills mounting and the quality of your search undermined by the ticking of the meter? Dialog Information Services will now let you meander at your leisure... on CD ROM. The data base company's first optical media offering is an educational reference tool called *ERIC (Educational Resources Information Center)*. A bibliographic storehouse sponsored by the U.S. Department of Education, *ERIC* consists of two files: Resources in Education, and Current Index to Journals in Education. *ERIC*, part of the series Dialog Ondisc, is the first of Dialog's 270 data bases to be committed to optical media and will be updated quarterly. *ERIC*'s annual fee is \$1950, which could well be a bargain in light of searches that can top \$100 per hour. Dialog is offering a Philips CM-100 CD ROM drive and controller board for \$740. Dialog Information Services, 3460 Hillview Ave., Palo Alto, CA 94304; 415/858-3785.



A power failure is a good occasion to kick yourself for not having acquired an uninterruptible power supply. Intellisoft's *Bookmark* can keep your blood pressure down and eliminate catastrophe from system crashes. The \$69.95 RAM-resident program enables you to pick up where you left off after you powered down—voluntarily or otherwise. *Bookmark* maintains two active hard disk files consisting of mirror images of all the data and code in conventional

(continues)

TOP HONORS FOR GRAPHICS

Software Digest®

RATINGS NEWSLETTER

Vol. 3, No. 11 / November 1986

... and file graphs. Speed tests print and plot graphs. Quality tests programs. The 1987 schedule will kick off with word processors in January and project management software in February.

Software Digest Rating	Overall Evaluation	Program Name	Version Tested	Ease of Learning	Ease of Use	Error Handling	Performance	Versatility	Memory Requirement	Price	Volume Purchase Discounts	Site Licensing	Program Can Be Copied	Demo Disk Available	Page
★★★★	8.6	Harvard Presentation Graphics	A.01	■	■	■	■	■	256K	\$395	✓	✓	✓	✓	26
★★★★	8.4	Chart-Master	6.2	■	■	■	■	■	192K	\$375	✓		✓		14
★★★	7.6	GEM Graph	1.0	■	■	■	■	■	320K	\$249	✓	✓	✓		18
★★★	7.4	Picture Perfect	3.4	■	■	■	■	■	384K	\$295	✓				36
★★★	7.2	Microsoft Chart	2.0	■	■	■	■	■	256K	\$295	✓	✓	✓		28

Ratings Key
 (On a scale of 0 to 10)
OVERALL EVALUATION
 ★★★★★ 9.0 or higher
 ★★★★ 8.0-8.9
 ★★★ 7.0-7.9
 ★★ 6.0-6.9
 ★ 5.0-5.9
 ALL OTHERS 4.9 or lower

Lots of experts are putting Harvard Presentation Graphics (HPG) at the head of the class. Software Digest gives HPG their highest rating ever for a business graphics package — a rating won for superior performance, combining quality output and fast creation of graphics.

PC Magazine names HPG a “superb choice” because it’s “flexible, fast, easy to use and well thought-

out.” They rank HPG as a “first-rate graphics package.”

Infoworld calls Harvard Presentation Graphics “an elegant and intuitive program,” that is also “powerful and versatile.”

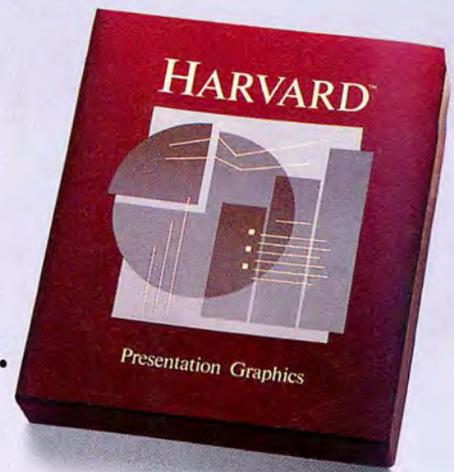
And, according to PC Week, “the real key to a presentation graphics package is output, and this is where HPG really shines.”

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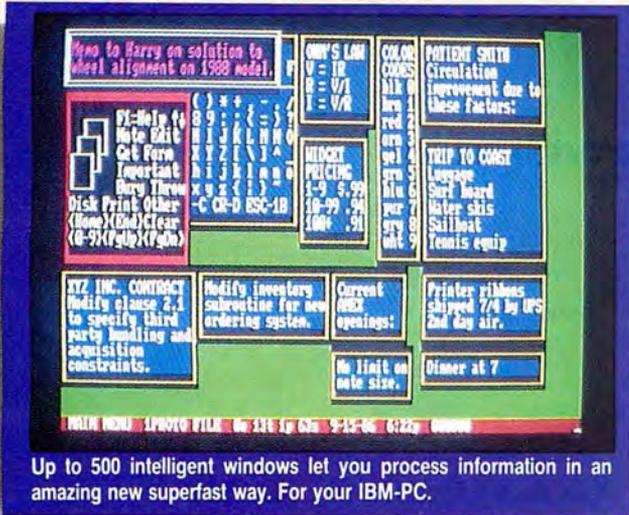
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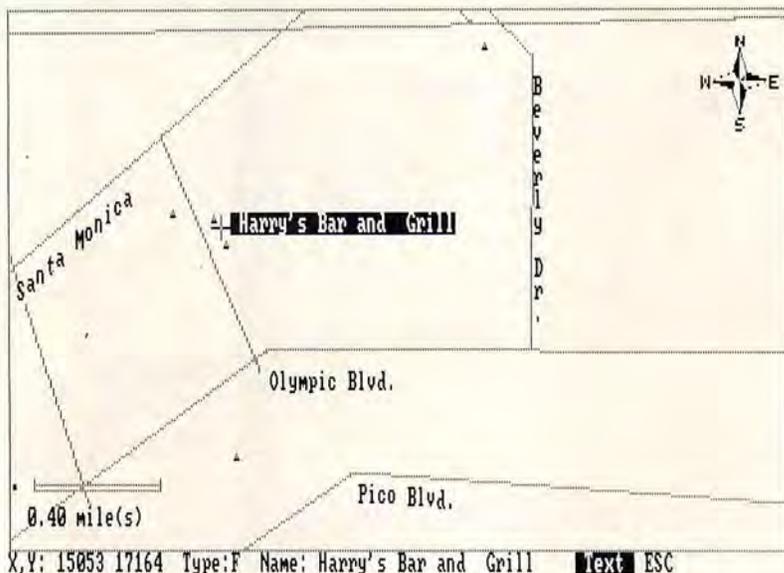
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Circle 89 on reader service card



Los Angeles on a Disk, a supplement to Klynas Engineering's Streets on a Disk, flags local landmarks. This one lies within easy striking distance of PC World's Los Angeles office.

RAM. The utility nominally saves to disk every 2 minutes or 1000 keystrokes, a regimen you can tinker with. If you'd rather not exit an application in the usual way, you can shut off the power with confidence and entrust *Bookmark* to find the way back, work intact. Intellisoft Int'l, 70 Digital Dr., Novato, CA 94948; 415/883-1188.



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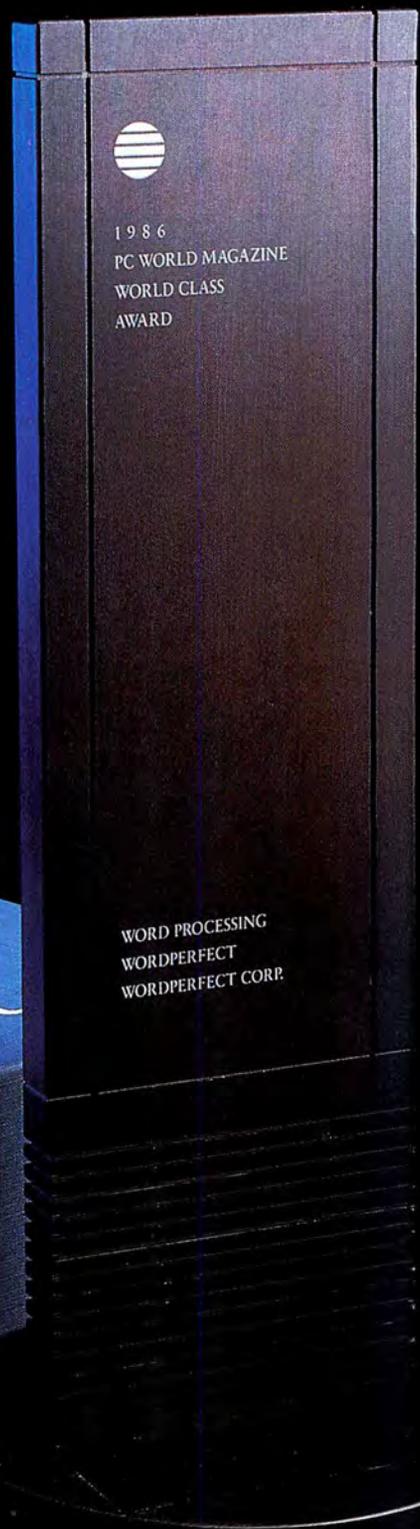
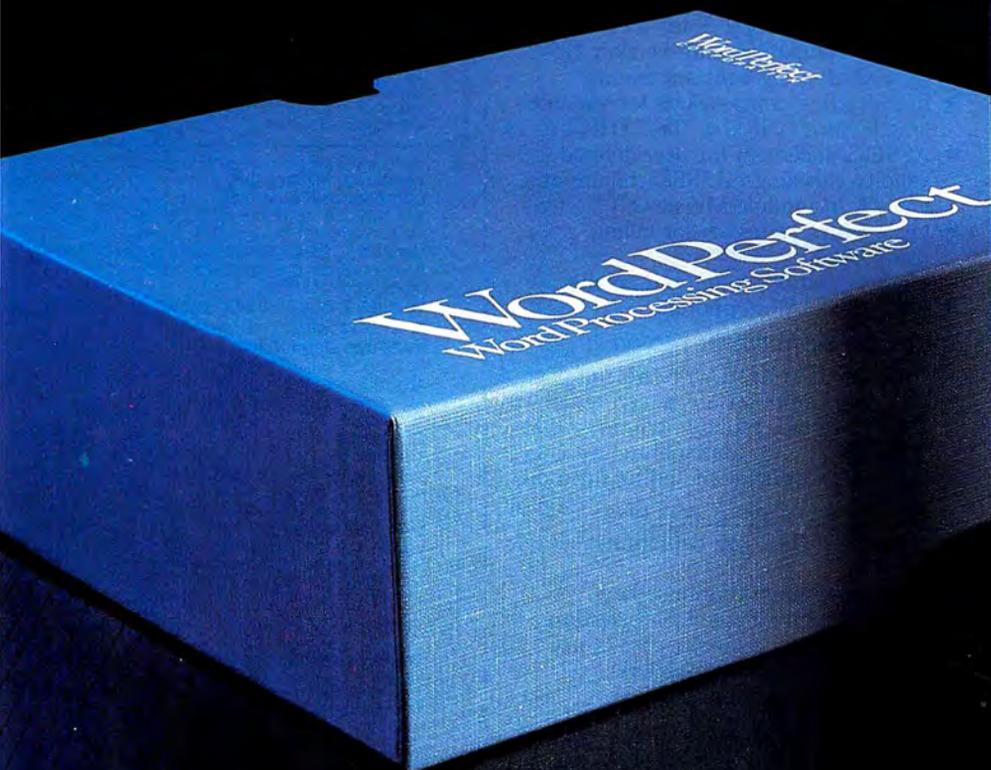
travel time, and fuel requirements. The only thing wrong with this scenario is that *Streets on a Disk* is best used on a deskbound PC hooked up to a printer, and that your strange city—for now—had better be Los Angeles, San Francisco, or Chicago (with Dallas and New York ready soon). *Streets on a Disk* comes with a map of the United States and can store up to 500 user-defined places on any municipal grid. You can annotate those destinations with phone numbers and comments and even build your own map by tracing it with a mouse. *Streets* is \$69.95 with a city map, \$49.95 without. Klynas Engineering, P.O. Box 1666, Simi Valley, CA 93062; 805/583-1029. ●

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Modula-2PC provides all the language features of Wirth's 3rd edition of *Programming in Modula-2*, as well as some extensions which match his most recent research into computer languages.

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We introduced version 1 of our compiler last spring. It compiled as much as 10 times faster than the competition. Now, *Modula-2PC version 2* can work for you even twice as fast as before — with a smaller compiler!

Standard Features of Modula-2PC:

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- ▶ Complete language reference manual, syntax reference card, sample programs

New Features of version 2!

- ▶ Execution speed increased in user programs from 50 to 150 percent
- ▶ User program size reduced by 25-50%
- ▶ Compiler size reduced, with all the version 1 features retained, plus a speed increase of nearly 2 times over version 1 (source compatible with version 1)
- ▶ Expanded string constant feature
- ▶ In-line string comparisons for variable length strings ("IF s1 = 'Test' THEN . . .")
- ▶ ASSERT statement for user-defined validity checking ("ASSERT failure at line 72, in module MyFileIO")
- ▶ DOS return codes set for failing compilation
- ▶ Library modules faster and smaller
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- Balance forward or open item billing
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THE Order Entry:

- Processes invoices singly or in batches
- Unshipped items are marked on the Order Report
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- Of course, THE Payroll calculates payroll including Federal & State taxes, prints checks, allows hand written checks, lets user maintain tax tables and keeps an extensive employee payroll history

THE Spreadsheet:

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THE Wordprocessor:

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THE Mailmerge:

- Integrates THE Wordprocessor & THE Name & Address System
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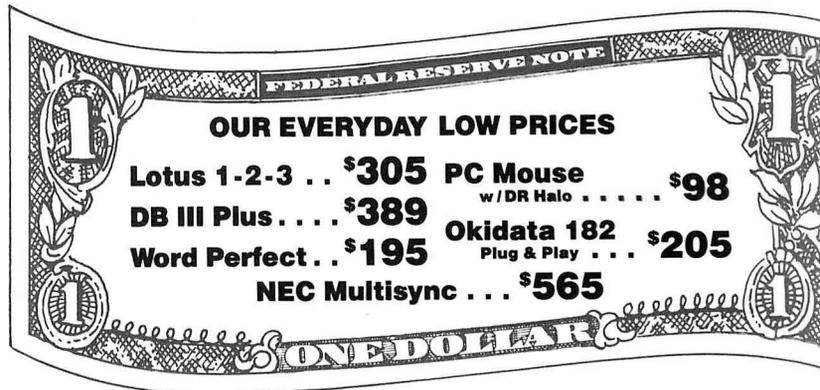
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A representative of the Vatican. The government of India. An intelligence officer who documents the debriefing of captured spies. The *Wall Street Journal's* Moscow reporter. A biblical scholar in Iowa.

What members of this eclectic group all have in common is the need to speak several languages. That inescapable fact brought them all to Gamma Productions, whose *Multi-Lingual Scholar* is nothing if not worldly. The \$350 word processor was, at last look, fluent in 32 languages and could handle 5 of them simultaneously.

Gamma even boasts one Soviet customer—a scientist with a PC

who faces a real typing challenge. Muses Linda Brandt, Gamma's vice president of marketing, "There's no IBM Selectric standard for Russian typewriters."

Meeting that challenge was child's play for *Multi-Lingual Scholar*, which completely remaps the keyboard and produces foreign language alphabets on screen and hard copy. Actually, the program is as much an alphabet-generator as a universal word processor.

Multi-Lingual Scholar is powered by a word processing engine that offers *WordStar*-like functionality. Program commands and underlying logic are in English, as is on-line help. The program is shipped with configuration files that automatically load five alphabets, assigning diacritical marks, overstrike characters, and accents to the function keypad. You can flip among any of the five alphabets or download others from a floppy disk.

There's more to word processing than the shape of the characters, of course. Gamma has man-

aged to teach *Multi-Lingual Scholar* to respect alphabetic differences without fixating on them. Accordingly, search and replace doesn't stumble over case, umlauts, and the like.

And with Hebrew and Arabic in the lexicon, says Brandt, Gamma "needed to reinvent the wheel to support certain language functions like bidirectional text entry." The result is a talent for right-to-left inserts, right-to-left block moves, and right-to-left paragraph reformatting.

Multi-Lingual Scholar easily sprouts new alphabets, thanks to a nimble font editor, scanner support, and the help of a few skilled calligraphers. "We don't have Chinese or Japanese alphabets with their many thousands of characters, but Eastern languages with Western-style alphabets—like Thai, Vietnamese, and Korean—are no problem at all," explains Brandt, who admits to speaking "a little bit of a lot of languages." All alphabets can be displayed or printed in at least two fonts on dot matrix and HP LaserJet printers, and Gamma recently added a Compugraphic driver for bona fide typeset output.

In seven years *Multi-Lingual Scholar* has moved beyond its cloistered origins. Brandt's broth-

PC World View reports items of interest to computer enthusiasts and significant insights about industry trends and personalities.

—Eric Bender

View

News and notes for the computing community

er, a biblical scholar, developed a Hebrew program for the Apple IIe and then sensed the market possibilities. Word of the program spread via a direct mail campaign aimed at Jewish educators. Christian scholars requested a Greek edition. Other academicians asked for Russian. And everyone wanted a PC version. Once targeted exclusively at academicians, the program is gathering favor among government workers and international businesspeople.

Gamma itself is still garage-shop size, with just five full-timers on the payroll. Brandt says interest in applying the program to foreign language instruction is mounting. And as *Multi-Lingual Scholar* finds its way into computers on the Continent and throughout the Middle East, the company will translate the program core into French and Arabic.

Although Gamma's stable of linguists has fielded inquiries from a variety of non-English speakers, most support calls come through in English. Brandt doesn't worry that a Tower of Babel will rise on Gamma's doorstep. "Computer-naive users are really more of a barrier than language issues," she says. —Ken Greenberg



Henrik Drescher



Mathias Oppersdorf

Daniel Ben-Horin's brainstorm brought bulletin-board computer experts together with the nontechnical staffs of nonprofit foundations.

Nonprofits Tap the WELL

A brand-new printer remained packed in its box at a small nonprofit foundation while staff members worked feverishly to type a report in time to meet a funding deadline. For Daniel Ben-Horin, a San Francisco writer and computer consultant—and formerly the administrator of a nonprofit organization—the scene was all too familiar.

“Nonprofits scrounge for hardware and software, run into a problem, and become paralyzed,” Ben-Horin observes. “The staff at a nonprofit is usually stronger on idealism than technical background. And the idea of paying a computer consultant \$75 an hour to mutter in computerese is pretty unappealing. Meanwhile, the so-called nerds on the bulletin board services [BBSs] have a wealth of information and are often eager to help neophytes along.”

That realization proved to be “the proverbial light bulb going off,” according to Ben-Horin. “I decided to try to connect the computer experts on the WELL [Whole Earth ‘Lectronic Link, a Northern California BBS that sponsors New Age and socially conscious conferences] with the computer problems in the nonprofit community.”

Once Ben-Horin kicked off a three-month pilot project (funded by an Oakland foundation), the response was immediate. From the Haight Ashbury Free Medical Clinic to a bilingual guerrilla theater troupe, almost every organization Ben-Horin contacted had a computer problem. These ranged from the trivial but crippling (Which one’s the serial port?) to

the complex (We have to convert our old Apple mailing list to *dBASE III*).

Fortunately, the old hands on the WELL met the response in kind. A strike force of 20 volunteers quickly assembled to answer questions posed on line. In some cases, the WELL experts made house calls, connecting hardware, debugging software, and setting up communications connections. WELL response was usually so fast that one group of participants dubbed themselves ENERT—the Emergency NERd Response Team.

“We’re delighted,” says Jillian Steiner Sandrock, program director for the Skaggs Foundation, which funded the Ben-Horin effort. “This project addresses real needs in the daily life of nonprofit organizations. Data base mailing lists, calendars, newsletters, bud-

Spreadsheet Experience Preferred

get reports using spreadsheets—these are the items that consume staff time at a nonprofit. Sometimes 10 or 15 minutes' worth of expert help can clear up computer problems that have been plaguing an organization for months."

Meg Holmberg, a staff member of Community Boards, a San Francisco conflict-resolution agency, contacted Ben-Horin with a *dBASE III* question and soon found herself watching WELL workers moving furniture around in order to hook up a loaner modem. Community Boards received an answer to its *dBASE* query and has now bought its own modem and is looking forward to life on line. "Hiring a consultant would have been prohibitively expensive," Holmberg says. "Plus, this way, we end up building the expertise in-house."

One likely next step for the project is offering "rescue kits," consisting of a modem, software, and foundation-funded installation, the better to enable nonprofits to tap directly into the WELL and national user group bulletin boards. A phone-in help line for nonprofits may complement that approach. And Ben-Horin—who says, "We just caught the spirit that marked the first phase of computer hacking ten years ago"—hopes the idea will catch on everywhere nonprofits live. —Charles Seiter

Now that the smoke from the PC revolution has cleared, the skills required of office workers will never be the same—not even for temporary workers, who are finding that few office professionals can live by typing speed alone.

Five years ago, Manpower Temporary Services, one of the world's largest purveyors of temporary office help (1250 offices in 32 countries), began training its workers to use dedicated word processors. "While we were trying to address that need," says Manpower president Mitchell Fromstein, "the PC exploded on the marketplace. We had to find some way to quickly and effectively provide our people with the skills needed for the automated office."

Plodding through software documentation proved too complicated and compulsory attendance at existing training programs too costly, so Manpower developed its own disk-based tutorials for popular applications software. Called Skillware, the tutorials prompt Manpower workers through step-by-step training sessions. When a worker completes the course, he or she receives an easy-to-use reference manual, and thereafter can call the Manpower office for technical advice. Overall, Fromstein reports, 150,000 people worldwide have completed Skillware training programs.

Manpower originally developed Skillware for *DisplayWrite 2* and

3, *WordStar 2000*, *MultiMate*, *1-2-3* release 1A, and *dBASE II*.

The list of supported applications has grown considerably since that first batch. "We're heavy in word processing software because that's the most popular office application," says Sharon Canter, Manpower information specialist. "But our *1-2-3* and *dBASE* training enable us to serve the largest possible customer base."

The company's research reveals that managers are increasingly delegating PC tasks—particularly spreadsheet applications—to support staff. Manpower has taken some 4000 workers through *1-2-3* training.

A temp who can hit the PC running generally proves a hit with Manpower clients. "We've needed help immediately for several projects that required knowledge of *DisplayWrite 3* and *WordStar*, and Skillware has saved us from having to train a temporary worker," says Dee Lydum, personnel manager at Mercy Healthcare Organization in Sacramento, California. "We don't lose any time, and the project gets completed."

Just as important, temps also benefit from Skillware training. Mary Ellen Donahue, a Manpower temporary worker in Houston, Texas, credits Skillware with helping her to overcome fear of computers and develop marketable job skills. "I've reached a point where learning software is relatively easy," she says. "I even learned to use *1-2-3* on my own at a Manpower job." —Wes Nihei

Robots Under Glass

Museum-goers get their hands on some genuine artificial intelligence.

An unusual museum show is making the rounds. This one includes an exhibit that looks back at you carefully—and tells you, in synthesized speech, what you're holding in your hand.

No big deal? Move on to the next display—the one that puts you in command of a large chemical plant. “Lots of things will go wrong,” exhibit planner Roy Gould explains; but your copilot is an expert system that will “guide you in getting things back under control before the whole plant explodes.”



Photographs by Scott Resnick



“Intelligent machines” welcome visitors to their show at the Boston Museum of Science, where their repertoire ranges from composing music to window washing (below left).

Robots and Beyond: The Age of Intelligent Machines opened at the Boston Museum of Science this winter and is expected to draw more than 1 million visitors annually during the course of a three-year tour in eight cities around the country. It's a \$4 million showpiece for state of the art machines with humanlike abilities. “We want it to be not just entertaining but provocative and disturbing, in the best sense,” says Gould.

While R2D2 and C3PO, the intrepid *Star Wars* duo, have fueled public expectations of robotics, less glamorous robots are steadily taking over drudge tasks today. One white-collar industrial model on exhibit endlessly performs

chemical analyses, “doing all the things graduate students hate to do,” Gould notes. “We're thinking of awarding it a degree at the end of the show.”

Much more spectacular are a “computer artist” that follows built-in rules about drawing to create original “art” and a “robot composer” that regurgitates musical ideas fed to it by a contemporary composer. This binary Bach “composes a short piece, dedicates it to you, puts the score up on the screen, and then performs it on a Kurzweil synthesizer,” Gould says.

So this is artificial intelligence? Gould's definition of that slippery

discipline joins a growing list: "It approaches AI if you're jealous of it."

Exhibit adviser Marvin Minsky, founder of the Artificial Intelligence Laboratory at the Massachusetts Institute of Technology, recalls that researchers of intelligent machines "started out with the things that seemed hardest, like chess playing. But they turned out to be the easiest."

While computers can play world-class chess, they strike out at most tasks that humans master shortly after leaving diapers.

"There's no machine that can tell a dog from a cat," Minsky notes. "There's no program that can look around a room and recognize the people—programs can't even *find* the people."

Computer scientists are currently hammering away on two major research problems: turning

machines into "experts" at given tasks, and enabling groups of such "experts" to work together to solve complicated problems. "Eventually, when they're as smart as people, we'll understand them no better than we understand people," Minsky says wryly. "It's going to be a strange future."
—E. B.

No Clearance, No Sale

Computer users apparently face no immediate threat from a Department of Defense (DOD) proposal that would restrict access to sensitive information on commercial computer data bases. But the proposal raises a serious question: Is computer-based media entitled to the same freedom of speech and press guarantees that more conventional media enjoy?

Diane Fountaine, the DOD's director of information systems, triggered a public debate late last year by declaring that it was only a matter of time before the government would regulate access to commercial data bases. Her remarks followed a DOD proposal to restrict access to sensitive data bases and to monitor the use of on-line systems.

Such control would fit within a broader federal effort to establish a category of information that is not classified but is sensitive from a national security standpoint.

The government is asserting a claim to protect such information from foreign agents, thieves, and terrorists.

The first targets have been Washington's own computers, and federal data processing managers have already begun to beef up the security of departmental data bases. Many of these files are available to the public through commercial access services; the Census Bureau offers on-line demographic data, for example. But the federal offering most likely to be restricted is the National Technical Information Service (NTIS), an on-line index to federal publications on science and technology.

Fountaine implied that the control program will eventually extend to privately operated data bases as well. And Jack Simpson, president of Mead Data Central,

confirms that federal agents have made inquiries about data base access controls. Mead Data Central is not generally regarded as a source of delicate information; it provides court decisions and news reports, principally for the legal profession.

Apparently, the proposed program would not immediately affect basic on-line communications and information services. Nancy Beckman of The Source says that the service "does not carry any data bases considered to have sensitive information" and would most likely escape regulation. Nor does she believe that operators of private bulletin boards and special-interest services have anything to fear.

Opponents of the DOD proposal maintain that it violates First Amendment guarantees. Even the government's action to secure its own data bases restricts freedom

(continues)

Show a Little Animation

Wipes, freeze frames, strobe frames, kaleidoscopes, color keying, video overlays: Rock videos shimmer because of these and a panoply of other graphics effects. But that sparkle has been little more than a gleam in the eye of the PC graphics community—until now.

No Clearance, No Sale (continued)

of information, according to the American Civil Liberties Union.

Nonetheless, it is not at all clear whether computerized information sources—data bases, bulletin boards, and perhaps even desktop publishing data—enjoy the same degree of First Amendment protection as newspapers, magazines, and television.

That question came before the Supreme Court in 1985 but was not resolved conclusively. A libel suit had been brought concerning an erroneous credit report on a Dun and Bradstreet data base. Lower courts based their rulings on whether the data base enjoyed “media status.” The Supreme Court all but ignored that issue, however, ruling against Dun and Bradstreet on other grounds.
—Richard H. Baker

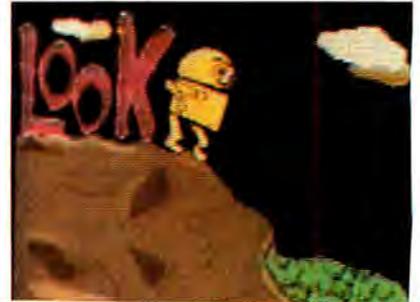
Today, PCs can rock along with Showstopper, a \$2550 video-effects system that can trace its roots to factory robotics and a television quiz show.

Showstopper is aimed at producers of industrial, training, rock, and wedding videos—and anyone else who’s dabbling in graphics special effects but would rather not spend \$500 an hour for an editing suite. Created by Limicon of Toronto, the package is built on the firm’s Softbus operating environment, which is geared to process control; robotics; and E-naps, a graphics-oriented programming language.

Showstopper is the commercial version of the animation software that Limicon created for TV’s first computer graphics quiz show—*Catch Phrase*—produced for syndicated distribution by Hollywood’s Pasetta Productions in 1985.

According to Limicon, its offering combines the generation speed and superior resolution of bit-mapped graphics with the compact file size of vector graphics. Graphics generation is so fast that Pasetta had to slow things down a bit to achieve the desired effects.

The package, which works with an AT&T Image Capture Board, performs such routines as skew, perspective, nonlinear four-axis distortion, and rotation. Animation features include blink, color mapping, tweening (which calculates intermediate positions between starting and end points for an animated object), and support for 10 billion dissolve routines.



Limicon’s Showstopper turned out these animated scenes for *Catch Phrase*, TV’s first (and only) computer-graphics quiz show.

With 3 minutes of fresh computer-generated animation a day, *Catch Phrase* holds the record for TV usage of computer graphics. And while the show wasn't a hit, Limicon's software did everything Pasetta's crew of professionals required, according to associate producer Mick McCullough. On the artist's desk, it helped create complex animation; in the TV studio, it controlled the giant flashing screen where the cartoons were displayed.

Within three weeks of first using the product, the average Pasetta artist was producing 20 seconds of finished animation a day and had time left over to generate new ideas. Eventually, that figure rose to a full minute. Not bad at all in a business in which every frame can be a work of art.

—G. Berton Latamore

Nothing Follows Suit

When a Fort Lauderdale construction company sued Lotus Development last year, alleging a devastating software failure, the move garnered a lot of headlines. It also sent a few shudders through the software industry, which is forever dreading some legal apocalypse that will quadruple liability insurance and leave hotshot executives wandering penniless in the streets.

In the suit, James A. Cummings, Inc., claimed that a bug in *Symphony* had caused the company to underbid a job by \$254,000 and asked that the construction firm be compensated for the glitch. A few months later, however, the suit was unceremoniously dropped—without any funds being siphoned from Lotus's huge cash reserves.

Cummings declined further comment, but an attorney representing Lotus maintained that the case had boiled down to user error: adding a new figure to a

worksheet (and expecting it to show up in recalculations) without placing it within a defined range. As the manuals for *Symphony* and its competitors show, spreadsheets just don't work that way. —E. B.

Richard H. Baker is a full-time writer and a part-time student of the First Amendment; Ken Greenberg is PC World's Southwest Editor; G. Berton Latamore writes on computers and communications; Wes Nihei is an Assistant Editor at PC World; and Charles Seiter runs a computational-chemistry services firm.

*Multi-Lingual Scholar version 3.0
Gamma Productions
710 Wilshire Blvd. #609
Santa Monica, CA 90401
213/394-8622
List price: \$350, laser printer
driver \$150
Requirements: 512K, one disk
drive, IBM Color/Graphics
Adapter or Hercules-compatible
graphics board, DOS 2.00 or
later version*

*Showstopper
Limicon, Inc.
144 Hampton Ave.
Toronto, Ontario
M4K 2Z1 Canada
416/465-4058
List price: with AT&T Image
Capture Board \$2550, Softbus
with E-naps interpreter \$99
Not copy protected ●*

A Few Minutes With ...

Edward Belove, vice president for research and development, Lotus Development: "At one point, the PC community had tight links with the opinion leaders. Those links are still there, but they're not as strong as they once were. A lot of the users we're trying to reach now are two steps removed from even their corporate opinion leaders."

Raymond Kurzweil, head of Kurzweil Applied Intelligence: "No robot today can tie shoelaces—maybe that's why robots don't wear shoes."

Thomas Davenport, management consultant with Index Systems: "In Burma, you have to put up about \$50,000 and get approval from the [national] cabinet to bring in a PC. I've seen companies like that."

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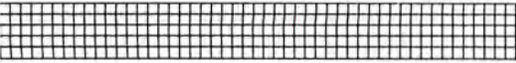
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From the Hardware Shelf

PC World offers first impressions of recent hardware releases



The Brits fight it out with a homegrown clone, a little chip solves an age-old problem, a switch plays print director, and a color printer tries to cover all the bases.

Edited by Eric Knorr

Amstrad PC1512

8086-based XT compatible

Pros: Low price, 8-MHz clock rate, fast hard disk, 16-color display

Cons: Three expansion slots, poor display resolution, room for only two half-height devices

*Vidco Electronics
1915 Harrison Rd.
Longview, TX 75604
214/297-4898*

List price: with one floppy drive and monochrome monitor \$799; with two floppy drives and monochrome monitor \$899; with one floppy drive and color monitor \$999; with two floppy drives and color monitor \$1099; with 20MB hard disk, floppy drive, and monochrome monitor \$1299; with 20MB hard disk, floppy drive, and color monitor \$1499

The most fashionable British imports used to be Jaguars and rock 'n' roll albums. If the lads at Amstrad have their way, however, this year's British invasion will belong to the PC1512, an XT compatible guaranteed to turn heads.

Amstrad, one of Britain's fastest-growing companies, is best known stateside for its \$500 PCW8256 dedicated home word processing system, sold primarily at Sears stores. Although word of Amstrad's new PC1512 is just beginning to reach this country, in England the machine has garnered almost as much glowing press as an expectant Princess Di. And on the Continent, more than 30,000 PC1512s are sold every month.

What's all the fuss? First and foremost is the price: \$799 nets you 512K RAM, a 360K floppy drive, a monochrome monitor, a mouse, color and monochrome graphics capabilities, one serial and one parallel port, a battery-powered clock/calendar, DOS 3.10, and—here's the kicker—Digital Research's GEM operating environment. For just \$700 more, you get a color monitor and a 20MB hard drive.

But the appeal of the Korean-made PC1512 goes beyond mere dollar value. With an 8086 CPU running at 8 MHz and a hard drive sporting a 30-millisecond average access time, the PC1512 is clearly a high-performance machine. It also displays some engineering panache: All the chips for the color/monochrome video adapter, floppy disk controller, serial and parallel ports, dedicated mouse port, and 512K RAM (plus sockets for an additional 128K) are mounted on the motherboard. The most unusual design feature is that the 90-watt power supply is mounted in the monitor casing, a scheme that makes a fan unnecessary for units lacking a hard disk. Of course, this—plus the nonstandard connector—requires that you use an Amstrad monitor.

Some of Amstrad's engineering innovations are designed to keep costs down, while others are simply commonsense conveniences. To begin with, the casing is plastic, and the system unit's footprint measures less than 15 inches square. The monitor's tilt-and-swivel base sits securely in a recess

atop the cabinet, an area that also provides a home for the clock/calendar's batteries—four standard AA cells, no less. For those who like to listen to their computers, the PC1512 provides a large speaker and an externally mounted volume control that sits next to the mouse and keyboard connectors in a small well on the left side of the machine. The nicest touch of all, however, is the snap-off plastic cover that provides complete access to the machine's three full-size expansion slots.

The PC1512's built-in video adapter also has a few tricks up its sleeve. Essentially, it emulates IBM's Color/Graphics Adapter (CGA), producing both medium-resolution (320-by-200-pixel) and high-resolution (640-by-200-pixel)

modes. However, Amstrad sweetens the pot by offering 16 colors in high-resolution mode, while IBM's CGA can produce only 2 colors at the same resolution. Amstrad's paper-white monochrome monitor emulates a color display and translates the 16 colors into as many shades of gray.

This end run around the CGA's limitations is clever, but in this case, Amstrad may have outsmarted itself. Even in so-called high-resolution mode, 200 lines are simply not enough for comfortable text-processing marathons—a limitation that may hamper the machine's inroads into the business world. If the PC1512

were not dependent on its own monitors, this would be less of an obstacle.

Yet it's hard to ignore the magnetism of the PC1512's color graphics—the colors actually appear more distinct than those of IBM's Enhanced Graphics Adapter. Best of all, *GEM* shines with the PC1512. Pairing the two might be the most successful match since Fred asked Ginger to dance.

Digital Research's perennially underrated graphics-based operating system is far easier to use than *Microsoft Windows*, enabling those who've secretly coveted a Macintosh or an Atari ST to have a blast without sacrificing IBM

(continues)



After outrageous success in Europe, the Amstrad PC1512 is invading the U.S. market. Complete with color monitor and GEM operating system, the 20MB hard disk model shown here retails for a mere \$1499.

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The image shows the front cover of the dBASE III PLUS software box set. At the top, it says 'ASHTON-TATE' in a serif font. Below that, 'dBASE III PLUS' is written in a larger, bold serif font. Underneath, the tagline 'The data management standard.' is written in a smaller, italicized serif font. The bottom half of the cover features a stylized graphic of a hand with fingers pointing upwards, rendered in a dark blue color against a light background.

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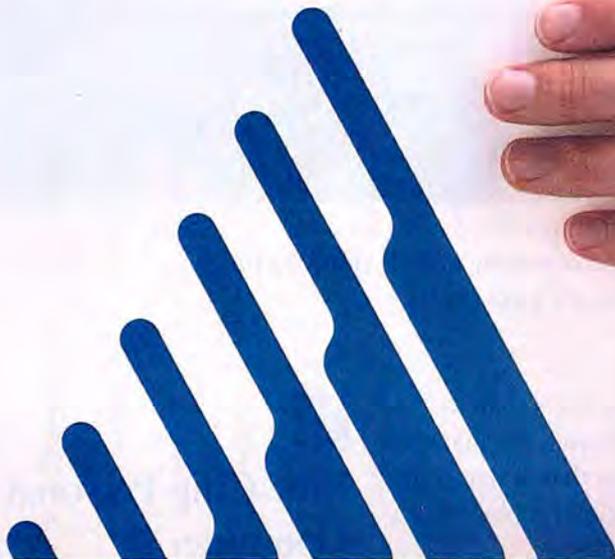
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Circle 867 on reader service card

compatibility. The two-button mouse rounds out the bundle, along with *GEM Paint*, *GEM Desktop*, a RAM disk utility, a hard disk backup program, and a rudimentary text editor.

Experienced users may need to adjust to the keyboard. Its layout is similar to that of the original AT, with some significant exceptions: *Two* keys (both forward and reverse) sit where the <Backspace> key usually resides, <Alt> is to the immediate left of <Ctrl>, and the backslash sits between the left <Shift> and the Z keys (similar to the original PC keyboard). As with most clone keyboards, the feel is none too snappy, but acceptable.

Fortunately for Amstrad, the PC1512's IBM compatibility doesn't appear to be an issue. In addition to the *GEM* family, the unit ran *WordPerfect*, *Flight Simulator*, *Framework II*, *TenKey*, *SuperKey*, and even *Night Mission Pinball* (a game especially sensitive to graphics adapters) without a hitch. The machine also successfully managed *WordStar*, *Microsoft Word*, *Jet*, and 1-2-3 releases 1A and 2.

Obviously, the PC1512 is no ordinary clone. Amstrad provides abundant clues that the machine is intended for the home market, not the least of which is a joystick port built into the keyboard. The PC1512's limitations—poor text resolution, room for just two half-height devices, and only three free expansion slots (two if you have a hard disk controller)—are far less



Mark Johnson

Hyundai's Excel shook the American auto industry. Will the company's \$800 clone do the same to this country's PC trade?

onerous to home users than to businesses. Moreover, the machine is easier to set up than a stereo system, and the manual is obviously written for beginners.

In short, Amstrad's PC1512 could well be the breakthrough home machine that the industry has been waiting for. In this country, the Texas firm Vidco Electronics is the exclusive PC1512 distributor, and you can bet those old boys are hoping the machine's low price, IBM compatibility, and big bundle of extras will make the PC1512 the perfect second computer. With a little luck, it could turn out to be the most significant British import since Sergeant Pepper. —Paul Meyers

Blue Chip Personal Computer

PC compatible

Pros: Low price, solid construction, five free slots
Cons: Slow processing speed, room for only two half-height devices, poor keyboard response

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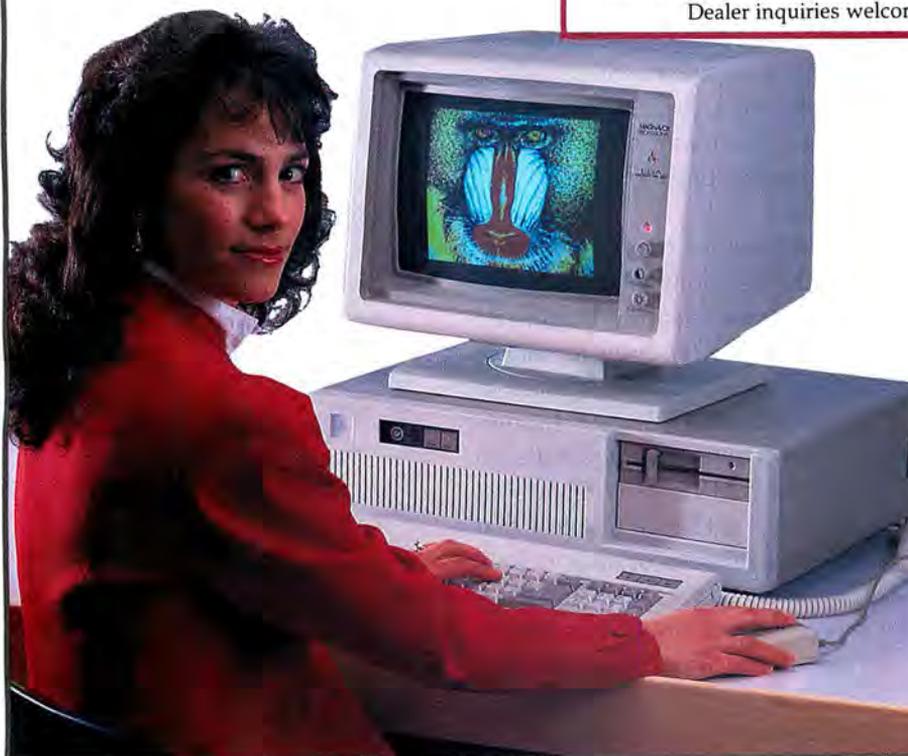
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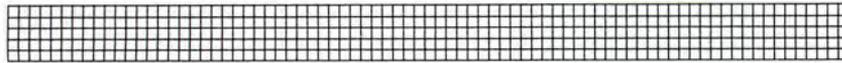
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List price: \$699, monochrome monitor \$89, 128K memory expansion board \$89, multifunction board \$109, color graphics board \$99, color monitor \$249, additional floppy disk drive \$129, MS-DOS 3.20 with GW BASIC \$99

Last year the huge South Korean conglomerate Hyundai unleashed two blockbuster products on the U.S. market. The first was the acclaimed Excel, a sensible automobile with a rock-bottom sticker price that charmed down-payments from thousands of consumers. Accompanied by less fanfare, another product arrived that reflected the same no-frills, low-cost approach—Hyundai's unassuming PC clone.

Marketed in this country by Blue Chip Electronics, a distributor of PC peripherals, Hyundai's PC currently goes by the name of the Blue Chip Personal Computer. It has turned up bearing the Blue Chip logo in Sears and Target stores and even in Toys R Us.

Combine this retail push with a list price of just \$699, and it's clear that Blue Chip is hoping to crack the home market.

In an arrangement sure to delight entry-level users, the price-busting Blue Chip PC comes fully configured; just slip the unit from its box, plug in the keyboard and monitor, and you're ready to roll. Already installed in the system unit are 512K RAM, a Tandon 360K floppy drive, and a monochrome graphics adapter; the

floppy disk controller, one serial port, and one parallel port are built into the motherboard. The only item not included in the asking price is the monochrome monitor, which sells for an additional \$89.

The system unit is housed in a sturdy metal cabinet that's one-third narrower than the IBM PC. The box conserves desk space, but it also leaves room for only two half-height devices (the second may be either a floppy drive or a hard disk). To the right of the drive bays is a push-push type power switch and a power indicator; a reset button and serial and parallel connectors are located on the machine's backplane.

Sliding the cover forward reveals an elegantly designed motherboard with six full-size expansion slots. The Blue Chip PC employs 256K chips, leaving the motherboard clean and uncluttered. In fact, the entire 512K occupies an area about the size of an open matchbook. Above this memory bank is the 8088 CPU, which runs at a pedestrian 4.77 MHz; a socket for an optional 8087 math coprocessor sits adjacent.

Although the chips for the ports and the disk controller are located on the motherboard, Hyundai decided to keep the chips for video display on an expansion board for easy upgrade. The monochrome display adapter included with the machine is Hercules compatible and drives a 12-inch monitor that's available in green or amber. Text characters on the Blue Chip PC's monitor are not quite as crisp as those produced by IBM's mono-

(continues)

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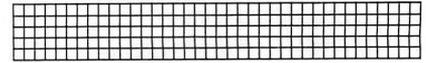
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chrome display, a problem that can be traced to the former's narrower video bandwidth (20 MHz versus IBM's 25 MHz). Blue Chip also sells a clone of IBM's Color/Graphics Adapter for \$109 and a color monitor for \$249.

The company offers several other add-ons, including an \$89 128K memory expansion board and a \$109 multifunction board with 128K RAM, a battery-powered clock/calendar, a second serial port, and a game port. Hard disks in 10MB and 20MB flavors, along with their requisite controllers, will soon be available, although at this writing Blue Chip has not settled on pricing. A 130-watt power supply provides the foundation for this expandability.

The keyboard, made by the Taiwanese company Behavior Tech, is probably the Blue Chip PC's biggest drawback. It has the familiar AT layout, but the keys are as mushy as those on a \$5 telephone. When hammered by a heavy-handed typist like myself, the keyboard sprays unwanted characters all over the place.

Unlike with most inexpensive clones, the Blue Chip PC's documentation is clear and complete. MS-DOS version 2.10 is included, along with a comprehensive diagnostic program and a DOS tutorial. GW BASIC (bundled with MS-DOS 3.20) is sold separately by Blue Chip for \$99.

The Blue Chip PC's BIOS is the product of Falcon Technology, a company apparently well versed in

(continues)

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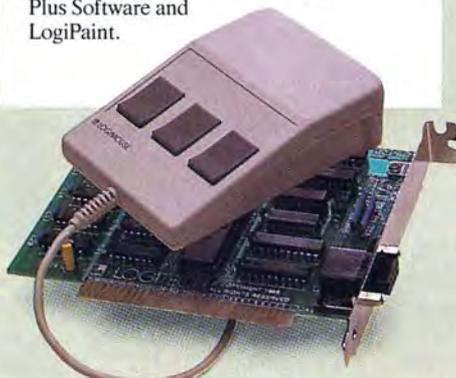
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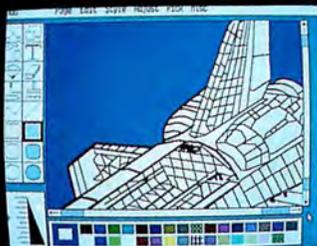
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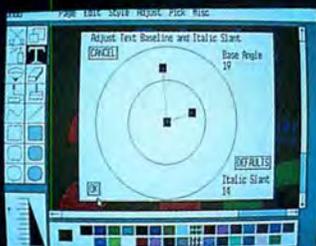
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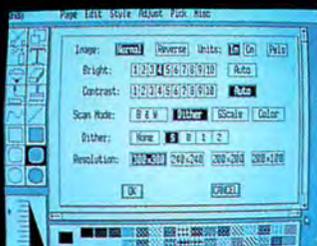


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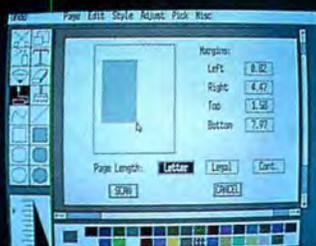


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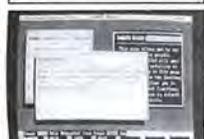
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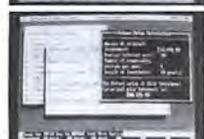
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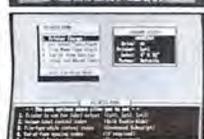
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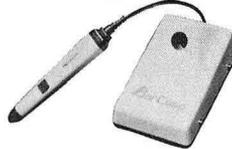
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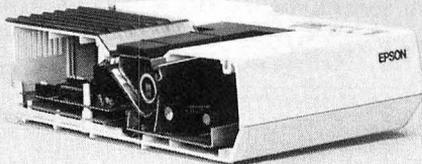
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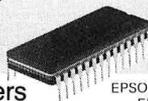
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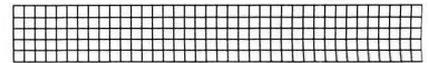
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PC compatibility. The unit showed it could handle 1-2-3 releases 1A and 2, as well as *Microsoft Word*, *Flight Simulator*, and *Windows*. *Symphony*, *Framework II*, *WordStar 3.3*, *Jet*, *TenKey*, and *SuperKey* also ran without incident.

Unlike many low-cost compatibles, the Blue Chip PC is a well-constructed machine, from its heavy-duty chassis to its nigh on immaculate motherboard. And with five free slots and a monitor that's quite acceptable for text processing, many businesses may find the Blue Chip a sound, economical alternative. In one form or another (hopefully with a faster processing speed), this runabout will probably be around for quite a while. —TJ Byers

Digital Products NetCommander 7

Programmable printer switch

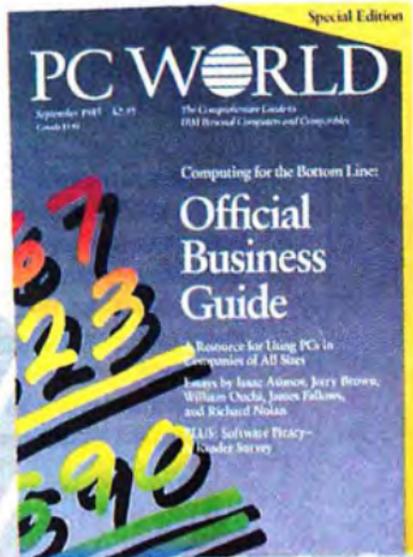
Pros: Flexible configuration, software switching, buffer, queuing capabilities

Cons: Difficult installation, high price

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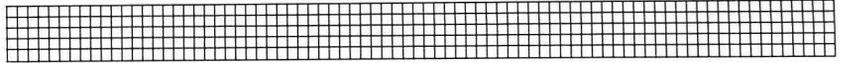
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Three printers, a plotter, and a Puma computerized running shoe all vie for my PC's single parallel port. I have more cables—mostly hanging unplugged—than an octopus has tentacles. In an effort to tidy things up, I installed Digital Products' NetCommander 7.

NetCommander 7 is a programmable electronic switch that can function as a print director or as a printer-sharing device for connecting multiple PCs to a single printer or to multiple printers. Although other switch configurations are available, the unit tested housed four serial and three parallel ports and 256K RAM in a metal cabinet about 12 inches square and 4 inches tall.

You can use any of NetCommander 7's ports for input or output. Because most of my output devices are parallel, I attached the PC to a serial port, while a NEC 3550 printer, an Epson EX-1000 color printer, and an Epson HI-80 plotter each occupied a parallel port. This meant, of course, that I had to route all parallel output to my PC's serial port by using the DOS command MODE LPT1: = COM1. An HP LaserJet Plus took up one of the three remaining serial ports.

Collecting the correct cables and connectors was the most difficult part of the installation. As mentioned, I had plenty of cables, but the connectors were of the wrong gender; printers and plotters have female connectors, as does the NetCommander 7. I finally got enough male-to-male cables from Digital Products to make the hookups.

Programming the NetCommander 7 requires running an initialization utility and assigning a name to each output port. This lengthy and cumbersome process produces a configuration file held in the switch's RAM, so it's fortunate that the NetCommander 7 has a battery backup to prevent accidental memory loss.

Once the switch is programmed, choosing a device is much like typing a DOS command. If you've selected the name *laser* for a port connected to a LaserJet, for example, simply typing 'nc laser' at the DOS prompt connects you with the desired device. You can also select a device by putting the port name (converted to hexadecimal) in the setup string of an application program. Thus, print files from 1-2-3 can be routed automatically to a LaserJet and *WordStar* files to a NEC printer. Since I sidestepped this programming feat, my biggest problem was remembering to select the proper printer prior to running a program. Digital Products is working on a pop-up menu program for selecting devices from within an application.

Only a small portion of the NetCommander 7's 256K RAM is used for setup data. The remainder is up for grabs, depending on your configuration. With multiple computers, the NetCommander 7 queues the output to a busy device until that device is available.

When used with one computer,

(continues)

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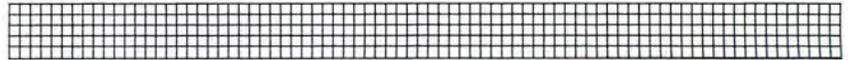
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From the Hardware Shelf



Mark Johnson

Low in price and rife with extras, Texas Instrument's Model 857 offers cartridge-based NLQ fonts and accessible controls, but its color output is uneven.

most of the NetCommander 7's memory becomes a print buffer.

One connection I couldn't make using the NetCommander 7 was the cable for my computerized running shoe: It has a special Puma connector on one end and a 25-pin male D-shell on the other. So if the devices you want to connect have unusual cables or non-standard interfaces, the NetCommander 7 may be more trouble than it's worth. Otherwise, it's an elegant (if expensive) way to make a connection.

—Donald B. Trivette

Texas Instruments Model 857 Color Printer

Color dot matrix printer

Pros: Low cost, good NLQ output, keypad feature selection
Cons: Mediocre color graphics, slow printing speed

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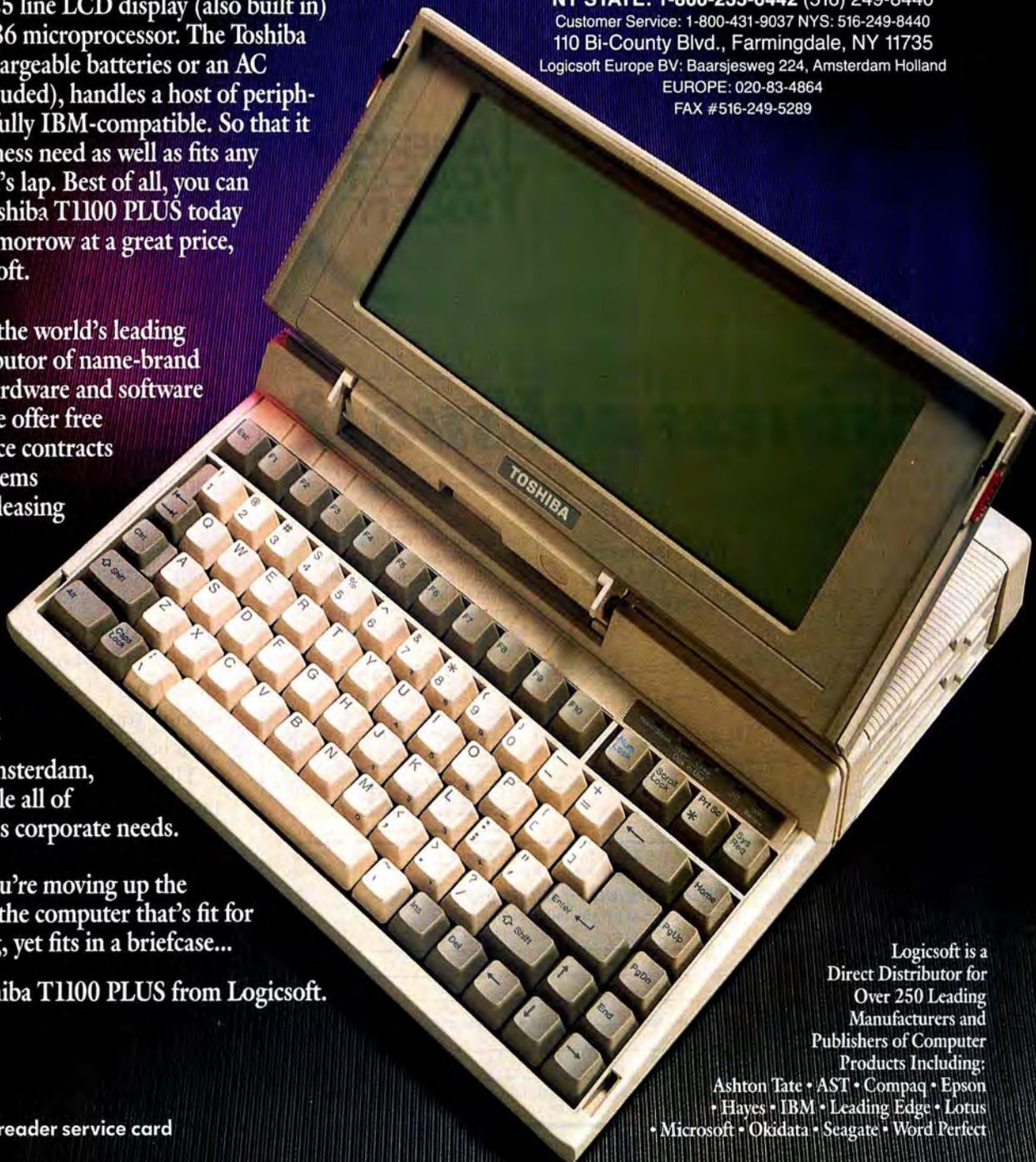
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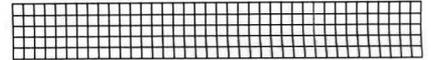
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Texas Instruments' 857 Color Printer does its best to please everyone. It offers color output, Epson MX-80 and JX-80 compatibility, a small footprint, a switchable parallel/serial port, and near letter quality (NLQ) printing using cartridge-based fonts—all for a reasonable \$899. And like most sensibly designed printers, it lets you select the lion's share of features from a keypad rather than forcing you to hunt for DIP switches at every turn.

The 857 uses a 9-pin printhead instead of the fashionable 24-pin variety, which contributes to a fairly ponderous printing speed, especially in NLQ mode. As usual, the manufacturer's character-per-second (cps) rating is overly optimistic: Texas Instruments claims a draft mode of 150 cps, but testing revealed that 85 to 95 cps is the norm. In NLQ mode the 857

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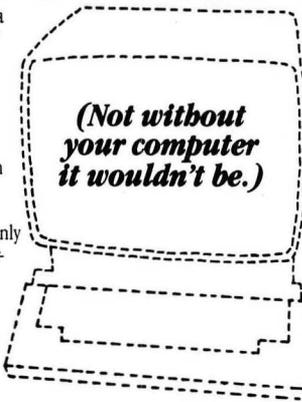
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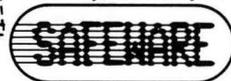


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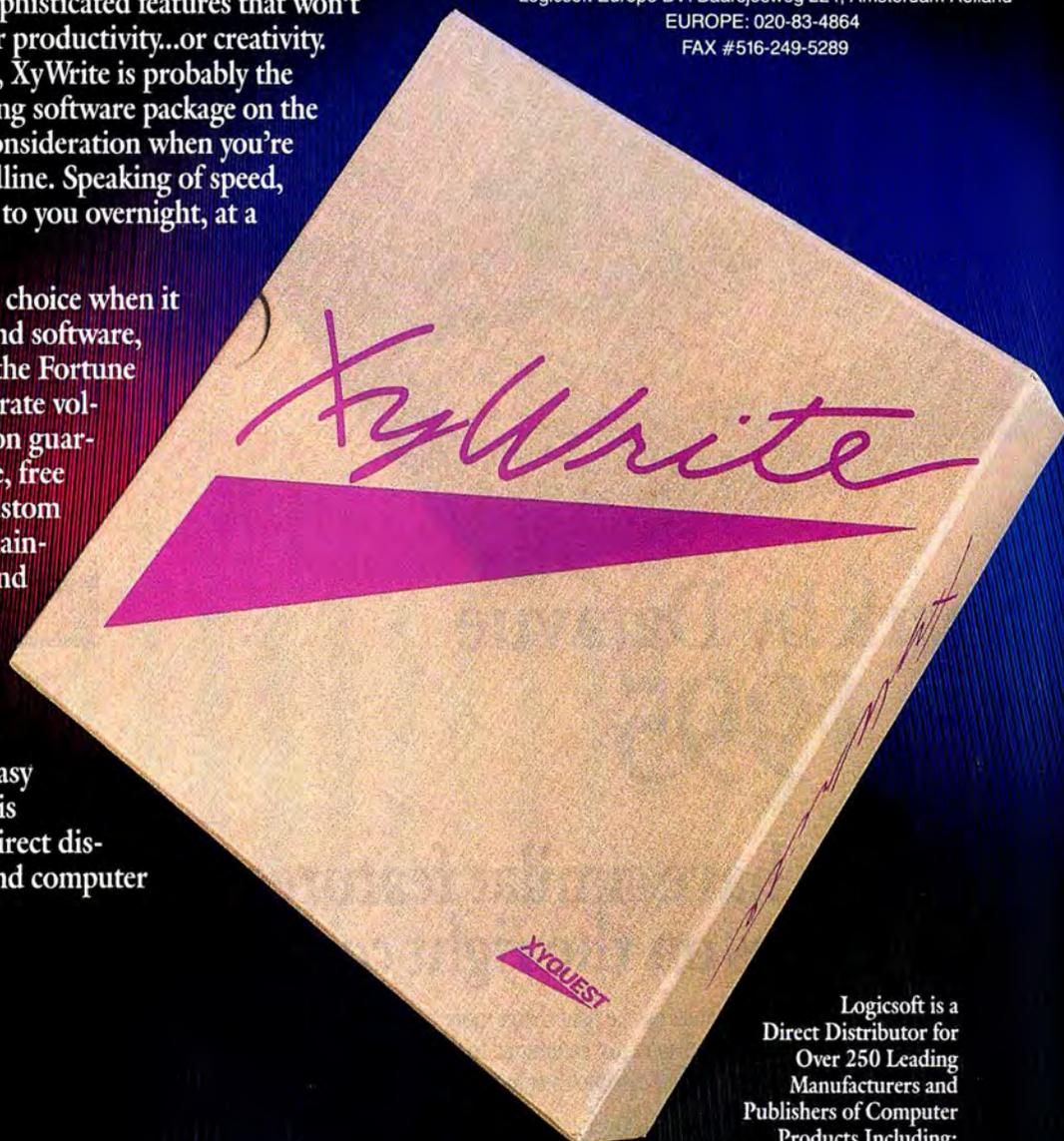
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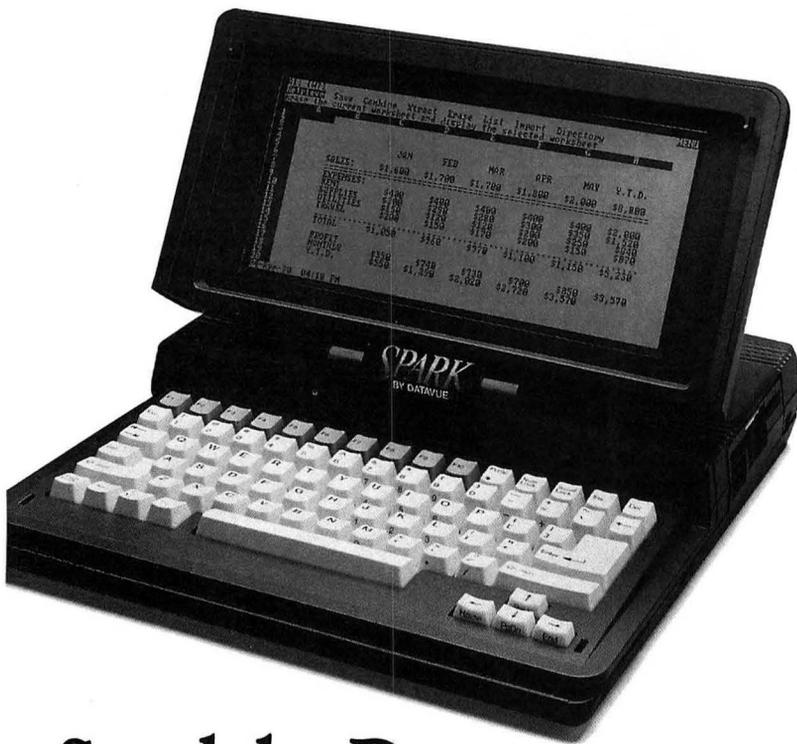


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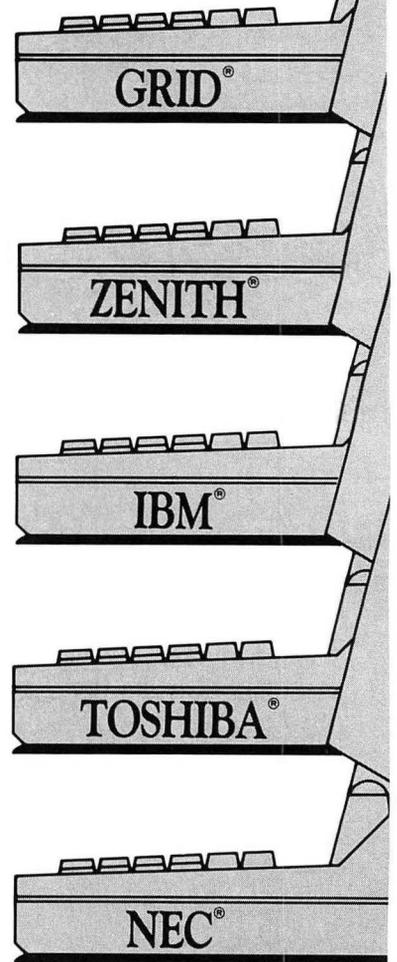
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Figure 1: The NLQ text produced by Texas Instruments' Model 857 Color Printer is fairly sharp, but the descenders on some letters are sometimes indistinct.

chugged along at 25 cps rather than at the advertised (but hardly breakneck) 35 cps.

The face of the 857 has three slots for font cartridges, and all the cartridges used by Texas Instruments' more popular 855 printer will work with the 857. Each cartridge contains just one font, which means you can mix only three fonts in a document. Thanks to multiple passes, the 857's 9-pin printhead creates fairly crisp NLQ output, although the descenders on some letters are a bit fuzzy (see Figure 1). The list of available fonts includes Courier, Courier Italic, Gothic, Modern, Modern PS (proportionally spaced), Script, Prestige Elite, and Orator 85. Oddly, if any of the three slots is empty, the 857 defaults to its Gothic 10 internal font, which prints only in draft mode.

The 857's DIP switches are generally for setup parameters. If you want to configure the printer's connector as a serial port, for example, you use DIP switches to establish the bps rate, the parity, and the protocol. But for day-to-day

tasks, you use the keypad almost exclusively. Selecting pitch, form length, line spacing, font cartridge, and draft or NLQ mode is a matter of punching a few buttons.

For its color acrobatics, the 857 uses a special ribbon with four bands—black, cyan, magenta, and yellow. The machine can print images in as many as seven colors (green, purple, and orange are produced by overprinting) at a resolution of up to 144 dots per inch (dpi). This sounds impressive, but the effect is disappointing.

Dot matrix color graphics are not known for pristine clarity, and the 857 is no exception. Cyan, magenta, and yellow come out fairly smooth, but the composite colors are often patchy or streaked. And of course, in all hues and densities, the characteristic dot pattern is clearly discernible.

Because the 857 is compatible with the Epson JX-80, any of the handful of software packages that have a JX-80 driver (such as Ashton-Tate's *Master* series) should be able to exploit the 857's color capabilities. You can also change colors using escape codes embedded in a print file or set one of the DIP switches to a default color other than black.

Most people, however, will probably use Texas Instruments' handy screen-dump utility. This program installs easily, automatically adding a line to your CONFIG.SYS file. When you press <Shift>-<PrtSc>, the program prints a color hard copy reproduction of what's on screen, offering a few options along the way. You can zoom in on areas of the screen, substitute levels of gray for color, and even print an on-screen image sideways. However, this last feature seems to exacerbate the patchiness in composite colors.

The paper-handling virtues of the 857 are first-rate. Unlike the vast majority of printers, the machine comes with its own tractor feeder, an item that normally sells for around \$150. Even more unusual is the fact that the tractor feeder seems to perform flawlessly. A sheet feeder is sold separately for a whopping \$500.

Strangely, the 857's color capability is not the printer's strongest suit. Its main attraction is a low price combined with a variety of sought-after features: a full-function keypad, multiple fonts, and a tractor feeder thrown in for the

(continues)

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Among the many good reasons why IBM is the giant of the microcomputer industry, the AT stands tall. Big on advanced features, the AT is probably the fastest and most sophisticated personal computer on the market. But even bigger is IBM's emphasis on quality workmanship and reputation for service. You can see that in IBM's case, biggest is truly best.

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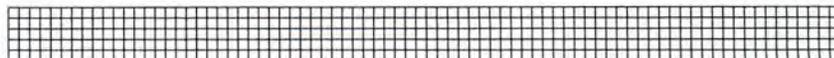
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ride. Aside from color capability, Texas Instruments' Model 855 offers all these features for \$100 less. Unless you find fairly crude color output tolerable, you'd do well to look elsewhere to satisfy your palette. —David Weinberger



No-Slot XT Clock

Battery-powered clock/calendar chip

Pros: Low cost, easy installation, long battery life

Cons: None

*Systems Manufacturing
Technology, Inc.*

*1145 Linda Vista Dr.
San Marcos, CA 92069
619/744-3590*

List price: \$59

Sometimes little things can be a real pain. If you cringe at the thought of restarting your system because it requires you to set the time and date (not again!), Systems Manufacturing Technology has an elegantly simple, low-cost solution for you: the No-Slot XT Clock.

The No-Slot XT Clock is a single-chip, real-time clock/calendar that installs quickly and easily in your PC, XT, or compatible to provide AT-like clock/calendar features. Inside the chip's plastic case are two lithium batteries, each with a life expectancy of 10 to 20 years. In fact, the \$59 No-Slot XT Clock carries a 10-year "No-Sweat" warranty.

The clock chip is nestled in a 28-pin DIP extender socket. To install the device, you simply locate an empty 28-pin ROM socket on the motherboard and plug in the chip. If you can't find an empty socket—no problem. Simply remove a ROM chip (be careful not to bend the tines), slip in the No-Slot XT Clock, and plug the ROM into the extender socket piggy-back fashion to restore full system configuration. No muss, no fuss.

If your PC uses 24-pin instead of 28-pin ROMs, you can generally install the No-Slot XT Clock on an expansion board. Many video display boards and hard disk controllers contain removable 28-pin BIOS PROMs that provide a happy home for the clock chip.

In a world where computer peripherals are growing increasingly complex, it's refreshing to see a simple solution to such a vexing problem. —TJ Byers

Paul Meyers is an independent San Francisco video producer and a freelance writer. Donald B. Trivette is a consultant and freelance writer living in Wrightsville Beach, North Carolina. TJ Byers is a freelance writer and the author of Inside the IBM PC AT (McGraw-Hill, New York, 1986). David Weinberger is a freelance writer living in Brookline, Massachusetts. ●

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"...You've simply got to look at R:BASE System V. It's brilliant."

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PC Week**



PLAY WITH YOUR DATA.

When we created R:BASE[®] System V, the whole idea was to make the full power of a sophisticated relational database available to people who don't feel like programming. Thanks to your enthusiasm, it's been quite a success. With our Express System, R:BASE System V offers you a combination of speed, power, and flexibility that's literally not available with any other DBMS. And now, we're introducing a new presentation graphics package that gives you the opportunity to play with your numbers and ideas in graph form.

But first, let's take a look at R:BASE System V, the product which makes R:BASE Graphics a powerful tool for understanding.

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With R:BASE System V, no matter how sophisticated the application, you just follow a simple, fill-in-the-blanks format, and our Application EXPRESS writes all the code automatically.

As a result, even as a first-time user, you can build a powerful, automated application. With the features you'd expect in a custom program from a professional programmer.

When you're done, you'll have automated the process

of understanding your data. And be able to use it to make better decisions. With other database products, building an application like that could take months. But for a fairly typical application, with R:BASE System V, it's a matter of hours. For example, let's take a look at a company called ACME Novelties and follow them through a sales analysis.

To update a report like this takes just a few keystrokes, even though it contains computed columns, subtotals, and multiple access. And this is just the beginning; with new R:BASE Graphics, there are literally thousands of ways to play with these numbers.



▲ With our Express System, it's easy to build an automated application without programming. From this point on, any of these functions can be performed by a simple menu pick.

Product Name	Units Sold	Average Unit Price	Total Dollars	Percent of Sales
Taslee Flex	29,603	1.17	\$ 34,635	21.6
Mister Majestic	11,202	2.72	30,469	19.0
Annihilator	6,509	3.90	25,385	15.8
TOTAL CHICAGO PLANT PRODUCT				
Straight Shooters	47,314	2.60	\$ 90,489	56.4
Little Rascals	101,650	0.56	\$ 56,924	35.5
TOTAL DETROIT PLANT PRODUCT	15,988	0.82	13,110	8.1
TOTAL BOTH PLANTS	117,638	0.69	\$ 70,034	43.6
	164,952	1.65	\$160,523	100.0

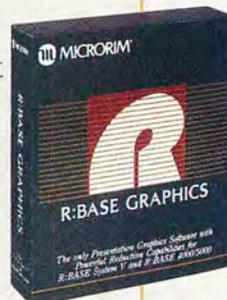
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Of the 100-plus graphics products on the market, this is the only one that works directly with R:BASE System V or R:BASE 5000/4000 data. And the only one that combines presentation-level graphics with powerful data reduction capabilities. With just a few keystrokes, R:BASE Graphics can sort through megabytes of data, retrieve just the data you're interested in, compare items any way you like, and put

them into presentation-quality chart or graph form.

You won't even have to interrupt your train of thought. With R:BASE Graphics, you keep right on using the same familiar interface. You enjoy a totally integrated solution that turns raw data into pure understanding. And now you can express it graphically.

Let's take a look at the example here and see how the process works. The first screen you see is raw, un-



sorted R:BASE data. (This is the same data R:BASE System V would use to give you the ACME Novelties weekly sales report.) All you do is tell R:BASE Graphics what you want, and how you want it. It goes into the database, performs the sorting requests, and creates a graphable subset of the database. If you want a column graph that compares total product sales by month, all it takes is a few keystrokes, and you've got it.

Of course, this is only one example; with R:BASE Graphics, using a database to reach new levels of understanding is limited only by the imagination.

R:BASE Graphics gives you eight standard chart or

graph formats, plus seven text fonts, 16 colors, and up to 32 windows of split-screen displays. R:BASE System V SuperMath functions have also been included for precise data handling. In all, there are over 40 mathematical, trigonometric, logical and financial operations. Of course, R:BASE Graphics supports most popular video control cards, plotters, and printers.

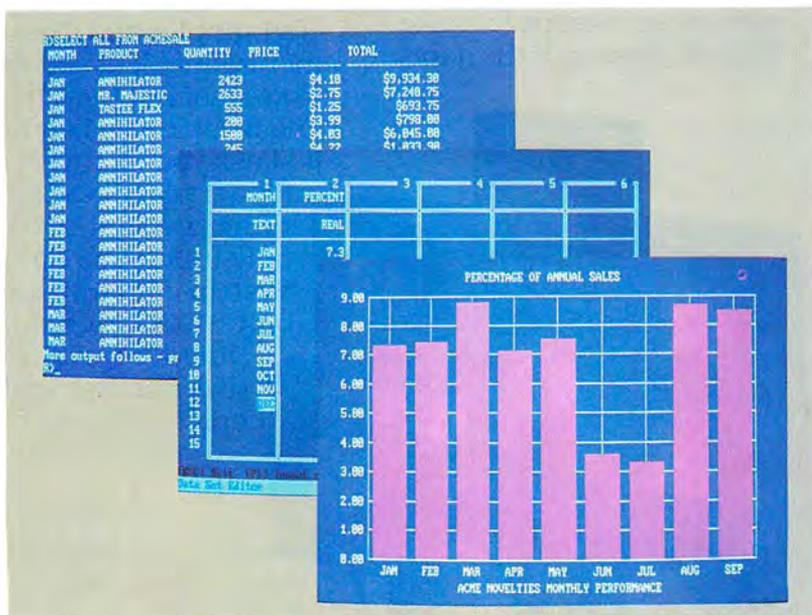
As you've already seen, by using R:BASE Graphics, ACME Novelties graphically identified their problem area: The Eastern Region. Now we'd like to show you another product that lets ACME review their data in a completely different way. R:BASE CLOUT.[®]

R:BASE CLOUT. THE DATA RETRIEVAL SOFTWARE THAT SPEAKS YOUR LANGUAGE. ENGLISH.

This artificial intelligence, natural language query software gives you another option. You just type your requests in plain English. CLOUT figures out exactly how to get the answers by translating common questions into computer commands.

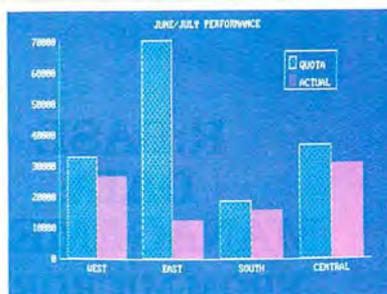
CLOUT's natural language dictionary contains 300 commonly used words, and you can add 500 more (with definitions) per database. By adding unique definitions, you can customize CLOUT to your specific needs. Now let's go back to our example for a minute:

From R:BASE Graphics, we saw the problem at ACME Novelties was weak sales in the Eastern Region. Now the question is— who's responsible? Suppose we had taught CLOUT that the name for distributors was "bigshots."



By breaking your sales down into percentage by month, and reviewing the data graphically, it's clear that something went seriously wrong in June and July, but as yet, nobody knows where.

Even though the data for quotas and actuals are stored in different tables, all you need to do is define what should appear on the chart. Now we see that the problem is weak sales in the Eastern Region. And come one step closer to turning a problem into a solution.



Current Series of Requests
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Dealer	Location	Sales '85	Sales '86
Universal	New York, NY	\$35,643.00	\$108,235.00
Goldfarb's	Baltimore, MD	\$34,721.00	\$121,745.00
Kingsly	Newark, NJ	\$25,078.00	\$42,138.00
VentCo	Boston, MA	\$23,612.00	\$26,545.00

Enter Request (or (ESC) for main menu.)
R:---

By exploring your data with CLOUT—our natural query language—you've managed to pinpoint the entire problem by typing in one sentence. From this point on, the answer looks to be a visit to the distributors. Which is about the only thing CLOUT can't do for you.

And that, in a nutshell, is what it's like to play with R:BASE System V—along with our R:BASE Graphics and R:BASE CLOUT options. The whole process is simple, natural and intuitive.

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Then there's R:BASE Program Interface, a library of relocatable routines that provide access to R:BASE data for applications written in Microsoft FORTRAN, C and Pascal. Which gives you application development flexibility that may not be available in a database programming language. By using Program Interface, it's possible to develop a wide variety of scientific, statistical, and advanced business applications.

Finally, there's R:BASE Runtime. For developers who have created a popular application with R:BASE

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From the Software Shelf

PC World offers first impressions of recent software releases

This month: Slick multiple-worksheet queries, “what if” wishes that come true, a context-switching utility, automated communications, and an intriguing trek into the future with Infocom

Edited by William Rodarmor and Reed McManus

X-Y-Z:Query

Multiple-worksheet query utility

Pros: Can query up to 1000 worksheets at a time

Cons: Has trouble with queries that include dates; weak documentation

Version 1.2

*Intex Solutions, Inc.
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617/431-1063*

List price: \$145 for 12-worksheet version, \$395 for 1000-worksheet version

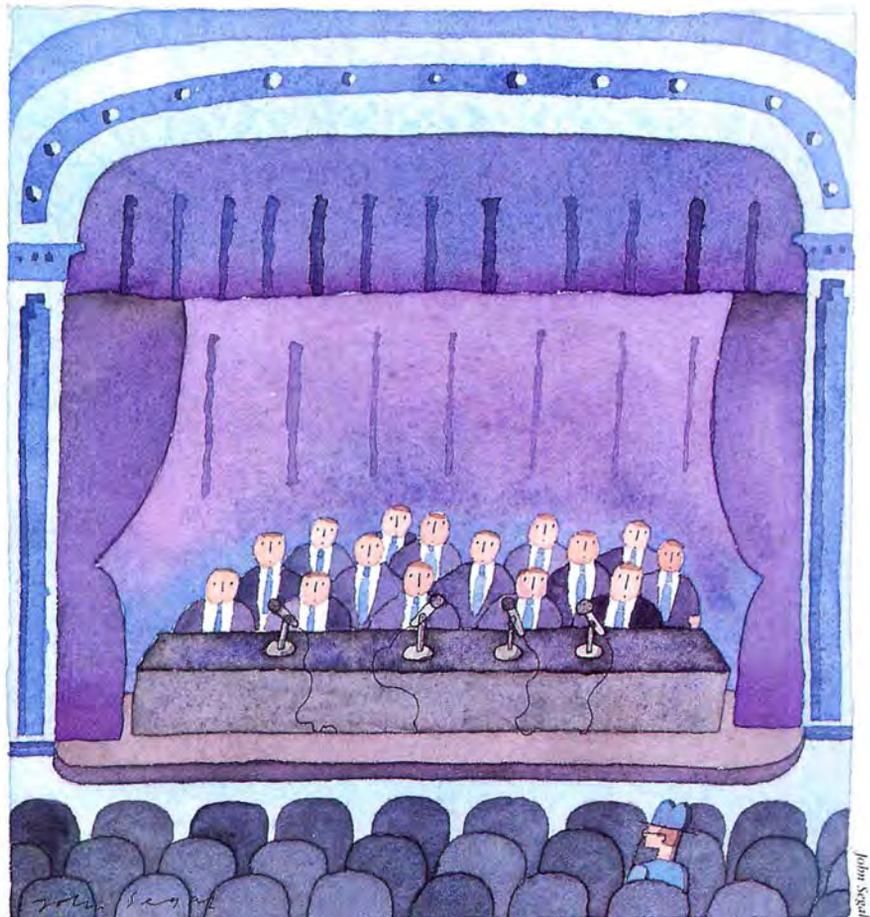
Requirements: 256K, two disk drives, DOS 2.00 or later version

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Rubik's Cube and puzzles like it appeal to us because they give the mind and fingers a “genuine three-dimensional workout,” writes Douglas Hofstadter in his book, *Metamagical Themas*. X-Y-Z: Query from Intex Solutions is all about the third dimension, and running it could give you a good workout in the process. What makes the program appealing? It can perform data base queries across more than one 1-2-3 or Symphony worksheet simultaneously.

Imagine a spreadsheet set up as a personnel data base for an office. Typically, each record (row) will contain several fields (columns): employee name, department, position, birthdate, hire

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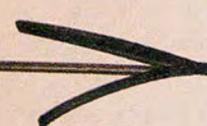
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date, salary, date of last promotion, and so on. With 1-2-3's commands, you can specify a wide range of queries on this data base to isolate the subset of data you're interested in. You could ask for all employees who were hired before January 1, 1986, for example. Or you could use logical operators to narrow your query further—all employees who earn more than \$25,000 AND who work in the marketing OR advertising department.

Now picture a *stack* of such spreadsheets—one from each of a dozen regional offices. Here's where the third dimension enters the picture—and where 1-2-3 grinds to a halt. Even Lotus's more sophisticated 1-2-3 *Report Writer* can't handle more than one file at a time. For X-Y-Z:Query, cutting through those 12 personnel data bases is all in a day's work. In fact, the program can access up to 1000 spreadsheet data bases simultaneously.

Although it lacks the flexible report-writing capabilities of 1-2-3 *Report Writer*, X-Y-Z:Query boasts some impressive features that can perform heretofore impossible feats.

X-Y-Z:Query uses menus and fill-in-the-blank forms. After you specify your input worksheets, you must then identify a master spreadsheet to let the program know which data fields to use. The program is quite flexible in letting you change such features as options, titles, and ranges.

Defining a query with X-Y-Z:Query isn't easy, but it's infinitely more intuitive than 1-2-3's round-about methods. You'll become comfortable with the process after some trial and error. As the program locates the records that meet your screening requirements, you can examine each one or send them all off to an ASCII file or to a new worksheet. This last option is particularly handy if you'd like a nicely formatted report: You can use the new worksheet as input to 1-2-3 *Report Writer*.

Your queries can get as complex as you like, since you can make successive queries about the results of the previous query. Another feature computes sums and averages as you screen the records.

X-Y-Z:Query lets you exercise a lot of freedom in your query requests. You can use * and ? as wild-card characters, just as you do in DOS. One particularly helpful feature enables you to find approximate matches. For example, ~25000 will match any number that falls within 1 percent of 25,000. In the personnel example, this feature could be used to find everyone whose salary was within \$250 of \$25,000.

As good as this program is, X-Y-Z:Query does get demerits in a few areas. It's terrible at dates, for instance. If your query involves a date, you must use 1-2-3's archaic serial-number date format, which is based on the number of days since December 31, 1899.

X-Y-Z:Query shares some features with Intex's companion product, X-Y-Z:Consolidate. Both

(continues)

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PC WORLD
October 1986

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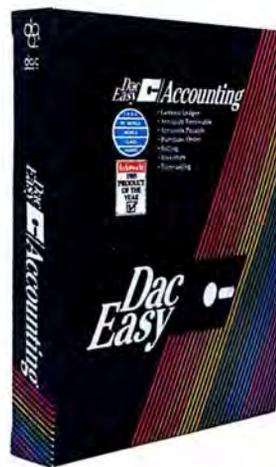


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come in two versions, each with different capacities, and you can use them on worksheets from any version of *1-2-3* or *Symphony*. You also can record your actions in a file, which you can then use as an input file to automate regularly performed tasks. And both *X-Y-Z:Query* and *X-Y-Z:Consolidate* are compatible with version 1.5 of Turner Hall's *SQZ*, so you can work directly with compressed worksheet files.

Although it has a few shortcomings, *X-Y-Z:Query* performs well once you figure it out. If you ever need to query across several data bases, you'll be glad to have this little program on hand. —*John Walkenbach*

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Installing the program is a breeze. Type *Goalseek* at the DOS prompt, and *Goal Solutions* becomes memory-resident. I encountered no compatibility problems using *Goal Solutions* on a system loaded with *SideKick*, *ProKey*, and *SQZ*. However, because the program requires 64K of memory, it will not run with *1-2-3* release 2 on a 256K PC. Once in memory, *Goal Solutions* sits patiently behind the spreadsheet waiting for you to call it into action by typing two slashes (//). *Goalrem*, a utility on the program disk, removes *Goal Solutions* from memory.

Goal Solutions interfaces well with *1-2-3*. The utility is instantly accessible, uses familiar *1-2-3* keyboard controls, and integrates seamlessly with its host. And *Goal Solutions* keeps the beginning *1-2-3* user firmly in mind; after 15 minutes with the written tutorial and demo worksheet, even a spreadsheet novice will be seeking goals left and right.

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You designate the number of iterations (up to 999) using the program's Parameter command and then select Seek to initiate calculation. You see *Goal Solutions'* iterative adjustments to the Variable cell and the corresponding changes in the goal cell. The process continues until the program reaches the goal or alerts you that it has found no solution in the specified number of iterations.

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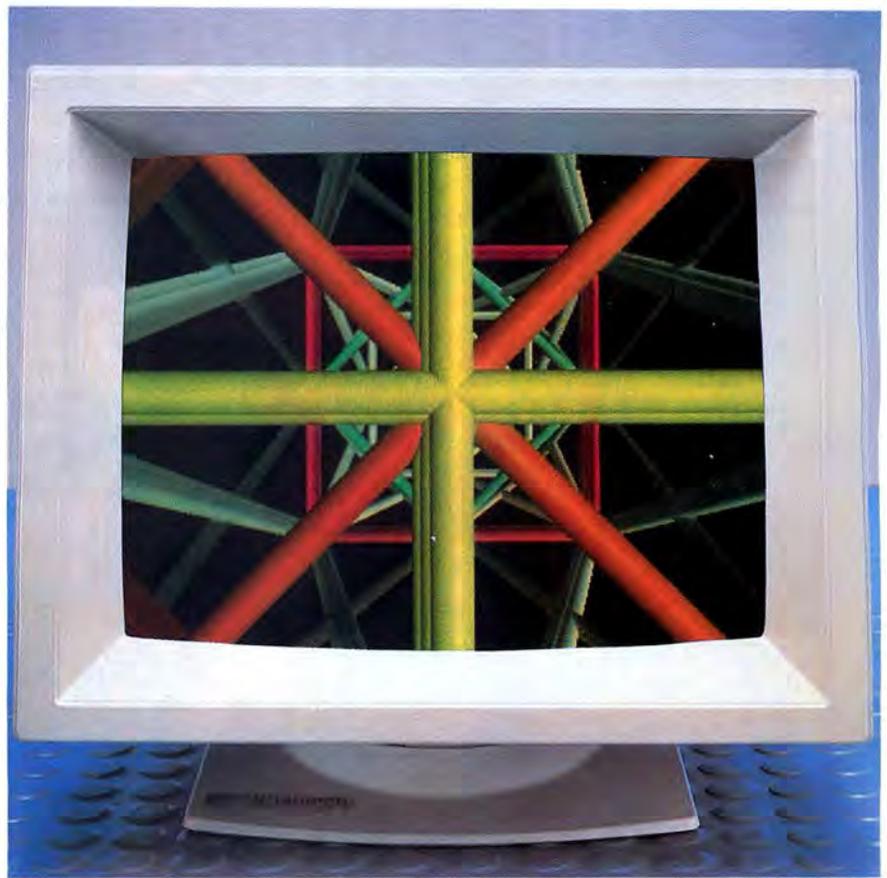
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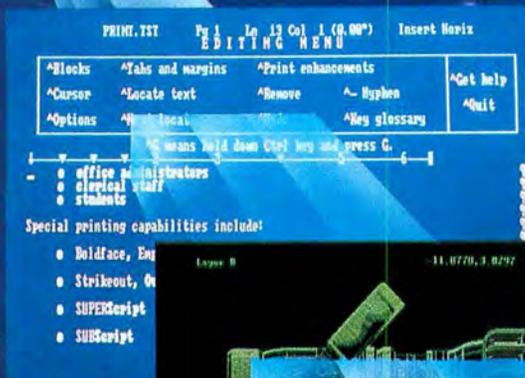
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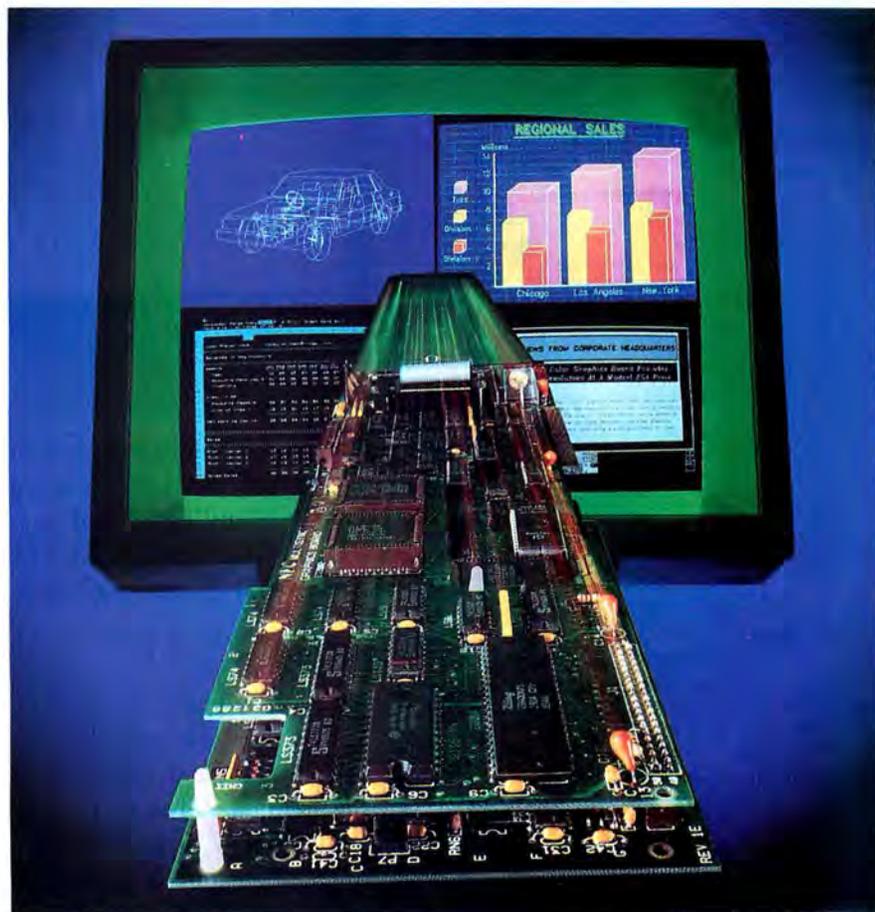
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Goal Solutions Form				
Goal Cell	Target	Achieved	Variable Cell	Required
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B REVENUE	3000000	3000000.00	UNITSQ1	156.47
C				
D				
E				
F UNITSQ1		156.47		
G UNITSQ2		160.52		
H UNITSQ3		164.67		
I UNITSQ4		168.93		
J TOTUNITS		650.59		
K				
L				
M				
N				

07-Jan-87 08:24 AM

CALC

Screen 1: Goal Solutions solves more than one set of independent goals simultaneously. Here, profit is targeted at \$1 million, based on changes in price, and revenue is targeted at \$3 million, based on changes in first-quarter unit sales.

completed its mission (see Screen 1). A single keystroke puts the solved values in the worksheet.

Goal Solutions solves up to five Goal, Target, and Variable sets simultaneously, maintaining the link between a variable and its goal throughout the process. Although you can define only five equations and five variables, each equation can include any or all of the variables. For example, using one worksheet's data, you can calculate optimum profit using three product prices (P1, P2, and P3) as the variables and optimum revenue using the same three variables.

Whether or not *Goal Solutions* can solve your problem depends on its complexity, the 1-2-3 functions you use, and the goal-seeking parameters you set. The program works well with all of 1-2-3's financial functions, but it is prone to produce an error message when you use 1-2-3's more complicated mathematical functions. For the latter uses you might consider a linear problem-solving program such as *What's Best* (see "What's Best," PCW, November 1986). To broaden *Goal Solutions*' chances for success, the Parameters command lets you choose how close to the target value the goal cell's value must be, designate upper and lower limits of the variable

(continues)

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cell, and include or exclude positive and negative numbers.

One serious flaw is that you can't use the <Break> key to stop the program. Several times I specified an input value incorrectly or hit the wrong key, and off it went; I had no recourse but to shut down my PC. You're in a similar jam if you want to stop processing a large worksheet that takes forever to recalculate.

Additional functions enable you to debug equations step-by-step in a fashion similar to 1-2-3's Step mode; to invoke macros and insert a new set of goals to be met; and to display the new values of selected worksheet cells. The program provides only minimal on-screen help.

What if "what if" were easy? If you regularly calculate financial data and set financial goals, *Goal Solutions* will earn its keep. —
Jeffrey Kahn



Software Carousel

PC switching utility

Pros: Makes up to ten

applications RAM-resident

Cons: Fills memory fast;

practical only with hard disk

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530 Chestnut St.

Manchester, NH 03101

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List price: \$59.95

Requirements: two floppy disks
(hard disk recommended), DOS
2.00 or later version

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Riding herd on the unruly memory-resident programs deep in our computers' innards has never been easy. Managers of TSR (terminate-and-stay-resident) programs are a minor godsend, but they're also minor league. Sorting out a few quirky little utilities is a far cry from keeping several full-blown programs like 1-2-3 resident in memory at the same time. Thanks to SoftLogic's *Software Carousel*, you can put almost any program into RAM and then have total recall.

Once you've loaded your computer programs into *Carousel's* framework, you can switch from one to another with the flick of a function key. A few programs, such as 1-2-3 release 2 and IBM's *Personal Editor*, already permit you to interrupt and restart them in midexecution; *Carousel* extends this ability to as many as ten programs at once.

Running *Carousel* is generally straightforward. You install it and then select a partition by pressing an <Alt>-function key combination. The partition is identified on a line above the DOS prompt by a name you assign. Once you select a partition, you can run any program just as you would from DOS. When you want to suspend operation of the current program, simply press a new <Alt>-function key combination to activate a new partition from which you may run another DOS program.

Carousel has no problem switching from a program running in medium-resolution graphics mode to one running in text mode to one running in high-resolution graphics mode. Programs running in different partitions may open the same DOS file and read it, but changing the file in one partition won't change the values in the others.

Concurrent execution isn't possible. You can't start a program in one partition and keep it running while you switch to a new partition. Switching suspends execution in the first partition; when you switch back, execution resumes at the point where it was interrupted. And *Carousel* is not a window environment; you can't display more than one program on the screen at a time.

The name assigned to a partition need not have anything to do with the program actually running in it. Partition 1 may be named 123 Taxes, but you could just as easily run a word processing program there instead (see Screen 2). You can also change the names and sizes of partitions without restarting the computer.

In case you forget which partitions are active, pressing <Alt>-<Space> calls up the *Carousel* menu, where a square to the left of 'memory size' identifies the program residing in a particular partition.

Carousel searches for memory with the zeal of a pig hunting for truffles. It first confirms the 640K

(continues)



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Why call it "Software Carousel"?

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Here's how it works. When you start Software Carousel, just tell it how much memory you have, load your software and go to work.

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<> Software Carousel <>

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O P T I O N S

E Exit from this menu
 C Change Memory Information
 R Rename a Memory Partition
 K Kill a Program
 H Help Display On & Off
 Fx F1 - F5 Switches to the Program as in SETUP Box
 ↑↓ Move the hi-lite. ← Selects

H E L P Information

This option will leave this menu and return to the program you came here from, in partition F1.

Your	S E T U P	Now	Total	800K
F1.	123 taxes		256K	
F2.	editor		128K	
F3.	words		128K	
F4.	word proof		128K	
F5.	Memory Partition 5, Un-named		80K	
	Free		168K	

Screen 2: Pressing <Alt>-<Space> at any time brings up Software Carousel's menu, with a list of file names and memory allocations.

DOS limit, then looks for extended and expanded memory, and finally goes to a hard disk for additional space.

Carousel's obvious disadvantage is that it requires an enormous amount of computer memory in order to have everything instantly accessible. Carousel doesn't compress programs or data; if a spreadsheet program and its data need 416K of RAM, that's how much must be allocated to the partition. The sum of the partitions must not exceed the total allocated memory.

Four years ago, when memory was expensive and hard disks were few, this sort of program would have been unthinkable; at today's prices, it's both possible and practical. The program itself occupies just 32K of memory.

Carousel's code seems well written and solid: All my software, including other TSRs,

worked properly with it. To make life easier, you should install SideKick and print spoolers before installing Carousel. With keyboard-enhancement programs like ProKey, you have a choice: Install them first, and they will define the keys the same way for all partitions; install them separately, and each partition can have its own unique key definitions.

Carousel is easy to use but too sluggish to be effective when most of its storage is allocated to a floppy disk. It's more practical with a hard disk available for secondary storage. When there's enough storage to keep all the programs in memory, Carousel puts on a great show. —Donald B. Trivette

(continues)



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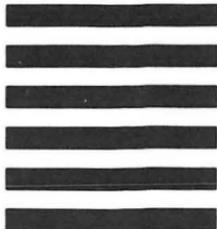
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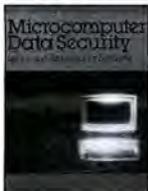
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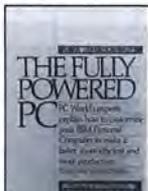
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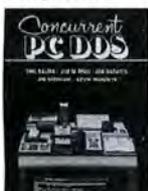
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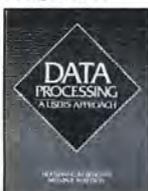
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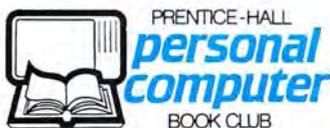
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Cons: Creation of log-on scripts is poorly documented

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Requirements: 192K, DOS 2.00 or later version

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There's no better way to get migraines than thinking about computer communications. Most of us have better things to fret about than parity, stop bits, log-on sequences, or downloading files. Wouldn't it be nice to have a software package that does it all for us automatically? Thanks to a new communications program from Hilgraeve, laziness may have its way.

HyperAccess does nearly everything right. It emulates a half-dozen terminals, including the VT100, IBM 3101, TeleVideo 950, and Zenith H-19; it performs file transfers with a variety of protocols; it can perform unattended calling; and it will set up your PC as a host computer. Unless you keep an eye on it, *HyperAccess* could take to chatting on your living-room telephone.

(continues)

New Version 3.0 with
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■ NETBIOS Support

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EasyLAN VERSION 3.0 HIGHLIGHTS

- *EasyLAN* shares printers, plotters, data, and disk storage
- Supports up to 18 PCs or compatibles
- New Network Commands
- New NETBIOS
- PC to PC file transfer
- Print spooling
- PBX support
- Easy to install
- Easy to operate
- Modem support
- Performs in the background

EasyLAN's low price matches the small business user's cost-sensitive budget. It is the office network solution for less than \$100 per PC.

EasyLAN performs its operations concurrently in the background. *EasyLAN* communications, file transfers and printer operations all take place while each PC simultaneously performs such normal DOS applications as Lotus 1-2-3,™ Wordstar,™ and dBASE.™

NEW NETBIOS SUPPORT—WRITE YOUR OWN COMMUNICATIONS PROGRAMS.

Programmers may use *EasyLAN* to develop network applications using NETBIOS (interrupt 5c). These applications can now be operated across the low-cost RS-232 communications links used by *EasyLAN*. Our new *EasyCALENDAR* program is an example of a network application that uses NETBIOS for program-to-program communications.

Multi-user data-base management applications that require a high-overhead network operating system will perform faster on high-cost networks operating at megabit speeds.

NEW VERSION 3.0 COMMANDS EXPAND NETWORK FLEXIBILITY

EZCLOCK lets PC's attached to the network read the time and date from a single master clock on the central PC, eliminating the need to install individual clock boards in each PC and insuring that all file entries and updates made across the network are dated.

The EZ Make Directory and EZ Remove Directory commands function identically to the DOS MKDIR and RMDIR commands, and give remote users increased flexibility when it comes to managing subdirectories on the central PC.

EZBEEP lets you send an audible signal across the network, alerting a PC user that a file or message is being sent.

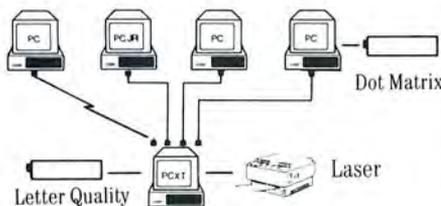
EasyLAN PBX SUPPORT BRINGS NEW FLEXIBILITY TO PC CONNECTIVITY

With *EasyLAN*'s PBX support, users can share peripherals and transfer files using PBX switched-circuit connections and existing twisted-pair wiring. *EasyLAN* has already been installed on a number of different PBX's, and recently was certified by Northern Telecom for use on its Meridian SL-1.

"The value is high "
 —InfoWorld Report Card

Disk sharing uses *EasyLAN*'s EZCOPY command to move files to and from PC's. ASCII or binary files can be transferred in the foreground, or in the background while other DOS programs run.

Printer sharing operates transparently with existing programs. Print files are automatically spooled to disk and scheduled for printing. Multiple printers on the central PC may be designated for individual printing tasks.



EasyLAN Office Network

EasyLAN SPECIFICATIONS

Each PC in the network requires an individual licensed copy of the *EasyLAN* program and takes 20k of memory on each satellite PC, a serial port, and DOS 2.0 or above. *EasyLAN* runs on all IBM PC models and compatibles. The central PC requires a serial port for each satellite PC. The COM2 and COM6 boards are serial port expansion boards which permit you to add serial ports to the central PC.

EASY TO INSTALL

EasyLAN can be installed in less time than it takes to enjoy your coffee break. Just plug the *EasyLAN* cables into existing serial ports. The *EasyLAN* Network Configuration Program provides menu driven installation program that will guide you step-by-step through the software installation process.

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MENU INTERFACE for easy set-up and use.

EasyCALENDAR's Data base for appointments, to-do lists and news resides on the central PC. Satellite PCs attached through *EasyLAN* version 3.0 send network transactions to the central data base to invoke *EasyCALENDAR* functions.

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EL 03	<i>EasyLAN</i> Expansion Kit—for 1-PC 30' cable, one disk & manual	\$119.95	_____	\$ _____
EL 10	<i>EasyLAN</i> disk & manual (3 1/4" disk \$89.95)	\$ 99.95	_____	\$ _____
EL 12	<i>EasyLAN</i> 30' cable	\$ 49.95	_____	\$ _____
EL 13	COM2-serial port expansion board, two ports	\$219.95	_____	\$ _____
EL 14	COM6-serial port expansion board, six ports	\$489.95	_____	\$ _____
EC 01	Easy CALENDAR Kit Supports 6-PC's and 10 people	\$199.95	_____	\$ _____
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Chris Veal, Partner, Regional Director of Micro Applications, Arthur Young.

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 Years ended December 31, 1986 and 1985

Sources of funds:
 Working capital provided from operations:
 Net income
 Items not affecting working capital in the
 current period:
 Depreciation and amortization
 Current portion of deferred taxes

	1986	1985
	\$2,336,478	\$ 972,434
	1,378,987	1,142,799
	<u>70,112</u>	<u>200,813</u>
	3,785,577	2,316,046
	47,512	179,007
	516,098	372,600
	92,546	1,500,500
	<u>52,374</u>	<u>776,890</u>
	4,494,107	5,149,587
	146,623	-
	(213,675)	-
	<u>1,211,729</u>	-
	1,144,677	-
	3,049,023	1,864,211
	2,622	76,111
	163,466	-
	<u>315,791</u>	-

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HyperACCESS

Call                               Modem port = 1
                                   Other Hayes-compatible modem

- Press F1-F5 for option, F9 for previous menu, or F10 for comm screen
  Use PgDn and PgUp keys to scroll

F1 Place a data call
F2 Place a voice or voice/data call
F3 Edit the list (Add, Change, or Delete)
F4 Redefine the modem and modem port
F5 Log calls in CALL.LOG           : Yes

# Remote System      Telephone Number  Setup  Baud  Sign-on
1 The WELL.....9,332-6106 well      1200
2 CompuServe (CS network).....N/A COMPUSERVE 1200 CISNET
3 Dow Jones.....N/A DOWJONES 1200 DOWTYM
4 EasyLink.....1-800-325-4112 EASYLINK 1200 EASYLINK
5 MCI Mail.....9,543-1560 MCIMAIL 1200 MCI
6 NewsNet (direct 1200 baud)....1-215-668-2645 NEWSNET 1200 NEWSNET
7 THE SOURCE (300 baud WATS)....1-800-368-3343 SOURCE 300 SOURCE
8 Another computer connected by cable....CABLE CALL 19200 HASIGNON

```

1:18

Screen 3: Function keys make it easy to navigate the HyperAccess menus. If you get lost, <F9> recalls the previous screen.

The latest edition of *HyperAccess*, version 3.20 (due out by press time), has a proprietary protocol for transfers between extremely high-speed modems (to 19,200 bps) that have built-in error checking, such as DCA's Fastlink and Telebit's TrailBlazer. The new version also features automatic file compression with transfers between two computers running *HyperAccess*, plus the ability to set the transmission rate to 57,000 bps (although some computers will not be able to handle data reliably at that speed).

Getting *HyperAccess* up and running is easy. The program comes with a diskful of scripts that you can use to teach it the log-on sequences for your favorite data base systems, bulletin boards,

or the company computer. Experienced users can use the program's HyperPilot script language to design sophisticated scripts for more complex tasks, such as unattended operation, error handling, and fielding a variety of responses from the host computer.

With HyperPilot, for example, you can create a script that will tell your PC to call MCI Mail at a specific time of day, log on, and download any electronic mail you have waiting; if the program has trouble making the connection, it will hang up and try again (see Screen 3). It will even keep a log of its activities.

Any piece of software that does this much is bound to be complicated, but many of *HyperAccess*'s functions are automated, so it virtually runs itself. And the documentation is better than average.

Hilgraeve includes an on-screen tutorial, and the manual is literate, well indexed, and easy to navigate. My only complaint is that the section devoted to creating scripts should be more complete to better cover HyperPilot's considerable capabilities.

HyperAccess is a thoughtful, well-conceived product. It performed every function asked of it and successfully communicated with every host computer it encountered. For all its sophistication, the program is easy to use, even for a beginner. I haven't been so impressed with a communications product since I first linked a pair of tin cans with a piece of string. —Wayne Rash, Jr.

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Cons: Text mode only

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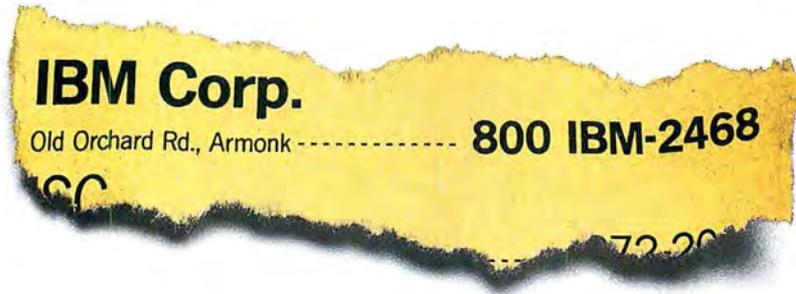
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Now call the people on the left, and you can

emulate some terminals, a limited number of system printers, and not all of the 5250 display attributes. Of course you'll be able to work with IBM file transfers, but once the goods are delivered, can you work with virtually no support of PC based products?

So before you call the number on the left by force of habit, consider who's really giving you the best solutions in 3X communications. And ask yourself this.

Who should be emulating whom?

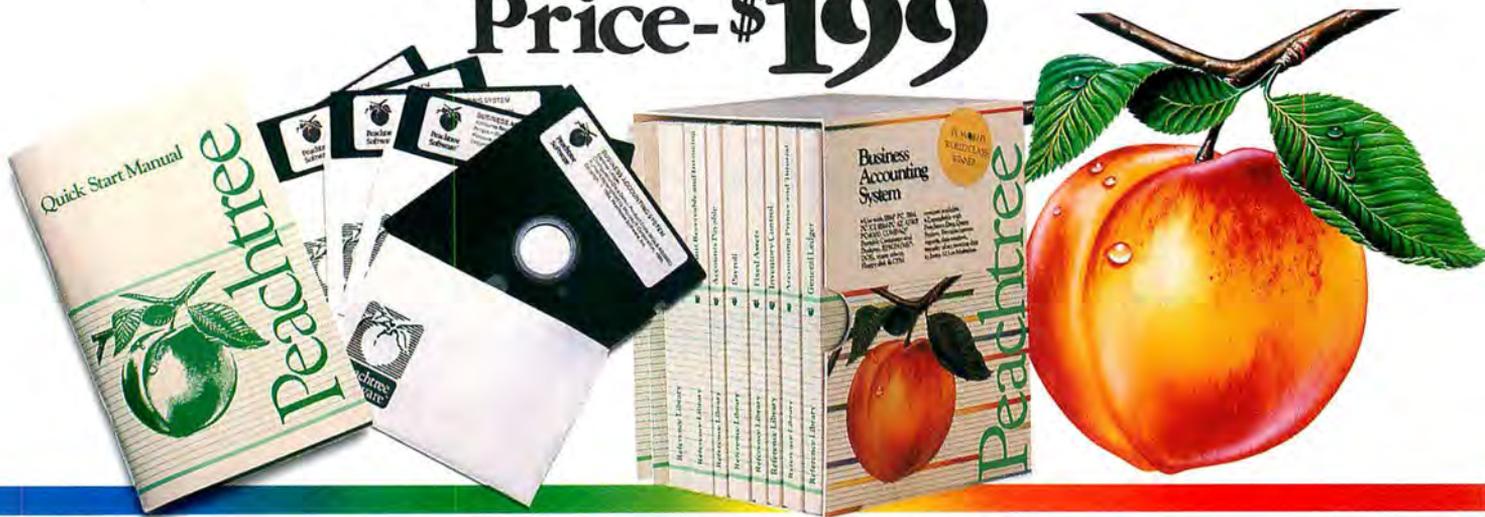
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It's 2031, and the world is nothing like the one you studied in civics class. The economy has been stagnating for decades; crime and urban decay are rampant; schools are violent hellholes; and the most popular escape is the fleeting, private nirvana supplied by "joybooths."

To restore order, government and industry leaders have proposed a radical new government plan that joins the moral values of the 1950s with the technological advances of the twenty-first century. Despite some ominously totalitarian features in the plan, a frustrated public embraces it.

Some high officials are concerned. Will the Plan for Renewed National Purpose bring peace and prosperity or will it prolong the chaos and decay? They turn to you. In Infocom's interactive fiction game, *A Mind Forever Voyaging*, you are PRISM, the world's first conscious, intelligent computer. Fully loaded with facts and figures about the world of 2031 and the government's plan, you are assigned to delve into the future and bring back reports of life ten years after the proposed plan takes effect. Only PRISM can see the future and know what must be done to save humanity.

You explore your home of Rockvil, South Dakota ("Jewel of the Quad States"), ten years into the future, observing people, buildings, and government operations, all the while recording conversations and activities for your report to the government's Dr. Perelman.

Except for a heavy police presence, everything seems fine. The city looks prosperous, the people seem happy and employed. Pleased with your 10-year forecast, the government decides to go ahead with its plan. However, your gut feelings haunt you. Things may not be as perfect as they appear. But you're a computer whose hunches carry no weight with bureaucrats. The best you can do is return to your simulations, delving 20, 30, 40, and 50 years into the future for clues to the fate of the earth.

As with most other Infocom interactive fiction treks, this is a text-only simulation in which your imagination must create all the graphics imagery. But the program's surprisingly facile 2000-word vocabulary keeps your creative juices flowing. To set the mood and help you along, the package includes a detailed map of Rockvil, the April 2031 issue of *Dakota Online Magazine*, and a Class One Security Mode Access Decoder. You should heed the manual's advice and sketch out detailed maps of your travels.

Although Infocom classifies *A Mind Forever Voyaging* as an advanced-level science fiction simulation, it is an excellent choice for a novice. Instead of digging through puzzles, magic spells, or mazes, you explore the future. Behave

(continues)

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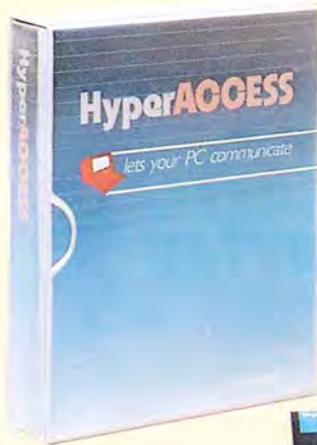
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John Walkenbach is a freelance writer and consultant in Manhattan Beach, California. Jeffrey Kahn is a computer specialist with an international energy consulting company in Setauket, New York. Donald B. Trivette is a freelance writer and consultant in Wrightsville Beach, North Carolina. Wayne Rash, Jr., is a microcomputer and office-automation consultant with American Management Systems in Arlington, Virginia. Mike Oppenheim is a freelance writer in Los Angeles.



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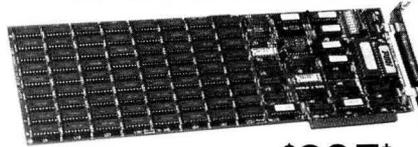


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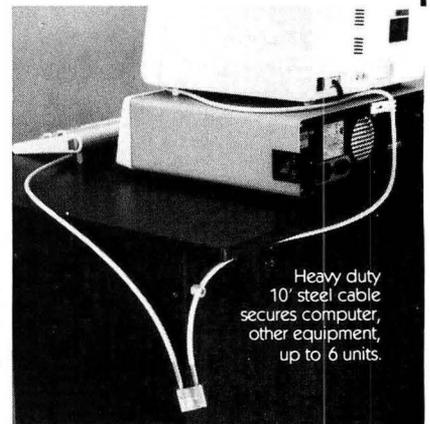
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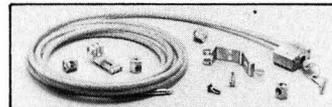
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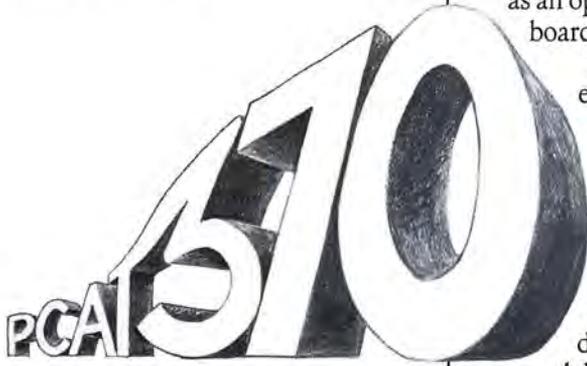
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Alsys launches
PC AT-TO-370 ADA
Cross-Compiler at
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80286 Debugger also
introduced.



A new Alsys cross-compiler permitting Ada programs to be written on an IBM-PC AT and executed on an IBM 370 was introduced at the November Ada Expo in Charleston, W. VA. The cross-compiler, pre-validated to AJPO test suite 1.7, is priced at \$2,995 and includes a 4 MB RAM board.

Two compilers, the Alsys validated PC AT self-hosted compiler, and the AT-to-370 cross-compiler, are offered as an option at \$4,995. One RAM board serves both compilers.

The cross-compiler, and especially the two-compiler option, implements a "distributed programming" environment for which the Ada language and its "package" concept is particularly suited. The two-compiler option permits developers to program in Ada and test their results at their workstations before uploading 370 object code to the mainframe.

Alsys also introduced its PC AT debugger called AdaPROBE at the Expo. AdaPROBE combines a unique AdaVIEWER with regular debug facilities.



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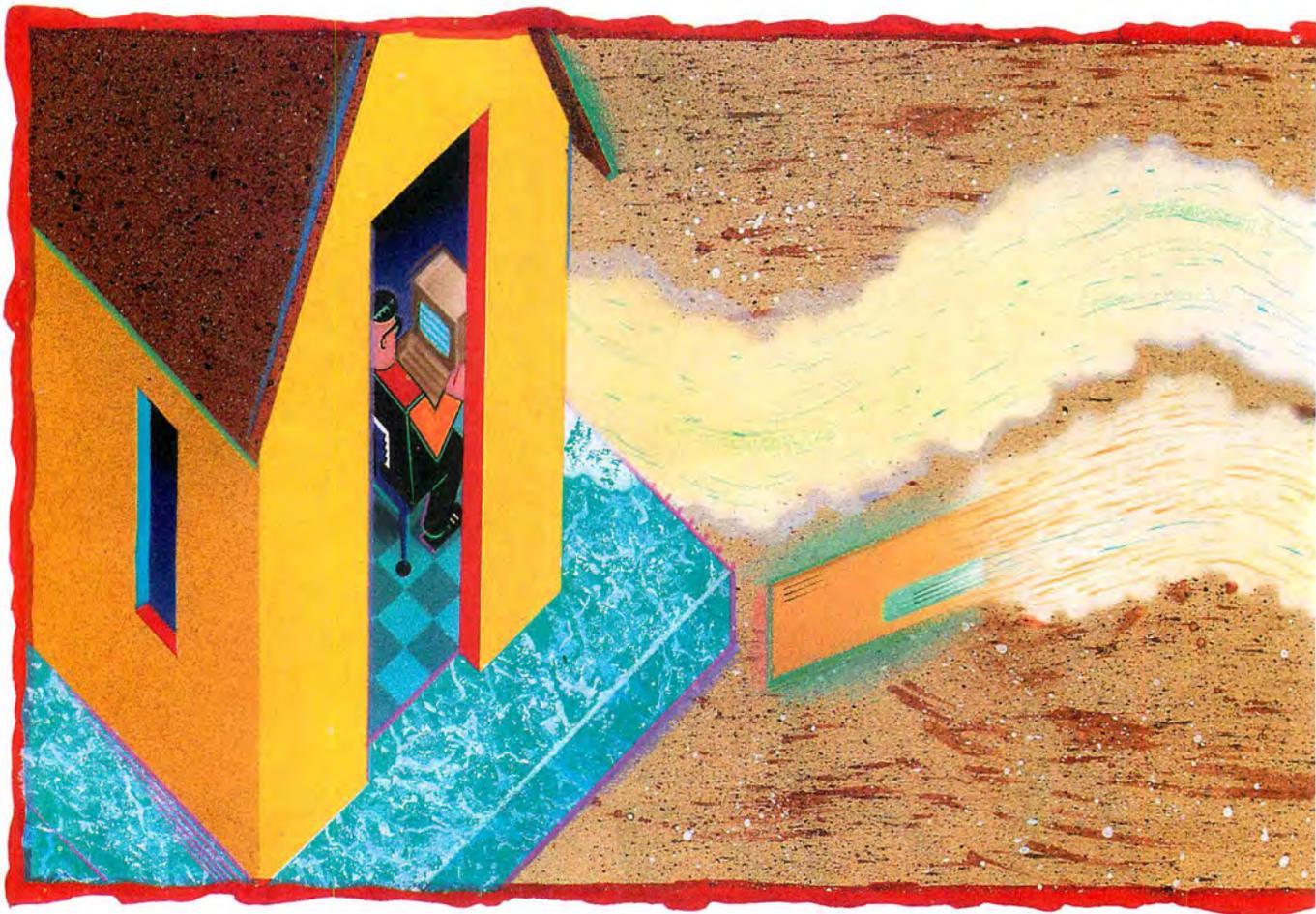
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The Electronic Taxman



The IRS Wants YOU—to send in your tax return by computer. Electronic filing helps tax preparers and gives some of us instant refunds, but guess who the big winner is?

Judy Rosenfeld

||||| A lot of tax returns are reaching the Internal Revenue Service this year without ever going near a mailbox. Tax preparers are transmitting them from their office PCs either directly to the IRS or through a number of new communications networks that offer a service much like electronic mail. What the IRS calls electronic filing is a natural outgrowth of computerized tax preparation. And while it mainly benefits the IRS and professional tax preparers, it offers the rest of us speed and accuracy—maybe even



Steve Lyons

next-day refunds. For the Internal Revenue Service, the future is here, and it looks like a modem.

The IRS has been working for decades to streamline the monumental task of processing paper tax returns. Each year more than 100 million individual tax returns and nearly 1 billion pieces of correspondence pour into IRS service centers. And as the nation's population grows, the number of returns and reports rises.

Mothered by necessity, electronic filing was launched in a 1986 pilot program and is gradually expanding. To IRS managers and their beleaguered employees, it must look like the Holy Grail: no more heavy mail sacks to heave around, no tedious envelope opening or counting, and no more sorting, numbering, or batching of paper returns. By eliminating drudgery, the IRS hopes to cut the chronic turnover among its 80,000-plus employees. It claims it won't lay off workers as electronic filing spreads, and it expects to retrain some of its workforce to manage elec-

To IRS managers and their beleaguered employees, electronic filing must look like the Holy Grail.

tronic and computer functions. The IRS is doing what any smart business would do: automating to cut labor costs.

Electronic filing even shifts the burden of key-punching tax return information to the outside preparers. "Everybody is a winner," says Mark Timmings of Cincinnati Bell Information Systems, "but the IRS really comes out on top."

Although electronic filing won't ever completely supplant paper returns, its popularity will match that of such tax preparation programs as ChipSoft's *TurboTax*, HowardSoft's *Tax Preparer*, and *PC/TaxCut* from Best Programs. In 1985, according to IRS reports, one-third of all professionally prepared individual tax returns were processed on PCs. Filing those returns electronically is as natural as sending word processed documents by electronic mail.

Says Steve Pyrek, an IRS public affairs representative, "Electronic filing cuts [tax return] processing time by two to three weeks and reduces errors because the numbers don't have to be punched in." Typically, 20 percent of paper returns contain mistakes,

By 1990 as many as 30 million returns may be filed electronically; in a decade, anyone with a PC should be able to file a tax return from anywhere in the world.

according to the IRS; with returns filed electronically, that figure drops to 2 percent. Moreover, electronic filing cuts the average six-week IRS turnaround time in half. For the IRS, quicker refunds mean fewer complaints from impatient taxpayers and less interest to pay on late refunds.

For taxpayers, the dramatic overhaul of the federal tax system should make electronic filing's speed especially attractive during this transitional year when many more people will be getting refunds. Taxpayers who file electronically won't have to worry about their bad arithmetic. Before accepting your return, the IRS mainframe screens it to make sure that you didn't make any mistakes in arithmetic or forget to check any boxes. If you did, you'll be the first to know—usually within 24 hours.

Ambitious Program, Slow Start

For all the promise of electronic filing, the IRS has dipped its toe in the waters very gingerly. The 1986 pilot program was limited to individuals who were owed refunds and who lived in one of three test areas where the IRS mainframe computers in Cincinnati could accept the electronic transmissions: Cincinnati itself; Phoenix; and Raleigh/Durham, North Carolina.



Bill Radtke/Reuters

Michael Coyle of Dan Cherry Tax Service hugs some of the paper tax returns his company won't be mailing this year. Thanks to electronic filing and the office Tandon, Coyle's firm has been uploading a quarter of its returns directly to IRS computers.

Despite the pilot program's limitations, five tax preparation heavyweights chose to join the 1986 pilot program: H&R Block; Peat, Marwick, Mitchell & Co.; Deloitte Haskins & Sells; Beneficial Tax Service Centers; and Hart & Gersbach of Cincinnati. With its "Rapid Refund" slogan, H&R Block touted electronic filing through television and newspaper ads, signs posted in its offices, and preparers' recommendations.

Last year the testing process wasn't as smooth as anticipated; some of the firms had to work through several test batches before their results matched those of the IRS. "The pilot program was a learning experience for us all," says Carolyn Buttolph, IRS project manager for the electronic filing program in Washington, D.C. "We lost money on the program

and so did the preparers, but all the firms thought enough of it to come back again."

This year the IRS program is still limited to refund-due individual returns but has expanded to four more test areas: Sacramento, California; Albany/Schenectady/Troy, New York; Milwaukee; and Norfolk/Newport News/Virginia Beach, Virginia. More than 100 firms in the IRS test areas signed up, with small regional accounting firms joining corporate giants. All told, phone lines are expected to deliver some 250,000 tax returns to the IRS, ten times more than last year. Seven new test areas will be added in

1988, and the IRS says the program will continue to expand until it is fully operational nationwide.

By 1990 as many as 30 million returns may be filed electronically; in a decade, anyone with a PC should be able to file tax returns from anywhere in the world.

So while the IRS strives to cut its paperwork, preparers are stuck with yet another form, at least for now. Two steps forward, one step back.

For the moment, however, electronic filing is for tax professionals. Preparers must have handled at least 100 tax returns professionally the year before they participate in the program, says Buttolph, and must successfully process and transmit a test batch of 50 dummy returns. "We want to see if they get the same results we do," she says.

Preparers can use any combination of software or hardware to prepare the returns, but the resulting files must be formatted so that the IRS mainframe can read and process the data as it would paper returns. The IRS also requires that the data undergo stringent validation checks to assure numeric accuracy and compliance with procedures. By filing indirectly through a communications network, low-volume filers can leave most of the technical hassles to someone else.

The Long Forms Get Longer

The IRS now accepts a wide range of forms for electronic filing: 1040EZ, 1040A, and 1040 with schedules A, B, C, D, E, G, R, SE, and W; and forms 2106, 2119, 2441, 3468, 3903, 4562, 6251, 6252, and 8283. The present electronic program doesn't accept

business returns, but the IRS plans to accept form 1120, for corporate returns, by next year. Forms 1041 (fiduciary) and 1065 (partnership) are special cases: They can already be transmitted electronically from anywhere in the United States, but the files must be received—on disk or magnetic tape—at the IRS service center in Andover, Massachusetts.

Only one glitch remains in this otherwise smooth flow of information: dealing with signatures. Tax returns must be signed by both taxpayer and preparer, but signatures don't transmit over telephone lines, and the IRS doesn't yet have optical character recognition (OCR) hardware and software to read electronically filed returns. True to form, the IRS responded by printing yet another piece of paper. Form 8453 is a written declaration that includes the required signatures as well as other key information from the return, such as taxable income. Tax preparers mail it in after the returns have been filed electronically. So while the IRS strives to cut its paperwork, preparers are stuck with yet another form, at least for now. Two steps forward, one step back.

Direct Filing: For the Big Boys Only

Of the two ways to file electronically, transmitting returns directly to the IRS computers is the most expensive and calls for the most skill in electronic communications. Direct filing requires a 4800-bps modem, a bisynchronous serial board, and IRS-compatible communications software (adhering to IBM's 3780 protocol). For the 1986 pilot program, the participating companies had to write their own software to comply with IRS specifications.

Direct filers transmit returns to the IRS's Cincinnati mainframes in batches of up to 500, with no minimum required. Like any modem-to-modem communication, direct filing has advantages and drawbacks. For one thing, you have to make an appointment. The IRS schedules the transmission, and an IRS representative calls at the specified time to give the go-ahead. "We call you," says Buttolph firmly, "you don't call us."

Dennis Notek figures he'll earn his \$4000 investment back in a year. That's what his company, Reliable Tax and Bookkeeping of Dayton, Ohio, paid for the software and high-speed modem to go on line with the IRS. As the head of one of Dayton's biggest

tax preparation firms, Notek figured it made sense to file directly. "We felt we had so much volume that we wanted to handle it all ourselves," says Notek. "We didn't want to have to rely on some other company." Reliable Tax has an IBM AT and an XT and plans to use the AT for daily electronic filing. The company expects to file 4500 returns this year—1500 of them electronically—and a lot more in the future.

Indirect Filing: E-Mail for Your Taxes

For smaller-volume preparers, indirect filing is cheaper and more convenient. The returns are first sent to one of several specialized commercial communications networks and later transmitted to the IRS. Preparers can upload their files at any time; it's almost like electronic mail. Indirect filers need a 1200- or 2400-bps modem, an asynchronous serial board, and a specialized communications program to hook up with the network. Such programs are available from a few companies, including CPAids of Kent, Ohio (see Screen 1); Pencil Pushers United of Lexington, Massachusetts; and Lacerte Software of Long Beach, California. They sell for about \$200, usually as add-on modules to the software houses' tax preparation packages.

This year, networks for uploading tax returns have been set up by a number of companies, including Speed>S Corporation in Minneapolis and Western Union Telegraph in Upper Saddle River, New Jersey.

Speed>S charges \$10 per return for "low-volume" filers (up to 250 returns per year) and guarantees error-free transmission. Customers simply dial a local access number, log on, and upload their files; Speed>S does the rest. The IRS acknowledges receipt of the files, and Speed>S then passes the word back to the preparer.

Western Union, which transmits files using *EasyLink*, charges only \$4 a return. The company admits losing money on the operation but is looking to the future. "This is a long-term strategy," says Arthur Shebar, senior marketing director. "It won't be long before 30 million tax returns will be sent to the IRS electronically each year. It's worthwhile to get positioned now."

An interesting entry in this burgeoning market is a generic filing program from Tax Masters, a Beneficial subsidiary in Peapack, New Jersey, that also runs an electronic network. *Tax Masters* can be used with any return, whether prepared by hand or computer. The preparer simply types in the information; the program reformats the file, runs the validity checks, and transmits the file in compressed form to

Screen 1: The Transmit menu of the CPAids Electronic Filing Option

```

Volume 001 contains the following 16 clients:           Volume limit = 100
1 CLOG01 * 6 111111      11 MYFILE * 16 SENDIT      21 .....
2 123456 * 7 QUAL02 *   12 FARMER * 17 .....      22 .....
3 AAAAAA * 8 QUAL03 *   13 MR5884   18 .....      23 .....
4 BLANK1 * 9 QUAL04 *   14 PAYIN2   19 .....      24 .....
5 ETEST1 * 10 QUAL05 *  15 SENDOK   20 .....      25 .....
t = QUALIFIES FOR ELECTRONIC FILING   T = TRANSMITTAL FILE CREATED
RESERVED WORDS:
XMIT  <====> Transmit qualifying electronic files (t)
RXMIT <====> Retransmit qualifying electronic files (T)
NEW   <====> Transmit clients not previously transmitted
ALL   <====> Transmit entire VOLUME
CHANGE <====> Change client Data disk
MODIFY <====> Add or delete clients in Volume
END   <====> End client entry
DIR   <====> Directory of clients on data disk
F/B   <====> ID Forward/Backward
[ Enter INDEX number(s) which correspond to client(s) to be TRANSMITTED ]
[ Or enter a RESERVED WORD or the first letter of a Reserved Word ]

<====> . <====>

```

the Tax Masters electronic filing center in Peapack. Tax Masters charges between \$3 and \$6 per return to upload to the IRS, depending on the volume.

Tax Masters even observes propriety: If an affectionate taxpayer enters 'Mom' under the heading of 'dependent', the filing program automatically changes it to 'Mother'—just the way the IRS wants it.

Michael Coyle likes electronic filing, but he's not starry-eyed about it. Some 1600 middle-income Virginia Beach people entrust their tax work to his Dan Cherry Tax Service, and Coyle doesn't want the IRS to mess things up. "Conceptually, it's a great idea," he says, "but I have doubts about the IRS's

If an affectionate taxpayer writes 'Mom' under the heading of 'dependent', the filing program automatically changes it to 'Mother'—just the way the IRS wants it.

ability to do it right." Coyle and other candidates for the program weren't encouraged when the IRS had made mistakes in preparing the first batch of test returns.

Coyle took the electronic plunge anyway. Running the *CPAids Electronic Filing Option* on the office Tandon XT clone, the company's four preparers have been transmitting 20 to 30 returns every other day since January; Coyle says they often upload 60 to 70 on Mondays, "because we've been working all weekend."

Sitting in his office on West Capitol Drive in Milwaukee, Adolphus Sanders laughs as he remembers the IRS's first botched returns. That didn't stop his company, Digital Tax Preparation Service, from joining Coyle in the growing legion of electronic filers. In 1986, 90 percent of Digital's clients got refunds; when the company switched to electronic fil-

ing, they flocked back—and brought their friends along. "The first reason we joined the program was to get more clients," says Sanders. Also a *CPAids* loyalist, Sanders runs the program on an Esprit ESP-9310 XT clone bought especially for that purpose.

■ The No-Wait Refund

Electronic filing has some nice features, but let's face it—it's mainly for the convenience of the tax collector. To make the program attractive to the rest of us, the IRS is adding a few enticing options. An electronic funds transfer (EFT) can deposit a refund directly into a taxpayer's bank account three weeks after a return is filed. In the future, an expanded EFT program will allow taxpayers to pay balance-due returns with debit and credit cards.

Finally, for people who can't wait even three weeks for their refund, the IRS has sanctioned the most mouth-watering option of all: Refund Anticipation Loans (RALs). For a fee—about \$25, this year—a bank lends you the amount of your refund and then cashes your check when it arrives three weeks later. Beneficial National Bank in Peapack, which dreamed up the idea and persuaded the IRS to approve it, will administer the RAL option for any participating electronic filing firm.

Electronic filing has some nice features, but let's face it—it's mainly for the convenience of the tax collector.

For now, RALs are available only in the three original IRS test areas; even so, Beneficial expects to make 25,000 to 35,000 loans this year. An agreement to handle RALs for H&R Block would send that figure through the ceiling. "On a national level, it could go to 1, 2, 5, or even 10 million loans," says Ross Longfield, president of Tax Masters. What is clear is that people want their refunds fast. Says Longfield, "When people know they have money coming, they've already got it spent."

Again, no program is perfect. Last year, when RALs were available on some manual returns in his area, Mike Coyle saw some banks take advantage of people. "A company not 500 yards from my office here in Virginia Beach was charging a \$25 fee *plus* a percentage of the refund," he says. "They were charging \$50 on a \$300 refund. I hope electronic filing will eliminate this sort of practice."

Whether it will or not, over the long haul electronic filing will probably change the tax business in ways that pioneers like Dennis Notek, Mike Coyle, and Adolphus Sanders could hardly predict. It will certainly spread; there's too much in it for the IRS. For the rest of us, electronic filing may be a mixed bag: We get faster service and quicker refunds, but if the changeover frees up a lot of IRS workers, let's hope the IRS retrains them as computer operators—and not auditors. ●

Judy Rosenfeld is a freelance writer in Woodland Hills, California.

CPAids Electronic Filing Option
CPAids
1061 Fraternity Circle
Kent, OH 44240
216/678-9015
List price: \$200
Requirements: 192K, two disk drives, DOS 2.00 or later version
Not copy protected

EasyLink Instant Mail Manager
Western Union Telegraph Co.
Upper Saddle River, NJ 07458
201/825-6116
List Price: \$150, filing charge \$4 per return
Requirements: 256K, two disk drives, DOS 2.10 or later version, 1200- or 2400-bps modem

Electronic Filing Option
Pencil Pushers United
1666 Massachusetts Ave.
Lexington, MA 02173
617/861-6962
List price: \$200
Requirements: 64K, two disk drives, DOS 2.00 or later version
Not copy protected

Speed>S Electronic Delivery
Speed>S Corp.
430 First Ave. N
Minneapolis, MN 55401-1713
612/341-0920
List price: \$80 per disk, \$50 per disk for two or more; filing charge \$10 per return
Requirements: 256K, one disk drive, DOS 2.00 or later version, 1200- or 2400-bps Hayes-compatible modem
Not copy protected

Tax Masters
Tax Masters
300 Beneficial Center
Peapack, NJ 07977
201/781-3000
List price: \$250, annual upgrades \$60 to \$80; filing charge \$3 to \$6 per return
Requirements: 256K, hard disk, Hayes-compatible 1200- or 2400-bps modem
Not copy protected

Network Giants Square Off



A showdown between LANs from 3Com and Novell isn't just another day at the races. The real measure of these two archrivals lies in their ease of maintenance, expandability, and day-to-day use.

Michael Goodwin

||||| As PC manufacturers from Taipei to Austin turn up their clock rates, the speed of personal computing is the obsession of the day. Two of the largest local area network (LAN) vendors, Novell and 3Com, have spent the past year exploiting MIPS mania with blockbuster advertisements that boast the fastest LANs in the West. Last December, the bravado culminated with a Novell-sponsored (and largely inconclusive) "shootout" in Silicon Valley.

Using six workstations and a battery of benchmarks, *PC World* recently took this gunslinging to neutral ground by putting 3Com and Novell software and hardware to the test. As the five winning configurations in Figure 1 indicate, the results of this showdown are unmistakable. Not only did Novell's *Advanced Netware/286* network software run consistently faster than 3Com's *3+Share*, but Novell's 286A server (a computer dedicated to running the network) also bested 3Com's 3Server3 by a substantial margin. And when a 6-MHz IBM AT was tested as a server, it was significantly slower than either the 286A or the 3Server3—a fact that deserves special attention, since many businesses consider the AT the server of choice.

Because the number of workstations has an enormous effect on performance, conclusions drawn from the comparative figures should be applied only to small LANs; additional workstations could lead to

vastly different results. Moreover, whatever a LAN's size, the workstations' processing power affects speed more than anything else does. All the marketing hype in the world can't change the fact that a network is just a way of sharing resources; the processing itself still takes place in the PC's CPU. When several workstations request access to the server at the same time, both 3Com and Novell system performance degrades noticeably. But under normal operating conditions, you may easily forget that your PC is hooked up to a LAN.

Benchmarks, then, are only part of the story. A real battle of the LANs must address not only speed but also the ease with which a system is installed and maintained. Ideally, a network is transparent to the end user. If work is disrupted every time you make minor adjustments or add a new workstation, even the fastest network will send productivity plummeting. Security, ease of use, and flexibility are the real issues that determine who is top gun.

■ What Is This Thing Called LAN?

Every LAN is built around four kinds of components: the network operating system, the network server, network boards (to link the workstations together), and the workstations themselves.

Novell sells servers and the *Netware* network operating system, but the company itself makes no network boards. 3Com offers servers, *3+Share*, and the EtherLink and EtherLink Plus boards. In addition, *Netware* and *3+Share* allow you to use almost any 80286 computer with a reasonably large hard disk as a network server.

The two companies' software packages have some fundamental differences. *Netware* is generally easier to install and maintain than *3+Share*, and its documentation is clearly superior. Novell's software also supports more brands of network boards, its utilities are easier to use, and—unlike *3+Share*—it's free of copy protection. Moreover, *Netware* comes fully configured and requires no add-on software.

3+Share, on the other hand, is basically an operating system shell. If you want certain important features, you must purchase the appropriate add-on packages. On the other hand, you get what you pay for, because these options are often more useful than their Novell equivalents. For example, 3Com's \$1000 3+Mail is a first-rate E-mail program, far more powerful than *Netware's* free (but hard-to-use) Mail program.

Although pricing out the software and hardware needed for a LAN is a complicated proposition, the bottom line is that Novell charges a bit more for the basic system. A dedicated server and the software to run a six-user system with E-mail (but no phone or remote access) costs \$9690 from Novell and \$8785

Netware Wins the Speed Battle

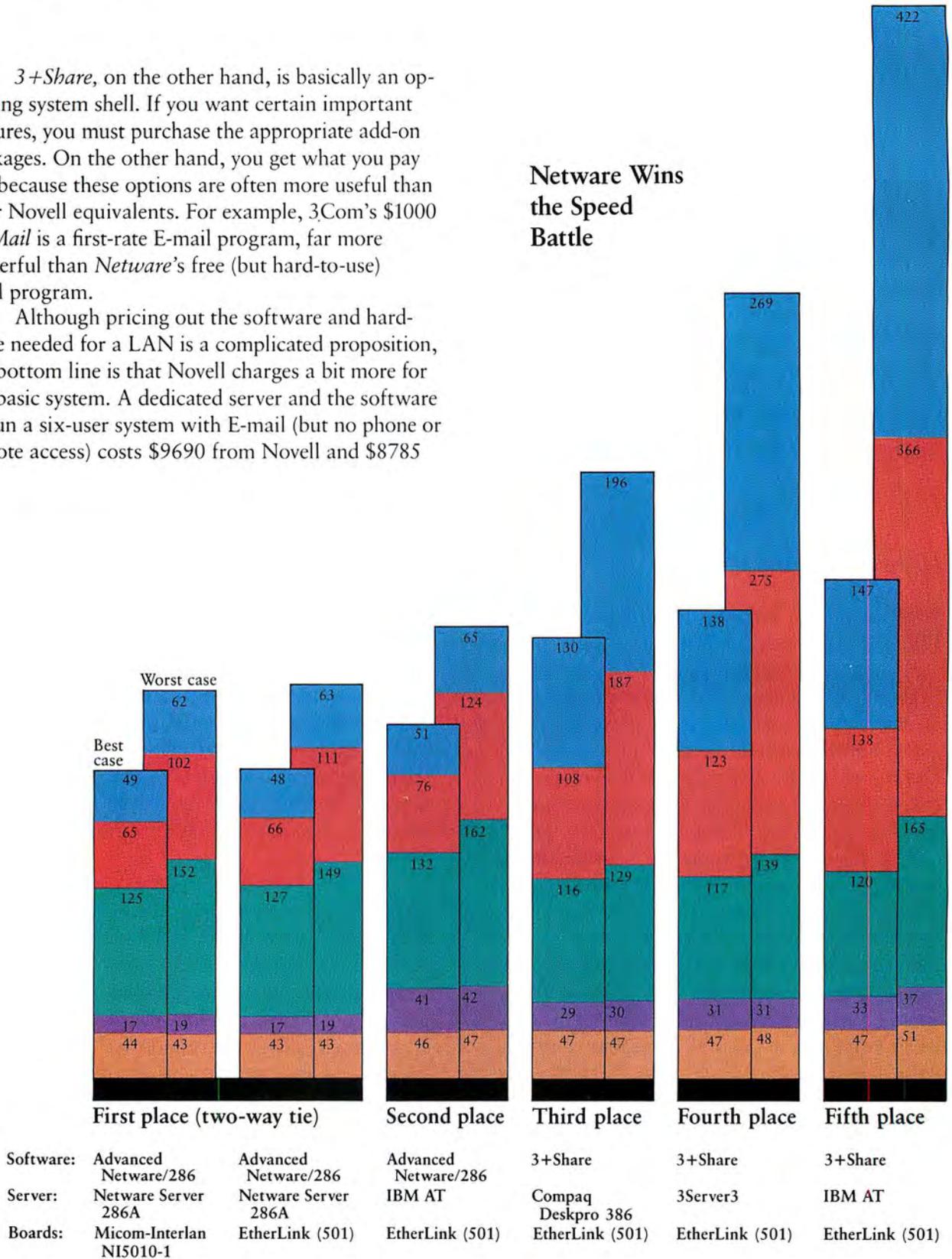


Figure 1: The five winning systems. Each of the test categories represents several individual tests. Shown here are the best- and worst-case results. All results are in seconds.

- dBASE III battery
- NewWord battery
- 1-2-3 test
- DOS copy test
- ARC.COM test

from 3Com. However, 3Server3 performance improves significantly with a \$1500 2MB memory expansion board, bringing its total price to \$10,385.

To simulate an average office computing environment, *PC World* set up a six-workstation bus network—an arrangement approximating the most common configuration for small LANs (see “Strategies for Sharing Resources,” *PCW*, February 1985). The two other common LAN topologies—ring and star networks—shine brightest on very large networks, so they were ruled out. And because most bus architecture LANs run with 3Com EtherLink (501) boards in the workstations and an EtherLink Plus (505) board in the server, these products were installed to follow suit. Partly due to their reputation as speed demons, *PC World* also tested Micom-Interlan’s NI5010-1 boards (marketed by Novell) with both *Netware* and *3+Share*.

■ Battling RAM

For end users running application software, *3+Share* and *Netware* are equally transparent. Once you log on and enter your password, a DOS prompt appears, just as if you were using a stand-alone PC. For those who purchase, install, or maintain LANs, however, the differences between the two systems are substantial.

One of the most striking differences between the rival systems is in the way the server’s memory is accessed. *Netware* uses a proprietary operating system that takes advantage of the 80286’s protected mode to access as much extended memory as the server will hold. By contrast, *3+Share* runs standard DOS—an arrangement that solves some problems but creates others. For instance, you can use the familiar DOS BACKUP command with *3+Share*, while *Netware* requires a proprietary backup program called *Larchive* that won’t work with many tape units. But because DOS still can’t run the 80286 or 80386 in their protected modes, *3+Share* is limited to 640K of RAM (except on the 3Server3, which offers 960K RAM).

Although *3+Share* can use expanded memory for system overhead, such as disk caching, it can’t use that memory for installing primary services. This means that if you run *3+Share* on anything but

Executive Summary

3+Share

Network software

In a small LAN, *3+Share* enables users to share resources effectively, but memory limitations and complex installation make the road to successful implementation a rocky one. However, the excellent assortment of inter-LAN communications add-ons could make *3+Share* a good choice where linking LANs is a major concern.

Software installation	Poor
Adding users and access rights	Fair
Printing	Fair
E-mail facility	Excellent
Overall value	Fair

Advanced Netware/286

Network software

Netware’s ease of installation and maintenance yield a relatively trouble-free system for sharing data and peripherals in a small LAN. The package’s proprietary operating system supports the 80286’s protected mode, leaving plenty of elbowroom for network tuning. However, its E-mail facility is primitive compared to *3+Share*’s.

Software installation	Excellent
Adding users and access rights	Excellent
Printing	Excellent
E-mail facility	Fair
Overall value	Excellent

3Com’s dedicated 3Server3, you can’t allocate enough RAM for both high-performance tuning and a full system simultaneously (see the sidebar “Speed Zone”). Several important services, such as *3+Mail* and *3+Route*, must be sacrificed or must run on a second server.

To access that extra 320K RAM, the 3Server3 does an end run around the 640K DOS limit by providing no CRT display—just a one-line LCD readout for (usually cryptic) error messages. This provides

Speed Zone

Although every network component influences speed, some effects are greater than others. Network boards, for instance, seem to have little impact; the reputed speed-demon Micoms turn out to be only marginally faster than the workhorse EtherLinks, all other factors being equal.

Unquestionably, the clock rates and bus structures of the constituent workstations have the greatest impact on performance. The test LAN was composed of four 80286 machines and two 8088 PCs. The fastest 80286 machine completed a word processing test in 41 seconds, while a 1982-vintage IBM PC took a lumbering 113 seconds.

Another critical element in the speed game is *tuning*—setting the number and size of data buffers, byte range locks, file descriptors, I/O request blocks, and so on to provide the greatest amount of elbowroom for incoming and outgoing data.

Both *Netware* and *3+Share* require tuning—and doing so makes a big difference. One early benchmark test using an IBM AT server and *3+Share* was made with the tuning inadvertently misset; completing the 1-2-3 benchmark took 223 seconds. When the tuning was corrected, the same test ran in 165 seconds.

Furthermore, networks must be tuned for prevailing activities. For instance, if your network is used primarily for data base applications, you'll want lots of small read/write

buffers; for word processing you'll need larger buffers, but fewer of them. Since *PC World's* benchmark tests included a variety of applications, tuning was averaged for best overall performance (see Figure 1).

Five benchmark tests were designed to simulate real-life office jobs using familiar software. Running mathematical tests like the Sieve of Erasthenes produces amusing numbers but doesn't tell you how long it will take to save a long report to disk with your word processor.

The first test copied a 10K file from the workstations to the server ten times, in DOS.

The second test was a *dBASE III* battery: a group of ordinary data base tasks that included adding 10 records to a shared data base, displaying 100 records from that data base, searching 1000 records for a string, locking and unlocking files and records, and so on.

The third test consisted of a group of word processing tasks using *NewWord*. The test loaded the program, then loaded a 50K file, found and replaced 214 4-character strings with 14-character strings, saved the file to disk, copied it, erased the copy, and renamed the original. It then loaded a 150K text file, moved to the end of the file, back to the top, and exited.

The fourth test used System Enhancement Associates' *ARC.COM*, a public domain utility that combines many files into one squeezed archive file for fast telecommunication. The benchmark archived and squeezed eight short text files and saved the archive file to disk.

The fifth test loaded *1-2-3*, read a 250K worksheet from disk, recalculated it, and saved it back to disk.

The battery of benchmarks was run on one workstation at a time to simulate a realistic, everyday situation in which different stations would be doing different jobs. The one-at-a-time scores for each workstation were averaged for the best-case figures. The tests were then run on all six workstations simultaneously, to simulate a situation in which overlapping data requests would congest the network bus and slow down the system. Those results were averaged for the worst-case figures.

You may notice that the Compaq 386 is on the chart running *3+Share* but not *Netware*. *Netware* was installed successfully on the 386 and ran very well on individual stations (its best-case averages were 3 $\frac{2}{3}$ percent faster than the winning systems' record). However, each time all six stations tried to access the server simultaneously, the system crashed with an impressive (and bewildering) variety of error messages. If Novell can make *Netware* run on the Compaq 386, the worst-case results should also have the edge. —M. G.

enough elbowroom for a full, high-performance system, but the lack of a display makes some critical installation and maintenance tasks laborious. Sometimes, to see what you're doing, you must borrow a display from a workstation in the LAN using a complicated program called *3Console* that establishes a temporary link between server and workstation.

■ The SYSOP's Lot

Many businesses hire LAN specialists to get their systems up and running, but the day will surely come when you decide to add a new user or another workstation. Perhaps a terrifying error message will appear on someone's screen, or you'll want to install a new data base program. Calling in a consultant every time you make a move can run into big money.

Inevitably, someone in your office will find himself or herself responsible for running the network. This system operator (or SYSOP) will depend on network utilities to perform day-to-day maintenance and on documentation for guidance.

Novell's *Netware* includes two excellent programs that make installation and maintenance relatively painless. *Syscon* enables you to add users, establish user access rights to specified subdirectories, assign people to user groups, and set up log-on scripts (see Screen 1). The second utility, *Filer*, enables you to add and delete files and subdirectories on the server. These facilities are part and parcel of *Netware* and come ready to use.

3+Share also includes a program to design menus for use in routine maintenance by SYSOPs and users. But installing this utility is burdensome: You not only must install separate files for various kinds of menus, but you also must set up and debug each option in a given menu. Furthermore, if you haven't installed the program perfectly, running it can disconnect you from critical data—which means you have to log off and then log back on to try again. By the time SYSOPs know enough about *3+Share*'s menu routine to configure it correctly, they probably won't need it anymore.

To make matters worse, *3+Share*'s installation and maintenance tasks are divided between two system superheroes, the Admin and the Server-User. If you log on as the Admin, for example, and try to execute a full system backup, you're instructed to log off and log back on as the Server-User. It's as if every time Superman tried to save Lois Lane, she told him to take a hike because she was waiting for Batman.

If you're bold enough to try installing *3+Share* yourself, be prepared for a bewildering array of error messages. The most annoying of these relate to RAM allocation. The setup utility frequently overestimates

Many people put E-mail near the top of the list of what they expect a LAN to handle. In this area 3+Share is clearly the victor.

the amount of RAM available (see Screen 2) and is later belied by an insufficient memory message on the server's LED when you try to run the system.

Installing and maintaining *Netware* is much easier. For one thing, *Netware* includes a user group feature that greatly simplifies adding new users (see Screen 2). The SYSOP can create a group (the advertising department, for instance) and give that group complex access rights to specific network subdirectories and files. This procedure needs to be done only once. Thereafter, when new employees join the advertising department, the SYSOP merely adds them to the advertising department group, and the new users automatically receive all relevant access rights.

3+Share provides no comparable feature. It enables the SYSOP to create groups, but just for sending and receiving E-mail; the groups have no inherent access rights on the network. Each new user must be given individual access rights from scratch.

As any SYSOP can tell you, a system as complex as a LAN requires organized, comprehensive documentation. Both companies provide an impressive stack of manuals, but the similarities stop there. While Novell's documentation is generally useful, 3Com's is maddeningly perverse. The 3Com manuals

have at least four different lists of error messages, but all too frequently you can't find the error message you need, no matter how many manuals you examine. The company acknowledges this problem and promises a wholesale revision in a later version.

Take This Job and Share It

End users will find logging on to either LAN a simple matter. If you don't have a hard disk, you put a specially prepared floppy disk in drive A: and turn on the computer (if you have a hard disk you simply turn on the computer). Assuming the SYSOP has installed the necessary batch files, all you need to do is enter a password, wait a couple of seconds for the DOS prompt, and get to work. On either system, the SYSOP should have provided you with the appropriate access rights. But if you need to change those rights—to access new data, for instance—things get trickier.

Netware allows a SYSOP to preset (and change) all user rights from the Syscon menu. If a user needs access to new data, the SYSOP simply adds the relevant subdirectory names, and the user still needs only one password. *3+Share*'s unwieldy system, on the other hand, requires users to administer their own security.

To give a new user access to data, *3+Share* demands that the owner of the data (specified at setup time) register a special sharename—usually a short code word—plus a password. In practice, this means all new users must link to the subdirectory where the data resides, supplying both the sharename and the password. Even printing a file can require another special password. Although much of this red tape can be handled with batch files, users may end up with a catalog of sharenames and passwords as long as a politician's Christmas list. What's more, *3+Share* places a ceiling on the number of sharenames that can be active on the network at one time; increasing that limit costs precious memory.

At start-up, *Netware* has an interesting way of executing its equivalent of DOS's (and *3+Share*'s) familiar PATH facility: It uses nested log-on scripts that reside on the server (see Screen 3). When a user logs

NetWare System Configuration U2.00 Wednesday December 10, 1986 8:42am
 User BUSTER_KEATON On File Server SHADOW

User Names	Available Topics	User Information
BEN_HECHT BUSTER_KEATON CLINT_EASTWOOD GUEST HOWARD_HAWKS JOHN_FORD STEVEN_SPIELBERG SUPERVISOR	Change Current Server e Server Informa up Information tem Login Scrip r Information	Full Name Groups Belonged To Login Script Password Security Equivalences Trustee Assignments User ID

Screen 1: Netware's Syscon utility offers a menu-driven, group-oriented approach to adding users and setting up access to files on the server.

Instruct Change Reset **Keep** Quit

Configure Parameters and Peripherals	
Server Component	Memory Usage
MS DOS	47K
Device Drivers	184K
CLOSYS	130K
Share	148K
Name	129K
N User Mail	141K
BACKUP	58K
Route	46K
Total Memory Used:	883K

Usage Summary	
Available Memory:	892K
Dos/Drivers Used:	231K
Services Used:	652K
Extra:	9K

Screen 2: 3Com's memory configuration screen looks straightforward, but the 'Extra' figure shown on the right is not always accurate.

Command Help

Keep your new parameter values

This command will save all of your parameter changes. Some services will begin using the new parameters, others will require you to reboot the server to make use of them. After executing this command, you will be returned to the main menu.

NetWare System Configuration U2.00 Wednesday December 10, 1986 8:42am
 User BUSTER_KEATON On File Server SHADOW

```

System Login Script

map s1:=shadow/sys:public
map s2:=shadow/sys:system/util
map s3:=shadow/sys:system/dos
map s4:=shadow/sys:system/benchmark
map s5:=shadow/sys:system/write
map s6:=shadow/sys:system/pro
map s7:=shadow/sys:system/batch
map e:=shadow/sys:system/benchmark
  
```

Screen 3: Because Netware's nested log-on scripts reside on the server, a SYSOP can change everyone's log-on routine by editing a single master file.

on, the script sets the search PATH, printer access, and several other parameters automatically. If necessary, the *Netware* SYSOP can change everyone's log-on routine by editing one master file. Since *3+Share*'s arrangement requires a batch file on each user's log-on floppy, systemwide changes mean the SYSOP has to edit files on every workstation.

Because LAN users share one or more printers, print spooling is a necessity. Each workstation dumps files into a software print spooler, from which they are then released into the printer queue. The trick is in telling the spooler when to release the file to the print queue.

Netware provides an elegant solution, allowing the SYSOP to set a spooler time-out. After you tell your word processor to print a file, a specified time elapses—say, 10 seconds—and then the spooler sends the file into the queue. Aside from the brief delay, this routine is transparent to the user.

3+Share's solution leaves something to be desired. Although DOS printing tasks seem to work fine, to send a document to the printer from within an application you must press <Ctrl>-<Alt>-<PrtSc> after executing that application's print command. And if you're printing single sheets, you must press this key sequence after every page.

Most of *Netware*'s basic system utilities are easier to execute than *3+Share*'s. Although *3+Share* performs most of the operations offered by *Netware*, its confusing two-key commands (such as 3F, 3N, 3M, 3P, and so on) are difficult to remember. This is where *3+Share*'s menu facility comes in handy. If the SYSOP configures this feature properly, the end user will be spared having to slog through alphabet soup.

Netware uses easy-to-remember commands: Rights reveals your access rights in any subdirectory, Setpass changes your password, and so on. *NetWare*'s menu-making program is easier to install than *3+Share*'s. The program's main drawback is that if you use *Netware*'s menu system to build a nested menu structure, end users are forced to backtrack, one menu at a time, until they return to the main menu. Fortunately, the built-in utility commands are so easy to use, the menu system is largely unnecessary.

■ Posting E-Mail

Many people put E-mail near the top of the list of what they expect a LAN to handle. In this area *3+Share* is clearly the victor. Unlike *Netware*'s Mail, you must pay extra for *3+Mail*, but the latter is vastly more powerful and easier to use.

Netware requires that you choose among reading or writing memos, files, mail, and several other confusing categories before you make a move. And if

Not only did Novell's Advanced Netware/286 network software run consistently faster than 3+Share, but Novell's 286A server also bested 3Com's 3Server3 by a substantial margin.

you make the wrong selection—or commit even the tiniest syntax error—you're punished with enigmatic error messages.

3+Mail, *3+Share*'s E-mail program, is so easy to use you may never need to crack the manual. Writing and editing messages, sending them, reading them, attaching files, sending carbon copies, saving file copies, and so on is fast and painless. And if you purchase *3+Route*, 3Com's internetwork telecommunications program, you can send messages to people on other 3Com LANs, even if you don't know precisely where those people are.

Together, these impressive programs enable you to provide a series of telephone numbers (or routes) for *3+Share* networks associated with remote companies, department designations, individuals, and so on. Then, if you want to send a message to someone

who you think is located at one of those remote locations, you simply include the location as part of the person's E-mail ID.

To send a message to Clint Eastwood at Malpaso Pictures, Universal Studios, for example, you might address the message to Clint Eastwood:Malpaso:Universal. If your network has a phone number for any of these three keys, it will automatically forward the message to the appropriate remote network (all in the background, so you won't have to interrupt your work). If that network can locate Clint, the message will be delivered. If it can't, but it knows additional routes for any of the three keys, it will pass the message to the next 3+Share network down the line.

■ The Winnah and Champeen

For several years now, LAN hardware and software have been developing apace. The days when primitive systems degraded performance so badly that users ripped the boards from their workstations are long gone. A properly tuned LAN offers ease and speed comparable to stand-alone workstation performance.

So if you need a network—and not everyone does (see “How to Avoid Networking” in this issue)—keep in mind that performance will likely be the least of your worries.

In situations where frequent internetwork communication is a major factor, opting for 3+Share could make more sense than Netware. But for simple installation, easy maintenance, and sheer pleasure in everyday use, those considering a LAN for a small office environment would be well served by Novell's winning software and hardware combination. ●

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3+Share

3Com Corp.

3165 Kifer Rd.

Santa Clara, CA 95052

408/562-6400

List price: \$1790; 3+Mail for server and five users \$495, for more than five users \$1000;

3+Path \$895; 3+Remote \$295;

3+Route \$1250

Requirements: 640K

3Server3

List price: \$5995

EtherLink (501)

List price: \$595

EtherLink Plus (505)

List price: \$895

Advanced Netware/286

Novell, Inc.

122 E. 1700 South St.

Provo, UT 84601

800/453-1267

List price: \$2195

Requirements: 640K, Netware Server 286A or other 80286-based computer

Netware Server 286A

List price: with 30MB hard disk

\$7495, with 42MB hard disk

\$8495

NI5010-1

Micom-Interlan, Inc.

155 Swanson Rd.

Boxborough, MA 01719

617/263-9929

List price: \$595

PCs Present and Accounted For

It's 9 a.m.—do you know where your company's PCs are? Atrium Information Group's Micro Resource Manager can help—if you give it enough support.

John Sykes

||||| You're a micro manager, and you're in the midst of another emergency this Friday morning. The head of sales and marketing needs a PC AT with 2MB of RAM for a client demo, and she needs it now. You know that any one of several ATs will fit the bill, but where are they hiding? If your record keeping were up to date, you wouldn't be on the brink of panic now.

Once that fire is out, you return to your office to study this month's huge PC-maintenance bill. A good portion of the equipment that's on the blink should be under warranty, but you haven't seen

the original invoices since the cleanup crew removed the packing material.

Meanwhile, your desk remains a sea of handwritten reports and 1-2-3 worksheets. You began the day trying to figure out how you could justify exceeding your budget for equipment you simply can't do without. You know that you've got a good case. Unfortunately, the information is in such disarray that weeks will pass before you can round up the figures you need. And by then it'll be too late.

Sound familiar? If so, Atrium Information Group's *Micro Resource Manager (MRM)* may be the answer to your woes. Atrium bills *MRM* as a "complete solution" for managing, supporting, and analyzing the acquisition and use of PCs. It is, if you can convince your boss to pay for a fairly expensive package and then to devote significant time and resources to keeping the system humming.

MRM is aimed at anyone who tracks personal computer purchases and usage patterns—information center and MIS department staff, department-level micro managers, and purchasing officers, among others.

MRM begins with inventory control—storing, and providing

quick access to, data on stockpiles of essentially unlimited numbers of items (such as systems, software, maintenance, peripherals, and training seminars). The Purchasing and Receiving modules enable the micro manager to minimize costs and shorten purchasing and receiving cycles. The Training and Support Reference Library module helps send technical communications to users, support staff, and senior management. *MRM* also generates a variety of reports that analyze past and current activity, as well as summarize trends. In short, it's an exceptionally detailed and comprehensive package.

■ Floppy Happy

When you break the shrink-wrap, your first task may be to overcome the shock of seeing the 27 floppies that make up *MRM*.

Even so, installation is smooth and straightforward, with the exception of a few prompts that don't jibe with the documentation. The entire procedure takes roughly 45 minutes on an XT. You can't get by with anything less than 640K and a 20MB drive, because the whole *MRM* system gobbles



John Hersey

up 11MB of disk space. It's probably best to use an AT or equivalent, since some modules (such as Printing) bog down on an XT.

Given a 27-disk package, common sense suggests that you begin with the written tutorial. Patience is in order here as you shuttle between the tutorial and the reference manual. A few misleading chapters and headings have been thrown in for good measure.

Fortunately, the tutorial guides you through most of what you need to know to set up an initial MRM data base. The demonstra-

tion data base is sufficiently thorough to enable you to perform realistic simulations when making ad hoc queries and manipulating files.

■ The Master Files

In building a production data base with *MRM*, the first job is to establish the security safeguards so dear to information systems professionals. You can set up multilevel security, restricting access to specific modules on a username basis.

Next, you create the master files that serve as the foundation of *MRM*. A summary of these files follows:

Vendor/Manufacturer Master File. This file must be set up first

and remains the only file that does not necessarily refer to other files. This is critical because *MRM* will not accept such information as vendor name or model number if you have not defined those variables in the appropriate master file. The vendor is not synonymous with the manufacturer; it's simply your source for the product.

Product Class Code Master File and Product Category Master File. *MRM* uses these for validating entries in other files. For example, when you enter a product class code (such as CPU) in a product file maintenance screen, *MRM* validates your entry against the Product Category Master File. The

Code Master File works in a similar fashion, adding another layer of detail to *MRM*.

Product Master File. This file, the basis for all product descriptions, includes records of anything that must be tracked and controlled—even mainframes and dumb terminals. Other than the obvious product descriptions, you can capture information on pricing, warranties, maintenance, and serial numbers. Data from this file can be automatically inserted into a record when the product name is selected.

Department Master File. Departments are key organizing elements within *MRM*. Department information is entered and linked with the product file to create a department profile. Resource usage and costs can then be analyzed on a departmental basis.

Navigation Routes

Calling upon the master files is the job of *MRM*'s five tightly integrated working modules: Inventory Management, Purchasing and Receiving, Help Desk, Training and Support Library, and Management Analysis. There's also a Utilities module.

MRM handles movement between the various modules efficiently. The function keys provide a quick assist in navigating between records and files and in adding information to the system—a capability Atrium calls “power steering.” Instead of keying in full descriptions of products, for example, *MRM* offers several shortcuts.

The <F9> key delivers a “point and select” capability, so you can automatically transfer information

from one record to another within the program. The <F10> key works in a similar fashion but retrieves data from an inactive or remote file, which is useful for entering vendor information into the product file, for instance. Using <Shift> with either function key enables you to narrow your search even further.

Using the other function keys, you can display the previous or next record, clear the current record, toggle between add and modify, zoom in for greater detail, trigger a “ditto” function to repeat previously entered data, and obtain help as needed. Help functions are comprehensive and clearly written.

As the system moves you from level to level, you're never more than an <Esc> key away from emerging from the depths of *MRM*. <Esc> steps back one level at a time.

Stocking Up on Inventory

Once you've invoked *MRM* and provided your user name and password, you generally proceed to Inventory Management, the repository of all product inventory and departmental configuration data.

Each inventory record can contain up to 33 fields, but not all fields must be defined for every record. You can, for example, set the serial number field to be mandatory or optional. Clearly, *MRM*'s overall utility depends on how religiously you enter and maintain this type of data. You can skip many fields without ill effect, but you should consider each one carefully.

The inventory record is broken into six categories: Product, Configuration, Purchase/Lease/Rental, Warranty, Maintenance, and

Comments (see Screen 1; for more insights on putting *MRM* to work, see the sidebar, “A Week in the Manager's Life”).

Prepared to Report

MRM offers more than 90 default report formats—surely enough to satisfy even the most demanding micro manager. Reports are generally grouped according to the program's five modules. Report categories run the gamut from Archived Inventory by Product to Vendors by Name; *MRM*'s diverse bag of tricks includes Chargeback Analysis by Department, Training and Support Notes by Product Category, and Mean-Time-Between-Failures

Executive Summary

Micro Resource Manager

Micro management software

Designed to assist corporate micro managers in their day-to-day work, *Micro Resource Manager* provides a powerful, well-integrated set of tools for inventory, purchasing and receiving, training and support, and management analysis. Exploiting these tools, however, demands considerable investment in software and staff time.

Data entry	Excellent
Data management	Excellent
Data analysis	Good
Reporting	Good
Overall value	Good

by Product. In addition, in excess of 50 ad hoc queries can be performed. If you need more, you can design custom reports using Progress (the relational data management language in which MRM is written), assuming that you've purchased the *Progress Query/Run-Time Option*.

Printing the program's default reports is relatively time-consuming—apparently a function of print routines, since the printer often sits idle awaiting data. On an XT, printing a simple one-page summary requires several minutes.

Before printing, you can obtain a record count (to ensure you've selected the right criteria) or preview the size of the report. Another convenience: Before the report itself prints, the list of criteria from which the report was generated is printed.

Getting the Word Out

MRM does not live by ledgers alone. Its support repertoire encompasses the Help Desk, consisting of Memo Reference and Action Request components and the Training and Support Reference Library.

With Memo Reference you can create and distribute memos targeted at specific audiences—users with ink jet printers, for example. You also use this program component to produce address labels and separate them according to destination (internal or external).

The Action Request File records all pleas for assistance that are directed to the micro management staff. This is a handy way to assign and track maintenance and trouble calls and can form the basis for charge-back analysis and time and materials tracking (see Screen 2).

MRM	INVENTORY FILE MAINTENANCE	MODIFY
Product		
Name: IBM AT 512K 1.2M-38M DRIV Model:		
Serial Number: 38281		Tag Number: MRM-000084
Product Code: COM111	Manufacturer: IBM	Category: CPU Type: H
Configuration		
Dept: CEO 0001	User: SIEVERS, AL	Install: 5/21/86
Purchase/Lease/Rental		
Vendor: COMPU	PO Number: 1817	Receive Date: 05/24/86
Cost Code: P	Purchase Price: \$5,995.00	Other Costs: \$0.00
	Lease/Rental Payment: \$0.00	Period:
	Start Date:	End Date:

Screen 1: Maintaining inventory records.

Copious amounts of information can be stored for each individual piece of equipment. MRM automatically generates a tag number if one is not entered. Product, configuration, and purchase/lease/rental information flows in and out of the master files. This screen would be used to modify any aspect of the record. Information can be added by the scroll, point, and select method (<F9> or <F10>) or by remote add (<F3>).

MRM	ACTION REQUEST FILE MAINTENANCE	MODIFY
Priority: 1 Assigned to: BOB Closed: Frequency:		
Hdw Failure: Y Down: 09/01/86 12:12 Up: 09/02/86 04:45 Hours Down: 16.55		
Resolution: Reformatted hard disk. OK.		
Cost		
Vendor: COMPF	Mnt Info: UNDER WARRANTY UNTIL 09/24/86	\$0.00
Staff: IR	Rate: \$40.00 Hours: 1.00	\$40.00
Material:		\$0.00
Labor Total: \$40.00	Material Total: \$0.00	Total: \$40.00

Screen 2: The Action Request screen, showing fields for priority, assignment, and detailed cost information. Reports can be generated to track assignments by personnel. Time and materials cost information and personnel billing rates can be tracked for charge-back purposes.

A Week in the Manager's Life

The beauty of *MRM* is that it serves as a self-contained environment for the business of micro management.

Suppose you need to order an XT, associated peripherals, software, and spare parts. You immediately proceed to *MRM*'s Purchasing and Receiving module to add a new purchase order. Once all data has been entered, you print a copy of the purchase order for verification and pass it on to the purchasing department for action.

A few days later the order arrives. You return to the Purchasing and Receiving module to accept it into inventory. This time you modify the original purchase order, adding product line items to inventory by indicating the quantity received.

As each item is accepted, the program prompts you to supply key information, such as serial number and internal tag number. This helps ensure tight inventory con-

trol and avoids crucial omissions. *MRM* next prompts you for department configuration information. If any items are back-ordered, the order remains open; *MRM* permits further tracking and follow-up through exception reports. Otherwise, once all items have been received, the purchase order is automatically closed.

Dealing with an ailing monitor or other faulty hardware is even more straightforward. You simply call up the Inventory Management module to determine whether a monitor is available from the spare parts inventory. If you find one, you create an Action Request memo to one of your staff members, advising immediate replacement

Dept: 15-INVES Config: 0002 IBM PC/XT EISNER, FRED		Dept: 25-UP Config: 0001 IBM XT 256K 10MB STEELE, GREG Categ: Tag #: [REDACTED]	
Dept: 25-UP Config: 0001		Dept: 25-UP Config: 0001	
Product Name	Model	Serial Number	Categ Tag Number
IBM XT 256K 360K-10M DRIV		50315	CPU MRM-000016
IBM MONITOR - COLOR		50324	MON MRM-000030
HERCULES COLOR CARD			VID MRM-000020
SUPERCALC	RZ VER.2.1		SS MRM-000047
** END OF LIST **			

Use F4 to toggle between configurations

Screen A: *MRM* easily transfers information between user configurations. The configuration header on the upper right corresponds to the itemized list displayed below. The user can point and select any item, and the item is then transferred to the department and configuration specified on the upper left. Note that the configuration includes both hardware and software.

and repair of the defective display device.

You then select Configuration File Maintenance, enabling you to modify the configuration and add the new monitor (see Screen A). You select the spare parts configuration, find an available monitor, and swap it for the broken one. Finally, you check to see if there's a warranty on the defective unit. By the time you're through, you've both maintained the integrity of your data base and advanced your firm's productivity.

And next time the vice president of finance informs you at the crack of dawn that he needs a report itemizing each department's year-to-date software expenditures in time for a 1 p.m. meeting with the president, don't fret. Just enter *MRM*'s Management Analysis module, pick the Cumulative Expenditures for Department report, select the proper criteria, and print it out a few moments later. —*J. S.*

The Training and Support Reference Library is a fount of micro management tips and techniques. One attractive feature is the program's ability to generate a system configuration handbook, aggregating information about specific hardware setups and printing those findings according to a default format. This wrinkle should prove particularly helpful to first-time users.

If you require data from another program, *MRM* files can be shipped to and from *dBASE III* and Data Language's Progress with the program's Import/Export feature.

■ Capability Versus Commitment

Overall, *MRM* is well conceived and designed, packing a great deal of power and flexibility into a fairly large package.

Justifying *MRM*'s cost to senior management could be a tough sell. Its savings tend to be "soft"—best measured in terms of time rather than in hard dollars. There may be immediate dollar savings in warranties and longer-term dollar savings as you optimize inventory. *MRM* will probably justify itself most easily in large organizations or in firms planning major growth in PCs.

You should weigh *MRM*'s functionality against its hefty price; the complete package lists for \$4750. A less capable version, priced at \$1450, may be a better value. Atrium also offers a lease option for the full version at \$163 per month for 36 months. Add \$750 per year for the support plan, training, and assistance fees. And don't forget the costs of staff time and equipment—including, most likely, a dedicated machine.

If you don't flinch at the cost, you'd be well advised to take a good, hard look at *MRM*. But don't underestimate the amount of work it requires. Pre-implementation planning alone is a significant effort; you need to decide what information is truly important and who will maintain the data base.

If you're already sitting on a large installed base of equipment and software, gathering and keying in that data will be a formidable task—and may involve peeking beneath the covers on system units to check what's really underneath. You might also need to change certain established procedures, such as equipment tagging and serial number identification.

MRM could well be a total solution for PC management, but making the program work requires a total commitment from your staff. ●

John Sykes is a micro manager with a large engineering and construction company.

Micro Resource Manager
Atrium Information Group, Inc.
200 W. Lowe Ave.

Fairfield, IA 52556
515/472-6400

List price: start-up \$1450,
standard \$4750, Progress
Query/Run-Time Option \$400
Requirements: 640K, 20MB
hard disk, DOS 2.00 or later
version

Economy of Words

PC-Type+, pfs:professional write, and Write Now are out to prove that high-quality word processing doesn't have to cost an arm and a leg.

Anita Amirrezvani

Any product that sells at a bargain price provokes skepticism about its worth. If a full-featured word processor costs \$400, the reasoning goes, how could you possibly get a good program for half that amount or less?

Fortunately, the old adage that you get what you pay for doesn't always apply to software. *PC-Write*, now legendary for its ease of use, speed, and range of capabilities, demonstrated that even a shareware program (\$89 with documentation and technical support) could perform as well as more expensive products.



PC-Type+, *pfs:professional write*, and *Write Now* are capable word processors that carry on *PC-Write*'s tradition of low cost and no copy protection. Although they vary considerably in their capabilities and in the effort required to learn them, all three perform with alacrity and offer enough basic editing and printing features to handle most word processing applications (see Table 1). If you don't need fancy features like windowing or outlining, one of these products could fill the bill and save you a bundle in the bargain.

PC-Type+ *PC-Type+* version 1.0 is ButtonWare's revamping of *PC-Type*, which was first issued in 1985 as shareware. Although *PC-Type+* costs only \$69.95, it offers many high-end features, including a mail merge facility, a 100,000-word spelling checker, and the ability to keep up to ten files open at one time. And because the program is written in assembly language and resides entirely in mem-

ory, it performs speedily (see Figure 1). *PC-Type+*'s main failing is the awkward grouping—and in some cases, clumsy implementation—of its plentiful commands.

PC-Type+'s hard disk installation routine is a bit primitive: Rather than create a subdirectory, the installation utility copies the program files to your root directory. However, the batch file does create PCT_HELP and PCT_DICT subdirectories as repositories for the on-line help and dictionary files. The program disk can be removed once the program is loaded, leaving floppy drive users free to swap data, spelling checker, and help disks at will.

When you start *PC-Type+*, an uncluttered work area showing the current file name appears. The bottom of the screen, which contains a command line, a function key menu, and a status line, is a bit busier. The command line serves an odd mix of procedures, from loading a file to moving the cursor a specified number of lines to executing DOS commands. As with *Microsoft Word*, you reach the command line by pressing <Esc>.

The ten function keys also perform a seemingly unrelated group of tasks: <F2> inserts a line below the cursor, <F3> summons a formatting menu, and <F4> lets

you quit the program without saving changes (but with the usual request for confirmation). The status line shows the current margins, paragraph indents, cursor column number, and tab stops, and it includes a pointer that tracks the horizontal position of the cursor. Curiously, *PC-Type+* requires that you type <Ctrl>-? to display the current page and line numbers.

The basic key combinations for cursor movement are pretty conventional. <Ctrl>-<CursorLeft> and <Ctrl>-<CursorRight> move the cursor to the previous word and to the next word, respectively; <Ctrl>-<CursorUp> and <Ctrl>-<CursorDown> provide a quick way to hop from paragraph to paragraph. When you first use *PC-Type+*, you'll probably rely on the function keys for marking, copying, and deleting text. As you progress, the faster <Alt>-letter key combinations (also reminiscent of *Microsoft Word*) should become more attractive.

Despite this well-intentioned design, the sloppy organization of the command set prevents you

from easily charting your course. There's no clear distinction between the operations performed by the function key menu and those executed through the command line. And because related commands often use the <Alt> or <Ctrl> key with a letter, it's difficult to keep them straight. For example, <Alt>-L marks a line of text, while <Ctrl>-L and <Ctrl>-B mark the beginning and end, respectively, of any given block of text. Likewise, <Alt>-M moves marked text to the line immediately below the cursor, while <Ctrl>-M inserts text in the middle of a paragraph.

Except for using <Backspace>, you delete text by marking it and pressing <Alt>-D. You can recover up to ten lines of deleted text by using <Alt>-W, the Whoops command. Yet this reconstruction occurs line by line; even if you killed only one word, all the characters on that line reappear in its place. *Whoops* is right.

Other flaws permeate the program. The process of inserting blank lines is especially crude. <Enter> inserts a blank line below the cursor rather than above;

Table 1: Three inexpensive word processors feature by feature

Features	PC-Type+	pfs: professional write	Write Now
Formatting and editing			
Maximum document size (pages)	250	32	30
Maximum line width (characters)	250	250	132
Tabs	●	●	●
Decimal tabs		●	
Save margins and tab settings		●	●
Automatic page breaks	●	●	●
Automatic text reformatting		●	●
Restore deleted text	●		●
Center text	●	●	●
Display page breaks	●	●	●
Display headers and footers on each page		●	
Display double-spacing		●	
Keystroke macros	●	●	
Printing			
Bold text	●	●	●
Underlined text	●	●	●
Subscripts/superscripts	●	●	●
Different print pitches within document	●	●	●
Accept printer control codes within file	●	●	●
Print file to disk	●	●	●
Form letters	●	●	●
Miscellaneous			
Subdirectory support	●	●	●
Disk directory	●	●	●
Delete files	●	●	●
Rename files	●	●	●
Copy files	●	●	●
Use DOS commands within program	●		
Accept ASCII files	●	●	●
Save files in ASCII format	●	●	●
Words in spelling checker dictionary	100,000	77,000	35,000
Word capacity of auxiliary dictionary	n/a	5000	unlimited

to insert a line above the cursor, you must use <Ctrl>-I. Even worse, you can't split a paragraph in the middle using <Enter>. <Ctrl>- ~ executes that function, but it moves text directly under the cursor instead of positioning it against the left margin.

Like a naysaying housekeeper, *PC-Type+* doesn't do windows, doesn't display headers and footers in text files, and doesn't save margin or tab settings. In addition, the search and replace commands are a bit arcane. To replace the word *old* with *new*, for example, you type */new/old/* on the command line—provided you want the program to search forward and ignore case. To search for an exact match, you use backslashes; searching backward requires a minus sign before the first slash.

PC-Type+'s formatting commands are generally easy to use. <F3> displays the Printer Character menu, which specifies character attributes (see Screen 1). The program marks only the first and last characters of the block you want emphasized. On a color monitor, different colors indicate boldface, italicized, or underlined text.

The 100,000-word spelling checker has the largest dictionary of the three programs, but it's a spelling checker only in a limited sense: It stops and lets you type in corrections when it encounters errors or unfamiliar words, but it doesn't suggest alternatives. You can also send the flagged word to a temporary auxiliary dictionary, which you can then add to the main dictionary through a separate procedure.

The program's printing options are fairly standard. You can specify the number of pages and copies

to print, as well as the line spacing (only single-spacing is displayed on screen). Drivers for nine popular printers are provided (including the HP LaserJet), and you can designate control codes for printers the program doesn't support.

Although *PC-Type+*'s ample documentation includes a handy alphabetical reference section describing each command, the manual doesn't sufficiently explain program operations by topic. Most users will find the on-line help far more useful. Each of the program's 70 help files explains a different function, and many of the help routines let you practice commands on the spot.

PC-Type+ packs a lot of extras—alphabetical sorting of lists, adding rows of numbers, key-stroke macros, cross hairs (vertical and horizontal lines for aligning columns and rows), and a separate program for printing labels. The mail merge includes logical operators and has the ability to import comma-delimited *WordStar* files. You can draw lines and boxes (for organization charts and so on) à la *WordPerfect*. With its multiplicity of features, *PC-Type+* strives to live up to its claim as “the ultimate word processor.”

Unfortunately, its organization of commands is rough around the edges. Equally annoying is its graceless implementation of several important editing functions, notably line insertions and the line-based undo command. This is a powerful program for the money, but unless you have plenty of time on your hands, look elsewhere for the ultimate word processor.

■ **pfs:professional write**
pfs:professional write version 1.0 is the upscale successor to Software Publishing's star performer, *pfs:write*. Though the slowest of the three programs reviewed here (see Figure 1), *pfs:professional write* is still a good performer, in part because both the program and the data files dwell in RAM. Although this \$199 program doesn't raise *pfs:write*'s restrictive 32-page limit per text file, it does offer a host of other improvements, including an address book, character graphics, a thesaurus, and a capable macro utility.

With a 320K minimum requirement, *pfs:professional write* takes up the most RAM of the three programs. Because there's no au-

tomated hard disk installation procedure, you must create a sub-directory and copy all of the system and dictionary files into it. A setup menu lets you specify the type of printer you're using, the directory (or disk) for storing data, the screen colors, and screen update speed (the slow setting eliminates snow on standard color displays).

Of the three programs reviewed, *professional write* is easiest to learn and use. The main menu is a simple affair with three items: Create/Edit, Setup, and Exit. The first option gets you into the work area, which sports a horizontal function-key menu at the top and a status line (indicating the file name plus the line and page numbers) and ruler line at the bottom. Pressing a function key

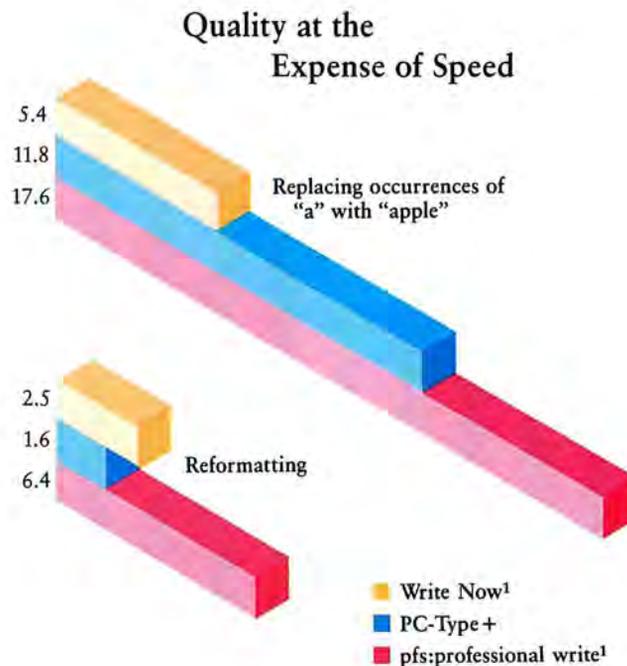
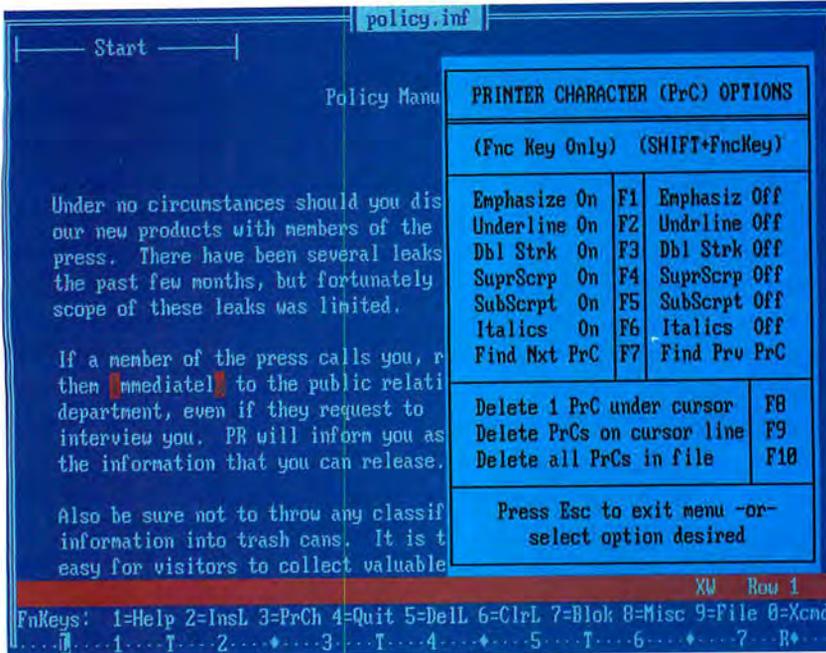
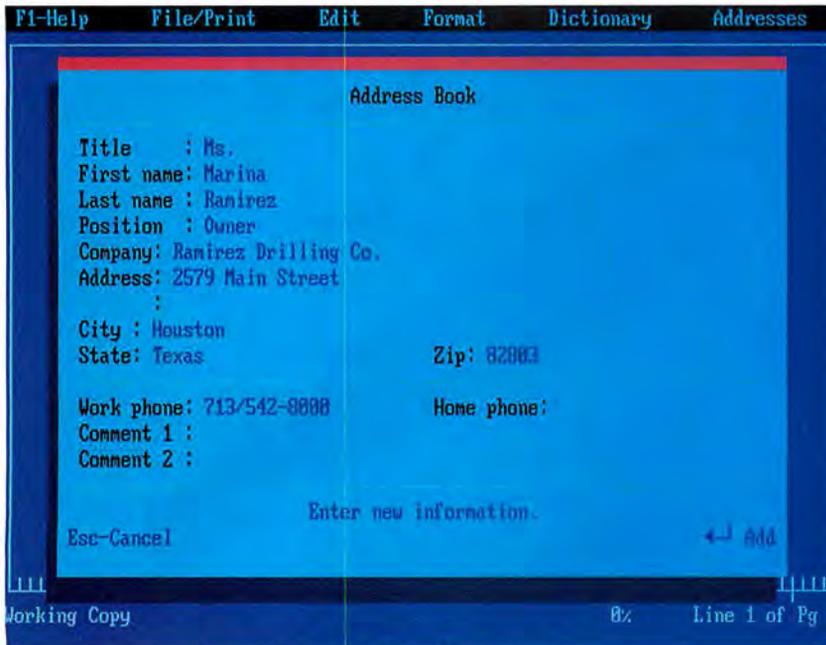


Figure 1: Speed test results (in seconds) based on a 2500-word file using a hard disk

¹ Text requires marking before formatting



Screen 1: PC-Type+’s formatting menu lists your options for enhancing text. The word ‘immediately’ will be printed in boldface.



Screen 2: pfs:professional write’s address book holds up to 256 entries.

tagged File/Print, Edit, Format, Dictionary, or Addresses pulls down a menu. Pressing <F1> paints a full screen of context-sensitive help.

Together, the function-key menus list just about every command you’ll need to use the program. As in *PC-Type+*, you can also use two-key combinations to speed things up, but the simple, consistent design of *professional write* makes these pairings much easier to learn. Most keyboard commands combine the <Ctrl> key with a mnemonic letter: <Ctrl>-G gets a file, <Ctrl>-S saves a file, <Ctrl>-W deletes a word, <Ctrl>-U underlines a word, and so on.

Marking, cutting, and pasting text the menu-driven way best illustrates *professional write*’s guiding hand. When you select Mark Text from the Edit menu, a pop-up message instructs you to move the cursor to the end of the block and press <F10>. This operation yields a subsidiary Block Operations menu with a total of eight options for cutting, copying, printing, and changing the format of the block; pasting the block is a matter pressing the Edit function key again and selecting the Paste option. Fortunately, <Ctrl>-letter key combinations enable experienced users to circumvent this flurry of menus.

The search-and-replace function is simple but effective. <Ctrl>-F summons a menu prompting you for the character string and its substitute and asks whether the operation should be manual or automatic. Unfortunately, the program is case insensitive, and it only searches forward from the cursor position. A plus: You can also count the number of words in

your document or find out how many times you've used a given word.

Professional write's 77,000-word spelling checker works within a file rather than after you save a document. Like the search function, the checker proofs the document from the cursor onward. When it finds a possible error, you can tell it to ignore the word for the rest of the check or add the word to the dictionary, or you can type a correction or choose a suggested spelling. You can also check the word at the cursor at any time. In addition, the program includes a rudimentary thesaurus, which tends to balk at all but the simplest words.

One substantial perk is *professional write's* address book, which holds up to 256 records. Preset fields are provided for title, first name, last name, position, company, and so on (see Screen 2). Pressing the <Tab> key takes you from field to field, and all the search-and-replace functions are available. Not surprisingly, the address book also provides the data for mail merges. Inserting fields in boilerplate documents is a bit simpler than with *PC-Type+*, and the array of functions (relative matches, range matches, and so on) is richer. *Professional write's* drawing functions are also superior and include three character-based line styles.

Professional write enables you to print a second file within the primary document file, a feature that's especially handy for inserting graphs or data from other *pfs* products. Typing **Join filename** in a document flags a text file insert, while the **Graph filename**

command lets you include graphs from *pfs:graph*, *pfs:professional plan*, and *Harvard Presentation Graphics*. Thirty-six popular printers are supported, and you can customize control codes for unlisted printers.

The documentation for *professional write* is a model of its kind, complete with a quick-start guide and clear descriptions, even for the intricacies of mail merging. From its well-designed menu to its streamlined editing commands, *professional write* exudes simplicity and competence. Although the short document length is still a severe constraint, users upgrading from *pfs:write* will find that the life cycle of what was previously an entry-level word processor has been greatly extended.

Write Now

Airus Incorporated's *Write Now* version 1.13 follows on the heels of *AI Typist*, a word processing program that purports to use artificial intelligence to complete words before you finish typing them. Like *pfs:professional write*, *Write Now* is a RAM-resident program that works quickly and limits you to about 30 pages of text per file. *Write Now's* spelling dictionary also lives in memory and is extremely fast. The \$150 program is easy to use, but its design is not as smooth and straightforward as *pfs:professional write's*, and it offers fewer fancy features.

Write Now has no setup program, but you can specify a subdirectory when you name a file or save the file to disk. Like *pfs:professional write*, the program's status line (located at the top of the screen) displays cursor position, page number, file name, and percentage of remaining document space. A ruler line beneath the

Executive Summary

PC-Type+

Word processing software

PC-Type+ has a wide range of capabilities—character graphics, mail merge, sorting, addition of numbers, a program for printing labels, and option menus galore—but it falls down on some basic editing functions and is difficult to learn. Copious on-screen help ameliorates this problem slightly.

Block mark, move, and delete	Fair
Search and replace	Fair
Spelling check	Fair
Printer control	Good
File management	Good
Overall value	Fair

pfs:professional write

Word processing software

Geared toward beginners and occasional users, *pfs:professional write* is a capable program and a joy to use. Extras include keystroke macros, mail merge, an address filer, character graphics, and a thesaurus.

Block mark, move, and delete	Excellent
Search and replace	Good
Spelling check	Excellent
Printer control	Excellent
File management	Fair
Overall value	Good

work area indicates margin and tab settings. At screen bottom, the function-key menu offers options for file operations, formatting, printing, and spelling checks.

Some cursor movement with *Write Now* follows an unfamiliar pattern. For instance, <Ctrl>-<PgUp> moves the cursor to the top of the previous page, and <Ctrl>-<PgDn> sends it to the top of the next page. A hodge-podge of other keys also provides transportation: The <GrayMinus> and <GrayPlus> keys scroll the screen up and down a line, respectively, while <Ctrl>-Q deletes text from the cursor to the end of the line. <Ctrl>-<Esc> restores deleted text—provided you don't press any other keys before using that command.

The program's search-and-replace function is rudimentary—but fast (see Figure 1). *Write Now* is always case sensitive and can only search forward from the cursor position. When the program snags a word, it presents you with two options: repeat the search or replace the word. If you choose a replacement, a pop-up message asks you to confirm your choice.

Using a small dictionary of 15,000 words (or 35,000 words if you have more than 256K), *Write Now* highlights a misspelled or unfamiliar word right after you type it. Turning on Spell Guard from the spelling submenu actually freezes the cursor at the error until you fix it or confirm the existing spelling—a ridiculous proposition with such a small dictionary. Unlike *PC-Type+* or *professional write*, *Write Now* also pops up suggested alternatives. Luckily,

you can turn off the real-time spelling checker altogether and opt to check an entire document when you're through. Or you can press <Ctrl>-<Enter> to check all occurrences of a single word.

Write Now's flashiest feature is billed as "clairvoyance," a psychic power inherited from *AI Typist* that guesses at a word as you type it. If you intend to use the word *disappearance*, for example, typing *disap* will cause the second *p* to appear, adding *e* will prompt the program to tack on *ar*, and typing the last *a* will summon *nce*. The more uncommon the combination of letters in the word, the more quickly—and likely—the program will guess correctly. *Thwart*,

for example, is completed after you type *thw*.

If you type much faster than 40 words per minute, forget about clairvoyance. It can't keep up, and when it guesses incorrectly, you must retrace your steps to fix the word. And if you ask the program to suggest spellings while you're typing quickly, the word window flashes on and off too fast for you to take advantage of it. Clairvoyance is a fun gimmick, but it's not meant for churning out vast quantities of text.

As with the other programs reviewed, saving and printing a document requires few keystrokes. One quirk, however, is that if you forget to name a file but save it anyway, the program tags it with the file name Nameless. A cute joke, but a cautionary prompt would be more helpful.

From *Write Now*'s Define Printer menu, you can choose one of 18 printer drivers or—as with its two peers—create a customized driver by specifying the appropriate control codes. You determine the look of your printed document on a page layout screen. The layout screen lists program defaults for margins, indentation, page offset, starting page number, and line spacing and lets you modify them (see Screen 3). You can also type in text for headers and footers and indicate the name of a mail merge file. Aside from these conveniences, *Write Now* offers fewer printing options than the other two programs.

Write Now's mail merge is vastly inferior to that of *pfs:professional write*. You enter numbers in the merge document, and the program merely inserts the field contents; no special functions are available. Like its *pfs* peer, how-

Executive Summary

Write Now

Word processing software

Write Now is a well-designed, easy-to-learn, entry-level product. Although the program has fewer capabilities than the others reviewed, its pop-up dictionary and ability to predict spelling in real time may be helpful to some users.

Block mark, move, and delete	Good
Search and replace	Fair
Spelling check	Good
Printer control	Fair
File management	Good
Overall value	Good

ever, *Write Now* enables you to call up a disk directory from within a document.

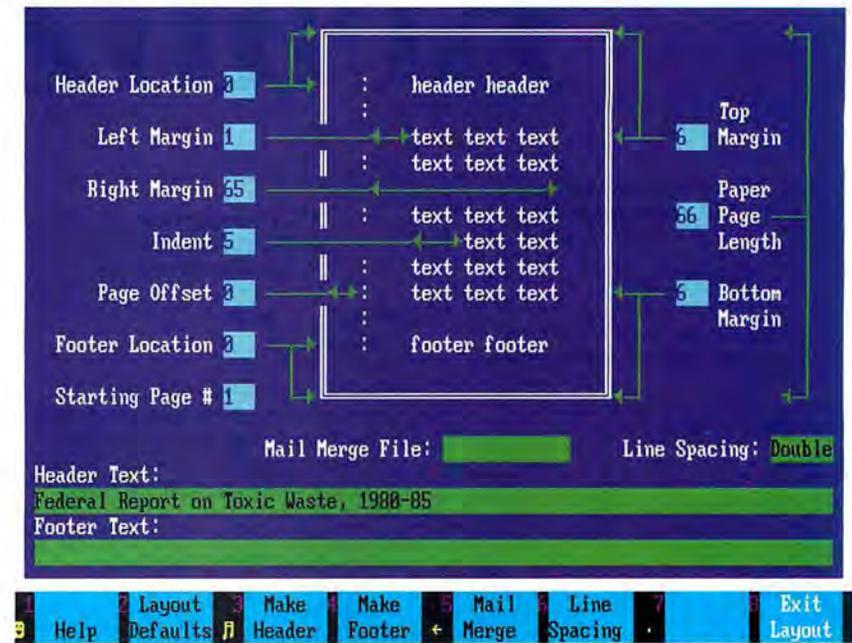
The 78-page user guide is brief, but it covers all the bases. It also provides a list of error messages, troubleshooting tips, and a command reference card. *Write Now's* on-screen help is context sensitive, but it's not as copious as *pfs:professional write's* or *PC-Type+'s*.

In the final analysis, many users may wish Airus had spent less time on gimmickry and more time on formatting, mail merge, and printing options—not to mention a bigger dictionary. A real-time spelling checker is arguably useful, but Spell Guard and clairvoyance will likely meet the same fate as lava lamps and pet rocks.

■ The Bargain-Base ment Solution

At the very least, *PC-Type+*, *pfs:professional write*, and *Write Now* demonstrate that you don't have to spend a fortune to get a functional product. Ironically, *PC-Type+*, the cheapest of the three programs, is also the most complex. The program's main problems are its poor printer support, its inept implementation of some basic editing features, and most of all, its often illogical arrangement of commands. If power is hard to reach, even a full-featured program is ineffective.

By contrast, *pfs:professional write* and *Write Now* are easy to learn and use. Of the two, *professional write* has the edge in both range of features and sheer elegance. *Write Now* has its attractions, and poor typists may find



Screen 3: You can modify *Write Now's* main formatting defaults on this instructive page layout screen.

it useful at first, but the extra \$50 for *professional write* would probably be well spent by most budding word processors. Price isn't the only yardstick of quality, but sometimes a few extra bucks can make the difference between raw capability and elegant implementation. ●

Anita Amirrezvani is a PC World Assistant Editor.

PC-Type+ version 1.0
 ButtonWare, Inc.
 P.O. Box 5786
 Bellevue, WA 98006
 800/528-8866, 206/454-0479
 List price: \$69.95; shareware version \$10 for disks only
 Requirements: 256K, one disk drive, DOS 2.00 or later version
 Not copy protected

pfs:professional write version 1.0
 Software Publishing Corp.
 1901 Landings Dr.
 Mountain View, CA 94043
 415/962-8910
 List price: \$199
 Requirements: 320K, two disk drives, DOS 2.00 or later version
 Not copy protected

Write Now version 1.13
 Airus, Inc.
 10200 S.W. Nimbus Ave. #G5
 Portland, OR 97223
 503/620-7000
 List price: \$150
 Requirements: 256K, one disk drive, DOS 2.00 or later version
 Not copy protected

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* ✓ Turbo BASIC 1.0	59.
* ✓ Word Wizard 1.0	41.
* ✓ Turbo Pascal 3.0 w/BCD & 8087 support	59.
* ✓ Turbo Pascal w/Turbo Tutor	75.
* ✓ Turbo Prolog 1.1	59.
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* ✓ Traveling Sidekick w/Sidekick	73.
* ✓ Reflex 1.1	87.
* ✓ Reflex Workshop 1.0	41.
* ✓ Superkey 1.1	59.
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* ✓ General Accounting C. 14	179.
Breakthrough ... NCP	
✓ Timeline 2.0	239.
✓ Timeline Graphics 1.0	105.
Broderbund ... CP	
* ✓ Print Shop	35.
* ✓ Print Shop Companion	33.
* ✓ Graphics Library 1	22.
* ✓ Graphics Library 2	22.
Chipsoft ... NCP	
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✓ Spreadsheet Auditor 3.0 (check your work)	89.
* ✓ SuperCalc 4 1.0	309.

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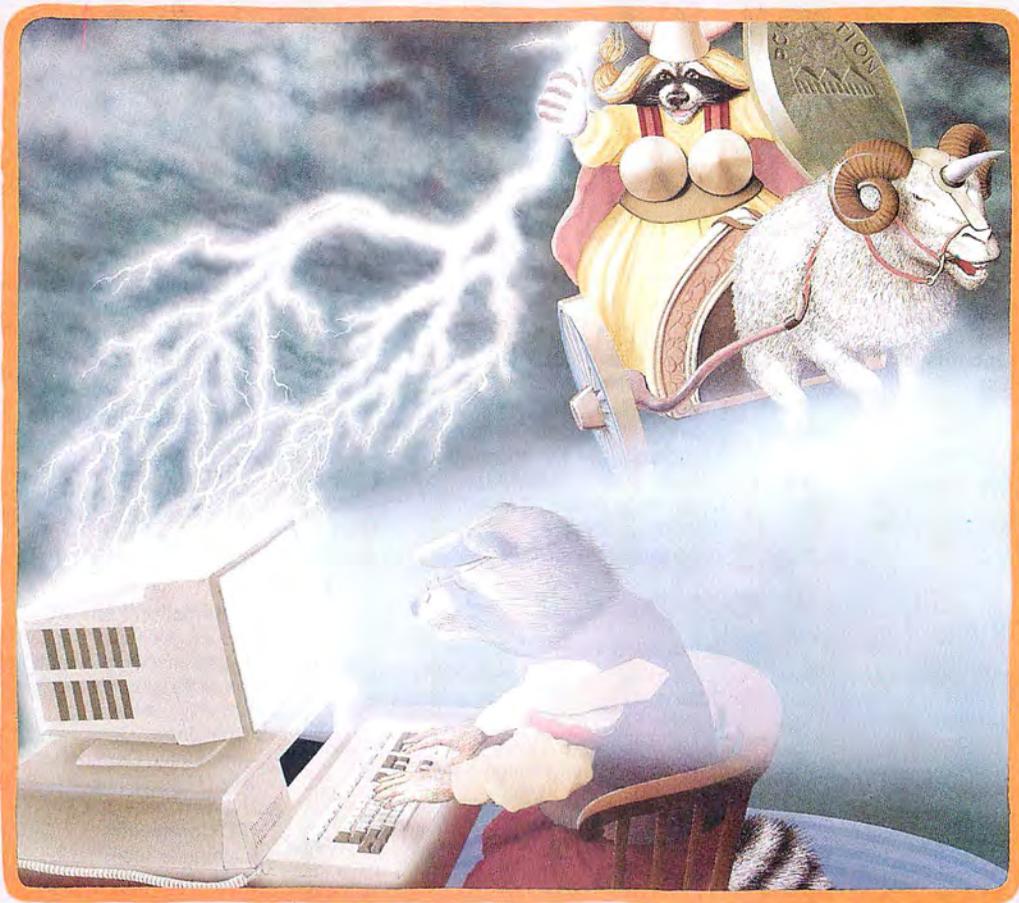
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The CD ROM revolution is coming—



but when, and in what form? Six key figures in the



CD ROM industry ponder the technology that



promises to radically transform business computing,



education, and home entertainment.



Left to right:
John Messerschmitt
George Wallace
Alan Kay
Tom Lopez
Stan Cornyn
Gary Kildall

■■■■ The rumors, the SRO conferences, the media hosannas, and the venture capital all center on the silvery 5-inch plastic disk known as CD ROM (compact disc read-only memory). A direct descendant of the popular audio CD that quickly turned the record album into a quaint relic, the CD ROM is capable of storing everything from text and computer-generated graphics to sound and video and can even interact with its human master. Combine the voluminous storage (about 550MB) with fast data retrieval software, and you have potentially the most cost-effective means of distributing large amounts of data.

Although expectations run high, mass acceptance still awaits. Unlike the CD, the CD ROM doesn't replace existing technology; this presents some creative challenges to would-be moguls trying to carve out a market. Unresolved technical and marketing issues similarly cloud CD ROM's otherwise sunny future. Is the CD ROM just a repository for gargantuan data bases? Or is it a means of turning the television into an interactive, all-in-one home entertainment and education center? Who owns the information on a CD ROM? Will a standard emerge that embraces the spectrum of optical video products from 5-inch CDs to 12-inch laser video disks? And will truly interactive video applications capture the imagination and pocketbooks of American consumers?

At the *PC World* CD ROM Forum, the jury was in, tackling these present realities and future imponderables. Attending the roundtable were Alan Kay, Apple Fellow; Gary Kildall, president of KnowledgeSet; Tom Lopez, vice president of Microsoft's CD ROM division; John Messerschmitt, vice president of North American Philips; George Wallace, vice president and general manager of McGraw-Hill; and Stan Cornyn, president of the Record Group. Moderating the panel were *PC World's* Editor-in-Chief, David Bunnell; Harry Miller, Editor; and Robert Luhn, Associate Editor.

By turns philosophical and pragmatic, the attendees seldom agreed on the CD ROM's purpose and market. But there was unanimity about the CD ROM's potential and a shared frustration with the real and perceived obstacles that prevent the CD ROM from becoming this year's success story. For some, it was the age-old question of the chicken and the egg. Without an installed base of players, how

does a company profitably develop and market a CD ROM? Others contend that playing it safe won't crack open the market. "We can't ease our way into this medium," says Stan Cornyn. "No one clamored for *Pong* until it was released."

Whatever their differences, the assembled pioneers agreed that the CD ROM's time is coming. When the cost of players, processing, and disk fabrication finally drops and inexpensive authoring systems reach developers, CD ROM applications are expected to flood the office, home, and classroom. But what will start the deluge, and when it will start, is still a matter of conjecture.

■ First Light

Miller: There was a lot of excitement at Microsoft's first CD ROM conference in 1986, but much of the attention focused on Grolier's *Electronic Encyclopedia* and a few vertical financial data bases. One year later, things haven't changed much. Where do we go from here—and where does the CD ROM fit in the business world?

Kildall: Optical storage has been with us for several years, and there's a trail of dead prognosticators who have peered into the future. But I'd say that this is the year a lot of production work happens. I think 1985 was the year of tire-kicking. People came by and said, "This is interesting. What's it all about? Give me some prices." In 1986 a lot of prototyping went on.

There are certainly some practical business applications. CD ROM is a very cost-effective way to deliver technical documentation.

Lopez: I'd broaden that to include in-house publishing. It's the only area where you really know the risks up front. You know how many people need to see the end result, who they are, and what kind of workstations they have. There are tremendous economic advantages. The cost of distributing loose-leaf parts catalogs, regulations, and so on, on a national or worldwide basis is considerable. And at the receiving end, somebody has to be paid to actually update the books. CD ROM would eliminate all this and certainly cut down on mailing costs.

Wallace: It's more than super microfiche. I'm not sure that the first step will necessarily be into business. It's not the way we think.

Cornyn: It reminds me of Thomas Edison finding the phonograph a marvelous dictating machine for businesses! I don't think of the CD ROM as a branch of the Container Corporation of America. The technology has far more potential.

Bunnell: True. But will CD ROM have a significant impact on personal computing? I fear that the CD ROM isn't a big enough step, that read/write optical storage is the key.

Messerschmitt: Whenever I give a speech, I'm always asked, When will CD ROM be erasable? And that misses the point. CD ROM and CD-I are about publishing—*punto finale*—with an opportunity to go beyond that, of course. This isn't a floppy or hard disk replacement. CD ROM just happens to be an accessory to a computer. Am I making the wrong speech?

Lopez: No. People have always considered computers as tools for storing and retrieving information. They haven't looked at them yet as information appliances, and that's what the CD ROM offers.

Kay: I'd quarrel with the metaphor. As we used to say back at Xerox PARC, Don't take anything away from users in the guise of giving them something more. As an information appliance, the CD ROM is less readable and portable than paper, and you can't annotate it. This won't change for years. To succeed in business, the CD ROM has to have its own magic—it can't be merely as good as paper or a floppy disk.

Kildall: Which is why I go back to technical documentation, because that typically isn't very portable.

Kay: This is the kind of application that really justifies the CD ROM's existence. When I was at Xerox, the company's repair division produced 475,000 new pieces of documentation each year that had to be translated into seven languages and distributed to 30,000 technicians all over the world. The company would have killed for the CD ROM then.

Kildall: And it's something we can make money on.

Wallace: But it's not enough to carry the CD ROM forward.

Kay: What about McGraw-Hill's entire catalog of books? Suppose display technology really improved. Could you imagine selling people home libraries?

'I don't think of the

CD ROM as a branch of the

Container Corporation of

America. The technology has

far more potential.'



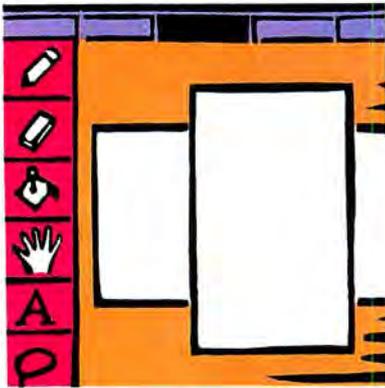
—Stan Cornyn

'What you really want from

a hypertext system is quick

rejection. You want to know,

Am I wasting my time?'



—Alan Kay

Wallace: Absolutely. And that's the point I'm trying to make. CD ROM has to go beyond microfiche. We have to create new ways of learning and interrelating the vast amount of data you can put on one of these disks.

■ Finding the Needle

Luhn: But how do you get to the data you want? Is hypertext a solution—and how do you retool your mind to deal with the concept?

Kay: Consider the book. It changed the way we deal with concepts. But today, how many kids walk into a library of their own volition and take advantage of what's there? They've been raised on television, and books don't fit into their patterns of getting information.

Information has gotten fragmented. People recognize images. In some ways, it takes us back to the days when people learned about their culture from looking at the stained glass windows in cathedrals. The CD ROM shares elements of both—it can be visual, and it can wait for you like a book. As with books, you have to train people to be efficient and fluent with the medium.

Kildall: Hypertext actually makes working with megabytes of data easier. You don't really have to train someone to use it, because the system makes the links between related information for you.

Lopez: Doesn't there have to be some sort of transitional metaphor that people can recognize?

Kildall: That's why we developed electronic bookmarks for our system.

Wallace: But say I want to publish professional reference books for scientists and engineers on a CD ROM, and interrelate not only the information but relevant software programs as well. As far as I know, the power—the processing, the artificial intelligence—doesn't exist now.

Kildall: The power lies in structuring information to be interrelated from the start. It's an old concept—and it's easier than using a traditional index or table of contents.

Kay: What you really want from a hypertext system—from any information retrieval system—is quick rejection. You want to know, Am I wasting my time?

Lopez: That's why I think full-text retrieval is a fraud that's been perpetrated on the end user. It's the

expectation of finding the needle in the haystack—and getting the haystack instead.

Kay: It's like searching the on-line version of the *Encyclopedia Britannica* that Nexis once offered. Every word in the English language could be found in so many contexts. It was impossible to find anything.

Lopez: The trouble is that we express ourselves in concepts, in phrases, in the way we put words together. I'm afraid that's going to be a tough nut for the AI people to crack.

Kildall: I could defend your positions, but remember that hypertext implies an edited, highly connected knowledge structure. There's little material out there in that form, and it's expensive to get it into that form. The transition from printed page to CD ROM—complete with interlinking and all the editorial decisions that implies—is going to take a very long time, maybe decades.

Kay: Vannevar Bush postulated a professional trailblazer who would find interest and “association trails” in knowledge . . .

Kildall: We did that to some extent with the original Grolier data base, analyzing the information network and asking ourselves, How tightly should these concepts be connected? The editors built in the links almost as an afterthought, capitalizing references to articles they thought relevant at some points and not at others. But that was a modest effort. When we figure out how to do it better, then we'll see a turning point for CD ROM.

■ The Cost of a New Generation

Luhn: Isn't cost the first hurdle to overcome?

Cornyn: It's the crisis of the year.

Wallace: You have to capture the information, structure it, and market it, all the while trying to make a buck. Throw a few images on the disk, and to make it really work, you've got to spend \$100,000 or pretty close to it. Don't forget that the issues the information-gatherer faces—copyright, who owns the data, how it gets used, who gets compensated and how—have not been addressed.

Messerschmitt: A lot of lawyers are going to get rich off this.

Lopez: Part of the answer is the sophisticated authoring systems that Microsoft and others are developing that allow companies such as McGraw-Hill to create CD ROM and CD-I programs without running up a George Lucas budget. They'll be available fairly soon and will allow publishers to do some

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—Tom Lopez

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—Gary Kildall

pretty exciting things without spending huge amounts.

Kay: The ability to inexpensively make a small number of disks would really speed the CD ROM's acceptance. But mastering costs are something like \$2000 a disk, which is too much.

Messerschmitt: I've got good news on that score. The people who bought mastering machines ostensibly for audio CDs are now buying VAX front ends so they can produce CD ROMs on their equipment. By now, there should be significant additional capacity and very rapid turnaround. By the middle of the year, you should be able to master CD ROMs for what it costs to print a book.

■ The Romance of CD-I

Cornyn: If we keep talking about words, connecting words, and data bases as the romance of CD ROM, we're really shortchanging the entire subject. People don't go to the movies to see scripts up on a screen; they indulge themselves in motion and sex and excitement. And I think that has something to do with knowledge as well.

Lopez: I don't disagree, but images are a bit imprecise sometimes. For better or worse, we're going to be using words for a long time.

Wallace: We're talking about two different worlds here, and emotionally we'd like to have one. CD ROM seems to happen on desktops and is more text- and computer-oriented, while CD-I happens on a TV screen eight feet away. It's hard to read text that way.

Kildall: CD ROM is a well-defined business today, and it sells. A lot of us in the computer industry don't know what to do with CD-I. People say it doesn't play full-motion video, so it can't be useful. But there are any number of things that CD-I can do that may change the way people study, for example.

Lopez: I don't think we have to apologize for the lack of motion. Multimedia slide shows achieve tremendous impact without any motion video at all. Even a single image can be powerful—it's all a matter of presentation.

Cornyn: Wouldn't it be wonderful if it were entertaining, exciting? If it sang and danced and involved you and made you laugh? Yet I don't hear much about that; I hear about niche markets and putting tool catalogs on these disks. I just wish we could expunge the vocabulary of all the terms that betray the computer mind-set.

In my home the television and the phonograph have been a great success; the personal computer's been a failure. But I realize that computers—and CD-I—can interact with you. And that's something my phonograph and television can't do. It bothers me that there hasn't been a rallying cry to the virtues of a product that can entertain you, that's standardized, and that's priced for the mass market.

Kildall: You have to remember that small companies like mine have to finance the future themselves. We have to go after the solid markets today. If we tried to create CD-I products today, we'd starve to death.

Miller: I'm hard-pressed to think of a long-term, mass-market success that was interactive—or just active as opposed to passive.

Kildall: If anything keeps people from going overboard on CD-I, it's the videodisk experience. People don't want to interact with the TV—they want full motion, to see things in real time.

Cornyn: Our CD-I programs are like going to the movies with a steering wheel. You're drawn through the experience—you don't go through the klutzy things forced on you by videodisks.

Bunnell: What exciting things will be done with CD-I? What will turn on the masses?

Cornyn: We're doing one now called "London Any Way You Turn." You walk down a London street (in stop-motion rather than full-motion video), and you can not only change the direction you walk but also change the fourth dimension, so at certain points you find yourself in Shakespeare's or Chaucer's or Caesar's time. If we do even a half-baked job, it will be fairly revolutionary.

Bunnell: But the example you cite must be extremely expensive to produce. How many hours of filming would it take?

Cornyn: Filming is the wrong word; it's slides, if you will. We're budgeted at around \$200,000, but I'd be thrilled if we come in at \$250,000. I don't find that an oppressive number, because I come from a tradition where a rock 'n' roll album costs \$200,000. Fortunately there are 170 million record players out there. I know Gary has to make more of a living than I do, because I'm fairly subsidized. But we can't keep talking about niche markets—let's swing for the fences.

■ Kick Starting CD-I

Kildall: It's clear that CD-I needs a kick-start from the people who are going to benefit from it—the people who will be selling the machines.

Cornyn: It's the classic chicken-and-egg problem. How does George, an enlightened person, go to his management at McGraw-Hill and say, "I want to invest \$250,000 in making a disk," when there's no installed base?

Kay: Well, if he sold 170 million disks he might make money.

Wallace: I *would* make money, no question.

Kay: But would the installed base grow?

Cornyn: I think the base grows off "hits," like Apple Computer grew off *VisiCalc*. I pray we find some hits so that this technology doesn't get superseded or forgotten. And we don't have to follow the example set by the computer industry. It's fairly unarguable that standardization makes the base boom. Yet people in the computer industry look upon standardization as some kind of straitjacket.

Messerschmitt: We're trying to address that problem. In the early days, Philips and a number of unrelated software and hardware companies did a lot of heroic things with the videodisk, but we failed to get interactivity off the ground. One reason: We launched a player that collected dust unless you put either a movie or an interactive disk in it. And then we were hit with the VCRs. But we learned from that experience.

The audio CD is the most successful consumer product ever introduced because everybody did the same thing, there was a lot of material available, and it was demonstrably better than the present technology. To build on the CD's acceptance, Philips has just announced a new extension called CD-V. For example, we've got a Phil Collins CD-V disk with 20 minutes of digital sound on one part and 5 minutes of full-motion LaserVision-quality video on another. Naturally, we've introduced an upscale player that plays your entire library of CDs, CD-Vs, plus 8- and 12-inch videodisks.

But you can't sell a videodisk player for \$1000. The market will force the price down. If CD-V is a hit, the hardware world will come along and eventually turn the CD-V player into a CD-I player. There are a lot of people working very hard to make that happen.

Cornyn: I think CD-V is a breakthrough and very exciting. I just hope manufacturers in Taiwan and South Korea get together and support standardization.

■ Economics and Education

Messerschmitt: If CD-I catches on anywhere, it will probably be in the schools. In the late seventies, the schools weren't ready for computers, much less laser video. Today computers are commonplace; Apple's got 60 percent of the school market.

Kay: Schools will probably embrace CD-I, for both bad and good reasons. They like packaged solutions to their problems; on the other hand, the technology could open up kids' minds. But I'm an arch-conservative when it comes to schools. The book is infinitely more efficient.

Of course, what would you rather do, read an article about the cell or actually peer into a detailed simulation of one? I'd jump at the latter, because it's dynamic; you get more points of view. This is what CD ROM is good at, not at imitating books.

Kildall: It can be a mind tool that pushes people to explore what they wouldn't have explored before. That came home one night when my daughter ran up to me and said she had to do a report on Costa Rica, and of course, it was due the next morning. I'm not an encyclopedia salesman, but boy, all of a sudden the value of the Grolier CD ROM was clear.

And you find the report is more in-depth, because it's no longer a function of how good you are with a card catalog. There's no reason to pass up a fact, because a path to the material has already been cut for you. It comes down to how well you can assimilate all the information.

Bunnell: Will schools have to buy a lot of hardware to use CD-I?

Cornyn: Not at all. CD-I is a form unto itself. All you need to do is hook up a player (which has a built-in computer) to a television set and control it with a joystick or a mouse or some sort of infrared device.

Bunnell: But they may have to buy a lot of players.

Wallace: And can they get an inexpensive player that hooks up to their Apples? It gets back to Alan's point, that educators buy packaged solutions. When a school district buys a K through 8 basal reading program, a publisher is elated because that means selling an integrated nine-grade package—books, workbooks, flash cards—all kinds of razor blades for the razor. If CD ROM programs aren't similarly complete and players aren't cheap, the schools won't buy them.

Kildall: But you can't show up with a disk and hope that schools will buy it. You have to satisfy their needs, and that means a publisher has to make a big commitment to a whole library of razor blades. You can blow some heavy bucks if it isn't done right.

Wallace: As always, it's a matter of figuring out what makes people buy. That means you get research funding, because you can't be learning out there on the cutting edge with your operating budget.

■ Selling a Standard

Miller: So far we've talked about everything from documentation to a stroll in London town—but where are the horizontal applications? Romance is important, Stan, but there is more to life. There's an emotional satisfaction from efficiency, from doing something faster and better than you've ever been able to do it before. The personal computer industry is based on that.

Lopez: The horizontal market isn't going to burst into being overnight—it's going to grow on a solid foundation of the mundane things we've been talking about, like in-house publishing, where the economic reasons for the CD ROM are compelling. Did Jobs and Wozniak predict *VisiCalc*?

Cornyn: I find Mr. Lopez optimistic. The scenario of a horizontal medium based on niche marketing doesn't play out.

Kildall: You're in the business of producing hits. And that's fundamentally different from the way the computer industry does business. This is a market where you collectively create a community as you go.

Lopez: I guess I have confidence in people's creativity and talent. Someone—maybe one of the companies represented here—will come up with something that will make people buy a CD ROM player.

Kay: I don't think it will take that much, given what the players can be sold for.

Kildall: If you had 20 good educational titles that allowed kids to do their homework better, and players cost \$250, we could sell several thousand machines.

Messerschmitt: What would one of those disks go for—\$99.50?

Kildall: If we could predict a market of 1 million players over the next three years, I might say \$10 or \$20. Is that a business?

Wallace: Not for a publisher. Let's say I want to create an interactive disk with five or six of my professional books. And I'll probably license the software from somebody else. At today's licensing rates, I can't make money on a \$10 disk.

Lopez: Can you use traditional printing costs as a reference point? Plus some sort of added value for the software?

Wallace: Perceived value is the key. The Grolier *Electronic Encyclopedia* did just fine at \$199 because the perceived value of encyclopedias is something like \$700.

Lopez: What troubles me about our conversation so far is that we've been talking about CD ROM as a transfer medium, which isn't. If I were you, George, I wouldn't look at my inventory of books—I'd find out what my customer's frustrations are. What are the information bottlenecks? And how could the CD ROM and the PC eliminate them?

Wallace: What about human nature? We found that a lot of our customers would rather go next door and ask the guy who has the book, because he's familiar with it and he knows the answer. Whatever we put on disk, it's going to take time to break old habits—or instill new ones.

Light at the End of the Tunnel

Cornyn: What I yearn to hear—one year after Microsoft's first CD ROM conference—is what will turn this technology into a mass medium. Because I don't think we have a chicken-and-egg problem. The chicken is huge and very much alive, and it's called

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That means you get research

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—George Wallace

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—John Messerschmitt

CD audio, and it's pouring out millions of players that, as John told us, will now have video capability built in. Who will put out the bucks to create the golden eggs?

Lopez: I don't know. Gary's stated the issue clearly. He's a businessman and he's got to survive, and so he'll produce what sells. Maybe McGraw-Hill will do it. They're an information owner, provider, and publisher, and they've chosen to be in the electronic publishing business.

There are lots of print publishers who may only want to be information providers and lots of software companies who may step in to do the publishing. Or a whole new class of companies may spring up.

Luhn: Can a traditional publisher like McGraw-Hill be both an information shaper and licensor? Is the company really going to devote money for the research and development?

Wallace: The answer is yes. Our president has said that loud and clear. We've got ten different divisions working on prototypes and, by your press time, there'll be a couple of McGraw-Hill CD ROM products for sale.

Luhn: But what's going to help the technology lurch forward?

Wallace: The creativity that demonstrates the CD ROM's power—and pieces of the puzzle falling into place. Steve Wozniak once said that the personal computer happened because the price of 16K RAM chips dropped by two-thirds. That was the magic piece to the puzzle—for that technology. For CD ROM, it's cheap processing, better displays, artificial intelligence, and more.

Lopez: Standards. So publishers can create products that run on machines made by anyone. And tools. Imagine trying to make a motion picture from scratch without the tools that exist today. It wouldn't cost \$40 million, but \$400 million.

Cornyn: That's a good analogy. Because it's a bucks issue—this is one industry you can't create by hacking away in a garage. That's why I'm pleased Microsoft is working on affordable solutions. We need the junior players—something less than 20th Century Fox and Coca-Cola—to start creating products in this medium.

Messerschmitt: We can't be too impatient. Things don't happen that fast when you're dealing with basic structural changes. The big CD ROM story isn't this March, but March '88 or '89. This

year, vertical market applications will make money; come '88, you'll see significant education products—for K through 12, English, math, the sciences—finished and ready to go to market with the total hardware system that's required to support them. And later, some exciting things for the home. I can assure you that Philips and its competitors are working furiously to supply cheap, reliable, and expandable machines to accommodate these products.

Cornyn: To me, the future lies in popularity, and that means CD-I. Granted, I'm a missionary, complete with arrows in my back, and I'm a little intolerant of people who keep saying CD ROM.

Lopez: But we're talking about a lot of the same concepts. I just see two different environments: the CD-I user in the living room watching TV and the CD ROM user sitting at a PC.

Cornyn: I think it's all going to come together under CD-I, because CD-I encompasses everything the computer techies and the CD ROM archivists want to do. If you add the capability of a videodisk—full-motion video—CD-I will appeal not only to lawyers and fisheries, but also to the masses. Bruce Springsteen's latest and Grolier's *Electronic Encyclopedia* and *Rambo* will all be part of the same family.

In short, let's build a hell of a big market. Let's settle on what people like and want and then publish in that medium. If that's CD-I, fine. Let's have a world standard that's bigger than the computer industry and the videodisk industry and the book industry—one standard so that the little disk can be played in India and Russia and Japan and the United States. I can't see that as a crime. ●

Stan Cornyn, president of the Record Group, is a Grammy award winner and former executive vice president at Warner Brothers Records. The Record Group is a private company currently under contract with Philips and Polygram Records to develop CD-I products and allied optical technologies.

Alan Kay, Apple Fellow and formerly with Xerox PARC, pioneered icon-oriented computer interfaces and helped develop the technology that inspired the Apple Macintosh. Kay, who holds bachelor's degrees in mathematics and molecular biology and a Ph.D. in computer science, is also a professional jazz musician and composer.

Gary Kildall, president of KnowledgeSet Corporation, is Chairman and CEO of Digital Research. Developer of CP/M, one of the first operating systems for the personal computer and precursor to MS-DOS, Kildall has a Ph.D. in computer science.

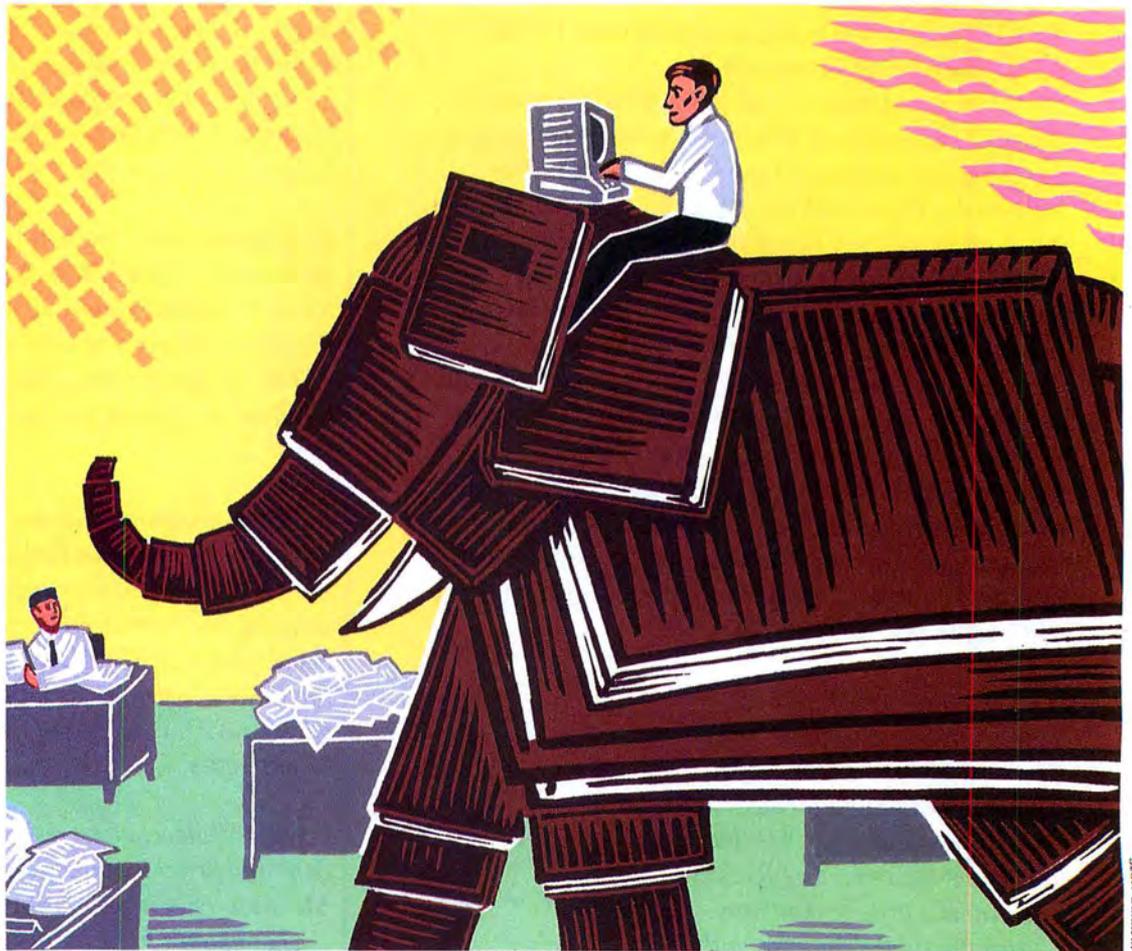
Tom Lopez, vice president of Microsoft's CD ROM division, formerly headed Cytation, one of the first companies to develop CD ROM applications. Microsoft acquired the firm in January 1986.

John Messerschmitt has been with North American Philips for nearly 40 years. As vice president, he had responsibility for developing CD ROM activity in the United States and is now engaged in CD-V and CD-I optical technologies.

George Wallace, vice president and general manager of McGraw-Hill, is responsible for the company's professional and reference division.

Mastering Corporate Data

Steve Cummings



*To store and disseminate
data more efficiently, forward-
looking organizations are
publishing archival material
on CD ROM.*

■■■■ In the last year, product developers have created a host of prototype CD ROM applications, from disk-based encyclopedias to monumental repositories of medical data and stock quotations. In the business world, companies are just beginning to exploit CD ROMs to store and manage their records. Although it has yet to prove cost-effective, CD ROM technology is winning high praise for in-house applications that require quick information retrieval from oceans of data.

Custom CD ROM applications demand a hefty investment. Lewis Miller, vice president of marketing at Knowledge Access, an electronic publishing firm in Mountain View, California, estimates that transferring 100MB of data on CD ROM from tape or floppies would cost nearly \$20,000. That figure breaks down as follows: \$15,000 for data compression, search and retrieval design, and indexing; and \$4500 for production of the master disk through a company such as Philips-Dupont. Copies of the master disk cost \$25 each for 100 or more or \$10 each for 1000 and up.

According to industry analysts, most in-house CD ROM applications currently under development are designed to simplify managing archival materials. "If a company prints a large volume of administrative or technical documents, keeping them accessible and organized can be a headache. Simply finding a place for them in the office may be a problem in itself," says Mike Befeler, vice president of strategic marketing at Reference Technology, a CD ROM software firm in Boulder, Colorado. "When

the documents are consolidated on a CD ROM, they're easier to keep track of, and you can find information quickly."

■ **Drowning in Useful Data**

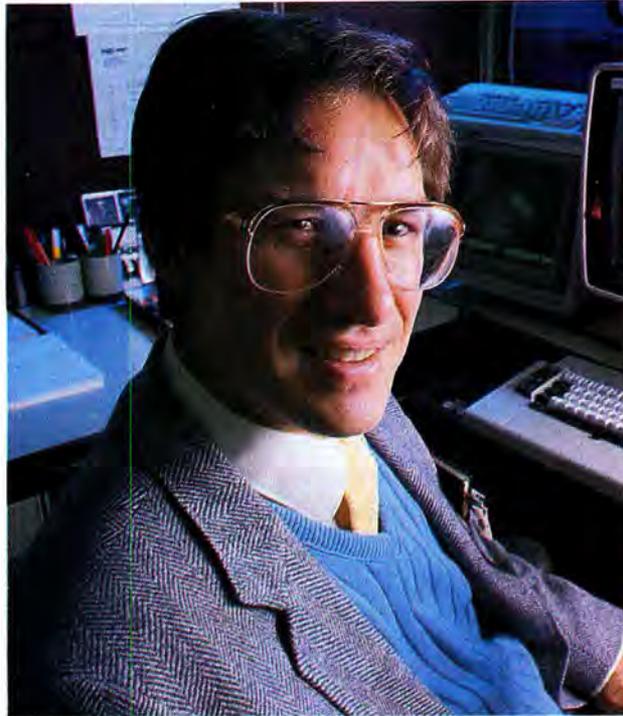
The ubiquitous parts catalog is among the unromantic but vital applications being transferred to CD ROM. "Companies like automotive and aerospace firms need to distribute information about thousands of parts to numerous maintenance locations," Befeler says. "Until now, they've used printed catalogs or microfiche to get the information out to their dealerships and maintenance stations.

"Anyone who's had to use parts catalogs knows how frustrating they can be—the page you're looking for is torn out, or you can't even find the right book. A CD ROM system lets the parts clerk pull up the right page by typing in a simple request. If the application is designed with graphics capabilities, he or she can see an image of the part as well as a description."

Policy and procedures manuals are also likely candidates for transfer to CD ROM. "Financial institutions send out tremendous volumes of data on government procedures and regulations," says Richard Paulson, vice president of marketing at Group L Software Corporation, a Herndon, Virginia, firm that markets text-search software and CD ROM services.

"These manuals are large, cumbersome, and complicated, and most people don't know how to

Paul Barclay spearheads Northern Telecom's effort to distribute technical documentation on CD ROM.



Diane Hall

find what they're looking for. Updates come out all the time, but many wind up in the circular file because it's too much trouble to put them in binders," Paulson says. "CD ROM is a much better way to manage all this material."

Although it's expensive to index in-house business data, purchase retrieval software, and master a CD ROM, the costs sometimes compare favorably with the charges incurred by downloading the same information from a mainframe, or by publishing it on paper. "Some large manufacturers spend as much as 20 percent of their revenues on printing and paper products," Paulson claims. "If you can reduce the amount of paper you're sending out, you'll save money, and people can just print out the parts they need."

■ Documentation on Disk

Although many corporations are planning CD ROM applications, few in-house projects are beyond the prototype stage. And most corporations, concerned about losing their competitive edge, are reluctant to discuss their nascent plans.

One exception is Northern Telecom, a Research Triangle Park, North Carolina, manufacturer of telecommunications equipment—including the intricate switches required for routing telephone calls. Paul Barclay, manager of marketing and engineering support for business systems at Northern Telecom, says the company is testing a prototype CD ROM version of its

technical documentation for the switches. If the application is approved, CD ROM disks containing the documentation will be distributed to the company's customers and field support personnel.

"We design our switches to be programmable so they can match the needs of our customers exactly," Barclay says. "You can tell the switch how it's supposed to function, which trunk lines are coming in, the name for a particular location on the system, and so on. Our users and field service people have to be able to reprogram the switches because the needs of our customers are dynamic, with constantly changing equipment and routing.

"We give our customers a two-week training course on how to put all that information into the switch. After the training, they can use written materials that spell out in detail what they have to do for every product."

Currently this documentation is available in printed form, on microfiche, and via an on-line connection to Northern Telecom's mainframe. Barclay says that putting it on CD ROM may well turn out to be a more efficient means of storage and distribution, especially if other company documents are also included.

In addition to its voluminous capacity for data, CD ROM provides another potential advantage. Says Barclay: "Using a CD ROM can be a lot faster than paging through a book or downloading the information from one of our computers. And sending out a CD ROM disk is faster than printing out the information and putting it into binders, or sending it over a telephone line."

Cost-effectiveness isn't a primary consideration at this early stage, but Barclay believes a CD ROM system will save the company money in the long run. "There'll probably be substantial cost savings due to the large volume," he says, "but we haven't made any serious cost comparisons yet."

For now, testing the system to ensure it works is more important. Northern Telecom is evaluating a prototype disk prepared by Group L containing 5MB of test data. "As soon as we decide CD ROM is the way to go, we'll be pursuing it very aggressively," says Barclay.

Figures at Your Fingers

At Statistics Canada, the central data-gathering agency for the Canadian government, a prototype CD ROM prepared by Reteco of Toronto may help to organize a gargantuan data base. If the application is approved after trials, CD ROMs will be distributed to the agency's regional offices and possibly offered for sale to the public.

Statistics Canada collects and sifts facts and figures on Canadian economic life and maintains an enormous quantity of information. "Our census survey is part of our statistical data base, but we also collect labor statistics, production data, price indexes, trade data, demographic information, and so on, in both English and French," says Brian Cheney, head of data development at the agency. "There's so much information that one of the main problems in using our data base is finding out what's available. Our CD ROM applica-

tion is a bibliographic system, a kind of meta-data base that tells you where the data is and how to get it. Later, we'll consider putting out the actual data on CD ROM as well."

Although information in the data base changes daily, the bibliographic references change only when new categories of data are added—a much slower process. "We can keep the system up to date by publishing a new master disk yearly and sending out supplements on floppy disks every month," says Cheney. "The software accesses both the CD ROM and the disk drive when the user asks the system to look up a reference."

Because all of Statistics Canada's regional offices already have PCs, Cheney anticipates few hurdles in distributing the CD ROM application throughout the agency. "Our offices use the data for analysis, for reports to other agencies, and for published reports. Employees work with it on their PCs with SPSS [a popular statistical analysis package] and 1-2-3. The proposed bibliographic system would really help the staff get the data they need faster."

Statistics Canada has tried alternative data retrieval methods with unsatisfactory results. "We have a microfiche reference, but you can't find what you're looking for quickly. The real benefit of the CD ROM bibliography is the search software, which lets you request data by keyword."

Because a large part of Statistics Canada's job is providing information to the public, the bibliographic application used by the staff may be published on CD ROM for public consumption as well. The agency's data base is rich in infor-

mation prized by private planners, economists, consulting firms, and large companies. Currently, users willing to pay a royalty fee and computer charges can download information from the mainframe's data base—once they find what they're looking for.

"The CD ROM bibliography would be a natural extension of the other ways we've delivered information to the public," says Cheney. "What we still need to know is how many people have CD ROM readers and how many will be willing to pay for the product."

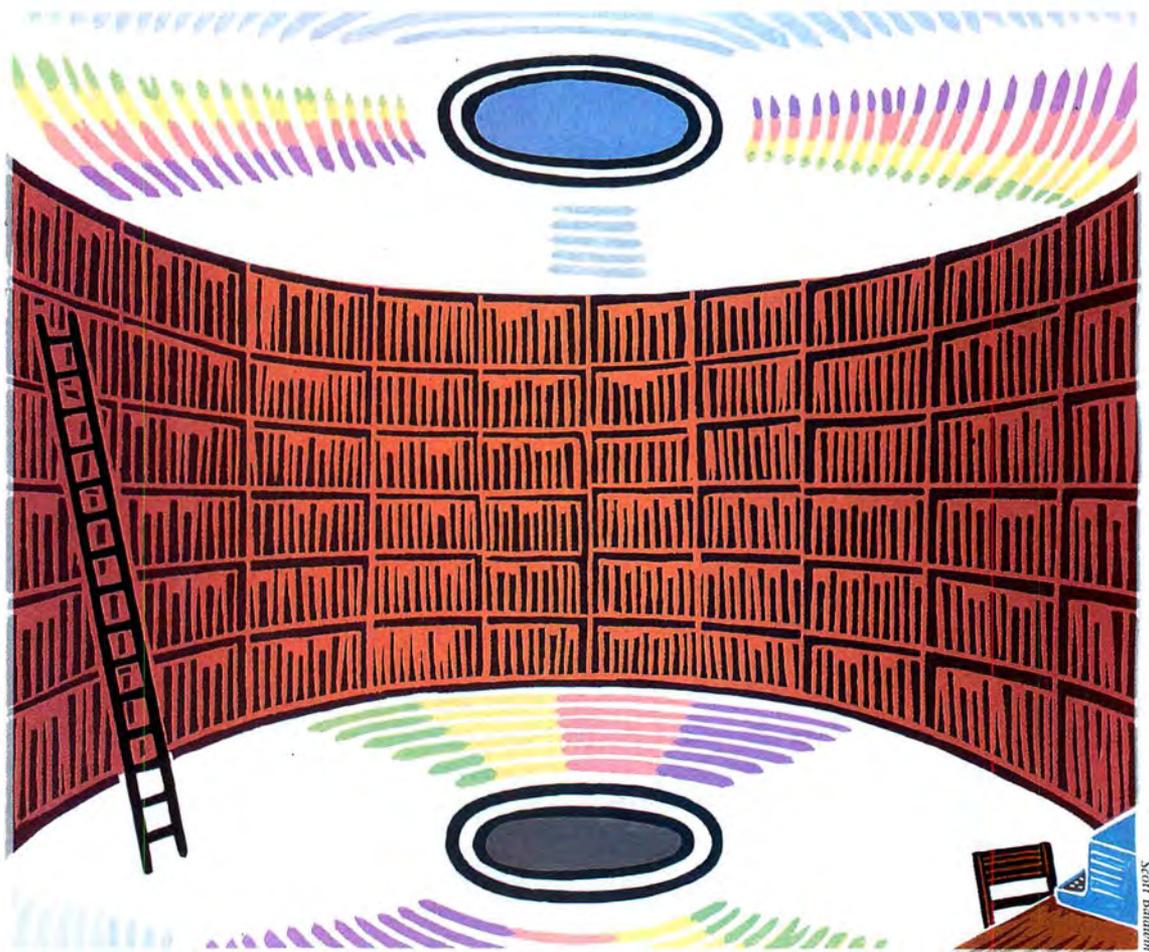
Like Northern Telecom, Statistics Canada has not performed a formal cost analysis of its CD ROM system. Cheney is convinced, however, that the project will result in significant savings. "If we ever do a study comparing mainframe computer time and communications expenses, I'm sure the CD ROM approach will come out way ahead," he says.

Most managers planning CD ROM applications will have to face difficult questions about the cost-effectiveness of using current CD ROM technology to distribute corporate data. Still, the value of a medium that allows for compact information storage and quick retrieval ensures that many companies will pursue internal CD ROM projects in the near future. ●

Steve Cummings is a freelance writer in Davis, California.

The Reference ROM

Reed McManus



Positioning itself as a

CD ROM pioneer,

Microsoft readies

Microsoft Bookshelf:

ten writer's reference

works on one compact disc

whose data can be

instantly inserted into word

processing documents.

■■■■ CD ROM is normally a look-but-don't-touch storage medium. Its 550MB capacity disks let you tap into vast storehouses of data, but all you can do with the data you discover is print it out or save it to disk. This limits the medium's usefulness to providing researchers with an off-line alternative to costly on-line data searches.

Microsoft Bookshelf, a set of CD ROM data bases with an interactive RAM-resident link, checks CD ROM out of the research library, dusts it off, and drops it on the everyday computer user's desk. Like any RAM-resident ("terminate-and-stay-resident," or TSR) program, *Microsoft Bookshelf's* system files hide in memory until you invoke the program from the keyboard. Unlike other RAM-resident utilities, however, this program has access to over 100MB of usable reference data that can be inserted directly into a word processing document. *PC World* previewed an early version of the package, which will be available in June 1987.

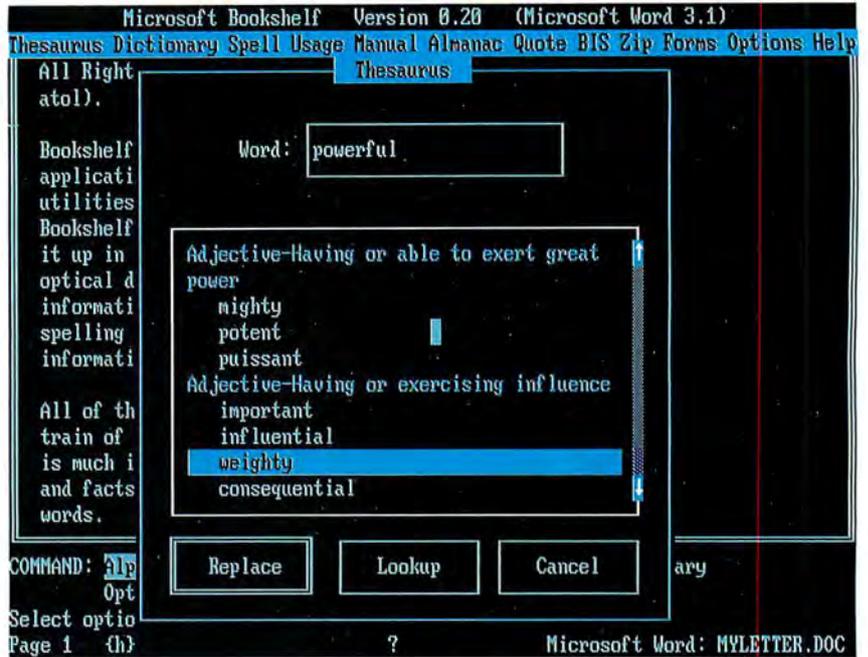
Microsoft Bookshelf's set of ten data bases is a condensed reference library for business and professional writers. Its single disk contains Houghton Mifflin's *Roget's II Thesaurus*, Bartlett's *Familiar Quotations*, *The World Almanac*, *The Chicago Manual of Style*, *The American Heritage Dictionary*, as well as Houghton Mifflin's *Usage Alert* and *Spelling Verifier and Correcter*. Also included are three data bases aimed

at business users: the U.S. Postal Service's *ZIP Code Directory*, the University of California Press's *Business Information Sources*, and Microsoft's own compendium, *Common Business Letters*. Microsoft plans to offer annual updates of the disk.

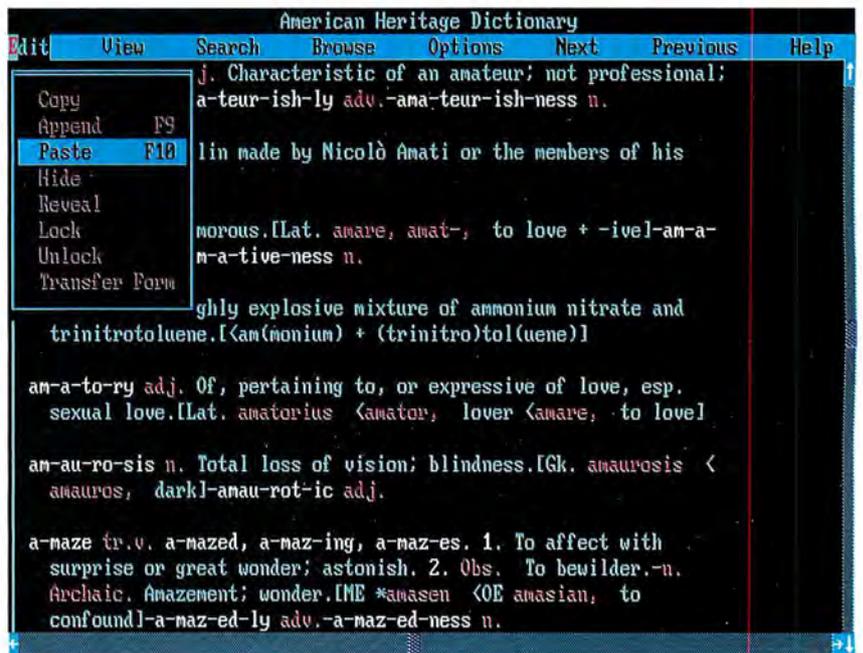
■ Word Processor Links

Although *Microsoft Bookshelf* can be used as a stand-alone program or as a background program with any application, it earns its keep when linked to a word processor. To load the program, type `cdr/r` at the DOS prompt or include the command in an AUTOEXEC.BAT file (`/r` makes the program memory-resident). *Bookshelf* can then be called up while you're using a word processor by pressing the `<Alt>` and `<Shift>` keys simultaneously. Its Word-Processor Capability Database configures the program to 12 word processors, including *Microsoft Word*, *Samna Word III*, and *MultiMate Advantage*. The program supports *Microsoft Word's* graphics mode and works with RAM-resident utilities that follow Microsoft's TSR programming guidelines (such as *SideKick*, *SuperKey*, and *ProKey*); it does not work with *Microsoft Windows*.

Screen 1: Microsoft Bookshelf's RAM-resident link in action. Choose Thesaurus from the menu bar, and the underlying word processor document's highlighted word appears in a dialog box. Scroll through the thesaurus's suggestions until an appropriate word is highlighted, then press <Enter> to replace the original word in the underlying document.



Screen 2: Microsoft Bookshelf's Paste command moves a dictionary definition (including a reference citation) from the scrap file into the underlying word processing document.



■ A Mouse That Roars

A single menu bar listing the program's ten data bases and its help and options menus appears at the top of the screen. Pulldown menus and dialogue boxes help you define search criteria, perform a search, and insert data into an active word processing document (see Screen 1). If you use a mouse, you can choose menu items with a single click and activate pulldown menu selections by pressing the mouse button and releasing it when the desired function is highlighted. In lieu of a mouse, you can activate all functions from the keyboard step-by-step or with macros.

Microsoft Bookshelf communicates with users primarily through dialogue boxes. When a dialogue box is activated, the program displays an edit box with several on-screen buttons. When operating in RAM-resident mode and linked to a word processor, the active document's highlighted or selected word appears in the text edit window of the dialogue box. The data base's default button (Look up or Replace, for example) is surrounded by double lines. To invoke it, simply press <Return> or click the item with the mouse. You move around the dialogue box with the <Tab> key. Once you've invoked a specific data base, <CursorLeft> and <CursorRight> switch you to the previous and next pulldown menus, while <CursorUp> and <CursorDown> arrow movements move within the pulldown menu.

The thesaurus, spelling, and usage data bases present search results in dialogue boxes, with alternate choices in a selectable list. To

replace words in the word processing document, you accept the default selection or tab to the appropriate word and press <Enter>. *The Chicago Manual of Style, World Almanac, Familiar Quotations, Business Information Sources, Common Business Letters, and American Heritage Dictionary* data bases add a full-screen browsing mode so that you can scroll through data base text at your leisure. Their Edit menus allow you to cut, paste, and append data and reference citations into a scrap file and then move them to your active document (see Screen 2). The ZIP code data base can process a document's highlighted address or one you type in and then return the appropriate ZIP code in a new dialogue box.

■ Search and Seizure

Rudimentary Boolean operators enable you to search data bases that offer full-screen browsing. The simple search structure is adequate but may disappoint experienced data base searchers. When you type items into separate editing windows of an Index Search dialogue box, the program searches words as AND operations. Terms appearing in the same editing box separated by single spaces are searched in the order they appear, while words in an editing box separated by commas are searched as OR operations ("Invasion,War" searches for references to either key word, for example). Wild cards and NOT operators are not supported. Once

a search is completed, you can view all occurrences or "zoom in" on references found in subheads, table titles, major headings, or chapters from the source data base. Text and footnotes can be displayed and pasted into the word processing document.

■ Custom-Fit Compact Discs

Microsoft Bookshelf's RAM-resident link makes a CD ROM's data storehouse instantly usable and goes far in showing how CD ROM can be an effective storage medium for everyday computer uses. Additional general-interest CD ROM reference works and data bases geared to financial, legal, medical, and other vertical markets are in the planning stages at Microsoft. *Microsoft Bookshelf* is just the groundbreaker for a library of instant, one-stop CD ROM reference works. ●

||| *Reed McManus is an Associate Editor for PC World.*

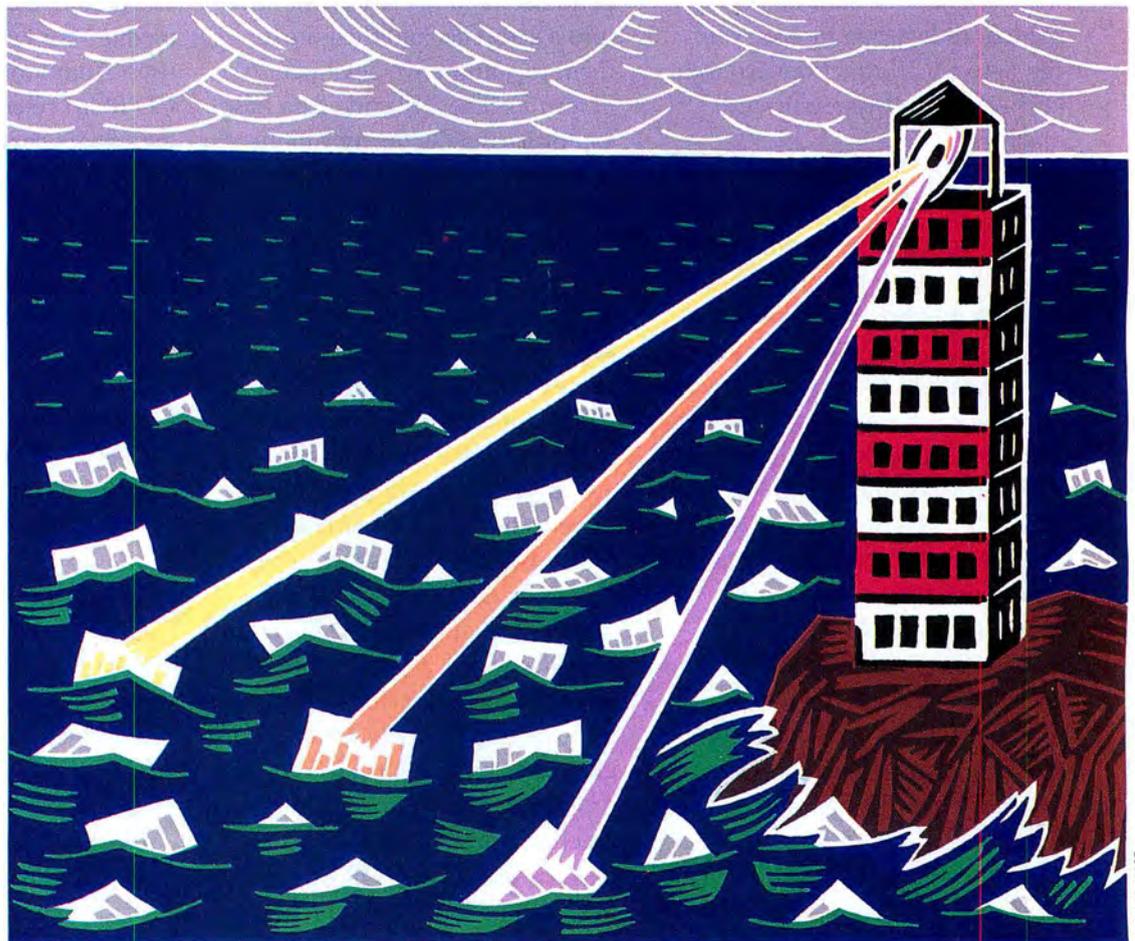
||| *Microsoft Bookshelf
Microsoft Corp.
16011 N.E. 36th Way
Box 97017
Redmond, WA 98073
800/426-9400, 206/882-8080
List price: \$295 from Microsoft;
disk with CD ROM player
available through retail outlets,
price to be announced; product
release: June 1987
Requirements: 512K (640K
recommended), CD ROM drive
with MS-DOS CD ROM
extensions, hard disk
recommended*

Bright Lights

on

Eric Bender

Financial Data



*Long the mainstay
of financial analysis, Lotus
Development is now
turning to CD ROM to deliver
massive data bases to the
financial services industry.*

||||| Here's the gee-whiz statistic: Each week Lotus Development's One Source service distributes an updated CD ROM disk that contains more than 300 million items of financial data. If each item represented one person, that total would exceed the combined populations of the United States and the United Kingdom.

But while that sheer volume of information is hard to grasp, One Source users are truly dazzled by the product's ability to, say, retrieve 20 years of sales data for two companies and create a comparative graph, all in about 3 seconds.

Announced in the fall of 1986 and released during the first quarter of this year, the service now reaches more than 300 clients. It's designed to bring mainframe-style financial data bases to the desktop, bypassing slow and costly time-sharing setups. One Source consolidates nine financial mainstays: Daily Stock Price History, Compustat, Value Line, Bonds, I/B/E/S, Ford Investor Services, Financial Post, Disclosure II, and Media General.

Not surprisingly, One Source is on intimate terms with 1-2-3. "Users can get at data from within 1-2-3 about 100 times faster than through the mainframe," says Lotus Information Services president Larry Moore. "Everyone's addicted to speed."

Fortunately, these customers can pay for it. The market for One Source, according to Lotus, consists of those employing 1-2-3 for investment analysis. They're divided into two main camps: the financial services industry (banks, investment companies, insurance companies, brokerage houses, and

money management firms) and internal corporate finance units.

In each camp the need for instant information can be crucial. After all, it makes little sense for a highly paid honcho to baby-sit a modem and then write down or rekey the resulting data. Instead, with One Source data zips off the CD player and heads immediately for 1-2-3. "Many of our customers are beginning to write reporting and graphics-based systems around the data, finally bringing this information into the day-to-day operations of the company," Moore emphasizes.

■ Apple Roots

Mainframe-class storage is a far cry from One Source's roots. When ISYS Corporation was formed in 1981 to offer investment analysis on personal computers, the delivery vehicle was an Apple II. Still, ISYS's founders envisioned the day when some form of optical storage would come along "and create the age of true electronic publishing," Moore says. In the meantime, they continued to move to higher-density storage—first to floppy-based IBM PCs, and then to PCs equipped with 20MB Bernoulli Boxes.

When Lotus acquired ISYS in February 1986, a 40MB Bernoulli Box seemed the likely next step. Instead, a year ago this month, Lotus plunged ahead with CD ROM. "All hell broke loose when we decided to do that," Moore recalls. "[Our deliveries] went from monthly to weekly, we dramatically increased the size of the data

Traditional Access to Financial Data Bases



Figure 1: The barriers 1-2-3 users face in traditional access to financial data bases stored on mainframes

bases we had been packaging, and we added two more.”

The ISYS group had been eyeing optical storage for some time. They didn't want to wait for fully erasable optical media to hit the market, and they dismissed write-once read-many (WORM) devices because of their sluggish write times.

Additionally, WORM drives carry \$4000 stickers, while CD players are dipping well below \$1000. With WORM, you haven't got Michael Jackson and Bruce Springsteen driving the component costs down, Moore points out. “And WORM still has only about one-third the disk capacity of CD ROM.”

Nonetheless, Lotus did face certain risks. First, the CD ROM file-format picture was considerably fuzzier a year ago. “We wanted a standard—we wanted software that would run on any drive so we wouldn't be locked into Philips,” Moore says. Lotus bet on the High Sierra format, and it paid off. Second, Moore's group needed to probe deeply into 1-2-3 to build a tight connection with the data bases—which didn't prove difficult once inside Lotus Development. And committing to 3M for CD production was scant reason for worry, what with about two dozen CD plants under construction.

Despite substantial development costs and the move to weekly updates, the switch to CD ROM has actually resulted in a savings for Lotus; serving existing ISYS customers now costs less than in the days before optical media, Moore says.

Signing Up

One Source is sold by subscription, with annual fees ranging from \$11,000 to \$27,000 depending on the data services selected. At the other end of the user's XT or AT is a DEC system built around a Philips player. Lotus bundles a pair of data access packages, *Lotus Financial* and *Microscan*, with the service.

As a 1-2-3 add-in, *Lotus Financial* sits in a familiar environment with new menu selections that import data and plunk it directly into spreadsheets. Among a host of financial analysis features is an automatic adjustment for stock splits. Users can create their own applications using 1-2-3 macros or rely on prepackaged reports to build balance sheets and income statements (see Screens 1 and 2).

Microscan, the latest generation of ISYS's menu-driven access and analysis software, is not linked to 1-2-3. “*Microscan* has a life of its own,” Moore says. So will a *Symphony* add-on, which is in the works.

Access software removes the need to remember the intricate routes into One Source's nine data bases. Proprietary data compression techniques squeeze the data bases down to 420MB. Clients can tap into only those services they've ordered.

Once they have received the weekly update, users can discard or archive earlier versions. Daily on-line updates arrive through standard asynchronous communications hookups. Downloading typically takes about 10 minutes, and the data is parked on a hard disk. Moore notes that the Lotus access software “transparently” joins CD-based data with hard disk data.

Those who need even quicker updates may opt for Lotus Signal,

which delivers market data in real time via FM sideband transmission or private satellite link.

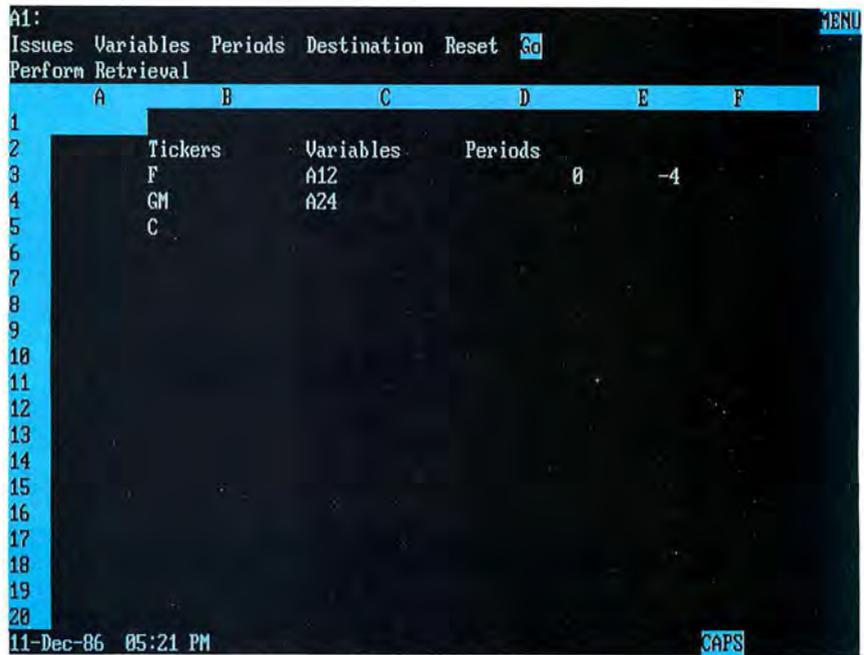
“Once you’re able to deliver very big data bases, the next thing people ask is ‘How do I get departmentwide access?’” Moore says. “We designed in everything for networking.” Accordingly, data can be copied from the CD player to a high-capacity file server on a local area network.

One other trend of note: Enterprising third parties are beginning to build templates around One Source data. Moore says vendors are at work on systems customized for modeling mergers, planning arbitrage attacks, and performing technical analyses.

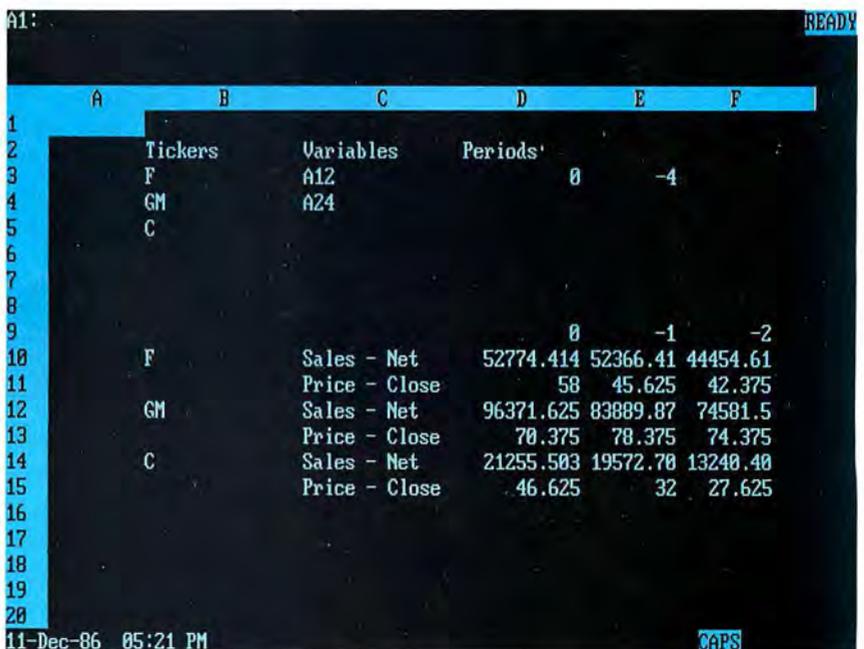
Overall, One Source fits squarely within the Lotus strategy of fanning out into new markets from its 1-2-3 centerpiece. The system extends Lotus’s strong thrust into financial services, an industry in which many company officials, including Lotus president and chief executive officer Jim Manzi, once worked. ●

Eric Bender is PC World’s East Coast Editor.

One Source
 Lotus Development Corp.
 55 Cambridge Pkwy.
 Cambridge, MA 02142
 617/577-8500
 List price: \$11,000 to \$27,000,
 depending on services
 Requirements: XT or AT with
 10MB hard disk drive, 640K,
 1200/2400-bps modem, DOS
 2.00 or later version, 1-2-3
 release 2.00 or 2.01 for Lotus
 Financial



Screen 1: With Lotus Financial access software, users can extract data from One Source data bases while within 1-2-3. Here, ticker symbols, variables, and time periods are specified to track five years of sales and stock performance for Ford, General Motors, and Chrysler. Variable A12 is net sales, and Variable A24 is closing price. The time periods are in years, moving backward from 1985. For example, -4 represents 1981. After the required data is identified, the command Go performs the data retrieval.



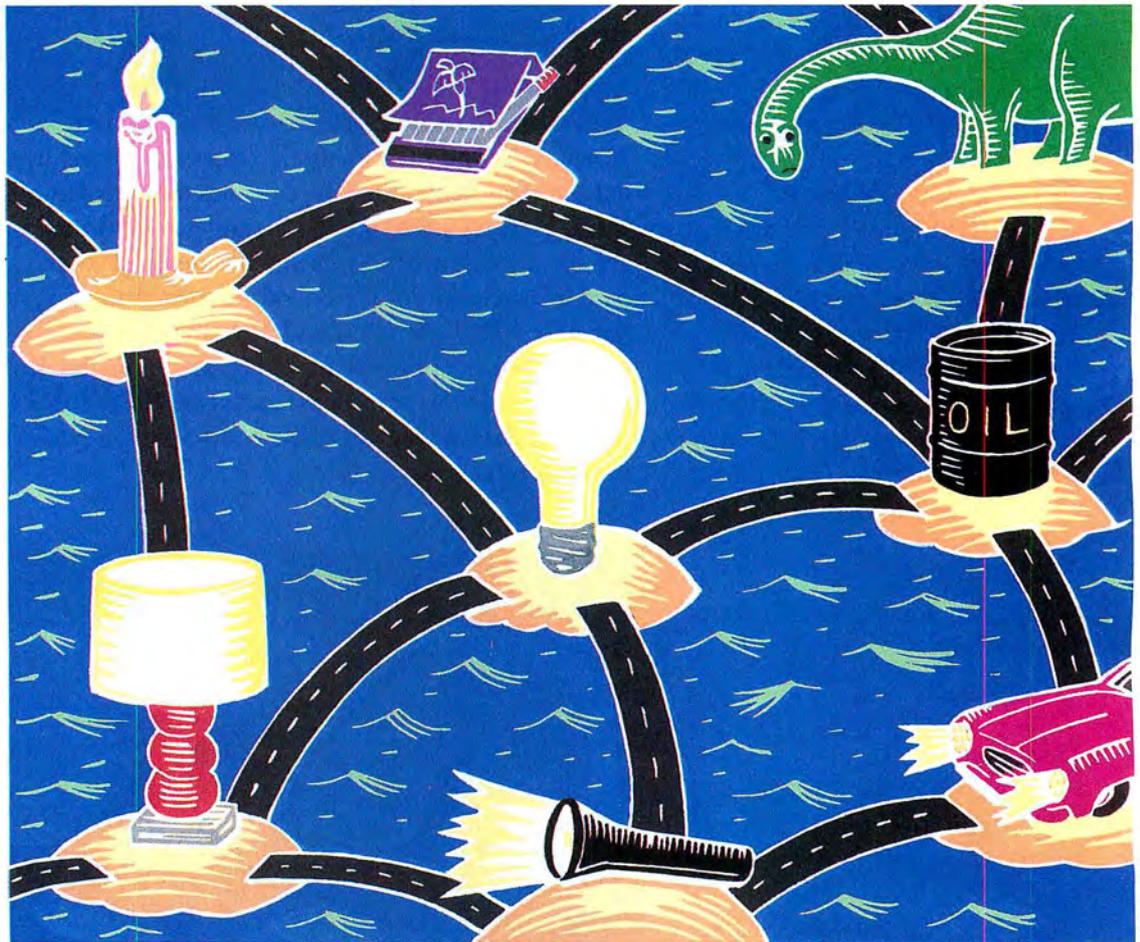
Screen 2: Within seconds, the data appears in the spreadsheet.

Built

by

TJ Byers

Association



Scott Badden

*Confronted with the CD
ROM's huge storage capacity,
programmers are looking
for ways to tag and retrieve
data. A visionary idea called
hypertext may turn out to be
the most practical approach.*

|||| Like any new technology, CD ROM holds both promise and challenge, and the light glinting off those shiny discs brings at least one problem into sharp relief. Having gigabytes of data available on a PC is all very well, but how do we locate any one specific piece of information? To help find needles in the CD ROM haystack, a visionary idea promises to mark hundreds of paths through the straw: hypertext.

The very quality that makes CD ROM so attractive—vast storage capacity—is also its biggest drawback. File directories, the mainstay of magnetic floppy and hard disks, can't effectively cope with the immense number of files a CD ROM can hold. The names wouldn't scroll across the screen for just a few seconds, but for hours. To keep data sorted in usable batches, we need something more than just a faster version of what we use now. Some claim that hypertext will be the answer.

Hypertext approaches data storage and retrieval associatively; a body of information is referenced within itself rather than to an outside directory. The ideal hypertext environment would solve the storage-and-retrieval problem by using a three-dimensional network of logical data links modeled after human intelligence.

In the meantime, a number of hypertext applications are available now, though they are pale shadows of what a true hypertext environment could provide.

■ In the Beginning

The term *hypertext* was coined by visionary writer and philosopher Ted Nelson in 1965, but the concept of an interconnected constellation of knowledge has been around for centuries. What the Hindus call *bhasha*, for example, is an approach to learning in which each question asked is pursued to its final answer, regardless of how long it takes. *Bhasha* is no rarefied theological construct, but a tool used in solving the problems of everyday life.

As a data retrieval method, the concept of hypertext was first discussed in "As We May Think," a prophetic 1945 *Atlantic* article by Vannevar Bush. Bush, Franklin D. Roosevelt's science adviser, was acutely aware of the problems associated with the growing mountain of research data, particularly that generated by the Manhattan Project.

As Bush saw it, storage and retrieval problems stem from the fact that documents are filed alphabetically by page number in a rigidly structured hierarchy of classes and subclasses modeled after library systems. Such a filing structure works well enough at the title level, but what if you have to locate something *within* a particular document? If the specific subject matter doesn't appear in

Indoor Lighting

In 1859 Moses Farmer lit his Salem, Massachusetts, house with electric lamps designed around a glowing platinum wire. These battery-powered lights were fairly primitive, however, and burned out quickly. The first successful **incandescent lamp** was tested in Thomas Edison's laboratory in Menlo Park, New Jersey, on October 21, 1879. The lamp burned for over 40 hours.

the document's title or index reference, you may well never find it.

Bush imagined a text storage system in which the documents and their context were indexed not alphabetically or numerically but by association—the way we think. Each time a new document was stored, logical links would be forged that would connect it to other documents already in storage. Later, those links could lead a researcher along paths to related documents.

To envision how a hypertext environment would work, suppose you needed information on the light bulb. In a library you might start with a document that refers to incandescent lights, such as an article on indoor lighting. If you're lucky, you'll find what you need; if not, you'll run into a dead end and have to start over again. But in a hypertext environment, just highlighting the subject in any part of a document will start you

Tracking the Hypertext Trail



Related Topics

Early history

Edison, Thomas

Scientific principles

Light

Electricity

down a path with as many branchings as your curiosity can create.

Suppose you start by selecting the word *incandescent*. In a hypertext environment, this brings up a menu of related topics, including one referring to the scientific principles behind the incandescent lamp. Choosing that item from the menu leads you to a book by Thomas Edison on how the light bulb works.

While reading about the invention of the light bulb, you learn that early incandescent lamps used a filament made of carbonized cotton instead of wire. So far, so good, but what's carbonized cotton?

The hypertext key on *carbonized cotton* suggests a document on carbon, which reveals that cotton and diamonds have a lot in common: Both are com-

Figure 1: Words can be linked to documents, which can then be displayed with a keystroke.

The Light Bulb

by Thomas Edison

I discovered that **carbonized cotton** was the best material for giving off light. Carbon has a high resistance to electricity, and it can be quickly brought to a white heat. I passed electricity through a carbonized filament enclosed in a glass container. All but one millionth part of the air had been removed from this container to keep the carbon from mixing with the oxygen and thus burning away.



posed mainly of carbon. Further inquiry leads to a piece on the formation of diamonds.

Suppose also that you come across a paper on nineteenth-century lighting methods that you might want to refer to later, in connection with a remodeling idea you have for your front porch. Like a Maine fisherman tying a red buoy on his lobster pot, you tag the document so you can find

it again. Because hypertext can support a very personal intellectual journey, you do the tagging, not a librarian. Let's say you link the nineteenth-century reference to your favorite architectural source book. Later, when you want to look up lighting again, you'll be able to find it from either document. In addition—and this is important—the link is also available to anyone else using the same hypertext environment.

Look where you've been: Cerebral serendipity has led a dance from indoor lighting to Thomas Edison to carbon and, finally, to gems, with an intriguing reference to nineteenth-century lighting along the way. All the items are related in a way that is both logical and intuitive—the way the human mind thinks (see Figure 1).

Moreover, the path is effortless, which is the central point about hypertext that Gabriel Ofesh makes in the recent book *CD ROM: The New Papyrus* (see the "CD ROM Resource Guide" in this issue). At no point in the journey were you ever without a hypertext link to some other point within the storage medium. Such a

search pattern is extremely difficult—if not impossible—to achieve using present indexing techniques. Unlike other storage schemes, hypertext has no dead ends.

■ Hypertext in Practice

The greatest challenge is moving hypertext from the crystal ball to the CRT. Talking about some universal filing system is all very well, but what has hypertext done for *you* lately? Perhaps quite a lot, as it turns out. With varying degrees of sophistication, hypertext applications are beginning to spread (see the sidebar "Guide: Do-It-Yourself Hypertext"). Some will grow with the CD ROM, and others will flourish apart from it.

It's worth noting that there are plenty of CD ROM applications where hypertext would serve no useful advantage. The structuring of 1-2-3 spreadsheets, for example, which already contain explicit linkage rules governing the relationship of data, wouldn't benefit from being in a hypertext environment.

■ Hypertext Today

Most current hypertext applications are slow and expensive: Each document must be indexed individually, and the connecting links must be hand-forged by people who know both the subject matter and hypertext methods. Because of this, software developers have implemented hypertext to only a limited degree.

The most common hypertext application occurs in text data management systems (TDMS) such as Fastware's *Thor*, Pro/Tem

Carbon

Carbon's atomic weight is 12.010, and it is tagged with the atomic number 6. Pure carbon exists in nature in two crystalline structures: black graphite and diamonds. You can also create a pure form of carbon by heating sugar until it stops smoking. Although carbon makes up less than 1 percent of all matter, it is part of all food, and exists in every form of life.



Diamonds

The diamond is the hardest natural substance known and is one of the most enduring of all gemstones; it is also one of the most valuable. Not only is it a popular choice for wedding and engagement rings, but it is widely used in industry for cutting, grinding, and boring. Diamonds consist of almost pure carbon. The small amount of impurities gives color to the gems. Most diamonds have 8 sides, forming a double pyramid. Some have only 6 sides, and others as many as 12. Diamonds were formed millions of years ago when carbon was subjected to extreme heat and pressure.

Guide: Do-It-Yourself Hypertext?

Last year, OWL International, a small company in Bellevue, Washington, startled the hypertext community by creating a program that contained neither data nor hypertext links, but only an empty screen and the tools to create a hypertext environment. In bringing out *Guide*, it was as if OWL had published a book with blank pages and had thoughtfully included a pen.

Where established hypertext products like the *Grolier Electronic Encyclopedia* supply both data and links, OWL decided to approach hypertext the other way around. *Guide* provides no set text to work from;

data is user-supplied, as are the hypertext links. Using *Guide* is as close as you're likely to get to do-it-yourself hypertext.

Suppose you are writing with *Guide's* word processor and want to add a comment, but you don't want the comment to appear in the text itself. Using what OWL calls a "button," you key onto a word in the text to create a hypertext link to a blank screen; you write the comment there. When you finish the note, you return to the main screen and proceed with the text.

Suppose further that after storing the com-

pleted text to disk in *Guide* format, you start another, unrelated document. If you decide you want to establish a relationship between the two documents, you can create a hypertext link using the tools provided in *Guide*. That link will give full access to both documents—including the comments made in the first document—from either file.

While it certainly isn't hypermedia, neither is *Guide* limited to mere text. Charts, drawings, and even photos can be inserted into *Guide* files using the program's hypertext tools.

Among the many applications offered by *Guide* are outline processing, word processing,

Software's *Notebook II*, and Paperback Software's *Executive Writer/Executive Filer*.

In most of these programs, text is cross-indexed using electronic note cards. To index part of a document, the user marks the text, calls up a note card, and jots down any appropriate keywords. (Some programs also allow the user to write notes on the card.)

The card is then stored with similar cards gathered from other parts of the document, as well as from other documents. To do a file search, a TDMS program uses Boolean operators with a keyword locator. The user specifies a keyword or combination of keywords, and the program searches all the index cards for it in much the same way that a word processor searches for word occurrences. The program reports all matches

to the user, who must then sift through the entries and pick out those that are applicable.

Obviously, this kind of retrieval lacks the ability to discriminate between keywords. Any document that happens to contain the keyword will show up in the search—an unnerving situation many of us have experienced with on-line data

desktop publishing, free-form data bases, and educational training aids. The program's graphics capabilities even enable the user to create slide shows on screen, with pictures that take their cue from paths established in the hypertext environment. The user may wander at will among the various screens, keying onto topics that are of interest, bypassing those that are not.

While *Guide* incorporates many of the functions of the earlier large-scale hypertext systems, it is geared more toward the individual than toward groups. It could turn out to be a single-user version of Xanadu. —TJB

services, which usually use TDMS indexing methods. Because of such rigidity, it is generally acknowledged that TDMS can't be considered more than rudimentary hypertext, if that.

Getting Static

"Static" hypertext is somewhat more sophisticated. This is where CD ROM and hypertext may have the most to offer each other.

The information on a CD ROM is permanent, so indexing it and creating linking tables becomes much less complex. The most impressive recent demonstration of this kind of hypertext is the *Grolier Electronic Encyclopedia* (see the "CD ROM Resource Guide" in this issue).

The Grolier project was carried out by Gary Kildall, Tom Rolander, and Tim Oren of KnowledgeSet Corporation in Monterey, California. The goal was to transfer the contents of the 20-volume *Academic American Encyclopedia* to a CD ROM and to make the information available in the form of interrelated screens; the solution was hypertext.

First, the hypertext links were forged, which turned out to be the easiest part of the project. The printed encyclopedia's key references were in capitalized bold type, so the KnowledgeSet pioneers developed a simple text-sorting algorithm to locate and index links already referenced in the text. The hypertext links were then distributed among three tables.

In the first table you can spot a reference and key onto it. This opens up a screen to a linked subject. While in that screen, you can key onto another reference, which then opens another screen, which may open another, and so forth. During this journey into the windows of knowledge, a path is maintained from the first screen to the last, so you can always find your way back to where you started.

The second table is a summary of all the references made within a given entry. Rather than plodding through a detailed report on the Ghanaian economy just to locate a reference to West African trade,

for instance, you can skip to the end of the entry where the collected references are displayed. Keying onto one of those references produces the same result as keying onto a reference from the report.

The third hypertext table is what distinguishes the Grolier effort from an upgraded form of TDMS. This final listing is an inversion table that lists all the links according to their relationship to the other links. If there is a subject you want to research horizontally, that is, across-the-board as opposed to in-depth, this table displays all other encyclopedia entries that cite the topic in their references.

Dynamic Hypertext

The Grolier encyclopedia is an example of static hypertext at its best—and at its most limited. Static hypertext is a one-way street; you can't write back to the disk. Once the text links are set, they can't be changed. In tests, KnowledgeSet's text-sorting algorithm located 98 percent of *Grolier Electronic Encyclopedia's* references. We don't know what the missing 2 percent contains, and couldn't add it if we did. How do we accommodate items that fall beyond the pale?

While combining CD ROM with magnetic media may address this problem in a limited way, the ultimate answer may come with what is usually called the "write-once read-many" (WORM) compact disc. With WORM, new links can be forged by the user as relationships between references

become apparent. This is commonly referred to as "dynamic" hypertext.

Dynamic hypertext could cut the cost of hypertext applications while improving their performance. The Grolier project, for example, didn't bother to man-

In its next incarnation, hypertext will likely support graphics and audio data bases. This is what people working in the field refer to as *hypermedia*. Here, video, sound, and text would all come together in what Ofiesh calls "a seamless carpet of knowledge."

Most analysts predict that by using WORM drives

we can achieve true hypertext within the limits of the

compact disc.

ually search for links that the text filter overlooked; it was just too expensive. But with a WORM drive, people could add those links while using the encyclopedia.

As users spot text references that don't appear in any of the hypertext linking tables, they could forge new links by writing them to the WORM drive. Such links, not identified by Grolier but noticed by sharp-eyed users, would add value to the CD ROM.

With WORM drives, users can also add new documents to the existing work. An entry on the 1992 presidential election could easily be added to the encyclopedia when the time comes, either as a publisher's update or as user-written text.

Most analysts predict that by using WORM drives we can achieve true hypertext within the limits of the compact disc. And as such drives become available in a few years, we will have a chance to test the prophecy.

If a hypermedia document about Johann Sebastian Bach referred to a certain musical passage, for instance, it would display the text, play the piece, and call up a slide show to entertain you during the performance. Efforts are already being directed toward the total integration of sight and sound in compact disc interactive (CD-I) systems, with Borland and Apple rumored to be among the active players. Meanwhile, contemporary students of hypertext are thinking along lines that sharply diverge from CD ROM technology.

Caverns Measureless to Man

"The ultimate hypertext goal is the global accumulation of knowledge," says writer Ted Nelson, who has been a tireless hypertext crusader for over 20 years. "It would be a universal publishing system where every interested person has direct access to humanity's accumulated knowledge—in effect, the ultimate publishing system where each person is both contributor and user."

This ultimate hypertext would give us instant access to unlimited amounts of updated information. Ideally, the information would grow with use, much as a muscle grows through exercise. With his visionary Project Xanadu, this is just what Ted Nelson has in mind.

While the effort is monumental, Nelson's concept is easily understood. Xanadu would start by assembling information into a large data base. Hypertext links are then forged among the data but remain hidden until called on. Whether or not the structure is complete isn't important.

Xanadu is then offered for use as an on-line, write-once environment. Anyone who wants to add new documents to the Xanadu environment or forge new links can do so, but data is never purged from the system. "Over time," says Nelson, "chains of links and interlinks grow, connecting seemingly unrelated thoughts as the information amasses and Xanadu becomes all-encompassing."

The idea of Xanadu has attracted both admirers and critics. Many authorities in the computer community feel that storing every written word in labyrinthine data bases is simply beyond human endeavor.

The Xanadu concept illustrates both the potential and the limitations of CD ROM technology. The key to implementing hypertext is the ability to constantly add new data and forge new links within a data base, which is exactly what CD ROM cannot do.

■ Hypertext and Artificial Intelligence

Ted Nelson thinks he can implement true hypertext without CD ROM; others think they can do it without artificial intelligence (AI). Originally, hypertext was thought to be so complex that it would take the power of AI to find a path through the data. This does not appear to be the case. "Too much has been made of the relationship between hypertext and AI," says

rules used by any good librarian. Once the interface places you inside the hypertext environment, further searches would be conducted through hypertext links."

Since the essence of hypertext is the dynamic linking of concepts, not everyone agrees that a system with static information cross-linked on a CD ROM is hypertext at all. Philippe Kahn of Borland, for example, dismisses the Grolier project as nothing but a fancy ap-

hypertext is still in the realm of abstraction. It seems inevitable that hypertext will become an accepted concept, but it will take time. As Machiavelli wrote in *The Prince*, "There is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things." ●

TJ Byers is a former NASA engineer and the author of several books on PC hardware.

If a hypermedia document about Johann Sebastian Bach

referred to a certain musical passage, it would display

the text, play the piece, and call up a slide show to entertain

you during the performance.

Tim Oren, the KnowledgeSet pioneer who is now with Apple Computer's optical division. "Hypertext can benefit from AI's existence, but it doesn't need it to succeed."

Oren's own storage-and-retrieval system would unite the best features of the various approaches: a CD ROM system that uses hypertext as the indexing medium and a "smart" interface between hypertext and the user. The interface would aid in the search for information on the CD ROM. "I prefer not to call it a smart system, but meaningful heuristics," says Oren. "Search patterns would be conducted according to established

plication of AI programming. "To call the Grolier project hypertext isn't accurate," says Kahn. "If Grolier is a hypertext effort, then our *Turbo Lightning* must be considered a hypertext product, and it isn't."

Borland is currently investigating CD ROM projects that have what Kahn calls "true hypertext implications," but he won't elaborate. "[Our applications] are still two to three years down the road," says Kahn, "and may never materialize if the CD ROM fails to establish itself in the PC market."

■ The Future of Hypertext

CD ROM technology and hypertext are evolving at the same time, so no doubt they will affect each other. But while people can hold and feel a compact disc,

Guide

OWL Int'l
14218 N.E. 21st St.
Bellevue, WA 98007
206/747-3203

List price: \$149.95

Requirements: Microsoft
Windows, 128K, two disk
drives, DOS 2.00 or later
version

Not copy protected

Microsoft Windows
Microsoft Corp.
16011 N.E. 36th Way
Box 97017
Redmond, WA 98073-9717
206/882-8088

List price: \$99

Requirements: 320K (512K
recommended), two disk drives,
DOS 2.00 or later version

Not copy protected

Ready When

Bryan Brewer

You Are, CD-I



*Compact discs dominate the
consumer electronics limelight,
and CD ROM is making
inroads in personal computing.
But CD-I may steal the show.*

■■■■ CD ROM and CD audio are barely upon us, and already a promising new star is waiting in the wings. Compact disc-interactive (CD-I) may upstage CD ROM and CD audio as early as this fall. The term *CD-I* describes both the data storage formats and the hardware specifications for a super CD player that will play existing music discs, read CD ROM data, and display video stills and animated graphics. A CD-I's vast amalgam of sounds, pictures, and text, stored on a 552MB optical disc, promises to inspire new ways to communicate and display information.

At least for now, though, PC users hoping to harness CD-I for business applications must be content with CD ROM. CD-I, designed to plug directly into TVs and stereos, is aimed at the home and educational markets and is geared primarily for play. Philips International and Sony, the two companies that masterminded CD audio (the digital audio compact disc) and CD ROM, envision a broad range of CD-I products, including interactive games, multimedia educational programs, interactive home reference materials, talking books, automobile navigation aids, and graphics accompaniment to music—none of which are typical corporate applications.

But PC incarnations of CD-I are possible. Because CD-I reads CD ROM formats (see Figure 1), a CD-I player can be a PC peripheral just as easily as a CD ROM player can, making multimegabyte data bases with pictures accessible to PC business users. Additionally, PC users will be able to control a

CD-I player's audio and video output in much the same way they can control a MIDI (Musical Instrument Digital Interface)-based music system.

■ It All Began With Music

CD-I springs from the most successful consumer electronics product of all time: CD audio. CD audio hit the U.S. market in 1983, and by 1986, returns from sales of compact discs and players eclipsed the dollar volume of LPs and turntables. Since CD-I machines will also play CD audio discs, hardware manufacturers are betting that consumers will find CD-I an attractive upgrade from CD audio and will eagerly move up to multimedia interactive capability.

CD-I and CD ROM discs store text and data in much the same way that CD audio discs store music. CD ROM, however, produces a binary signal that any microcomputer can read (see "CD ROM: The Little Leviathan," *PCW*, October 1986). A CD-I player contains a Motorola 68000-series microprocessor and its own ROM-based operating system software, CD-RTOS (compact disc-real-time operating system), to interweave graphics and sound with text and data. CD-RTOS is a derivative of OS-9, a UNIX-based multitasking system developed by Microware Systems of Des Moines.

The CD-I data storage standard, called the Green Book, builds on CD ROM by defining additional formats for several levels of video, graphics, and audio information. The Green Book ensures that any CD-I disc will play on any CD-I player.

Much of CD audio's financial success, however, is due to its position as the worldwide standard.

There are currently no competing digital audio disc formats. Philips and Sony hope to continue this hegemony with CD-I.

The two companies announced the CD-I format in February 1986 and presented it to industry representatives at the Microsoft CD ROM conference the following month. The announcement was timed to give the High Sierra Group, an ad hoc industry organization spearheading a CD ROM standard, time to modify their proposal to ensure CD ROM compatibility with CD-I file structures.

Although the announcement initially muddied the waters of the nascent CD ROM marketplace, Philips and Sony made clear their intention to establish a single standard for interactive compact disc applications.

■ CD-I Players and Products

Given CD-I's entertainment bent, it should come as no surprise that initial CD-I systems will, like CD audio players, be stereo add-ons rather than computer peripherals. Although no manufacturers are ready to unveil players or products just yet, several companies more familiar to the audio and video markets than to the PC market—Panasonic, Hitachi, and Denon, as well as Philips and Sony—appear eager to dive into the CD-I waters.

In addition to the Motorola 68000 series processor and CD-RTOS, CD-I players will house audio and video circuitry and from 512K to 1MB of RAM. Each player will also have video-input

and -output jacks, an input device (such as a mouse or keyboard), and one or more connectors for other devices such as printers, disk drives, or another computer.

By all accounts, the first CD-I players will cost about \$1500, but that price will likely drop as the market matures. However, don't expect the price of a CD-I player to plummet quite as fast as the CD audio player's did, from \$1000 or more to as little as \$100 in less than four years.

Audio Basics

CD-I offers four sound levels. Its highest sound level, CD audio, equals the top-quality sound produced by compact music discs.

The next three levels—high-fidelity mode, mid-fidelity mode, and speech mode—compress audio information to store large volumes of sound efficiently. These three audio levels produce sound that's roughly equivalent in quality to

that of an LP album, an FM radio broadcast, and an AM broadcast, respectively. Digital compression saves disc space and allows playing times longer than is possible with CD audio. The trade-off, however, is poorer sound quality (see Figure 2). Each CD-I sound level can produce either stereo or monophonic sound.

CD-I's four audio levels will enable program developers to mix and match the quality and quantity of sound on a CD-I. A CD-I encyclopedia's entry for Beethoven, for instance, might provide a CD-quality stereo excerpt from the *Fifth Symphony*, along with a narrated monophonic biography.

Video Magic

CD-I video is similarly flexible. A CD-I player uses three levels of color display that correspond to television studio-quality video stills, RGB computer graphics, and cartoonlike animation. It's possible to store RGB graphics information in memory for use with application software such as a

paint program. All three formats support standard televisions, high-resolution RGB color monitors, and digital TVs.

Combining these three video formats, a CD-I program can construct complex displays. With a CD-I travelogue of Paris, for instance, you might first use a grid map to select the section of the city you'd like to visit. An animated "talking head" tour guide could then usher you through the Louvre or point out the sights as you stroll along the Champs Elysées.

Interactive Applications

More than likely, the first wave of interactive compact disc products for business will add CD-I features to existing CD ROM applications. A CD-I version of Compact Disclosure's CD ROM data base, for example, could create the look and feel of an annual report by adding graphics to the data base's Spartan financial data.

In the office, CD-I dictionaries could pronounce words and display illustrations. Inventory catalogs could contain pictures of products and demonstrate how they work. Marketing presentations on CD-I might use narration, music, and animated graphics to help sell products and services.

Auto maintenance training programs could show future mechanics how to rebuild a carburetor step-by-step or how to interpret engine sounds. On the shop floor, a CD-I program could lead new workers through the operating procedures for complex machin-

CD-I and Compatibility

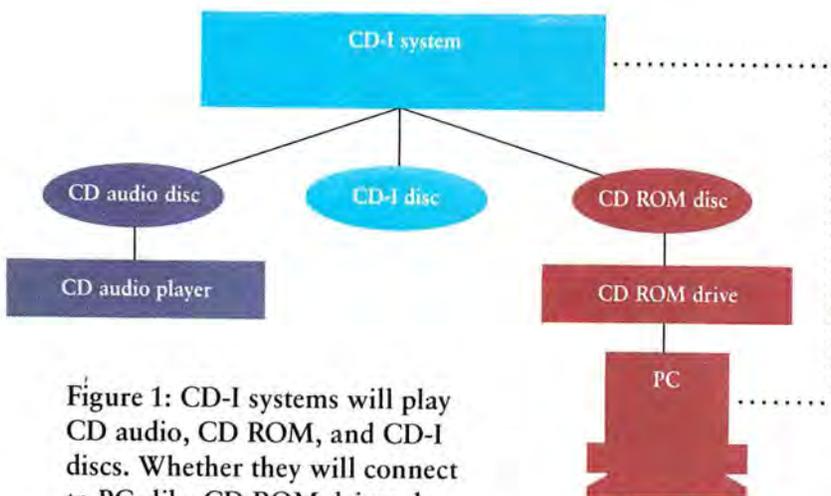


Figure 1: CD-I systems will play CD audio, CD ROM, and CD-I discs. Whether they will connect to PCs like CD ROM drives do remains to be seen.

ery. Other potential uses include interactive parts catalogs and multimedia reference works.

Entertainment, education, and self-improvement software will be CD-I's *métier*. Adding high-fidelity audio and color animation will endow these programs with added realism. A learn-to-paint program might enable you to compare your work on canvas stroke-by-stroke with an on-screen version of a masterpiece by Rembrandt or Cézanne.

CD-I Faces the Bottom Line

For all its potential, CD-I must still find its way from the drawing board to dealer shelves. Philips, majority owner of PolyGram Records, the world's largest recording label, is sparing no effort to promote CD-I.

To get the CD-I ball rolling, Philips/PolyGram has funded several business ventures. One of these is The Record Group (TRG), a Burbank, California, CD-I production and publishing outfit. TRG is currently working on 15 titles slated for release with the first CD-I players in late 1987.

One TRG product in the works is *The Time Machine*, a world history program based on ever-fluctuating geopolitical maps. The program displays changes in the world's political boundaries at a rate of one year per second beginning from 500 B.C. You can stop at any year and view the world's "headlines" or hear a report on key historical events.

Across town in West Los Angeles, a second Philips/PolyGram venture, American Interactive Media (AIM), seeks to form joint ventures with software publishers and other information providers to

produce software for CD-I. AIM calls its products "edutainment" programs; they range from flight simulation to music composition.

Philips also hopes to encourage independent CD-I developers by creating a CD-I production services venture—in essence, a CD-I optical printing company—with one of the world's largest printing companies, R.R. Donnelley & Sons of Chicago. Called Opt-Image, this company will offer CD-I publishers complete production services, including applications design, software development, data encoding, and assistance with audio and video supplementation of existing material.

Pleasure Before Business

Will CD-I succeed? Will it find its way onto corporate desktops? On both counts, it's far too early to tell. CD-I hardware manufacturers are clearly aiming at the home and entertainment markets, primarily because CD-I's musical abilities can tap into the market pioneered by CD audio. Until CD-I develops an installed base sufficient to ensure its economic stability, business applications will likely be put on hold.

Ultimately, CD-I's impact on the business market will depend on whether it becomes a useful tool in the technology mix of the office. For business operations, which are primarily text-oriented, CD ROM will do just fine.

Just the same, an optimistic PolyGram forecast last year projected that 1.7 billion compact disc players would be in the hands of consumers worldwide by 1995. If

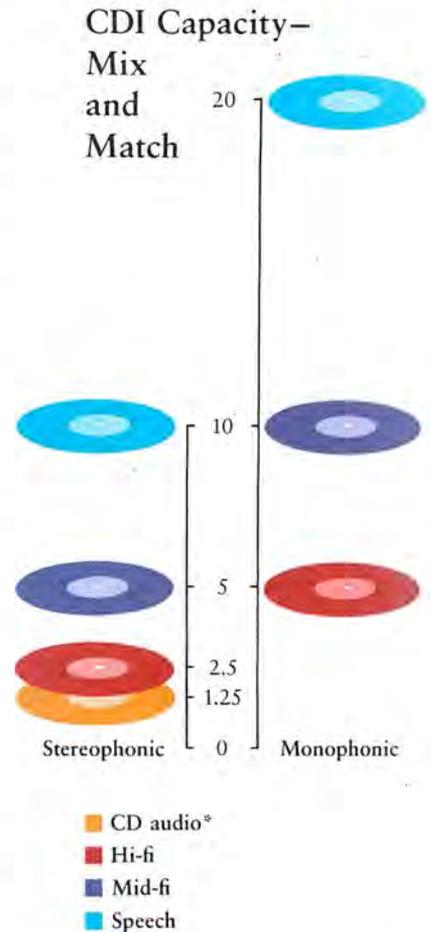


Figure 2: Approximate playing times in hours for CD-I audio

* Not available in monophonic

only 1 in 100 of those is a CD-I player, it represents an installed base of 17 million CD-compatible machines. With those kinds of numbers, CD-I may well usher in a new era of electronic global publishing. ☉

Bryan Brewer is president of Earth View, a Seattle company specializing in interactive applications for compact discs. He is also contributing editor to Digital Audio magazine and CD ROM Review.

CD ROM Resource Guide



Scott Baldwin

Edited by Wes Nihei

CD ROM Drives

Hitachi CDR-1502S
Stand-alone 552MB drive connects with up to four other CD ROMs

Hitachi Corp.
OEM Division
1200 Wall St. W
Lyndhurst, NJ 07071
201/935-5300
List price: \$1050
Requirements: 256K, DOS 2.00 or later version

Hitachi CDR-2500
Internal half-height 552MB drive
Hitachi Corp.
List price: \$1000
Requirements: 256K, DOS 2.00 or later version

Hitachi CDR-2500S
Stand-alone 552MB drive
Hitachi Corp.
List price: \$1100
Requirements: 256K, DOS 2.00 or later version

LMS CM 200
Internal half-height 600MB drive; also available as stand-alone unit (formerly Philips CM 100)
Laser Magnetic Storage Int'l
200 Park Ave. #5501
New York, NY 10166
212/578-9400
List price: \$1000, available third quarter 1987
Requirements: 64K, DOS 2.00 or later version

Panasonic SQ-D1
Half-height internal 540MB drive
Panasonic Industrial Co.
2 Panasonic Way
Secaucus, NJ 07094
201/392-4602
List price: \$1495
Requirements: 256K, DOS 2.00 or later version

Panasonic SQ-D101
Stand-alone 540MB drive
Panasonic Industrial Co.
List price: \$1695
Requirements: 256K, DOS 2.00 or later version

Romulus
Stand-alone 540MB drive
KnowledgeSet
2511 Garden Rd., Ste. C
Monterey, CA 93940
408/375-2638
List price: \$849
Requirements: 256K, DOS 2.00 or later version

Sony CDU-100
Stand-alone 540MB drive
Sony Corporation of America
Optical Memory Group
675 River Oaks Pkwy.
San Jose, CA 95134
408/280-0111
List price: \$915
Requirements: 256K, DOS 2.00 or later version; hard disk recommended

Sony CDU-5002
Full-height internal 540MB drive
Sony Corporation of America
List price: \$840
Requirements: 256K, DOS 2.00 or later version; hard disk recommended

Toshiba XM 2000
Full-height internal and stand-alone versions, 600MB or 680MB
Toshiba America, Inc.
Disk Products Division
3910 Freedom Circle #103
Santa Clara, CA 95054
408/727-3939

List price: not available at press time

Requirements: not available at press time

CD ROM Applications

Financial

Compact Disclosure version 2.0
Data base of text and financial information on 11,000 public corporations

Disclosure Information Group
5161 River Rd.
Bethesda, MD 20816
301/951-1300

List price: with CD ROM player \$3500, with CD ROM player and quarterly updates \$4500

Requirements: 256K (512K recommended), DOS 2.00 or later version

CD/Corporate

Four disks containing financial information on 10,000 publicly traded industrial, technology, consumer, and service companies in the United States

Datext Inc.
444 Washington St.
Woburn, MA 01801
617/938-6667

List price: annual subscription with monthly updates \$9600 per disk, all four disks \$19,600

Requirements: 512K, hard disk, DOS 2.00 or later version

CD/CorpTech

Profiles, product descriptions, and key-executive information for 14,000 high-technology companies

Datext Inc.

List price: annual subscription with quarterly updates \$7500

Requirements: 512K, hard disk, DOS 2.00 or later version

One Source

Nine financial data bases, including Compustat, Value Line, Daily Stock Price History, and Disclosure II

Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
617/577-8500

List price: \$11,000 to \$30,000
Requirements: 512K, DOS 2.00 or later version

PC Plus

Compustat data base containing 20 years of financial information on 6500 U.S. companies
Standard & Poor's Compustat Services
7400 S. Alton Ct.
Englewood, CO 80112
800/525-8640

List price: not available at press time

Requirements: 640K, 10MB hard disk, DOS 2.00 or later version

Your Marketing Consultant

Data base of demographic information for U.S. states, counties, metropolitan areas, and television markets

Bill Communications
633 Third Ave.
New York, NY 10017
212/986-4800

List price: with access software \$1900

Requirements: 512K, DOS 2.00 or later version; hard disk recommended

References

BiblioFile

Catalog of the Library of Congress
The Library Corporation
P.O. Box 40035
Washington, DC 20016
800/624-0559, 304/725-7220

List price: with CD ROM player and monthly updates \$2930, with monthly updates \$1470 per year, with quarterly updates \$870 per year

Requirements: 512K, two disk drives, DOS 2.00 or later version

Books in Print

Annual bibliography of all books published in the United States
R.R. Bowker Co.
205 E. 42nd St.
New York, NY 10017
212/916-1605

List price: three-year subscription with Sony CD ROM player \$1210, three-year subscription with Hitachi CD ROM player \$1155, annual subscription \$895

Requirements: 512K, two disk drives, DOS 2.00 or later version

Dissertation Abstracts on Disk
Data base of 900,000 doctoral dissertation titles dating from 1861; abstracts start from June 1980

University Microfilms Int'l
300 North Zeeb Rd.
Ann Arbor, MI 48106
313/761-4700

List price: 1861 to June 1980 \$5495, July 1980 to 1986 \$995
Requirements: 512K, hard disk, DOS 2.00 or later version

ERIC

Bibliographic data base developed by the U.S. Department of Education containing education-related research and journal articles

Dialog Information Services
3460 Hillview Ave.
Palo Alto, CA 94303
415/858-3785

List price: 1966 to present with quarterly updates \$3450 per year, 1981 to present with quarterly updates \$1950 per year
Requirements: 384K (640K recommended), hard disk, DOS 2.00 or later version

Grolier Electronic Encyclopedia
Grolier's 20-volume Academic American Encyclopedia
Grolier Electronic Publishing
95 Madison Ave. #1100
New York, NY 10016
212/696-9750

List price: \$199, with CD ROM player \$1495; yearly updates \$24.95

Requirements: 256K, DOS 2.00 or later version

Ulrich's International Periodical Directory

International bibliography of regularly issued periodicals, updated quarterly

R.R. Bowker Co.

List price: three-year subscription with Sony CD ROM player \$710, three-year subscription with Hitachi CD ROM player \$655, annual subscription \$395

Requirements: 512K, two disk drives, DOS 2.00 or later version

Wilsondisc

Ten-disk set of periodical indexes including Reader's Guide to Periodical Literature, Business Periodicals Index, and Applied Science & Technology Index

H.W. Wilson Co.
950 University Ave.
Bronx, NY 10452
212/588-2266

List price: not available at press time

Requirements: 640K, hard disk, DOS 3.10

Legal

Optext

Full text of the Code of Federal Regulations

VLS Inc.
5215-11 Monroe St.
Toledo, OH 43623
419/882-8819

List price: \$695, Optext Research and Retrieval Software \$595

Requirements: 512K, hard disk, DOS 2.00 or later version

Science and Medicine

Aquatic Sciences and Fisheries
Data base of abstracts on the biology and ecology of marine and freshwater environments

Cambridge Scientific Abstracts
5161 River Rd.

Bethesda, MD 20816
800/638-8076

List price: with quarterly updates \$2250

Requirements: 360K, two disk drives, DOS 2.00 or later version

Life Sciences Collection version 1.0

Citations from 5000 journals, books, monographs, conferences, and patents in various fields of the life sciences, including microbiology, neuro-

sciences, biochemistry, and ecology

Cambridge Scientific Abstracts
List price: 1982 and 1983 \$750,

1984 and 1985 \$750, 1986 with quarterly updates \$975

Requirements: 360K, two disk drives, DOS 2.00 or later version

The McGraw-Hill CD ROM
Science and Technical Reference Set

Collection of 7300 articles from the McGraw-Hill Concise Encyclopedia of Science and Technology and 98,500 terms from the Dictionary of Scientific and Technical Terms

McGraw-Hill, Inc.
1221 Avenue of the Americas
New York, NY 10020
212/512-3474

List price: \$300

Requirements: 640K, DOS 2.00 or later version; hard disk recommended

Medline version 1.0

Biomedical data base of abstracts from 3500 medical, dental, and nursing journals

Cambridge Scientific Abstracts
List price: 1982 to 1985 \$750 each, 1986 with quarterly updates \$975

Requirements: 360K, two disk drives, DOS 2.00 or later version

PsycLIT

Information on psychology and behavioral sciences from the American Psychological Association

SilverPlatter Information, Inc.
37 Walnut St.
Wellesley Hills, MA 02181
617/239-0306

List price: with quarterly updates
\$4995

Requirements: 512K, two disk
drives, DOS 2.00 or later
version

General Interest

A-V Online

Data base of audiovisual materials
from the National Information
Center for Educational Media
SilverPlatter Information, Inc.
List price: \$795

Requirements: 512K, two disk
drives, DOS 2.00 or later
version

PC-SIG Library

Compilation of 605 programs
from PC-SIG's software library
PC-SIG

1020 E. Duane Ave., Ste. D
Sunnyvale, CA 94086
408/730-9291

List price: \$195, with two up-
dates \$395, individual update
\$150

Requirements: 64K, one disk
drive, DOS 3.10

Services

Data Base Transfer to CD ROM

Batelle Software Products Center
505 King Ave.
Columbus, OH 43201
614/424-7387

Knowledge Access
2685 Marine Way #1305
Mountain View, CA 94043
415/969-0606

Reference Technology, Inc.
5700 Flatiron Pkwy.
Boulder, CO 80301
303/449-4157

Reteaco, Inc.
1051 Clinton St.

Buffalo, NY 14206
800/387-5002

CD ROM Disk Replication

Digital Audio Disk Corp.
1800 N. Fruitridge Ave.
Terre Haute, IN 47805
812/466-6821

Discovery Systems
555 Metro Pl. N
Columbus, OH 43017
614/761-2000

3M Optical Recording Project
3M Center, Bldg. 225-4S-09
St. Paul, MN 55144
612/736-9581

Books

CDI and Interactive Videodisc
Technology
Howard Sams & Co.
4300 W. 62nd St.
Indianapolis, IN 46268
317/298-5400
List price: \$24.95

CD ROM Vol. I: The New
Papyrus
Microsoft Press
16011 N.E. 36th #97017
Redmond, WA 98073-9717
800/638-3030
List price: \$21.95

CD ROM Vol. II: Optical
Publishing
Microsoft Press
List price: \$22.95

Essential Guide to CD-ROM
Meckler Publishing
11 Ferry Ln. W
Westport, CT 06880
203/226-69677
List price: \$29.95

Publishing With CD ROM
Meckler Publishing
List price: \$29.95

Periodicals

CD Data Report
Langley Publications, Inc.
1350 Beverly Rd. #1151-324
McLean, VA 22101
703/241-2131
Cost: \$225 per year

CD-ROM Review
CW Communications, Inc.
80 Elm St.
Peterborough, NH 03458
603/924-9471
Cost: premier issue \$3.95, bi-
monthly from March 1987
\$19.97 per year

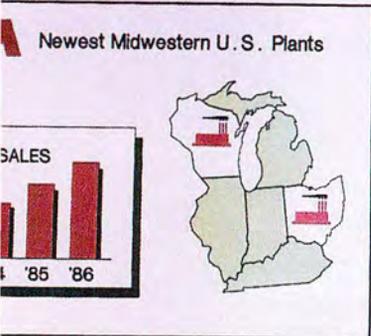
The CD ROM Sourcebook
DDRI
6609 Rosecroft Pl.
Falls Church, VA 22043
703/237-0682
Cost: \$525 per year

Optical Information Systems
Meckler Publishing
Cost: \$95 per year, biweekly up-
dates \$189.50 per year

Optical Information Systems
Update Library and Information
Center Applications
Meckler Publishing
Cost: \$65 per year

Optical Memory News
256 Laguna Honda Blvd.
San Francisco, CA 94116-1496
415/681-3700
Cost: \$295 per year

The Videodisc Monitor
Future Systems, Inc.
P.O. Box 26
Falls Church, VA 22046
703/241-1799
Cost: \$227 per year

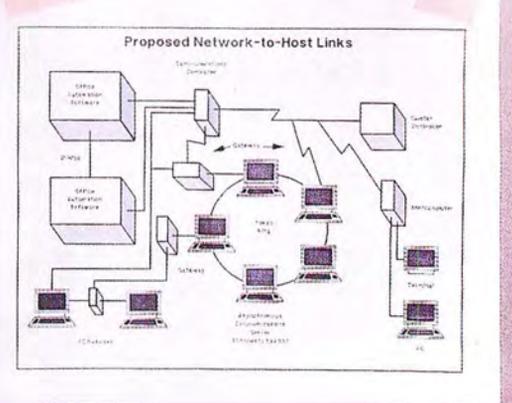


From the Desk of
Jonathan Smith
Manager, ESD Division

PRIORITY	ITEM	RESULTS
1		
2		
3		
NOTES		

Activity Planner

NOVEMBER						
SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
		1	2 Site Prep.	3	4	5
6	7 Tokyo	8	9	10	11	12
13	14	15 Dallas	16	17	18	19
20	21	22 Prod. Eval.	23	24 Thanksgiving	25	26
27	28	29	30			



Lotus® always wanted to get into pictures. It was just a matter of getting the product exactly right. That's why Freelance® Plus is big news. It's a powerful graphics package for business that adds real punch, real impact to all your work. Whether it's memos, reports, forms, bulletins, schedules or full-blown presentations.

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The Report Card on Alpha Corporation

- ✓ People
- ✓ Products
- ✓ Recognition
- ✓ Distribution
- ✓ Growth
- ✓ Profits

Customer Service Dept.
 Metro-Manufacturing Group, Inc.
 2501 W. Shawmut Blvd.
 Chicago, IL 60649

Bulletin for March/April 1986

New Phone System

This spring our department will be installing a new phone system to handle the growth that has occurred at Alpha since our last office expansion. The new system will allow us to handle the growing number of calls that we receive from our customers. This new system will also allow us to handle the growing number of calls that we receive from our suppliers.

New Supervisor

A new supervisor will be starting work in the Customer Service Dept. in the month of April. The new supervisor will be responsible for the day-to-day operations of the department. He will be working closely with the other supervisors in the department to ensure that we are providing the best possible service to our customers.

Good Work!

For the month of March our total number of completed calls was 1,234. Our quality score was 98%. We thank you for your hard work in the past two years and we look forward to your continued success in the future.

SAMPLE KEYBOARD

↑ FUNCTION KEYS ↑ TYPEWRITER KEYBOARD ↑ NUMERICAL KEYPAD

TRAINING GUIDE, Figure 2

One Program
 charts, symbols
 diagrams, etc., etc.

*Overheads
 + Slides, too.*

Automotive Products

Sales in millions June 1986

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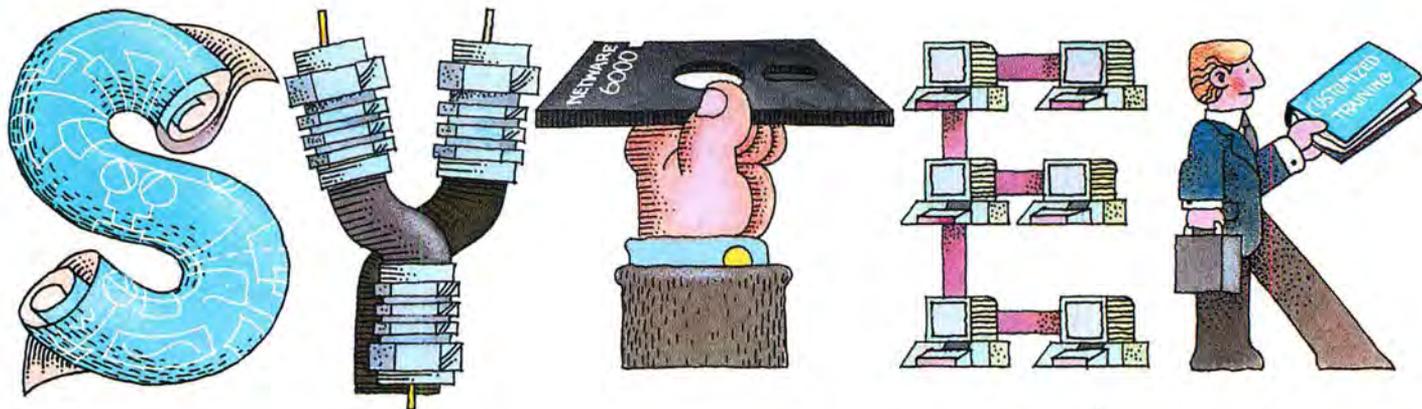
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Mr. J. C. Ryan, President
Flossmoor Soup Company
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August 1, 1987

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1988	\$7,300,000	\$2,100,000
1989	\$8,400,000	\$2,600,000
1990	\$9,300,000	\$4,800,000
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Spring 1987



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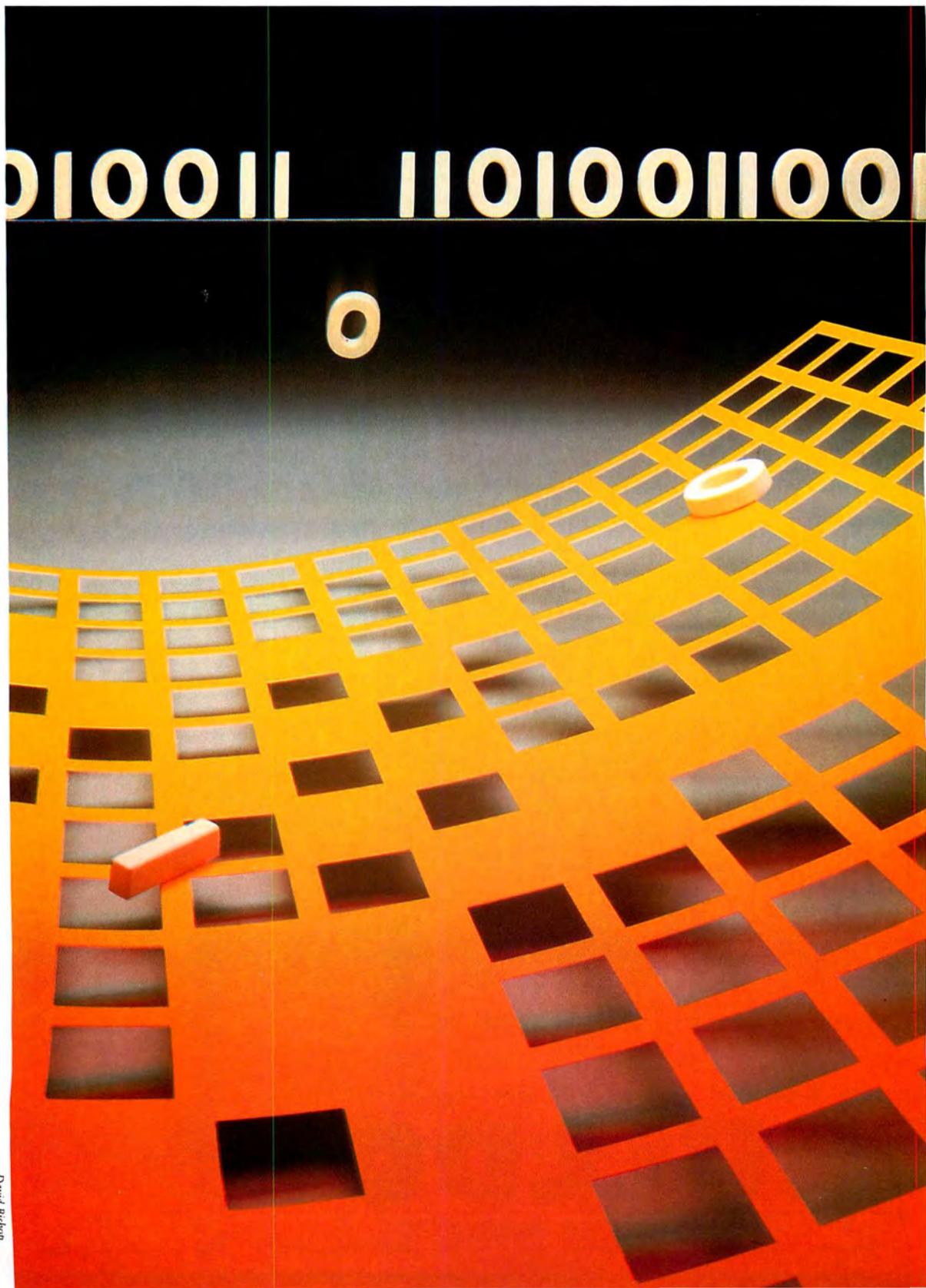


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Network Security Strategies

Local area networks encourage data sharing but can easily succumb to data pilfering and destruction. Here's solid advice on how to keep your LAN as leakproof as possible.

Judy Getts

■■■■ The Freedom of Information Act may be a triumph of democracy, but it wasn't intended to apply to the information on your local area network (LAN). Regrettably, LAN administrators often learn this lesson the hard way: Someone sabotages a file that was supposedly off-limits. A week after passwords are assigned, they're as familiar around the department as mug shots at the post office. Or worse, data compiled during seven months of market research somehow slips out the back door with an ex-employee.

Nightmares like these abound, and virtually every network manager can regale you with such stories. Most network supervisors, however, are simply too preoccupied with keeping the LAN working (and responding to the grievances of users when it isn't) to focus on an issue so peripheral to other concerns. But as LANs become ever more crucial company and departmental data-passing systems, the need to ensure

that data isn't shared willy-nilly becomes more acute (see "Network Management: Tips and Traps," *PCW*, September 1986).

"Companies must recognize that when they start hooking together PCs, it's imperative that security be established in a more formal manner," says consultant David Ferris, chairman of the Ferris Corporation in San Francisco. He estimates that 95 percent of all local area networks lack basic security. Ferris calls that state of affairs "very bad business."

The prevailing casual attitude toward security comes as no surprise to those who live with the issue day to day. A recent Ernst & Whinney survey of data security professionals revealed that 81 percent incurred some financial loss as a result of porous or nonexistent computer security provisions, and many cited LANs as an area of special vulnerability.

Data security practices and policies should be an outgrowth of common business sense. And whether your LAN links 5 PCs or 5000, establishing a LAN security regime early in the network's life should be a top priority. It may take time and more than a little thought, but in the long run that effort will spare you, as network administrator, needless hassles. Moreover, it will help guarantee that your company's data doesn't fall into unfriendly hands.

Charting the Path

Ideally, you should evaluate your data security needs well before purchasing and installing the network.

What kind of network topology is most secure? By design, ring and star configurations are less susceptible to sabotage than bus-structured layouts, where pulling out a T-connector dooms the entire network (for more on physical security, see the sidebar “Hardware Hints”).

What level of protection should the network operating system provide? Is the degree of security in sync with features included in the multiuser applications you want to run? Novell’s *Netware* requires that each user enter a password to log on to the LAN; IBM’s *PC Network* doesn’t; and 3Com’s *3+Share* makes a log-on password optional. *Netware*’s security hinges on assignable access rights, *PC Network*’s on passwords to files and directories, and *3+Share*’s on a combination of the two. *Netware* doesn’t store files in DOS format, so it’s impossible to gain access to files simply by restarting the server and loading DOS.

Do any departments, such as payroll, rely on data that is best kept off the screens of other PC users within the work group? Might such users be linked via their own LAN? If a dedicated LAN isn’t feasible, you’ll need to take extra care in building security around such information. Note that such applications as data management add a layer of security to the network and must be monitored along with the LAN’s own data protection procedures. Applications can include their own encrypted user names and passwords, tamper-detection checksums, audit trails, automatic data recovery techniques, and data privacy utilities.

Unfortunately, hindsight is usually far more acute in such situations than forethought. More often than not, it’s the LAN administrator who must deal with security in all its ramifications once the LAN is in place. That responsibility typically begins with the assignment of user access privileges to programs and data residing on the server.

Depending upon the network software, you’ll have a variety of access levels to assign. These include the most basic privileges—such as read-only, which permits a user to read a file but no more, or read/write/delete, which allows a user not only to read and write to a file but also to erase it.

Novell’s *Netware* provides eight basic access rights—read, write, open, create, delete, search, modify, and parental (which gives a user complete rights

Whether your LAN links 5 PCs or 5000, establishing a LAN security regime early in the network’s life should be a top priority.

within a certain area of the network, including creation of subdirectories and control of other users’ rights). Rights can be assigned on a user-by-user basis, to groups of users, or to directories. And files themselves can be assigned a status of read-only, read/write, shareable, or nonshareable.

Netware is distinguished in part by its log-in scripts capability. Administrators can tailor scripts that specify the files a user can and cannot access—even the times of day that certain applications can be used (only from 9 to 5 for the data base, for example). Log-in scripts are ideal for rendering everything but certain applications off-limits to a given user.

3Com’s *3+Share* is less elaborate. Users can be given either regular or administrative rights. Administrators can perform such network maintenance tasks as modifying password and access rights at the application level of the server’s directory; altering the print queue, passwords, and access rights; and moving users to different servers. Regular users can create their own subdirectories, authorize others to use as little or as much shared disk space as they wish, and change their own portion of the print queue.

3Com’s system includes three levels of directory access—read, write, and create (which encompasses the ability to delete). A directory can also be flagged

Control File Access for Data Security

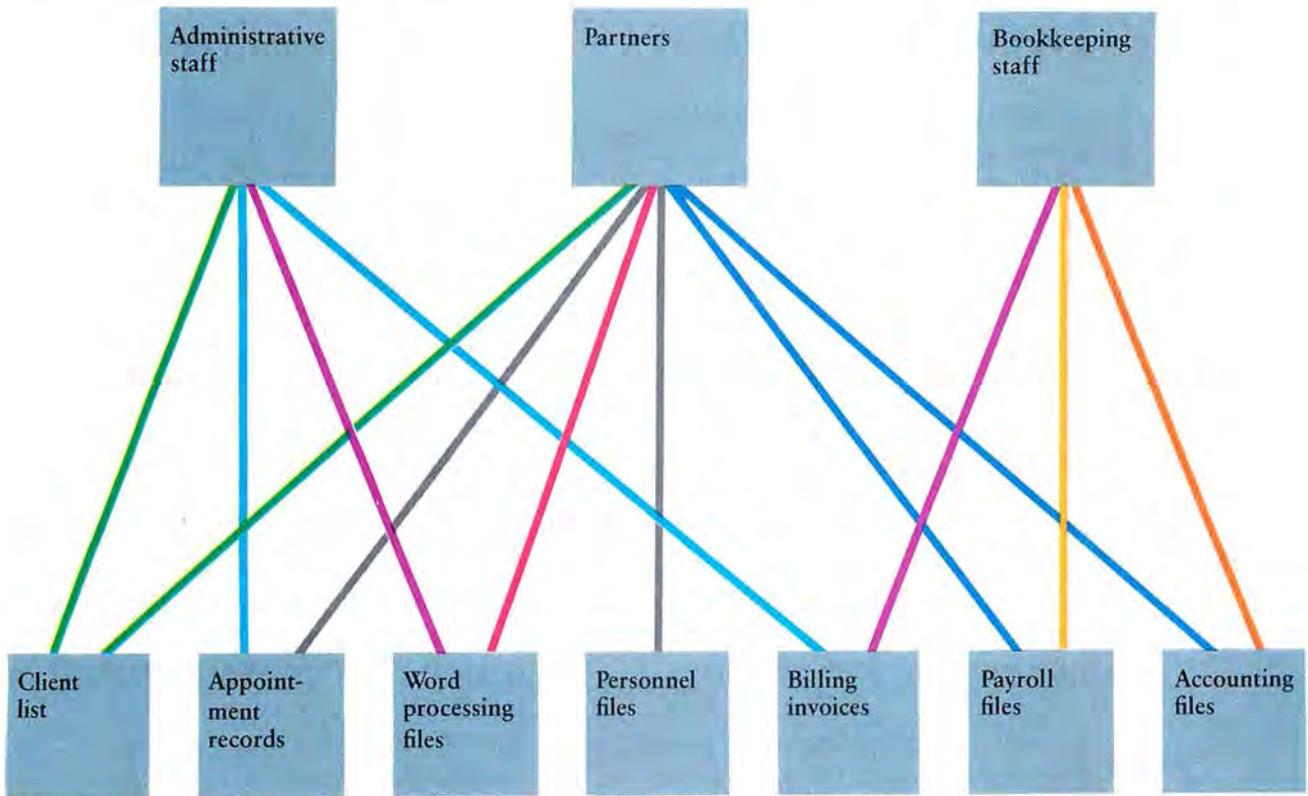


Figure 1: This schematic illustrates data access levels and the ways data is shared among groups of network users.

- Read, open
- Read, open, search
- Read, write, open, create
- Read, write, open, create, search
- Read, write, create, search, modify
- Read, write, create, search, modify, delete
- Read, write, open, create, search, delete
- Read, write, open, create, search, modify, delete

private (which permits only single-user access), public (which enables anyone to read a file in it but not create or write to a file), or shareable (which lets users read, write, and create files in that directory).

usage and on how freely information can flow within your department or company. If yours is a department marked by high personnel turnover, a constant barrage of confidential projects, or a stream of government contracts, access will need to be assigned accordingly.

Start by mapping out which groups of employees get access to what kinds of data. Create a schematic, similar to an organization chart, showing how data will be shared among these groups and then build on that (see Figure 1). Add individuals to the

■ The Eyes Have It

Few hard-and-fast rules exist to help you determine who needs just read-only access to word processing files and who's entitled to read/write/create access to a given data base. Access assignment can be a complex task—so much so that companies like Novell offer courses on the subject. How these access rights are allotted ultimately depends upon LAN

Hardware Hints

Once you've secured the LAN's data stream, direct your attention to network peripherals. Don't give short shrift to physically protecting the file server. Sensible security may not be the most economical course of action, but it's certain to pay off over time. You may have to shell out for a dedicated server (one not used as a workstation) that can be locked in a room by itself.

It's not even farfetched to consider padlocking the unit to the table so the machine won't mysteriously vanish one morning. If the server has a keyboard, remove it so unauthorized fingers will find it difficult to tamper with the net. If you can't do without a keyboard and you've got an AT compatible or a 386 system, use the front-mounted keylock—and take the keys. If you lack a spare room, consider purchasing furniture that can house the server securely. Furniture designed for the task typically includes a locked cupboard to store the unit.

Although a rigorous file backup schedule lies more in the domain of network housekeeping than in the realm of security, consider a quick, convenient removable storage device—like a Bernoulli box—as your backup vehicle. Western Digital's Versastak line of modular, cableless storage devices may also do the trick. Whatever medium you use, lock it up at night.

If the LAN is linked to other departmental networks and carries information not suited for broadcast—like general ledger or payroll data—the connection should be by way of a *router*. A router is simply a dedicated microprocessor that shuttles messages between workstations; it passes to other LANs only information that is properly addressed.

Modems should not be tethered to network workstations unless absolutely necessary. If a modem is set for auto-answer, an outsider may be able to call in, make a few wild stabs at passwords, and with luck obtain access to the LAN and its cargo of data. If a modem must be connected to the network, it should be on a callback basis, which requires that a caller enter a password, log off, and await a return call at a preset telephone number.

Securing individual workstations is more ticklish. Doing so with complete assurance is almost impossible; the most practical approach is to stash start-up disks under lock and key each night and hope for the best. That approach is mandatory if network passwords are stored in batch files on a floppy disk, as they are on IBM's *PC Network*.

Although diskless PCs are often lauded for helping secure an office environment (on the theory that someone without a floppy drive can't possibly download confidential data), network consultants rarely recommend them for anything but such security-

conscious establishments as military bases and aerospace contractors.

One argument against diskless workstations holds that by taking local storage away from a PC, you're transforming it into a terminal. Diskless workstations obviously can't be used for any of the desktop applications for which PCs are intended. If your need for information control is that demanding, it's more economical to purchase a terminal outright. Diskless workstations have also been known to pose other complications for LANs; some networks require that a special ROM chip be added to the network interface board.

You might also want to consider redirecting the drives of some PCs so that their users can no longer download information from the server. This tactic isn't as draconian as it sounds. When the network is accessed, such users' A: and B: drives logically become those drives on the server—which precludes copying information to local drives. This tack is not as restrictive as relying on a diskless workstation, because users retain local storage for local applications. Similarly, it's more generous than read-only access, because users can continue to create and modify shared data. —J. G.

groups and list the applications they'll be using, along with the level of access each requires (see "A Matter of Public Record," *PCW*, May 1985).

The most important axiom is also the simplest: If people don't need access to something, don't give it to them. As Novell spokesperson Michael Durr explains, "You want each [user on the LAN] to have the view of the world that he or she needs to have, but no more."

For each class of data, you should supply a dollar amount for the potential loss to the company should that information be destroyed or divulged to outsiders.

Don't hesitate to assign full access, or supervisor's rights, to one user other than yourself. If you leave the office, or if a glitch in software keeps you from accessing the LAN, you can rely on a backup supervisor who has full privileges to access files and directories.

As you begin to govern access to information, you might also want to chart out the various types of data that will reside on the network and rank those types in order of confidentiality. If something is so sensitive it could harm the company if revealed—information about a hostile takeover bid, a lawsuit, a decision to cut the dividend—the most expedient solution may be to remove it from the LAN altogether and store it on removable media that can be locked away at night. Although subtracting sensitive data sounds like a quick way to fill the net with scattershot information, in practice this restriction does not undermine the LAN for most users.

The list will keep priorities uppermost as you assign access. Some consultants advise that for each class of data, you should supply a dollar amount for

the potential loss to the company should that information be destroyed or divulged to outsiders—an effective tactic for keeping you and your supervisors aware of the value of safeguarding information on the LAN.

Once you've granted access rights and privileges, create an access reference sheet for each employee, listing the data to be accessed, the reason for

Figure 2: This employee access reference sheet for Novell's Netware tracks data to be accessed, states why access is necessary, delineates the user's access privileges, and specifies applications required.

Name: Larry Trachte
Position: Research coordinator
Applications: Word processing, data management, printing
Directory: Word processing subdirectory/market reports—European markets
Privileges: Read, write, open, create, delete, search, modify
Reason: Must oversee research on, and creation of, reports for overseas markets
Directory: Word processing subdirectory/market reports—East Asia markets
Privileges: Read, write, open, create, delete, search, modify
Reason: Must oversee research on, and creation of, reports for overseas markets
Directory: Word processing subdirectory/departmental correspondence
Privileges: Read, write, open, create, search
Reason: For department supervision
Directory: Data base subdirectory/market statistics—European markets
Privileges: Read, write, search
Reason: Needs to update data, information needed for reports
Directory: Data base subdirectory/market statistics—East Asia markets
Privileges: Read, write, search
Reason: Needs to update data, information needed for reports

access, the user's access privileges, and the applications required (see Figure 2). Over time you'll inevitably expand some users' privileges and limit others', so be sure to keep your records up to date.

As the network is used, you'll gain a more realistic fix on security needs. That sophistication, coupled with changes in personnel and work assignments, may alter the information flow markedly. In most LANs there's no technical hardship in modifying user access rights, but there may be a political price to pay. One company's initial hands-off approach to security led to open rebellion when the need to tighten procedures arose. Nonetheless, when staff members move on, it's imperative that you cancel their access rights to departmental files and applications.

Of Menus and Audit Trails

The ability to sharply define user access via the LAN operating system is the backbone of network security, but other software tools can help as well. Most useful are programs that enable you to create custom menus for each user or group of users, effectively confining them to specific applications. Insulating users from DOS has benefits for management as well as for security. If users unschooled in PC and network decorum cannot access the DOS prompt, they cannot wreak havoc on shared files. In the absence of safeguards, users may be prone to litter data base directories with spreadsheet files, or far worse, enter a command like DEL \ unwittingly in the root directory. A few simple steps, however, can deter even a skilled user armed with DEBUG from network mischief.

3Com's *3+Share* enables the network manager to set up windowlike menu systems and include up to seven levels of password protection. The latest version of Novell's *Netware* also provides a means of moving users out of harm's way, and other LANs, such as Torus Systems' *Tapestry*, are designed expressly for safe and easy navigation around the network. Indeed, with *Tapestry*, you can tailor Macintosh-like icon menus for each user (see Screen 1).

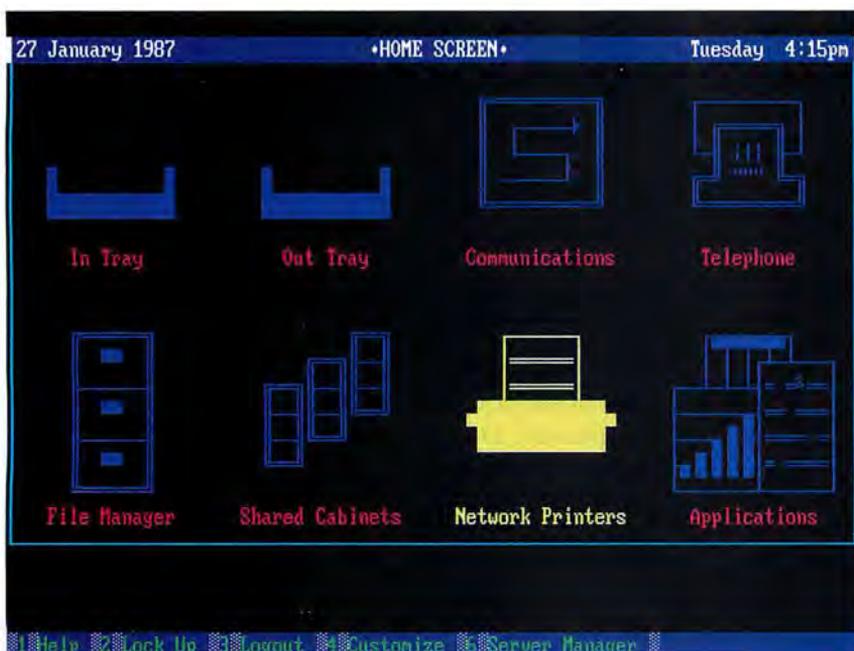
Even if your LAN lacks such a menuing capability, several utility programs can pick up the slack, and some toss in a network activity audit trail that can help trace security breaches. Harvey Software's *ProDisk Control*, a RAM-resident pop-up, enables you to create a menu system for each user by linking menus to the user's password. The program also keeps a log of individual network usage, time-stamping access to various shared applications.

Cyber-Tech's *CT-MACS* similarly permits you to fashion custom menus. It too is RAM-resident and includes a network auditing feature, as well as a macro capability that can serve up applications and accommodate user responses. Also in the ballpark is *Direct Net* from Delta Technology. *Direct Net* is essentially a network version of *Direct Access*, the company's popular hard disk menuing utility. With it, you can create up to 20 two-level menus for each user and maintain a log of network usage.

Because the bulk of PC-based networks and multiuser applications now support IBM's NETBIOS standard, your program and network operating system will likely agree on file- and record-locking conventions. It's important, however, to distinguish between *data integrity*, which concerns the protection of data shared among users who have identical access rights, and *data security*, which deals with the various levels of access.

The ability to sharply define user access via the LAN operating system is the backbone of network security, but other software tools can help as well.

You may never need to scout around for application software that provides data security features beyond those included in the network operating system. Still, if your LAN is passing critical financial data, you may want to look closely at the security provisions of newly emerging LAN applications. *dBASE III Plus* includes encryption capabilities in addition to multiple levels of password protection. *MDBS III*, from Micro Data Base Systems, is festooned with sophisticated security options. This heavyweight data manager includes password protection, selective encryption of data fields or records, and literally thousands of levels of definable access. *MDBS* also provides an audit trail that logs user name, time of access, and nature of transaction, including a record of commands entered.



Screen 1: Tapestry, a network operating system shell from Torus Systems, enables you to create Macintosh-like icon menus for each LAN user, thereby discouraging wayward forays into shared data.

Cracking Encryption

On a network, encryption software is best used selectively, not indiscriminately. Encrypting data can be time-consuming, even with “low-security” encryption routines. In addition, if any part of an encrypted file is damaged—even a single bit—the file will be unrecoverable. What’s more, if your network and application software provide efficient file security, encryption just isn’t necessary.

Figure 3: LAN Security Checklist

- List types of shared information.
- Map out how information will be shared.
- Install separate LANs for sensitive data.
- Assign access rights based on need.
- Create and maintain a data base of users and their access rights.
- Store highly confidential information on removable media.
- Install a menuing system to govern access.
- Redirect local drives to limit downloading.
- Rename selected DOS commands, like FORMAT.
- Flag command and executable files ‘execute only’.
- Assign full network access to a backup administrator.
- Make encryption software available to users.
- Secure the file server under lock and key or remove its keyboard.
- Lock up start-up floppy disks each night.
- Disconnect modems from the LAN or connect only call-back modems.
- Establish a formal data security policy governing password and network usage.
- Impress on users the importance of keeping passwords confidential.
- Instruct users on methods of password selection.
- Ensure that users fully understand the significance of network security.

Encryption is most appropriate for highly confidential data stored on a workstation’s hard disk to which several users have access. Alternatively, groups of employees or your supervisors may wish to encrypt shared data that they’d rather you, the network administrator, not see (this of course assumes that your network provides you with complete access to all files).

If files must be encoded, it is wiser to do so on workstations than on the server, primarily because encryption itself tends to be processing-intensive (see “Speaking in Codes,” PCW, May 1985).

Password Politics

You’re almost ready to let users in. Before you do, be sure to rename such dangerous commands as Format, with which neophyte users can inadvertently bring down the walls. Command and executable files installed on the server should be flagged read-only so they cannot be corrupted.

Passwords are the network’s Achilles’ heel. Easily forgotten, they’re as communicable as the common cold. Assign users passwords to access the LAN

On a network, encryption software is best used selectively, not indiscriminately. Encrypting data can be time-consuming.

and their files only once. Thereafter, let users choose their own. Be clear about the rules of password selection: no obvious terms like *IBMPC* or *LAN*; no nicknames; no names of pets, children, or spouses—or users’ own names, for that matter. Instead, promote the use of nonsense strings that don’t need to be written down to be remembered. Perhaps even more important, never insert passwords into batch files.

In most instances, you should change passwords every two to three months. If there’s heavy foot traffic around workstations, however, you should

change passwords more frequently. In one psychiatric clinic, passwords are changed daily, both because of passersby and because of the highly private nature of files on the server.

Remember not to turn your desire for security into an obstacle to network access.

A final word about passwords: Some LANs have password administration utilities that periodically change passwords. Using such tools is convenient but may not be prudent policy. Don't automatically or arbitrarily change passwords; a user may not receive the new one in time, and the change could be disruptive. Remember not to turn your desire for security into an obstacle to network access.

The Human Dimension

Despite your most diplomatic efforts at instituting LAN security, some users will inevitably—and understandably—bristle at the restrictions you impose. Passwords and other precautions seem to get in the way of work. But without the support of network users, much of your work on security can go for naught. (For a handy review of network security procedures, see Figure 3.)

What can you do? Strive to create a working environment in which security concerns become second nature. Says Howard Conrad, a consultant with Network Consulting Associates of Gaithersburg, Maryland, "Educate users to understand that data is critical and that the loss of any data may damage the company. That's the best security you can have." ●

Judy Getts, a Contributing Editor for PC World, writes on communications issues from Wauwatosa, Wisconsin.

CT-MACS
Cyber-Tech, Inc.
323 S. Franklin Bldg. #C-380
Chicago, IL 60606
312/938-0026
*Requirements: 48K, DOS 2.00
or later version*
*List price: single-user version
\$49.95, network version
\$449.95 per server*

Direct Net
Delta Technology Int'l, Inc.
1621 Westgate Rd.
Eau Claire, WI 54703
800/242-6368, 715/832-7575
*Requirements: 192K, DOS 2.00
or later version*
List price: \$195 per server

MDBS III
Micro Data Base Systems
P.O. Box 248
Lafayette, IN 47902
800/344-5832, 317/463-2581
*Requirements: 256K, one disk
drive, DOS 2.00 or later version*
*List price: single-user version
\$3900*

ProDisk Control
Harvey Software
P.O. Box 06596
Fort Myers, FL 33906
800/231-0269, 813/482-8600
*Requirements: 85K, DOS 2.00
or later version*
List price: \$99.95 per server

How to Avoid Networking

If you don't want to invest in a complicated and expensive local area network, consider linking your PCs and peripherals with simple switch boxes and an electronic mail service. These inexpensive alternatives tackle many of the same problems a LAN is employed to solve.

Donald B. Trivette



Local area networks (LANs) connect and share computer devices and data. They are by nature complicated to install, complicated to maintain, and, more often than not, complicated to operate. They require dedicated hardware and software, as well as a bundle of money. If you want connectivity but prefer to avoid complexity, there are low-cost alternatives. Economical and easy-to-use switch boxes perform a LAN's basic functions: sharing peripherals such as printers and modems and transferring data files among PCs. Add a subscription to

an electronic mail service, and you can pass data to a PC across the room or across the country.

Keep in mind that a low-budget network doesn't provide some key LAN features. Users won't be able to work from the same program files or simultaneously access data files. But you also won't have to foot the average LAN's \$1000-per-workstation bill.

However, one of the most glaring restrictions of any peripheral-sharing network (including LANs) is the limited distance a device may be located from the source computer. Serial devices, such as serial printers or modems, may be linked by hundreds of feet of cable without problem. But faster, more



Jeffrey Neubury

sensitive parallel devices are limited to 12 to 50 feet of cable, depending on the quality of the cable used. While a local area network uses shielded coaxial cable and signal repeaters to strengthen transmissions and extend a network's reach, an unaided switch system is limited to a small group of computers and peripherals in proximity to each other. This factor alone may determine whether you can get by without investing in a LAN.

When considering any kind of simple switch system, bear in

mind cables' inherent limitations and use high-quality cables. For parallel-port applications where even a superior cable is inadequate, Intellicom's \$179 *Long-Link* device converts a parallel transmission to serial and back to parallel, extending a parallel device's reach to 7000 feet.

Switches come with a variety of connections: Some have Centronics connectors, some have D-shell connectors, and some have one or more cables already built into the switch. Study manufacturers' catalogs and literature to determine the kinds of connectors on the switch, and then make a list of the

cables you'll need. There are few things as frustrating as needing a male-to-female cable and finding you have three male-to-male cables. Cables can be expensive, so to compare prices accurately, you must know what cables come with the switch and how many you'll need to buy.

■ One Computer and Several Printers

One common problem is configuring a single PC to work with multiple printers. For example, you might want to use a dot matrix printer for quick drafts and a letter quality or laser printer for presentation work. Because most printers require a parallel port and most PC systems provide only one serial and one parallel port, connecting both printers to the PC simultaneously may be impossible; the draft printer may be quietly gathering dust while the higher-quality printer feverishly carries the brunt of the workload.

Placing the printers side by side and swapping their cables back and forth is a workable but inelegant solution. A simple A-B

switch costing between \$80 and \$200 does the trick. Over 60 manufacturers offer switching devices, with models for every possible computer configuration.

An A-B switch is a small box with three connectors on the back and a rotary switch with positions marked *A* and *B* on the front. Two printers (either parallel or serial, but not one of each) and one computer plug into the cabinet (see Figure 1). When the switch is turned to *A*, the computer is connected to one printer; when turned to *B*, the computer is connected to the other printer. A-B switches are also available in A-B-C and A-B-C-D configurations to support up to four peripherals. Pay attention to your printer interfaces: If one printer is parallel and the other serial, you can't use a mechanical switch to change from one peripheral to the other. (Nor is one necessary. After using the DOS MODE command to set the parameters of the serial port to which one of the printers is connected, you can use the command MODE LPT1: = COM1 to select the serial printer, and MODE LPT1: to select the parallel printer.)

■ Several Computers and One Printer

In a location where several computers only occasionally need to print documents, sharing one printer is generally economical and practical. While you could simply place the printer on a rolling cart and move it from PC to PC, a more convenient hardware alternative is a printer-sharing switch (see Figure 2), which costs

from \$80 to \$200. Designed in configurations that enable two, three, or four computers to share one printer, the switch is usually located near the printer. When someone needs a printout, he or she turns the switch dial to the setting for the appropriate PC. If other computer users try to send data to the printer when someone else is printing, they receive a busy signal.

If two computers need to share two printers, a \$200 crossover switch works well (see Figure 3). Consider, for example, a small office with a PC connected to a dot matrix printer and an AT connected to a laser printer. When the PC user needs the laser printer, he or she throws the crossover switch to its alternate setting, swapping the dot matrix printer for the laser printer. The AT user ends up—albeit temporarily—with the less attractive dot matrix output. Crossover switches support only two computers and two printers. For more complicated switching arrangements, you need an electronic switch.

High-end laser printers with internal electric switches, such as the Okidata Laserline 6, can connect several computers directly to a printer, thereby spreading the printer's cost among several machines. When one user is sending data to the printer, the other computer users receive a busy signal if they try to print.

This type of electronic switch is less expensive than those that

buffer the output from other computers until the first job is finished. A well-equipped printer buffer such as Black Box Products' \$649 Multi-Port Spooler II stores up to 54K of data from up to five computers and automatically sends the jobs to a printer in the order received. Digital Products' \$795 Print Director 6-S connects five computers to one printer and provides a 256K buffer.

■ Many Computers, Many Printers

An electronic switch is the preferred mediator when you want to hook together more than four devices (more than two computers and two peripherals, for example) or when you want to orchestrate peripheral switching without leaving your computer. For multiple computers to select among multiple printers, an electronic switch must be programmed for every possible system configuration, requiring a lengthy and difficult installation process. In addition, each computer must run software to send instructions to the switch.

Digital Products' NetCommander 16/250 is a good example of a "smart switch" that can coordinate up to four computers and three printers. Although you can't connect a serial to a parallel device, NetCommander enables four serial devices and three parallel devices to exchange data freely. The serial ports from the two PCs in the earlier example may be connected to two of the switch's four serial connectors; three printers with parallel interfaces may be connected to the switches' three parallel connectors (see Figure 4). Two serial printers or two addi-

tional PCs can then be connected to the NetCommander's two remaining serial connectors.

Once the mechanical connections are made, an installation program customizes the switching software and downloads it to the switch itself. This involves answering questions about the data transfer speeds and the locations of the various devices and giving each connection a unique name such as LASERPR, DOTMX, or NECLQ. The switch's backup power supply saves the configuration file if power is lost.

In operation, you select a printer by running a PC program that presents a menu of device choices. Selecting LASERPR, for example, sends a character string to the switch that configures the correct connection between the PC and the laser printer. If another PC is using the laser printer, the output from the second PC is buffered and saved until the laser printer is available.

Electronic switches range from \$300 for a relatively simple configuration to just under \$3000 for the NetCommander, with its internal Z80 processor and battery backup. Electronic switches, such as those from Crosspoint Systems, present *SideKick*-like menus that pop up within an application, so you can select a printer at any time. Less convenient switches force you to select the appropriate printer before running an application.

Five LAN Alternatives

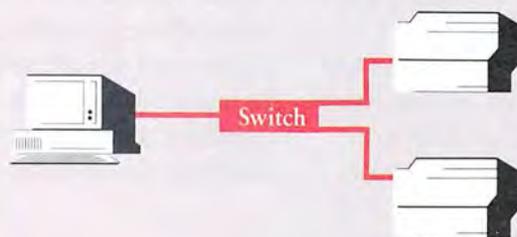


Figure 1:
An A-B switch allows one PC to use either of two printers.

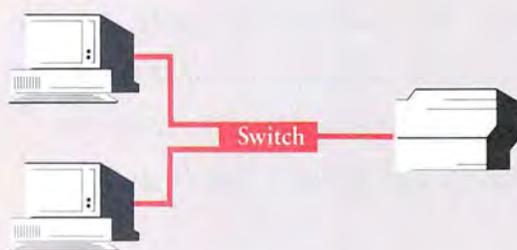


Figure 2:
Two computers share one printer through an A-B switch.

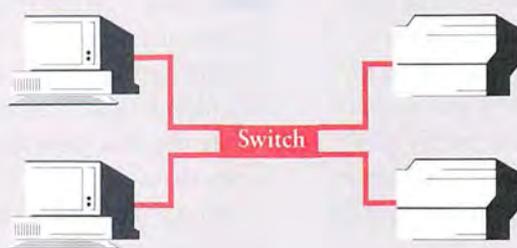


Figure 3:
A crossover switch allows either of two PCs to use either of two peripherals.

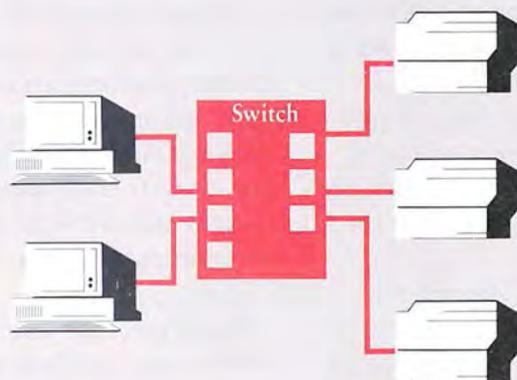


Figure 4:
An electronic switch enables two PCs to send serial data to any of three parallel devices.

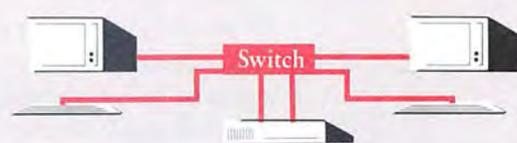


Figure 5:
Multiple keyboards and monitors can be connected to a single PC.

Unusual Connections

Other low-cost network applications defy neat classification. Intra Computer offers a \$195 switch that connects one computer with two keyboards and monitors, thus allowing two workers to share a single PC (see Figure 5).

the computer is connected to a serial printer; in a third, the computer is connected to a modem; and in a fourth position, a modem is connected directly to a printer for unattended printing of telecommunicated data. Intra Computer sells this jewel for \$200.

New York can send sales statistics to an IBM PC user in Los Angeles by transferring the file through MCI. E-mail has become so popular that Lotus Development and MCI developed *Lotus Express*, a RAM-resident program that simplifies tedious telecommunications tasks by automatically uploading and downloading messages to and from the service (see *Product Outlook*, PCW, March 1987).

You send data files to another computer inexpensively using a wide area network consisting of a modem, communications software, and an electronic mail service such as MCI.

Physically connecting computers is particularly useful when transferring data from a laptop to a PC. Such a task requires that the serial port on one computer be connected by a null modem cable to a serial port on another computer. The cable convinces each computer that it is connected to a modem when no modem is present. This is done by connecting the "send" pin of the serial port of one PC to the "receive" pin of the other PC's serial port, and vice versa. IQ Technologies' Universal Smart Cable SC 817, a sophisticated null modem cable, figures out the type of device at each end and configures itself accordingly.

The Kano Group's PC Buddy links as many as eight keyboards and monitors to a single computer. Each workstation is wired to the next using up to 500 feet of coaxial cable. When one user is connected to the computer, all other screens and keyboards are locked out.

Applied Computer Systems' switch connects multiple PCs in a manner reminiscent of college language labs. From a master control, an instructor can look at the screen of any PC in class, display the instructor's screen on any or all student screens in the class, or show any student's screen to the entire class.

Another unusual switch—the Delta 3-Way Switch—connects any two of three serial devices. For example, in one switch position, all connections are open; in another,

Shared Data

Besides connecting shareable peripherals, networks earn their keep by enabling users to share data files without having to distribute the data physically on floppy disks or tapes. There are several ways to create simple file-sharing networks without resorting to a LAN.

You send data files to another computer inexpensively using a wide area network consisting of a modem, communications software, and an electronic mail service such as MCI. The hardware and software combination costs no more than \$250 per PC, and transmitting a file costs as little as 45 cents.

E-mail users can send data to another user's mailbox and download data without coordinating the efforts of the two computers. E-mail is also useful when the data formats of the sending and receiving computers differ, because text is sent in industry-standard ASCII code. An Apple Macintosh user in

To transfer data with Smart Cable, you run a standard PC communications program on the sending and receiving computers. For example, *Crosstalk's* Go Local command establishes a connection so you can download or upload files as though the two computers were connected by modems. But the computers transfer data at a searing 9600 bps, four times faster than with a 2400-bps modem.

These transfer methods do not actually share data between computers; instead, they copy data

from one PC's storage device to that of another. True data sharing occurs when two or more machines can access and update data from a single storage device. Only PC LANs and minicomputer and mainframe computer networks support such sophisticated operations.

Lo-Cal Area Networks

■ Circuit-switching devices fill the gap between an expensive LAN and no network at all. If your system includes no more than four to six PCs and two peripherals, and you don't need the heavy-workload, multiuser capabilities of a full-scale LAN, a mechanical or electronic switch box teamed with an electronic mail service could provide all the device and data sharing you need. Common sense dictates, and experience confirms, that the most reliable solutions are the least complicated ones. The bottom line: Keep it simple. ●

Donald B. Trivette is a freelance writer and consultant based in Wrightsville Beach, North Carolina.

2-Position and 3-Position Data Directors

Computer Accessories Corp.
6610 Nancy Ridge Dr.
San Diego, CA 92121
800/582-2580, 800/582-0852
California, 619/457-5500
List price: 2-Position Data

Director \$99.95, 3-Position
Data Director \$149.95

Crossover Switch, Delta 3-Way Switch, A-B Switches

Intra Computer, Inc.

101 W. 31st St.
New York, NY 10001
212/947-5533

List price: Crossover Switch

2C-2P (2 computers to 2
printers) \$220, 2C-1P (2
computers to 1 printer) and
1C-2P (1 computer to 2
printers) \$165; Delta 3-Way
Switch \$200

Crosspoint 8 and AB+

Crosspoint Systems

1710 Willow Creek Circle #14
Eugene, OR 97402

800/225-7781, 503/485-4254
List price: Crosspoint 8 \$795,
AB+ \$495

The Logical Connection

Fifth Generation Systems

7942 Picardy Ave.
Baton Rouge, LA 70809

800/225-2775
List price: 256K \$495, 512K
\$595

Long-Link

Intellicom

9259 Eton Ave.
Chatsworth, CA 91311
800/992-2882, 818/882-8866
List price: \$179

Lotus Express

Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
617/577-8500
List price: \$100

MCI Mail

MCI Telecommunications Corp.
2000 M St. NW
Washington, DC 20036
800/424-6677, 202/293-4255
List price: monthly subscription
\$18 per PC; sending up to 500
characters 45 cents, 501 to 7500
characters \$1, each additional
7500 characters \$1

Multi-Port Spooler II

Black Box Products

P.O. Box 12800
Pittsburgh, PA 15241
800/552-3800, 412/746-5565
List price: 5 to 1 (5 computers to
1 printer) \$649, 4 to 2 (4
computers to 2 printers) \$749

NetCommander 16/250 and

Print Director 6-S

Digital Products, Inc.

108 Water St.
Watertown, MA 02172
800/243-2333, 617/924-1680
List price: NetCommander
\$2950, Print Director \$795

PCBuddy

Kano Group

106-314 E. Holly St.
Bellingham, WA 98225
800/663-8552, 604/669-5200
List price: first station \$425 plus
keyboard and monitor,
additional stations \$199

Universal Smart Cable SC 817

IQ Technologies

11811 N.E. First St.
Bellevue, WA 98005
206/451-0232
List price: \$49.95

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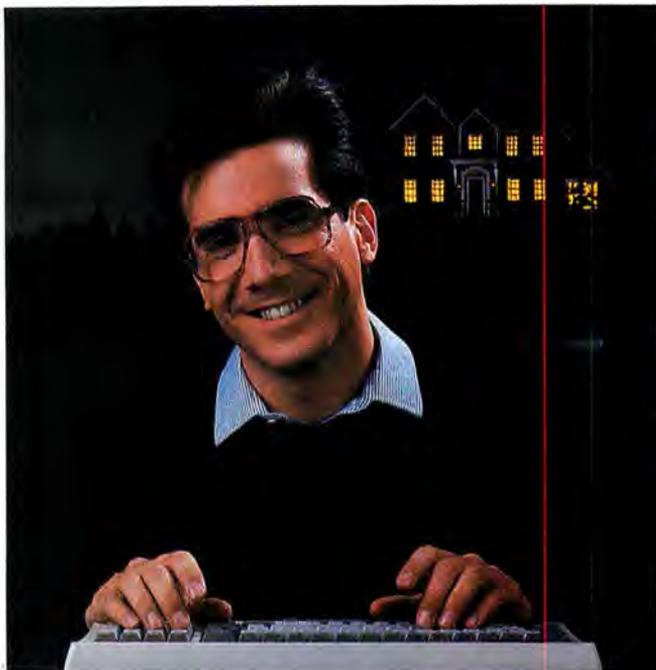
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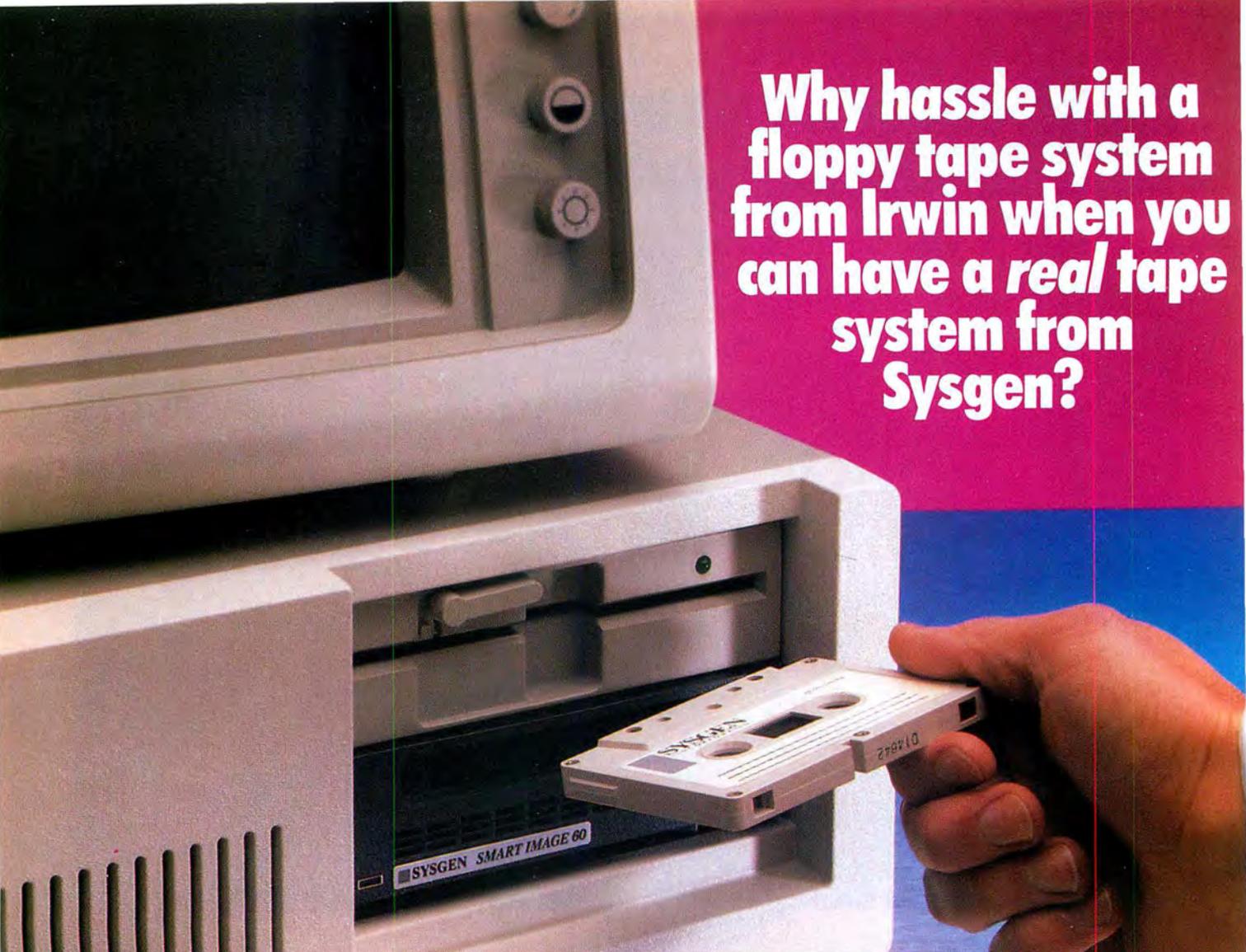


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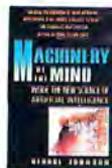
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Sourcebooks

Further explorations into personal computer technology

This month: two sides of AI, a compendium of PC tricks and tools, and an all-too-basic primer on desktop publishing

Michael Harper



AI Range Wars

Machinery of the Mind: Inside the New Science of Artificial Intelligence

George Johnson

Times Books, New York, 1986

336 pages

\$19.95 hardcover

Author George Johnson writes for the “curious nonspecialist,” but his book *Machinery of the Mind* is much more than a good layman’s guide to machine-programmable models of human thought and creativity.

Johnson does an exemplary job of explaining complex ideas without either mystifying or patronizing the educated general reader. The hype surrounding artificial intelligence (AI) makes it hard to distinguish science from science fiction, but this comprehensive and detailed survey is a trustworthy guide. Moreover, Johnson is not afraid to tackle the profound philosophical issues involved, so he has a lot to say not only about machines and programs but also about what is involved in being human.

In addition to all this, his story has some of the drama and conflict of a best-selling novel. AI researchers are divided into “scientists” and “engineers,” and they resemble the ranchers and farmers of the Old West in that they don’t always see eye to eye.

If you believe the scientists, the cowardly engineers have chickened out on the challenge of cognitive modeling—the struggle to understand the mysteries of the

human mind. They have settled instead for knowledge engineering and intelligent artifacts—clever programming that provides the results of human thinking in a narrow field without pretending to replicate the human process. Engineers are engaged in an undignified scramble to be first into the marketplace with expert systems, which draw upon the accumulated knowledge of specialists but cannot creatively transcend the specific rules and heuristics programmed into them. (But expert systems have other attractions for the business world—as one brochure puts it, they “don’t get sick, resign, or take early retirement.”)

According to the engineers, the scientists are ivory-tower academics whose demand that current AI programs be based upon an impeccable theory of human cognition is simply pie in the sky. An accurate representation of human thinking is still a dream, but knowledge engineers have already created expert systems that can diagnose illnesses better than many doctors or successfully predict where valuable mineral fields will be found. An authentic engineer believes that true AI will be achieved by inspired tinkering, “by building systems one after the other, seeing what works and what does not.”

The scientist/engineer schizophrenia sometimes infects individual AI researchers. Roger Schank, the Yale “scientist” who also founded a firm that “engineered” natural-language front ends for corporate computers, told a 1984 convention: “Because we’ve promised so much . . . we must produce working systems.

(continues)

Reprinted Without Permission from PC Magazine

Column: **Dr. Dr. Zucker 'Cures'**

The First Cure for Slot-Phobia

Sunnyvale, CA, December 1986



Many of you know me by my pretty face, full length lab coat and infamous stethoscope from our company ads (ATD), and from seeing me joking and having fun at industry functions. 2,000 people at a Comdex party started yelling for "Dr. Dr. Zucker" after some bozo band member stopped a song and announced that a famous person was at the event.

To all my fans out there, all I can say is ... thank you. To those of you who don't know what to make of me, yes, I am a little zany, and "Dr. Dr." is not a typo, but a take-off on "Major Major" in "Catch-22". Speaking of typos, a Canadian publication recently did a feature on the success we've had with our "Zuckerboard" line of add-on boards. The headline called me "The Crown Prince of Add-on Boards." Later in the story, I was called the "Clown Prince" of add-on boards. I'm not sure if that was a typo or a pretty good observation. Hey, I enjoy what I'm doing.

Although I'm a real doctor (Ph. D type), the lab coat and stethoscope symbolize the fun I get out of fixing things or making things work better. In fact, this column (the first in a series that will appear every other issue), is about one of my recent discoveries, a cure for "slot phobia".

Everyone wants to save money, be more productive and be better prepared for the future. I've come up with a prescription for each of these — ATD's new "First Cure" for slot phobia.

The "First Cure" for slot phobia is a half card primary board with 1 Meg or 128k plus 0.5 Meg of external memory that snaps into another secondary half card. Since each half

card has all the power and function of a standard long card (and more), the two cards together are equivalent to two long cards in just one slot.

As with most strokes of genius, this one is so simple and obvious that everyone else overlooked it except yours truly, who came up with the idea while tinkering in my laboratory. With the First Cure, for example, you can get as much memory as you want in only one expansion slot by pairing the two half cards. The secondary board can be traded in at any time for credit toward a higher density expansion board in easy to swallow and affordable increments of 1, 2, 4 or 8 megs on the second board.

What I've done is offer users more memory now, plus upward expandability in the future without obsoleting the initial purchase or having to use up valuable slot space.

It wasn't too long ago when 64k of memory seemed like more memory than anyone knew what to do with. Two years ago, Intel and Lotus came out with the expanded memory standard — two and three megs of memory. Last year, IBM introduced DOS 3.2, which allows up to 16 megs as a virtual disk on the AT. More memory enhancement is on the horizon. Our board supports the IBM standard for the AT.

As the industry matures, users will want to add more and more memory and functions. With my cure for slot phobia, you can do this easily and economically up to 9 megabytes in a single slot. The "First Cure" is so simple, it's hard to explain in a column. It's sort of like trying to play Mozart with a kazoo rather than a full symphony. Contact us or ask your dealer for more information.

Note: Dr. Dr. Zucker (Matt Zuckerman, Ph.D.) is president of ATD, Inc. of Sunnyvale, CA, 235 Santa Ana Court, (408-720-1938).

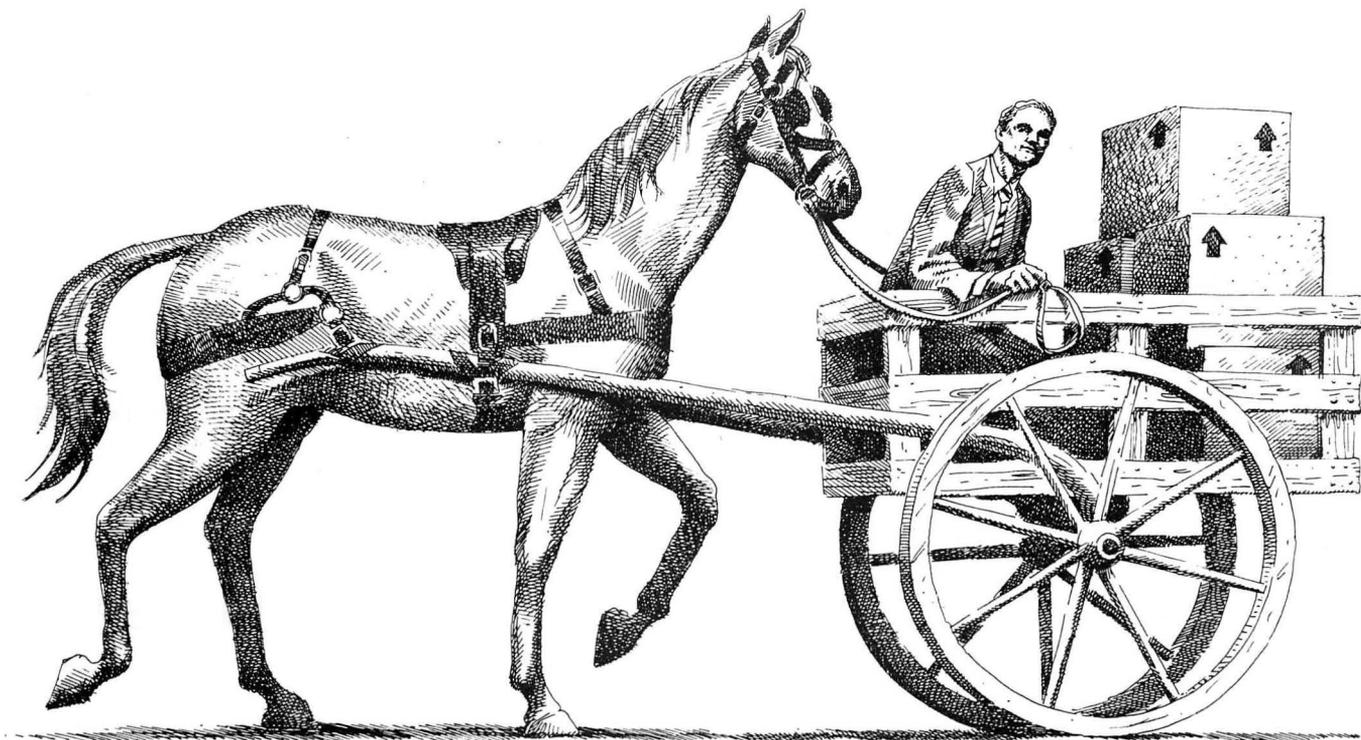
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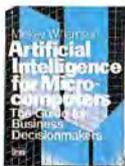
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Some of you must devote yourselves to doing that, and part of me devotes myself to doing that. Some of you had better commit to doing science, and part of me devotes myself to doing that, too.”

It has been predicted that AI software will be a \$1.5-billion-a-year business by 1990, and both venture capitalists and corporate recruiters are avidly pursuing the professors. But the present greening of AI may be good business and bad science, because corporate demand coupled with corporate resources could empty the university labs. Comparative neophytes are being lured into business as “senior” knowledge engineers earning \$100,000 a year. One prominent researcher, Daniel Bobrow of Xerox, told Johnson that Bell Labs and IBM would like to hire every one of the 25 to 30 AI Ph.D.s produced annually; “So who will go to the universities? Some people claim that we’re eating our own seed corn.”



The Price of Intelligence

Artificial Intelligence for Microcomputers: The Guide for Business Decisionmakers
Mickey Williamson
Brady Communications Co., Inc., New York, 1986
184 pages
\$17.95 softcover; also available in hardcover

Judging from *Artificial Intelligence for Microcomputers: The Guide for Business Decisionmakers*, author Mickey Williamson seems to think that most independent businessmen and corporate executives suffer from a high level of computer anxiety. The tone of the book is sometimes that of a kindergarten teacher encouraging a shy child.

But if you are wondering what PC-based expert systems and natural language front ends can do for you, don't be deterred by the occasional cuteness (“Come along, you'll learn some things about computer intelligence,” and “That wasn't such a big deal, was it?”). Williamson finds the patronizing tone too uncomfortable to maintain for very long, and most of the time this well-organized, easy-to-use guide provides clear, down-to-earth explanations of AI concepts and jargon. It also offers sensible advice, both of a general nature and about particular products available for PCs.

After a brief sketch of the history of AI, Williamson tries to help the reader decide whether his or her business could benefit from a knowledge-based or expert system or from a natural language query system for a data base. He discusses the principles underlying these systems in readable, non-technical language and looks at some products that actually made it into the marketplace.

One such product is *Clout 2*, which lets users employ conversational English to search data bases created by most major data base

programs and which Williamson actually employed while writing the book. The book describes and compares the popular AI languages LISP and Prolog in practical detail and reviews versions of each that have been marketed for the PC.

Williamson also surveys several decision-analysis tools and describes a number of knowledge-based system-development shells. These range from the comparatively simple and inexpensive *Insight* and *Insight 2*, which are “totally menu- and function-key driven” and “should be superb for education and training,” to the very powerful, \$10,000-plus *M.I* development tool. The most sophisticated knowledge engineering program described in the book, *M.I* is the first entry into the PC market from Teknowledge, a company founded by Stanford researcher Edward Feigenbaum. Even the experienced programmer is advised to spend a week at the Palo Alto training course before attempting to use the system.

But you don't have to spend upwards of \$10,000 to get a useful level of machine intelligence. Williamson also reviews *Expert-Ease* (“suitable for any problem which has a limited number of solutions and only one possible solution for each example”); *Exsys* (“has extensive math capabilities, ... can support a large number of possible outcomes, calculate certainty factors, and explain the rules it used in reaching a conclusion”); *KDS* (“a versatile ... interactive development and run-time consultation system that makes its

(continues)

DD: Enlarged Backspace and Shift keys
IBM: Same.

DD: Two Ctrl and Alt keys for ambidextrous access.
IBM: Same.

DD: Positive-tactile, firm-feel keys.
IBM: Same.

DD: 12 Function keys for increased automatic operation.
IBM: Same.

DD: Extra-wide, easy-to-find Return key.
IBM: Changed sizes again by shrinking their Return key.

DD: Dedicated Function Control keys.
IBM: Same.

DD: Caps, Num and Scroll Lock indicator lights.
IBM: No lights on their XT.

DD: Separate dedicated Numeric Pad with enlarged Enter key, four Arithmetic Function keys.
IBM: Same.

DD: Isolated Escape key.
IBM: Same.

DD: Switch-selectable compatibility with IBM, PC, XT, AT, PCjr, AT&T and all compatibles.
IBM: Enhanced keyboard runs only on their new XT's, AT's and ignores their installed base which probably includes you.

DD: Switch allows you to swap position of Ctrl and Caps lock.
IBM: Moved Ctrl to bottom row, you have no choice!

DD: Separate Cursor and Screen Control keys.
IBM: Same.



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Business Computer Digest Aug 86

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Jerry Pourmelle, Byte Magazine Sept. 86

"This keyboard is neat to type on and feels solid. It has tactile feedback keys...I can type much faster on it." Test Drive Scorecard: DataDesk-10 Key Tronics-9
Teleconnect Magazine May 86

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own rules from examples"); and *KES* ("people who consult a *KES*-based system need no computer skills; most interaction is through answering multiple-choice questions").

These product reviews are incisive but rather brief, and it is reasonable to assume that the extent of the reviewer's hands-on experience varies from system to system. But Williamson knows that any detailed review is soon dated, given the speed with which things happen in AI. The reviews do flesh out the book's sensible general discussions with concrete examples of what AI can do; and they provide a model of the types of things to look for and questions to ask concerning the products that the near future will bring.



Peering Behind the DOS Veil

*PC Secrets: Tips for Power
Performance*

James E. Kelley, Jr.

Osborne/McGraw-Hill, Berkeley,
California, 1986

224 pages

\$16.95 softcover

"Power performance is at your command with these secrets for mastering the PC," the blurb promises, and the cover features a bold stamp of the kind that sup-

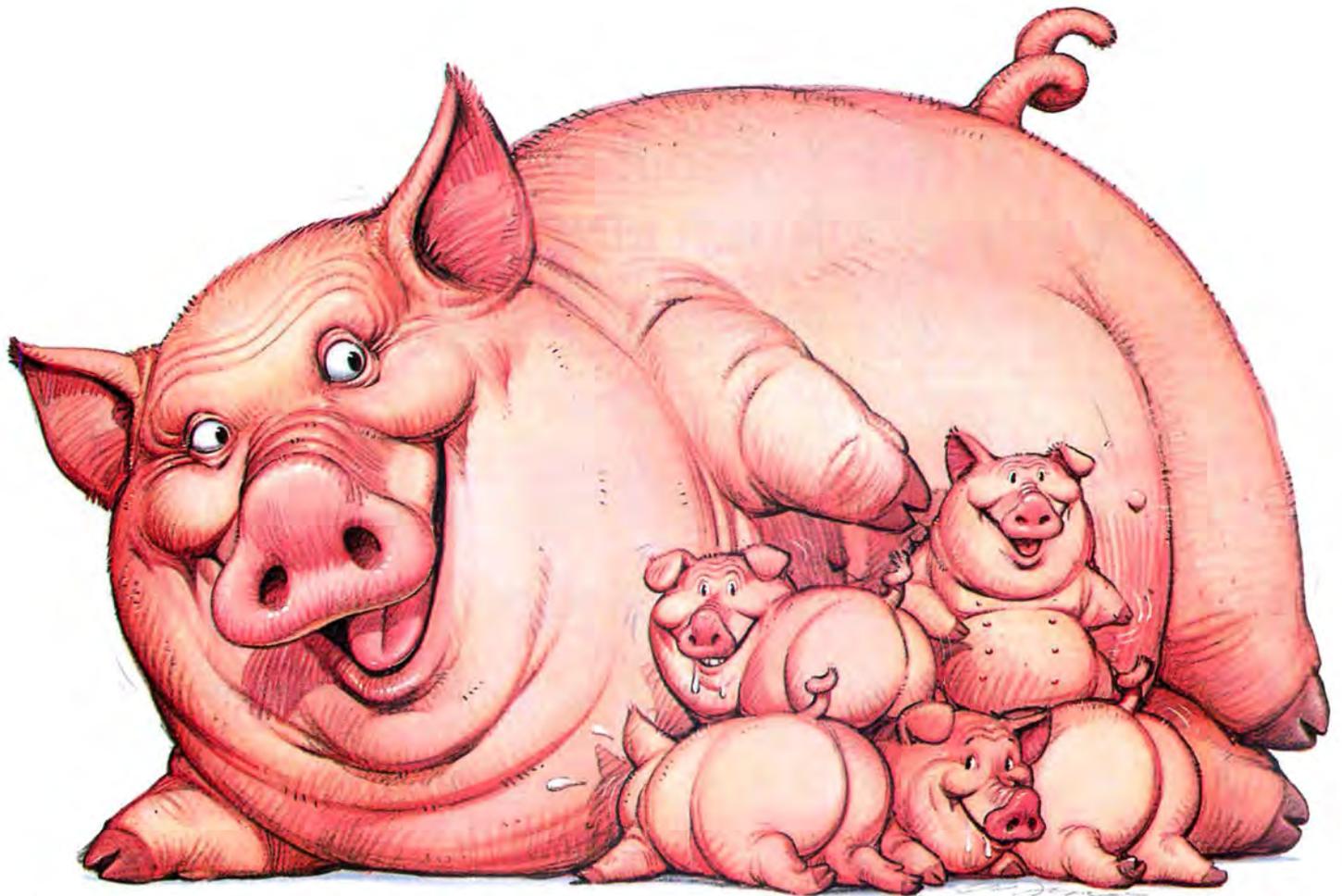
posedly appears on classified documents. But all this is publisher's hype for a much more modest affair. James E. Kelley's *PC Secrets* is a potpourri of tips, tricks, and small utility programs that requires no more expertise than "some practice with an application or two" and a reasonable familiarity with DOS (preferably DOS 2.xx versions).

During more than three years of PC use, Kelley stuffed a drawerful of file folders with "short handwritten notes, program fragments, and clippings from magazines and other sources," including *PC World*. In *PC Secrets*, he distills and organizes the most interesting bits and pieces from these folders.

The result is still a hodgepodge, a mixture of the trivial and the useful, but it's worth remembering that one person's trivia can be another person's lifesaver. For someone who doesn't know not to attach paper clips to floppy disks or expose disks to airport security X-ray machines and metal detectors, that information may be worth many times the price of the book. Still, many of what Kelley calls tricks are of the trivial variety. A chapter with the promising title "Inside Jobs," for example, doesn't communicate much more than how to install extra memory chips yourself.

More noteworthy are the utility programs and system enhancements included in the book. Some are written in BASIC or BASICA,

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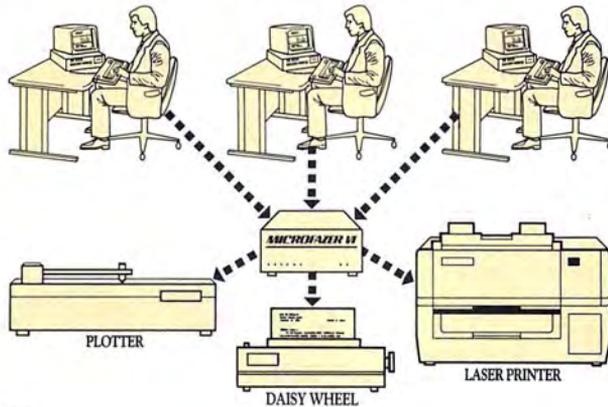
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some are DOS batch file programs, and still others are assembly language programs prepared with DOS's DEBUG. In each case Kelley assumes no prior experience; anyone able to follow simple, explicit instructions and copy a listing correctly can implement the programs. One potentially useful program lets you download the date and time from the computer clock and stamp this information on any file or document; a second program exploits this facility to create a computer usage log, which could come in handy if the

IRS audits your business deduction for a computer located at home.

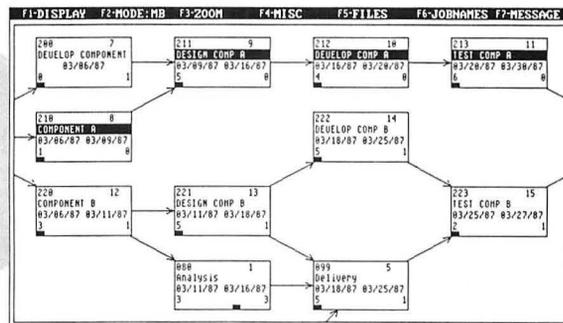
PC Secrets is such a blend of simplicity and sophistication that few people will read it right through from start to finish, and the book wasn't really designed for that approach. It is more useful as browsing material or as a reference tool, and the excellent index helps. The inexperienced user will probably find much that is worthwhile among the various tips and programs—how to recover files erased in error or redefine keys, for example. Kelley himself claims that “with few exceptions I have used or am using all the tricks in this book in the normal course of my work.”

This book may also provide valuable incentive to start poking around in DOS and BASIC. By itself *PC Secrets* won't teach anyone to program in BASIC or assembly language, but Kelley has tried to include enough information with his programs to indicate why and how the languages do what they do. A relative beginner who follows the instructions and explanations will end up with a much better understanding of his or her system and will have acquired some handy utilities in the process.

(continues)

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- Work Breakdown Structures
- Gantt Chart
- PERT Chart
- Project Costing
- Project Cost and Schedule Tracking
- Resource Allocation
- Resource Leveling
- Comprehensive Reports



- Interactive Graphics
- Multi-Project Operation
- Sub-Project Integration
- Lead and Lag
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SUMMARY

- Adults 25 to 50
- Single/Married
- Graduated college/graduate school
- Professional/Entrepreneurs
- Household income \$100,000 plus
- Victory/Vanue homeowners

CONSUMER DATA SUMMARY

Crucial Household Income

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Household Expenditures

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	EAFT-2	\$3,957,000
SOUTHERN REGION	SOUTH-1	\$2,000,000
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CENTRAL REGION	CENT-1	\$1,000,000
	CENT-2	\$1,700,000
WESTERN REGION	WEST-1	\$2,000,000
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Advice for the Oblivious

Desktop Publishing From A to Z
 Bill Grout, Irene Athanasopoulos,
 and Rebecca Kutlin
 Osborne/McGraw-Hill, Berkeley,
 California, 1986
 \$17.95 softcover

Once the affordable laser printer made it possible to produce camera-ready copy without employing a professional typesetter, interest

in desktop publishing began to mount until today it is one of the hottest subjects in personal computing. The number of available laser printers is multiplying as fast as features and type fonts. Optical scanners; high-resolution, full-page monitors; and new page-layout software are announced almost daily.

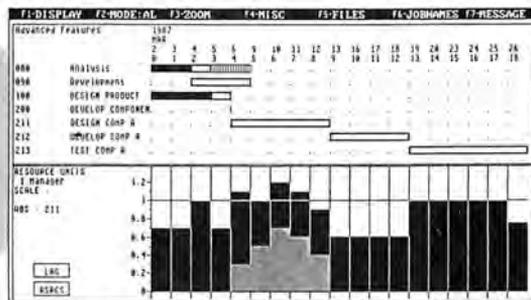
A reliable guide to all this technology would find a ready audience, but *Desktop Publishing From A to Z* only partly measures up. The book would more aptly have been titled *Desktop Publishing: The ABCs*, because it's more a primer than an encyclopedia. It explicitly addresses the beginner, which is fine, but in other respects it seems to be confused about both its purpose and its audience.

To their credit, coauthors Bill Grout, Irene Athanasopoulos, and Rebecca Kutlin attempt to cover the range of technology and equipment involved in desktop publishing; the descriptions, while not very detailed, provide enough information for readers to determine what's needed for a particular purpose. Some product descriptions provide useful examples of what the technology can do, although the pace of innovation is currently so heated that reviews date quickly. Case in point: While many of the products mentioned work with PCs, all the page-layout programs reviewed are for the Macintosh. When the book was

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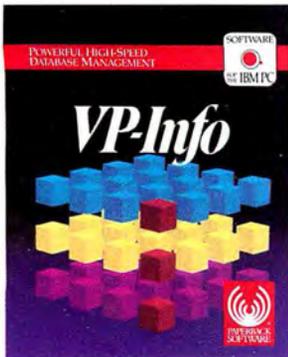
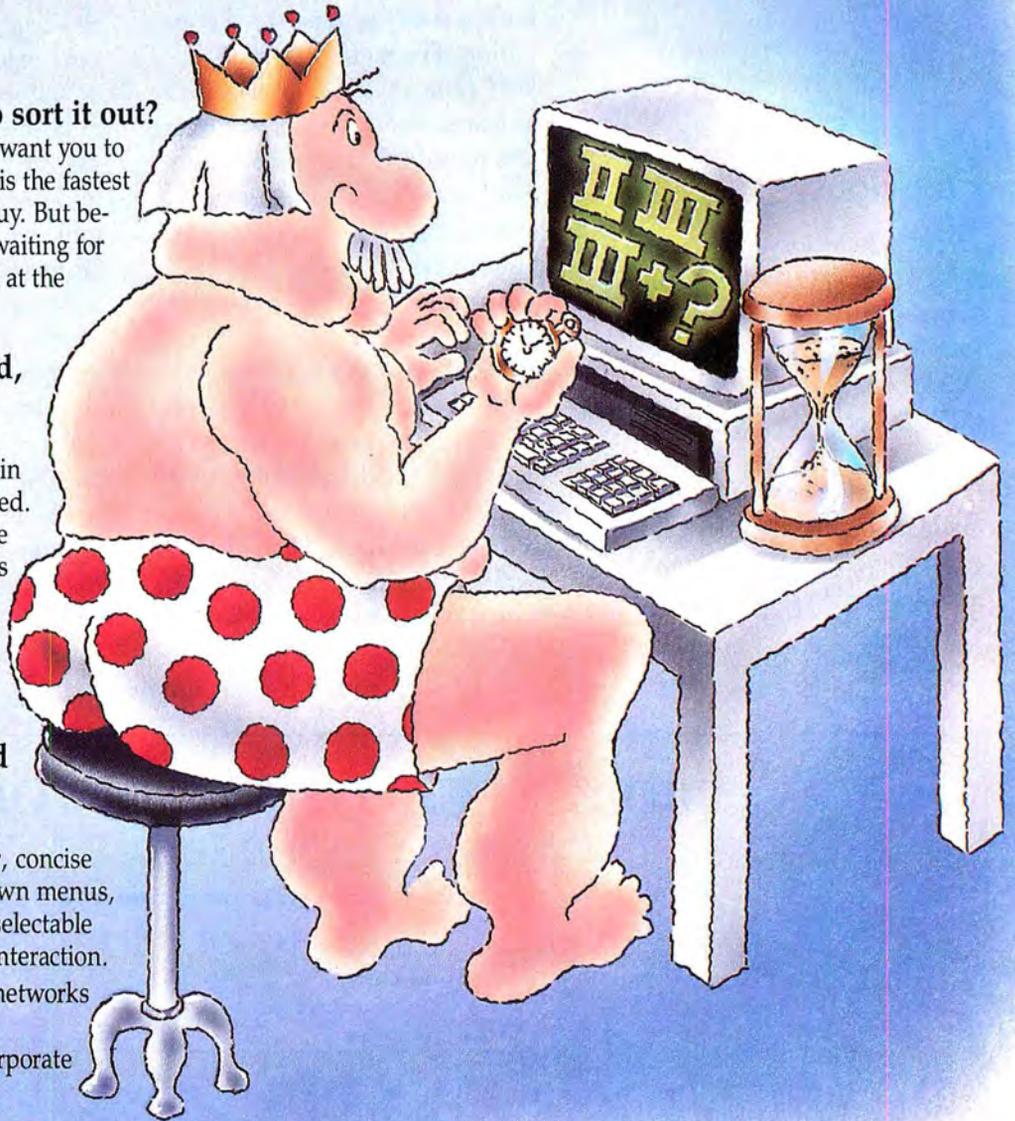
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written, PC packages were “mainly provided for professional publishing, at prices that only professionals [could] afford.”

The problem is that such limited technology doesn't provide enough material for a book, so the authors devote a lot of space to advice on running a small business for profit, which—despite gestures to both corporate executives and nonprofit enterprises—is what they seem to assume their readers want to do. This is rather strange, because the introduction states that “if you seek to make your living publishing . . . the simplified methods outlined in this book may not bring you success.”

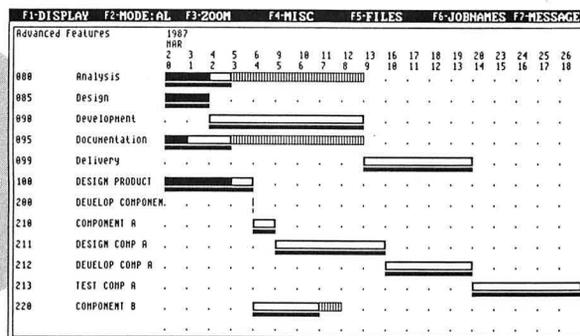
Whatever might be said of the “simplified methods,” I certainly hold out little hope of financial success for the reader who needs to be told that “if you are paying salaries, the total amount paid out is estimated by the number of hours or weeks worked”; or that “salaries and benefits expenses depend on how many people you employ or add to your staff during the year”; or even that “a common procedure among personal computer users is to make backup copies of diskettes.” The book's advice on business management certainly doesn't violate common sense, but it rarely rises above it. Where it does, the advice is too general to be really useful.

The authors sometimes assume that their readers want to be desktop publishers but don't have a clue about what to publish. So there's advice on choosing a topic (“write about subjects and activities you know and like best”) and on finding something to say about it (“libraries and bookstores are the first places to look for books, periodicals, and reference materials”). There may, for all I know, be people who don't know these things. If so, I hope they never find out about desktop publishing.

Michael Harper teaches English at Scripps College in Claremont, California. ●

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The Help Screen

PC World offers answers and advice at every level

This month: extending the PC's lifespan; speeding up your network; connecting the PC to mainframes, minis, and other PCs with a single board; plus a program that gives a PC 30 extra function keys

Karl Koessel

On or Off?

Q. When I returned recently from a two-week vacation, I discovered that my 640K AT, with 2MB expanded RAM and a 30MB internal hard disk, had been left running the entire time. Fortunately, a screen-blanking program that shuts off the video signal to the display whenever the keyboard is inactive for more than 10 minutes was loaded, so the monitor was saved. The other components also apparently escaped harm, which raises the question: Can I leave my machine on continuously? Would doing so wear out the memory chips? What about the microprocessor and the hard disk? The debate at work has been heated, and one colleague contends that it's actually better to always leave the system on. What's your opinion?

*Randy Thorndike
Santa Monica, California*

A. A computer system is composed of many parts, each with a different tolerance to remaining on or, conversely, to being turned on and off repeatedly. You already know that an unchanging image damages the monitor by scoring an impression into the phosphor coating on the back of the screen. A screen-blanking program protects your video investment.

Integrated circuits inside the PC—the microprocessor, memory, and so on—can be damaged if they overheat (even when electricity isn't flowing). But unless the ambient temperature exceeds 90 degrees, the system's ventilation openings are blocked, or the PC is stuffed with expansion cards that generate excessive heat, the system's fan should push enough cool air over the chips to prevent them from frying.

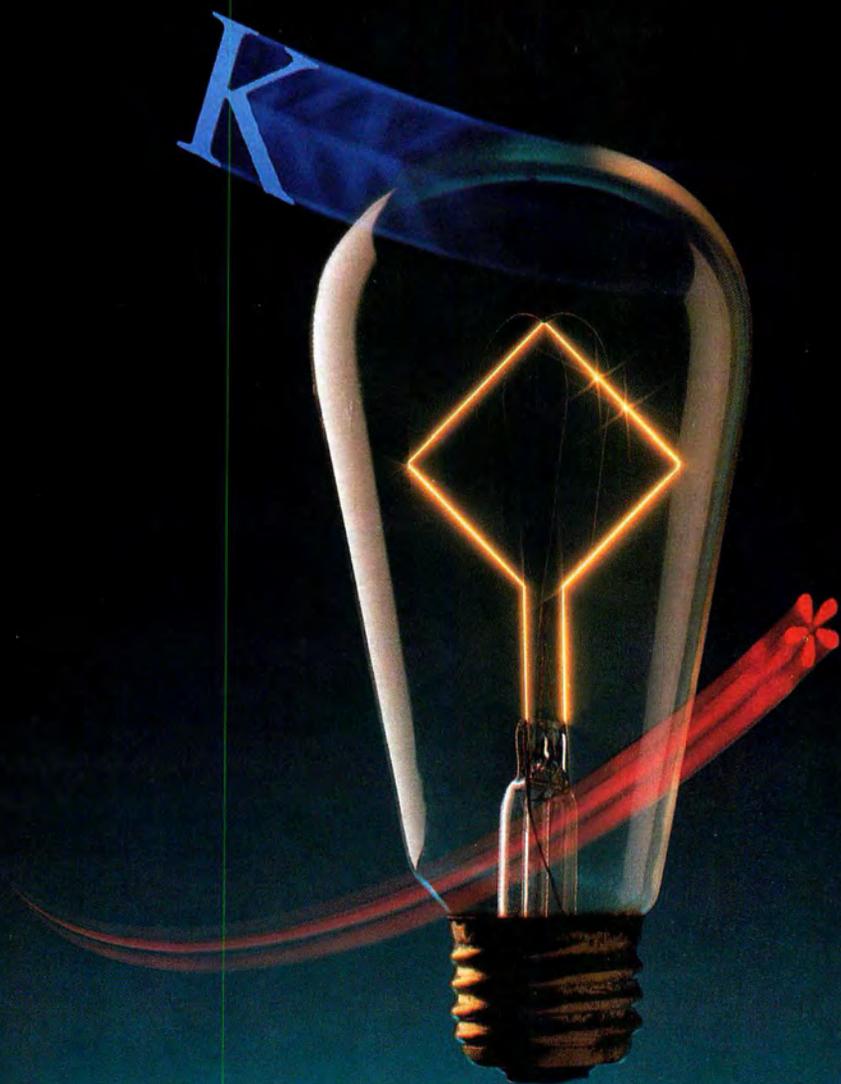
Note, too, that unlike water in a pipe, electrons do not wear out the solid-state components they travel through. If anything, the temperature peaks and valleys that occur when a PC is turned on and off expand and contract the silicon and possibly fatigue the circuits. But most of the chips would still outlive you even if you turned the PC on and off repeatedly for the remainder of your days.

An electromechanical device like a hard disk drive complicates the issue. As the drive's magnetic platter spins, it wears out bearings. But the bearings may experience even greater stress when the system is frequently turned on and off. If the read/write heads aren't parked before the drive is shut down, they may settle on the disk and wear down the magnetic media as well. For these reasons alone, you might be tempted to leave your system on continuously. But keep in mind that a spinning disk is far more susceptible to damage than one that's off. A modest earthquake or something bumping into the system can send the read/write heads crashing onto the disk, rendering it useless.

In short, the choice is yours. If a PC is properly ventilated and equipped with a screen blanking program and the hard disk heads are parked when you're away, you can leave it on day and night. Will an 8.6 quake roll into town before the hard disk's bearings crumble? Only the Ultimate OEM knows for sure . . .

(continues)

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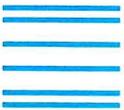
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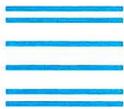
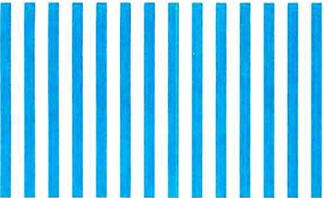
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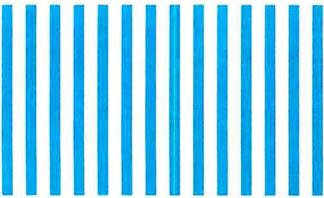
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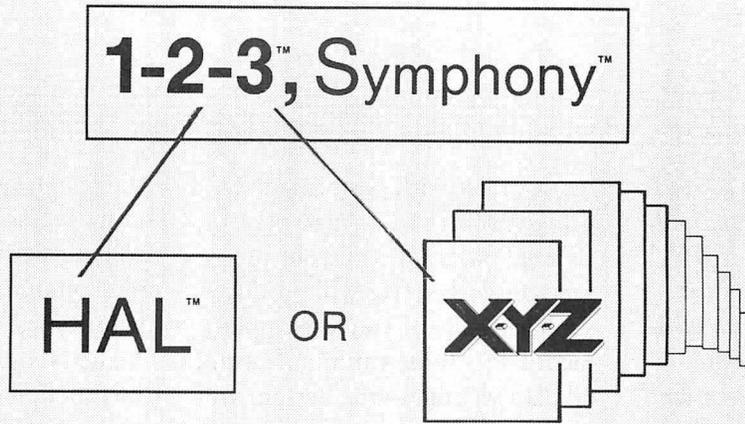
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Faster Service

Q. I manage a local area network [LAN] and I'd like to boost its performance. Bear in mind that the LAN is more or less "tuned up," print servers are separate from the dedicated file server, and I don't have the option of reducing the number of workstations or replacing existing hardware with something more efficient. I've thought about adding a second file server, but are there any better alternatives?

*Ernest Martinez
Washington, DC*

A. Check out disk-caching software if it's not already implemented on your system. Your network vendor should be able to recommend cache programs compatible with your network.

Also take a look at Batram, a battery-backed RAM disk, and the optional FTS (fault-tolerant storage) network-caching and backup programs from Santa Clara Systems. Batram is essentially a box full of RAM chips supported by a very large, long-lasting (two weeks), rechargeable electrolytic gel battery. The 4MB base unit comes with four free slots, which can each accept a 4MB memory expansion board, boosting total capacity to 20MB. When megabit chips become commonplace, the device will be capable of storing 80MB.

Although Batram can replace a server's hard disk and dramatically

improve network performance, using Batram and its network-caching program with your present network server will produce similar results. If you also implement FTS's write-through feature, all data written to the Batram will also be automatically written to the hard disk without any degradation in network performance.

The Corporate Connection

Q. My AT connects to the parent company's mainframe via an IRMA board and to a DEC mini-computer via an asynchronous serial connection. Now my department wants to install a LAN, which means my system will have to accommodate yet another adapter. Is there a single-board solution for corporate users needing to make all three connections?

*Howard Wiesenstein
New York, New York*

A. There is indeed. Late last year Ungermann-Bass (UB) introduced the Net/One Universal Workstation Series, the result of two years of development aimed specifically at supporting the information needs of large corporations. (UB has been integrating LANs into existing information systems for more than seven years.) Three key Universal Workstation Series products—the 3270 NIUpc adapter, the Net/One 3270 PC network operating system, and the Net/One 3270 PC Graphics programmed symbol and graphics hardware support software—

enable a networked PC to concurrently access text and graphics from network file servers, DEC minicomputers, and IBM mainframes.

The NIUpc board can match the functionality of a high-performance NETBIOS-compatible network board and an IBM 3278/79 Emulation Adapter or a DCA IRMA-compatible micro-to-mainframe board. It also supports Ethernet baseband, broadband, and token-ring twisted-pair wiring, so you need only one type of wiring to connect a PC to all three information sources. Net/One is a DOS-compatible multitasking network operating system that can run four concurrent sessions in separate windows; a window can emulate the 3270 (with support for the 3270 PC API), VT100 terminals, and the 3101 terminal with a 3287 printer. The programmed symbol and graphics software enables mainframe applications such as IBM Graphic Display Data Manager (GDDM), SAS/Graph, and DISSPLA to run on a PC equipped with an IBM Color/Graphics or Enhanced Graphics Adapter.

Thirty More Function Keys

Q. I've used the DEFKEY.BAS program [.*], PCW, February 1986] to redefine my PC's function keys, and it's worked quite well. But now I have an IBM PC AT*

(continues)

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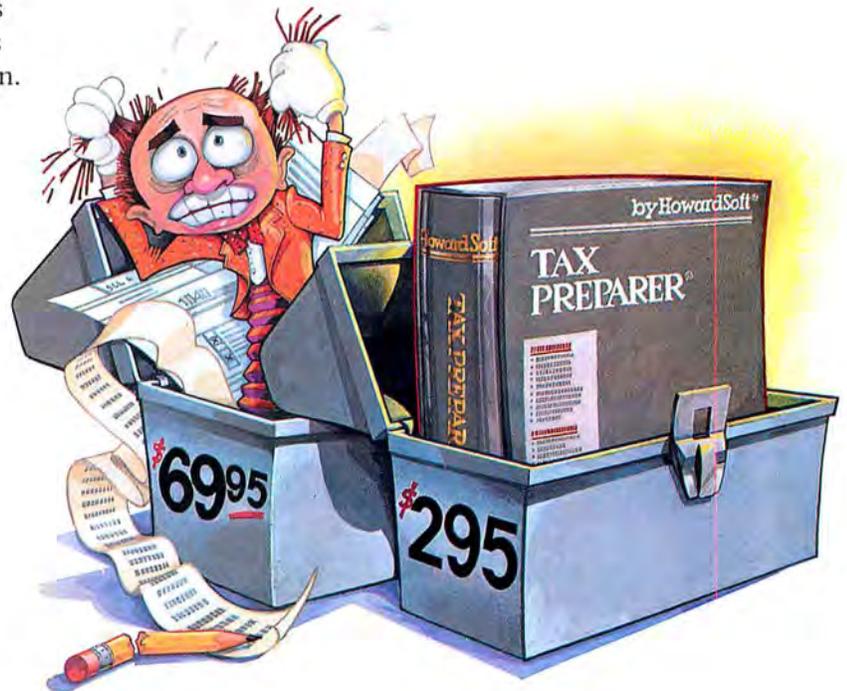
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```

100 DEFINT A-Z : KEY OFF : CLS
106 DIM FKEYS(40) : SHIFTS(2)="Shift+" : SHIFTS(3)="Ctrl+" : SHIFTS(4)="Alt+"
110 ESC$=CHR$(27) : QS=CHR$(34) : SEM$=CHR$(59) : PS=CHR$(112)
120 PRINT "This program creates a .COM file to redefine DOS
function keys."
130 LOCATE 4,1
140 INPUT "Enter a name for the new .COM file: ",FS
150 IF FS="" THEN END
160 NAM$=FS+".com"
170 '
175 FOR J=1 TO 4
180 LOCATE 6,1
190 PRINT "Enter the characters for each key (press END when done):"
200 FOR K=1 TO 10
210 LOCATE 7+K,1
220 PRINT SHIFTS(J)+"F" + MID$(STR$(K),2) + ": ";
230 GOSUB 440 : FKEYS(K+(J-1)*10)=XS
240 NEXT
245 CLS : NEXT
250 '
260 OPEN NAM$ FOR OUTPUT AS #1
270 FOR I=1 TO 19:READ Z:PRINT #1,CHR$(Z);:NEXT
280 DATA 190,19,1,180,2,138,20,128,250,0
290 DATA 116,5,205,33,70,235,244,205,32
300 '
310 FOR K=1 TO 40
320 DF$="0" + SEM$ + MID$(STR$(58+K),2)
325 IF K>10 THEN DF$="0" + SEM$ + MID$(STR$(73+K),2)
330 PRINT #1,ESC$ + "[ " + DF$;
340 IF FKEYS(K) > "" THEN 370 'if no definition,
350 PRINT #1,SEM$ + DF$ + PS; 'reset key to normal
360 GOTO 380
370 PRINT #1,SEM$ + QS + FKEYS(K) + QS + PS; 'output a defin
380 NEXT
390 PRINT #1,CHR$(0); 'this marks the end of the definitions
400 CLOSE
410 LOCATE 22,1:PRINT "File ";NAM$;" now contains those key definitions."
420 END
430 '
440 XS="" : X2$="" : R=CSRLIN : C=POS(0)
450 LOCATE R,C,1 : PRINT X2$;
460 Z$=INKEY$ : IF Z$="" THEN 460
470 Z2$=Z$
480 IF LEN(Z2$)=1 THEN 520
490 IF ASC(MID$(Z2$,2))=79 THEN RETURN 'test for END key
500 BEEP : GOTO 450
510 '
520 IF Z2$=CHR$(8) THEN 600 'backspace
530 IF Z2$=CHR$(10) THEN Z2$=CHR$(25)
540 IF Z2$=CHR$(13) THEN Z2$=CHR$(127)
550 '
560 XS=XS+Z2$ 'add a character to a definition
570 X2$=X2$+Z2$
580 GOTO 450
590 '
600 IF XS="" THEN 450 'remove last char. if backspace pressed
610 XS=LEFT$(XS,LEN(XS)-1)
620 X2$=LEFT$(X2$,LEN(X2$)-1)
630 LOCATE R,POS(0)-1 : PRINT " ";
640 GOTO 450

```

Listing 1: DEFKEY.BAS

with the enhanced 101-key keyboard. Can I modify the program to take advantage of the AT's enhanced keyboard—and specifically the two additional function keys, <F11> and <F12>?

Wylie K. Bearup
Vicksburg, Mississippi

A. Yes and no. DEFKEY.BAS uses the extended screen and keyboard driver ANSI.SYS to redefine the function keys. Unfortunately, ANSI.SYS cannot currently recognize the codes that the new keys on the enhanced keyboard send to the system. To access the codes for <F11> and <F12>, a programmer must use the BIOS functions INT 16h AH=10h, 11h, and 12h, rather than the traditional BIOS functions INT 16h AH=00h, 01h, and 02h. As you might imagine, patching ANSI.SYS in this case is rather complicated and not for the faint of heart.

But how would you like 30 extra function keys instead? The revised DEFKEY.BAS program shown in Listing 1 is nearly identical to the original program submitted by Thomas Poff, but the revised version will also prompt you for the 30 key assignments for <Shift>, <Ctrl>, and <Alt> combinations with <F1> through <F10>. The relevant additions to the code—four new lines, one expanded line, and one changed numeral—are highlighted in the listing to make editing the original program easier.

(continues)

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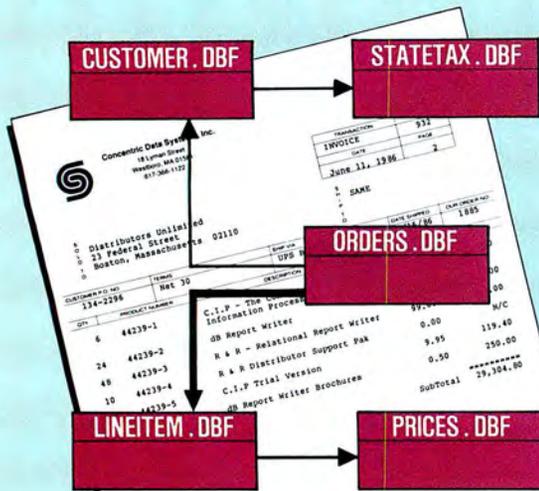
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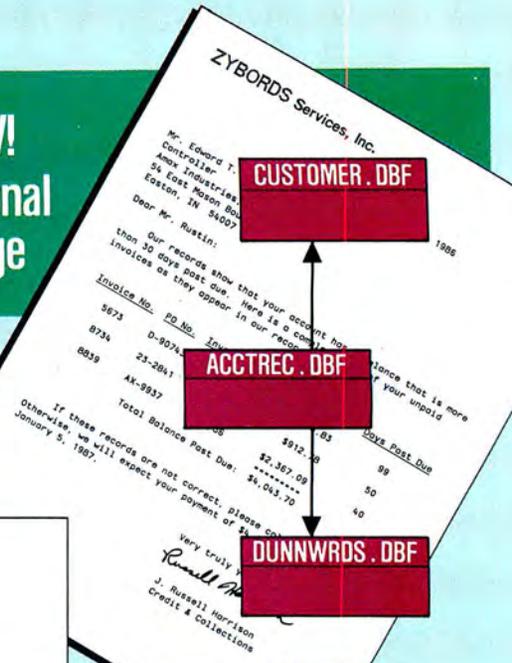
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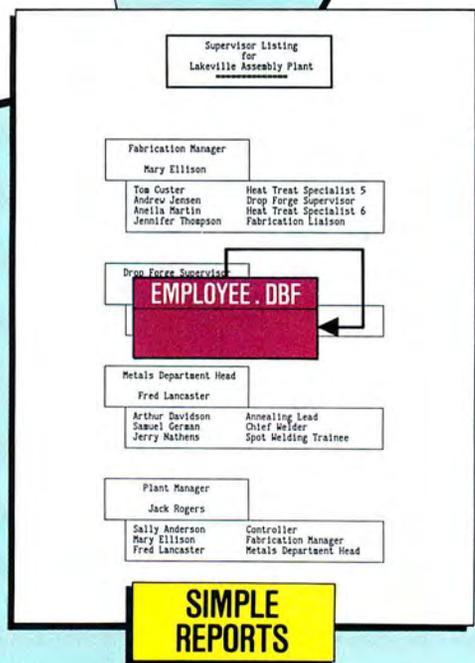


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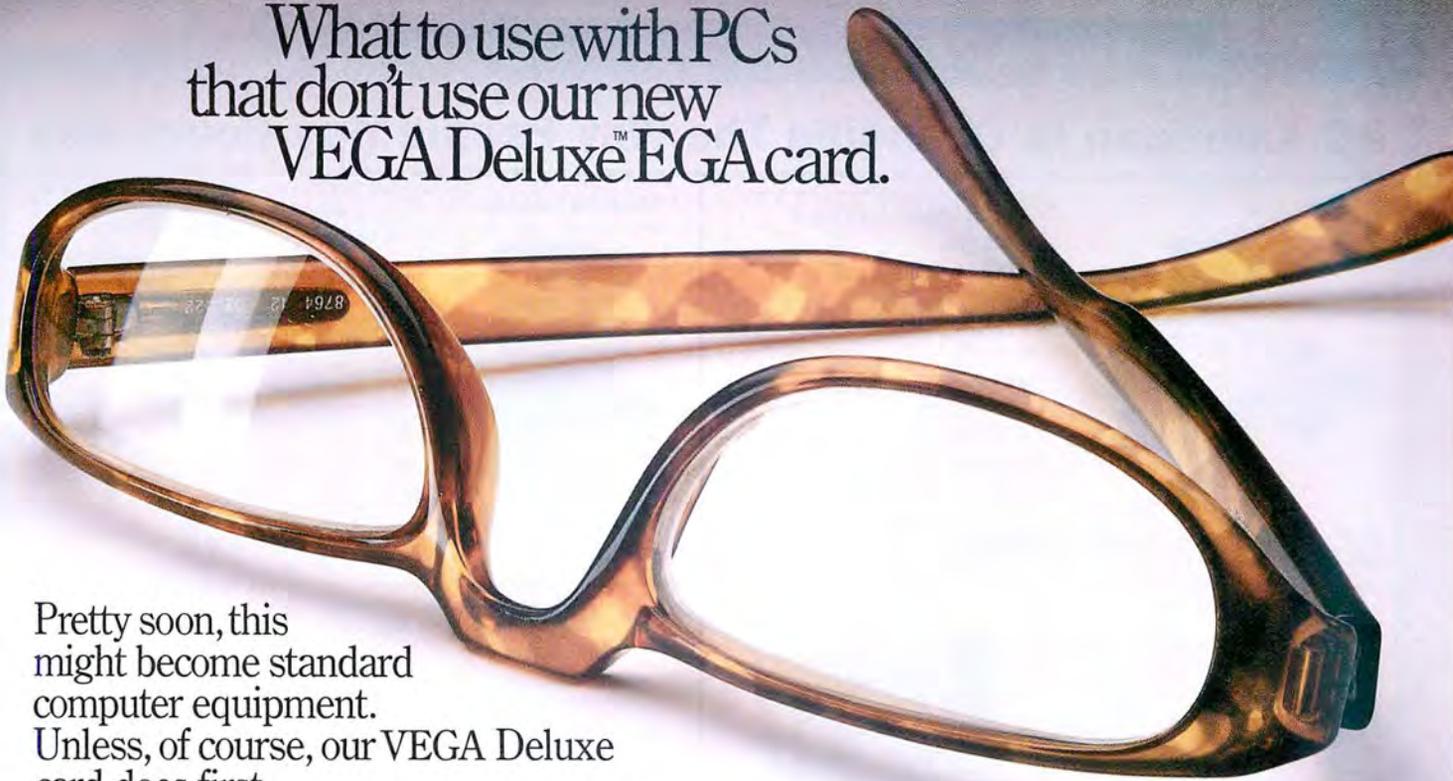
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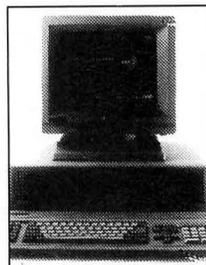
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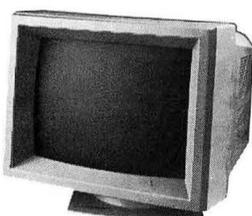
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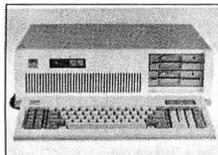
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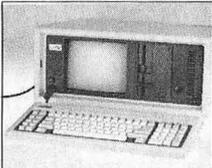
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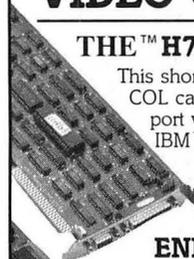
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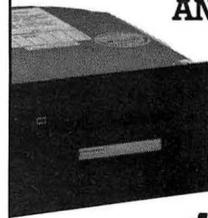
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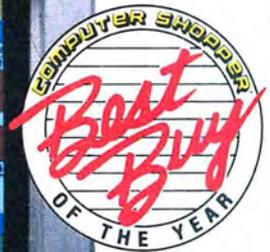
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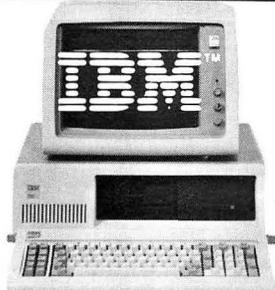
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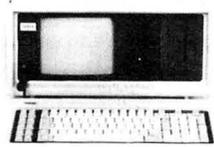
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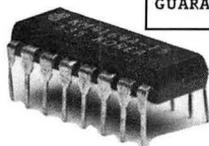
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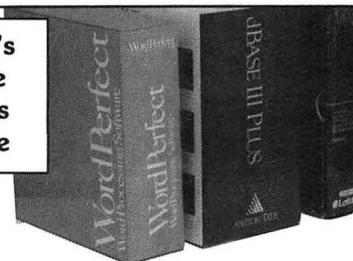
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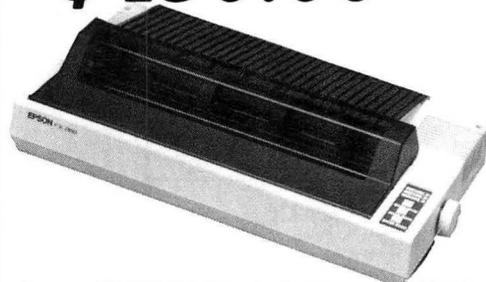
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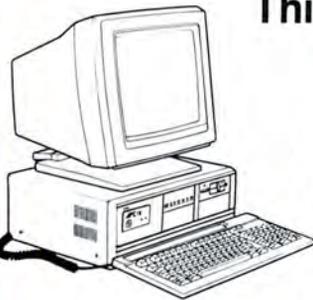


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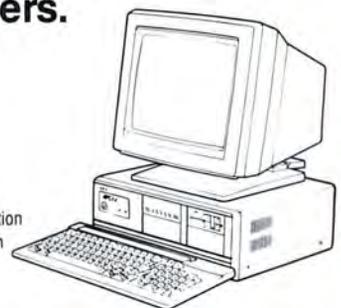
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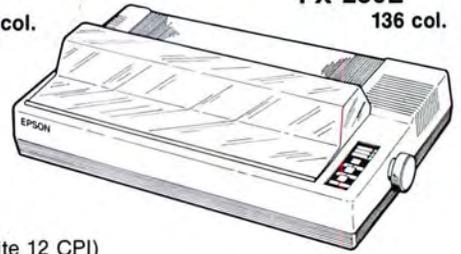
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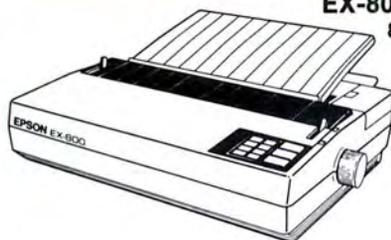


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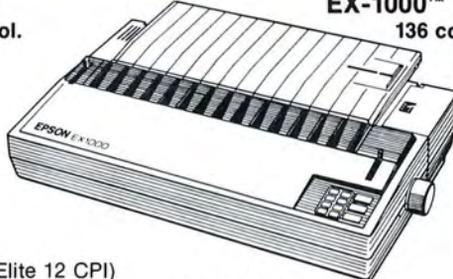


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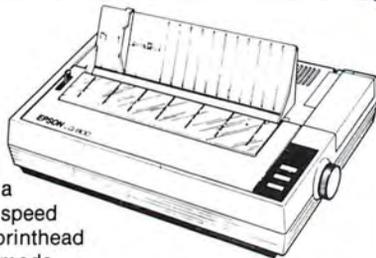
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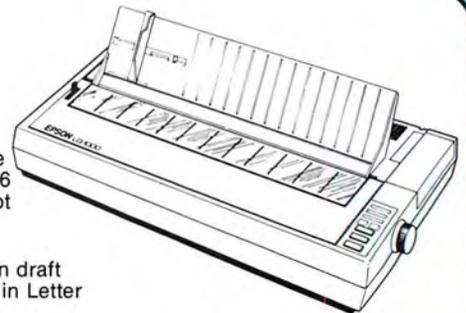
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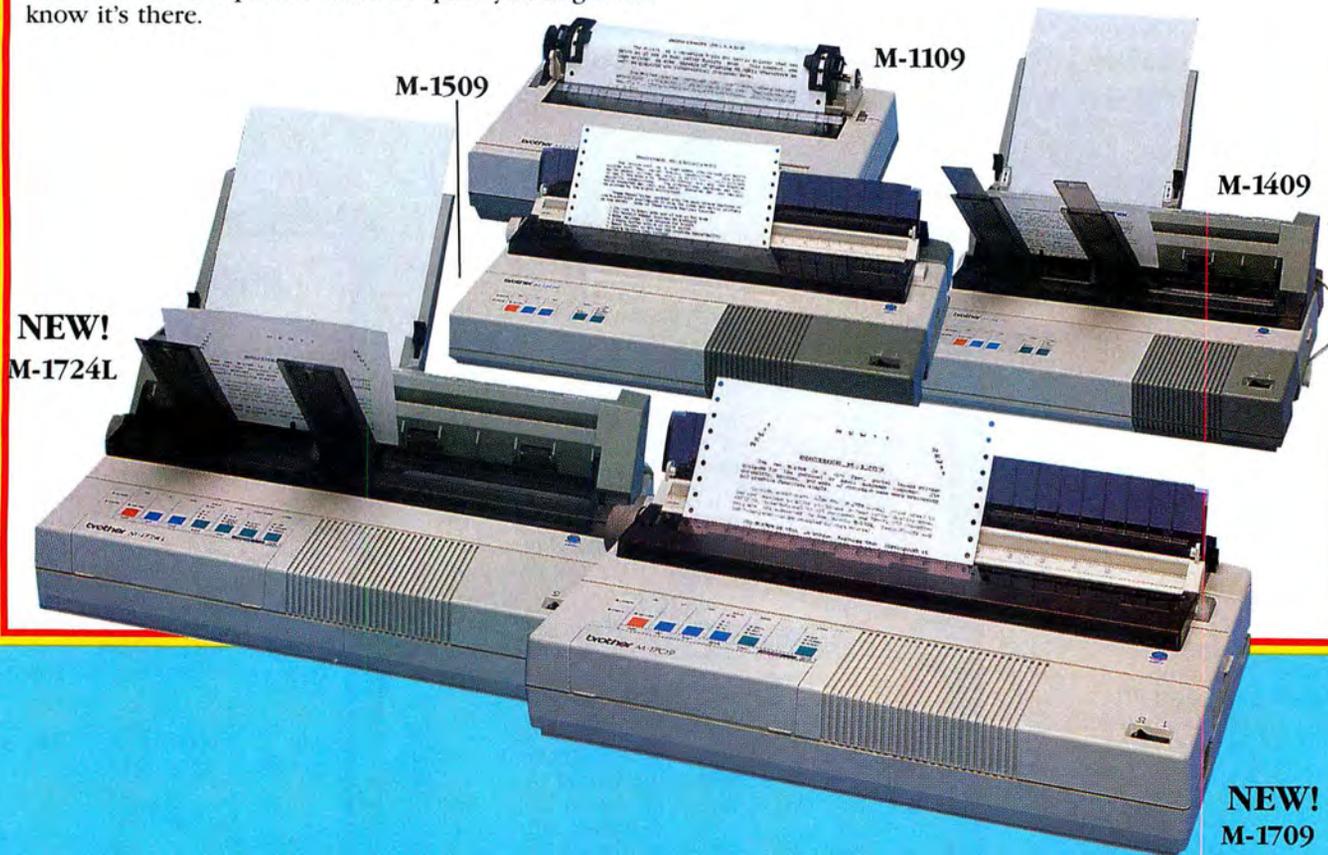
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A fix for X-MAKER2-.BAS, another blank line in ECHO, . and .. discoveries, a macro library for Word-Perfect, a bug in VDISK2.COM, and more power from INKEY\$ in BASIC

Edited by Mike Cushman

You'll notice that a new editor has taken the *.* helm this month. This column has had several editors since its inception in *PC World's* first issue in 1983, and each has tried to gather the most pertinent and interesting items possible. That tradition continues.

Readers, of course, are the column's lifeblood, a source of ideas, hints, tips, and discoveries. So if you have a PC revelation to share, don't hesitate to send it in. We're particularly interested in items dealing with spreadsheets, data managers, word processors, communications programs, and other popular applications. And as always, BASIC and Pascal programs are welcome. When submitting items to *.* , please include a printout of the listing, a disk file of the program or patch, and a note detailing the item's function. For further submission information, check the tag at the end of this column.

Editor's note: A reader recently wondered why 130COLOR.BAS (.* , PCW, November 1985), after displaying the program's multi-color image, stopped the PC dead in its tracks. The reason: Line 915 contains an LPRINT statement, which sends the printer a list of the foreground and background color numbers for the 130 unique colors and the 6 fifty-fifty mixtures of primary colors. Because the program lacks an error-checking routine that would enable it to recover, BASIC halts the program and displays an error message if the printer is off or unavailable. Since 130COLOR.BAS runs in an unsupported low-resolution mode, the message is illegible.*

To fix 130COLOR.BAS, add this line:

914 ON ERROR GOTO 920

Normal BASIC programs display legible text, so if you don't have a printer, you can change LPRINTs to PRINTs. However, this modification will cause the text intended for the printer to overwrite the information on the screen. LPRINT statements can also simply be removed.

Squashing an X-MAKER2 Bug

While testing the new X-MAKER2.BAS and DATAMKR2-.BAS programs [*.* , PCW, December 1986], I discovered a discrepancy in how each determines the checksum. Before DATA-MKR2 writes a checksum (line 210), it uses the function defined in line 20 to truncate all but the two lowest digits. Consequently, DATAMKR2 can generate only checksums ranging from 00h to FFh.

Because X-MAKER2 does not process the checksum through the RIGHT\$ function, it can, in certain circumstances, generate checksums 100h and 101h. When X-MAKER2 compares 100h or 101h to the double-digit checksums created by DATAMKR2, an error naturally results, and X-MAKER2 admonishes you to 'Check your work'. The problem, however, resides in X-MAKER2.

You can solve that problem by patching line 70 of X-MAKER2-.BAS with the MOD function to ensure that SUM does not exceed

(continues)

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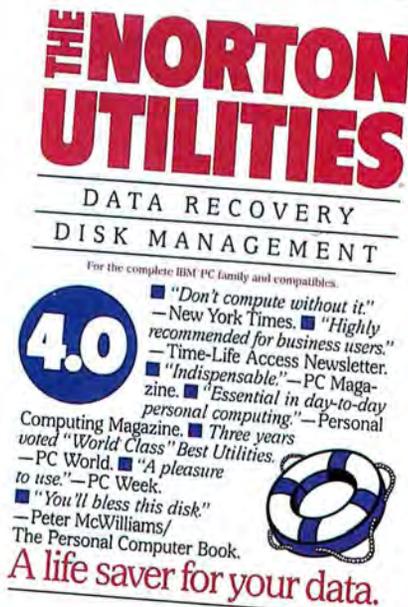
It also performs several entirely new functions that are worth the price of the program all by themselves.

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Which of the new Norton Utilities is best for you is up to you, of course.

But one thing's for sure.

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Peter Norton

COMPUTING

BOB STANTON HAD A GREAT IDEA. AN HOUR LATER HE WAS TESTING IT.

Appointments. Everybody takes them — dentists, auto-body shops, dance instructors. And lots of computer applications need appointment screens.

Bob thought that a calendar made a terrific graphic metaphor for taking appointments. Simply use the arrow keys to pick an open date, then press the Enter key, and up pops an appointment window.

Lucky for Bob, he's a CLARION programmer, one of a fast growing cadre of super-productive application developers.

With CLARION's Screener utility, he painted a white calendar on a black background. Then he drew a white-on-blue track around the page and between the days. He typed in the days of the week — and *voila!* — a calendar!

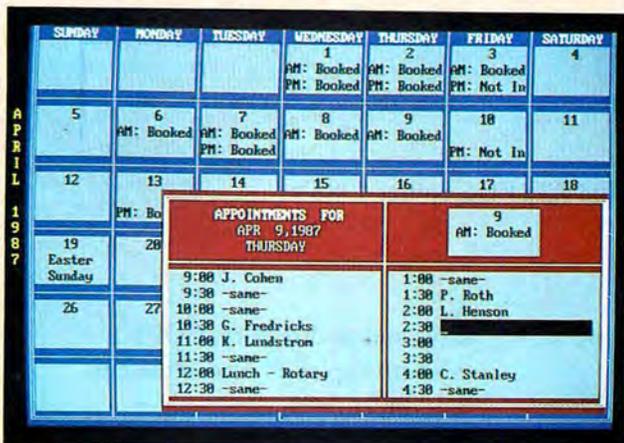
CLARION knows that a PC monitor is refreshed from memory, so it treats a screen layout like a group of variables. Just move data to a screen variable, and it shows up on the monitor.

Bob set up dimensioned screen variables for the days of the month and a screen pointer for selecting a date, and he was done. Then Screener generated the code.

Then Bob drew the appointments window, built an appointment file, filled in the connecting code and tested it — ONE HOUR AFTER HE STARTED!

Testing was a breeze. Screener doesn't just write code, it compiles your source, displays a screen, gets the changes, then replaces the old code in your program.

So here are Bob's appointment screens. You can see the source listing to the right. We marked all the code Screener wrote for him.



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```
70 READ CKSUM$ : IF (SUM MOD 256)=FNHEX(CKSUM$) THEN 30 ELSE GOTO 170
```

Listing 1: Correction to line 70 of December 1986's X-MAKER2.BAS

255 (FFh). The corrected line is shown in Listing 1.

*Harry Daykin
Jackson, Michigan*

More Blank Lines

There's more than one way to create a blank line with DOS 3.10 ["Blank Lines With ECHO," *.* , PCW, November 1986]. Placing a period immediately after the DOS 3.10 ECHO command also echoes a blank line.

*Steve Conary
Barrington, Illinois*

Dot Discoveries

I recently discovered that . and .. can be handy tools for managing and navigating subdirectories. DEL . (or ERASE .) erases all files in the current directory (that is, it works the same as DEL *.* and ERASE *.*). DEL .. (or ERASE ..) erases all files in the parent directory of the current directory (this is potentially a devastating command, so issue it with care). CD .. switches to the parent directory of the current directory. COPY .. copies all the files in the parent directory to the current directory, while COPY . . d:\path copies all the files in the parent directory to the specified

drive and/or directory. COPY . d:\path copies all files in the current directory to the specified destination.

*Daniel M. Lentz
South Milwaukee, Wisconsin*

*Editor's note: Be careful when using the COPY . d:\path command. If you press <Enter> before supplying a drive or directory, COPY . (and COPY .\.) will copy the files over themselves. (DOS won't issue the 'File cannot be copied to itself' error message associated with COPY *.* because each 'filename.ext' does not match '.\filename.ext'.) This COPY bug effectively truncates large files; once the first part of a file is written again to disk, COPY looks for the next part of the file. Unfortunately, the original has now been replaced by the partial copy. Since there is no more data, COPY assumes its work is done.*

Accidentally typing characters after the COPY command can be just as deadly. For example, adding /A to COPY . or COPY .\ . can quickly trash anything but a text file. The /A compels COPY to stop copying a file

when it encounters a Control Z (ASCII 26), the end-of-file marker for text files. If a program file, graphics file, or any file compressed with a utility such as Cubit or SQZ contains a byte with ASCII value 26, copying stops and the file is ruined.

A Path to WordPerfect Macros

I use WordPerfect macros to perform complicated feats, as well as for more mundane chores, such as setting tabs and margins and printing documents.

After I created my 130th macro, I decided that my collection deserved a subdirectory of its own. Normally, WordPerfect macros are invoked by pressing <Alt> in combination with another key. However, when a macro does not reside in either the current directory or the same directory as WP-.EXE, you must call it by typing <Alt>-<F10> and supplying the path to the macro subdirectory followed by the file name of the macro.

To automate access to my macro collection, I created a macro-calling macro-<Alt>-M -that issues an <Alt>-<F10> and automatically supplies the path to the subdirectory holding the macro files. In this instance, WordPerfect resides in a subdirectory named WORD, so I stored the macro mélange in the C:\WORD\MACROS subdirectory. Thus, to call a macro I type <Alt>-M instead of <Alt>-<F10>.

(continues)

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< Ctrl > - < F10 >	Turn on the macro recorder
< Alt > - M	Name the macro <Alt>-M
< Alt > - < F10 >	Issue command to call second macro
C: \WORD \MACROS \	Identify the macro subdirectory (Don't press <Enter>!)
< Ctrl > - < F10 >	Turn off the macro recorder
F1	Clear the screen

Figure 1: ALTM.MAC, a WordPerfect macro-calling macro

To create the <Alt>-M macro, follow the steps outlined in Figure 1. Remember to include the trailing backslash after entering the name of the macro subdirectory. Note, too, that the <Alt>-M macro file, ALTM.MAC, must reside in the same directory as WP.EXE.

Dave Tocus
Rockville, Maryland

Editor's note: Because the same key combination that turns on the macro recorder, <Ctrl>-<F10>, also turns the macro recorder off, it doesn't seem possible to create a macro-creating macro that would save macros in a predesignated subdirectory. So when you want to make a macro and store it in the macro subdirectory, instead of pressing the <Alt>-key combination to name the macro, enter the appropriate path and the desired macro file name.

Fixing VDISK2.COM

The VDISK2.COM RAM disk program on the *PC World Utilities Disk*, included with *The Fully Powered PC* (Simon & Schuster, New York, 1985), has a small but pesky bug. The program is supposed to create a 360K RAM disk, but it locks up the computer whenever more than half of the RAM disk is used. I knew something was awry when I restarted the system, ran CHKDSK on the RAM drive, and discovered that the sum of the 'bytes total disk space' and 'bytes free' values was nearly 180K more than total system memory.

The VDISK2 patch in Figure 2 cures this handy utility's ills. Slip a disk containing a copy of VDISK2.COM and a copy of DEBUG.COM (from the DOS Supplementary Programs disk) into drive A: and type **A:DEBUG A:VDISK2.COM <Enter>**. When DEBUG's hyphen prompt appears,

(continues)

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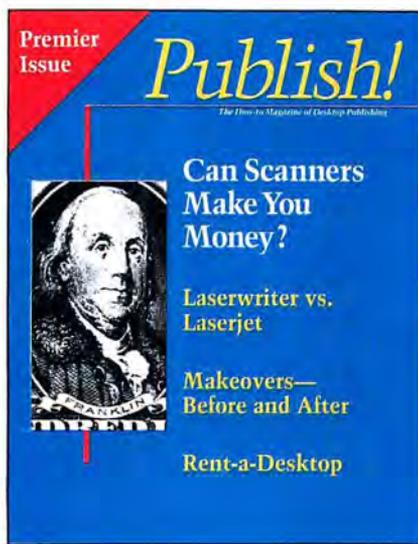
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```

-e 219 5A < Enter >
-e 262 FD < Enter >
-e 292 07 < Enter >
-w < Enter >
Writing 0300 bytes
-q < Enter >

```

Figure 2: A patch for VDISK2.COM

enter the text printed in boldface type in the figure. Test the patched version of VDISK2.COM before replacing the original.

*Ronald Dorchester
San Antonio, Texas*

Handful of Keys

BASIC's reserved variable INKEY\$ is commonly used [incorrectly] to capture a single key-stroke; but until a key is pressed, the program loops idly. [Use INPUT\$(1) to fetch a single key-stroke.] To better use your PC's processing power—and to take advantage of INKEY\$'s talents—use INKEY\$ as part of a larger loop that completes other tasks while waiting for a key to be pressed.

MULTTASK.BAS illustrates this concept [see Listing 2]. The program consists of a conditional loop that clears the keyboard buffer (line 40), a main loop, and seven subroutines. The main loop (lines 50 through 100) first branches to the subroutine at lines 300 through 460 to check the serial port for any incoming data. If a character is found, the program

(continues)

```

10 'MULTTASK.BAS
30 '
31 ' Clear the keyboard buffer
32 '
40 IF INKEY$ <> "" THEN GOTO 40
45 PRINT "Press <Esc> to quit." : GOSUB 2000

50 '
51 ' Main Loop
52 '
60 NONE = 0 ' Nothing done yet
65 GOSUB 300 ' Check if data has been received
70 GOSUB 600 ' Check for data to send
80 FIRST$ = INKEY$: IF FIRST$ <> "" THEN GOSUB 800: NONE=1
90 IF NONE = 0 THEN GOSUB 2000 ' Do task if nothing else done
100 GOTO 50

300 '
301 ' Subroutine to check if data was received.
302 '
310 DELAY = 5 ' Five second check
320 GOSUB 5000 ' Read the current time
330 TSTART = TSEC ' Set start to current time
335 '
336 ' Check serial port
337 '
340 OPEN "COM1:4800,N,8,1,CS,DS,CD" AS #1 'Open the serial port
350 IF LOC(1) <> 0 THEN GOTO 400 ' Check for data received
360 GOSUB 5000 ' Read the current time
370 IF TSEC - DELAY < 0 THEN TSEC=TSEC+86400 ' Check midnight
380 IF TSEC > TSTART + DELAY THEN GOTO 460 ' Check time elapsed
390 GOTO 350
400 '
401 ' Data received. Delay allows transmission to finish
402 '
410 IMESS$=INPUT$( LOC(1),#1 ) ' Capture transmitted data
420 FOR II = 1 TO 200: NEXT II ' Delay to complete transmission
430 IF LOC(1) <> 0 THEN IMESS$ = IMESS$ + INPUT$( LOC(1),#1 )
440 NONE = 1 ' Something was done
450 '
451 ' Put routine to save data here
452 '
460 CLOSE #1 : RETURN

600 '
601 ' Subroutine to check for data to send
602 '
610 ON ERROR GOTO 720 ' Check for data file existence
620 OPEN "I", #1, "DATA.DAT" ' Causes error if no data file
640 AS = INPUT$( LOC(1),#1 ) ' Get data to send
650 ON ERROR GOTO 0 ' Cancel error checking
660 OPEN "COM1:4800,N,8,1,CS,DS,CD" AS #2 ' Open the serial port
670 PRINT #2, AS ' Send the data
680 CLOSE #1 : KILL "DATA.DAT" ' Close data file and erase
690 NONE = 1 ' Something was done
700 CLOSE ' Close the serial port
710 RETURN
720 RESUME 700 ' End check if no DATA.DAT

800 '
801 ' Subroutine to capture keystrokes from keyboard interrupt
802 '
810 MESS$ = MESS$ + FIRST$ ' Append main loop key
820 AS=INKEY$ : IF AS <> "" THEN MESS$ = MESS$ + AS : GOTO 820
825 GOSUB 970 ' Check for <Esc>

```

(continues)

Listing 2: MULTTASK.BAS uses INKEY\$ as part of a loop to check for information received or transmitted from the serial port or characters entered at the keyboard. If data is not traveling to or fro, the program performs other processing tasks and then returns to the loop for another series of checks.

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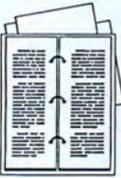
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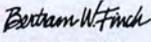
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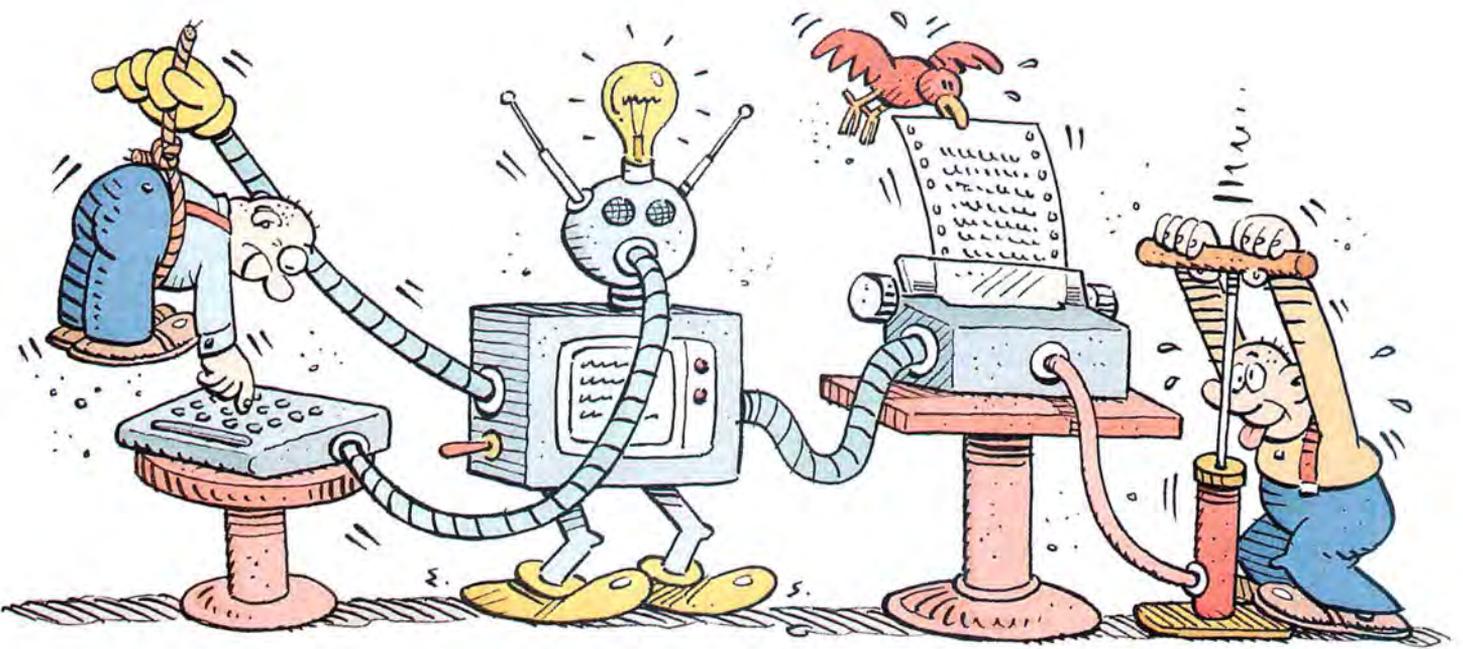
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```

830 IF RIGHTS(MESS$,1) = CHR$(13) THEN 900 ' Check for <Enter>
840 '
841 '   Allow time to receive <Enter>
842 '
850 FOR I = 1 TO 20           ' Start timing loop
860 A$=INKEY$ : IF A$ <> "" THEN MESS$ = MESS$ + A$ : GOTO 860
870 GOSUB 970               ' Check for <Esc>
880 NEXT I                 ' End timing loop
890 IF RIGHTS(MESS$,1) <> CHR$(13) THEN 960 ' No <Enter>
900 '
901 '   Check string from keyboard for application
902 '
910 PRINT LEFT$( MESS$,LEN(MESS$)-1 ); ' Print keyboard string
920 PRINT " <- Was received from the keyboard"
930 IF MESS$ = "TASK #1" + CHR$(13) THEN GOTO 1000
940 IF MESS$ = "TASK #2" + CHR$(13) THEN GOTO 1100
950 MESS$ = ""             ' Clear the keyboard string
960 RETURN
970 IF INSTR(MESS$,CHR$(27)) THEN 990 ' Check for <Esc>
980 RETURN
990 RESET : END           ' <Esc> pressed, quit

1000 '
1001 ' Put TASK #1 here
1002 '
1010 PRINT "TASK #1 would be running"
1020 RETURN

1100 '
1101 ' Put Task #2 here.
1102 '
1110 PRINT "TASK #2 would be running"
1120 RETURN

2000 '
2001 ' Some ongoing task belongs here
2002 '
2010 ROW=CSRLIN : COLUMN=POS(0)           'For this example, print the time
2020 LOCATE 1,74 : PRINT LEFT$(TIME$,5); 'in screen's upper right corner
2030 LOCATE ROW,COLUMN
2090 RETURN

5000 '
5001 ' Subroutine to convert the current time to seconds
5002 '
5010 TSEC = VAL(MID$(TIME$,1,2))*3600      ' Convert hours
5020 TSEC = TSEC + VAL(MID$(TIME$,4,2))*60 ' Convert and add minutes
5030 TSEC = TSEC + VAL(MID$(TIME$,7,2))   ' Add seconds
5040 RETURN

6000 END

```

Listing 2 (continued)

executes a delay loop at line 420 that ensures all incoming data is received before the routine is exited.

MULTTASK.BAS's serial input routine also incorporates a 5-second time-out that stops the computer from "sitting" in the routine too long. The time-out's duration can be adjusted in line

310. (The subroutine at lines 5000 through 5040 calculates the current time in seconds for the time check.)

The main loop then branches to another subroutine (lines 600 through 720) that checks for the existence of a file called DATA-

.DAT. The file contains data to be transmitted through COM1. Once the data is sent, the file is erased.

When a key is pressed, the keyboard interrupt routine (lines 800 through 960) is called and immediately stores any keystrokes in the variable MESS\$. Line 830 checks to see if <Enter> has been pressed to signal completion of keyboard input. Lines 850 through 870 give the program extra time to wait for <Enter> as the routine continues to build the string. If entering the string takes longer than the allotted time, the program returns to the main loop.

However, entered keystrokes are not lost, but remain in the variable MESS\$, and subsequent keystrokes are appended to the variable. When <Enter> is pressed, the contents of MESS\$ are displayed on screen, accompanied by the message, '<- Was received from the keyboard'.

For example, if you type TASK #1 and press <Enter>, the keyboard input routine branches to a subroutine at line 1000, where a task would be kept. At this point, MULTTASK.BAS displays the message 'TASK #1 would be running'. If you enter TASK #2, a similar procedure takes place.

If data is not being received or transmitted via the COM port and keys aren't being pressed, the main loop branches to line 2000 to perform some ongoing task. In this example, the task simply displays the time in the upper right corner of the screen. MULTTASK.BAS then returns to the main loop to begin the series of checks anew.

(continues)



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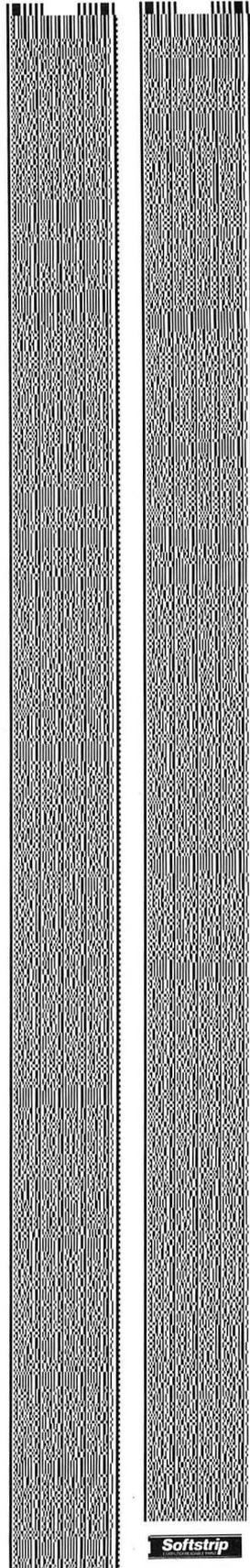
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These Softstrips contain *.*'s April program listings. They can be read by Cauzin's Softstrip System Reader.



Other statements, such as ON COM and ON KEY, could be used in place of INKEY\$, but they don't allow a program to finish its current task; rather, they force it to jump immediately to the corresponding routine.

While the subroutines in MULTTASK.BAS aren't fancy, they do illustrate the powerful potential of the reserved variable INKEY\$.

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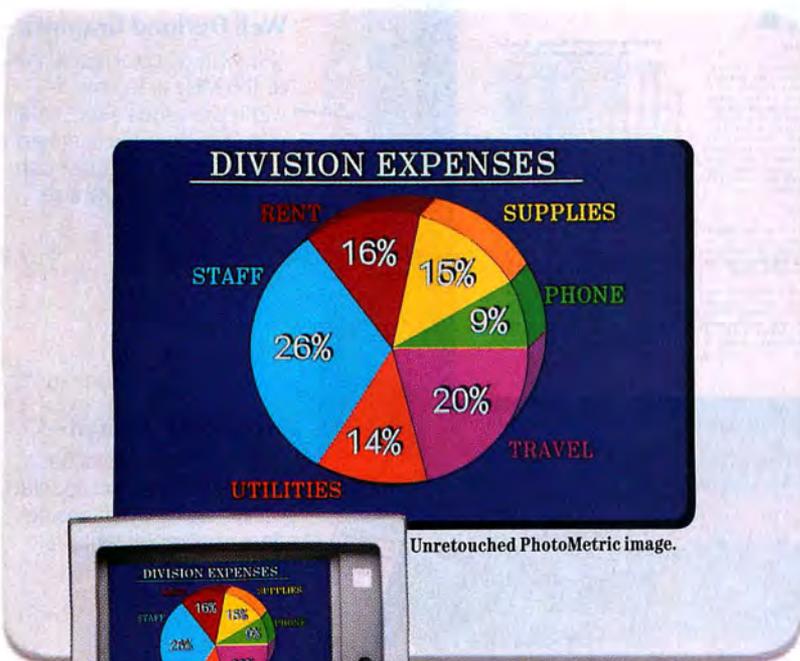
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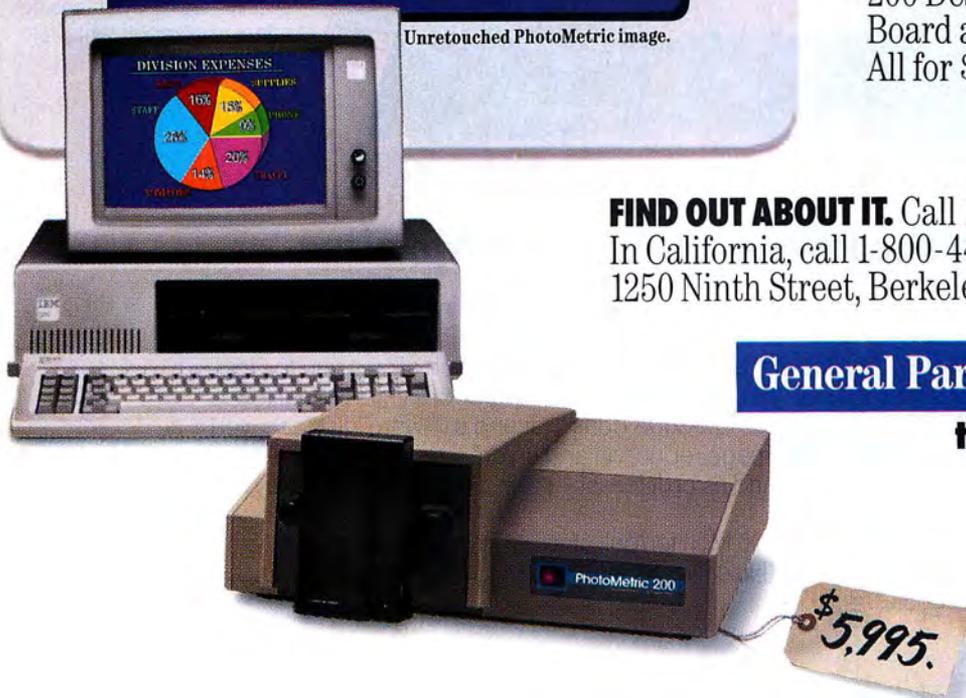
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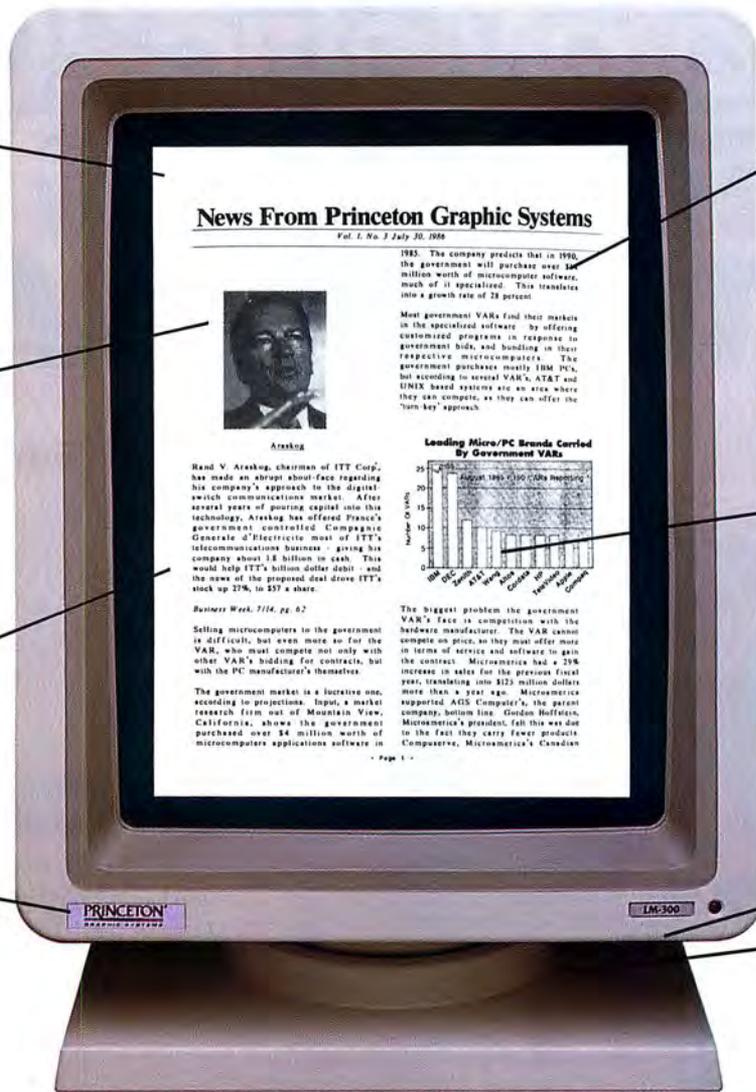
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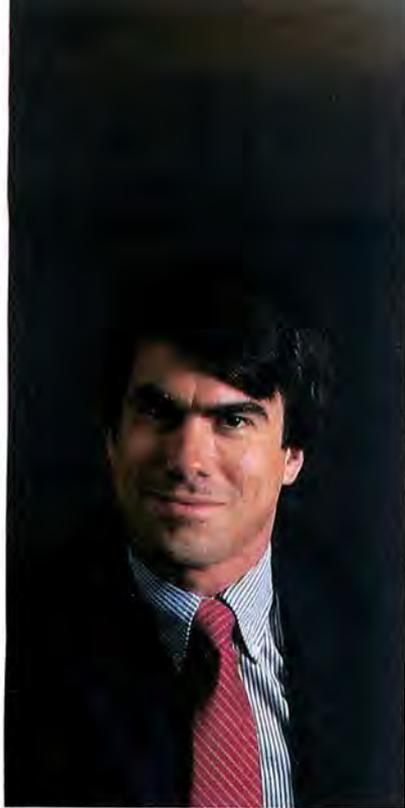
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Kevin Strehlo

MicroPro's Model A

With the release of WordStar 4.0, MicroPro finally decides to let millions of long-suffering users come in from the cold.

How old is *WordStar*? In the chronology of personal computing, it's ancient.

Back when MicroPro introduced *WordStar* in 1978, the Apple II had been shipping for less than a year, and the only mass storage available was a cassette drive. Steve Wozniak was still making excuses about why he hadn't finished his floppy disk controller. For personal computers in general, hard disk drives cost more than \$1000 per megabyte.

VisiCalc wasn't out yet. Dan Bricklin had just conceived of the electronic spreadsheet. And Bob Frankston was working nights in his Cambridge attic on a *VisiCalc* prototype.

Nor was the concept of personal computer as word processor firmly established. A survey of 231 personal computer owners taken at the 1978 National Computer Conference showed that while virtually all of them programmed in BASIC, only half used their PCs for text editing. And much of that text was program code. The first

rumors of an IBM personal computer surfaced at the 1978 show, three years before its actual introduction.

The reigning king of PC word processing—for all intents and purposes the *only* microcomputer word processing program—was Michael Shrayner's *Electric Pencil*. The program was a wonder; it let nontechnical types make practical use of machines that had been just the playthings of programmers and tinkerers.

But *Electric Pencil* had two glaring flaws: It lost keystrokes when it wrapped words from the end of a line, and Shrayner had to rewrite the program significantly each time he moved it to a new computer.

WordStar, by contrast, didn't lose keystrokes. And it was modular, so to move the program to any CP/M machine required at most a new video driver. In the days when

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the competition was among manufacturers of incompatible machines that were united only by an ability to run CP/M, modularity was a decisive advantage.

By the time IBM introduced the PC in August 1981, *WordStar* was the word processor of choice on nearly every significant personal computer. Even Apple II owners were buying CP/M boards so they could run the popular, powerful word processing program. Although exact numbers are difficult to come by, *WordStar* dominated the market. There were said to be more pirated copies of *WordStar* in use than all other personal computer word processing programs combined.

The PC version of *WordStar*, essentially the same as the old CP/M version that ran in 64K, failed to take advantage of the new machine's greater memory capacity. Yet *WordStar* quickly established itself as the premier word processing program on the premier machine.

WordStar's complete dominance of the word processing market in personal computing's early years has rarely been matched in the annals of American business. One analogy does come to mind: Highland Park, Michigan, in the spring of 1913, when Henry Ford sent the first Model T rumbling off his new assembly line.

When Ford cut the Model T's assembly time from 13 hours to 1 1/2 hours, the resulting price drop sent demand for the already popular car into orbit. Ford's Tin Lizzie dominated the automobile industry for more than a decade.

But the egocentric Ford wouldn't listen when underlings warned him it was time to move ahead. Only in 1927 did he replace the Model T with the Model A, finally installing the shock absorbers, the gas gauge, the speedometer, and the other amenities that Chevrolet had incorporated into its cars—and had used to ambush Ford.

Ford's action was too little, too late. Ford had stuck with an essentially unchanged Model T for 19 years; his company never regained its position atop the automobile market.

MicroPro stuck with an unchanged *WordStar* for nine.

Actually, MicroPro roused itself to make a move only seven years into *WordStar's* life, unveiling *WordStar 2000* in October 1984. But that event almost didn't happen—and some, in hindsight, say it shouldn't have.

MicroPro waited until new, more powerful word processors like *MultiMate*, *Microsoft Word*, and *WordPerfect* had grabbed a significant share of the market before introducing a new version of the program to counter them. And the resultant product wasn't developed in-house.

Within MicroPro, some strident voices had been telling president and marketing guru Seymour Rubinstein that he needed a word processor with more clout than *WordStar*. Nonetheless, development proceeded on spreadsheet, data management, and graphics

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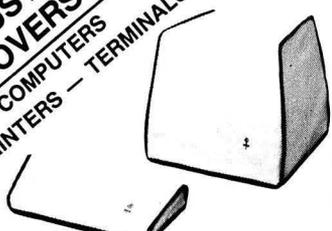
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programs, while virtually nothing happened in the word processing arena. *WordStar* updates largely incorporated what users begged for—ad hoc patches and new printer drivers—rather than features that decisively moved the product ahead.

One employee did pester Rubinstein into looking at a new word processor that was being developed by a small firm nearby in Marin County. Its features roughly matched those of *WordStar* challengers, and it was written in the highly portable C programming language, which appeared to be an advantage. The program was purchased and brought in-house for further development under the code name Ivan—the once and future *WordStar 2000*.

At about the same time, MicroPro's venture capitalists decided the time was ripe to cash in their chips. They brought in Sperry executive Glenn Haney to take MicroPro public.

Haney didn't seem to listen to the developers who insisted Ivan had a problem: It was deadly slow. "He told us users said a program didn't have to be fast," says a former MicroPro employee, who asks not to be named. "And one of the people he brought from Sperry, Bill Crowell, said speed didn't matter because everybody was going to be using PC ATs."

Many of MicroPro's old guard held the newcomers in disdain, feeling that the ex-Sperry crew and their coterie of newly minted MBAs didn't know a thing about

personal computer software. According to some accounts, MicroPro was a sea of dissension and disorganization at the time.

What truly rankled the old guard, however, was that at least some of the company's new management believed *WordStar* users would switch en masse to *WordStar 2000*, along with present and potential users of *WordPerfect* and the other competing programs. As Haney put it when *WordStar 2000* was finally released: "We are reasserting our claim as the undisputed leader. We are never again going to be seriously challenged in word processing."

"It was a great miscalculation," says another MicroPro insider who prefers anonymity. Although the company had endured much criticism for *WordStar*'s cryptic control-key sequences, and although mnemonic commands made infinitely more sense, "No current users really wanted to retrain their fingers," says the insider. "If people had to learn all new commands, what was to stop them from switching to one of the established word processors? Something that was fast." Even when part of *WordStar 2000*'s C code was rewritten in assembly language, the program remained something less than a speed demon.

MicroPro's overall revenues continued to drop, and Haney's words on market leadership began to haunt him.

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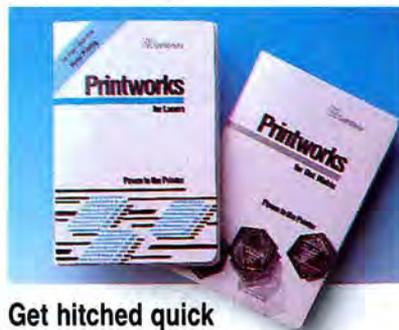
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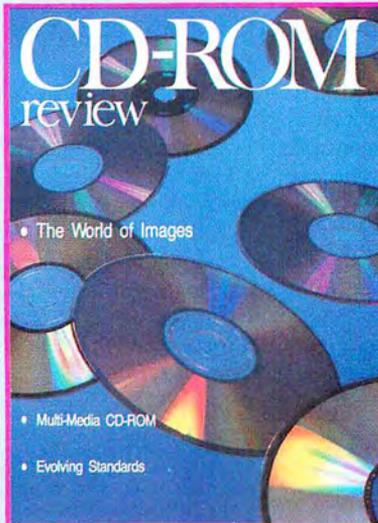
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Meanwhile, two key employees, Stan Reynolds and Peter Mierau, wanted to correct *WordStar's* glaring inadequacies—the inability to save margin settings between editing sessions, lack of both an undo command and support for DOS subdirectories, and the absence of advanced features like table of contents generation. At the same time, Reynolds and Mierau didn't want to jettison *WordStar's* major assets: the millions of fingers trained in the *WordStar* way and the program's reputation for speed and ease of use once it was mastered.

But management clung stubbornly to another vision and seemed content to believe *WordStar* users could wait. Haney wanted to capture the audience for low-end word processing packages like Software Publishing Corporation's *pfs:write*. He poured resources into the release of MicroPro's low-end *Easy* package, which had no link to the original *WordStar*. Ironically, Haney made the move just as shrinking sales at the low end forced Software Publishing to release a more capable product.

At the same time, Haney had no choice but to assign programmers to revamp *WordStar 2000*. (That move would eventually pay off in improved revenues for the product and moderate sales in the corporate market, but not enough to reverse the companywide decline in sales.) Unfortunately, the development budget included only crumbs for the *WordStar* upgrade.

Long before *WordStar 2000* was patched up, Reynolds and Mierau left the company to found NewStar, their launching pad for the word processor *NewWord*. Former MicroPro employees say the two always intended to sell the fruits of their labors to MicroPro.

But MicroPro would have none of it. There was talk inside the company of stolen code and possible legal action. Seymour Rubinstein, an emotional man, viewed their departure as a defection and refused to even talk to them. Thus did MicroPro miss the chance to pick up the sorely needed *WordStar* upgrade for a song. One former MicroPro employee suggests the firm could have bought the *NewWord* source code for \$300,000.

Rebuffed, Reynolds and Mierau marketed *NewWord* and got good notices from reviewers and users. But the company lacked the resources to make the improved *WordStar* clone really fly. "Our ad budget was \$670 a month," recalls Walt Feigenson, the former Sorcim vice president who joined NewStar.

Last September Haney left MicroPro, having watched the company's revenues drop by half during his tenure, and Leon Williams replaced him. Only then did a channel of communication finally open between NewStar and MicroPro.

Before Williams even took the job, he gave NewStar a call. "MicroPro's telemarketing showed that we were their biggest competitor," says Feigenson. "And Williams is a real product man."

(continues)

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Williams apparently liked what he saw. Although MicroPro did have a *WordStar* upgrade in the works, he decided to save time and stem the erosion in market share by acquiring NewStar for \$3 million. "Williams said we could get him into the market with a competitive product nine months to a year before he could do it himself," says Feigenson, now a MicroPro vice president.

In retrospect, it seems clear that if MicroPro had bought *NewWord* when it was first offered, the company could have saved \$2.7 million and stanchd the flow of *WordStar* users switching to other word processors.

With a little fine-tuning, MicroPro turned *NewWord* into *WordStar Professional 4.0*. Among its formidable stable of features is the Microlytics *Word Finder* thesaurus. Microlytics president Michael Weiner says he sought the deal aggressively because "the new *WordStar* is going to be an enormous success."

Weiner is convinced MicroPro has a winner on its hands in part because of a marketing masterstroke: an "amnesty period" that allows *WordStar* users to upgrade, regardless of how they've come by the program. Enthuses Weiner, "The amnesty period is especially brilliant. They needed a way to tell all the 'unofficial' users to come in out of the cold and become legit, and I think they found it."

WordStar has something like 1 million registered users, and 2 to 3 million "familiar" users—which Feigenson defines as "people who bought *WordStar* and never sent in the registration card, or somehow acquired the software without buying it." This second group is MicroPro's target for the amnesty period.

For a company trying to improve its image, what better way than by offering to forgive and forget (especially if it can make \$100 a pop from a few hundred thousand "familiar" users)?

For \$89 plus \$5 shipping, anyone can upgrade to the new version without fulfilling the usual requirement of sending in the manual or the original program disk. "All that users have to do to show proof of ownership is to present a serial number," says MicroPro spokesman Lee Lensky. (A serial number appears on the sign-on screen of every copy of *WordStar*, registered or otherwise.) Lensky says that MicroPro will do only enough tracking to ensure that just one upgrade shipment goes out for each serial number.

As an added inducement, each upgrade includes certificates good for special discounts on Borland's *SideKick* and Living Videotext's *Ready*—which use familiar *WordStar* keystrokes for text editing—as well as New England Software's *Graph-in-the-Box*. And the initial retail package of *WordStar 4.0* features a choice of either a \$100 rebate—which brings the street price down to under \$150—or all three aforementioned utilities for free.

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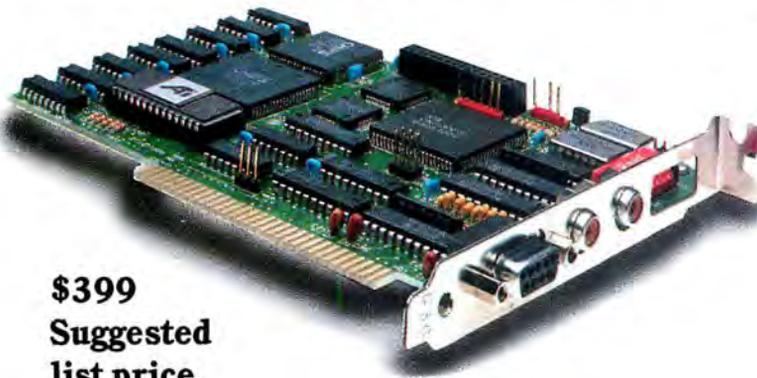
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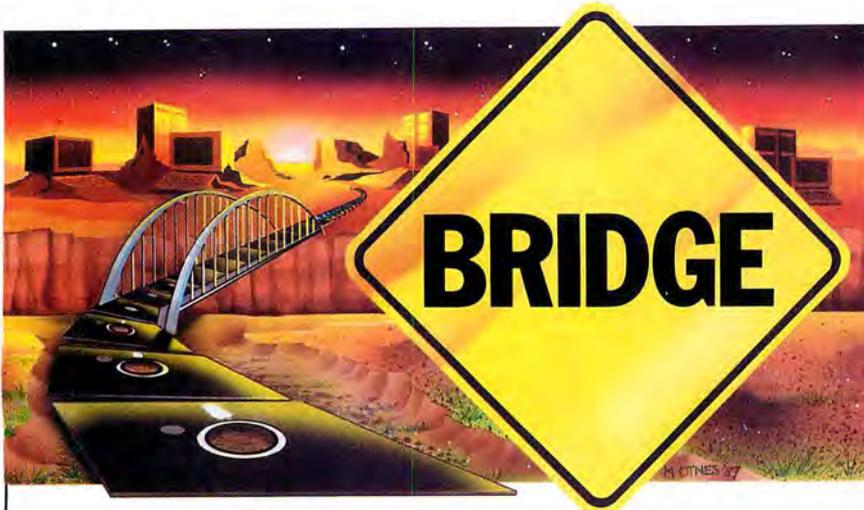
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This is impressive stuff, as is version 4.0's bevy of 135 enhancements of version 3.3. One lingering complaint is that text does not automatically reformat as it's edited—you'll still need the <Ctrl>-B reformat command. On the other hand, eliminating <Ctrl>-B would have changed what MicroPro calls "the classic look and commands" of *WordStar*. But not to worry—MicroPro promises additional upgrades in the near future, which could well include an option either to use <Ctrl>-B or to reformat text automatically.

MicroPro also vows to pay more attention to customer feedback. Feigenson says the company is doubling the size of its support staff. If you have pet peeves with *WordStar* or if there are features you'd like to see added, you may actually be able to bend someone's ear at MicroPro—and see some action taken. Such considerate behavior, after all, laid the groundwork for *WordPerfect's* dramatic rise.

Anything is possible. Ford, a company that never returned to first place following the intransigent behavior of its founder, has made huge strides recently by stressing that "Quality is Job 1." For the sake of the millions of *WordStar* users, here's hoping that MicroPro can improve its responsiveness to customers to the same degree. ●

Kevin Strehlo hunts for PC tales and WordStar upgrades from an office overlooking Silicon Valley.

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FORMAT: The standard format includes a product ID, a 300-character descriptive ad, and company name, address, and telephone number.

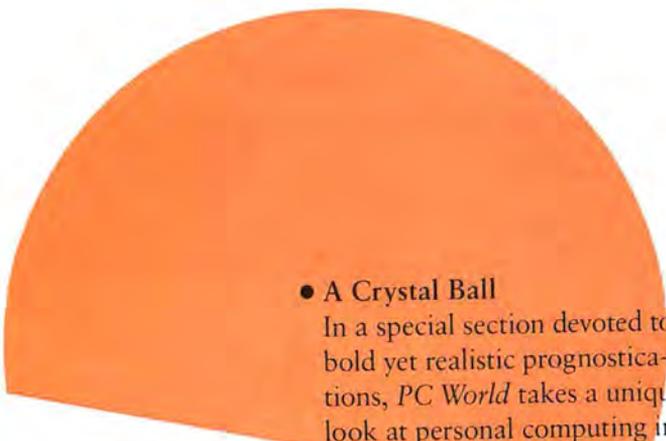
Advertisers may choose among categories already in use, or they may create their own. Display advertisers can cross-reference their current ad to the PC World Directory for increased exposure at low cost.

RATES: Listings are accepted for three-time consecutive insertions at a rate of \$975 (\$325 per issue). We offer a six-time insertion, 15 percent discount contract for a total of \$1626 (\$271 per issue). Listings must be prepaid (except for established display advertisers) upon submission of ad copy. Checks, money orders, VISA, and MasterCard are acceptable.

DEADLINE: For copy deadlines, contact a PC World Directory sales representative at 415/546-7722 or 800/435-7766 (nat'l), 800/435-7760 (CA). Please send copy and prepayment to PC World Directory, 501 Second St., San Francisco, CA 94107.

May Preview

The Future of Computing



- **A Crystal Ball**

In a special section devoted to bold yet realistic prognostications, *PC World* takes a unique look at personal computing in the year 2000. By looking at distinct areas of hardware—CPU, storage, output devices, and displays—and software, we foresee a seamless productivity environment in which computers of the future will work in much the same way people think.

- **A Spokesman**

Robert Carr, Ashton-Tate's chief scientist and the creator of the integrated package *Framework*, draws on his extensive experience in the computer industry to share some inside tips and tricks for designing menus that make applications easier to use.

- **A New Frontier**

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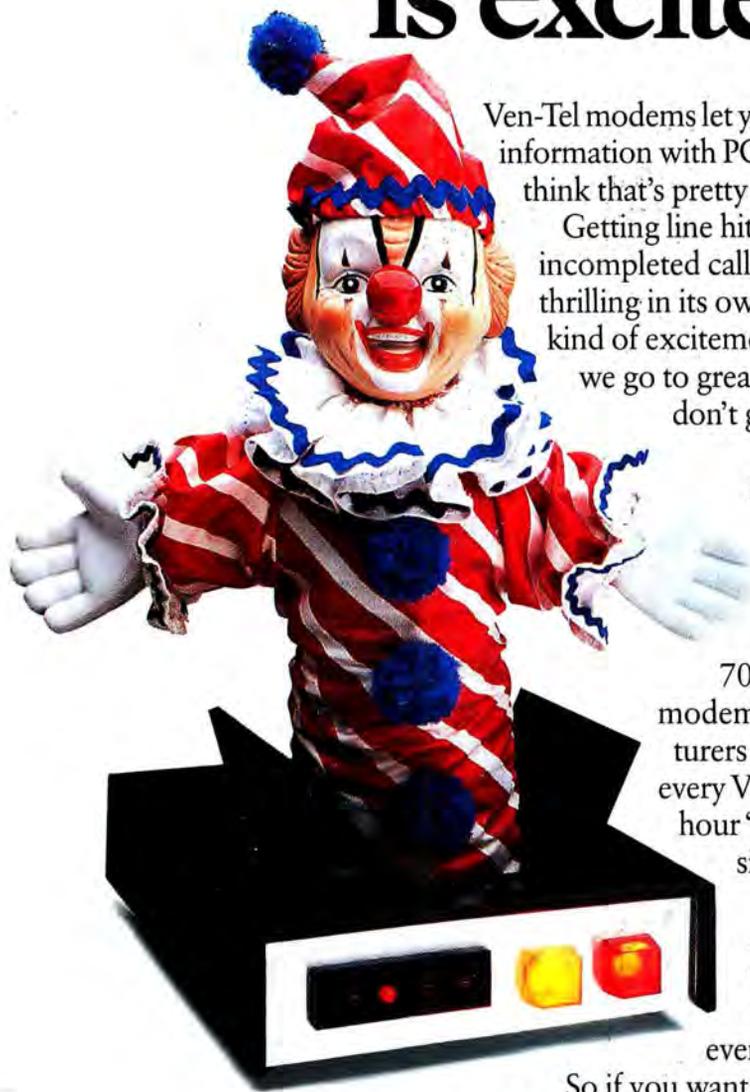
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