Special Edition

PC WORLD

September 1985 *$2.95*
Canada $3.95

The Comprehensive Guide to IBM Personal Computers and Compatibles

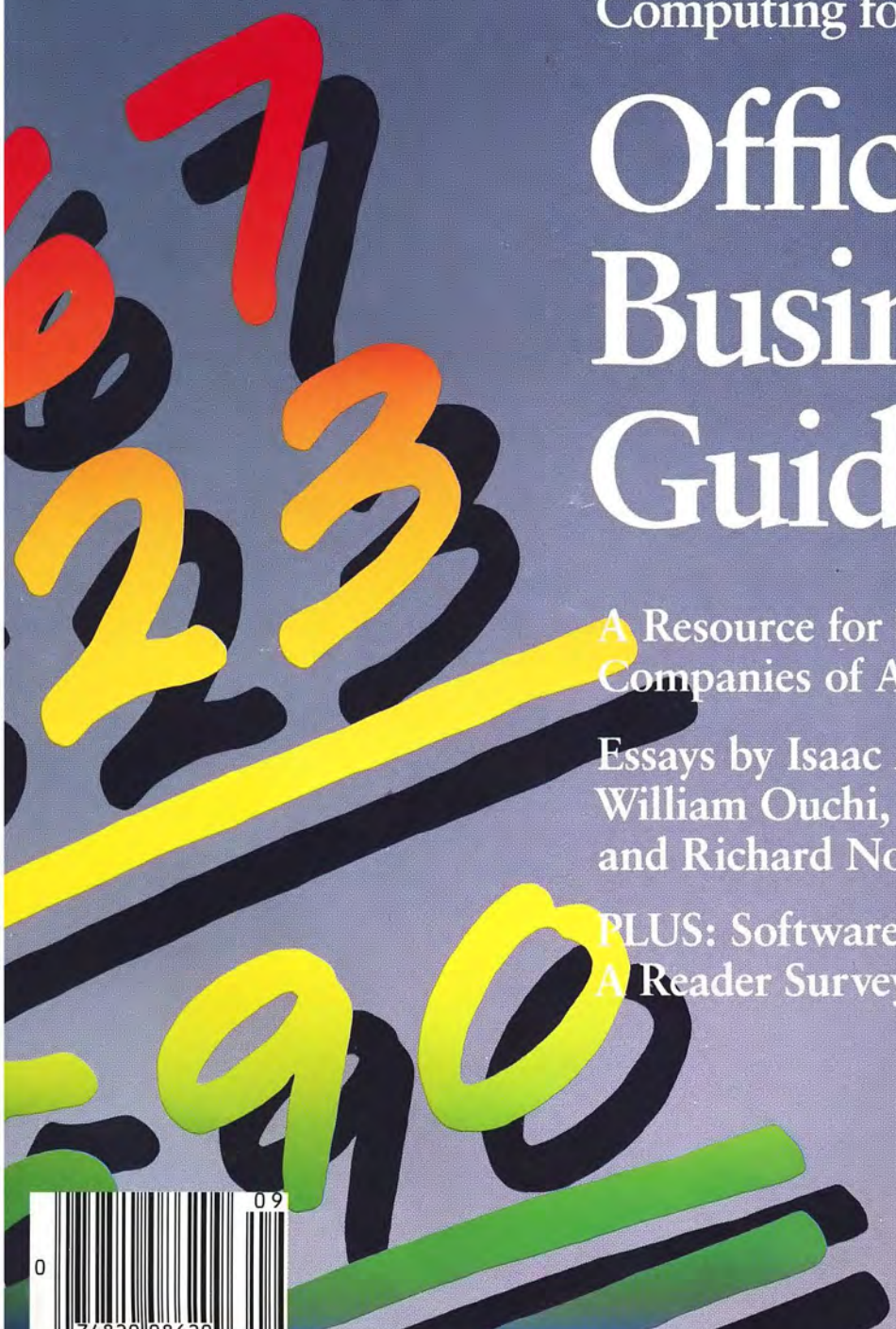
Computing for the Bottom Line:

Official Business Guide

A Resource for Using PCs in Companies of All Sizes

Essays by Isaac Asimov, Jerry Brown, William Ouchi, James Fallows, and Richard Nolan

PLUS: Software Piracy—A Reader Survey



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PC WORLD
September 1985
Official Business Guide

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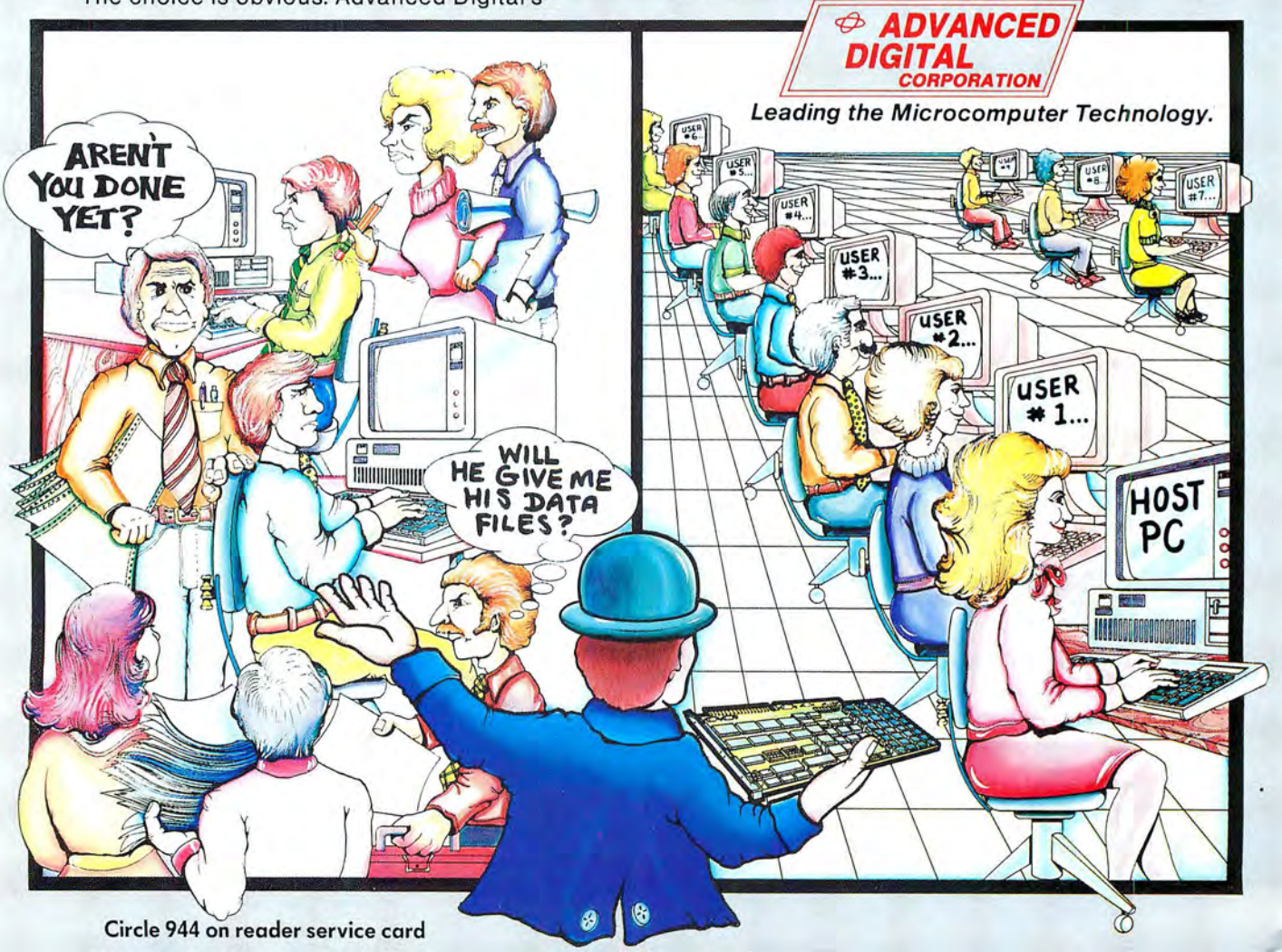

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The Comprehensive Guide to IBM Personal Computers and Compatibles
September 1985

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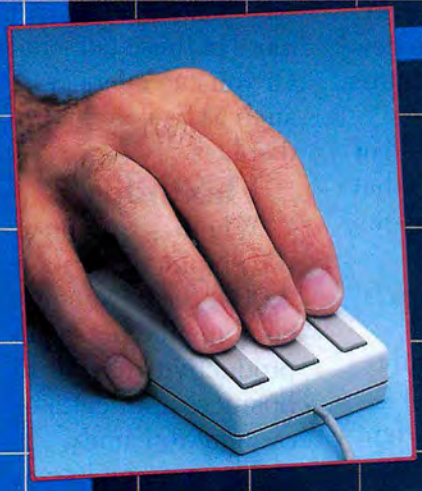

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IBM System/36 PC.

And you can get traditional PC functions such as spreadsheets and word processing.

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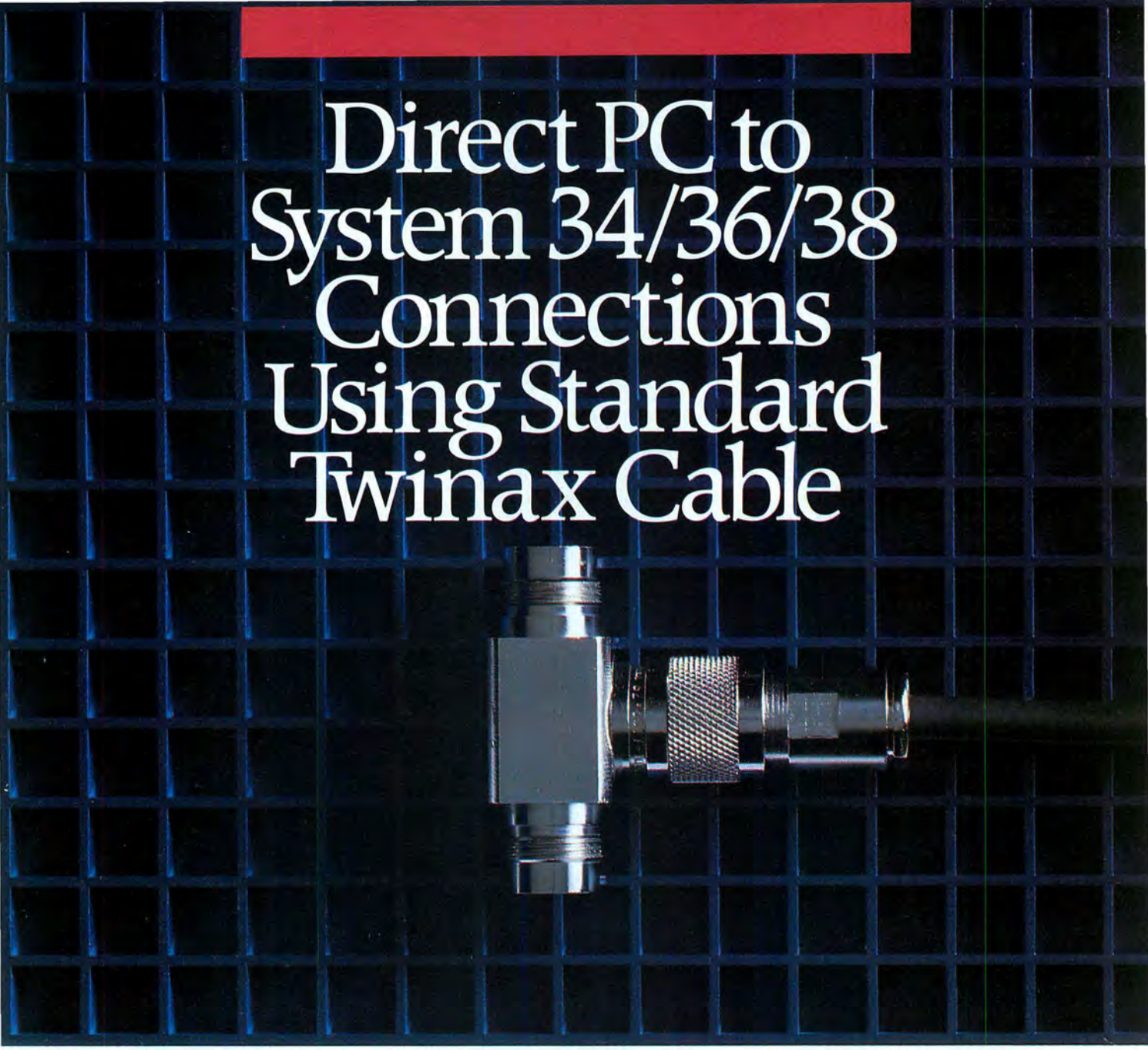

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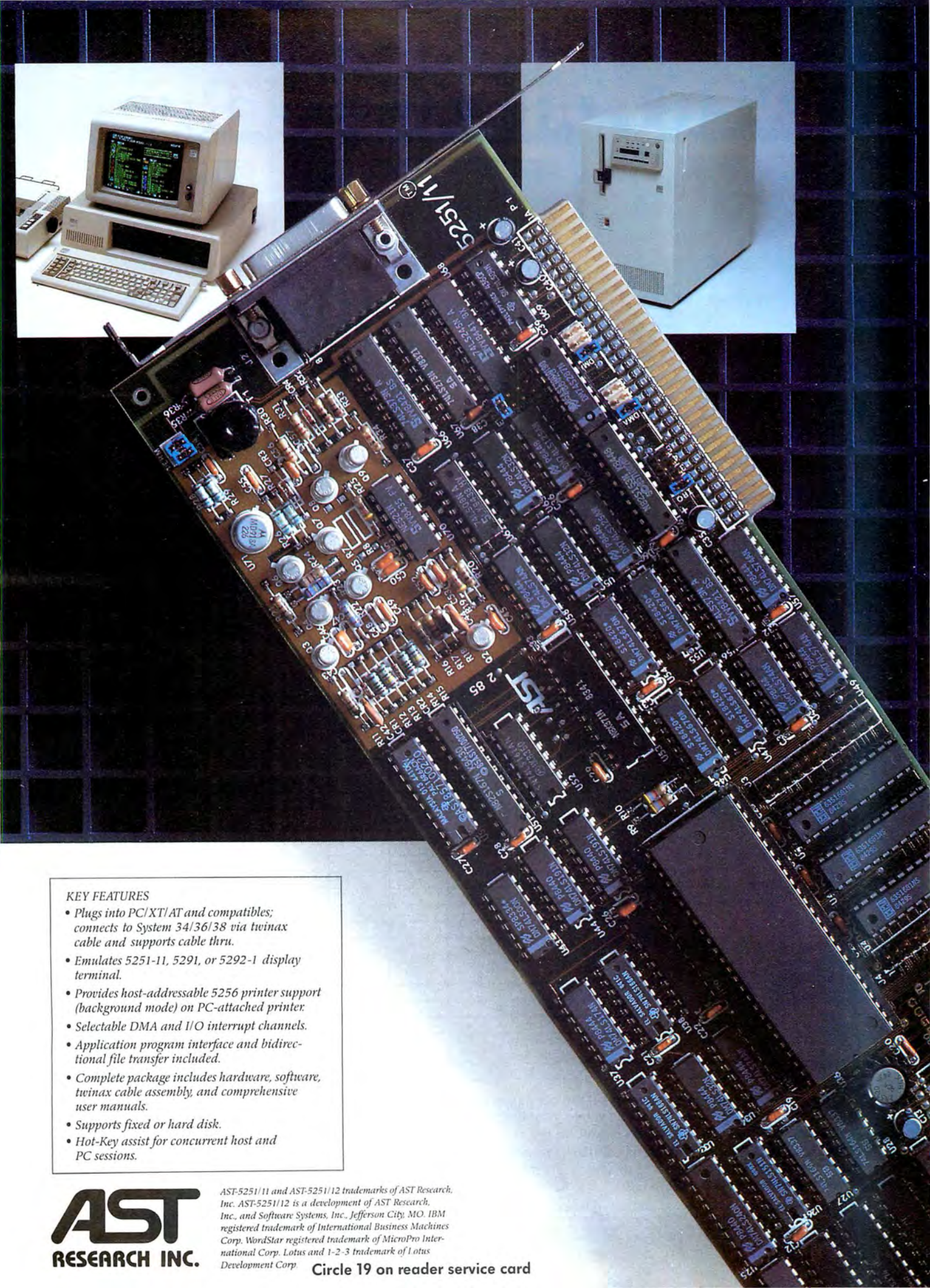

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- *Emulates 5251-11, 5291, or 5292-1 display terminal.*
- *Provides host-addressable 5256 printer support (background mode) on PC-attached printer.*
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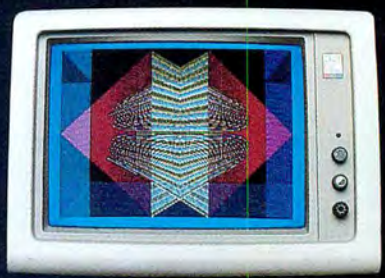

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The Edge

The Plain Facts:

EVEREX THE EDGE	Everex The Edge	Paradise Modular Graphics	Tecmar Graphics Master	Tseng Lab Ultra Pak	Persyst Bob	Hercules Graphics Card
• IBM Monochrome Compatible, 720x348, High Resolution	✓		✓	✓		✓
• Runs Lotus 1-2-3™ and Symphony™ in high resolution monochrome:	✓		✓			✓
—132 columnsx25 rows	✓			✓		
—132 columnsx44 rows	✓			✓		
• PC Paintbrush in monochrome	✓		✓	✓		✓
• 16 shades of green on the IBM monochrome monitor	✓	✓				
• Runs color software on the IBM monochrome monitor, full screen:	✓	✓				
—Flight Simulator	✓	✓				
—PC Paintbrush	✓	✓				
—PC Paint	✓	✓				
—PC Tutor	✓	✓				
—Pinball	✓					
—Without software patch needed	✓					
• Automatic Boot-up without software patch needed	✓		✓	✓	✓	✓
• Runs Lotus 1-2-3™ and Symphony™ in high resolution color:	✓		✓			
—16 colors, 320x200	✓		✓			
—4 colors, 640x200	✓		✓			
• Printer port (standard)	✓		✓	✓	✓	✓
• Software switchable among color, monochrome and 132 columns mode	✓					
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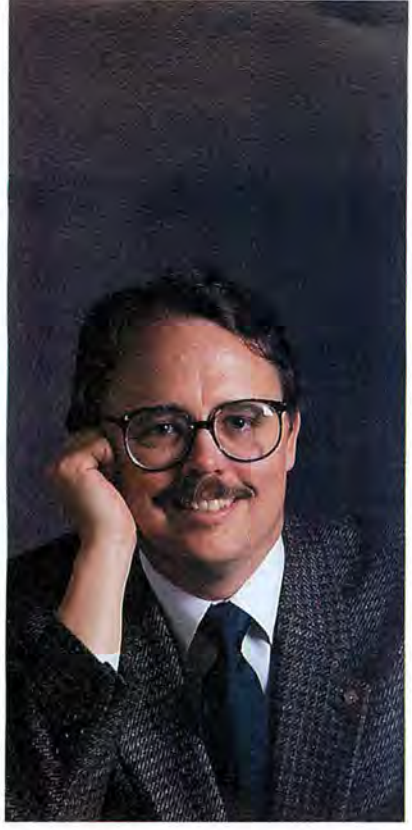


David Bunnell

Shining Some Light on Software Piracy

PC World proves software publishers can unlock their treasure chests without sacrificing the ship.

Software piracy has been a constant, nagging problem for personal computing.

Like many ailments, piracy has inspired a series of old wives' tales: almost everybody's theories on the causes and cures differ. *PC World* surveyed a sample of its readers in order to cut through the fallacies and find the facts about who actually owns or uses "unauthorized" programs.

Our results are staggering. They clearly indicate that illegal copying and distribution of all categories of popular software is a widespread practice at home and at the office.

Despite this alarming revelation, the results strongly support the contention that unauthorized copies help sell authorized copies. Why? Because people who use pirated software often decide to buy legitimate copies or recommend that their friends or their companies purchase the software.

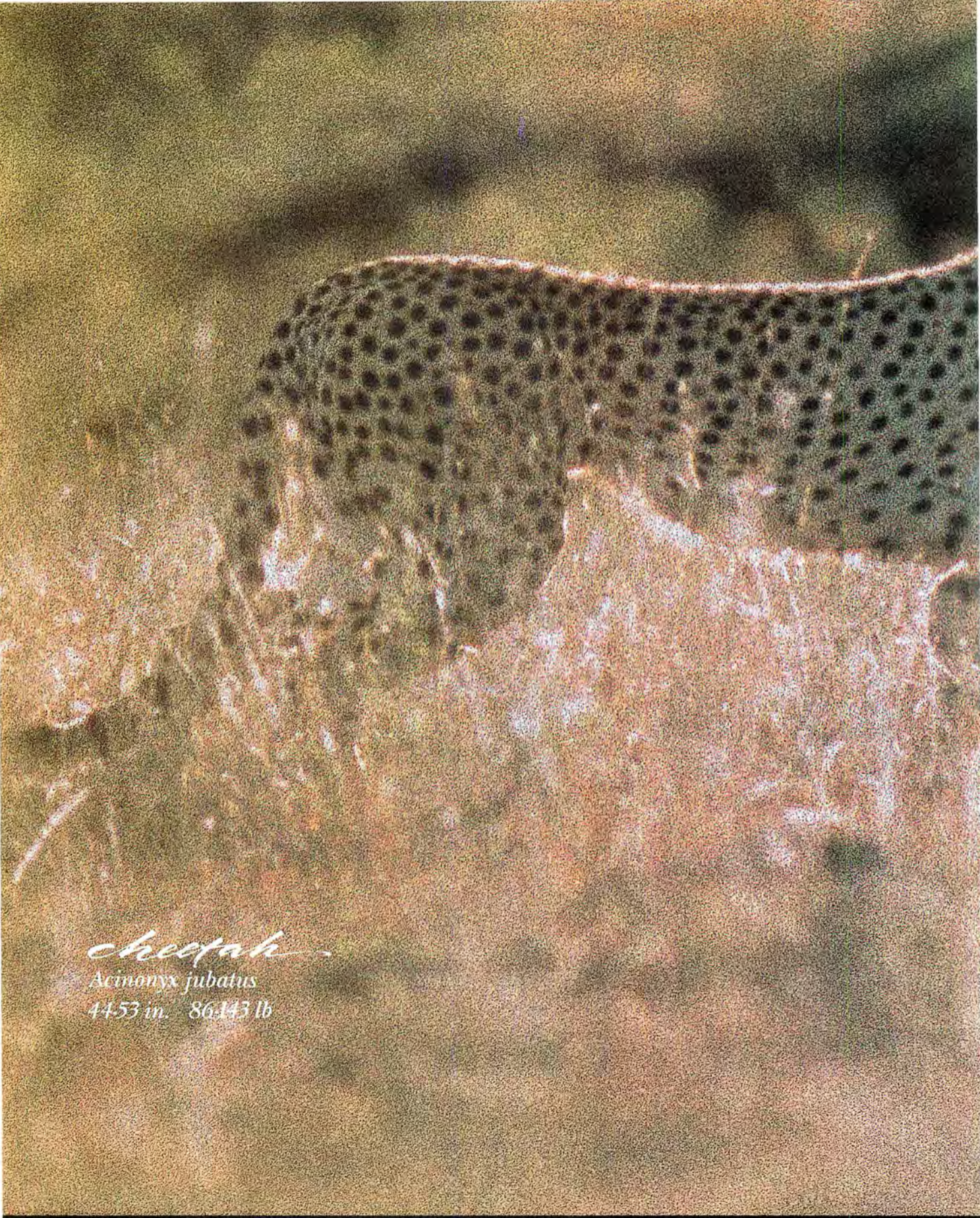
Thus, John Dvorak's theory that unauthorized copies sell software is no longer just hearsay. Our survey proves it. We now have a basis for truly understanding the problem.

Historically, there have been notorious levels of rancor between zealous publishers guarding their software protectively–and in the process making it awkward to use–and radical users contending that copying software is a right guaranteed in both the Constitution and the Ten Commandments.

These two segments may never see eye to eye. But the rest of us don't have to watch them turn the personal computer business into a Belfast street battle.

The fiercest combatants are motivated mainly by unmitigated, shortsighted selfishness. According to the vast majority of *PC World* readers surveyed, software publishers and users share a mutual interest and are generally in agreement: Authors and publishers need to be paid for their work.

(continues)



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TAPE: PC/T

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Surprisingly, users would even agree to a minimal form of copy protection on purchased software. So the notion that people want to rip off software developers just isn't true.

An international software congress of users, authors, publishers, and other key PC people should be formed to help resolve the piracy problem and to ensure that all sides of the issue are examined.

Such a congress could draft major documents analyzing the issue and could establish standards for protecting users as well as software publishers. Users in turn would encourage publishers to adhere to the copy-protection standards by exerting their purchasing muscle. And following a "Users Code of Ethics," these honest enthusiasts would support publishers' efforts to find and stop the minority of users who *really* steal software.

Were such a congress truly successful, it could transform the environment in which programs are authored, published, and used. Ideally, software would no longer be crippled by cumbersome protection schemes. Adequate methods of program testing would be developed. And buyers would be permitted trial runs before making final purchasing decisions.

(continues)

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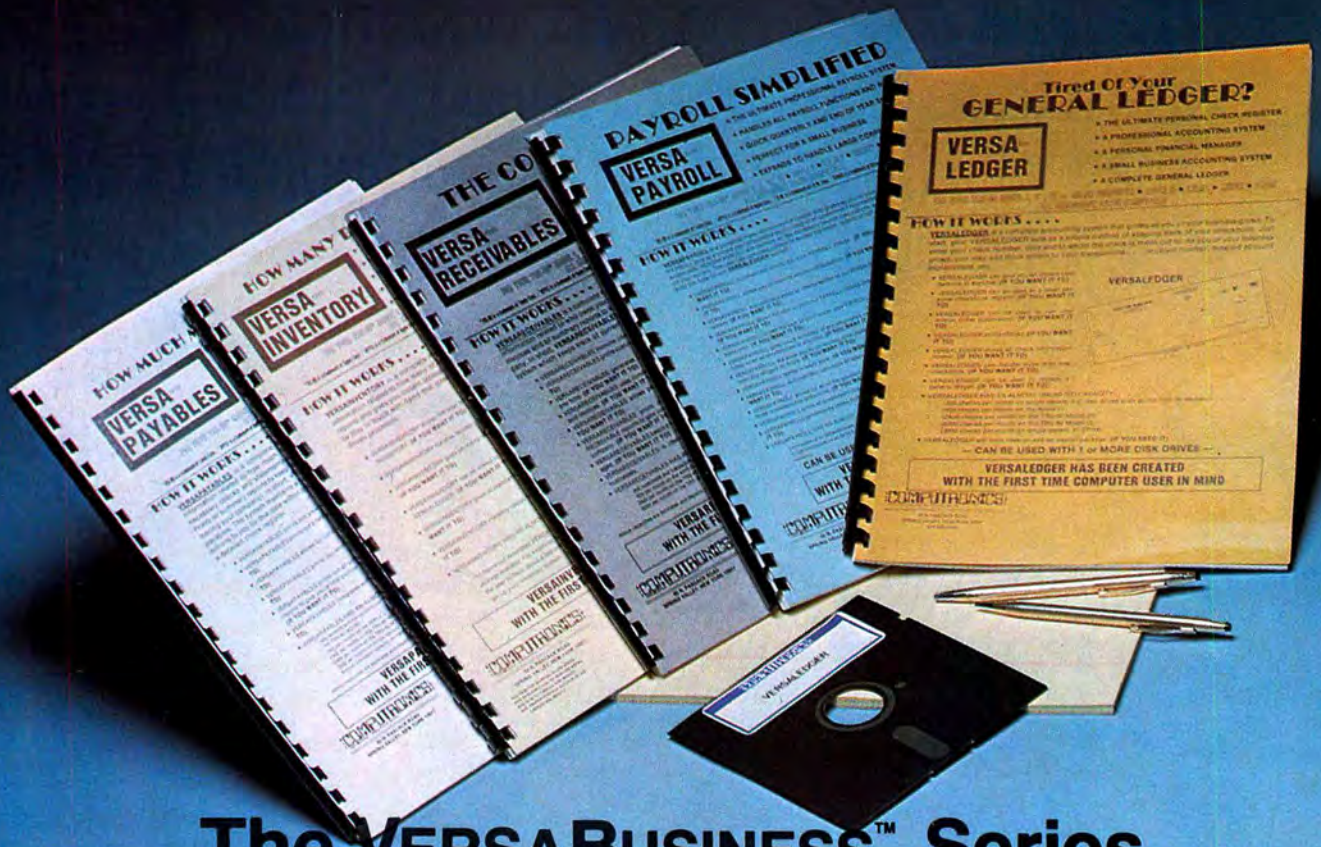

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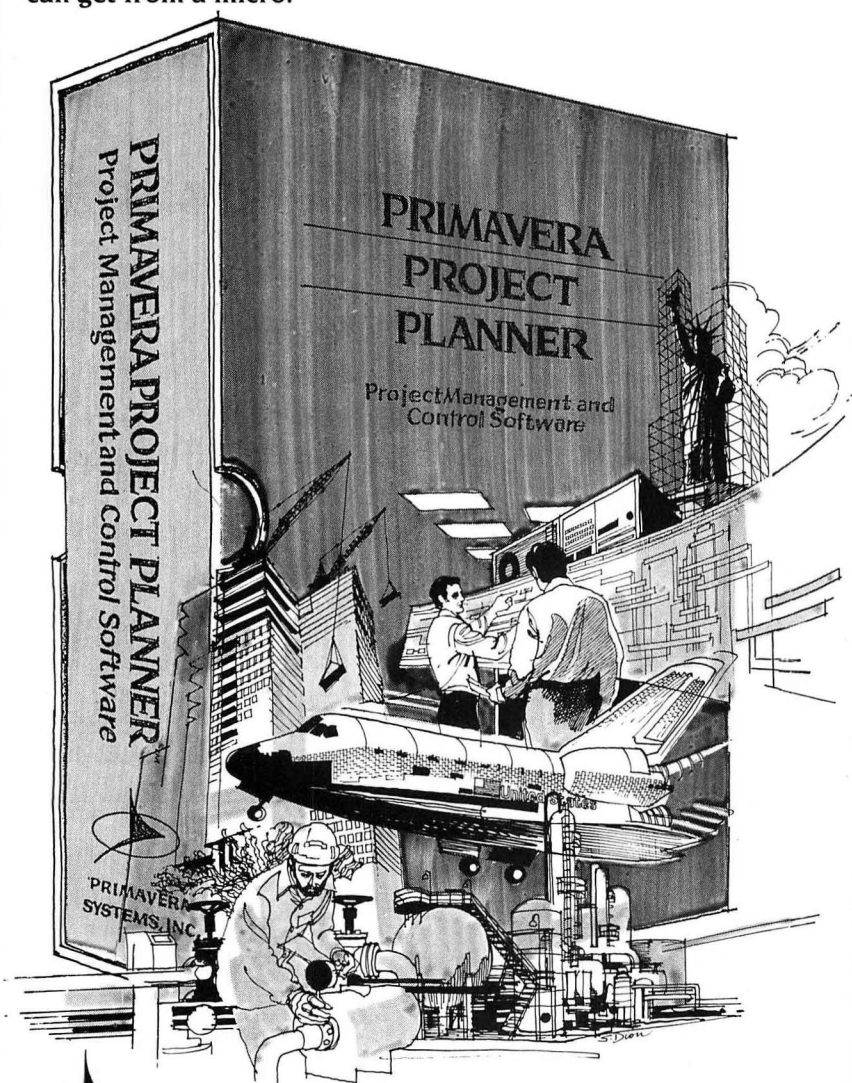

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In such an altered, open environment, software sales would increase significantly—encouraging the publication of both more software and cheaper software. Everyone would profit.

I encourage everyone who is concerned about software piracy to read Darcy DiNucci's article, "Copying Software: Who's Right?," in this issue. Review and study the results of the survey. If you think the concept of a software congress has merit, please send me your suggestions on how to forge ahead with this idea. With enough support from users, authors, and publishers, there may be light at the end of the piracy tunnel...

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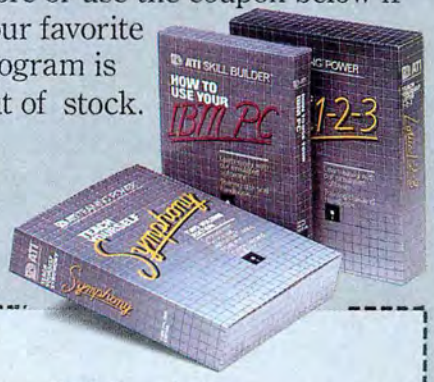

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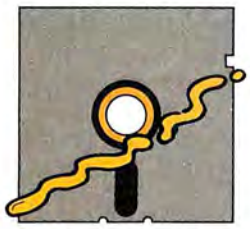

Hot dog mustard

Dust (cough-cough)

Tacky white tape

Boss's cigar ashes

Clouds of smoke

Spilled milk

Potted plant–no pot

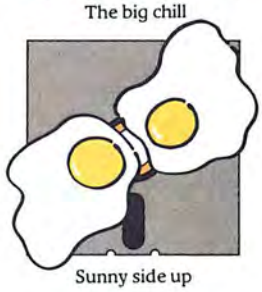
The big chill

Lunchcounter ketchup

Dry martini, one olive

Fizzy orange soda

Waterbased ink spots

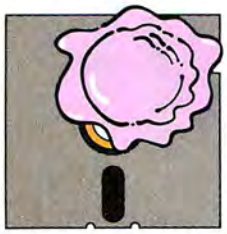

Sunny side up

English breakfast tea

Eraser bits

Chocolate fingerprints

Sudsy soap bubbles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FILE lets you create the filing system that will best fit your particular needs. Unlike other database software, you can design forms any way you want without having to follow a lot of complicated rules.

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REPORT is the perfect companion to FILE. It lets you quickly create summaries of your FILE data with totals, averages, counts and other calculations. So you can get a quick look at the bottom line.

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Ken Greenberg

The New Status Quo

The small businessman is smart; he realizes there's no free lunch. On the other hand, he knows where to go to get a good inexpensive sandwich. –*George Morrow*

Once upon a time, when data processing was confined to clinical cubicles ministered by white-coated swamis, computing had little direct connection with boardrooms and business meetings.

Certainly computing has had a home in the Fortune 500 since the days of vacuum tubes, but the art was antiseptic and untouchable, the domain of an elite cadre of skilled linguists fluent in COBOL. That language was, in a way, a tip-off, a harbinger of who among business, science, and education professionals would win the right to direct computing energies.

Personal computers have affirmed that trend toward business applications and extended it. In the past half dozen years, the PC has made the phrase "computing for business" a marvelous redundancy. That new status quo is what this special issue of *PC World* is all about.

Until the PC caught on, a manager in search of increased productivity wasn't likely to depend on an adding machine or any other piece of office equipment. The personal computer revolution has transformed the business executive's acceptance of what computers spit forth into an excitement about–and participation in–shoving data into them. With stunning rapidity, business discovered that given enough units and the right software, PCs change *processes,* often dramatically.

No longer are managers personally estranged from the tools that for so long held DP departments in thrall. Check any photo in any business publication: The personal computer has become a desktop appliance, a fixture with only its applications and its potential unfixed. The numbers confirm that this approbation is profound and widespread. International Data Corporation, the Boston-based market research firm, projects a workstation for every white collar worker by 1987, with PCs representing a third of that total.

But George Morrow is right–there is no free lunch. PCs don't deliver Valhalla. They doctor work

(continues)

INTRODUCING THE PRINTER THAT MAKES THE BEST IMPRESSION ON ANY SYSTEM.

Most printers have been designed to work best with just one computing system.

So if you bought different systems for different reasons, you also ended up buying different printers. And matching each printer to its system.

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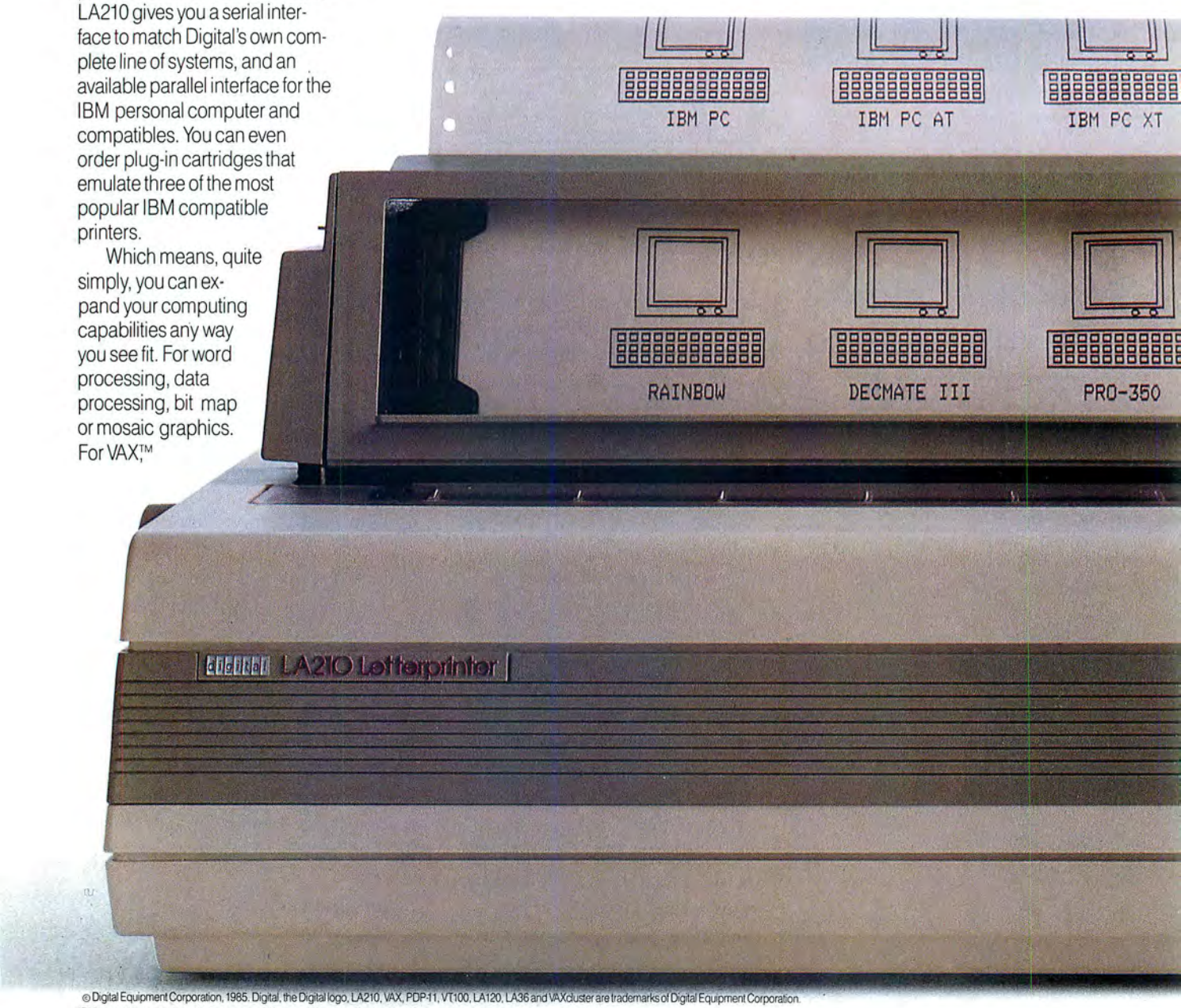
But when your needs change, so can the LA210.

Flick a switch and the LA210 shifts to an 18x33 matrix for crisp, near-letter quality copy at up to 40 characters per second.

Or let your host computer change modes for you automatically under program control.

There's more, too. With its standard Courier type face, the LA210 can print 11 languages,



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plus Digital's VT100™ line drawing set. And it gives you a choice of more than 35 optional faces and fonts – Courier, Orator, Gothic, APL, and italics as well as special custom fonts – through plug-in cartridges that let you vary your type face even more. Finally, the LA210 lets you print bold or condensed and change faces or fonts on a dynamic character-by-character basis. So your output is truly customized to suit just about any presentation you have in mind.

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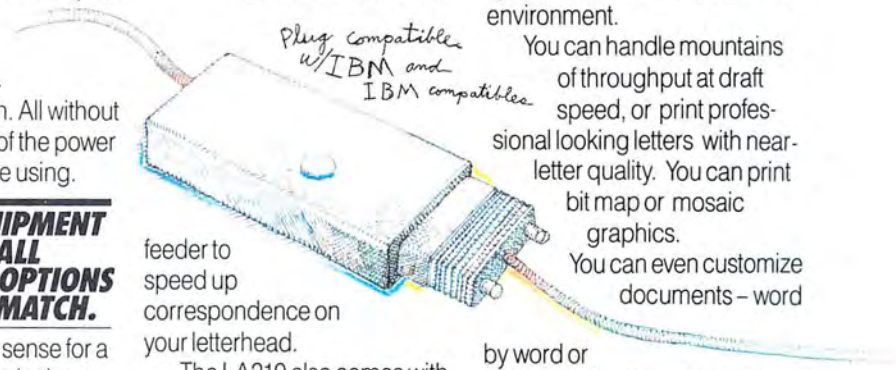

The LA210 also comes with one more feature no other printer can offer. Digital's exceptional reputation. We've set industry standards with products like VAX and PDP-11 systems. We've done the same in terminals and printers with our VT100, LA36, LA120, and others. In fact, with more than 750,000 printers installed worldwide, we're a recognized leader with a proven record of reliability. And we back every printer we sell with one of the most comprehensive service plans in the business.

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flow and alter work habits, sometimes maddeningly. They're not guarantors of an error-free existence; as George has also been heard to admonish, computers sometimes just enable you to make mistakes faster.

That humbling shot of reality aside, PCs also liberate. They foster productivity. They keep costs down. And they nourish the bottom line. Personal computing has become part of the business world's daily diet–the vaunted good, cheap sandwich. Thanks largely to the business community's voracious appetite for new applications, companies large and small are taking personal computing places few anticipated when all this began less than a decade ago.

When the only computers around were as big as a bus, a manager's intentions were apt to be obscured in translation from business plan to flowchart. Today, in a very real sense, the business community has assumed the role of systems designer. Software developers write code with business users, not just a sliver of silicon, in mind. Hardware companies vault barriers to satisfy the demand for squeezing more from the machine. It's a cycle whose upward spiral Wall Street must envy: As users gain savvy, new product genres emerge, and the PC itself undergoes redefinition. At the same time, ever-smarter software means that new users–or users new to a given application–can get up and running with unprecedented speed.

That cycle typifies this issue of *PC World*. New categories of business software match more specific, more sophisticated requirements. And the best do so with surprising ease. That applies to a pair of new power tools for the business class, featured in "Review." Both break the mold and do so with few compromises. "Reflex: Analysis With Finesse" evaluates Analytica's *Reflex*, a data analysis tool with the

structure of a data manager, the trappings of a spreadsheet, and the face of a Macintosh. As described in "Enable: Compact and Capable," the five-function integrated program achieves standalone power in each of its components–and does so on a refreshingly meager diet of RAM.

This issue also snags a second business software trend of note. Almost imperceptibly, such mainstays of corporate personal computing as *1-2-3* and *dBASE* have become "environments"–homes to an infinite variety of designer applications that lift them out of the realm of pure application software. "Ready-to-Run Accounting" assesses one in an expanding medley of templates designed with business productivity in mind. In "Hands On," "A New Way to Frame Projects" continues that theme with an application that'll help you turn *Framework* into a project manager.

As today's personal computer approximates the power of yesterday's mini, the line between micros and mainframes continues to blur. Increasingly, business users are instigating efforts to run mainframe data through PC software. "From Here to Mainframe (and Back)" in "Getting Started" is a primer on what you need to know before building that bridge to your local repository of corporate data. In "State of the Art," we examine a budding revolution in application programs as personal computer software continues to converge upon the mainframe world. "Experts on Call" looks at knowledge-based systems and explores the ways in which they're extending the reach of both the PC and the expert behind the keyboard.

The fourth major business computing current tackled in this special issue is surely the most delicate. Unauthorized duplication of

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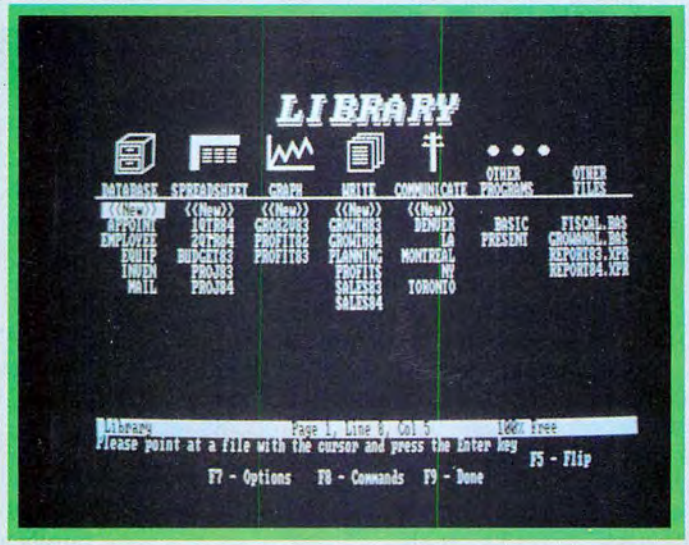

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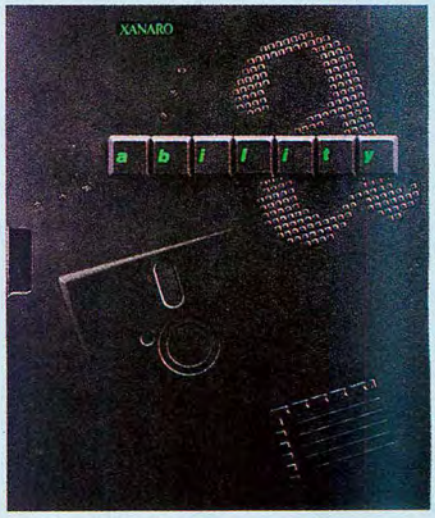

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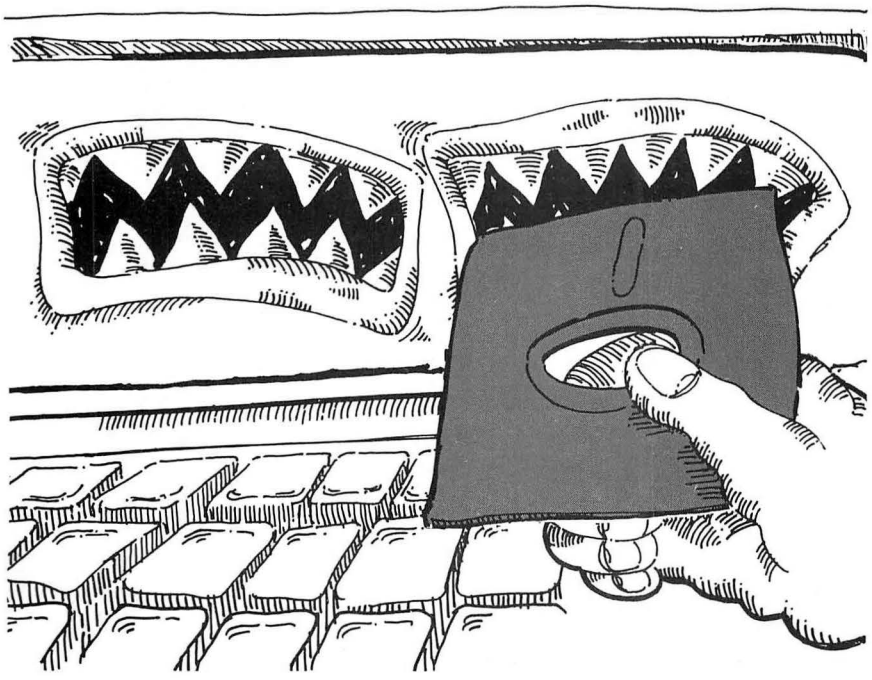

Circle 582 on reader service card

Ken Greenberg

software poses a thorny and fundamental dilemma for individual users, businesses, and software vendors alike. In the "Community" section, "Copying Software: Who's Right?" examines software piracy in depth, laying out the findings of *PC World*'s own reader survey on the prevalence of piracy and user attitudes toward it. This special report also scrutinizes copy-protection schemes, legal ramifications, site licensing, and the ways in which one major corporation copes with the problem.

In this edition we've also assembled an eclectic mix of observers and catalysts of the PC as a business tool. William Ouchi, the author of *Theory Z*, recommends friendly political persuasion to help marry off telecommunications to personal computers; James Fallows, Washington Editor of the *Atlantic*, reflects on the PC's contributions toward founding a global village; Richard Nolan, one of corporate America's preferred data processing consultants, chronicles how and why the MIS community gingerly but inevitably embraced microcomputing; science fiction visionary Isaac Asimov looks ahead at the PC as a vehicle for expert systems and ruminates on the contest between human and synthesized thought; and Edmund G. Brown, Jr., the former California governor, pins

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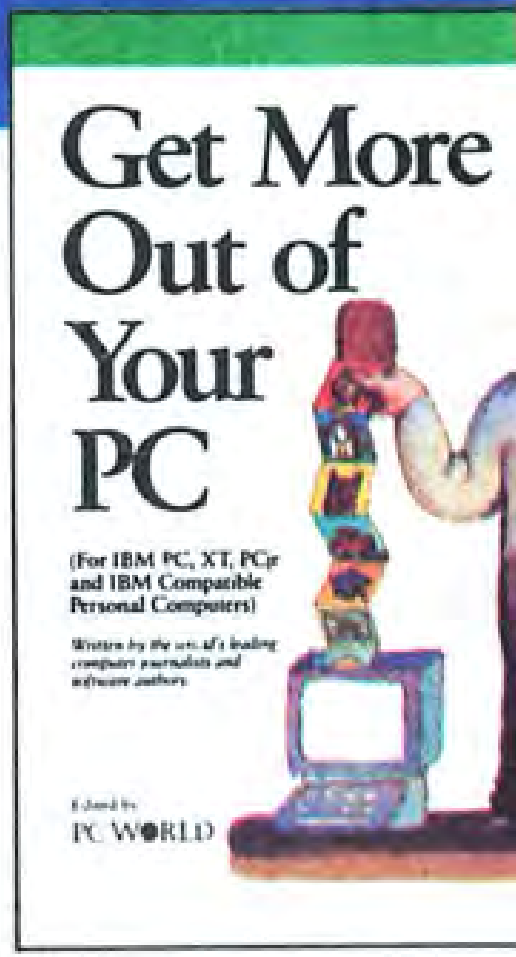

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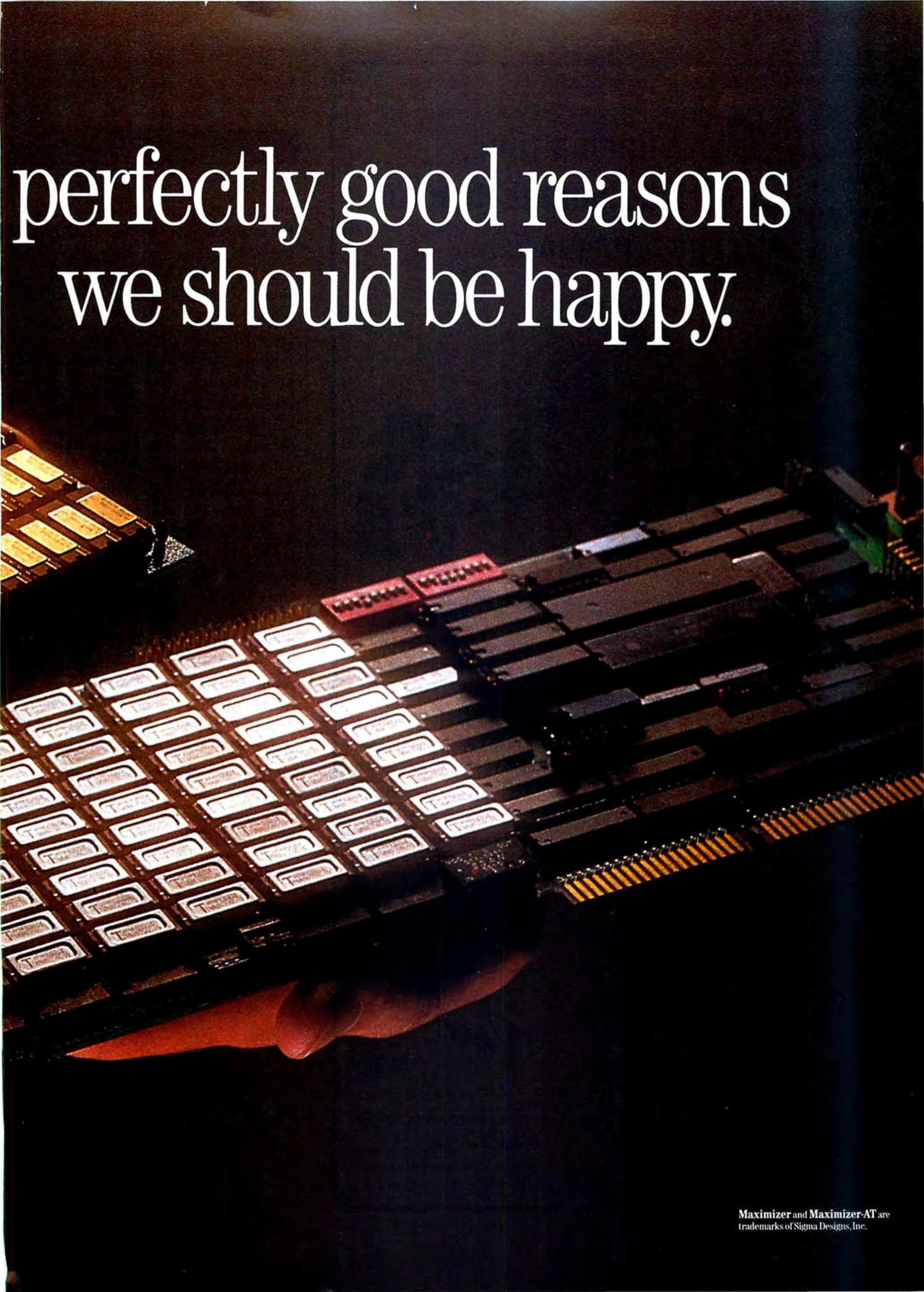

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the competitive hopes of American business on the technology that produced the PC–and on an economy that optimizes its use.

As Richard Nolan suggests, the advent of the PC has inalterably shifted control of processing power from computer experts to computing professionals. Call them gurus. Or power users. Or just plain businesspeople.

Even as office automation, information centers, and micro-to-mainframe links fray the edges of PC autonomy, my guess is that control over PCs will remain "in the field." The PC revolution cannot be repealed; consider only the speed with which it took off, the palpable productivity gains it engendered, the energy that continues to fuel new applications and new architectures. With emerging technologies and innovative software, the dog is finally wagging the tail: Problem solving is the goal, the PC is the means.

This issue celebrates the PC as a potential boon to every business. Delivering on that promise isn't always easy, but as long as the PC remains *personal*, computing is everybody's business.

Sandwich, anyone?

Ken Greenberg is an Associate Editor of PC World.

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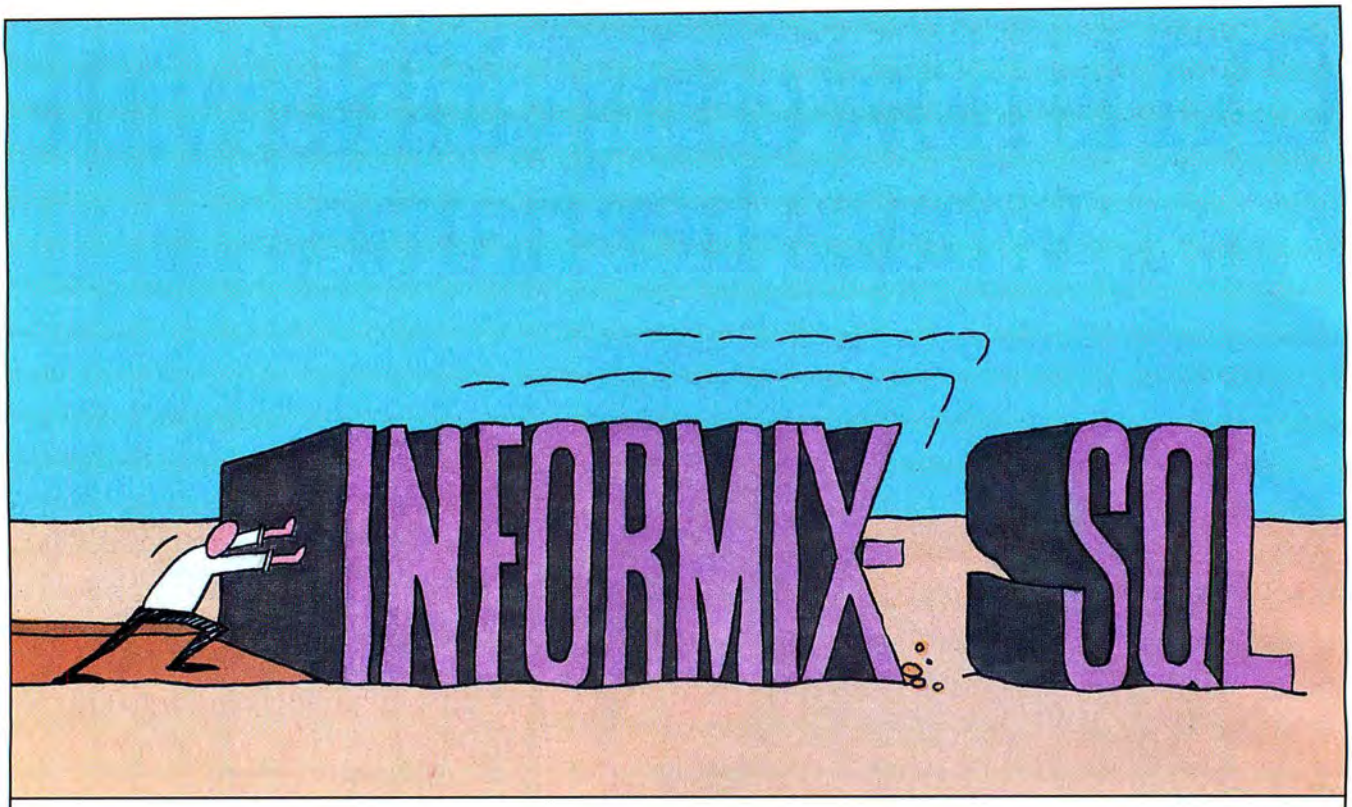

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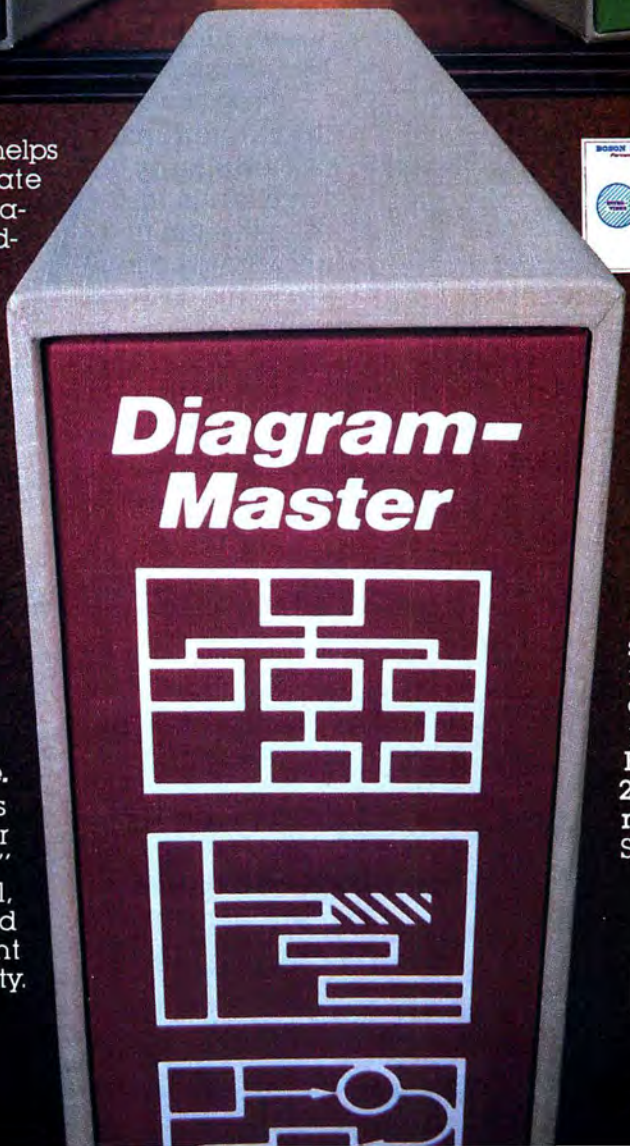

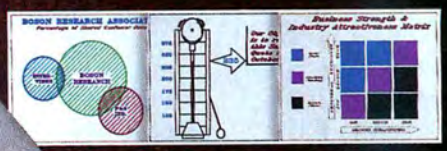

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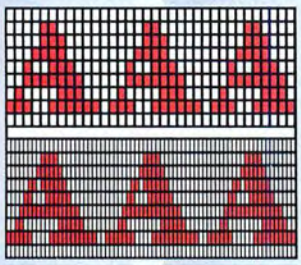

Typical coarse dot pitch vs. Sony Trinitron super-fine dot pitch.

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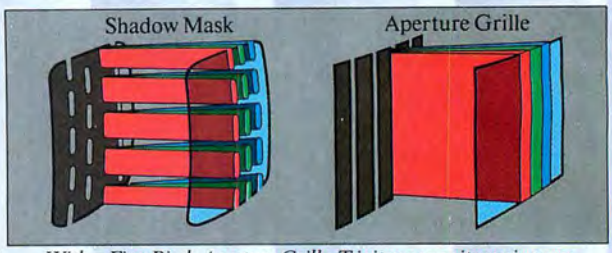

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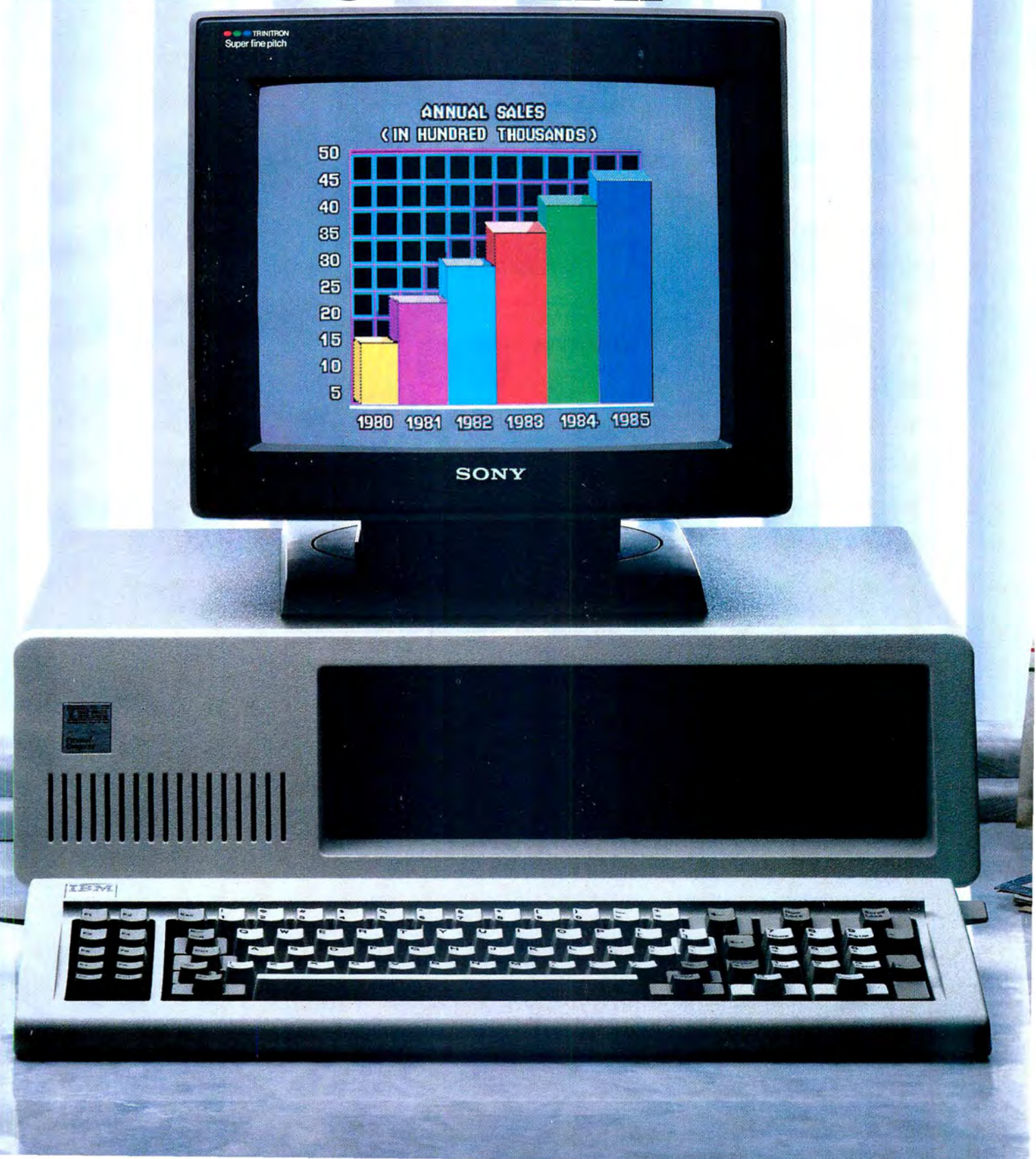

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John C. Dvorak

The Last Computer Book

Is the computer book dead? The book publishing and distribution establishment have returned their attention to more traditional fare.

When the first summer fog rolled into San Francisco last May, it brought with it a cultural fog called the American Booksellers Association convention. Prior to the show's arrival, the death knell had been sounded for computer books and bookstores as software distribution channels. Hot products with great expectations, like the *Whole Earth Software Catalog*, failed to recoup their megabuck advances. The New York-based publishing industry had reverted to its old formulas over the past year. Forget computer books, kid. Think romance novels; think calendars glamorizing steroid-shooting, grease-coated, naked young males, photographed after a gentle spray of moisture from a houseplant atomizer. Computer books? Faugh!

Que Publishing, Osborne/McGraw-Hill, Weber, Sybex, and other computer book publishers were at the show in a futile last-ditch attempt to regain the attention of the market. They mostly languished while the crowds lined up for Mr. T. "I pity the fool who writes computer books, grrrrr!"

So what happened to the good old computer book? It's gone forever. The smart money in nonfiction is banking on books about corporations. After watching *In Search of Excellence* sell a few million copies (the book was given no initial chance of success by the New York illuminati), the New Yorkers are now going to do it their way. Their way means another book with John "Megatrends" Naisbitt's name on it. Maybe Jane Fonda can do *The Corporate Workout*.

By this time next year there should be battalions of books about how you or your company can do better simply by reading them. The key to success with this kind of book is to write it for the middle- and lower-level managers who have nothing better to do than read books all day–books that say their bosses are boneheads.

Meanwhile, where were all the electronic publishing divisions created a few years ago when computer books were about to over-

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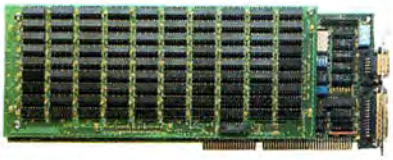

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take fiction in sales? Publishing companies that jumped onto the computer-book bandwagon quickly discovered that while typical book salespeople can say things like "Tracy Kidder is a heck of a writer," they stand agape when asked a simple question like "does the book include information about operating systems?" The response turns out to be, "Huh? Operating systems? Is that something doctors do?" Then a fly zooms into their mouth.

So the simple solution is to avoid the problem. Besides, computers generally clash with checked jackets and striped pants, the standard attire of a sales "pro."

The last computer book may well have been Steve Ditlea's *Digital Deli.* The publishing community figures that if publisher Peter Workman (who uses a combination artsy-craftsy/ICBM approach to selling his products) can't make a best-seller out of a computer book, nobody can.

At the show Workman told me his company was "disappointed" with the book's sales. He didn't think any computer book will ever make it. I couldn't help noticing the pair of plastic Hagar-the-Horrible horns that Workman had on his head. Hagar-the-Horrible

(continues)

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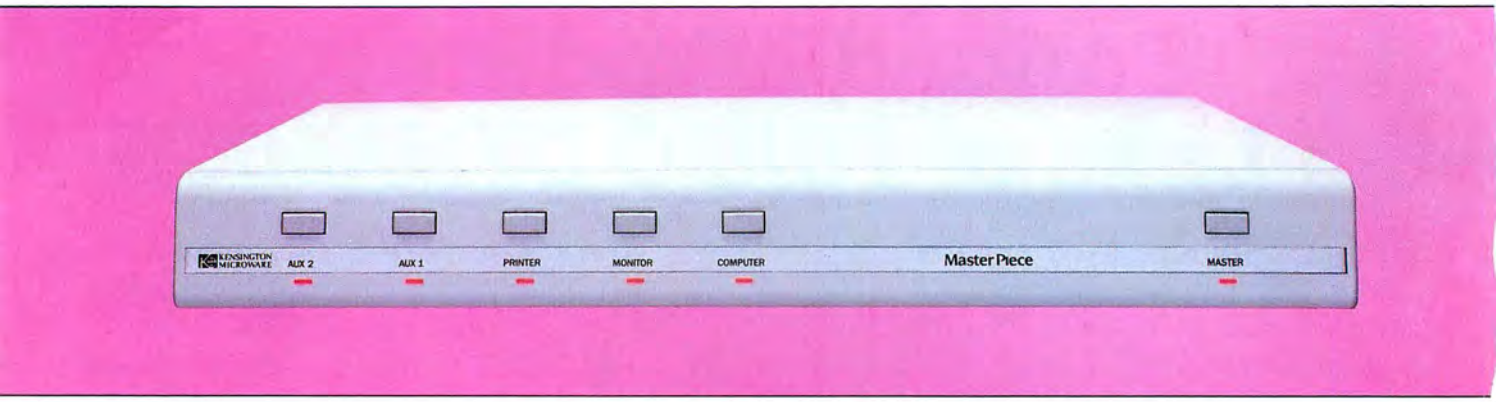

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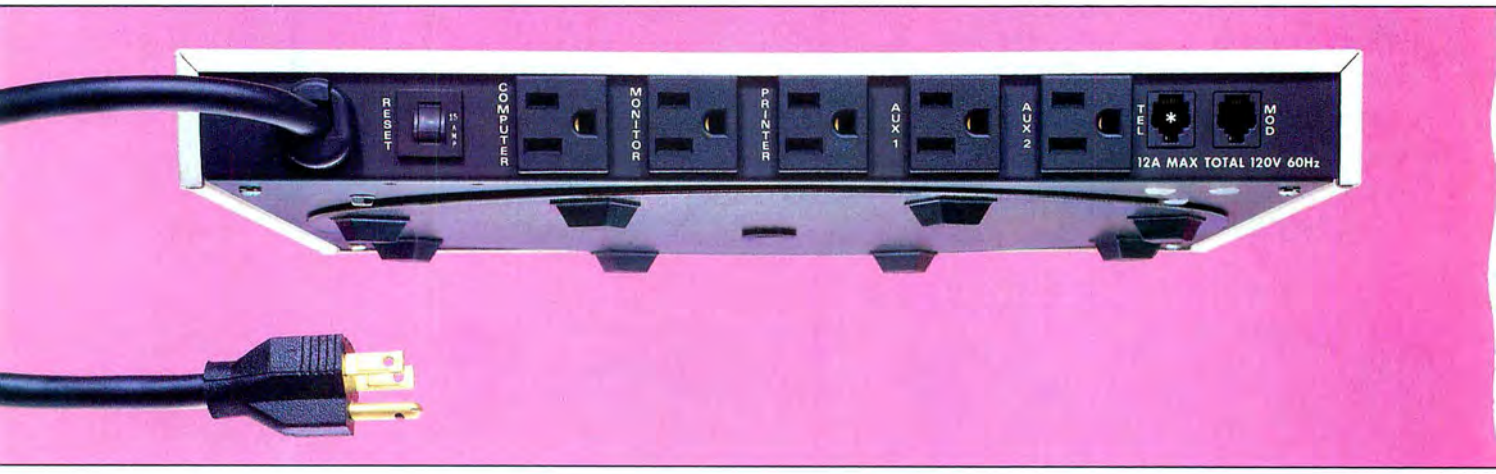

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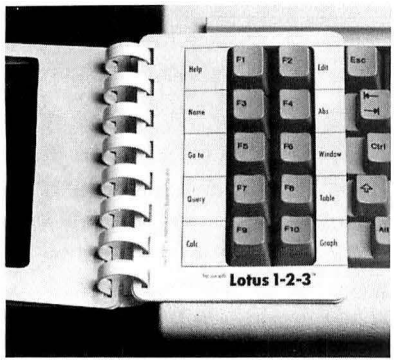

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cartoon books were the hot product from Workman this season. The company was celebrating by giving away Hagar horns to all comers. More than a few bookstore owners roamed around the show with those idiotic horns on their heads.

Bookstore owners, unfortunately, look to the New York publishers for guidance. Who could know better what's happening in society than guys in tailor-made three-piece suits lounging in fancy 40th-floor offices overlooking 6th Avenue? Of course bookstore owners in middle America should know what's happening in the country, but it seems they've been badgered to death by salespeople. In the process, they've somehow lost the simple power of observation. And it shows.

The small stores just can't figure out why more poetry isn't sold. "People watch too damn much TV," they say. "Have you seen our newest pop-up books, by the way?"

The TV-book schism was mocked outside of Moscone Center by a group of tongue-in-cheek protesters condemning books and praising TV with signs that said "Less reading, more viewing." They called themselves the Couch Potatoes. Undoubtedly they were actually a group of TV-hating zealots looking for a cheap media plug.

Meanwhile, across from the potatoes was a sincere protest group promoting a book claiming that Acquired Immune Deficiency Syndrome (AIDS) is caused by silver dental fillings. Maybe the dental/AIDS book will fill a cavity in the marketplace. Whatever the case, the computer book fad is over. Things are back to normal in bookland. The best sellers are still gossipy Jackie Collins books and picture books and calendars and gimmick books. The bookstore owners can relax and wipe their brows knowing they won't have to put in any more effort than usual. But maybe it's for the best. Otherwise we might have to live with 1000 books about the history of the Macintosh. And who needs that?

John C. Dvorak is a writer and editor in Berkeley, California. He recently edited Dell Publishing's Dvorak's Instant Expert Series, *and his columns are featured in the* San Francisco Examiner *and* InfoWorld.

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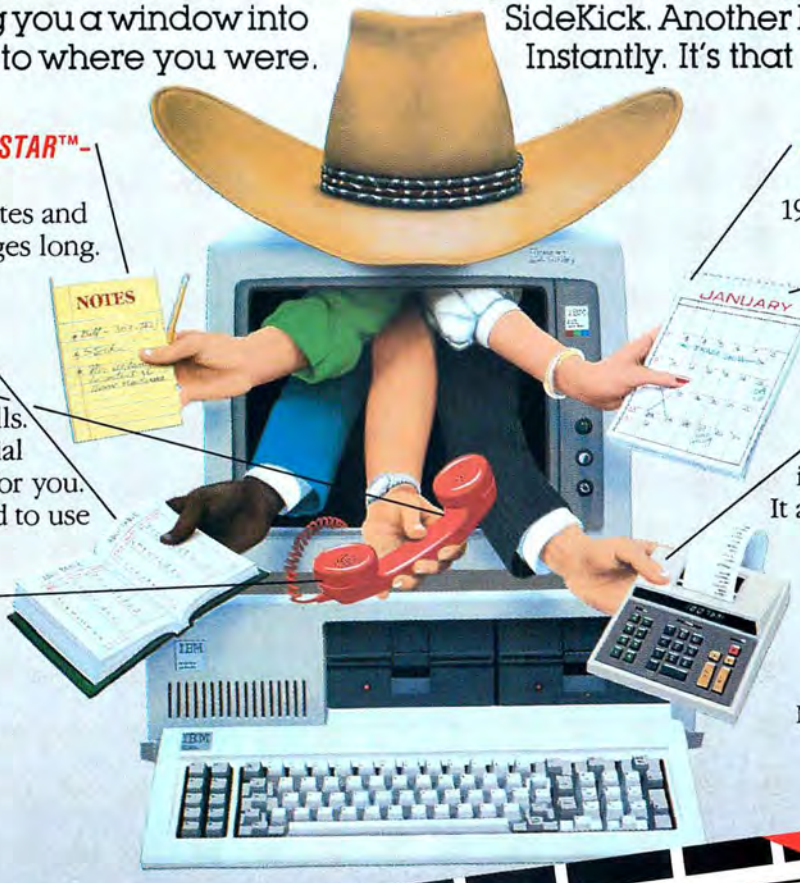

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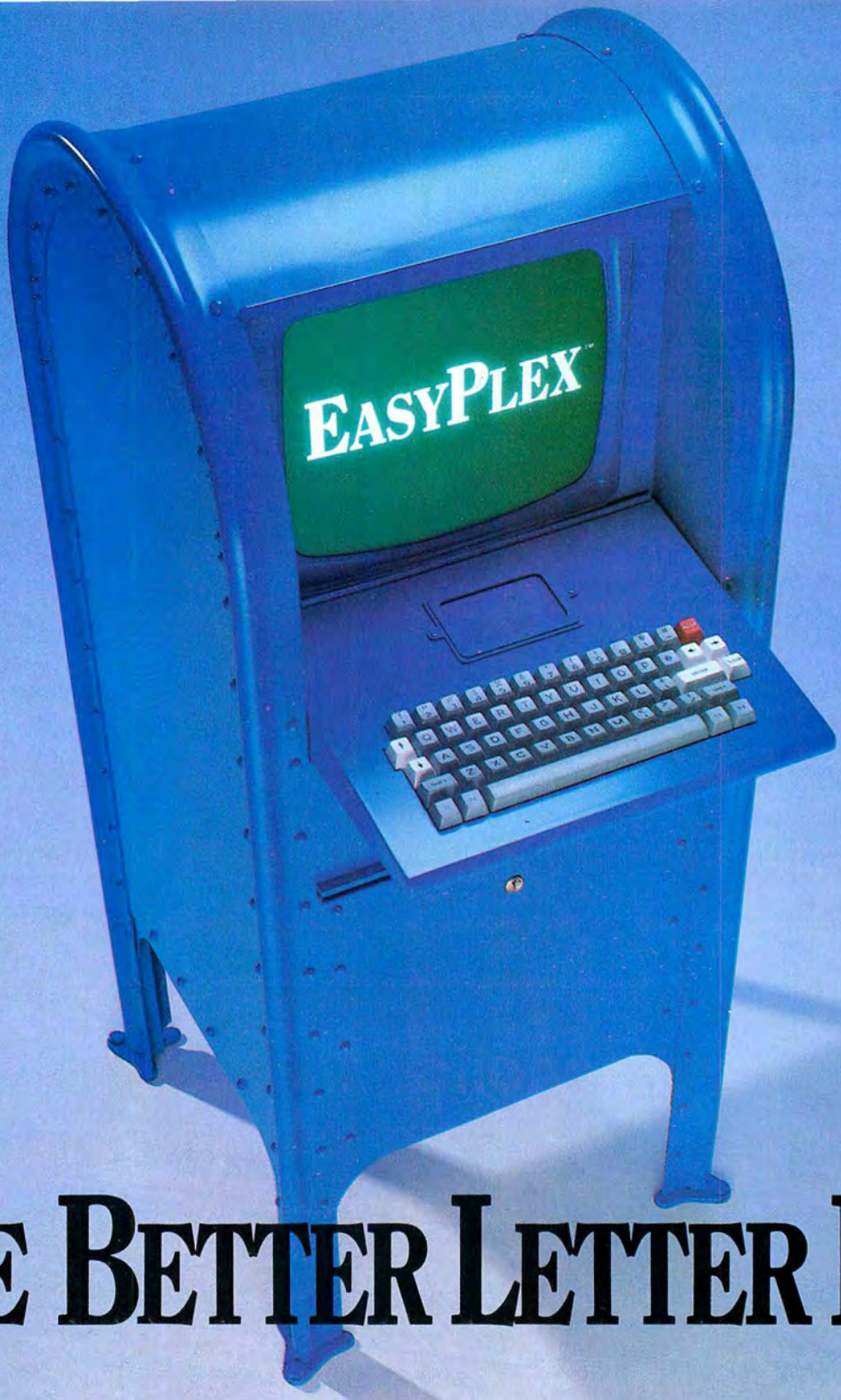

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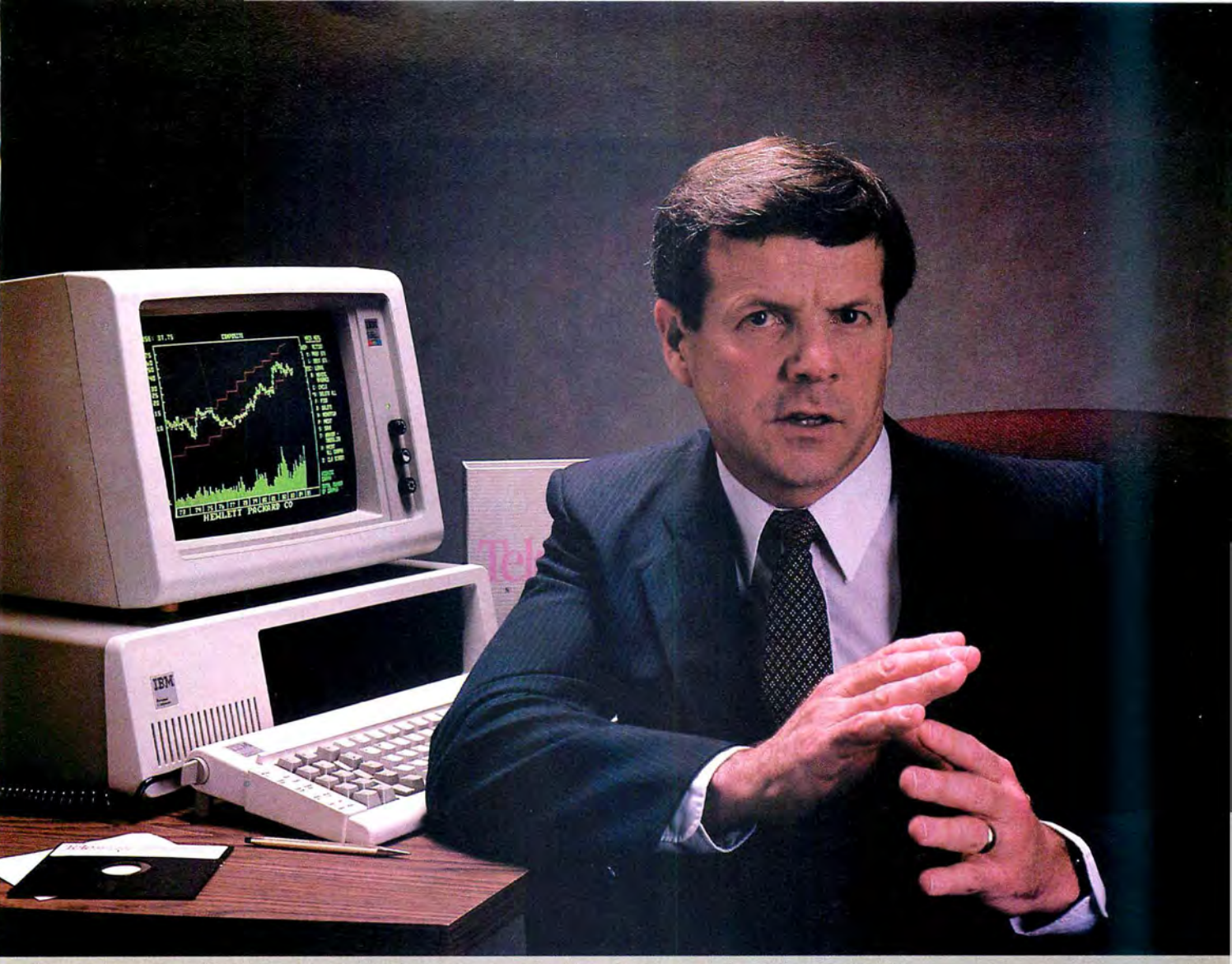

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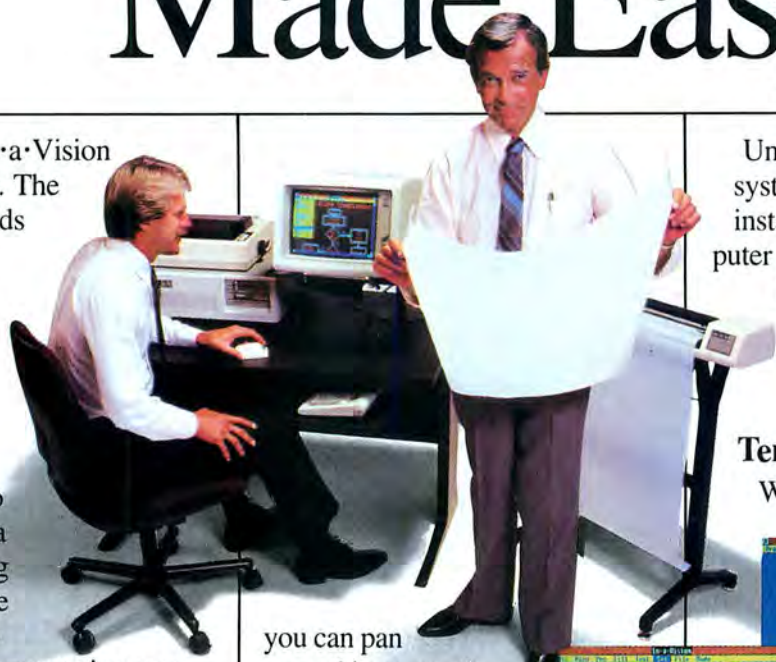

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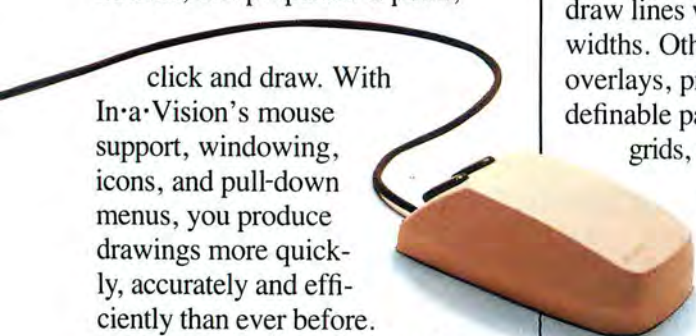

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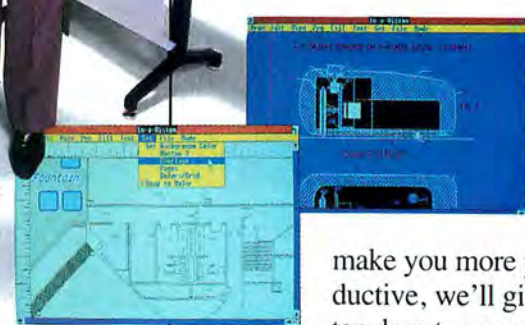

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Letters

Reactions and responses from the PC World community

Misunderstood Mainframe

I read your publication regularly and find it to be the best in its field. However, I suggest that you be a little more careful when commenting on areas of computing with which you are apparently unfamiliar.

The editorial response to James W. Franklin's letter ["The First Word Processor," *Letters, PCW,* May 1985] states that "the System/360 was the first programmable processor" and that "the IBM 7094 was one of the PC's ancestors, with tubes and boards that had to be wired by hand." Perhaps you meant to say that the System/360 was the first *micro*-programmed processor–it certainly wasn't the first stored-program computer. Second, while some of the peripheral equipment that supported the 7094 may have contained tubes and hand-wired boards, to so characterize a transistorized, stored-program computer that supported compiler languages such as FORTRAN is clearly a misrepresentation of the power and capabilities of the machine.

James A. Shields
Columbia, Maryland

Pardon our wayward trek into mainframe history. You certainly are correct. We intended no affront to the IBM 7094, a venerable representative of programmable second-generation hardware using solid-state components. Readers seeking additional information may want to consult "The Architecture of IBM's Early Computers," in the IBM Journal of Research and Development, *Vol. 25, No. 5, September 1981. –Ed.*

Challenging the Myth

Permit me to add a few details to David McCune's description of Graphic Software Systems' *GSS-Drivers* as an implementation of the virtual device interface (VDI) ["The Myth of the Virtual Device," *PCW,* April 1985].

First, the generic labels available to the application programmer are not limited to Display, Printer, and Plotter but also include Camera, Metafile, Joystick, Mouse, Grafin, and Grafout. This choice permits the use of input as well as output devices.

A major advantage of the VDI is the portability of applications that use it. Programs written with the DOS version of *GSS-Drivers* need only to be recompiled for use under UNIX. No translation or recoding is required.

GSS now has a device driver development package available, and many peripheral manufacturers are producing their own VDI device drivers.

The VDI's device independence is no myth; programmers are benefitting from it right now.

Joseph H. Rawlings, III
GSS Customer Support Engineer
Wilsonville, Oregon

The GSS implementation of the VDI works. But while the VDI is a useful programming tool, it isn't always a godsend. Expecting an interface to many devices to be truly virtual is unreasonable.

It's true that VDI calls can be used to inquire about the characteristics of a particular device. But a programmer faced with writing handlers for a variety of devices with widely differing graphics capabilities may easily wonder what

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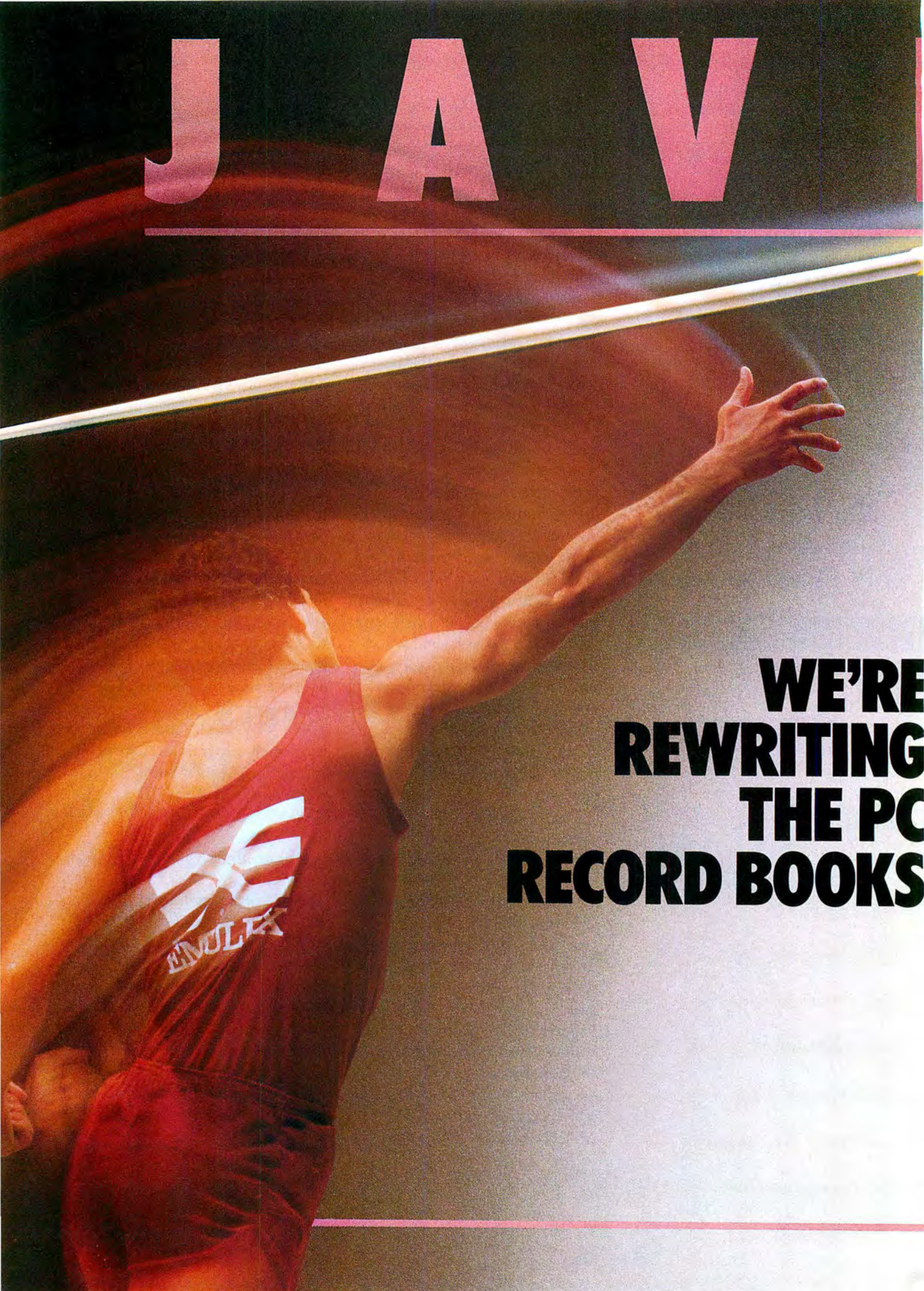
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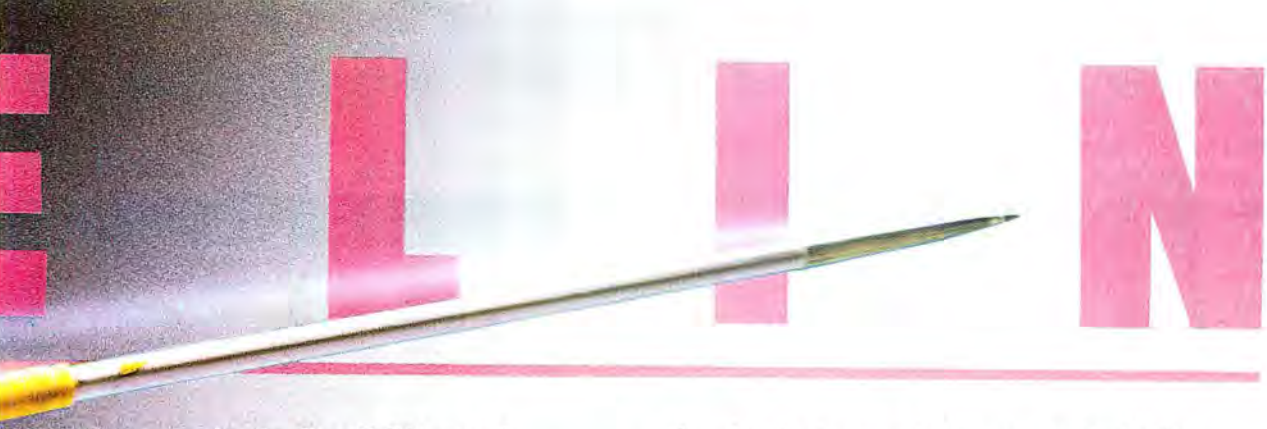

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is "virtual" about the interface. To be sure, using the VDI is easier than writing your own drivers for each device, but it is not the panacea that its name implies. –David F. McCune

Relating to Six

I found a major technical error in your review of ASAP Systems' *Six* data manager ["Easy to Relate," *PCW*, April 1985]. The article states that the screen directory defines "a hierarchical relationship between files" and that "data cells can be accessed only by a screen defined at a lower level of the directory." This is simply not true. A screen's data can be accessed from other screens listed before and after it in the directory.

The review also claims that the "rigid screen hierarchy incorporated in the system makes design changes difficult to implement." Not only is there no screen hierarchy, but *Six* is extremely flexible. The name, length, type, and validation parameters of a data item can be changed at any time. And *Six* automatically transfers data between files during a major design change such as moving a billing address from a customer file to an invoice file. To say that "*Six* favors those who have a well-planned design and don't anticipate making changes" is clearly false.

When a reviewer's choice is based upon technically unsound reasoning, he or she does a disservice not only to the product developer but to the publication's readership.

Victor N. Gamaly
ASAP Systems, Inc.
Soquel, California

I don't believe I've done a disservice to anyone, least of all the readership of PC World. *My reasons for favoring one product over*

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42	9,000	30,000	18,000	18,000	18,000
43	5,850	19,500	11,700	11,700	11,700
44	2,100	6,600	6,600	6,600	6,600
45	2,500	2,500	2,500	2,500	2,500
46	500	2,000	1,000		3,000
47	300	400	500	750	750
48	5,760	5,760	5,760	5,760	5,760
49	230	285	320	335	345
50	7,500	5,000	1,000	1,000	1,000
51	5,000	5,000	5,000	5,000	5,000
52		9,500			
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another are based more on accessibility than on technical merits. I still believe Power-base *to be much easier to use and more flexible than* Six.

For example, it's difficult in Six *to change a file structure that involves an index after data has been added. You must duplicate the original screen, save the new screen with changes, and then delete the old screen. That's not very friendly.*

As for the technical objection, I stand corrected. It is possible to do forward and backward chaining of indexed elements between screens. This is not controlled via a hierarchy, but your documentation is unclear on this point. –Manuel Sotomayor

Good Enough for Amateurs

Michael Guttman missed the point about *Infoscope* ["Tunnel Vision," *PCW*, April 1985]. The program is designed for people who are *not* expert users and is obviously not meant to compete with the *dBASE*s of the world.

Infoscope is the first program I've seen that is truly user-friendly, and its manual is written in plain English. The program's limited memory is adequate for the applications it was intended for. In all, for a rank amateur who uses a personal computer for all kinds of household jobs, *Infoscope* is excellent.

Conrad Perl
Springfield, Virginia

Perhaps if the Infoscope *manual didn't explicitly say that the program "has been designed to accommodate users with all levels of expertise" (page 2) and that it can be used to "manage almost any collection of data you are likely to have" (page 3), Mr. Perl might have a point. As it is, I don't think you have to be an expert to come up with an application that requires simple arithmetic or the ability to make global changes to a*

(continues)

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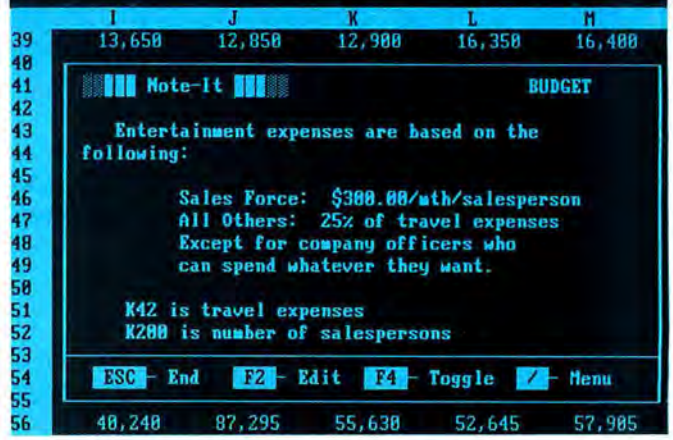

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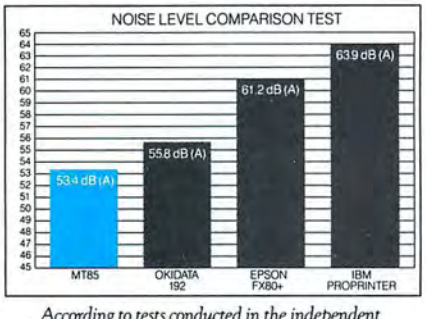

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data base–neither of which Infoscope *supports. If these sorts of limitations don't bother Mr. Perl, fine. However, they certainly bothered me and others to whom I showed the product. –Michael Guttman*

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Your article on multiuser data management software for local area networks ["A Matter of Public Record," *PCW*, May 1985] confuses some of the features of System Automation Software's PC version of *reQuest* with those of the version we produce for the Convergent Technologies (CT) line of computers marketed by NCR, A.B. Dick, Burroughs, and others.

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Correction

In "Inside Modems" (*PCW*, July 1985), the price and phone number listed for the Qubié PC212A/1200 modem were incorrect. The modem's list price is $279, and the correct phone number for sales information is 805/987-9741. In addition, the article didn't mention the modem's auxiliary serial port connection. We apologize for any inconvenience this error may have caused.

Letters should be mailed to Letters, PC World, *555 De Haro St., San Francisco, CA 94107, or sent electronically to MCI Mail PCWORLD, CompuServe 74055,412, The Source STE908, or Direct-Net 500. We reserve the right to edit letters. Letters should not exceed 300 words.*

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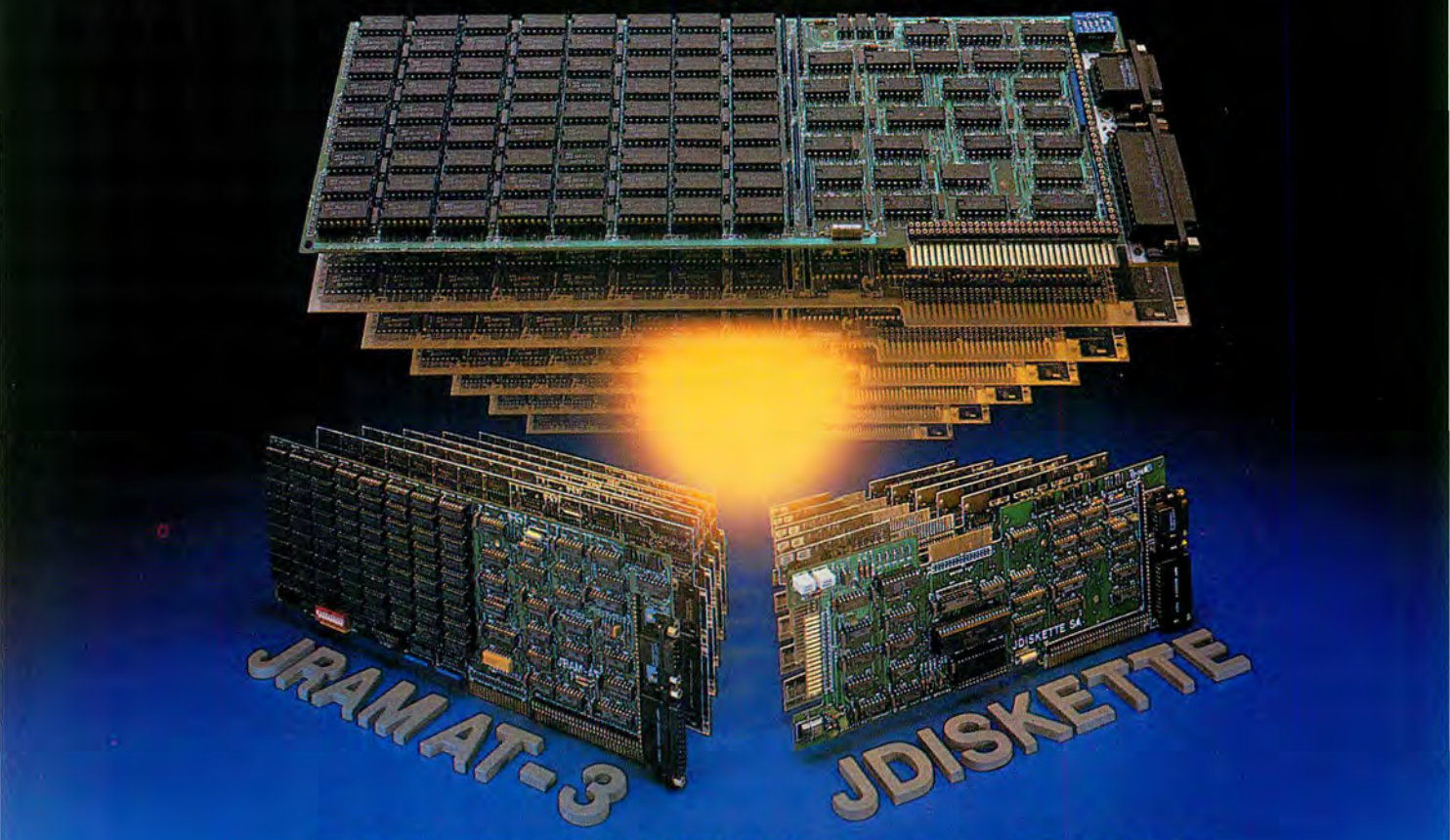
THE FAMILY TREE

JRAM-3



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PC WORLD

The PC's Mid-Life Crisis

Credit an obscure Renaissance man for one of the most cogent ideas of the immediate postwar era.

Scholar, professor, inventor of mechanical calculators, progenitor of the Manhattan Project, and science advisor to President Franklin D. Roosevelt–Vannevar Bush was all these. But Bush also had a knack with a crystal ball.

PC World View *reports new developments in computer technology, items of interest to computer enthusiasts, and the most significant and enticing insights about industry trends and personalities. We've reserved the "Grapevine" section of this column for industry reports that are still at the speculative stage.*
–Ken Greenberg

Vannevar Bush, spiritual father of the personal computer, tinkers with an invention.

Two generations have passed since Bush detailed what proved to be a most amazing bit of prescience. Vannevar Bush, you see, predicted the personal computer.

This August marks the 40th anniversary of the publication of his article "As We May Think" in the *Atlantic Monthly*. World War II was almost history. Pioneering work with computers was under way. The few in existence consisted of small empires of vacuum tubes that filled entire rooms. But what Bush had in mind was a miniature machine:

"Consider a future device for individual use, which is a sort of mechanized private file and library. It needs a name, and, to coin one at random, 'memex' will do . . .

"It consists of a desk, and while it can presumably be operated from a distance, it is primarily the piece of furniture at which [the individual] works. On the top are slanting translucent screens, on which material can be projected for convenient reading. There is a keyboard, and sets of buttons and levers."

Bush went on to describe the memex–the memory extender–in detail. It could act as a calculator, or it could store millions of pages of text and pictures in structured form–a kind of massive relational data base. Bush foresaw specialized data bases with built-in "trails." Much like today's expert systems, these programs would help chemists synthesize compounds and physicians diagnose illnesses.

View

News and notes for the computing community

No one ever attempted to build the memex, but Bush's ideas influenced future researchers, including Alan Kay, who led the pioneering research into personal computers at Xerox, and Douglas Englebart, inventor of the mouse. All of which suggests that Vannevar Bush did at least as much inspiring as prognosticating. *–Ted Nace*

Viennese Valley?

Me-tooism is all too entrenched in Silicon Valley, as slumping earnings and flirtations with bankruptcy painfully demonstrate. Shelves are crowded with too much product, too little differentiation.

But if you're a country whose industry is on the skids and fading fast, you don't merely consider duplicating products–you vow to duplicate an entire industry.

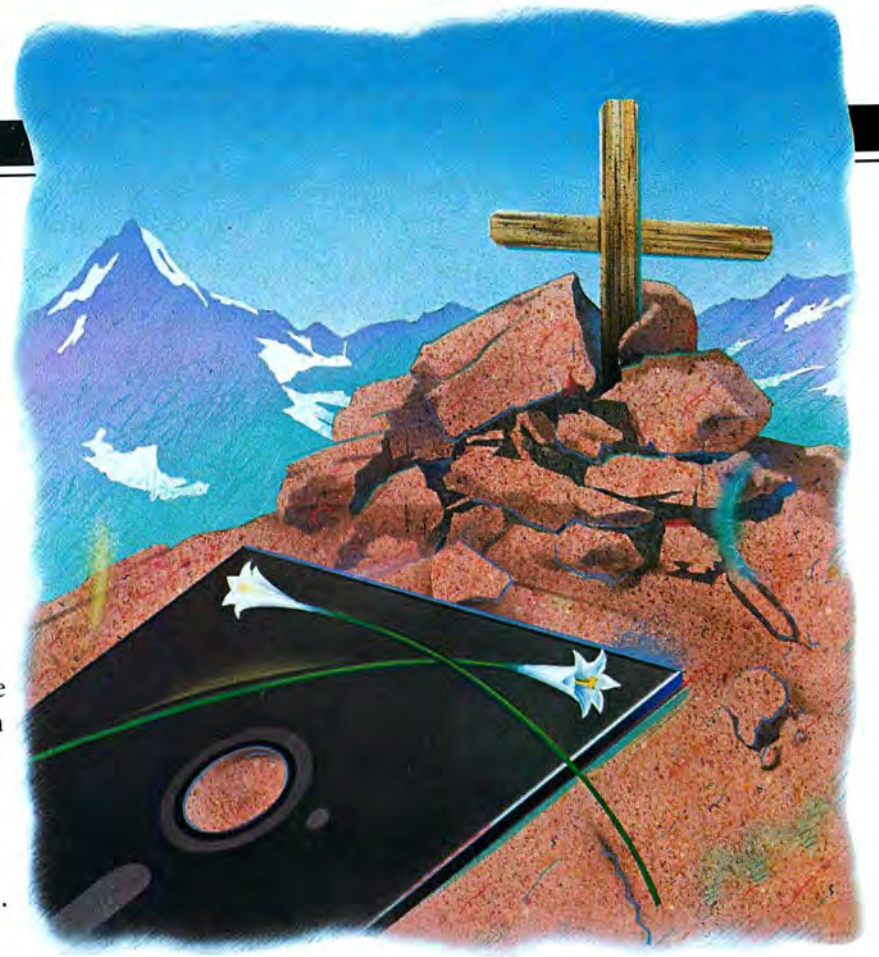
Singapore is passé; Austria has begun proposing to Silicon Valley companies that they give the Old World a spin. Bearing gifts of lucrative subsidies and promising easy access to European markets, an arm of the Austrian government has come knocking on the doors of California's high-tech manufacturers. ICD (Industrial Cooperation and Development) Austria has set up shop in Menlo Park, California, and rolled out a red carpet that extends all the way to Salzburg.

A government-chartered organization created to court and counsel potential business investors, ICD Austria is doing its wooing via MAP, the Manufacture in Austria Program. And according to MAP literature, the advantages awaiting foreign manufacturers in Austria are legion. They include a stable work force with a relative aversion to strikes; salaries in the electronics industry as much as 40 percent below those of European neighbors; enticingly low tax rates; duty-free export to Europe's 350 million consumers; advanced transportation and telecommunications systems; industrial sites, vacated by Austria's moribund steel industry, now at the ready; and a panoply of financial incentives.

In lieu of candy and valentines, ICD is prepared to ply investors with grants of between 15 and 50 percent of R&D and operational costs (including such bennies as $5000 cash grants per job created), "generously subsidized" loans, and a percentage of building and equipment leases. Investors can even use some manufacturing sites gratis for up to three years; at that time, they can either continue the lease at commercial rates or buy the facility outright for a depreciated price.

Foreign investment in Austria has risen from $1.8 billion in 1973 to $3.3 billion in recent years, thanks in part to dollar transfusions from such American heavyweights as GM and ITT. Can the silicon stalwarts of Santa Clara be far behind? *–Marina Hirsch*

Heaven Can't Wait



World View correspondent David Kaye, a law professor at Arizona State University, was leafing through an assortment of arid professional journals not long ago when he spied a piece from *Probate Notes.*

The article, entitled "How to Computerize Your Probate Practice," divvied up the field into three classes: the ominous Pre-Death Software Programs, the more decisive Post-Death Software Programs, and Kaye's favorite, "an especially intriguing category designated simply as Other Related Software Programs."

You don't suppose these packages support billing by the hour . . .

PC Clones! Remember?

Quick now, what do NCR, Leading Edge, Victor, Sanyo, Zenith, Olivetti, Xerox, Hitachi, and Epson have in common?

If you guessed they're about to gobble each other up T. Boone Pickens-style, thereby inundating the world with junk bonds, nice try. No, it's simply that they all know the meaning of perseverance. Every one is doggedly turning out *new* PC compatibles–not AT look-alikes. Right now. In mid-1985. And just when you thought the PC-clone market went the way of supply-side economics.

The moral is, if you can't be on time, at least make a credible showing. For Zenith and NCR, sleek is in. Leading Edge is vying for price leadership. Olivetti is selling the AT&T PC 6300 as the real thing, with Xerox cutting in on that dance. In all, it's an appealing group of machines, distinguished by faster processors or lower price tags or extra compartments for storage devices, or, in NCR's case, a detached monitor (finally). Like Victor and Sanyo, all belatedly learned the perils of infidelity to the PC standard, and most are unerring this time out.

But let's be brutally honest here: Few of these machines have any kind of a shot at a share of the PC retail market. The market has congealed around a handful of vendors, none of whom seems likely to stumble fatally. Yet the lateness of the hour aside, this fresh batch of PC compatibles reflects maturing technology and a more sensible approach to doing as IBM does.

Makes you wonder whether a few more players might be alive and kicking had manufacturers not been so hasty to get something, anything, on dealer shelves back in '83.

Rhyme and Reason

To most people computers and poetry seem to be as improbable a combination as Mister Rogers and Mr. T, but poet Michael Newman specializes in the unlikely.

A protégé of the English poet W. H. Auden, Newman also studied neurophysiology at Columbia Medical School. His restlessness with both mainstream medical research and "normal" poetry sparked the creation of his own lyrical kingdom that straddles the boundary between the two.

Newman staked his claim to immortality with a vast assemblage of poems distinguished by titles like "Steroids: An ode to what just fixed my tendon," but he eventually took on the challenge of designing educational board games. Despite such whimsical names as Cell City and Lymphofuzz, the games were intended to introduce children to formidable topics like endocrinology and virology.

The peripatetic Newman, who now heeds a different muse, has created what he bills as the world's first poetry processor. Using color and sound to indicate meter and rhyme schemes, Newman has transformed the PC into a loom for weaving verse into classical forms–sonnets and sestinas and villanelles–while enabling budding computer poets to keep track of a poem's myriad elements. Newman's program also boasts a hefty data base of successful poems that permits you to clone Shakespeare or Browning, borrowing a master's structure but substituting your own words.

Dubbing poetry "the ultimate word game" for children and "natural-language programming" for adults, Newman insists that his package–which awaits full-scale commercial development–will be every bit as popular in the home as in the classroom. He cites the success of music composition programs as justification for his conviction that fitting poetry to an interactive medium will breathe new life into hitherto dormant lyrical forms.

Drawing on physiological research, Newman notes that "the musical intonation of speech–prosody–causes blood to flow to right-brain cell circuits, engendering images. It also sends reward chemicals to the brain. Poetry is as marketable as a drug but delivers the virtues of prayer."

Besides which, he adds, it's fun–"the only game worth playing besides basketball." *–Ted Nace*

Michael Newman, peripatetic purveyor of poetry processing

Big Blue's News

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The Good, the VAD, and the Ugly

To whom does a real estate contractor turn when setting up a PC-based project management system? How does a budget-conscious hospital go about automating its manual medical records system? And what oracle can dispense wisdom to the CPA who must take the PC plunge to stay competitive?

Until recently, the only source and solace for specialized business

(continues)

Big Blue's News
(continued)

applications was the retail computer store, which supplied the PCs, sometimes the right but often the wrong software, and seldom any training. Sad to say, most retail outlets lack the patience, inclination, and technical wherewithal to help a business get started with PCs.

Enter the IBM Value-Added Dealer (VAD). IBM-approved VADs not only deliver and set up PCs, they often provide specially crafted software, peripherals, technical support, and training. While a VAD won't necessarily supply what was once referred to as a "turnkey" system, these dealers promise the next best thing. VADs offer hardware and software combinations that range from a few thousand dollars to more than $100,000.

The ranks of PC VADs–already 600 strong–are swelling as IBM certifies more and more of them. The benefits of a VAD network are obvious: IBM penetrates vertical markets (particularly in such areas as medicine, real estate, accounting, and law) via merchandisers steeped in these customers' special needs. A VAD, in the wry words of one dealer, can "leverage the credibility of its software" with the imprimatur of IBM's logo–and have a more or less guaranteed supply of machines. For the user, it means attentive hand-holding and a system cut to fit.

The lure of IBM's pinstripe coattails is apparently irresistible to companies large and small. "People stock XTs like legal pads–they're a commodity item," says Lisa Stockberger, marketing director for Voicetek, a VAD that sells voice messaging systems with the XT and the AT. Adds Voicetek treasurer Scott Wolf, "In the corporate world IBM is a known quantity, so selling our product is that much easier. And IBM gives VADs a substantial leg up on dealers when it comes to getting machines."

For those desperately seeking systems like the AT, a VAD can be an alternative when retail shelves are bare. But even VADs are occasionally left in the cold–and the chill varies proportionately with the size of the VAD and its dependence on IBM.

Software Shop Systems, which bundles its *Software Shop Construction System* accounting program with the AT, generates nearly 50 percent of its business from VAD sales. When AT production ground to a near-halt in January, the company was forced to buy machines on the gray market–from retail stores and discount outlets–to keep its doors open as customer demand for the AT snowballed.

Buying a so-called gray-market machine–one that has passed from hand to hand before reaching its final home–is perilous for customer and VAD alike, however. It isn't covered by IBM warranty. VADs playing the gray-market game also forgo the standard 33 percent equipment discount, clearing 8 percent at best.

Of course, the heavy hitters in the PC VAD world assert that IBM doesn't play favorites when it comes to hardware supplies. One of IBM's largest VADs, Technical Marketing Services (TMS) of Nashville, Tennessee, hawks software and the PC family to every business niche from churches to CPAs. Richard Hagemeyer, a director at TMS, pointedly notes that VADs do not have priority over retail dealers–but quickly admits that his company has never had much trouble getting PCs.

Whatever the perils, VADs continue to hitch their wagons and profits to IBM. Although enthusiasm runs high, VADs are cautious about becoming too dependent on IBM. While the Big Blue logo lends a VAD a certain cachet, most are making deals with competing manufacturers–as insurance for a case of the blues.
–Robert Luhn

Robert Luhn is an Associate Editor for PC World. *Ted Nace is a freelance writer based in Berkeley, California–a designation that also applies to Marina Hirsch.*

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Separate module compilation	Yes	No
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program code	Yes	No
data	Yes	Yes
Overlay support	Yes	Yes
Math library support		
8087/80287 emulation	Yes	No
8087/80287 coprocessor support	Yes	No*
Floating-point	Fast IEEE	non IEEE
BCD floating-point	Yes	No*
MS-DOS® 3.1 network support (incl. IBM LAN)	Yes	No
Link multiple routines	Yes	No
Link existing third-party libraries	Yes	No
Link with Microsoft FORTRAN, C and Macro Assembler	Yes	No
Relocatable object format	Yes	No
Transport source between MS-DOS and XENIX	Yes	No
Do source level debugging	Yes	No
LINKER included	Yes	No
Library Manager included	Yes	No
Utility to modify and examine header	Yes	No
Compress utility	Yes	No
Pascal Benchmarks—done on a COMPAQ Plus™ with 512K memory with no 8087		
	—Execution Time—	
Gauss-Seidel	:05.15	:07.60
Sieve of eratosthenes	:13.15	:15.88
Trig	:13.11	:34.97

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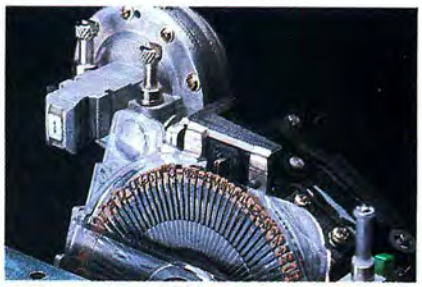

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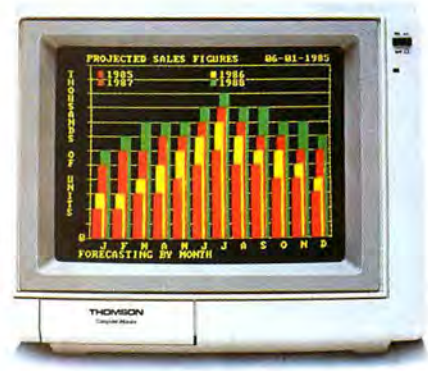

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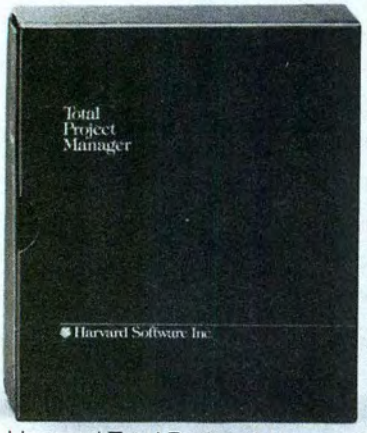

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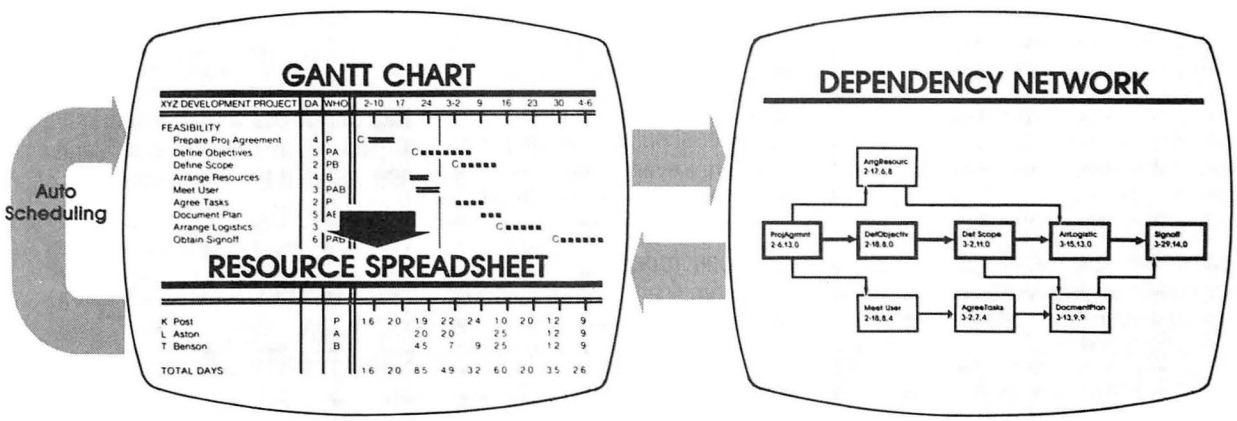

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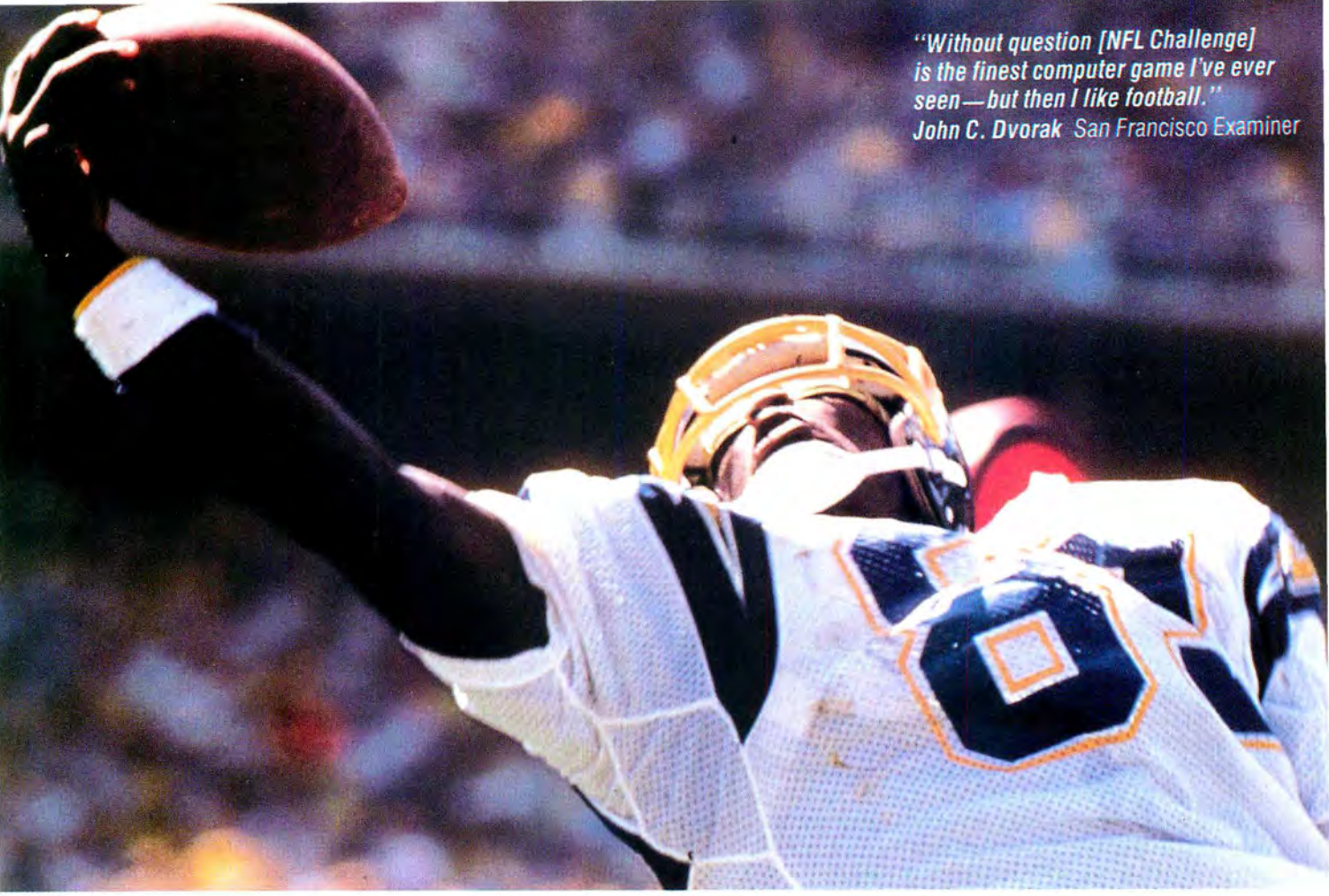

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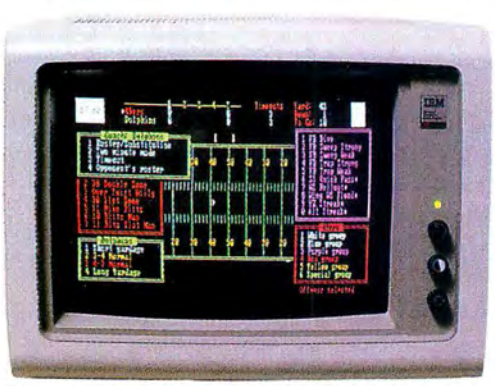

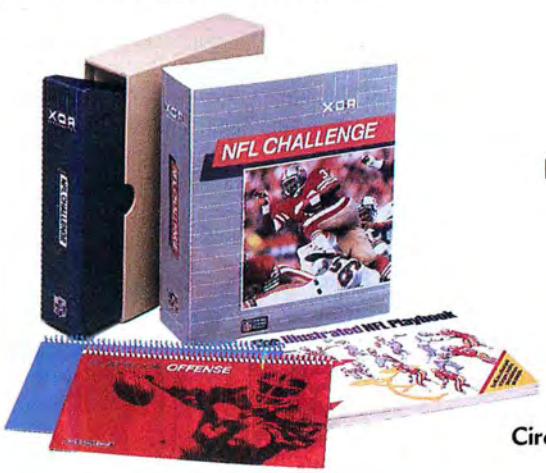

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Circle 764 on reader service card

The Help Screen

PC World offers answers and advice at every level

This month we look at Hewlett-Packard's top-of-the-line plotter and laser printer, transfer Apple II data to the PC, and create a 43-line version of WordStar for use with the Enhanced IBM Graphics Adapter.

Karl Koessel

The Plotter Thickens–Unattended

Q. My company graphs management production data with 1-2-3. *We use an Okidata 93, but we would like to get a plotter to enhance the output. Our problem lies in the number of graphs we produce. Of the various plotters on the market, we have yet to find one that automatically advances to the next preselected graph. Our discussions with plotter manufacturers have led us to conclude the trouble is the software. Is there software (or hardware) available that will produce selected graphs when left unattended?*

Dave Nichols
Glen Burnie, Maryland

A. The solution to your problem encompasses both software and hardware. You need software that, unattended, can plot selected graphs consecutively–and you need a plotter that can eject a finished plot and automatically reload paper. Hewlett-Packard's 7550 is an 8-pen plotter with a built-in, 150-sheet paper bin (which can use either 8½- by 11- or 11- by 17-inch paper). Because *1-2-3* requires that you interact with each plot, you'll need a different graphics package in order to use the HP plotter's auto-loading capability. Both *Graphwriter,* from Graphic Communication, and *KeyChart Presentation Graphics Software System,* from SoftKey Software Products, enable you to select several graphs (including those imported from *1-2-3*) and generate each graph consecutively (and in any quantity) without further effort on your part.

Controlling the LaserJet

Q. My firm recently purchased the Hewlett-Packard LaserJet Printer, and we're extremely impressed with its range of features. Accessing those features, however, isn't easy; doing so with BASIC is feasible, but that's a pretty clumsy approach. Do you know of any utility programs that convert LaserJet escape codes into DOS commands and assign each one to a function key?

Wing Lee
Tacoma, Washington

A. First, check out Ted Nace's article in the "Hands On" section of this issue ("Dress Up Your Documents"). Nace's tutorial explains how you can use the HP LaserJet with *Microsoft Word* and *WordStar.* Independent of an application program, you can assign LaserJet escape codes to DOS function keys using the technique described in "Key Reassignments With DEBUG," *.*, *PCW,* Vol. 2, No. 13. You might want to ask your local HP authorized dealer or sales office for a copy of the "HP LaserJet Printer Third Party Software List." It's a useful compendium of programs, written by independent software vendors, that support the LaserJet.

Picking Text Files From an Apple

Q. As a former owner of an Apple IIe, I've naturally created a large number of data files with that machine. I recently purchased an XT and want to transfer these same data files to its hard disk. Are you aware of any hardware I can install in my XT that will en-

(continues)

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Circle 781 on reader service card

able it to read my Apple floppy disks and transfer that data to the 10MB hard disk?

If such an arrangement isn't possible, how might I go about transferring data directly from an Apple to the PC? (For the time being, I have access to a colleague's Apple II.) Exactly what equipment do I need to carry out such a transfer? I wish to transfer directly–without telephone lines and a modem–because the telephone service in this part of the world isn't terribly reliable.

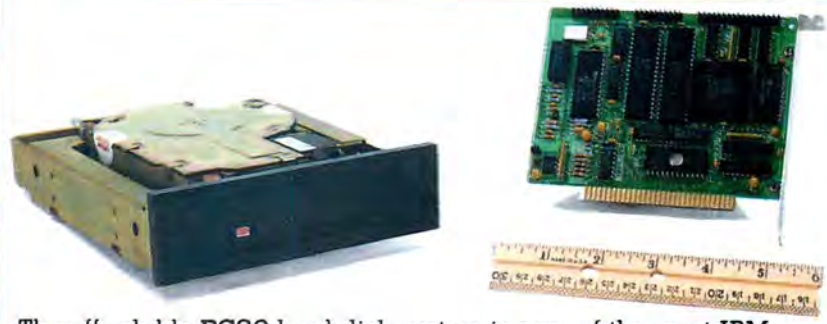
S. P. Crow
Bombay, India

A. The PC's floppy disk controller can be programmed to read most non-DOS formats. It cannot, however, read Apple DOS or ProDOS formats.

Apple Turnover, from Vertex Systems, enables you to read, write, and format Apple DOS disks. (Vertex Systems intends to support ProDOS eventually.) The package consists of a disk containing the program to manipulate Apple DOS disks; a board, which plugs into a PC expansion slot; and a cable, with which you connect the IBM disk controller to the Apple Turnover board. The floppy drive cable currently connected to your IBM disk controller is then connected to the Apple Turnover board.

(continues)

Internal 20 Meg $599
External 20 Meg $749



The affordable **PC20** hard disk system is one of the most **IBM** compatible setups around--you'll be able to boot directly from the quiet, 3-1/2 in. drive. This highly reliable and rugged drive uses plated media. Our free software lets you get the most out of your hard disk--**1dir** organizes directories with a **visual shell** that speeds operation and frees you from the intricacies of DOS commands. And our **exclusive** 5-1/4 in. controller fits into a short slot--perfect for computers like the Tandy 1000, Panasonic Sr. Partner, and IBM Portable PC. **PC20** comes complete with a low power drive, controller, bezels, cables and illustrated instruction manual.

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There's also another, cheaper method. If your colleague's Apple and your XT have serial ports, and you and your colleague have communications software, you can obtain or make a null modem cable to link the serial ports and transfer data from one computer directly to the other. This method, however, entails the headache of dealing with wiring requirements, various cable connectors, and two communications packages.

Compressed WordStar and the EGA

Q. How did you generate a 43-line WordStar *display with the IBM Enhanced Graphics Adapter and Enhanced Color Display, as shown in Screen 1 of "Clearly Resolved,"* PCW, *June 1985?*

Dana Cline
Denver, Colorado

A. To patch *WordStar* so it will display 42 screen lines above the function key assignments line, place a copy of DEBUG (which resides on the DOS Supplemental Programs disk) in drive A: and a copy of *WordStar* (WS.COM, WSOVLY1.OVR, and WSMSGS.OVR) in drive B:. Type **DEBUG B:WS.COM** < **Enter** > . At the hyphen prompt, type **E 248** < **Enter** > . A string of hexadecimal numbers ending in ':0248' will appear, followed by a 2-digit hexadecimal number and a period. The 2-digit number–18 (24 decimal), if this value has not been modified previously–is the number of

(continues)

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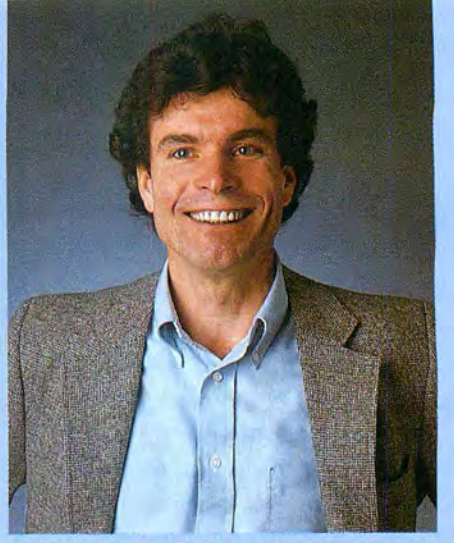

David Rose, inventor of ProKey.

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ProKey 4.0 keyword macros unsnarl PC use.

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And all these programs have different complicated commands that are tedious to type and easily forgotten. How much easier life would be if all you needed to operate your program was a small vocabulary of sensible words.

Want to log onto Dow Jones with your communications package to check on how your IBM stock is doing? Just type the keyword you previously selected for this function, "IBM". Need to print a profit and loss statement? Typing "p&l" is all it takes.

Behind the scenes, ProKey 4.0 checks its memory for the string of commands required to carry out the task and executes them automatically. Forgotten what functions you have available? Just call up the built-in menu that describes them in plain English.

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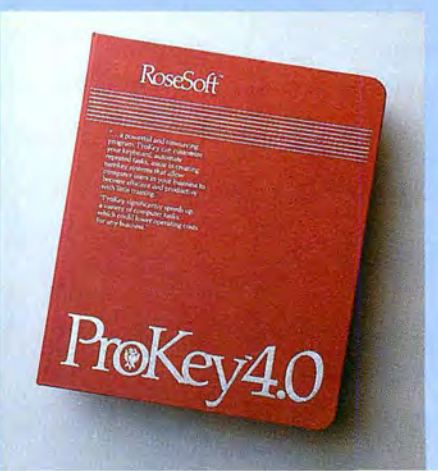

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Circle 162 on reader service card

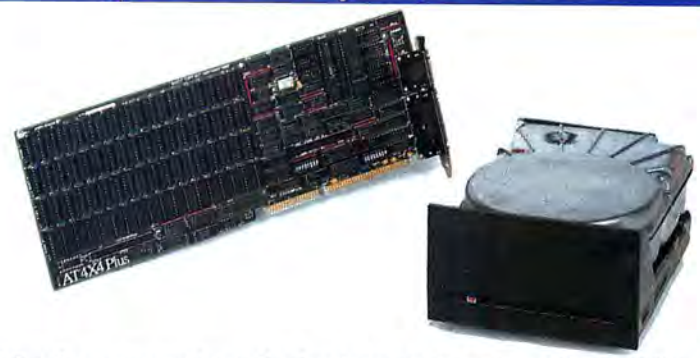
screen lines that *WordStar* uses above the function key assignments line. Type **2A**, which is 42 in decimal, and press **< Enter >**. Then type **W < Enter >** to write the change to disk and **Q < Enter >** to quit DEBUG. Finally, to avoid confusing this altered version with your regular *WordStar*, rename this program with the command **REN B:WS.COM B:WS43.COM < Enter >**.

Now that you have a 43-line *WordStar*, you need a way to switch the Enhanced Graphics Adapter (EGA) into its 43-line text mode and back into its 25-line text mode. Type **DEBUG < Enter >**. At the hyphen prompt, type **A < Enter >**. This invokes DEBUG's assembler so you can create a small .COM file that will change the EGA's screen mode. (If you've never done any assembly language programming, don't fret–it's a snap with DEBUG.) Now type the following assembly language instructions, pressing <Enter> after each line:

```
MOV AX,2
INT 10
MOV AX,1112
MOV BL,0
MOV DL,2B
INT 10
MOV AX,40
MOV ES,AX
MOV SI,87
```

(continues)

AT Enhancement Kit (ATK-1) $1595



Our AT enhancement kit is the best way to turn your Basic AT into an enhanced version--and then some! By adding the Basic Time **AT4X4Plus** with 512K of memory to your system, you'll have 640K of contiguous memory with 128K above 1 Megabyte (double split memory addressing) for use with VDISK. **AT4X4Plus** comes standard with a serial and parallel port. Up to 4 Megabytes of memory, three more serial ports and a game port are optional. The **44 Meg** (as opposed to a 20 Meg) hard disk is a high-speed voice-coil-driven model with a 30 ms. average access time.

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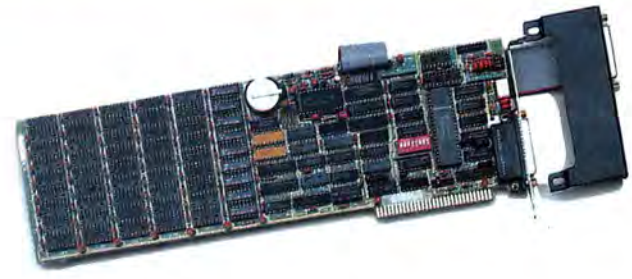
BT6Plus 64K $179
BT6Plus 384K $279



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Circle 142 on reader service card

```
ES:
OR BYTE PTR [SI],1
MOV AX,100
MOV CX,700
INT 10
MOV AX,1200
MOV BL,20
INT 10
```

If you have an IBM Monochrome Monitor attached to your EGA, skip this paragraph. Otherwise, type **RET**, press **< Enter >**, press **< Ctrl > - < Break >**, and then type

```
R CX  < Enter >
2A  < Enter >
N 43.COM  < Enter >
W  < Enter >
```

If you have an Enhanced Color Display attached to your EGA, skip this paragraph. Otherwise, add these instructions:

```
MOV DX,3B4
MOV AL,14
OUT DX,AL
INC DX
MOV AL,7
OUT DX,AL
RET
```

Then press **< Ctrl > - < Break >**, and type

```
R CX  < Enter >
34  < Enter >
N 43.COM  < Enter >
W  < Enter >
```

Type the following to change the 43-line routine into the 25-line routine:

(continues)

Enhanced Keyboard ff5151 $159

An affordable, productive solution to your non-standard keyboard. **ff5151** uses solid-state capacitive key switches--giving you tactile feedback through your fingers. Avoid Num Lock confusion with our separate cursor control and numeric keypads and LED indicators on the Lock keys. We've returned keys to their standard setup including an extra wide Control key adjacent to the **A** for Wordstar users. Other features include an extra Control key in the function key row, 3-position height adjustment and sleek color matched styling. Plugs into IBM PC, PC/XT and Compaq Deskpro.

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A 105 < Enter >
MOV AX,1122 < Enter >
MOV BL,0 < Enter >
MOV DL,19 < Enter >
< Ctrl > - < Break >
A 117 < Enter >
AND BYTE PTR [SI],FE < Enter >
MOV AX,100 < Enter >
MOV CX,B0C < Enter >
INT 10 < Enter >
RET < Enter >
< Ctrl > - < Break >
R CX < Enter >
23 < Enter >
N 25.COM < Enter >

If you have an IBM Monochrome Monitor attached to your EGA, type **E 101 < Enter > 2 < Enter >**. For either monitor, finish by typing **W < Enter > Q < Enter >**.

You now have two .COM files: 43.COM and 25.COM. 25.COM does not restore the cursor on the Enhanced Color Display, nor does it restore the 9-by-14 character set on the Monochrome Monitor, and so must be followed by the command **MODE 80 < Enter >**. To simplify the use of your 43-line *WordStar*, create the following batch file, called W43.BAT:

43
WS43
25
MODE 80

Finally, copy MODE.COM from your DOS disk onto this disk. To use your 43-line *WordStar*, type **W43 < Enter >**. When you exit *WordStar*, the Enhanced Color Display or Monochrome Monitor will return to its 25-line text mode.

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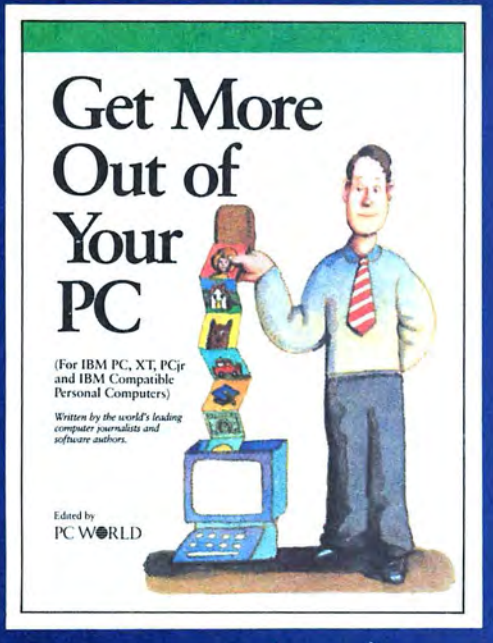

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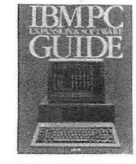

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Circle 58 on reader service card

Theory PC

A leading business analyst suggests grassroots action is essential if the PC is to become an indispensable management tool.

William G. Ouchi

The personal computer is not yet a universal appliance. Although the PC has gained wide acceptance–in California, for example, one in nine households has one–the industry's once-frantic growth rate has calmed of late. Explanations for the current hiatus abound, but the primary reason may well be the difficulty of using a PC as a communications device. If it doesn't afford effortless and inexpensive access to on-line services and data bases, videotex, and other PCs, some have suggested that a computer isn't much more than a costly typewriter or calculator–hardly tomorrow's miracle worker.

The difficulty of telecommunications via PC is part of a vexing cycle: Consumers will not buy PCs in massive numbers unless thousands of diverse services are available, but service providers will not introduce new home banking, news, or electronic mail services for the mass market until millions of PCs are sitting next to the toasters and the TVs.

When the nascent PC industry confronted a similar chicken-and-egg problem at its outset, a lively, competitive market provided the solution. The marketplace encouraged development of both hardware and software standards; consequently, consumers could buy what they needed at an affordable price. Why hasn't the marketplace provided a similar solution for telecommunications? More to the point, will it do so, given a tad more time?

Because the communications industry itself is, in several key respects, a natural monopoly rather than a "perfect" market (although this, too, may change with new technology), the telecommunications problem resists a market solution. A market solution assumes a rough equality among providers and a similar equality among consumers; members of each group must have unrestricted access to the others. But in the telephone network business, which forms the heart of the PC user's communications system, real efficiency for all users exists only if a single provider dominates each locality. (For long distance services, the economies of scale are more limited, enabling several long distance carriers to compete effectively with one another.)

Without government regulation of natural monopolies, the consumer is at the monopolists' mercy. For this reason the FCC and other federal agencies regulate most aspects of local telephone service, and each state public utilities commission sets the rates that those companies ("network carriers") may charge their customers.

Network carriers are restricted primarily in the range of software services they're authorized to offer. At present, the Bell operating companies are prohibited from providing all but a very narrow range of technical services. We're still some distance from being able to plug a PC into a phone jack and seamlessly reconcile analog and digital information. Anyone who has a PC at home or in a small business knows that direct communication with another personal computer simply can't happen without additional cost (read: modem) and bother (read: communications software).

Local phone companies are not permitted to receive unaltered output from an IBM PC and deliver it in usable form to Apple, Wang, or Hewlett-Packard machines, or even to another IBM PC. They *are* permitted to perform the protocol conversion that a modem-equipped PC needs to talk to a mainframe–a translational trick that lets you tap into The Source and CompuServe. Unregulated value-added network carriers, such as Tymnet, can also provide this service.

In fact, such value-added networks are allowed to provide any sort of service we might want, but they can't economically run wires into our homes and businesses (and thereby impinge on the phone company's natural monopoly). Our current problem is that the people who *can* efficiently offer universal network service to homes and offices aren't allowed to provide PC services, and the people permitted to supply those services cannot realistically deliver them to small users. How, you might ask, did we get ourselves into this fix?

The answer, curiously, was the desire to protect the consumer's interests. When AT&T was parceled out two years ago, the company's regulators and competitors

feared that if Bell operating units were permitted to sell PC services to consumers, they would crush competition, offer fewer services at higher rates, and generally leave consumers worse off. For this reason, the local regulated carriers, both Bell and non-Bell, were prohibited from offering such services. At the time, computer manufacturers endorsed this decision.

Today, however, the situation has changed dramatically. Many hardware manufacturers, on-line service providers, and consumers large and small feel that the PC's usefulness has been artificially limited by the restrictions imposed on local telephone companies. Few feel that telephone companies should be completely deregulated. The regional phone companies are eminently capable of delivering carefully delineated PC services to consumers who otherwise could not afford the modems, boards, and communications software required for one PC to communicate with another. If local phone companies were allowed to connect one PC user to another and to provide inexpensive, easy connections to independent vendor services, the PC's full potential would be a *fait accompli*. Indeed, it's likely that all segments of the electronics industry would expand rapidly as consumers availed themselves of a wide range of new services.

The day will come when you'll be able to plug a PC directly into a telephone outlet and send a message to Oxnard or Oshkosh or to your Uncle Walter's personal computer (whatever the make) in Walla Walla–and, unlike today, do so without fretting about the hardware and software that make it possible. How soon? Perhaps sooner than you think.

Like any democracy, our government responds swiftly when a consensus forms. The interests of consumers often differ from those of producers. But when consumers' and producers' interests converge, government policy change can be accomplished quickly. The consumer's role is to let both producers and government officials know that change is essential.

In this case, it appears that the interests of consumers and producers just may converge. Both sides want the small business computer to be more useful for telecommunications, and both will benefit directly if the personal computer becomes a universal appliance. Many segments of the computing and telecommunications industries are seeking areas of telecommunications policy consensus to present to the government. Projects underway at universities, within industry trade associations, and inside government agencies seek consensus to redefine the role of the local telephone company–a role that will, in the end, benefit the consumer.

Standard protocols in telecommunications are bound to take root as they did with software operating systems. Just as software standards were decided in the marketplace, so should telecommunications standards be decided by the votes consumers cast with their dollars.

On questions of public policy, however, consumers cannot vote with their pocketbooks. Public policy on the proper role of the network carriers will be decided by government officials. If home and business users of personal computers let their elected representatives know that they want a flexible, easy-to-use telecommunications system–and if the producers agree that this development will provoke rapid expansion of the industry–then the change will come, and come quickly.

William G. Ouchi is a professor at the UCLA Graduate School of Management and the author of Theory Z: How American Business Can Meet the Japanese Challenge *(Avon Books, New York, 1981) and* The M-Form Society: How American Teamwork Can Recapture the Competitive Edge *(Addison-Wesley, Reading, Mass., 1984).*

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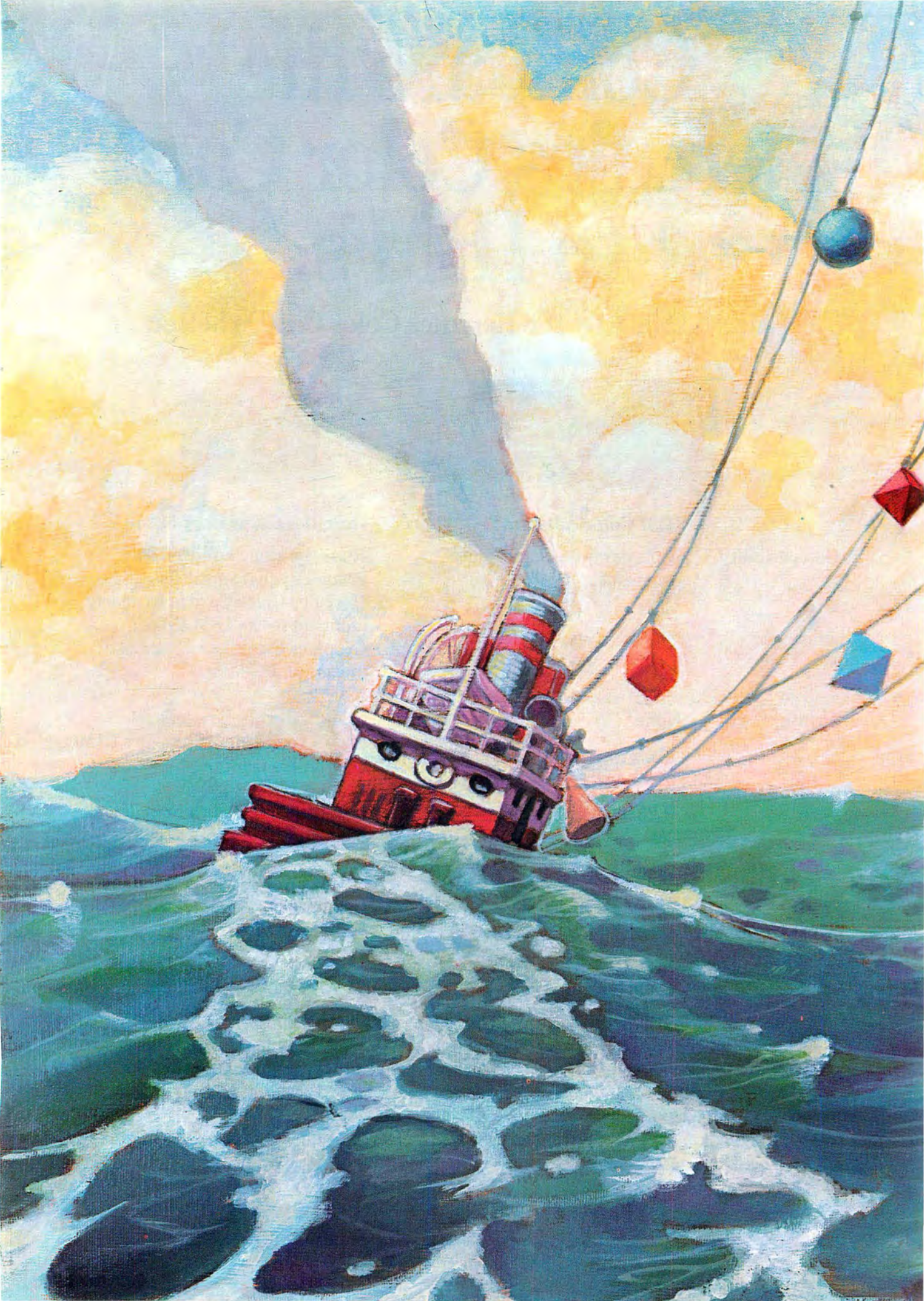

From Here to Mainframe (and Back)

Business computing increasingly depends on a fluid interchange of data among computers, whatever their size. Here's a primer that traces the path from PC to mainframe, with stops at points in between.

Janet Goldenberg and Raymond Panko

Once they were as haughtily independent as rival marching bands, each following their own drummer and blaring their own tunes. But more and more, PCs and mainframes are playing in the same ensemble. Inspiring this new movement is the recognition that each computer fills a niche the other can't: Nimble and inexpensive PCs can process data without hefty timesharing costs and long delays, while mainframes can apply gargantuan processing power to huge centralized data bases.

Those who've tried to unite these contrapuntal talents have faced significant problems. From a technical standpoint, micros and mainframes represent two ends of a hardware-software spectrum that must be adjusted for scale. Although random access to corporate data might seem desirable for improving productivity, that very accessibility terrifies some DP managers because of its potential threat to security. For users, entering mainframe territory has its own perils, such as strange operating systems and unfriendly software. But this much is indisputable: By their very presence in the mainframe world, PCs are transforming the tasks to which corporate data is applied–and that change is beginning to pay off for everyone.

As personal computers gain in power and pervasiveness, their ability to talk to mainframes becomes more routine. Estimates from International Data Corporation (IDC), a market research firm, reveal 190,000 micro-to-mainframe links currently in place, nearly double the total of a year ago. IDC projects 260,000 installations by the end of 1986.

The reason is simple: PCs are now almost cost-competitive with many of the dedicated mainframe terminals they can mimic–but the PC delivers far greater versatility (what data processing buffs like to call off-line processing capability). And new hardware and software is making it easier than ever to unite the two worlds.

Why Link Up?

PC users currently have several powerful incentives for tapping into mainframes. First, they can download data from corporate or commercial data bases, such as The Source, or upload files to a central data cache or an electronic-mail depot. Second, their PCs can act as kite strings to powerful software that runs on the mainframe–thus gaining access, on a time-sharing basis, to such products as NOMAD and Focus or to mainframe application software, particularly statistical analysis packages and transaction processing systems. Third, the mainframe can act as a server for PC networks that is more efficient than PC-based local area networks (LANs); by using existing connections to the corporate mainframe, PCs can not only share data but access sophisticated peripheral equipment such as high-speed printers and large-capacity disk drives. This capability is particularly handy for DP shops because the PC can store data otherwise bound for often backlogged mainframe disk drives.

Office automation represents a fourth, much-heralded application. Serving as workstations that are fully integrated into a corporate voice-data network, PCs can take advantage of systems that provide electronic mail, calendar management, and other complex sharing of local and centralized computing resources.

Of these inducements, the most compelling is generally the need for significant data transfers: Retrieving information from a mainframe, then handing that data off to the PC for further analysis; and feeding PC-based data to the mainframe for additional massaging.

Terminal Variety

In the meantime, establishing basic micro-mainframe links remains a first, halting step for many firms. Joining a PC to a mainframe requires three ingredients: a transmission line between the PC and the main, or host, computer; application software, which usually resides on the host but may be on the PC or on both; and hardware and software capable of turning the PC into a terminal and of understanding a host's transmission (see Figure 1).

This last element lies at the heart of the connection between micros and mainframes and is divided into two components: terminal emulation–the PC's ability to masquerade as one of the terminals that normally serve the host, and protocol conversion–the capacity to translate between the telecommunications protocol of the host and that of the PC. A PC in this guise can be wired directly to a host computer network, or it can be connected remotely–usually over telephone lines, but sometimes by radio or satellite. Terminal emulation is becoming increasingly popular; roughly 200 programs currently crowd the market.

If you are linking your PC to a larger computer, the host will likely require that your PC emulate one of two broad classes of terminals: TTY or dedicated (host-specific).

Terminal emulation
TTY terminal
Dedicated terminal
Protocol converter

Transmission line
Direct cable
Telephone
LAN or PBX

Application software
Host-based
PC-based
Integrated PC-host

Figure 1: Road map for the PC-host link

The venerable TTY terminal, the earliest and most generic approach, is still both the most popular and the cheapest. TTY is, simply put, the lowest-common-denominator solution, but it remains the only inexpensive way to communicate with an IBM mainframe. A "dumb" terminal in that it lacks intrinsic processing power, the TTY uses a time-honored set of protocols, or electronic standards, to communicate with the host computer: It sends and receives data asynchronously (one character at a time), it uses the ASCII (American Standard Code for Information Interchange) character code, and it employs the RS-232C interface to connect with the outside world. Like a teletype (from which it derives its name), a TTY terminal is line, rather than full-screen, oriented.

Because this set of standards has been around for so long, many if not most mainframes can work with TTYs—and you can access the host through a conventional 300- or 1200-bps modem. But not all mainframes jibe with TTYs—and even if a link can be established, the old-fashioned TTY terminal may not be able to use some of its host's more modern, full-screen software. In addition, the TTY "standard" fails to stipulate all facets of protocol, such as whether the connection is to be full- or half-duplex, the rate at which data flows, and how each device tells the other to pause if one transmits data too quickly. With TTY emulation, spelling out the details is up to you (see the sidebar "Rules of the Game").

And if your PC lacks an RS-232C serial interface board, you'll need to spend about $80 for one, along with software to do the actual TTY emulation. Such communications packages range in price from $35 to $350; *PC-Talk III*, *Crosstalk XVI*, and *Smartcom II*, for example, all support TTY emulation.

Dedicated Workers

Dedicated terminals, by contrast, are tailored to work with a specific model or group of host computers. IBM's mainframe family, for example, uses the 3270 line of terminals; smaller IBM business computers use the 5250 series. Each performs perfectly with its respective host because it speaks the host's language: It communicates asynchronously or synchronously as the host's protocol demands, matches the host's data transmission speed, and works with all of the host's software, offering full-screen access to data.

Dedicated terminals are easier to install than TTYs because the protocols are preset; you needn't know anything about them. On the negative side, it's usually costly to emulate a dedicated terminal—roughly $1000—in part because of the additional hardware dedicated terminal emulation requires. Terminal emulation software is not available for every host-PC combination; dedicated terminals work exclusively with one type of host computer.

To emulate a dedicated terminal that is able to communicate with its host, you need a kit that includes both a specialized expansion board for the PC and software for both computers. For those seeking to mimic IBM dedicated terminals, DCA's IRMA family of micro-to-mainframe links is a popular way to do so. The basic $1195 kit includes a board that lets you cable your PC directly to the host's network (see the discussion under "Protocol Converters").

Rules of the Game

Janet Goldenberg

Like the ritualized courtesies of diplomats, communications protocols enable disparate types of computer equipment to negotiate on common ground. These electronic standards, which govern everything from the rate of data transmission to the way data is encoded, are usually set by the host computer and must be brought into accord before any exchange can occur.

When setting up your micro-mainframe link you will probably encounter the technical terms that follow. The main point to remember is that you needn't know precisely what the jargon means–you just need to ensure that the protocol is the same at both ends of the connection.

Synchronous/asynchronous. Inexpensive and low-performance communications products almost always exchange data asynchronously; that is, they transfer data in single-byte units that can be traded without synchronizing both devices' internal clocks. More sophisticated devices, including many mainframe computers, usually send data synchronously –that is, in large, tightly organized blocks. Although technically harder to accomplish, synchronous transmission can occur many times faster than asynchronous, better accommodating the volume of data that mainframes handle. But because there is no widely accepted standard for synchronous transmission, you must ensure that the devices you connect use the same synchronous protocol.

Character code. When computers talk to the outside world, they represent their keyboard characters with a standard set of numbers called a character code. All personal computers and most non-IBM minis and mainframes use the 128-unit ASCII code, in which each alphanumeric and control character is represented by a number between 0 and 127. IBM mainframes use a different, 256-unit code called EBCDIC, which incorporates extra characters and control codes. If both PC and host run the same communications software, they may also be able to transfer data in raw binary format, making possible the exchange of compiled programs as well as alphanumeric information.

Interfaces. TTY and VT 100 terminals employ the standard RS-232C serial interface, which uses a special

chip to send data one byte at a time. Dedicated terminal boards have proprietary types of interfaces that can often send data much faster–but will work with only one type or family of computer.

Bits per second/baud rate. These terms are often used interchangeably to describe the rate at which data flows between two devices, but at high transmission speeds only *bits per second* is correct. In micro-to-mainframe connections these speeds typically range from 300 bps for TTYs using inexpensive modems to 2 million bps or more for cabled, dedicated terminals.

Half- and full-duplex. When making a connection, two computers must agree on whether their conversation will be "you talk, I listen," as on a CB radio (*half-duplex*), or two-way, as with a telephone (*full-duplex*). Full-duplex is the preferred mode because the characters that appear when you type are actually echoes from the other device. If all else is well, this mode provides steady confirmation that your message is being received intact.

IRMA also comes with software that enables you to customize your keyboard and toggle between the host and your personal computer. Optional software provides enhanced data security, smoother file transfer, and other features.

The VT 100 Alternative

Tucked between the two major categories is a third terminal, the Digital Equipment Corporation VT 100.

Like a TTY, a VT 100 is an asynchronous ASCII RS-232C terminal, transmitting at much slower speeds than a dedicated terminal. Unlike a TTY, however, the VT 100 has some intelligence and is capable of full-screen editing. The VT 100 also relies on a more sophisticated protocol than does the TTY.

All DEC hosts can work with a VT 100, as can a variety of other minicomputers from various vendors. Emulating a VT 100 requires the same serial board you'd use for TTY emulation, plus a terminal emulation program. The better VT 100 terminal emulators can mimic TTYs and the older VT 52 terminals as well, thus permitting access to IBM mainframes.

Because PCs can emulate many kinds of terminals, your choice depends on the type of host computer you want to address. If the host won't talk well–or at all–to a TTY-type terminal, your only alternative may be dedicated terminal emulation. But if you must connect to several different host computers–for example, to both Dow Jones and the corporate mainframe–TTYs may be your best bet. To allow for multiple contingencies, some users install two or more terminal emulation kits on their PCs and buy communications software that can emulate both TTY and dedicated terminals.

Protocol Converters

A protocol converter is electronics in a box or on a board in the communication line between PC and the mainframe (see Figure 2). This device functions as a clever double agent: It tricks the host computer into perceiving your PC as a dedicated terminal while convincing your PC that the host is an ordinary TTY host. If you want to connect an assortment of PCs to your company's main computer, you may be able to enjoy the benefits of both TTY and dedicated terminals by installing a dial-in protocol converter at the host. Thus, you can cheaply configure all your PCs as TTYs, yet have most if not all the advantages of dedicated terminals. The principal drawback is a transmission speed limited to 19,200 bps–positively poky compared to the million-plus bps rates possible with dedicated terminals cabled directly to the mainframe.

But on the plus side, protocol converters resolve a variety of disparities in communications conventions. Their diplomatic talents range from packaging data for transmission and error checking to performing character code conversions (from the PC's ASCII to the IBM mainframe's EBCDIC [Extended Binary Coded Decimal Interchange Code]).

In Control

Once you've decided which terminal to emulate, the next step is to select a transmission link between your PC and the host computer. (In a practical sense, the type of terminal emulation influences the mode of transmission, so it's not entirely a matter of choice.) If the host and the PC are physically close, you can use direct cabling or a local area network; otherwise, you must use telephone lines.

If your terminal emulator is a TTY type, its RS-232C interface puts strict limitations on the speed and distance of the linkup. Because the RS-232C was designed to send data via modem over telephone lines–an error-prone procedure at high speeds–its transmission rate is limited to 19,200 bps. The RS-232C standard requires that TTYs be kept on a fairly short leash: about 50 feet, or just long enough to reach to the nearest telephone jack. Although TTY terminals and hosts can be connected directly, and though special devices can boost the distance between them, the RS-232C is basically a short-distance interface (see Figure 3).

In contrast to the primitive restrictions imposed by TTYs, dedicated terminals can be cabled to a main computer over much greater distance–across an office floor or through an entire building. They can also communicate at rates of up to 4 million bps. But to do all this, a PC must use the host's specific cabling system. Figure 4 shows the cabling path for an IBM mainframe, which uses a device called a local controller to direct traffic from several nearby terminals. A remote controller, also shown, does the same for terminals dialing in by telephone.

Controllers are special devices that effectively manage the time demands on a single mainframe, enabling the big box to serve multiple terminals. Although the activity of a controller is invisible to the user–indeed, users appear to be connected to the mainframe directly–all terminals are actually linked to a controller on the mainframe network.

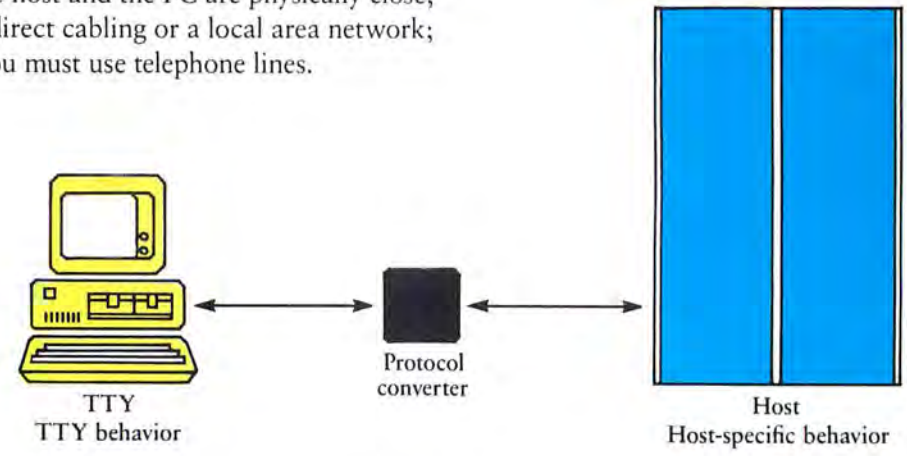

Figure 2: The protocol conversion process minimizes disparities between terminal and host.

In that network, the mainframe may be next door or in the next state. A controller can be attached directly to the mainframe (dubbed local, or channel-attached, communications) from a distance of up to 2000 feet in the same building. Beyond that distance

Although the activity of a controller is invisible to the user—indeed, users appear to be connected to the mainframe directly—all terminals are actually linked to a controller on the mainframe network.

the controller communicates by modem to another controller, which in turn is hooked up to the mainframe directly—hence, remote communications.

AST Research, among others, is working on a way to eliminate the necessity for micro-to-mainframe boards in every PC—and for costly controllers as well. AST recently released a $2200 board that links one PC on a local area network to an IBM mainframe and enables every other PC on the network to function as a dedicated terminal.

If a direct connection isn't feasible, you'll need compatible modems at either end of the telephone line. Any terminal can be linked to a host via phone lines and a modem, but of course the speed of the modem imposes its own limits. And only the most sophisticated modems perform error detection, vital for typically noisy phone lines. Special equipment is often needed to connect a TTY terminal to a host for such local communications.

You might also rely on a LAN or PBX (private branch exchange or telephone switching computer). Many organizations have now installed LANs or PBX systems that can accommodate both TTY and dedicated terminals. Once a signal reaches the LAN or PBX port, it can travel to any host in the system, regardless of distance. With a special IBM interface, the port can transfer data at 2 million bps.

(There is one caveat: When makers of LANs and PBXs boast that they can handle synchronous communications—preferred over asynchronous because it is much faster—they usually mean only IBM's brand of synchronous communications. Actually, several standards for synchronous communications exist, varying with the manufacturer. To confuse matters further, IBM itself has two of these: an older bi-synchronous standard and a newer SDLC [synchronous data link control]. Some LANs and PBXs support only one of these, while others support both.)

The Business of Applications

Once you've set up your PC-host connection, you'll need software to function as an intelligent gatekeeper between the two worlds. This software, which runs on the host and perhaps on the PC as well, is designed to smooth the technological bridge

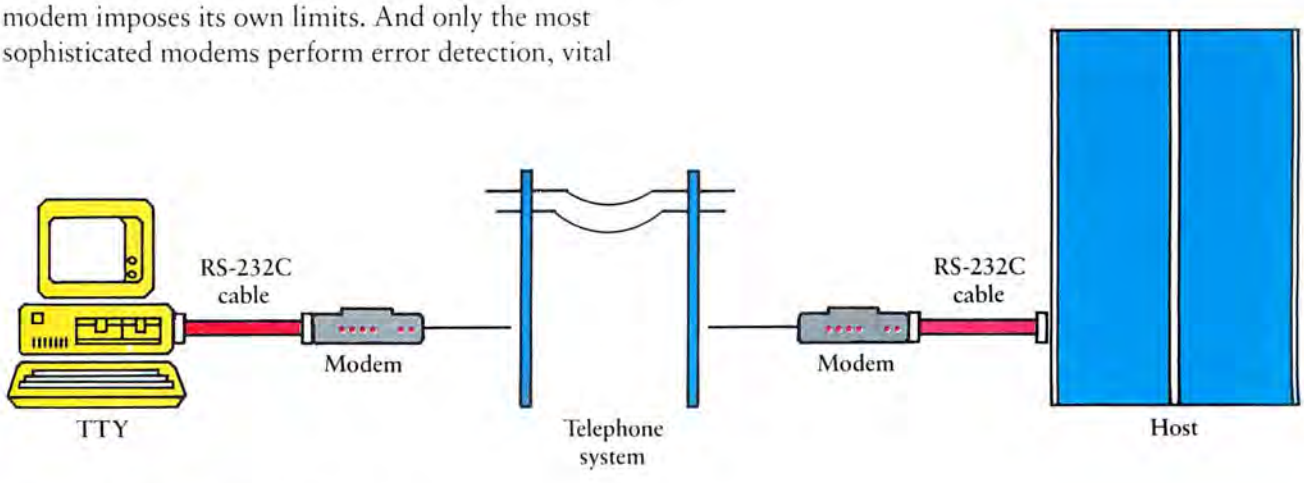

Figure 3: Connecting a host and a TTY using the RS-232C interface via modems over the telephone system

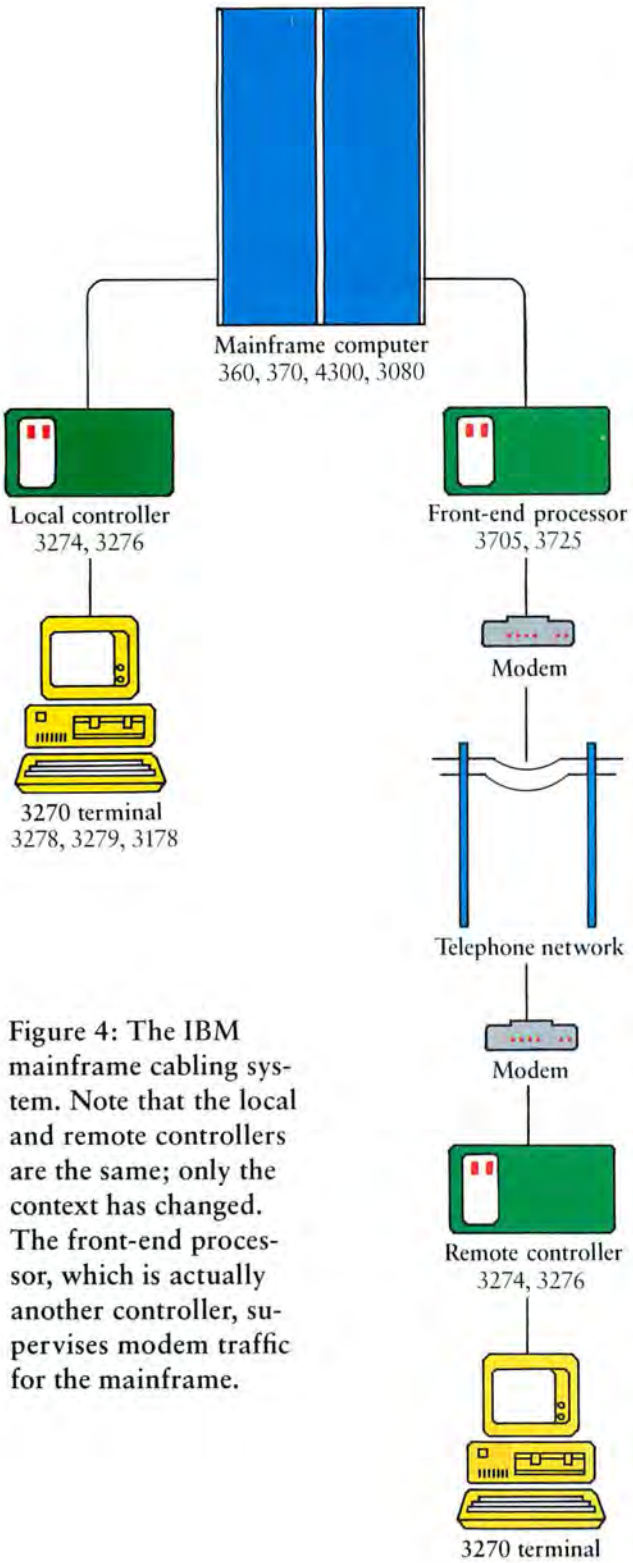

Figure 4: The IBM mainframe cabling system. Note that the local and remote controllers are the same; only the context has changed. The front-end processor, which is actually another controller, supervises modem traffic for the mainframe.

between computers and to shelter nonprogrammers from the often unfriendly realm of mainframe software.

Until recently, a PC posing as a terminal could at best only download data from the host computer and capture it to disk. To manipulate this data with PC-based software, such as *dBASE* or *1-2-3*, you had to laboriously reenter it in the proper format. Now, a new generation of software can capture and convey data automatically. Informatics General's *Answer* series, which includes versions for *1-2-3*, *dBASE*, *Reflex*, and *Cornerstone*, is one such offering. *Answer*'s Extractor component resides on the mainframe, handling security, data base access, and scheduling. A corresponding PC-based component translates incoming data to the proper format for the program in question. To use a program like *Answer*, you can rely on either TTY or dedicated terminal emulation.

Also new and noteworthy is *Symphony Link*, a Lotus product that enables *Symphony* users to talk to IBM mainframes. *Symphony Link*, used in conjunction with an IRMA board, provides dedicated terminal emulation, two-way data transfer, and access to mainframe programs and utilities. On the drawing board is *Symphony Link*'s full integration with Cullinet's ICMS (Information Center Management System) mainframe environment. Via its *Universal Link* facility, ICMS will also open the mainframe to dedicated terminals and to PCs running *1-2-3* and Cullinet's *Goldengate* integrated package.

The *Answer* series and Lotus/Cullinet products work because several companies have put their heads together, fashioning related products for micro and mainframe. By PC standards, however, packages like these can be costly. A typical Lotus/*Answer* configuration for 50 personal computers sells for around $45,000 (or $900 per PC), and you must buy additional software for any other PC applications you wish to incorporate. Moreover, this price tag does not include the cost of dedicated terminal boards or other communications devices, which are required for each PC. And it certainly does not take into account the expense of mainframe software, which runs well into six figures.

Adapting mainframe software for the PC represents a smoother–and far more cost-effective–approach. When one vendor is the source of both

software products, micro and mainframe can exchange sophisticated files while losing very little in translation. Mainframe data can be downloaded to the PC, manipulated off line, then merged again with the mainframe data base, thereby substantially reducing time-sharing costs. Focus, a so-called "fourth-generation" mainframe package, has spawned *PC/Focus*, an early, successful entry in this product genre. With a terminal emulator and an IRMA board, a *PC/Focus* user can read and write files in both environments as if they were one (see "A New Focus on Data Management," *PCW*, February 1985).

Adapting mainframe software for the PC represents a smoother–and far more cost-effective–approach. When one vendor is the source of both software products, micro and mainframe can exchange sophisticated files while losing very little in translation.

Multiple Submissions

Setting up one micro-mainframe connection can be difficult, but if you want to communicate with more than one mainframe, the complexities can be daunting. To talk to all the computers on your list, you may have to outfit your PC with two or three terminal emulation packages and communications boards. Although a single universal terminal emulator would be preferable, it isn't here yet.

You may also be confounded by the need to remember the myriad passwords and commands required to operate the various systems you use. While good communications software can store logon routines for several host systems, once you're on line it's up to you to recall the command structure of the system you're using. The ideal solution–still some time away–is software that lets you phrase your query in natural language and then translates it precisely into your host's peculiar argot. But for the moment, cosmopolitan computer users will simply have to master a wealth of detail.

In the not-too-distant future we will see the emergence of sophisticated software that lets PCs, hosts, and LANs harmonize more completely. Until then, micro-mainframe communications remains an early, auspicious duet.

Janet Goldenberg is a freelance writer based in San Francisco. Raymond Panko is an associate professor of business administration at the University of Hawaii.

Answer Series
Informatics General Corp.
21050 Vanowen St.
Canoga Park, CA 91304
818/716-1616
List price: dBASE/Answer, Lotus/Answer, Cornerstone/Answer, Reflex/Answer $550 each
Requirements: 256K, DOS 2.00 or later version, two disk drives, communications board, IBM-compatible mainframe computer and mainframe software

Crosstalk XVI
Microstuf, Inc.
1000 Holcomb Woods Pkwy. #440
Roswell, GA 30076
404/998-3998
List price: $195
Requirements: 128K, one disk drive, serial port

(continues)

Goldengate
Cullinet PC Software, Inc.
400 Blue Hill Dr.
Westwood, MA 02090
617/329-7700
List price: $795
Requirements: 320K, one disk drive, hard disk, color graphics board, color monitor or composite video monochrome monitor

IRMA Board, Irmalette, Irmaline
Digital Communications Associates, Inc. (DCA)
303 Technology Park
Norcross, GA 30092
404/448-1400
List price: IRMA board $1195, Irmalette $395, Irmaline $1295; Irmalette/Irmaline bundle $1395
Requirements: 128K, DOS 1.10 or later version, one disk drive

PC/Focus
Information Builders
1250 Broadway
New York, NY 10001
212/736-4433
List price: $1595
Requirements: 512K, DOS 2.00 or later version, one disk drive, hard disk (additional RAM, modem, and IRMA board recommended)

PC-Talk III
Freeware
Headlands Press, Inc.
P.O. Box 862
Tiburon, CA 94920
415/435-0770
List price: requested donation $35
Requirements: 64K, compiled version 128K; one disk drive; modem

Smartcom II
Hayes Microcomputer Products, Inc.
5923 Peachtree Industrial Blvd.
Norcross, GA 30092
404/449-8791
List price: $149
Requirements: 128K, one disk drive, serial port

Symphony Link
Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
617/577-8500
List price: $395
Requirements: 512K, Symphony, IRMA board or Irmalette/Irmaline combination, IBM 3274 or 3276 Control Unit and appropriate host connection, host file transfer software from DCA

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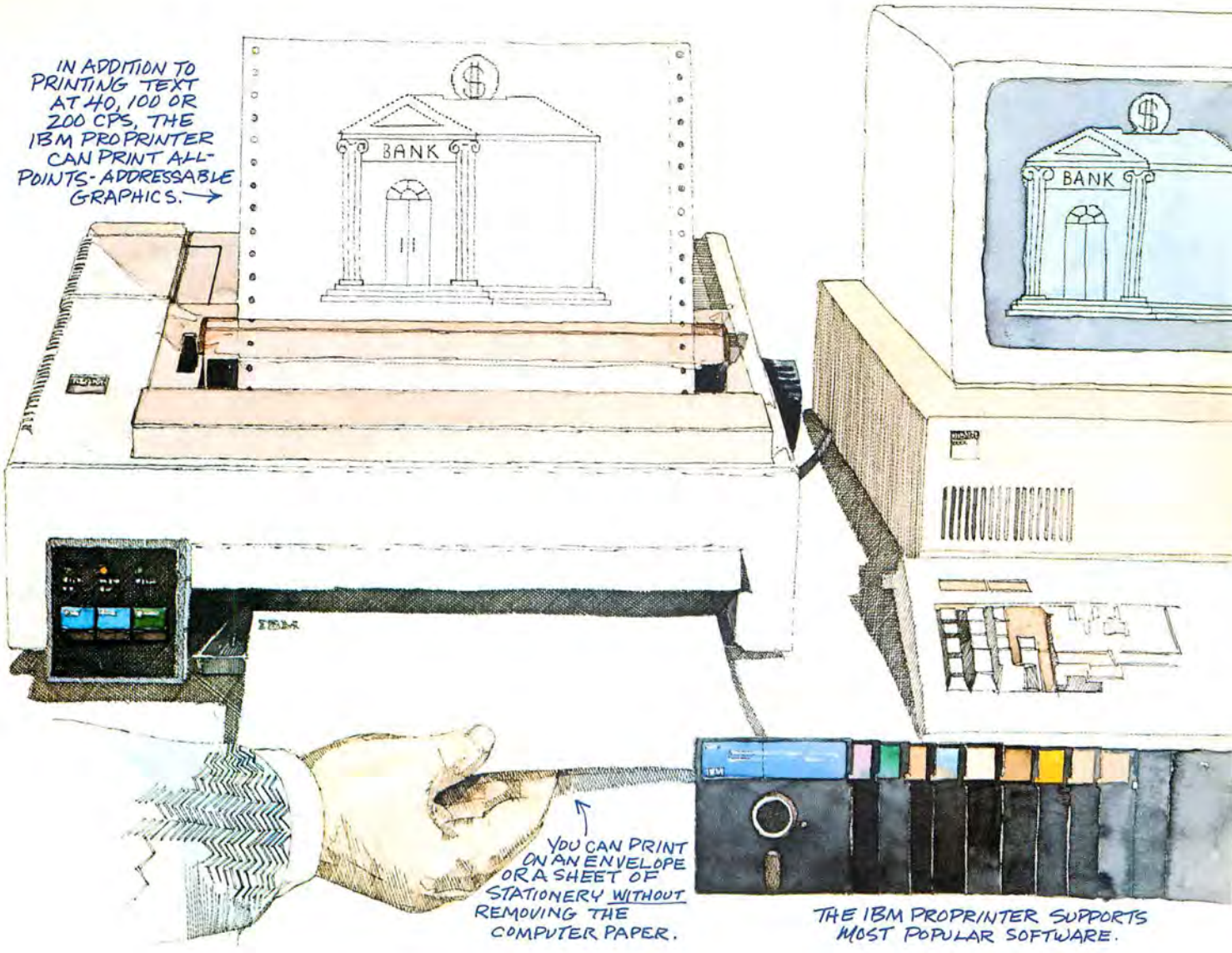

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Circle 723 on reader service card

The PC as Innovator

The former governor of California reflects on the quantum leap in productivity—and economic potential—that PCs represent.

Edmund G. Brown, Jr.

The computer is the Proteus of machines, taking on a thousand forms and serving a thousand functions. Its truly revolutionary character, however, lies in its interactive capacity. Unlike a book, a telephone, a radio, or a TV, a computer reacts to the information it receives and processes it according to instructions we give it. The computer can also be combined with other machines such as the videodisk player to further augment its extraordinary capacity. For each of us, this new technology offers the ability to handle the unprecedented quantities of information modern life now requires, thereby enabling us to learn and work with significantly greater effectiveness.

The arrival of the personal computer could not have been more opportune; its power to enhance productivity is crucial to our becoming a more efficient and competitive society. The United States is paradoxically enjoying one of the richest yet one of the most vulnerable economies in history. Our salaries and our services cost so much that poorer competitors, particularly in Asia, are gaining increasing advantage through their lower-cost operations. In this sense, our strength is a weakness that impedes us. This strange phenomenon (known as the retarding-lead syndrome) is a tendency among prosperous societies to decline and fall behind—a result of relying on deeply entrenched but obsolete patterns of national behavior. Unless we use our technology—particularly the computer—to create new market niches for our high-cost economy, we will simply be overwhelmed by the onslaught of foreign goods at once higher in quality and lower in price than our own.

As if these commercial pressures were not enough, ominous world demographic shifts are inexorably turning the population of the United States into a diminishing and aging minority. In the next 15 years 750 million people will enter the world's work force; more than 90 percent of them will live outside the United States and Europe. In most countries the median age is significantly lower than in the United States; in Mexico it is half that of our own.

Such monumental change leaves us no choice but to innovate at a faster rate, automate pervasively, and tap into neglected pools of human talent, particularly older workers and minorities. For the foreseeable future, our principal task will be to inspire and educate enough people to ensure that our economy can meet the mounting foreign competition. Letting millions of people fall below their potential is a disaster for the individuals and the nation. We must

design an environment of lifelong learning that fully equips us all to keep pace with the dizzying changes of the marketplace.

Despite modest educational reforms of the last few years, we have not yet restructured our learning system to enable people of all backgrounds and ages to use these new information tools. The coming advances in telecommunications, computational power, and educational software will soon make a type of universal literacy possible.

So much formal education still consists in memorizing data—data that will eventually reside in a data base and be accessible by PC. As we incorporate the computer into our lives as a brain outside our brains, what we can learn and what we need to learn will change. One obvious example of such change is the replacement of the slide rule by the pocket calculator. In the future we may, with the aid of computer simulation, teach the laws of motion to younger students than is possible in the traditional curriculum.

Each state needs to create experimental schools where students have access to their own PCs. In such schools both curriculum and teacher training could be designed to fit the new technology, rather than being an afterthought. Close cooperation would be established with educational research centers to ensure that new ways of learning would be developed and widely shared. Geographically separated, teachers and students could work together via electronic "learning networks," breaking down the walls that segregate contemporary education into specific places and named institutions. Students using word processors might, for example, compose essays at a much earlier age than is now customary—and learn to revise them until they met a standard of excellence. Using a network, these students could also learn to collaborate with others, whether in their own classroom or in another city. One can easily imagine such a model being successfully applied to the fields of mathematics, art, history, and science as well.

This transformation in learning demands leadership in Washington, in the state capitals, and in school districts across the country. Otherwise, it will be impossible for lower-income areas to gain equitable access to this new technology. We cannot afford to squander human talent. If we intend to reach our competitive potential, we must be prepared to train and even to inspire. This requires a major public commitment to those schools and to those areas of our country where educational achievement lags behind the national average.

The personal computer can improve our lives if we as a society learn to exploit its potential. The problem isn't strictly technical; it's also a deep political and educational challenge. The past weighs heavily upon us and inclines our educators and politicians to resist innovation. In today's explosive world, however, we will prosper only as we combine wisdom with technology and continually equip ourselves to fit a profoundly changing world.

The arrival of the personal computer could not have been more opportune; its power to enhance productivity is crucial to our becoming a more efficient and competitive society.

Edmund G. Brown, Jr., now heads the National Committee on Industrial Innovation.

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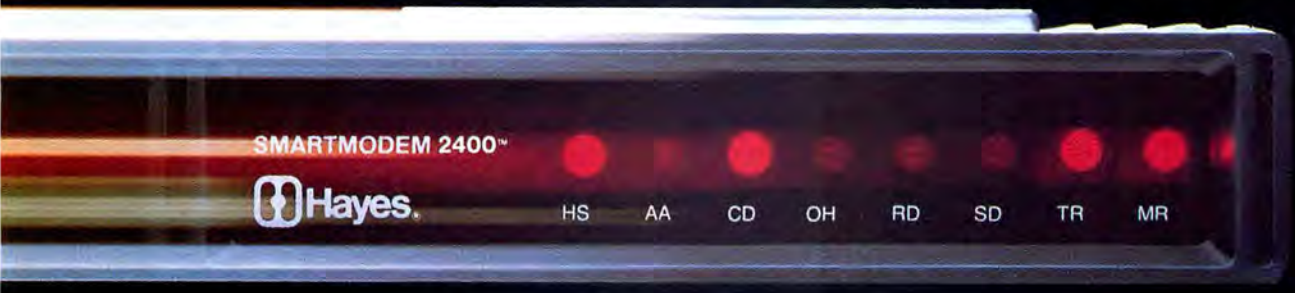

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Circle 815 on reader service card

EXCLUSIVE REPORT

Copying Software: Who's Right?

Do you use unauthorized copies of software? This and other equally straightforward queries about software piracy were sent to PC World readers. Here's what they told us.

Darcy DiNucci

The software industry claims its profits are being plundered by software pirates. These unscrupulous users don't think twice about stealing any program they want–not by slyly lifting it from a dealer's shelf, but by typing COPY *.* b: at the DOS prompt. In a few minutes and for the cost of a floppy disk, they have a software package worth perhaps several hundred dollars.

The war the software industry is waging against these shadowy "pirates" has ranged through myriad copy-protection systems and heated lawsuits. But the question remains: Where's the enemy? A highly publicized survey by the market research firm Future Computing reported that unauthorized copies accounted for 50 percent of the software in use, costing the software industry $1.3 billion in revenues between 1981 and 1984 and threatening an additional $800 million loss in 1985. Other studies and industry analysts, however, have downplayed the phenomenon. No one is sure how much copying goes on or how substantial a threat to the software industry it poses, but the armies continue to clash.

PC World asked a random sample of subscribers what they thought about the issue. Three themes ran through the survey: How widespread is copying? Why do people do it? And how can the issue be resolved?

How pervasive is unauthorized duplication of software? Nearly 60 percent of our sample have used illegal copies.

Why do people do it? For good reasons. They want backups, they want to use programs on their hard disks, they want to test programs before they commit their office budgets–and they don't think any of this is too much to ask. They feel uncomfortable with the software industry's pricing and licensing policies. They *don't* do it just to save money.

How can the issue be resolved? Perhaps it won't be as difficult as software publishers and users fear. The so-called pirates agree with publishers on many

points. They believe they should pay for the programs they use, and they understand the need for copy protection. Yet they are wary about product quality, and they're convinced that any copy-protection scheme can and will be overcome. Primarily, it's the definition of *unauthorized copy* they contest: The uses to which they feel they are entitled have been labeled illegal. Some compromise is in order.

The Respondents

Those who completed the survey constitute a fair representation of *PC World*'s subscribers, but probably not of the population as a whole. Respondents represent a group that is highly influential in shaping the PC's role in business. Thirty-five percent describe their jobs as top management, 11 percent are in management information systems or data processing positions, and most of the rest are dispersed through other professional positions: professional practice (such as law and medicine), analysis, marketing, and engineering. Forty-six percent earn between $35,000 and $65,000 per year. The respondents are preponderantly male (91 percent), and 69 percent are between the ages of 31 and 50.

Sixty-three percent use a personal computer both at home and at work. Eleven percent use a personal computer only at home, and 23 percent use a PC only at work. Sixty-two percent work in large companies (those with more than 100 employees), with 25 percent in companies that employ more than 5000. Fifteen percent represent companies of fewer than 5 employees. Sixty-one percent of the respondents consider themselves advanced computer users.

How Many Copies?

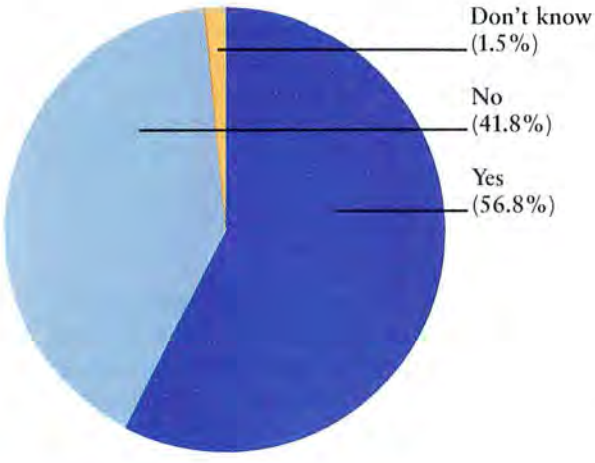
In the survey, "unauthorized" software is defined as "any copy of a program that was made without the approval of the manufacturer," in accordance with the licenses that accompany most software packages. (An excerpt from IBM's license, containing typical terms, is shown in Figure 1.) Fifty-seven percent of survey respondents admit to having used unauthorized copies of software.

The percentages are about the same in large and small companies, but higher for those respondents who consider themselves advanced users and for those who use computers both at home and at work.

Those who have used unauthorized software report that about 27 percent of their business software is unauthorized; they have an average of 8.3 authorized and 2.2 unauthorized programs at work. This does not translate to a 27 percent loss in revenues for software publishers, however; these same users say that if they couldn't have obtained a free copy, they would have bought only one of their two unauthorized programs. Responses are about the same for large and small companies. (See the sidebar "The Corporate Clampdown" for an example of company efforts to stop piracy on the job.)

According to the survey, the home is the main site of unauthorized software duplication and use. Those who have used unauthorized copies of software have an average of about six authorized and five unauthorized copies at home. Members of this contingent say they would have bought approximately 25 percent of those unauthorized programs if they couldn't have copied them. The total amount of software at home is almost equal to that at the workplace.

Only a few respondents (1 percent) don't know whether their software copies are authorized. This suggests that the industry's attempt to educate the public about software protection laws has worked and has perhaps reached the saturation point—at least for the management sector that the respondents represent. People who use unauthorized copies know what they're doing.



Have you ever used unauthorized copies of software?

Multiple Motives

The raw numbers seem to confirm software publishers' fears: A majority of business users possess illegally copied software. Our other results, however, reveal the fuller picture. These "pirates" and their booty are not what the industry imagines.

In seeking the reasons people copy software illegally, we used a two-pronged approach. First, the survey listed several possible explanations and asked those who had used unauthorized software to rank the importance of each. Following the list was space for respondents to name their own reasons. Second, the closing section of the survey form offered all respondents a chance to address the general topic of software piracy.

The simple explanation that it just doesn't make sense to pay for something you can get for free didn't click with respondents; only 10 percent of those who have copied software attribute significant importance to this rationale. The other simple out—it's okay because everyone does it—didn't gain much support either; only 8 percent of those who use unauthorized software subscribe to that explanation.

Nor is it true that people who copy software can't afford to buy the programs they need; most respondents rank this reason as only "somewhat" or "not at all" important. (It is more crucial, of course, to those who earn less than $20,000 than to those with larger incomes.) In support of the low ranking most people give this reason, other survey results show that, except at the extremes, income seems unrelated to whether or not someone copies software.

Demonstrable Need

Easy explanations of copiers' motives, then, won't suffice. Those who have used unauthorized software say they are more than willing to pay for a good product—and often have. But, they explain, they have been burned too often by plunking down several

hundred dollars for a program that didn't fit their needs. They conclude that in the absence of available demonstration software or money-back guarantees, the only way to forestall such costly mistakes is to copy the program. Seventy-two percent of those who have used unauthorized software indicate that not wanting to risk money on a program they'd never used was "important" or "very important" to their decision to copy.

Many respondents say that after a trial, they have often bought a package for its documentation and support. "I have no qualms about a one-time unauthorized use of a software product to test it for my needs and equipment and to verify that it works," avers one respondent. "If it works correctly, is well documented, offers decent customer support, and meets my needs, then I'll buy it. There is a great deal of misrepresented, poorly documented, and poorly written software on the market."

Sixty-three percent rank the opportunity to experiment with new programs as "important" or "very important" to their decision to copy. As one respondent says, "People I know with unauthorized copies are generally like myself–they want to see what it does and how it works. If it's good, they'll attempt to purchase it for the documentation." Quite a few respondents suggest that the availability of demo disks would curtail piracy considerably.

IBM Program License Agreement

YOU SHOULD CAREFULLY READ THE FOLLOWING TERMS AND CONDITIONS BEFORE OPENING THIS PACKAGE. OPENING THIS PACKAGE INDICATES YOUR ACCEPTANCE OF THESE TERMS AND CONDITIONS. IF YOU DO NOT AGREE WITH THEM, YOU SHOULD PROMPTLY RETURN THE PACKAGE UNOPENED AND YOUR MONEY WILL BE REFUNDED.

LICENSE

You may:

a. use the program on a single machine;

b. copy the program into any machine-readable or printed form for backup or modification purposes in support of your use of the program on the single machine (Certain programs, however, may include mechanisms to limit or inhibit copying. They are marked "copy protected.");

c. modify the program and/or merge it into another program for your use on the single machine (Any portion of this program merged into another program will continue to be subject to the terms and conditions of this Agreement.); and,

d. transfer the program and license to another party if the other party agrees to accept the terms and conditions of this Agreement. If you transfer the program, you must at the same time either transfer all copies whether in printed or machine-readable form to the same party or destroy any copies not transferred; this includes all modifications and portions of the program contained or merged into other programs.

You must reproduce and include the copyright notice on any copy, modification or portion merged into another program.

YOU MAY NOT USE, COPY, MODIFY, OR TRANSFER THE PROGRAM, OR ANY COPY, MODIFICATION OR MERGED PORTION, IN WHOLE OR IN PART, EXCEPT AS EXPRESSLY PROVIDED FOR IN THIS LICENSE.

IF YOU TRANSFER POSSESSION OF ANY COPY, MODIFICATION OR MERGED PORTION OF THE PROGRAM TO ANOTHER PARTY, YOUR LICENSE IS AUTOMATICALLY TERMINATED.

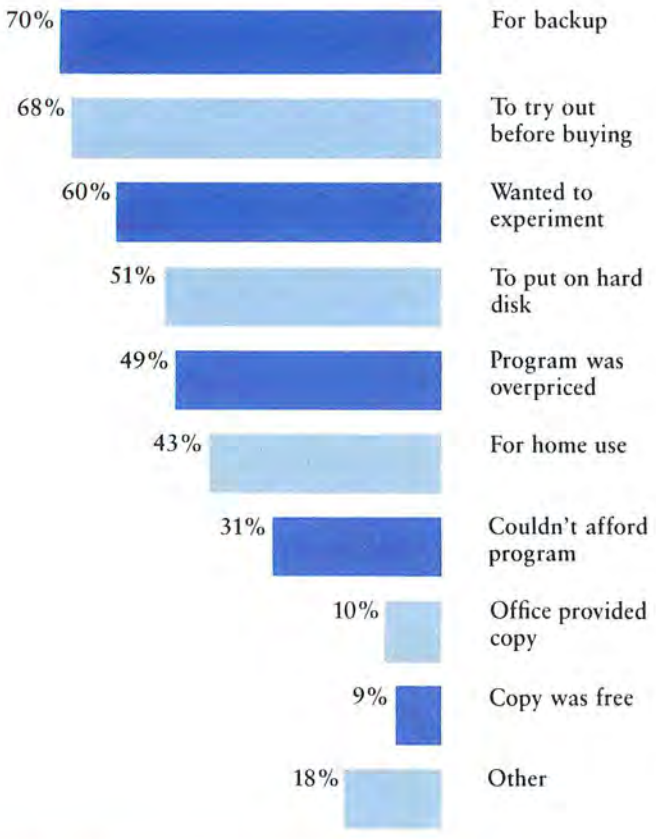
Figure 1: A typical software license, like IBM's standard license, excerpted here, allows the buyer to make copies for use on a single machine only. Transferring a copy to another user automatically terminates the agreement, that is, revokes the buyer's right to use the software. Having two or more copies in use breaks the law. The user accepts the terms of the license by opening the software package.

EXCLUSIVE REPORT

What Price Piracy?

Forty-seven percent of those who have used unauthorized software also indicate that programs' unreasonable prices are "important" or "very important" to their decision to copy, and 64 percent agree that people wouldn't copy programs if software manufacturers charged reasonable prices. Underscoring that sentiment, 65 percent say they have purchased programs they could have obtained for free because they considered the price of the software reasonable. Several respondents state that the software industry has brought the problem on itself by exorbitant pricing. "If manufacturers weren't so greedy when setting prices, fewer unauthorized copies would be made," opines one respondent.

Ashton-Tate president Edward Esber, Jr., sees the problem differently. "I don't think pricing is unfair. We as an industry have failed to convey the value of our software," he told *PC World*. "We price software all in one. There's a little component of upgrades, a little component of training, of customer support, material cost, and profit. We have not priced our software with [the possibility of] copying in mind. One only has to say to people, 'If you think pricing is unfair, here are my financials. Tell me where I'm overspending.'"



Why do you use unauthorized copies of software?*

*based on number of respondents ranking reason as "important" or "very important"

Restricted License

Many of the unauthorized copies reported are simply backups—exceeding the one copy granted by most licenses. One poignant explanation: "I've reformatted the hard disk on my AT six times. If I relied on manufacturers' backup schemes, I wouldn't have any backups left. I use *CopyWrite* [a bit-copying program that specializes in overcoming copy-protection systems] to make all the backups I need." The need for backup copies is cited as an "important" or "very important" reason for copying by 76 percent of those who have used bootleg software.

Others find the licenses' stipulation that purchasers can't use their business software on their home machines objectionable. "It's silly to have to buy a separate copy of a program for home when I could, in all fairness, just stay at the office and use it anyway," one reader comments; another notes, "When I buy a book I can read it anywhere—not only at my desk or at home." And another states, "Having paid for the use of a program, I expect to be able to use that program legally wherever I require. This suggests the need for a change in the definition of 'unauthorized copy.'" Of those who have used unauthorized software, 47 percent call the need for a copy for home use an "important" or "very important" factor in their decision to copy.

The need to transfer programs onto a hard disk is "very important" to 43 percent of those who have used unauthorized software. To do this, they have often had to turn to a bit-copying program to bypass copy protection—a potential licensing violation, but unreasonable? Thirty-five percent (perhaps those without hard disks) rank this motive "not at all important."

(continues on page 134)

The Corporate Clampdown

Kristin Anundsen

"Most people who make copies of software don't realize they're not supposed to. They don't read the license information that comes in the software package. We see this mainly as an education problem," says Robert Proctor, systems analyst at Chevron Corporation in San Francisco.

Nearly half those surveyed in our poll believe their employers are doing a good job of preventing unauthorized software duplication at the office. (Employees of large companies have a higher opinion of their employers' efforts than do employees of smaller firms–54 percent versus 40 percent.) Chevron's education effort is an example of corporate action taken to ensure that employees don't copy software at the workplace.

Chevron's computer services department carries out its "copying awareness" program primarily through a newsletter distributed to everyone who uses a personal computer at work. Every two or three months, the newsletter runs an article that explains the reasons for adhering to copyright laws or a story about a company that has been sued for software copyright infringement. The computer services department also ensures that each personal computer in the company sports a sticker warning about copyright violations.

Proctor says Chevron rarely finds illegal copies of software in its offices. When it does, the company destroys the bootleg copy and offers to buy a copy of the software for the employee. The user is not punished.

"We've never found a case where the copying is a deliberate violation of the copyright laws or our policy of compliance," says Proctor. According to Proctor, an employee generally makes a copy for someone else as a convenience measure, and the illegal copy often turns up when the new user innocently asks for help.

How many copies are made by those who know better than to ask for help is an open question. It is also difficult to tell whether employees take copies home. Proctor assumes that few do.

Proctor understands the limitations of any company's ability to police software use. "As more and more people in the company use personal computers, and as the types of software multiply, the potential for illegal copying increases," he notes. "The answer is to make sure employees know they could get their companies–and themselves–into a lot of trouble if they violate copyright laws."

Does your company need an immediate vehicle for informing employees about software copyright laws? ADAPSO will be glad to provide its "Thou Shalt Not Dupe" brochure, which contains an explanation of the software laws and a sample policy statement. For a free copy, or to order a batch at a nominal charge, contact ADAPSO, 1300 N. 17th St. #300, Arlington, VA 22209, 703/522-5055.

EXCLUSIVE REPORT

Pinstripe Suits

Kristin Anundsen

Piracy doesn't pay—at least that's what software publishers are trying to convince their customers. To get the point across, they're suing alleged copiers for hefty amounts. The spectre of litigation flashes a clear warning to would-be pirates: Flout the copyright laws at your own peril.

That peril could be considerable. Lotus Development collected an undisclosed amount in an out-of-court settlement against Health Group and another in a suit against Mueller for alleged illegal copying of *1-2-3*. MicroPro International was joined by ADAPSO in a $225,000 suit against a subsidiary of American Brands, which was accused of making unauthorized copies of MicroPro's *WordStar, SpellStar,* and *MailMerge.* American Brands settled out of court and published a mea culpa. MicroPro had previously sued two other companies but couldn't collect because those companies went out of business.

The use of software is controlled by copyright and license laws. Software copyrights are protected by the Software Protection Act, which was incorporated into the Federal Copyright Law in 1980. This law stipulates that a user can make only archival copies of a software package.

License agreements, which fall under the purview of state law, generally take the restrictions further. Some prohibit the buyer from making even the archival copies allowed by copyright law, mandating that the buyer must receive backups from the publisher. Generally, licenses also specify that the buyer is entitled to use the program on one machine only.

Software license law is a murky area. The controversy centers around what is known as the shrink-wrap license. When you buy PC software, the license is usually packed just under the plastic wrapping. A large sticker on the outside ordinarily proclaims that when you break the seal to extract your purchase, you have agreed to the terms of the license. Many legal experts feel that this kind of "agreement" is not legally enforceable because the buyer has nothing to say about the terms and often can't read them prior to purchase. Negotiated licenses, which are signed by both buyer and vendor, are regarded as legally more substantial.

The legal weight of software licenses will probably remain unsettled for some time. Law depends on precedent, established by a history of cases fought in the courts. So far, no precedent has been set; defendants have settled out of court.

Lindsay Kiang, legal counsel for Lotus Development, is confident that the law will back software publishers when the shrink-wrap license finally has its day in court. "We're not looking for a test case," he says. "It's fairly clear to me that shrink-wrap licenses are valid and legally enforceable."

Software developers are trying to solidify their legal ground by persuading state legislatures to introduce software license protection bills. Louisiana's Software License Enforcement

Act, which declares the lawfulness of the standard licenses, is the prototype for a bill introduced in the Arizona and California legislatures. Outcry from computer consultants and consumers, however, has delayed action on the proposed legislation. For Vault Corporation, maker of the Prolok copy-protection scheme, the Louisiana law is apparently enough. Earlier this year, Vault filed a $100 million civil suit in that state against Quaid Software, publisher of *Copywrite,* a bit-copying program.

If your company learns that it's being sued for copyright infringement, you can be sure it's in trouble already. A software manufacturer isn't likely to go after a corporate customer unless the manufacturer has already amassed volumes of evidence—litigation is expensive for plaintiff as well as defendant. And the plaintiff need only show that the defendant has made more than the archival copies allowed under copyright law.

How do software pulishers determine that a firm is making illegal copies? Perhaps a conscience-stricken or disgruntled former employee reports it. "I get about five calls a week reporting unauthorized copying," says E. Ric Giardina, MicroPro's legal counsel. Other tip-offs could be technical support requests from several people giving the same code number, or employees ordering upgrades and unwittingly sending in old disks that turn out to be unauthorized copies. Software companies seeking to verify suspicions have been known to inquire of photocopy centers in the vicinity of the suspected lawbreaker whether large numbers of a particular manual have recently been reproduced.

Statutory damages (those provided for by statute) can be as high as $50,000 for "each willful infringement." Alternatively, the plaintiff can demand compensatory damages to offset financial losses suffered as a result of piracy, or recover from the defendant any profits made through use of the pirated materals.

Thus far, legal struggles over unauthorized copying have been confined to the corporate realm. Says Lotus's Kiang, "We have a range of responses, depending on the extent of the problem. We've sued large corporations that tolerate or encourage copying. If [the copying] isn't blatant or organized, we often handle the matter through correspondence."

What about home users who make a few extra copies of *dBASE II* or *1-2-3* for their personal use or to share with a friend? That's just as illegal, but chances are they'll get away with it. It's simply not worth it for software firms to go after the little guy.

"We don't want to sue a lot of people," Kiang says. Lotus hopes to stop known copiers through letters and legal action. For the rest, the company is counting on the publicity the big cases generate to get the word out: Copying is illegal, and it will not be tolerated.

Thanks to Jordan Breslow and Thorne D. Harris III for legal help.

EXCLUSIVE REPORT

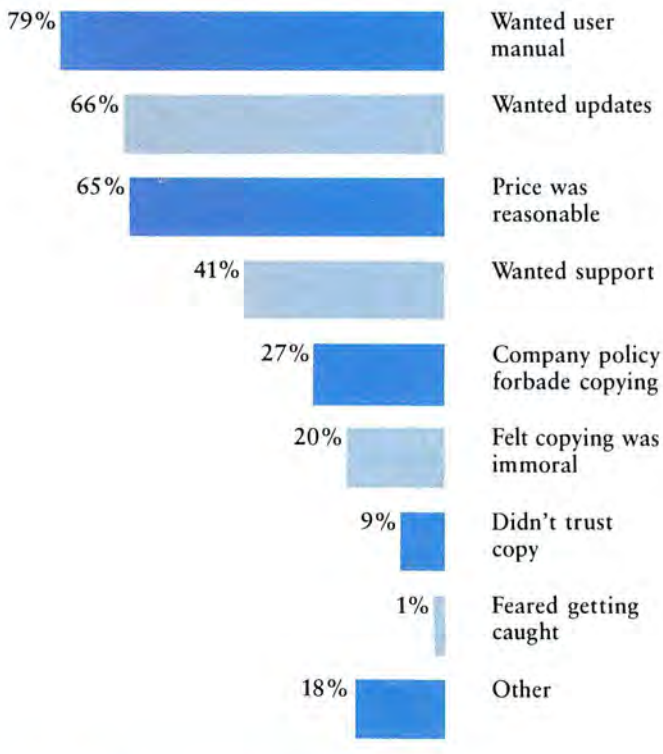
Piracy Redefined

PC World's definition of "unauthorized software" as "any copy not authorized by the manufacturer" is strict. When respondents say they have one authorized and three unauthorized software copies, they could mean the original copy, which they use, and three backups. Some respondents worry that they'll be considered pirates for making such copies, although they feel they are acting scrupulously to protect the manufacturers' rights; they emphasize that they always buy their main working copy of a program. One respondent states, "At no time is an 'unauthorized' copy being used at the same time as an authorized [one]."

The users' good faith is most strikingly demonstrated by one statistic: 80 percent of those who have used pirated software have at least once purchased software that they could have obtained free. The reasons underlying such behavior may be illuminating to the software industry.

One respondent puts it succinctly: "I buy because of what is offered with the purchase–support and small, neat manuals." Seventy-nine percent of those who have used unauthorized programs decided to buy software rather than copy it because they wanted the documentation. Sixty-six percent say the need for updates contributed to the decision to buy, and 41 percent cite the need for service and support.

Less tangible forces motivate others. Twenty-seven percent say their company's policy against copying holds them back. Twenty percent are kept from copying by their feeling that it is wrong. Only about 1 percent do not make copies because they worry about what would happen if they were caught.



Why have you purchased software when you could have copied it?

Copy Protection

The narrowness of the gap between users' and publishers' attitudes becomes even more striking when you consider the respondents' views on copy protection. This issue has been a major bone of contention for software publishers and consumers. Consumers have denounced every technical means publishers have used to prevent copying of their disks; the schemes simply interfere with use of the product. But 57 percent of the respondents believe that software should be protected and that manufacturers cannot allow random copying. Forty-eight percent of respondents dismiss the idea that copy protection is not needed because most people don't make copies (but 26 percent hold to that theory).

Publishers take note: 69 percent of those who have used unauthorized software say they would have no objection to any software-protection scheme that didn't interfere with their own use of the program, but 43 percent have at some point decided not to buy software because it was copy protected. Asked what specific copy-protection schemes would stop them from purchasing a program, 62 percent veto a hardware lock, and 48 percent blackball the Prolok-type "fingerprint" scheme that requires that the original "key" disk be present in the system each time the program is run. Twenty-eight percent find uncopyable disks unacceptable even with a backup provided.

Only 13 percent object to a Superlok-like scheme, which permits the user a certain number of installed copies. The so-called "worm," which causes a program to self-destruct if its code is tampered with, would keep 83 percent of the respondents from buying the program. (See the sidebar "How You Gonna Stop Me?" for an overview of schemes in use.)

Only 10 percent of the group say none of the common copy-protection systems the survey names would discourage them from buying a program. Contrast this figure with the 69 percent who theoretically support transparent copy protection, and you see the problem. One respondent fumes, "I am furious with Ashton-Tate for screwing up *dBASE III* [with its copy-protection scheme]–it won't work with my PC-compatible's hard disk. Naturally, I purchased a $40 device to permanently install [the program] on a hard disk."

Fifty-seven percent of respondents believe that software should be protected and that manufacturers cannot allow random copying.

Of the unauthorized copies in use, more than half (57 percent) are of copy-protected programs. Those who call themselves advanced users have copied no more protected programs than users in other categories. Those who use computers only at home, however, have duplicated many more copy-protected programs than any other group (an average of about 9 programs as opposed to the general average of about 4). These results support the popular belief (held by 77 percent of the respondents) that trying to protect software is fruitless because someone will always figure out how to overcome any protection scheme.

For our sample, bit-copying programs such as *Copy II PC* constitute the most popular method of bypassing copy protection; 68 percent of those who have used copies of protected programs have taken that route around the bar at least once. Fifteen percent have defeated a protection scheme via their own programming, and 11 percent have obtained a bypass method through a club, user group, or bulletin board. Thirty-three percent don't know how the copy protection was broken; they obtained the program after the copy protection had been removed.

Market Impact

Does piracy have a stranglehold on the software industry? Software publishers plead that the industry depends on innovation, and nobody's going to work his or her heart out on a new product if that labor won't be rewarded. They maintain that pirates are robbing themselves; without the lure of profit to spur programmers, software R&D will dry up. Although 51 percent of survey respondents agree with that theory, their sympathy does not seem to hinder copying. One skeptical respondent comments, "The incredible profusion of PC software demonstrates that pirating does not suppress software development."

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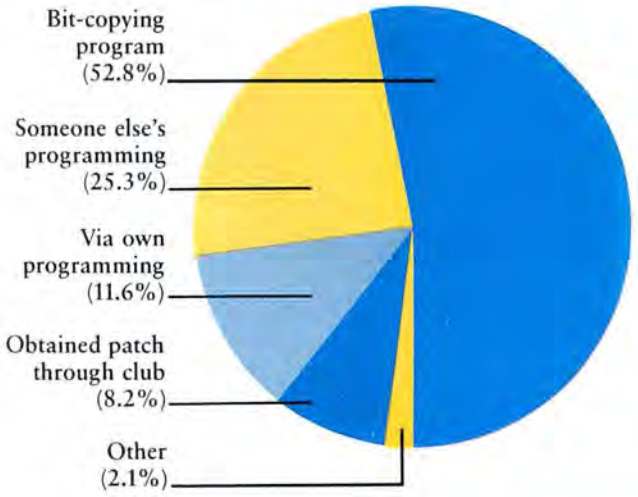


How have you bypassed copy protection?

EXCLUSIVE REPORT

How You Gonna Stop Me?

Kristin Anundsen

A *Microsoft Project* user was startled recently by a message that appeared on his display while he was using the Norton Disk Look utility with the program:

INTERNAL SECURITY
VIOLATION
The tree of evil bears bitter fruit,
crime does not pay.
THE SHADOW KNOWS
⋮
Trashing Program Disk

This, he concluded angrily, was a hidden "worm," a snare laid by the manufacturer to prevent unauthorized duplication by destroying the program disk–along with whatever data it contained–when anyone attempted to make an illegal copy. He'd heard about worms, but his company had decided not to buy any software that contained them. This one, however, seemed to have sneaked past the defenses.

As it happens, the message was only a scare–the product of a programmer's devious sense of humor. The worm did not exist, and his program disk remained intact. In fact, the rumored copy-protection worm seems to be apocryphal. Vault Corporation, a leading purveyor of copy-protection systems, reportedly once began developing a worm, but dropped the project when word reached the press and software consumers responded with outrage.

Mother Jones' Son's Software uses a more lighthearted, though pointed, approach. Appended to the license for its software is the warning, "30 days after you violate this agreement, ownership of your eternal soul passes to us." Some vendors claim that this warning is about as effective as any other method in use.

Software manufacturers have tried virtually every means imaginable to stop users from copying software. The worm scare and the wry threat are unusual approaches, but indicative of the attention software publishers are giving the issue. Copy-protection methods usually use hardware, software, or a combination of the two to prevent disk copying. The goal is to deter piracy without interfering with authorized use. Thus far, no scheme has been completely successful on either count.

Vault Corporation's Prolok is one of the most widely used copy-protection systems. Prolok consists of a physical "fingerprint" stamped on disks the company sells to software publishers. (Other similar schemes, including Vault's Unilok product, use magnetic marks.) The software checks for the fingerprint each time the program is run; if the user has copied the program to a different disk, the program will not execute. You can make any number of backup copies, but to use the program, the code must be copied back onto the

original disk. If you use *1-2-3* you are familiar with the effect of this method (*1-2-3* uses Filelok, a related Vault product.)

Softguard Systems' Superlok represents another common approach. Superlok counts the number of copies made from each disk. You can make only as many backup copies of a Superloked disk as the vendor specifies–three is a typical limit. You can install the program onto a hard disk or other floppies and then "un-install" copies back to the original disk to set the copy meter back. Ashton-Tate's products, including *dBASE III* and *Framework,* and the original release of *WordStar 2000* use this method.

Each of these systems sounds reasonable, likely to bother only those who are foiled in their attempts to copy the software illegally. But these techniques–and almost every other approach tried–have proven to be thorns in the sides of all users. Owners of hard disk systems have complained about Prolok's requirement that the original floppy disk be inserted each time the program is run, denying the user the convenience of loading the program from the hard disk. To answer this complaint, Vault now offers a version for hard disk use that resembles the Superlok scheme.

The Superlok system is fairly unobtrusive but still creates a problem by allowing only limited backup copies. Users have also had trouble using the system on non-IBM hard disks, although Softguard has reported progress on that front.

Two years ago, in an effort to find a secure and usable copy-protection system, ADAPSO–whose members include such industry powerhouses as Ashton-Tate and Lotus–created a clearinghouse to solicit and disseminate ideas for the ideal copy-protection device. This year, the organization proposed a copy-protection standard.

ADAPSO's proposal is a hardware/software team called a lock and key; the system is similar to others already on the market, such as the Metafile system from Metafile Information Systems. Although the ins and outs of implementation haven't been established as of this writing, the concept is fairly clear. The *key* is a device that plugs into a hardware *key ring,* which the user connects to the computer's serial port. The key ring's pass-through connection allows other peripherals, such as modems or printers, to connect to the same port. (ADAPSO expects that computer manufacturers will eventually build a key ring into their machines.) The *lock* is code, embedded in an application, that must connect with the key before the protected program can run. You can make unlimited copies of the disk, but the program won't run on any computer that doesn't have the key in the key ring.

(continues)

EXCLUSIVE REPORT

The system's proponents cite a number of advantages: the scheme could be used on any computer that has a serial port (which most do); vendors could relax their "no return" policies, knowing that the user couldn't have made extra copies of the disk without obtaining extra keys; and the lock and key could control the number of copies of a program used under a site license.

The Microcomputer Managers Association, a New York group whose membership includes PC managers from 500 companies, has protested the ADAPSO system loudly. The group claims that it would be too difficult for large organizations to administer distribution of keys. The organization also points out that not every computer has a serial port to hold the key ring. Joe Diodati of Softguard Systems adds, "Once you establish a standard, you give the copy busters a target they all can shoot at."

The question is not settled; despite ADAPSO's advocacy, software manufacturers–even those that belong to ADAPSO–are far from reaching consensus on the ideal copy-protection scheme, and consumers complain about all the methods. Ultimately, as long as people delight in the challenge of overcoming software security systems, it's unlikely that any copy-protection system will work. The technical battle between software manufacturers and consumers seems likely to drag on.

Some industry analysts suggest that software copiers might actually exist symbiotically with the software industry. They point out that illegal copying greatly increases a product's market penetration and name recognition. *WordStar*'s long and successful life has often been attributed to this effect–and the program's preeminence has crowded many others out of the field. To test this theory, we asked respondents possessing unauthorized software whether they have ever recommended a favorite bootleg program to a friend. Eighty percent say they have. One respondent supports the symbiosis theory with this comment: "I use unauthorized copies at home only to familiarize myself with the program. Based on this knowledge, I purchase the software for work. This only benefits the software company, since I am learning and recommending software that I would otherwise not have tried."

PC World's survey suggests that the industry doesn't have much to worry about from piracy. Those who copy are hardly the dastardly outlaws the industry alleges. They will, generally, pay for what they use. One reader offers a reasonable suggestion: "Offer a free test period using a copy-protected version. Upon purchase, sign a license agreement indicating no copies will be made with an unprotected version."

Send software into the world with no protection? Why not? Not only does protection seem unnecessary, it has thus far proved of little value. Although ADAPSO (Association of Data Processing Service Organizations) and individual members like Lotus Development are still erecting bulwarks, others have already laid down their arms. Almost daily, headlines in industry journals announce the conversion of another software publisher–MicroPro, Samna, Microrim, Borland–to the ranks of the unprotected. Each PR department hauls out the same lingo: "In the interest of our customers' needs, we have dropped copy protection."

As an alternative, several companies are announcing site-licensing plans, in which software publishers negotiate licenses with individual companies,

often offering price concessions for large purchases. Such licenses free the purchaser (and seller) from monitoring adherence to individual licenses for each software copy (see the sidebar "License to Copy").

Meanwhile, incorporation of personal computers into the data management superstructures of business, combined with the increasing use of PCs in local area networks, will inevitably bring about more broadly defined policies, generally in the form of site licenses. The refusal of many to buy copy-protected products and the outcry for site licenses has already had an effect.

Results support the popular belief that trying to protect software is fruitless because someone will always figure out how to overcome any protection scheme.

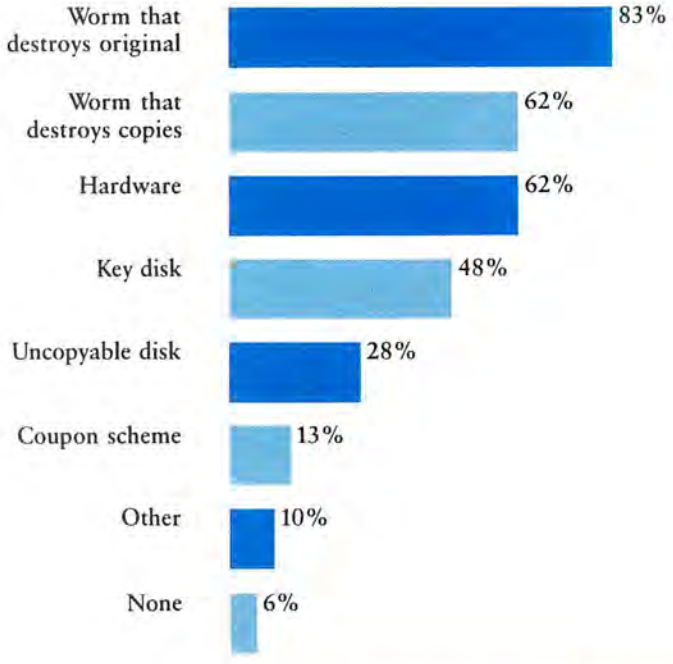
Even the stickiest issue–software prices–may be slouching toward resolution. Prices are dropping, especially under site license plans, though whether the industry and users will ever agree on what constitutes a fair price for business software is an open question. A delicate, if incalculable, balance appears to exist between pricing and the urge to copy. Observes one respondent, "Borland International [manufacturer of Turbo Pascal and *SideKick*] has shown that good products, fairly priced, can succeed in the market"–with or without copy protection.

Is there any way to end software piracy completely? Probably not. In the end, software publishers, like the record and videotape manufacturers before them, may just have to accept the eventuality that when the technology is available, people will copy their products; it's unlikely that an air-tight copy-protection scheme can ever be devised. But the self-confessed copiers represented in the survey are generally a scrupulous lot. They're more than willing to play by the rules–if they consider the rules fair. They're not asking much, and their cries are almost unanimous: reliable demonstration disks or money-back policies, the rights to make unlimited backups and to use their software on all their PCs, and no copy protection to gum up the works. One respondent, comparing the software industry to other publishers, points out, "Copyrights provide some protection, but low cost and quality provide effective protection."

"You copy?" The phrase is Cape Canaveral lingo for "You understand?" For today's PC user, "You copy?" is a symbol of misunderstanding. It's not so much a question as an unpleasant reality, a consequence of the software industry's perceived failure to play fair. *PC World*'s survey conveys user frustration, but that sentiment is balanced by a degree of empathy and a desire to meet the industry halfway in resolving the thorny matter of software piracy.

Darcy DiNucci is Assistant Editor for PC World.

(For the sidebar "License to Copy," please turn page.)



Which copy-protection plans would stop you from buying programs that used them?

EXCLUSIVE REPORT

License to Copy

Kristin Anundsen

What's a software manufacturer to do? Suing a customer for copyright infringement isn't the best way to cement a vendor-user relationship. But what if the only alternatives are either to saddle all your customers with unwieldy copy-protection devices or to let yourself be robbed by pirates?

What's a DP manager to do? It's hard enough to ensure that the possibly hundreds of PC users under your purview obtain the software they need. It's almost impossible to make sure they don't copy it for somebody else.

A number of vendors and corporate users have devised a solution. It's site licensing–standard operating procedure for mainframe software and, many corporations are finding, an increasingly attractive strategy for large PC installations. The standard shrink-wrap licenses and prices for PC software were intended for individual users and are ill-suited to the corporate environment. As one respondent to our survey pointed out, "I don't want to pay full price for multiple copies of software within a business site. I don't need multiple copies of the documentation."

In a traditional site license agreement, a user pays a lump sum for the right to use a particular software package throughout a given site, but PC site licenses are as varied as the customers themselves. Even the definition of *site* is elusive; it may mean one building, a local area network, or a multinational corporation with all its subsidiaries.

Almost any type of agreement between user organization and vendor that bypasses the standard shrink-wrap license has been termed a site license. Some site licenses are simply agreements to discount the purchase of multiple copies of a program. At the other extreme are software firms that allow the buyer to make unlimited copies throughout a site after payment of a flat fee. Most site licenses, however, allow the user to make or use a specified number of copies for a certain fee. Licenses vary in amount of documentation, upgrades, and support provided. Some licenses go so far as to authorize employees to duplicate software for use at home–for an added fee.

One of the most liberal site license plans is that offered by Select Information Systems, a division of Summa Technologies. Select charges $7000 for the right to make unlimited copies of its *Freestyle* word processing program and documentation for on-site use. For $2800 more, it allows a licensed company's employees to make copies for personal use. A year of technical support costs another $1000. Select's package is a good deal for many organizations, since the $7000 fee is equivalent to the purchase price of only 25 copies of the

program. The Multimate Corporation, on the other hand, expects to control the number of copies in use. Its site license price schedule establishes fees based on how many copies are in use.

Site licensing offers users two major benefits. Under a flat-fee, unlimited-copy plan, users can stop worrying about legal liabilities arising from copyright infringement. They also generally receive substantial discounts—the cost is often 50 to 80 percent less than for individual purchases of the software. Organizations such as universities, with many workstations and limited ability to monitor software use, are good candidates for site licensing.

Software manufacturers also win. They too avoid lawsuits. They receive large advance payments. Sales volumes go up, sometimes dramatically, and the licensing arrangement encourages companies to standardize on one software package. Under site licenses that allow users to make copies, manufacturers avoid the costs of floppy disk and documentation duplication, as well as the expense and bother of shipping, billing, and inventory. And the clear-cut, mutually-agreed-upon license is a relief to all concerned.

PC site licensing was pioneered by small companies trying to gain a foothold in the market by meeting a consumer demand that larger companies could afford to ignore. As user demand for site licenses grows, even the market leaders are starting to jump on the bandwagon. MicroPro and Multimate now offer site licenses for their popular word processing programs, but some manufacturers—most notably and resolutely Lotus Development—are still holding out.

Although some vendors feel that site licensing makes piracy irrelevant, others point out that customers who obtain site licenses are still responsible for making sure the software stays on site, and that, where applicable, it's used on only the specified number of workstations—a difficult task without copy protection or another security system.

Customers have a few reservations as well. Some complain about having to pay for duplication and documentation, and a few feel that they may receive inferior service as "second-class" customers who have paid in advance and no longer need to be courted. Calculating the net benefits can be complicated.

Although clearly no panacea, PC site licensing appears to have a bright future. If users want something, competitive pressures usually dictate that they'll get it.

Kristin Anundsen is a freelance writer based in San Francisco.

Cautious Capital

Venture capital funded start-ups have been the rage in America's silicon valleys, gulches, and glens since the PC was born. As the personal computer industry matures, entrepreneurs are putting their money where they believe the brightest new markets are.

Jane Ferguson

Malthus could have predicted the ugly scene that followed the high-tech frenzy of 1981-83, when an estimated 1200 companies came screaming into the world with venture capitalists as their midwives. He would have nodded wisely as one after another was savaged in the personal computer shakeout that decimated firms such as Osborne and Ovation and left unscathed only the strongest, such as Lotus and Compaq.

What went wrong? Everything seemed to be in place: Investors were eager to cash in on the next high-tech success story, venture capitalists were awash in backing and actively sought out investments, and people and companies with promising ideas were plentiful. What was lacking was a demand for products. The massive amount of capital that was showered on start-ups temporarily waived the law of supply and demand but couldn't repeal it permanently.

"The natural market predators were at bay," says David Gold, a San Jose, California, consultant to venture capitalists. "Any little seed got to survive." Came the cruel dawn of 1984, and many of those seeds succumbed. "The natural predators are back," Gold says, and the hardest hit were the hundreds of "me-too" companies, those whose products, whether personal computers or word processors, were undistinguished from the surrounding offerings.

Mirroring the growing pains of the industry as a whole, the U.S. venture capital pool expanded from $12.2 billion in 1983 to $16 billion last year, according to the authoritative *Venture Capital Journal*, a publication based in Wellesley Hills, Massachusetts. But new money in 1984 amounted to $3.2 billion, a slight dip from 1983's $3.4 billion and the first slide since 1977.

Proceeding With Caution

No one disputes that venture capitalists have been watching the weeding-out process in horror. The question is whether they are taking their $16 billion bundle and fleeing the personal computer field altogether for greener pastures. Surprisingly, most aren't.

These days, it is much harder for a start-up company to get money from more cautious and selective venture capitalists, but millions of dollars are still being doled out to those companies that

Entrepreneur, heal thyself: "The reason to go public is to fund growth already demonstrated by demand." –Floyd Kvamme of Kleiner, Perkins, Caulfield & Byers

avoid saturated markets and focus on fresh market niches. The glut of personal computers, disk drives, word processors, and integrated software packages has made these products steadily less appealing to investors. What has caught the backers' attention is job-specific (or vertical market) business software and hardware, artificial intelligence, and data communications–fields that allow start-ups to avoid butting heads with the entrenched leaders of the personal computer industry.

Carving Out a Niche

One such venture-capital-fed success is Optionware Inc. of Bloomfield, Connecticut.

Ian Boyd, Optionware's president, figures that it costs $5 million to bring a new piece of software to market these days, much of which is gobbled up by the advertising and marketing expenditures needed to be heard above the competitive roar. Boyd began scouting around for venture money in February 1984, after surviving without it for two and a half years on $1.6 million he had himself provided with help from a bank. It took him a year to get another $3 million.

Optionware's line of templates works with Lotus Development's *1-2-3*, and hence is aimed at *1-2-3*'s 750,000 users. Boyd predicts they'll turn to his products so they won't have to develop specific program applications themselves.

Although many venture capitalists liked what he was doing, Boyd says they had a hands-off attitude toward the software industry. "The whole venture process took an enormous amount of time," Boyd says. "It's a problem for a young company. You have to go the venture capital route to survive and thrive." The very search for money robs the company of the precious time it needs to devote to getting its products on the market as quickly as possible. "The top executive team is stretched to its limits," says Boyd, adding that the quest for venture capital cannot be delegated. In other words, you have to showcase your best players in the bid for bucks.

Hitting the road in February 1984, Boyd says that by March he had received a $1 million offer but "stupidly" turned it down because

he didn't think it was enough. He hadn't considered that he could get money from more than one venturer, a strategy he employed in August 1984, when a total of $1.2 million came through from Aetna Life & Casualty and Technology Translations, both of Hartford, Connecticut. Those two firms followed through with another $1.8 million last January.

Boyd still retains controlling interest in his firm, which he says wouldn't have been the case had he depended on venture dollars from the start. It's not unusual for a firm's owners to lose as much as 95 percent control of their firm when taking on venture capital.

What sold the venture backers on Optionware was Boyd's pitch that his firm is the first mass-market developer and publisher of business software that analyzes everything from department budgets and market share to personal income tax and sales quotas. To back his claim, Boyd began with 56 distinct software packages priced at $99 each, along with a management team that included a former vice president from Pepsico and other corporate heavyweights familiar with mass marketing.

Up With Vertical Markets

Vertical market software also rang the bell for Venture Founders of Waltham, Massachusetts, when it decided to back Softbridge Microsystems of neighboring Cambridge. But unlike Optionware's mass market approach, Softbridge is targeting its $4500 vertical market product at financial planners who serve clients with annual incomes of $100,000 and up.

The *Softbridge Financial Planner* wraps *1-2-3*, *MultiMate*, and Relational Database System's *Informix* data manager into an integrated package along with the Softbridge financial planning programs. "I see this as the next wave of computer software," says Joseph Frye, a general partner in Venture Founders, the lead investor in Softbridge, and one of several investors to pump an additional $3 million into the start-up in second-round financing last December. "Our product is not a blank sheet. It's already thoughtfully designed to do 90 percent of the job. [Its users] are thinkers, not programmers," Frye adds. The financial planning package is just the first of what Softbridge hopes will be a lengthy skein of offerings aimed at specific professional markets.

Hardware Heroics

Software firms aren't the only ones on the receiving end of venture capital in a tight market, although their lower overhead certainly makes them more attractive candidates. One well-heeled hardware start-up is Zaisan, which bills itself as the first company to enhance a PC-compatible personal computer with a telephone for simultaneous voice and data communications. The ES.3 Professional Workstation retails for $2595, and the company also makes a dumb terminal.

Since February 1984, Zaisan has managed to attract a whopping $21 million in venture capital, making it one of the top venture-funded firms in the United States. Mark Fowler, president of the Houston-based company, actually had to turn down investors. The huge amounts of capital necessary to start production forced Fowler to give up majority ownership and spread shares among a host of investors, including Burr, Egan, and Deleage of Boston; L.F. Rothschild of New York; Hambrecht & Quist of San Francisco; and the Mayfield Fund of Menlo Park, California.

But with all that cash can come trouble, particularly if the key ingredients–timing, management, and product–don't coalesce. While Compaq Computer, Zaisan's Houston neighbor, parlayed its venture dowry into profitability and market penetration, Zaisan has been struggling to stay afloat. The company experienced a round of layoffs, then mulled over soliciting yet another round of venture financing. Officials attribute the turnabout to an overestimation of demand.

"There are pockets of opportunity in and around the data communications industry," says Mayfield Fund's Norman Fogelsong. In addition to companies like Zaisan that make integrated voice-data computer systems, Mayfield has put its money behind manufacturers of satellite communications systems, high-speed multiplexers, test equipment for fiber optics, and teleconferencing systems. Mayfield is also a major backer of 3Com's EtherSeries local area network (LAN). With no clear industry standard, the LAN field is wide open but exceptionally risky. Where and how the dust settles around industry heavyweights IBM and AT&T may determine the de facto standards that govern success for network players of all sizes. "The sur-

vivors will be those who mesh with the ultimate industry standards," Fogelsong notes.

A Graphic Example

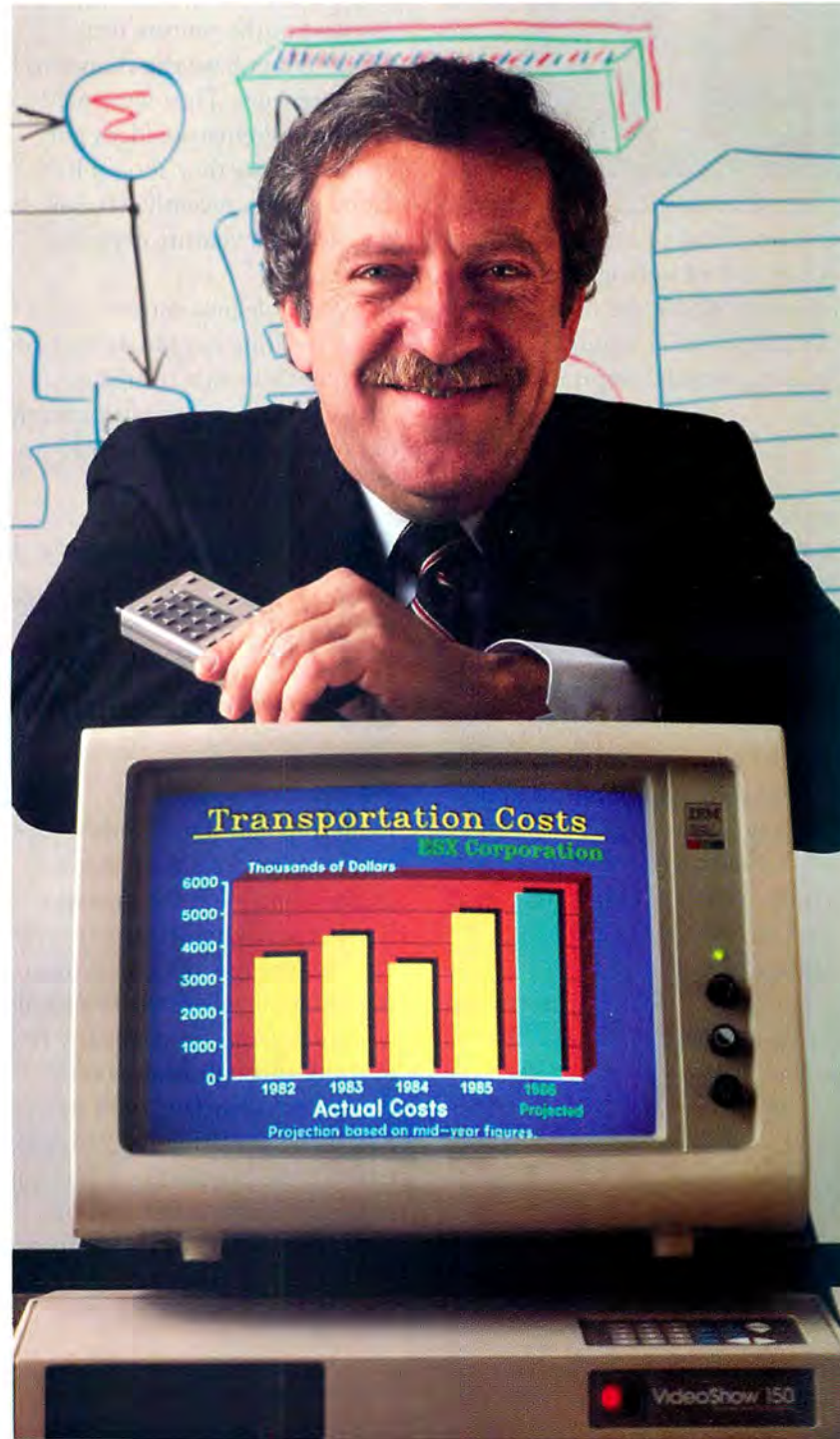
Top-rated investment firms Sevin Rosen Management Company of Dallas and Kleiner, Perkins, Caulfield & Byers of San Francisco made fortunes as lead investors in Lotus Development and Compaq. In February 1984, they turned their attention to General Parametrics of Berkeley, California, whose VideoShow 150 business graphics presentation system remains one of a kind. "They sought me out," says Herb Baskin, president of the hardware and software company he established in 1981. "I never had an interest in venture capital–it found me. We keep our eye on developing excellent products, not on developing capital."

Baskin won't say how much he received–he reportedly started the company with $100,000 of his own money and $500,000 from friends–but he loves to expound on General Parametrics' product line. The company's $595 software package, *PictureIt*, helps executives create high-quality color business graphics that are stored on disk. The disks are inserted into the $3500 VideoShow 150 unit, a portable, briefcase-size system that displays the graphics and comes equipped with video outlets so the presentation can be videotaped with voice-over as it is being given. Other accoutrements include a $2999 video image recorder to produce instant slides and a $699 program called *PrintMaker* that produces on-the-spot hard copy for handouts (see "Show Business," *PCW*, June 1985).

Product before profit: "We keep our eye on developing excellent products, not on developing capital." –Herb Baskin, creator of the VideoShow

Lessons Learned

What can be learned from a hardware company that attracted venture capital even in the dark days of 1984? Baskin bristles at the suggestion that venture capitalists masterminded the very high-tech craze that sealed the doom of so many companies in the personal computer industry. He claims all the hullabaloo over venture capitalist responsibility for the excesses of 1983–and today's wariness–arises from victimized companies that weren't much good anyway.



Conspicuous success: "I don't owe anything to anybody. Part of the risk of management is not knowing where the next dollar is coming from." –Sandra Kurtzig, budding venture capitalist

"The public has to take responsibility for its actions," says Baskin. Venture capitalists, who make their money putting the young companies they finance on the public block, were simply developing supply to meet investors' demands. Observes Baskin, "Say I have an old Ford worth $500. The Ford becomes a hot model and everyone wants to give me $2000 for it. I sell the piece of junk for $2000. Who's at fault? Did I push it on anyone? No. I just took advantage of the situation."

Baskin describes as "hysterical" the new-issues market of 1983 when investors stood ten deep to buy shares of the latest high-tech company at inflated prices–and then got burned when the stock hit the skids. "People are the wiser for it now," he says. "There's been a restoration of a more orderly market."

Too Much, Too Soon?

Meanwhile, Sandra Kurtzig, whose decade-old Ask Computer Systems is one of Silicon Valley's most conspicuous successes, believes some entrepreneurs got the raw end of the venture deal. "They didn't have the chance to be entrepreneurs. They were paid start-ups. Premature ideas got funded before they should have." Kurtzig, who recently left Ask, has dabbled as a venture capitalist herself.

Kurtzig defines entrepreneurs as people willing to take the risk of starting their own company. When a venture capitalist encourages a manager of a company to jump ship and start another venture–and pays a salary that is greater than what the manager had been making–there's no risk. "Part of the risk of management is not knowing where the next dollar is coming from, so you really have to think through what you're doing," says Kurtzig, who started Ask on a shoestring in 1974 and, without the benefit of venture capital, built it into a $65 million company. "I didn't owe anything to anybody. I didn't have the experience to know what to do with money if I had it. I made every mistake possible."

Kurtzig, however, extols the virtues of venture capital and says if she were to do it again, she'd get venture backing and thus start on a faster track. Still, she acknowledges the traps. In the fervor of 1983, some venture capitalists were bringing their seedlings to market at a scorching pace–sometimes within two years, instead of the routine seven to ten. "Managers never had the opportunity to struggle together through thick and thin," she says. Ask had that opportunity. Kurtzig's company was almost seven years old when it went public in 1981, giving her the time to learn from mistakes. Would Ask be as successful today if it had had a cushion of venture capital to fall back on? "Probably not," Kurtzig concludes.

Kurtzig believes some entrepreneurs got the raw end of the venture deal. 'They didn't have the chance to be entrepreneurs. They were paid start-ups.'

Time Is Money

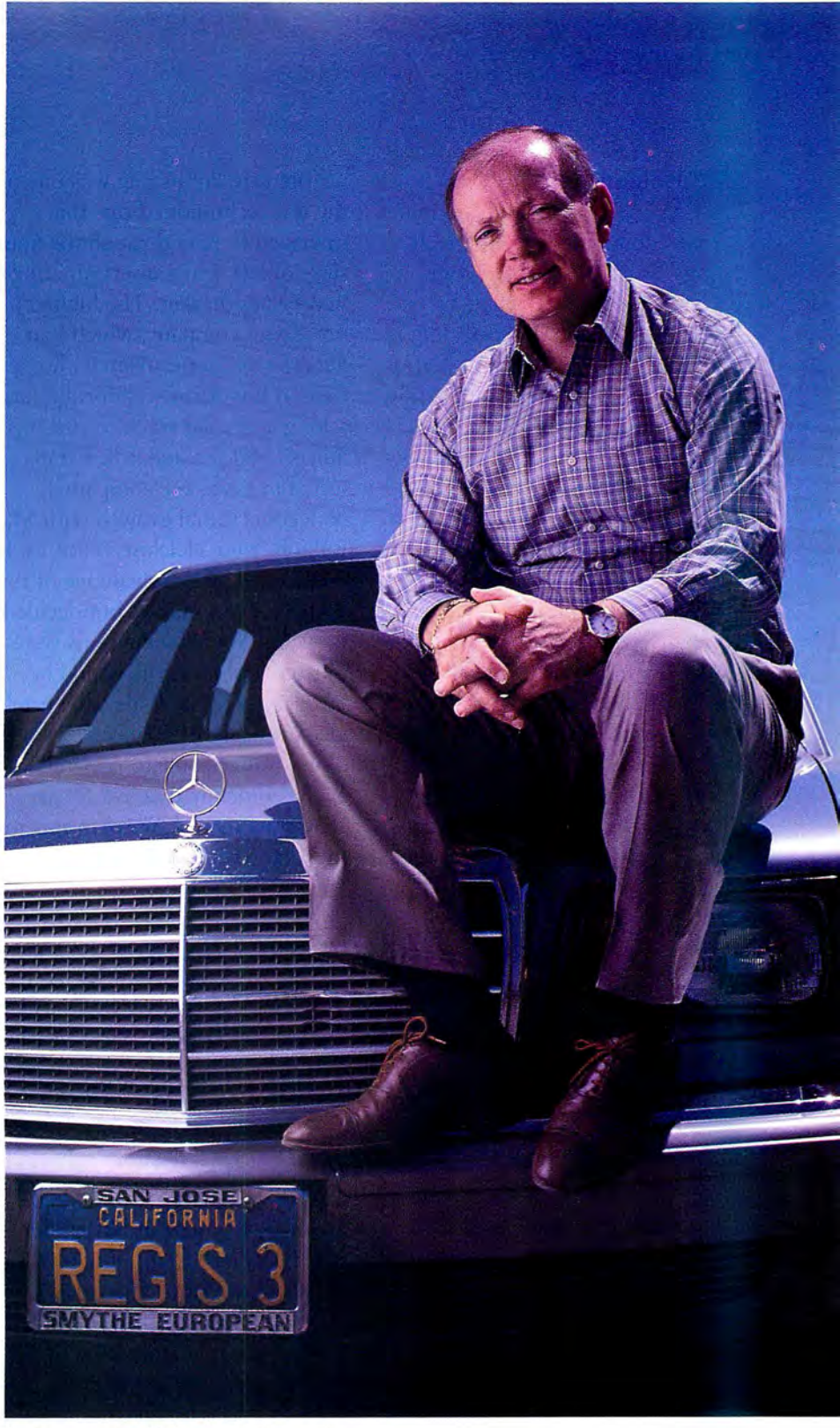
Times have changed, proclaims Regis McKenna. His prominent firm, Regis McKenna Public Relations of Palo Alto, California, caters to hot high-tech companies. "We don't have the luxury of waiting five years to grow a company," says McKenna, noting that most

products have only six months to get out the door before they're either killed by look-alikes or outdated. Firms have to mature rapidly to avoid being swallowed by larger companies on the prowl for technology.

In today's market, McKenna says, a start-up needs $5 million in seed capital, and another $25 million in second- and third-round financing. Then it's time to make, for instance, $100 million in the public market to support volume production. Despite the cynical contention that venture capitalists watch the market with greedy eyes and jump in when they can cut the best deal, McKenna claims public offerings are made "to get the company to a size where it won't fail, not to make individuals rich."

Floyd Kvamme, a partner with Kleiner, Perkins, Caulfield & Byers and a former Apple Computer executive, says some companies are ready to make a public offering in two years, while others never are. "The reason to go public is to fund growth already demonstrated by demand in the marketplace," he suggests. He allows that venture capitalists contributed to the industry shakeout by propping up poor performers even when it became apparent they would never stand on their own. That applies with particular force to the hordes of disk drive start-ups and most of the PC-compatibles manufacturers.

Kvamme thinks it's too simplistic to point the finger at venture capitalists for the abundance of high-tech failures. The entrepreneurs themselves and the investment bankers underwriting public offerings also figure in the picture. "There are lot of feet in that fire," he observes.



Riding high: "We don't have the luxury of waiting five years to grow a company." –Regis McKenna, CEO of Regis McKenna Public Relations

Going Public

In 1983, the new issues market was dominated by high technology firms. Nearly 900 companies went public, raising a record $12.95 billion, according to Norman Fosback, editor of *New Issues*, a Florida-based publication covering initial public offerings. It wasn't uncommon for a company with no earnings history to offer stock at $22 a share and get mounds of cash from a technology-hungry public. In some cases, stock sold for 40 times a company's earnings, reflecting pie-in-the-sky expectations. And venture capitalists, who typically cash out in public offerings, were making a killing.

The only place left to go was down. As the casualty list of technology companies grew, investor ardor cooled. Venture capitalists began spending their time and money nursing the wounded in their portfolios rather than funding new ventures. By 1984 the ranks had thinned considerably. Only 15 percent of 1984's 531 new issues were high-technology firms. And their single-digit price-to-earnings ratios and moderate offerings—in the $7-per-share range—mirrored the caution on Wall Street. The $4 billion raised in 1984 only highlighted the excesses of 1983.

Software Publishing was one of the few technology firms that managed to pass through the fine sieve of last year's discriminating new-issues market. The highly successful company, which markets the *pfs:* series from its home base in Los Altos, California, has a long and solid track record by Silicon Valley standards. Established in 1979, the company financed its initial growth with $1.2 million from Melchor Ventures. It could have taken advantage of the buoyant 1983 market but decided to wait. "We felt valuations were inflated and investors would be hurt," says Kathy Bailey, the firm's vice president of finance. "We didn't want people to remember us as the company that lost 50 percent of its money. We're in this for the long term." Software Publishing made its move in November 1984, netting $10 million on a $7-per-share offering. The stock climbed to $16.50 three months later.

General Parametrics' Herb Baskin expects to take his company public later this year. Along with some financial analysts, he believes the market will have relaxed its stiff attitude toward technology issues by then, and prices won't be as lean as in 1984.

'Venture capitalists are being worked very hard now,' cleaning up 'messy situations' in their portfolios, Frye says. 'There's no scarcity of venture capital, but there is a scarcity of time.'

Meanwhile, some venture capitalists remain undeterred by the shakeout. Many continue to look for opportunities in the computer field, according to Joseph Frye of Venture Founders, who insists the slowdown doesn't mean they've switched to biotechnology or bacon bits. "Venture capitalists are being worked very hard now," cleaning up "messy situations" in their portfolios, Frye says. "There's no scarcity of venture capital, but there is a scarcity of time."

A Taxing Proposition

Capital gains tax rates may determine the future of high-tech venture capital. The industry received a huge boost in 1978 when the rate was cut to 28 percent from 49 percent, and again in 1981 when it dropped to 20 percent. If the engines of entrepreneurship had been humming, they then began to roar. The Reagan administration's current proposal to drop the rate to 17.5 percent would signal another boost for venture capitalists.

While the tax law hangs in the balance, discriminating financiers still are aggressively seeking out first-rate companies with new ideas, says Baskin. Investments are being made more cautiously, with an eye toward products that meet demands in a market that is no longer booming. The only venture capitalists in full retreat are those who didn't choose carefully during the high-tech binge.

Jane Ferguson is a stringer for Time *magazine and a frequent contributor to* PC World.

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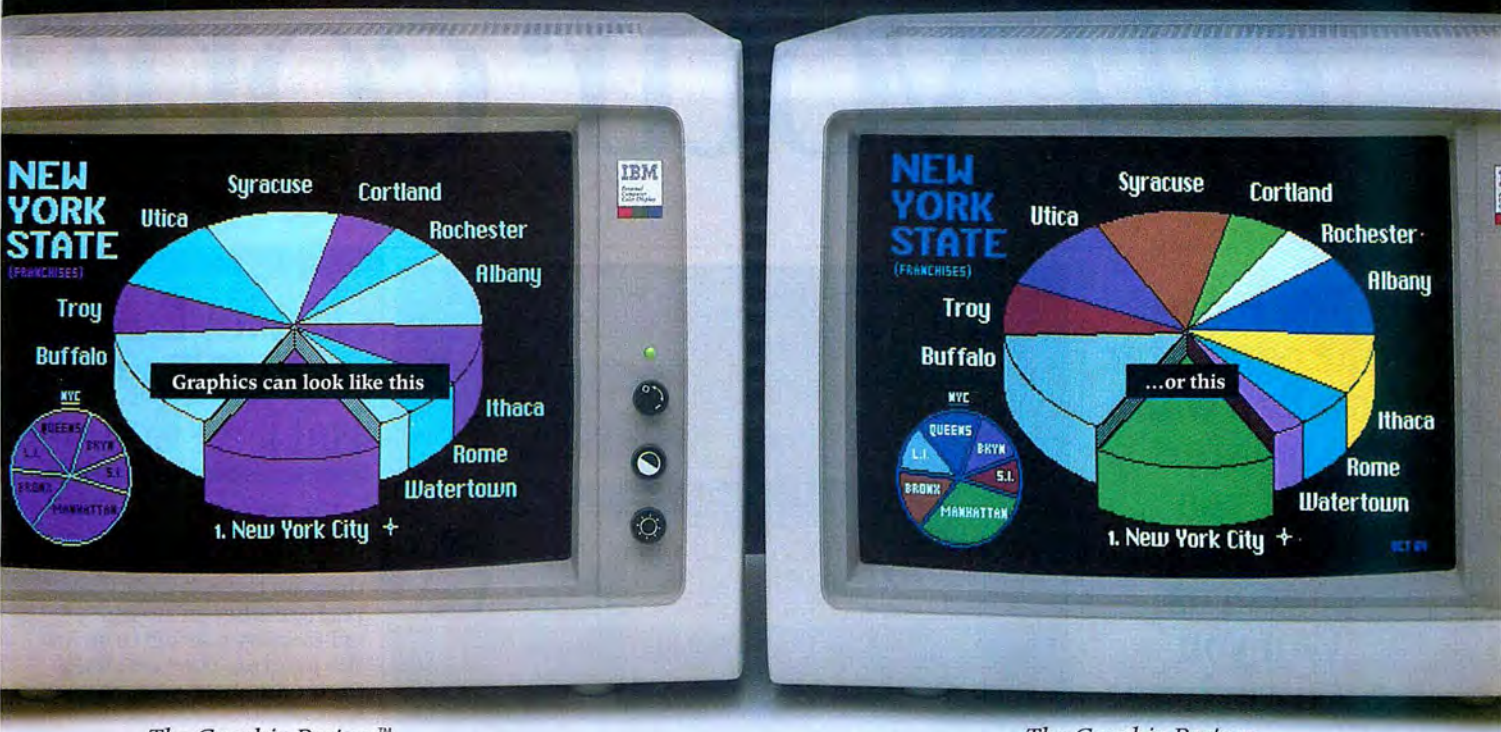

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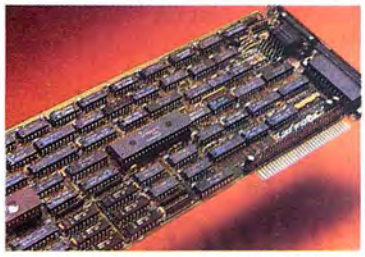

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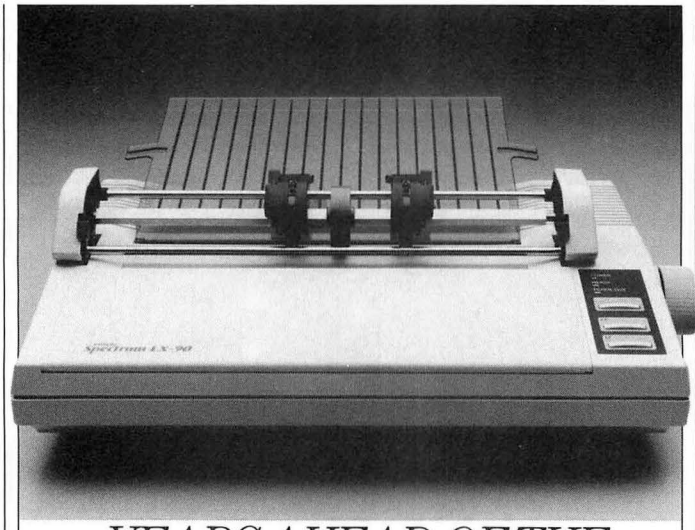

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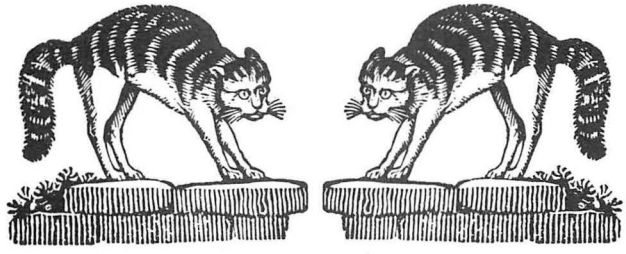

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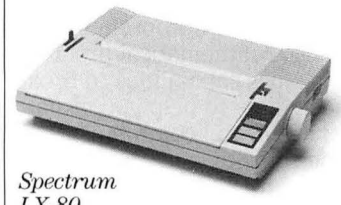

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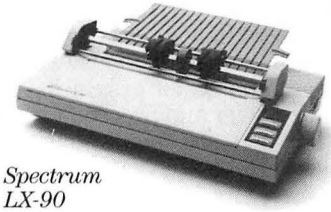

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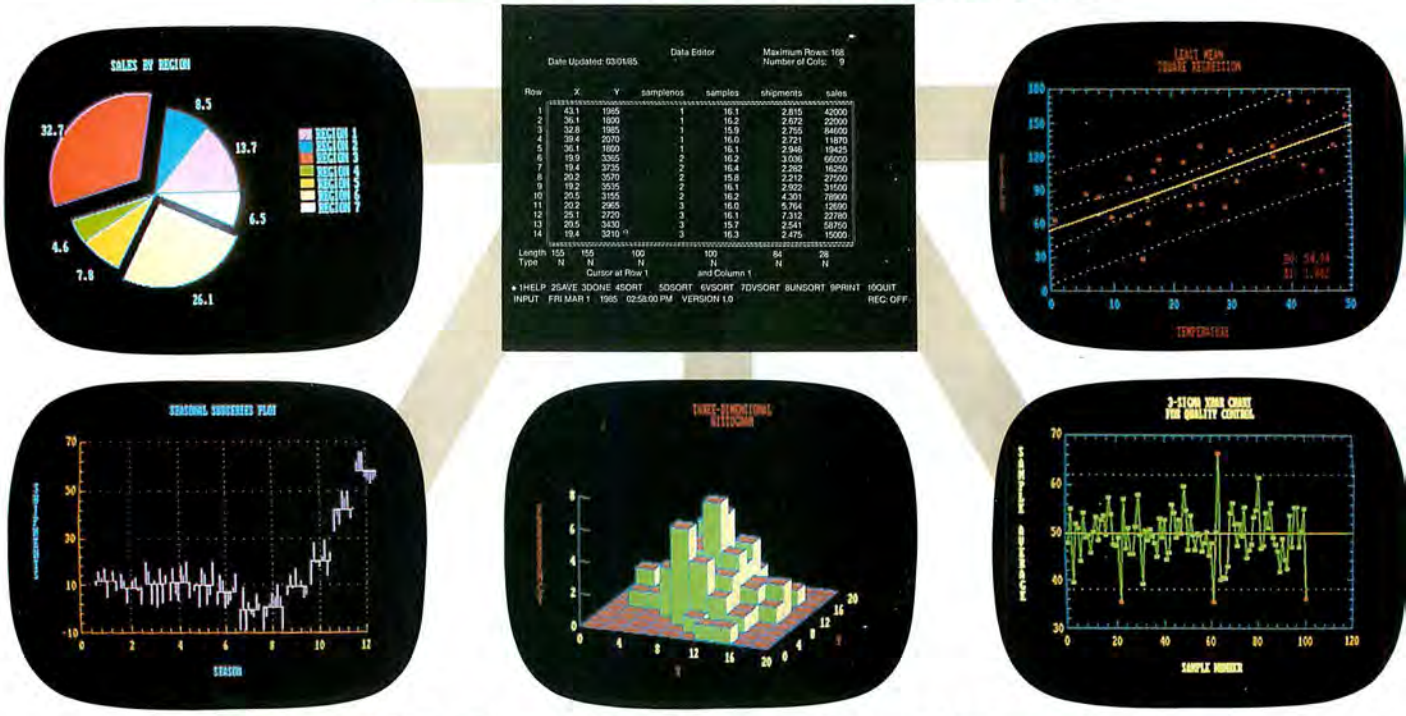

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STATGRAPHICS operates on IBM PC's and compatibles under DOS, Version 2.0 or later. A minimum of 384K RAM, a graphics adapter and compatible monitor, and two double-sided disk drives or a hard disk are required. An 8087 math coprocessor and 512K RAM are recommended.

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Circle 16 on reader service card

BEFORE YOU GET ON THE WRONG TRACK, READ THIS ABOUT THE ONLY ROM-BOOTABLE, PLUG-COMPATIBLE, XENIX SUPPORTING, HEAD-CRASH PROTECTED, HIGH-PERFORMANCE HARD DISK UPGRADE KIT FOR YOUR IBM PC-AT.

Rotary Voice Coil (RVC)
R/W head positioner
Fast and Accurate

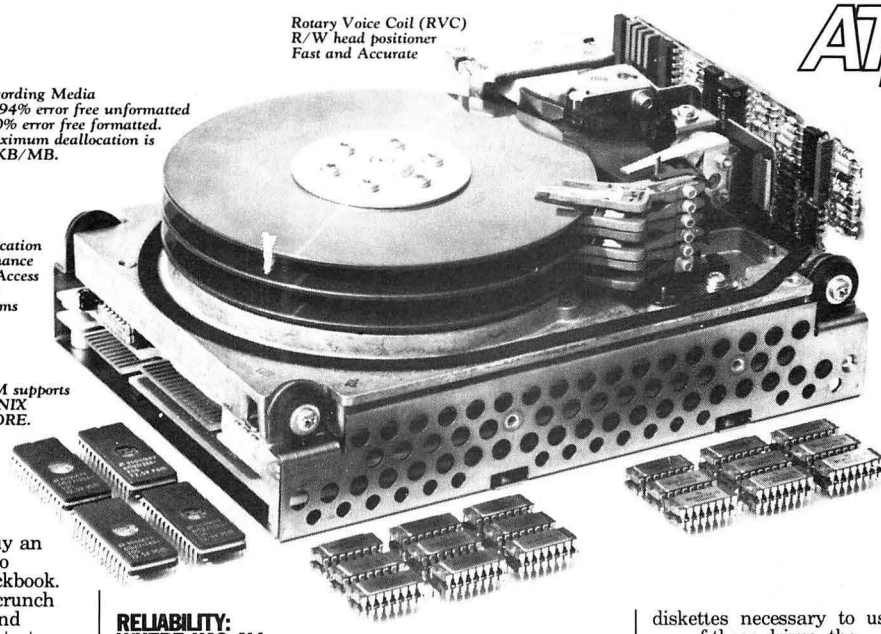
ATplus T.M.

ATplus drives are are manufactured for CORE by CONTROL DATA

Full one year warranty. Service available worldwide.

(drive shown with cover removed)

Recording Media
99.94% error free unformatted
100% error free formatted.
Maximum deallocation is 10KB/MB.



Up to 30% faster than IBM's drive. Exceeds IBM specification for AT high-performance hard disk. Average Access 20 & 30 MB: 39ms 40, 56, 72 MB: 28 ms

Automatic Park & Lock (AP&L) Senses power interrupt, retracts heads to safe landing-zone. Heads never land on data, virtually eliminating risk of data loss.

Bootable ROM supports DOS and XENIX Only from CORE.

Memory option. 18 - 128 Kilobit (150ns) D-RAM chip set. Adds 256 KB to PC-AT basic model making 512KB PC-AT. With an ATplus drive, you can build the PC-AT IBM should have built in the first place.

THE BALANCING ACT OF 1985.

You didn't buy an IBM PC-AT just to balance your checkbook. You bought it to crunch lots of numbers and words, in the shortest possible time. A labor saver. A time saver. Hence, a money saver.

So, do your part for effective money management; hard disk storage is no place to be penny-wise and pound foolish.

TELL 'EM YOU NEED HIGH SPEED AND DATA PROTECTION.

These and other important features do add cost, but that makes a premium drive.

Anything that can be made, can be made cheaper, sell for less, offer lower performance, and probably die young.

Remember, usually you get what you pay for, and you ALWAYS get what you don't.

ALL HARD DISKS ARE NOT CREATED EQUAL.

There are vast differences in the speed and reliability of Winchester hard disks. Since the IBM PC-AT is an incredibly fast machine, a slow drive can make an AT run like an XT.

So, before you get stuck with a slow drive in your AT, save your boss two grand and buy an XT.

Or better yet, buy the AT and avoid any drive with Access Times over 40 milliseconds.

RELIABILITY: WHERE HAS ALL THE DATA GONE?

Now tell 'em the drive must have a data protection scheme. One that's easy to use and reliable.

Winchester heads read and write while "flying" a few microns above the data surface. If the heads contact the recording media, you risk a head crash, and significant or total data loss.

So, even a fast drive without data protection is virtually worthless. Frankly, we'd rather sleep at night.

BEWARE OF USER-DEPENDENT PROTECTION SCHEMES.

Some drives have a safe landing zone for the heads, but you need to call a separate program to send 'em there. If you don't call that program, and most folks won't, the heads in these drives ALWAYS land on data when powered down.

The slightest bump or vibration can move the heads, wiping out those data tracks. And the R/W heads can become contaminated, thus increasing the error rate, slowing down average access until the whole drive fails.

Consequently, those drives offer a very high risk of head crashes, a false sense of security, and little else.

What's your data worth? $200? $400? Specify AUTOMATIC data protection. ATplus has it. And it doesn't cost, it pays.

PEACE OF MIND.

Specify AUTOMATIC park and lock of the heads on power down.

This system provides unparalleled head crash protection, by sensing power loss to the drive, and retracting the heads to a dedicated landing zone before they can land on your data.

Since this is 100% automatic, user-dependent risk is eliminated.

OUR DRIVES HAVE ALL BEEN TO BOOT CAMP.

Avoid drives that CLAIM PC-AT compatibility but can't BOOT the AT. By the time you juggle the diskettes necessary to use one of those drives, the phrase "user-hostile" will have deep personal significance.

We believe that computers ought to serve people, not the other way around.

BEWARE OF THE BARGAIN BAND-SCHLEPPER.

Avoid drives with inexpensive Band-Stepper positioner technology. These were pretty good way back in 1980, considering that's all anyone had. But by today's standards, they're inaccurate and very mechanical.

They waste time looking for the right track to read or write. And they're worth no where near the price you'll pay for 'em –in more ways than one.

THE HIGH TECH SOLUTION.

Specify state-of-the-art ROTARY VOICE COIL (RVC) head positioner and CLOSED LOOP SERVO technologies.

This system uses a DEDICATED SERVO SURFACE (DSS) for continuous head location information.

The RVC and DSS use a large scale microprocessor to translate new track-seek commands into current that is applied directly to the RVC.

This moves and holds the R/W heads at the exact track intended.

Speed is dramatically increased since head movement is created electronically, with minimal mechanical interfacing.

BESIDES BEING THE SOLE SOURCE.

Specify names you know and can trust. Like Control Data Corporation, a world leader in hard disk technology. And CORE INTERNATIONAL, a growth company with over ten years in computer technology, design and manufacturing.

ATPLUS: IDEAL FOR THE SPECS MANIAC.

ATplus High Performance Hard Disk Upgrade kits, available in 20, 30, 40, 56, and 72 MB capacities.

They have ALL the above features and none of the shortcomings of "bargain" drives.

And your AT will accept any two ATplus drives, for up to 144MB of bootable, reliable, DOS and XENIX supporting high-performance on-line storage, all inside the box.

TELL YOUR DEALER...

That only ATplus Hard Disk Upgrade Kits from CORE will do.

If he or she doesn't have 'em, we'll gladly set them up as ATplus authorized dealers.

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Circle 322 on reader service card

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ERROR-FREE SPREADSHEETS. EVERY TIME.

▶The most powerful spreadsheet checking tool you can buy.
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This simple error-trapping utility displays and prints out the formulas **behind** your spreadsheets – lets you check and verify figures, totals and projections quickly and easily.

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▶Macro Analysis added.
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▶Sorry, Sideways.™
Our new easy-to-use Sideprint utility lets you print your spreadsheets sideways – without print files or gluelines.

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This new report gives you a birds-eye view of your worksheet. The contents of each cell are represented by a single character, so errors can be easily spotted by observing changes or breaks in recurring patterns.

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The Auditor costs just $149. And that's a small price to pay for spreadsheets you **know** you can count on.

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8 Powerful New Features

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FOR SPREADSHEETS YOU CAN COUNT ON

The Personal Connection

A leading journalist and computer sage extols the potential of the machine to bring businesses—and people—together.

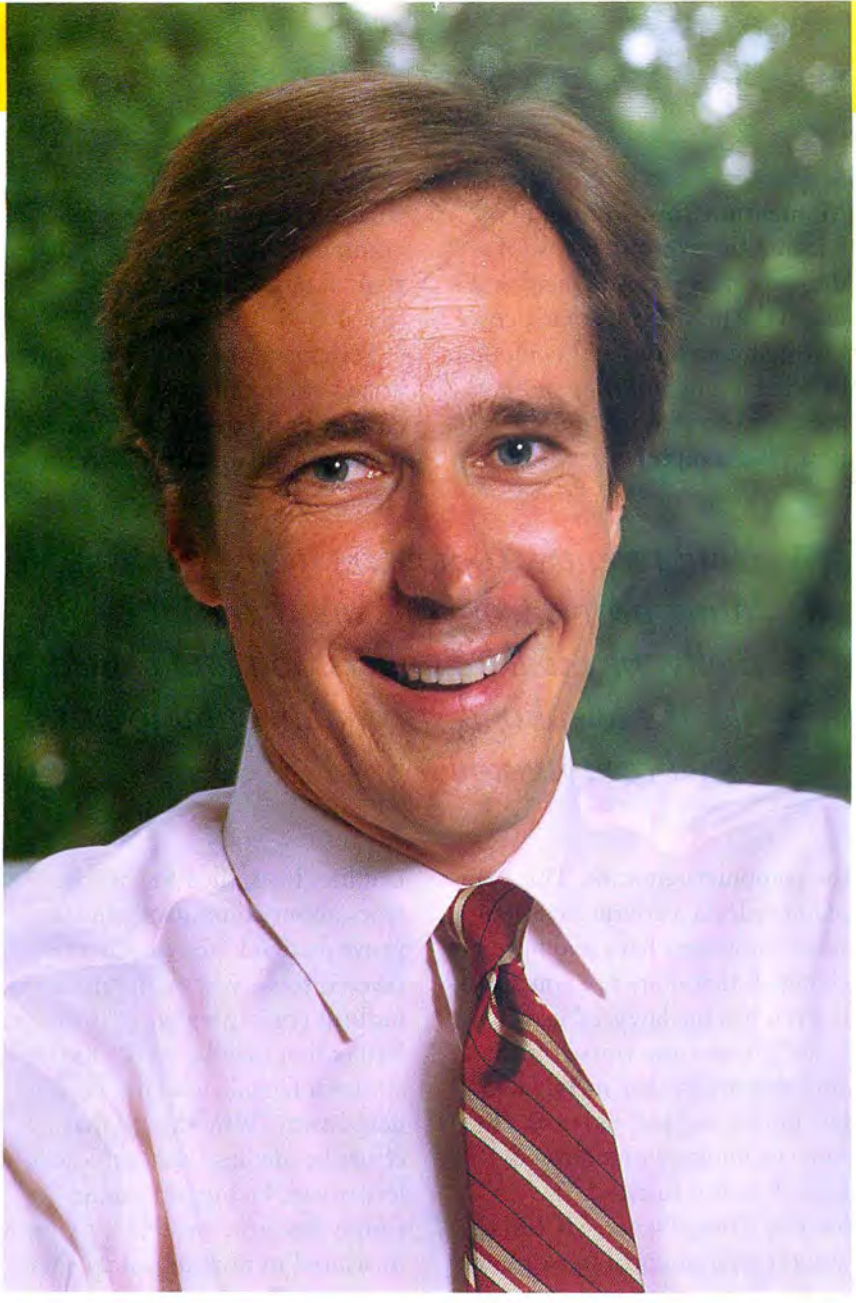
James Fallows

Within the memory even of computer greenhorns, the symbolism of the industry has undergone one enormous change. Starting in the late 1940s, when the first hulking, room-size computers were being assembled and George Orwell was foreshadowing the nightmare of the computerized totalitarian state, computers were seen as the ultimate instruments of oppression and control. Computers would launch nuclear wars, by accident or on their own initiative. They would store forever every indication of our socially deviant traits. When Norman Mailer wrote *The Armies of the Night*, about the 1967 protests against the Vietnam War, he used the computer as a shorthand for everything that was brutalizing and impersonal. He did not need to explain the reference; his readers could be expected to understand.

Voting for Autonomy

But within the last five years computers have come to carry precisely the opposite connotation: Far from being instruments of oppression, they have become a major force for independence, diversity, decentralized control. The change did not follow from such cuddly commercial imagery as Apple pioneered; the crucial factor was that information that had once been the monopoly of data processing departments and government agencies could suddenly be obtained and used on thousands of desks.

So powerful is the new identification of computers with democratization that columnist John Evan Bremner, among others, has suggested that the gravest threat to the Soviet police state's survival is not the Star Wars initiative, or the Islamic-separatist movement, or the farm crisis in the Ukraine, but rather the emergence of the computer. The Soviet Union cannot afford to forgo the benefits of the era's dominant machine; but it also cannot afford the uncontrolled spread of information that



computers would permit. How much more rapidly would the samizdat circulate when passed not by hand but across a computer network?

The significant change in the computer's image, from oppressive to liberating, was fostered by the falling prices that made computers widely available and by the communications networks that enabled information to flow. The continued spread of communications systems—modems, data banks, electronic-mail networks—will, I believe, soon be responsible for a second fundamental change in the computer's connotation. Until recently, computers were seen as isolating people from one another. But eventually these machines will be understood and valued, like the telephone, as basic tools of social communion.

Social Significance

During the early years of the personal computer revolution, when operating systems were churlish and few useful programs could be found, mastering a computer meant developing a passion; and like chess and other noncarnal passions, understanding and using a computer were largely solitary pursuits. Other people might physically be present, across the chessboard or at the computer club, but the excitement and drama were internal, independent of human company.

With the rise of communications systems, computers should become less interesting in themselves, as objects for endless tampering (often called programming), and more important as vehicles for what human beings have always most valued: establishing contact with others. Again like the telephone, computers seem certain to change our patterns of communication without changing our nature.

Some practical-minded, businesslike changes in communications are already upon us. I now take it for granted that when I have written an article, I will be able to send it through my modem to friends in Texas, Massachusetts, and Washington state and receive their comments within an hour. My sense of awe is rekindled only with difficulty. I could not rouse it even when I stood by a pay phone at a U-Tote-Em in Lubbock, Texas, and sent from my portable computer an article to someone sitting in an office that overlooked Times Square. Ten years ago overnight courier services seemed revolutionary. The sales projections you worked up this afternoon in Boston could be on your Dallas manager's desk by noon the next day! Now the couriers are being forced into a freight-handler's role, since businesses with communications systems can transfer sales projections, internal reports, and financial data from coast to coast in seconds, and call on the couriers only for items too bulky to travel through a modem. Law firms can instantly pull citations from Lexis; financial analysts can follow an entire industry's performance via Nexis; other businesses as well have come to rely on the countless high-priced data bases now available.

Momentum Toward Equality

Because the exorbitant cost of these services restricts their benefits to the privileged, some people fear that data bases and computers in general will open yet another gap between the rich and the poor, the computer-literate and the computer-ignorant. This complaint reflects a confusion about what computers have and have not changed. If you are not yourself a lawyer, has the lawyers' use of Lexis left you any worse off than you were when they merely had law books and you did not? The same technology that created Lexis has also fostered The Source, CompuServe, MCI Mail, and the thousands of free or low-cost bulletin boards through which students, retirees, and, yes, lawyers, can share information with one another.

Like the coming of the telephone, these networks create a new means of communication, one that should make society more, not less, equal. Not everyone can afford a Centrex system, but because so many people can afford telephones, and will be able to afford computers, the ability to communicate is more fairly shared than at any other moment in history.

Perhaps in turning to computerized communications, we may further drain the juice of human contact from an already arid social life. If so, then the atavistic fears about computers' effects may prove justified. Yet we have long revered those who maintain a faithful correspondence, through letters that may be weeks in transit, with friends who live continents away. Why should that effort be any less honorable—any less warm, loving, or human—simply because the delivery time is measured in minutes rather than months?

Until recently, computers were seen as isolating people from one another. But eventually they will be understood and valued, like the telephone, as fundamental tools of social communion.

James Fallows is the Washington Editor of the Atlantic. *His book* Human Capital *will be published in early 1986 by Random House.*

TAPE IT EASY.

Boy, are you in for a surprise. You know you need mass storage. And you know you need some kind of backup.

But what you don't know is that making a backup from your hard disk can take the patience of a saint. And tax the memory of an elephant.

Unless, of course, you have a little TLC. The new TrimLine Combo from Corvus. You get mass storage (20 Mbytes). The incredible speed and efficiency of a hard disk. And an integral tape backup.

But there the similarity between a Corvus and anything else ends.

First of all, your TLC fits in beautifully. Between your IBM PC's monitor and base. No bulky boxes. And no clumsy cables and wires to trip over.

Next, you get the world's easiest tape backup system. If you like using command lines, fine. The TLC will accommodate you. But if you're more interested in simplicity, just use one of the TLC's menus. And one of your fingers.

You can back up the entire disk. All your data for the day. A group of selected files. Or just one single file. As a matter of fact, you can back up whatever you want. Which will save you quite a bit of time and aggravation.

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Scared? Don't be. Just tape it easy. Check out the TrimLine Combo from Corvus.

In addition to all the features, it's one of the lowest-priced tape backup systems you can find.

For more information and the name of your nearest Corvus TLC dealer, call (800-4-CORVUS).

CORVUS

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Circle 49 on reader service card

Reflex: Analysis With Finesse

Analytica has come up with an unconventional approach to data analysis, inspired by both 1-2-3 and the Macintosh. Reflex breaks the mold, enabling you to get more from your data than you may have thought possible.

Stephen A. Blumenthal and Gail Rosen

As any regular reader of these pages knows, the market is flooded with data management products striving for new heights in user-friendliness. While such programs may be so amiable they all but kiss you good-night, there's often a price, in the form of serious design limitations, for all that ease of use.

Perhaps the best way to create a friendly, accessible, *useful* data manager is to forsake the data base management system (DBMS) orthodoxy altogether. And that's precisely what Analytica has

sought to do. Analytica's *Reflex* is neither full-fledged data manager nor spreadsheet, but a hybrid that marries the data manipulation talents of the former to the analytical capabilities of the latter–and tosses in graphics for good measure. Not only is the program friendly and fast, it also enables you to establish quantitative relationships between fields within the same record–something ordinary data management products simply don't do.

This novel product slant has some notable limitations of its own. *Reflex* does not have a programming language, is not fully relational, does not support macros, and, although it requires a graphics board, does not support color. Moreover, because the program is RAM-based, *Reflex* requires that you have a minimum 384K of RAM at your beck and call (the program alone takes up 290K); that leaves only enough room for relatively small data bases or for byte-size chunks of files exported from other programs.

Circling the Elephant

As in the parable of the blind men and the elephant, how you characterize this program depends on the angle from which you view it. If you're a seasoned devotee of *1-2-3,* you'll find *Reflex* strangely familiar; as a modest DBMS with analysis capabilities, *Reflex* can even be an adjunct to *1-2-3*. In *Reflex,* however, the emphasis is as much on the current state of business as on spreadsheet-style forecasting. If you're new to data management, *Reflex*'s interactive graphics will be a distinct aid to productivity, not to mention enormous fun.

Then again, if you're looking for a full-blown data manager that can apply the usual complement of DBMS features to sizable data bases without requiring additional hardware, *Reflex* is liable to leave you cold. But even if this program doesn't fill the bill as the definitive data manager, it's certainly a package you can use effectively from the start.

Reflex is designed with the technological neophyte in mind. The program should prove invaluable to anyone from sales managers who must monitor sales by product, container size, store location, and salesperson to stockbrokers who compare customer objectives with the performance of investment products maintained in client portfolios. Whatever the situation, *Reflex* serves small businesses that need to track and analyze data and sort, filter, and file customer lists and sales reports–as well as overworked middle managers who may not need a transactional data manager like *dBASE III* or *R:base 5000* (and who, in all probability, lack the time to master such a demanding product).

A Petal From Lotus

Reflex draws heavily on *1-2-3*'s visual style but has received a Mac-like facelift. As in *1-2-3, Reflex*'s commands appear at the top of the screen; when you make a selection, a pull-down menu of additional options appears, while an explanatory line at the bottom of the screen helps you get your bearings. To choose a command, you move the pointer to the menu option via cursor key (or mouse). Up to three windows can appear on the screen simultaneously, and the program has a readable sans serif character set–essential to operating in graphics mode. Analytica even built in a mechanism that highlights the menu options available in the current mode. As on the Mac, unavailable options appear in a dimmed font. Choosing a forbidden option produces a polite warning in the corner of the screen. Should you actually make an error, *Reflex* will beep at you.

Learning to use *Reflex* is like taking a refresher course in *1-2-3*. And since the less you have to learn, the better, being able to apply knowledge of the Lotus program to another product is a treat.

Points of similarity between the two programs abound. An apostrophe before a cell entry indicates a text cell; you use the slash key to call the command line and then select a command by typing its initial (for example, V for View); the <Esc> key enables you to back out of a command series. And like *1-2-3, Reflex* makes extensive use of the PC's function keys. The <F1> and <F2> keys invoke the Help and Edit functions, and <F9> recalculates. The Choices function key, <F10>, proffers a list of current field names from which to select and changes dynamically as those names change. Choices, which is accessible from any point in the program, can also list relevant file names, display formats, report attributes, and other options. The remaining keys perform functions

unique to data managers, such as paging through records, bringing up the next or previous record, moving directly to the first or last record in a file, and sorting and filtering records.

Five Different Viewpoints

With *Reflex,* you work with five "views": Form View, used for building a data base; List View, for arranging the data base in list form; Graph and Crosstab Views, for displaying and analyzing data; and Report View, for printing information from any of the other four views.

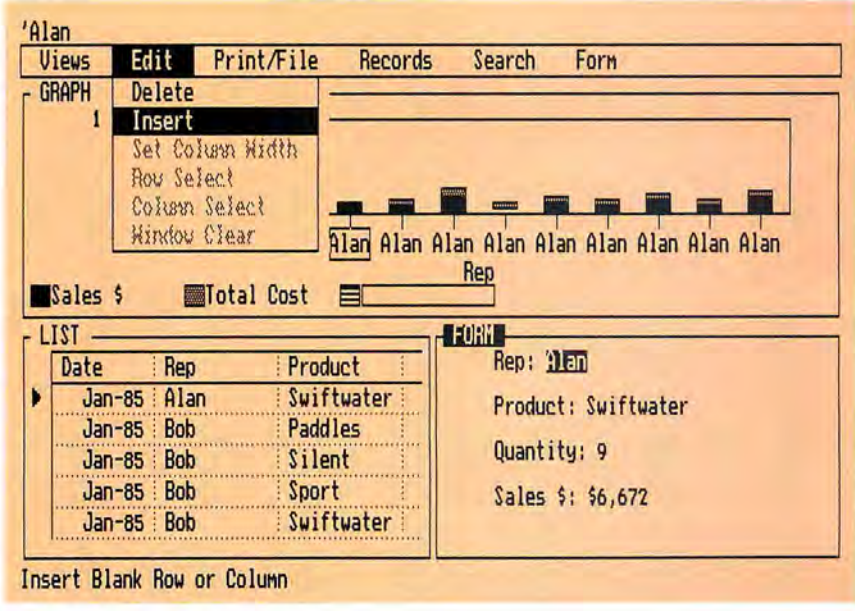
Each of *Reflex*'s five views can display the same information but in different format; commands are consistent throughout the views, and any change you make in one view is reflected in the others. List View's column-and-row data display permits instant, side-by-side comparison (see Screen 1). Within List View you can reshuffle or temporarily delete columns with celerity. Moving data could scarcely be easier; you type the column heading where you want it and presto, the column moves. For differing perspectives on data, you can split the screen horizontally or vertically and inspect up to three views simultaneously. Needless to say, a program that displays sales figures identifying your best customers on half the screen—and simultaneously enables you to page through those customer records on the other half—is worth its weight in educated guesses.

Formulating the Form

In producing work screens analogous to the familiar paper forms used in commercial transactions, *Reflex* follows the current trend in business software: You design the form by typing field names where you want them and then build the data base by filling in the blanks. Personnel files, sales reports, and inventory control systems are classic examples of records better stored within the mysterious reaches of machines than on the mashed pulp of a thousand evergreen forests.

You begin using *Reflex* with the Form Design screen, a blank display on which you draw your form. While this form appears to be the electronic equivalent of the venerable 3-by-5 card, it boasts built-in spreadsheetlike calculation capabilities. You place the cursor where you want a field name to appear, then type in the name you assign to that field. Press <Enter>, repeat the process for as many fields as you need, select Form Exit Design, and the monster lives. You are automatically returned to Form View, where you may begin data entry.

Reflex accepts up to 65,000 records per file, 128 fields per record, and 254 characters per field. The size of a working data base is limited by RAM and the total number of characters in a record. If, for example, you had 10 25-character fields per record, then you'd need 300K of work space to hold 1200



Screen 1: Reflex can display up to three windows at a time—a handy way of enabling you to view one record in detail while the program lists related records (pointing to the record you're scrutinizing) and displays a graph of one salesperson's performance.

records. The *Reflex* data base structure is malleable–fields can be added, deleted, modified, or moved as you desire. With the Edit command, you can correct errors, change field names, and expand or contract the fields themselves.

Record creation is a fill-in-the-blanks process, using the form you designed. An editing line at the top of the screen displays the entire field entry; though the form itself initially displays only as many characters as fit in the blank, you can scroll across the entire field. Field entries can include numeric data, text, and dates. Field categories can be changed without modifying field information. Once you've entered data in any field on the first record, *Reflex* automatically creates a new blank record at the end of the data base, enabling you to continue with data entry.

Reflex Action

In most data bases some information (such as brand names, dates, or container sizes) will be repeated from record to record. The *Reflex* Vary Tool largely eliminates the tedious typing such an assignment requires. Like *1-2-3*'s Range Copy command, Vary can create a series of records with duplicate data already filled in.

For example, analyzing monthly results from five departments over a five-year period would ordinarily require 300 records. With *Reflex*, you complete 1 record, and the Vary command then creates the same record for each division. You use Vary again to create division records for each month, and then a third time to create monthly division records for each year. The Vary command works with any type of field.

An even slicker way to put Vary to work is to engage its "what-if" capability. By automatically changing data in a series of records, *Reflex* can reflect the impact of projected business strategies. Varying an entry in a numeric field (for example, increasing the value 25 to 75 in increments of 5) makes "what-if" scenarios easy to construct.

Keeping Tabs

If the Vary command enables a DBMS to act like a spreadsheet, the *Reflex* Crosstab View attends to the here and now–a "what is," rather than "what if," approach.

When it's necessary to keep track of sales representatives–not to mention specific product performance and market penetration–managers are likely to find Crosstab View the program's greatest contribution to making short work of long jobs. In Crosstab View you can perform flexible analyses through data base manipulation. Cross-tabulation lets you compare and cross-total data between any given set of records, and it automatically provides summaries of your data.

With Crosstab View, overall sales can be compared to total sales for each product and simultaneously compared to total sales for each sales representative. This three-dimensional analysis yields a

Screen 2: The List View allows you to retrieve a specific record from the data base, then zero in for a closer look.

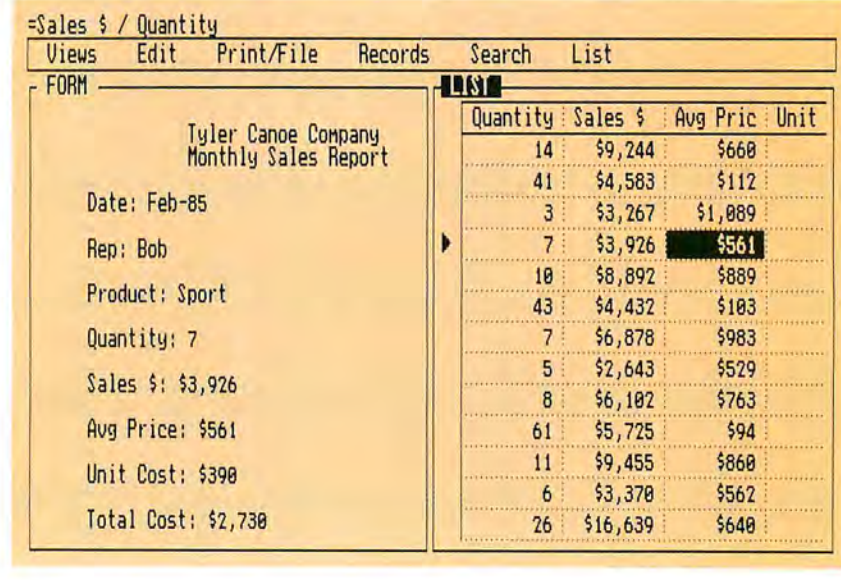


chart that tabulates total sales for each product by representative (see Screen 2). A host of built-in mathematical functions are at your disposal, among them sum, average, standard deviation, variance, minimum, and maximum. You can display numerical Crosstab chart entries in a variety of formats (fixed, general, scientific, financial, percentage, or currency) with up to 15 digits of precision.

Filter Kings

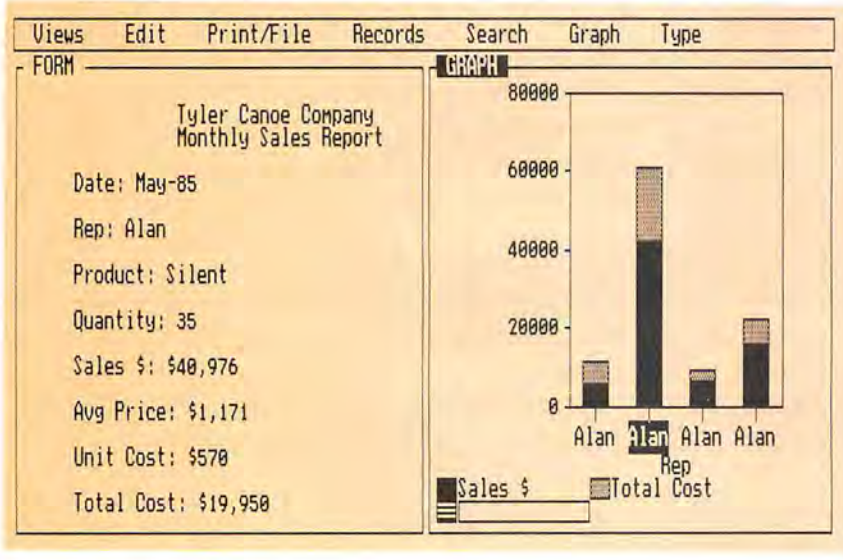
As any businessperson knows or soon learns, filtering data fosters quick analysis. Answering the objective question "How many customers do we have in Hoboken?" helps solve management's more existential question "Is sending salespeople to Hoboken worthwhile?" You can filter a *Reflex* data base for a list of records meeting certain criteria–for example, all sales in excess of $10,000. To enter filter conditions, you choose from a list of such logical operators as equal, greater than, and less than signs (the documentation includes a complete list). Filtering creates a subset of the data base, which the program treats as the working data base. The screen displays only the filtered information, although, of course, the complete data base is still safely stored on disk.

Reflex allows any field in a record to be a sort field. The program handles up to five sort fields, each of which may be sorted in ascending or descending alphabetical, chronological, and/or numerical order. Thus, two records with identical data in a primary sort field can be resorted on the second field of your choosing. Records with identical first and second fields are sorted on the third specified field, and so on. A sort through the records in any view establishes the order for the entire data base in all the views. *Reflex* is case-sensitive when searching and sorting.

By setting search conditions in a sort, you can also locate an individual record–a helpful feature in determining, for example, which client in the Southeast enjoyed the highest mail-order volume or in tracking individual sales performances.

Clarifying With Graphs

For a truly graphic portrayal of data, *Reflex* enables you to create graphs and then use them as the basis of additional data analysis. You can, for example, zero in on a particular graph item–say, the name of a hotshot salesperson–and split the screen to see his or her customer records in the Form or List View.



Screen 3: With Reflex's Graph View you can track that firebrand salesperson–and determine whether rising curves are flukes or recurring phenomena.

And because graphics are integrated with all *Reflex* views, the impact of a change in any view is immediately apparent in the graph (see Screen 3). What's more, you can move the cursor along the points of a line graph and see the Form or List View for the data represented by any point.

To graph data, you select Graph from the view choices. The graph can replace Form or List data or occupy a portion of a screen split horizontally or vertically. *Reflex* supports five graph types: scatter, line, bar, stacked bar, and pie chart. You simply choose one and specify the *x*- and *y*-axis fields, and the graph appears.

You can scroll through a graph if it occupies more than one screen, and you can change it instantly from one type to another. While graphs usually consist of individual records displaying points for each value, *Reflex*'s built-in functions are also available in the graphics component. Using @SUM, for example, the program can calculate and then total summary values (that is, records with the same value in the *x*-axis field, such as the name of a sales rep); these aggregate values, rather than the individual points, will then be plotted on the screen (see Screen 4).

Esoteric Functions

Reflex contains an assortment of additional functions that speed calculation and analysis tasks. The program's Field & Sort settings create display formats and control the massaging of data during sorting, filtering, and the setup of calculated fields.

In *Reflex* parlance, a calculated field is one containing a formula that operates on data included in other fields–and, accordingly, generates new information. Several fields can be linked to create models and thus provide another way of performing the redoubtable "what-if" analyses. In addition to arithmetic operators, formulas can make use of logical operators and the full complement of *Reflex*'s built-in functions.

On top of the functions already specified, *Reflex* boasts a number of financial functions (present and future value, compound growth rate, and equal loan payment calculations) and additional mathematical functions (random number generation, rounding up to 15 digits, pi, and a few trigonometric functions). Even the date function contains a useful wrinkle: It can return not only the current day, month, and year but also the number of days, months, and years between two dates. With the program's special functions, a calculated field will return a true or false statement based on whether that field has an error or null value.

Reporting for Duty

Reflex's report production facility is particularly easy to use, making it all the more impressive. Without much bother you can create both detail and summary reports that include calculations of totals, averages, counts, minimums and maximums, variances, standard deviations, percentages, and running totals. Subtotals can be printed at any break in a sort field. You can, for example, generate a subtotal based on a change in a date field, obtaining total sales for the day as a subtotal of total sales for the reporting period.

Reflex reports are created on screen, but not quite according to the what-you-see-is-what-you-get method. The on-screen report displays only the field names; to see the report as it will appear in print, you need to spend a few moments calling up the Preview feature. If you don't like what you see, Preview permits adjustments. From Report View, you can print lists of information, mailing labels, and summaries of data base records. Headers, footers, titles, and conclusions can be included with a few keystrokes.

A significant drawback, however, is the program's inability to integrate graphics into a report. You can combine a graph window with text on screen–but not in the final printed document. Interestingly, although the program does not support color, you can produce color graphics output on the HP 7470 and 7475A six-pen color plotters.

Rules for Importers

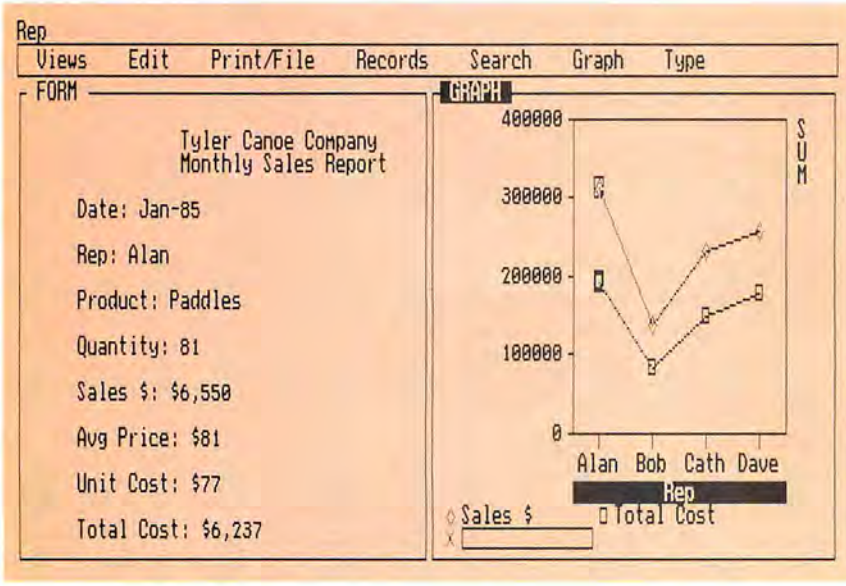
In the best of all possible worlds, *Reflex* would be put to use scoping out data you routinely enter in your favorite spreadsheet or DBMS, then hand off to the new kid. Analytica more or less planned it that way; *Reflex* can read data from *1-2-3*, *Symphony*, *dBASE*, and *pfs:file*, and it understands both DIF and ASCII formats. *Reflex* enables you to import selected *dBASE* fields, an essential capability for a program whose limited work space won't tolerate ingestion of large *dBASE* files.

Using Report View, you can export *Reflex* files for use with most word processors, *dBASE*, *1-2-3*, and *Symphony*. Simply enter Report View and choose the names of the fields you wish to export. A few keystrokes later the *Reflex* file is printed to disk as a report, where your recipient program can have at it.

Truth to tell, however, translating "foreign" information into a single data base format is not a snap; properly identifying the location and the type of data to be translated can be time-consuming. This is so despite a useful tool that supplies a format for designating information to be translated. *Reflex* reads *1-2-3* files, for example, as if it were translating a *Reflex* List View—row by row. Each column label is a field name, each column consists of field values, and each row represents another record. For convenience, *Reflex* will recognize data identified by *1-2-3* range names. You can also rearrange the columns of a List View or, by filtering, temporarily dispense with extraneous data.

Thanks for the Memory

Every silver lining has a cloud; for *Reflex*, it's the amount of memory it needs—lots. Analytica suggests a minimum 384K, but even home users are kidding themselves if they intend to use this program with less than 640K. The program's RAM-based approach results, on the one hand, in much faster searching and sorting and, on the other, in the enrichment of the good people who make expansion boards. (On yet a third hand, there's the inherent vulnerability of holding all your irreplaceable records in RAM. Save to disk regularly when using *Reflex*, or you may suffer the random wrath of power failures.) A spokesperson at Analytica confirmed that the company is evaluating a variety of hardware and software approaches to accessing memory above 640K.



Screen 4: The Graph View also serves as a convenient means of measuring one sales whiz's performance against the entire crew.

While we're on the topic of hardware, the *Reflex* manual notes that the program requires either an IBM Color/Graphics Adapter or a Hercules Monochrome Graphics Card. You'd think that if you were bereft of either you couldn't use the product. Not so, fortunately; a Quadcolor board worked without a hitch. Obviously, boards compatible with *Reflex* video drivers exist; perhaps someday Analytica will share the list of acceptable boards with the world. (The aforementioned spokesperson indicated that the next release of *Reflex* may support color.)

Power at the Ready

The *Reflex* package includes a poorly fitting function key template (Compaq owners can request an alternate), a notebook-size manual, a disk of sample data bases used with the manual's tutorials, an excellent help disk, and a McGraw-Hill paperback entitled *Reflex in Business*. The book offers 17 examples of "typical" business analyses speedily wrought through use of the program.

For most nontechnical business users, the power available in data managers like *dBASE III* remains untapped because it isn't exactly what the doctor ordered–or what day-to-day chores call for. Just as most of us won't be jumping off cliffs in the fragile embrace of hang gliding equipment, neither are we likely to take seriously the prospect of programming our way to data management nirvana. Particularly if we don't have to.

Reflex is commendably accessible and offers thorough, even elegant, analysis capabilities that other DBMS products lack. Indeed, thanks to an intelligible structure and an enticing interface, it even manages some *1-2-3* feats, but with less pain and a bit more flash. Given this unique position, *Reflex* could well find a distinct and comfortable market niche. The most serious threat may come from Lotus itself: version 2.0 of *1-2-3* reportedly contains a clutch of *Reflex*-like enhancements.

Thanks to recent agreements, *Reflex* users can now access Informatics General mainframe data and run the package on 3Com's EtherSeries local area networks. Both developments should make *Reflex* attractive to the growing office automation market.

Reflex is commendably accessible and offers thorough, even elegant, analysis capabilities other DMBS products lack.

Without claiming definitively that *Reflex* embodies a fundamental new approach to business software, we're convinced the program does offer novices and PC veterans alike the pleasure of useable power–providing your machine sports a graphics board. That's a big caveat, and if your PC is not so equipped, you'll miss out on the satisfaction–and, yes, enjoyment–that using *Reflex* offers.

Stephen A. Blumenthal is a Washington, D.C., attorney and director of regulatory relations for the Securities Industry Association. Gail Rosen is a freelance technical writer based in Berkeley, California.

Reflex
Analytica Corp.
3155 Kearney St.
Fremont, CA 94538
800/556-2283
List price: $495
Requirements: 384K; two disk drives; IBM Color/Graphics Adapter, Hercules Monochrome Graphics Card, or equivalent; graphics display
Copy protection: no

Ready-to-Run Accounting

If your accounting needs are modest, 1-2-3 provides a hospitable home for a surprisingly complete general ledger template.

Ralph Soucie

As useful as stand-alone accounting systems are, they tend to be both costly and complex. If you're willing to shell out $500 for a general ledger package–and then buckle down for the conversion from manual to PC-based accounting–before you're through you'll probably spend still more for payroll and inventory-control modules. For small businesses eager to automate their bookkeeping, a more modest approach is called for.

Good news. Alfred Publishing's *Ready-to-Run Accounting*, a template that works with *1-2-3* and *Symphony*, may be just what the controller ordered. At less than $50, *Ready-to-Run Accounting* acts and feels more like a full-fledged program than a template.

For purposes of this review, I tested only the *1-2-3* version; Alfred Publishing describes the *Symphony* release as "functionally identical."

As with any Lotus template, of course, certain restrictions apply. The limited scope of *Ready-to-Run* isn't likely to attract CPAs or businesses in need of heavy-duty accounting. Because templates are often tightly written to conserve RAM, don't look for elaborate context-sensitive help screens. And unless you're on intimate terms with *1-2-3*'s macro capabilities or *Symphony*'s command language, you'll be confined to the program structure Alfred Publishing gives you–but what a useful structure that is. As an introduction to basic automated accounting–either cash or accrual–you can hardly go wrong with this template. That's true whether you're an old hand at *1-2-3* and *Symphony* or just getting acquainted with either Lotus package.

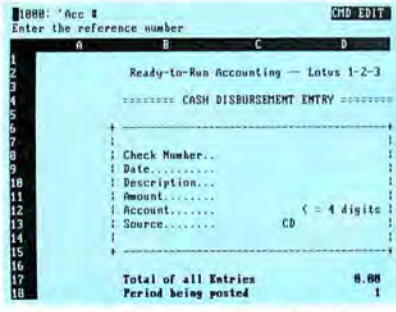
Easy Does It

Installation is a snap: Simply place the template disk in drive A: and type *Lotus* (for *1-2-3*) or *Symphony*. A batch file then copies the appropriate version to your blank formatted disk in drive B:. From there you can experiment with dummy data included in the template. Before you enter live data, invoke a few macros to clear out the sample files, and you're on your way.

You move about the 14 linked *Ready-to-Run Accounting* worksheets exclusively through labeled macro commands, so familiarity with *1-2-3* isn't mandatory. If you're comfortable with *1-2-3*'s command line, you'll like *Ready-to-Run*'s fidelity to the original. Data entry is as straightforward as filling in the blanks of an on-screen input form (see Screen 1). Other input screens help you enter bank deposits, receivables, payables, and general journal entries. You can post entries to previous accounting periods, run updates and reports midmonth (or any time), and maintain books based on 13 four-week periods rather

than on one entire calendar year. The template even flags simple data entry errors, such as alpha characters in a numeric field, accounting periods in excess of 13, or account numbers that don't jibe with the chart of accounts.

Program documentation, which is in the form of a softbound book, indicates that *Ready-to-Run* will handle up to 450 checks per month, although even 200 would seem to justify the purchase of a stand-alone general ledger package. The template comes with



Screen 1: Data entry in Ready-to-Run is a fill-in-the-blanks exercise.

charts of accounts and financial statements for four business categories: professional office, grocery, real estate, and generic small business.

Ready-to-Run can generate and date-stamp seven classes of reports, including trial balance, detailed general ledger, and journal (or transaction) listings; charts of accounts; financial statements; non-aged accounts receivable; and accounts payable. All financial statements are derived from a data base of transactions. However, keep in mind that this is a general ledger package; the accounts payable and accounts receivable components are rudimentary at best—each supports only 100 accounts.

Capacity to print invoices is also limited. *Ready-to-Run* cannot produce departmental statements, inventory reports, or statements of changes in financial position. Unlike some *1-2-3* templates, *Ready-to-Run* offers no help with graphics.

Improvised Accounting

Because *Ready-to-Run* data files fit neatly into a canned application, they are off-limits to anyone using *1-2-3* for other purposes. Here again the template beast rears its ugly head: Just as the office PC guru can't import *Ready-to-Run* accounting data into a stand-alone general ledger, neither can anyone automatically import data from *1-2-3* or any other program.

However, this limitation has an important exception. Alfred Publishing has attempted to anticipate the *1-2-3* novice's basic accounting needs, as the template's default business categories suggest. But to the veteran for whom macros are old hat, customization *is* feasible—and probably a good deal easier than tinkering with the formatting codes commonly found in dedicated general ledger modules. You can access template macros on screen or peruse the manual for detailed listings.

You may want to alter the template to create specific account descriptions, but it's more likely that you'll patch the ledger and statement files to delete superfluous accounts. Opting to customize means adjusting cell references, an activity that, once undertaken, must be executed with care lest formulas be corrupted.

Ready-to-Run is generally bug-free; I encountered only a few minor kinks. The General Journal screen, for example, prompts for a description of 'this payment'. Anyone attempting to record depreciation or write off a bad debt at this point might correctly conclude that a gaffe had occurred, but the goof is the template's, not the user's. The correct response is to forge ahead fearlessly.

A Worthy Primer

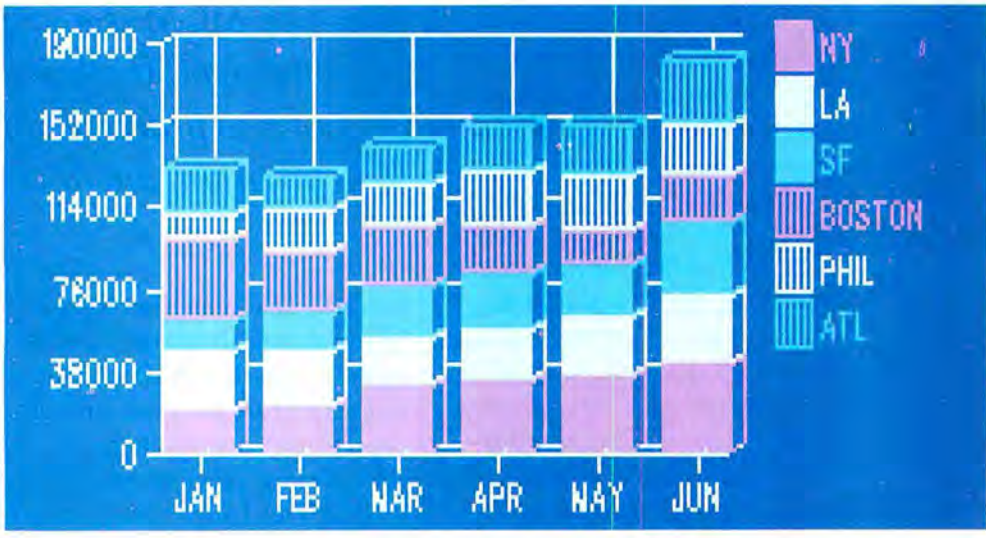
If you're a soldier in that army of small businesses that have yet to choose a general ledger package and aren't sure precisely how to go about doing so, *Ready-to-Run Accounting* provides a painless and inexpensive way to survey your fiscal terrain. Its manual, an excellent primer on double-entry accounting, makes such assessment that much easier. If you're willing to append macros here and there, you can even adapt the template to personal financial management.

Alfred Publishing plans additional modules for payroll, inventory, accounts receivable and invoicing, and accounts payable. If properly implemented, these packages may well make *Ready-to-Run* powerful enough to give the best of the stand-alone general ledger packages a run for their money.

Ralph Soucie is a CPA in Portland, Oregon.

Ready-to-Run Accounting
Alfred Publishing
15335 Morrison St.
Sherman Oaks, CA 91413
213/995-8811
List price: $49.95, book without disk $24.95
Requirements: with 1-2-3 256K, two disk drives; with Symphony 448K, two disk drives
Not copy protected

Enable: Compact and Capable



Is integrated software still viable? Can a five-function package be quick, friendly, flexible, full of features–and still manage to do everything in 192K of RAM? Meet Enable.

Merrily Shinyeda

There don't appear to be many shrinking violets at The Software Group of Ballston Lake, New York. This venture capital funded start-up, which devised and markets *Enable*, a five-function integrated package, claims the product sets new standards for the genre by offering full integration without sacrificing features, speed, ease of use, or your T-bills. Sound familiar? Is The Software Group just one more boxcar in a long freight train of integrated software hyperbole–and, if truth be told, disappointment?

Surprise, surprise. Compared to integrated packages that slickly weave together components of limited functionality or force you to go to night school to master them (while they mangle your work habits), *Enable does* break new ground.

If sold individually, *Enable*'s word processing, spreadsheet, data management, graphics, and telecommunications components would fare well indeed. With the five rolled into one, *Enable* offers the level of integration you need to combine files created with individual modules into a single document that can be displayed on the screen, edited, and printed. The program reformats text, sorts and selects records, and performs computations, all at lightning speed.

What's more, *Enable* is relatively easy to use, with a uniform command structure and a working environment that complement the five applications. (Version 1.0 was evaluated for this article; where appropriate, the article also describes enhancements included in version 1.1, which was released this summer.)

Now for the slightly bad news. *Enable* is available in two flavors–one for floppy-disk-based systems and another for hard disk systems. Although the program is tightly written and boasts near-seamless integration, only the hard disk edition is worth serious consideration. The floppy-disk-based offering requires disk-swapping so extensive that running *Enable* without a hard disk is just about unthinkable.

Master Control

Unlike *1-2-3* and *Symphony*, which are spreadsheet based, or *Framework*, which centers around an outline processor, *Enable* relies on a sophisticated central supervisory component similar to the control program you'd find running on an IBM/370. The Software Group calls this the Master Control Module (MCM).

The MCM insulates users from DOS, handling systemwide functions and containing features common to all five elements. Concentrating this capability in one place eliminates system redundancies and allows *Enable* to operate on an economical 192K of RAM, although 256K is advisable. As the super traffic cop and chief integrator, the MCM deals with memory allocation, file management, macros, windows, limited concurrency, and hardware configuration. While *Enable* obtains a good deal of its blistering speed from its origins in machine code, the MCM enhances the program's quickness and provides its striking degree of consistency from function to function.

Above all, the MCM does windows–the gist of integration in *Enable*. The program can display up to eight windows containing documents created under different program components. These windows can be moved about, reduced or expanded in size, or overlaid on one another. You can copy cells from a spreadsheet displayed in one window into a report in another window by means of several menu-driven steps. In similar fashion, you can combine word processing documents, insert graphs into text documents, or copy data base records into a spreadsheet.

In version 1.0, this is a "cut and paste" process, so subsequent changes to the source document are not reflected in the inserted material. That limitation is reportedly overcome in version 1.1: Updates in both the DBMS and the spreadsheet are reflected throughout the program's modules. What's more, previous restrictions on data interchange between modules–from the spreadsheet to the DBMS, or from word processing to either the spreadsheet or the DBMS–have been lifted. That means, for example, that a field in a data management record can contain the name of a spreadsheet, which is then available to be displayed or printed.

The MCM contains all text-editing functions. You can tinker with a spreadsheet or records in a data base, change legends on a graph, or even edit text you've just received during a telecommunications session. For repetitive tasks in any of *Enable*'s modules, the MCM's macro facility makes it possible to store frequently used commands and keystrokes for later execution. You might, for example, want to store under a single character a word processing document format including left and right margins and tabs or boilerplate paragraphs; you can retrieve what you've saved by simply pressing <Alt>-<F9> and the character name you assigned it. Similarly, you can design a macro to produce a spreadsheet template that will display cell labels and enter formulas in appropriate positions.

The MCM is a superb memory and task manager. It allows the simultaneous running of one primary application, a print spooling program, and a communications session.

Macros can also be interactive, as The Software Group demonstrated in fashioning *Enable*'s training module. With this capability, you can design on-screen presentations using a combination of graphs and other data and specify the timing of your choice. A macro can also prompt for data entry by using a "wait for input" command following a message. These macros can be saved on disk as word processing documents and altered later if necessary.

The MCM is a superb memory and task manager. It allows the simultaneous running of one primary application, a print spooling program, and a communications session. This concurrent processing feature makes it possible to capture data sent from another system while a report is being printed and a spreadsheet recalculated.

As file caretaker, the MCM is also responsible for saving, deleting, copying, and renaming files.

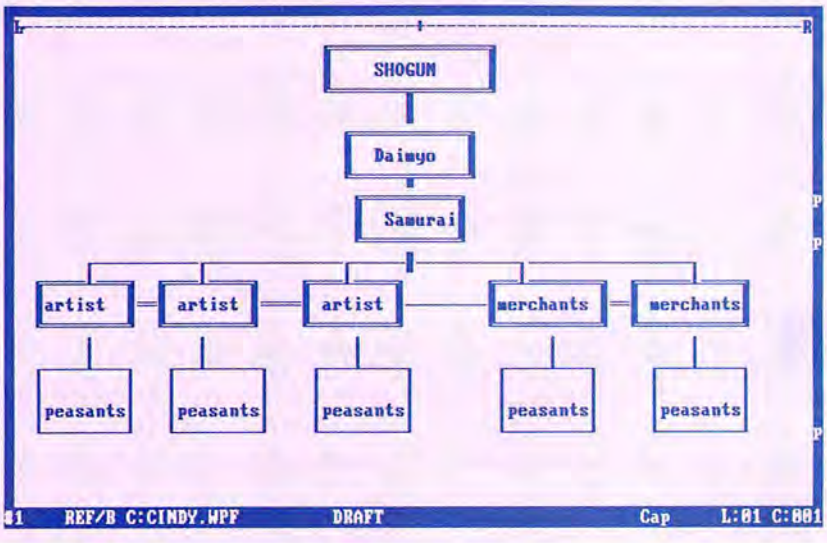
Through the MCM, *Enable* can display the names of all files on the disk or limit the display to those created under a specific application. The MCM can also import and export ASCII and DIF files as well as those created with *dBASE II, 1-2-3, VisiCalc, WordStar, MultiMate, EasyWriter,* and *Volkswriter,* which means you needn't start from scratch with *Enable* (see the discussion under "File It Away").

With version 1.1 of *Enable,* you can write your own menus or create customized pop-up windows, help screens, and error messages, any of which can be jazzed up with color. And should you need a DOS command that's not in the MCM's repertoire, you can access DOS without leaving the program.

Getting Oriented

Enable's Main menu provides access to the five applications. Selecting an application from the Main menu activates a Top Line menu that displays the command choices for that component. Except for the DBMS/Graphics module, menu structure and operation are consistent throughout; *Enable* generally relies on the PC's function keys to trigger operations. DBMS/Graphics offers a great many more commands than a Top Line menu can hold, and so relies on a chart that contains every option.

Enable's consistency and surface simplicity notwithstanding, most discerning users would balk at having to labor through a multilevel menu to perform simple functions such as line deletions or global recalculations. For these users, *Enable* offers "expert commands." Relying on a combination of function and alphanumeric keys, *Enable* users can circumvent the menus. The entire process–both keyboard contortions and reliance on memory–is, however, uncomfortably reminiscent of *WordStar* and a far cry from the convenience of *1-2-3*'s command initials option.



Screen 1: An organization chart generated with the Enable word processor and the box-drawing character set

Working With Words

Enable combines an impressive list of text-editing features with the ability to integrate graphs, spreadsheets, and data base information into a single document. Indeed, because the word processor can be pressed into service in any *Enable* module, this component truly does quintuple duty.

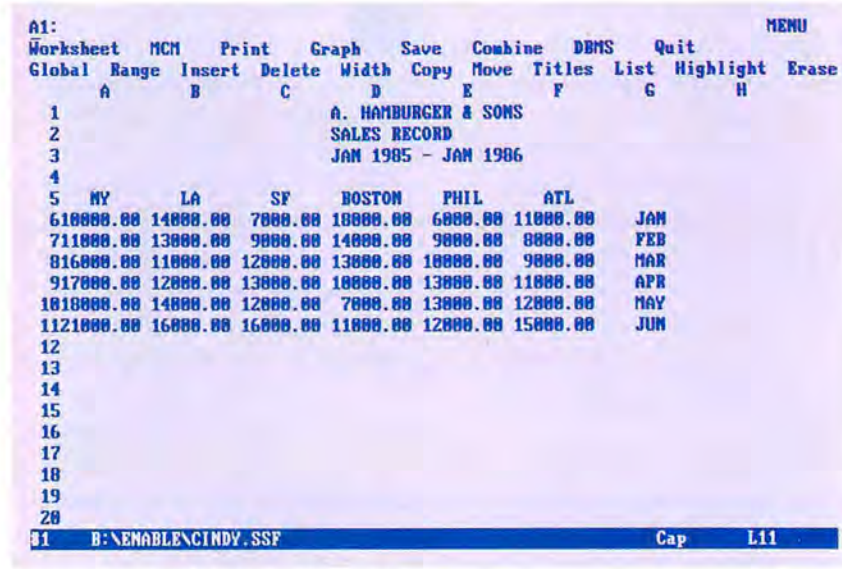
Enable takes a two-fold approach to editing and viewing word processing files. For quick and dirty input and editing, *Enable* offers a draft mode. In that mode, the screen is littered with rulers, page breaks, and other stylistic notations. Page endings are not automatically adjusted as text is inserted or deleted, which eliminates delays between edits. For final on-screen proofing and last-minute editing, *Enable* provides a what-you-see-is-what-you-get mode, sans control characters. In that more formal mode, the document appears on screen exactly as it will when printed–complete with bold type, headers and footers, and footnotes.

Flexible formatting capabilities make it possible to enhance documents with block-indented paragraphs and variable line spacing. A full range of print attributes can further emphasize important points. *Enable*'s superscript and subscript features and box-drawing character set were clearly created with the real world in mind; you can use them to generate fairly intricate organization charts (see Screen 1).

Most single-function word processing packages generate headers and footers and number pages automatically. While *Enable* can't alternate the placement of headers and footers—a requirement on double-sided manuscripts—it can automatically number pages and insert the date. Unlike some word processing packages, *Enable* supports headers and footers of unlimited length. In addition, *Enable* makes footnote creation and renumbering a breeze.

Enable is just as talented when searching for and replacing text. You can search forward or backward to locate exact occurrences, or you can direct the program to ignore case or execute wild-card searches. You can also mark relevant passages with the electronic equivalent of a paper clip.

When entering numerical data, you can use *Enable*'s calculator mode to perform arithmetic operations and most of the functions offered in the spreadsheet module. For serious writers—or writers of serious reports—version 1.1 contains several potent additions: automatic indexing and table of contents features, plus multiple-column copy and move capabilities.



Screen 2: Enable's spreadsheet is modeled on Lotus's familiar 1-2-3

A rudimentary mail merge facility for personalizing form letters and generating labels rounds out *Enable*'s stable of word processing tools. While this mail merge function can't sort or select from a mailing list, it does tie into the DBMS module, where sophisticated sorting and report generation can be done.

Crunching Numbers

At first glance, the *Enable* spreadsheet feels like an old friend; its structure and commands suggest a slimmed-down *1-2-3* (see Screen 2). In version 1.0, The Software Group issued standard worksheets measuring 255 rows by 255 columns. The updated version of *Enable* permits you to configure those 65,000-odd cells in any of six ways, from the old 255 by 255 to 4095 rows by 15 columns. And you can reconfigure any spreadsheet while you're in it.

That's still on the puny side if you look at the numbers alone—*1-2-3* tops out at 2048 rows by 256 columns. But there's more to *Enable* than meets the eye. Because the program employs virtual memory—a technique that allows information to be paged in and out and thus avoids the storage of unused "white space"—a worksheet's size is limited only by available disk space. Theoretically, eight worksheets can be open at once, but *Enable* lacks a *Multiplan*-like facility to genuinely link worksheets. *Enable* does, however, permit consolidation of portions of worksheets. Data from a spreadsheet stored on disk or displayed in a second window can be copied, added to, or subtracted from values contained in designated cells.

For worksheets that extend over several pages, *Enable*'s Border option lets you choose the rows or columns to repeat on each page, making it easy to interpret data on

any page without having to refer to the first page for row and column headings. You can include a one-line header or footer–implemented via the word processor–that identifies the spreadsheet and provides other important information.

Enable includes more than 50 built-in arithmetic, logical, financial, and statistical functions. Calculations can be automatic, manual, or iterative. (The iterative option lets you specify up to 20 recalculations for resolving intentional circular references.) Under typical circumstances, recalculation is swift, but if you really want to fly, *Enable* obliges with support for the 8087 math coprocessor. To ease the process of identifying related formulas and editing circular references, *Enable* can highlight all cells that reference a specific cell; you can also vary a critical cell and check your results before moving on. Additionally, you can create a window to list formulas, range names, and a given worksheet's status.

Transferring a customer list from *Enable*'s DBMS module to a pertinent spreadsheet is as straightforward as copying the list from an open data base window. You can mark records and designate fields in any order. When these data base values and labels are transferred into a specified worksheet range, the program automatically adjusts column widths to accommodate the new entry and recalculates any formulas on the spreadsheet accordingly.

The latest release of *Enable* suggests that The Software Group is intent on wooing Lotus devotees. *Enable* now fully supports *1-2-3* macros; users making the switch can convert their existing macros or create *Enable* macros with the same commands.

Seriously Managing Data

Unlike some data management packages, *Enable* has not forsaken ease of use in its quest for power. Data base design consists of screens full of questions, options, and instructions. These queries and choices also guide you through each step of data base manipulation and maintenance. Given this interactive approach–plus enough time and storage space–you could create a massive 130MB relational data base of some 65,000 records. Each record can have up to 254 real and computed fields, and a field can extend to a maximum of 254 characters. As many as 16 fields per record can contain a word processing document or a worksheet.

Enable's data manager doesn't compel you to work in an alien environment as do some spreadsheet-based integrated packages. By simply responding to questions, you define a field's length and characteristics. To ensure the accuracy of data entry, up to 20 validation criteria and user-constructed error and help messages can be attached to each field.

Enable builds a full-screen input form from your responses (in yet another example of the program's tight integration, the *Enable* word processor actually creates the input screens). If you're interested in even greater customization, the word processor can be used to reposition fields and insert additional descriptive information. The system can automatically supply data required for certain fields, such as those for current date and time. You can access other *Enable* data bases and transfer specific information into designated fields. Fields can accept formulas and can even be made conditional; a "go to field if" statement can be attached to a field, further simplifying data entry. Such an option automatically advances the cursor to a predetermined field if a specific value has been entered. In addition, version 1.1 of *Enable* endorses direct conversion of *1-2-3* data into the DBMS module format.

> *The latest release of* Enable *suggests The Software Group is intent on wooing Lotus devotees.* Enable *now fully supports* 1-2-3 *macros.*

You can search a data base via *Enable*'s structured query language or its prompt-driven query commands. Records can be sorted on up to eight fields using Boolean, arithmetic, relational, or wild-card operators. Sorted records are temporarily stored as a "select set." It's possible, for example, to extract a list of employees who have been with the com-

pany ten years or more, earn between $25,000 and $30,000, and participate in an employee stock option plan. The resulting select set can be further sorted by zip code and merged with a form letter using the mail merge function. Output can also consist of a customized report or graph illustrating the relationship between earnings and plan participation.

Enable's data management functions are easily accessible by heeding the prompts and plucking options from the menu screens. On the other hand, this approach can become tedious and may eventually impede productivity; indeed, this process should be tightened up considerably. For instance, rather than presenting a blank input form when you add records to a data base, *Enable* requires that you press <F10> and then select from the options Next, Ignore, or Quit.

Similarly, moving from one function to another requires too many keystrokes. Once you have added information to your data base and want to edit a record, you have to press <F10> and select Quit. Pressing <F10> again returns you to the Main menu, where you have to select EditOpts and then Edit Select from the pull-down menu that follows. Sound grim? It doesn't end there. You must specify both the file and the input form, then wait for the program to find the file. The expert commands hasten this process somewhat but require you to memorize multiple keystrokes.

In evaluating version 1.0, I was confounded by an inability to access three key DBMS functions–merge, verify, and update–that were included on menus and in the manual but weren't implemented until version 1.1.

Enable's data manager doesn't compel you to work in an alien environment as do some spreadsheet-based integrated packages. By simply responding to questions, you define a field's length and characteristics.

You can navigate your way around the DBMS report writer via menus, or you can use the module's command language. In generating output, *Enable* leaves much to your discretion: Reports can include virtual fields, fields from multiple data bases, and up to 16 page break conditions.

Illustrating a Point

Enable's Graphics module yields seven distinct graph types: two-dimensional vertical or vertical stacked bar, three-dimensional vertical bar, three-dimensional vertical stacked, pie, line, or *x-y* chart. These graphs may contain up to eight data groups selected from a spreadsheet or data base, and they can be enhanced with vertical or horizontal grids, shading, and coloring. Graphs can be displayed on a graphics monitor in either two-color high resolution or four-color medium resolution, while the source document is displayed on a monochrome monitor. When displaying graphs in color, *Enable* offers two palette choices–each containing three colors–to complement your choice of background color.

A graph derived from a spreadsheet or a data base can be captioned by transferring labels directly from the source document and adding a main heading and subheadings. To create presentation-quality graphics, these titles can be displayed or printed in any of nine fonts. If you've got a color plotter, you can print titles in up to ten colors to distinguish the data groups.

If a graph is based on spreadsheet data, its settings are automatically stored with the worksheet. Graphs can be saved as a separate word processing file–the text of which, like any word processing file, can be edited, reformatted, and printed. Want to incorporate graphs into an existing

text file? Use *Enable*'s windowing feature to modify the graph's size and position, then invoke the program's copy command to transfer the graph into the text file. You can view the results on the screen as a compound document, in which charts and worksheet (or text or DBMS file) coexist simultaneously (see Screen 3).

On Line and Ready

Enable offers two approaches to communications–quick connect and setup. If you subscribe to an on-line service like Dow Jones, Arbitron, or NewsNet, or if you exchange data regularly with other computers, you can create and store up to 64 communications setup routines simply by answering a series of prompts. Once a setup is stored, establishing a connection is just a matter of a few keystrokes; quick connect is in fact a subset of the setup option.

Enable's communications component is hardly an afterthought. You can send and receive data at rates of 110 bps to 9600 bps. The package supports the XMODEM file transfer protocol and includes its own data transfer method that boasts enhanced error-checking features. Version 1.1 adds VT 100 terminal emulation to this lineup.

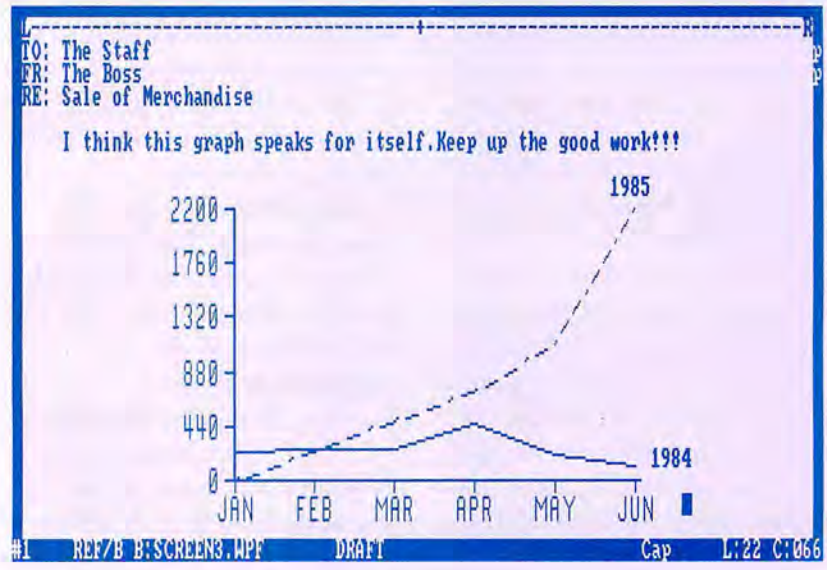
Receiving data–and quickly putting it to good use–is a snap. At any time during a transmission, you can enter the word processing module, then capture and edit the file. Communication is uninterrupted, and data is stored in a buffer in RAM. The Software Group claims that if both sender and recipient are using *Enable*, transmission of worksheets and graphics is error-free.

Looking for Output

Enable is extremely able at a number of things, but generating output isn't always one of them. On a floppy-based system, printing can be troublesome if space is at a premium on your data disk. When the print command is given, *Enable* temporarily transfers a print utility file called TSGPRT.SSP to the data disk. Once your file has been printed, TSGPRT.SSP is deleted. The size of this extra file is generally twice the size of the data file. Because this file must reside on the data disk, it's essential that adequate space be left on your disk to accommodate it.

Should the TSGPRT.SSP file need more space than you've got, you have the option of deleting a file, copying surplus files to another disk (and then deleting them from the working disk), or canceling the print request. If you choose to cancel the request, *Enable* will warn you that data may be lost. Assuming you cancel, you'll also find that the TSGPRT.SSP file remains on your disk and that the directory indicates you're fresh out of disk space.

Once a print command has been executed and printing begins, there appears to be no way to cancel a print command. If you need to interrupt printing for any reason, you'll have to turn off the printer and restart the system. If you do so, however, you'll find



Screen 3: A line graph generated in the spreadsheet mode is combined with a text or DBMS file to create a compound document.

that the pesky TSGPRT.SSP file remains on your data disk. Accordingly, deleting the TSGPRT.SSP file whenever a print command has been aborted is mandatory.

File It Away

For *Enable*, a program without a hefty base of users, smooth file translation is essential. The good news is that you can transfer your *dBASE II* or *1-2-3* files to *Enable*. The bad news is that doing so can be extremely time-consuming. I sat patiently for 3 minutes while *Enable* painted onto the screen, line by line, a *1-2-3* file of 300 rows by 12 columns. *dBASE* conversion takes a bit of effort; you must initially convert files to the *Enable* format, then specify the fields to fill.

One other disk-related quirk is also worth noting. *Enable* copies a 33K *1-2-3* transfer utility (SYSTEM.TSG) onto the disk before it begins to transfer a *1-2-3* file. As with interrupting a print request, there is no way to halt data transfer once it begins other than restarting the entire system.

An Amiable Workhorse

Enable isn't perfect, but it's well designed and does include the requisite essentials plus an impressive complement of extended features. The first round of enhancements bodes well for the product. Version 1.1 admirably addresses some of the limitations and drawbacks of 1.0. For version 1.2, The Software Group should consider adding an automatic "save to disk" facility. Notations throughout the documentation warn that Quit does not save files; you must remember to return to the Main menu (or press <Alt>-<F10> to bypass the Main menu in favor of the Save menu) to store a file.

Program documentation is clean, accessible, and sensible. Recognizing that not everybody is going to want or need all five *Enable* functions all the time, The Software Group made the manuals modular. With comprehensive spiral-bound booklets for each program component, you're spared the tedium of thumbing through a thick binder in quest of information on a persnickety detail.

> Enable *is extremely able at a number of things, but generating output isn't always one of them. On a floppy-based system, printing can be troublesome if space is at a premium on your data disk.*

Although The Software Group built (and brags about) a product that exhibits a modest appetite for RAM–and thus appeals to a broad segment of the market–the logistics of actual usage commend *Enable* only to hard disk owners. Still, it's a mark of *Enable*'s value that the deeper you go into the program, the more power and sophistication it yields. On speed and degree of integration alone, *Enable* sets an enviable standard. Based on its auspicious first offering, The Software Group is *able*–and then some.

Merrily Shinyeda is a Contributing Editor for PC World *and director of the Sierra Group, an information systems market research company based in Tempe, Arizona.*

Enable
The Software Group
Northway Ten Executive Park
Ballston Lake, NY 12019
518/877-8600
List price: $695
Requirements: 192K, two disk drives
Copy-protected and non-copy-protected versions available; site licensing also available

And the Word Is Good

With its vastly improved manual and new array of features, Microsoft Word has become the born-again word processor.

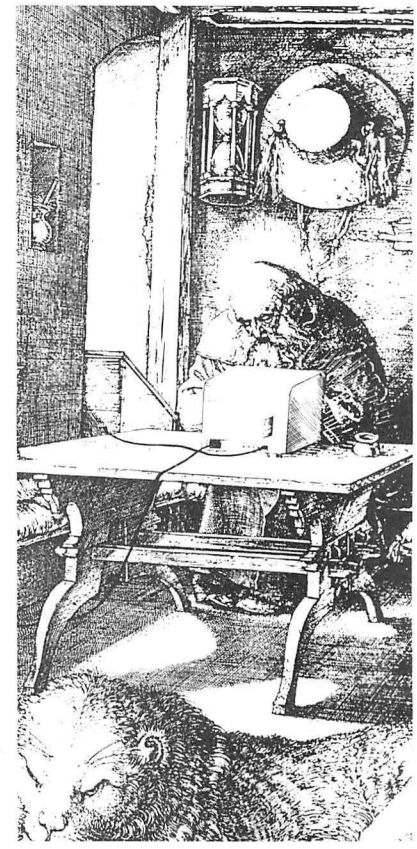
Burton L. Alperson

When *Microsoft Word* was introduced in 1983, it rapidly gained a reputation as one of the most powerful word processors available for the IBM PC and compatible computers. Two subsequent revisions (versions 1.10 and 1.15) added even more power: a merge capability with IF ... THEN ... ELSE logic, a spelling checker, and a revised copy protection scheme enabling the program to run on the PC AT.

Word also became known as difficult to use. Actually, the program itself has never been difficult–it contains one of the simplest, most elegant user interfaces yet produced for a powerful word processor. But the documentation, which was disorganized, confusing, and poorly indexed, seemed intentionally designed to hide that fact. Thus, an outstanding program was rendered inaccessible to many users.

Times change, and it appears that Microsoft has heeded the complaints. Version 2.0 has been released with new documentation and an excellent on-line tutorial that should bring a novice up to speed painlessly and quickly.

Better documentation is only part of the story. This new version smoothes out some rough edges, corrects important omissions, and adds further capabilities. The program still sells for its original $375 list price and, in fact, now includes a 30-day money-back guarantee.



An English-Language Interface

The first thing you notice about *Word* is that it speaks to you in English rather than computerese. Some other word processors ask you to mark the beginning and end of a "block" of text before specifying an action (cut and paste, underline, and so forth). A "block" is a natural way for a programmer to think of a unit of text, but it is not the way a writer thinks. *Word*, on the other hand, asks you to select one or more characters, words, sentences, or paragraphs for action. That is to say, the program approaches these concepts in the same way that you do.

Selections are immediately highlighted in inverse video, and actions are accurately represented on the screen. For instance, underlined text is underlined on the screen, and boldface text becomes bold. On a computer equipped with a color graphics board, all other print enhancements (italics, strikeovers, small caps, subscripts, superscripts) are also accurately represented. On the IBM Monochrome Display these latter enhancements appear underlined unless the computer contains the new IBM Enhanced Graphics Adapter.

Most operations are available as menu selections, eliminating the need to remember the control codes that were common in word processors of an earlier generation. At the same time, the keystrokes required to activate commands are typically fewer than with other word processors.

The Mouse

Actions such as text selection, paging through a document, opening and closing windows, and selecting and activating commands can be accomplished with either the keyboard or an optional mouse. (See "War of the Words," *PCW*, Vol. 1, No. 8, and "Getting the Word," *PCW*, Vol. 2, No. 4, for detailed descriptions of these operations.) Considerable debate has occurred about the usefulness of the mouse in word processing in general and in *Word* in particular. One Microsoft competitor has been quoted as saying it will include a mouse in its program when humans grow a third hand. Others, myself included, rave about the wonders of the beast.

An essential point has been overlooked in all this discussion of the mouse: There is more than one kind of word processing. For high-speed production typing you can live very well without the mouse. You may even be better off, because you can type faster if you don't move your hands from the keyboard.

The Spell function is smoothly integrated with Microsoft Word *and reasonably speedy in comparison with other spelling programs.*

But for creative writing and editing, the mouse is a natural, intuitive tool that keeps your attention focused on the content and scope of your work. With the mouse, you point first to the paragraph or sentence you want to move and then to the place where you want to move it. Point at the location where you want a window, and the window opens. For this kind of work, mouse operation rapidly begins to feel like an extension of yourself, and you are not likely to worry about whether your hand has left the keyboard.

The Editing Screen

The editing screen in *Microsoft Word*, version 2.0, has several new enhancements. In earlier versions only 19 lines of the 25-line screen were available for text. The remainder of the screen was occupied by borders, a menu, and ruler and status lines. You can now use 22 lines for text. The menu appears only when you strike <Esc>, which is how you move from text mode to command mode (similar to using the slash key in *1-2-3*). If 22 lines of text are not enough, the program also supports the Hercules Graphics Card, which can generate a 43-line screen.

The new IBM Enhanced Graphics Adapter (EGA) and Enhanced Color Display are supported as well. The standard EGA produces *Word*'s graphics on the IBM Monochrome Display. When configured with an extra 128K, the EGA also provides color graphics on a standard RGB monitor and high-resolution color graphics on the IBM Enhanced Color Display. Using *Word* with the EGA and the Enhanced Color Display produces such an excellent image that I now do all my word processing in color (using white text on a blue background).

Word provides a unique solution to the what-you-see-is-what-you-get problem. In other programs and in earlier versions of *Word*, you can't tell whether words are spread out on the screen because you have inadvertently typed too many spaces or because the computer is justifying the text; nor can you tell whether you have used the <Space> bar or the <Tab> key to space text.

Version 2.0 of *Word* solves both those problems with its Complete screen-verification option. When text is displayed in this mode, each

space you have typed appears as a faint dot. Spaces that the computer generates for screen justification are empty. Tabs are represented by small arrows. Thus, it's easy to distinguish what you have typed from what the computer has supplied.

The Mysterious Library Function

Microsoft Word has always listed a function called Library. Previously, attempts to activate it produced a message saying that the Library was reserved for future use. The Library has now been implemented, and it contains three options: You can run a program or issue a DOS command from within *Word;* you can hyphenate the current document; or you can engage the spelling checker to correct the current document.

Being able to run another program or issue a DOS command from within *Word* adds great flexibility. For example, I keep a BASIC telephone dialing program installed on a RAM disk. I can now activate the Library option while in the middle of a word processing session. The program prompts me with 'LIBRARY RUN:', and I respond with **E:BASICA E:PHONE-P.** Within 3 seconds the phone dialer is ready. After I make my calls I exit the phone dialer and am greeted with the message, 'Press a key to resume Word'. The program returns immediately, with the cursor exactly where it was.

You can use the Run command to format a new disk if the need arises, to copy a file, or to perform any other legitimate DOS operation. A similar Run option exists in *WordStar,* but I have never been able to get it to function properly. Problems ranged from the option's not working with a given version of DOS to its locking up my machine and destroying my work. This *WordStar* experience prompted me to try every variation I could think of with the *Word* option, but I could not force the program to fail.

Word's second Library function—a hyphenation routine—allows you to approve or change each hyphen the program inserts, or simply let the program make its own choices. Hyphens are "optional"; that is, a hyphen will appear in the printed document only if it is needed at the end of a line. You can do all the editing you wish without worrying about an inappropriate hyphen appearing in your final copy.

The automatic hyphenation routine is embarrassingly accurate. The first time I used it, I overrode the program's decisions on 9 of 11 words. According to my dictionary, I was wrong in all 9 cases.

The third Library function allows you to check the spelling in your current document with an 80,000 word dictionary. (You can also engage this spelling checker from DOS to check any *Word* document.)

The Spell function is smoothly integrated with *Microsoft Word* and reasonably speedy in comparison with other spelling programs. You can see misspelled words in context, and an excellent dictionary lookup function allows you to select the word you want with a cursor key or the mouse. You can easily add words to the Main Dictionary, which is used for all documents; a User Dictionary, which you can invoke as an option; or a Document Dictionary, which is checked only for a specified document.

The spelling checker contains several interesting subprograms that can be invoked from DOS or from the Library. These include word counts, word frequency counts, and anagram generation. The current release has a minor bug in the word count and word frequency subprograms, however. Unlike the rest of *Word,* these subprograms require you to supply the drive letter and the path name for the document to be processed. These subprograms always look to drive B: for text unless instructed differently; apparently, they cannot be configured to recognize another default drive.

The copy-protection scheme made RAM disk operation clumsy in previous versions of Word. *Although version 2.0 has simplified this operation, RAM disk operation may not be worth the effort with this program.*

Style Sheets

A style sheet stores all the formatting information you wish to preserve about a document type. You can save any formatting options available in *Word*. Style sheets are stored in the Gallery. You might have style sheets for memos, letters, draft and final versions of articles, tables, and so on. When you create a document, simply invoke the appropriate style sheet and the document is automatically formatted. You can also use style sheets to experiment with different formatting styles.

Version 2.0 contains some important style sheet improvements. First, their creation and use are clearly explained with detailed examples in both the new documentation and the on-line tutorial. The old manual essentially said, "*Word* has style sheets. Here's an example." Trying to learn from that documentation was like scaling Annapurna. With the new manual, however, anyone should be able to learn to use style sheets in short order.

Second, the style sheets themselves have been simplified. In previous releases you chose a Usage for each style sheet from among 29 different terms, including Normal Division, Front Matter, Nested, and Folio. In addition, each Usage had several Variants. The new version's style sheets are simply structured, eschewing the verbal barrage that characterized earlier incarnations of the program. Usage choices now consist of Character, Paragraph, and Division. These choices specify the unit of text you wish to encompass with a style change—a group of characters, a paragraph, or a larger section of the document.

One file-conversion utility has implications far beyond word processing. This program is the Rosetta stone for the tremendous variety of translations performed on the PC.

Once you select a Usage, the program suggests a Variant. You can accept the selection, or override it by choosing a Variant from the list provided on screen. In addition to showing possible Variants, the list also displays those you have already assigned. If you use style sheets created with previous versions of *Word*, they will automatically be converted to the new structure.

Printer Support

Word now directly supports almost 50 printers, including the Hewlett-Packard LaserJet and the Apple, DEC, and Xerox laser printers.

Additional printer support is available. The Microsoft Special Interest Group has placed a program called WORDPR.BAS on CompuServe. This menu-driven program will automatically create a *Word* printer driver for any printer; the driver will produce all print enhancements except proportional spacing.

Compatibility

Microsoft Word is copy-protected. Mercifully, it does not use *Prolok* copy protection, so you needn't keep a floppy disk in drive A: for hard disk or RAM disk operation nor worry that a "worm" (a mechanism that some copy-protection schemes reportedly use) will be planted in your system to destroy data. The program comes with one backup disk, and the Setup program allows you to copy the program to a hard disk once.

Because it is copy-protected, the standard *Word* program cannot be run on a network. Microsoft's telemarketing division makes a special network version available on request. (The pricing policy for multiuser versions had not been determined at press time.)

The copy-protection scheme made RAM disk operation clumsy in previous versions of *Word*. Although version 2.0 has simplified this operation, RAM disk operation may not be worth the effort with this program. I ran several tests of various configurations, including floppy disks only, hard disk only, floppy disks for text with program files on a RAM disk, hard disk for text with program files on a RAM disk, and all-RAM-disk operation for both hard disk and floppy disk systems. The only operation in which RAM disk use made a difference was automatic hyphenation. The speed of other operations that I tried (loading and saving files, global search and replace, and so on) was relatively unaffected by RAM disk use.

Although *Word* can create text macros (abbreviations for frequently used text) with its glossary function, it cannot create command macros (sequences of commands that are run often). Consequently, it's a great relief that this version of *Word* is fully compatible with *ProKey*, version 4.0. With the two programs, you have full macro capability.

New Strategies and Functions

Word's new documentation has not only been made comprehensible, it has been enhanced with explanations of strategies for important specialized tasks. Procedures like preparing text for telecommunications, dealing with ASCII files, and writing programs with *Word* have their own sections in the manual. Topics of less general interest, like mixing multicolumn and single-column formats on the same page, are dealt with in a question-and-answer section.

My only serious objection to earlier versions of *Microsoft Word* was the program's inability to keep successive paragraphs together. Although a Keep Together option prevented one paragraph from being split by a page break, there was no way to force two paragraphs to stay on the same page without resorting to manual pagination. This presented a problem in long documents when you didn't want to leave a subheading stranded at the bottom of a page.

The new version has remedied this omission. You can now invoke a Keep Follow option that guarantees paragraphs will stay together no matter how automatic pagination slices up the document.

The pagination process itself has been improved in version 2.0. Unlike most word processors, when you are editing, *Word* does not show how pages will appear; it shows the page breaks that existed the last time the document was printed. This strategy is useful if you like to make corrections on hard copy first, then transfer them to disk. If you need to see the revised page breaks, you can invoke the Repaginate command. That command has been speeded up in version 2.0 and contains a new option. You can accept the page breaks the program proposes or modify them by using the cursor keys—an interesting and useful compromise for dealing with pagination.

Version 2.0 comes with two translation utilities. The first, called CONVWS, is a variation on the CONVERT program in earlier versions. It converts *WordStar* files into *Microsoft Word* files. The second utility, CONVERTD, is a generalized file-translation routine with implications far beyond word processing. It will convert columnar ASCII files, delimited ASCII files, DIF (Data Interchange Format) files (such as those produced by *VisiCalc*), *dBASE II* text files, *Multiplan* files, and *1-2-3* files. CONVERTD can produce files in any of those formats (except *1-2-3*) and in *Microsoft Chart* format. This conversion utility is the Rosetta stone for the tremendous variety of translation work performed on the PC.

Summing It Up

Ever since the first version of *Word* was released, I have planned to write a book teaching how to use the program. I am dropping the project. The new documentation and tutorial are so good that the need for such a book has evaporated. Microsoft has turned a documentation disaster into a model manual.

Microsoft Word is outstanding. If you are in the market for a word processor, you owe it to yourself to take advantage of the 30-day guarantee and test the program. It is not just one of the best word processors available; its price makes *Microsoft Word* a bargain in comparison to the competition.

Burton L. Alperson is a professor of psychology at California State University at Los Angeles and a Contributing Editor to PC World. *He is also director of training and development for Regent Data Systems in Los Angeles.*

Microsoft Word, version 2.0
Microsoft Corp.
10700 Northup Way
Bellevue, WA 98004
800/426-9400, 206/828-8088
Alaska, Hawaii, and Washington
List price: $375
Requirements: 128K, one disk drive (DOS 2.00 for copying to hard disk)

Asimov Ponders PCs

I think, therefore I am . . . a computer? PCs are slowly climbing the IQ scale, but no one knows if they will help humans make better decisions. Isaac Asimov examines how far a computer's reach can exceed its grasp.

Isaac Asimov

Every advance in problem-solving tools must have given rise to vague fears. One can well imagine predynastic Egyptian architects suspiciously viewing the first measuring sticks. "People will grow dependent on these mechanical contrivances," they might have said disapprovingly. "They will forget how to judge distance with a keen eye and mind and will place responsibility for decisions on these inanimate pieces of wood. Instead of making a slow, good decision, they will make a quick bad one."

I dare say that the abacus, Arabic numerals, the slide rule, and the mechanical calculator all roused similar misapprehensions.

Now it is the personal computer–and its "intelligent" software–that seemingly will shield us from responsibility and allow our minds to wither.

Yet all problem-solving advances, whether wooden sticks or electronic spreadsheets, have confronted humans with a tautological enigma: A solution is implicit in the information given to solve a problem. Even as we seek the solution to 7×9, we possess information that implies the inevitable answer, 63. We could look at a multiplication table, or if we had time, we could arrange 9 heaps of 7 pebbles each and then count all the pebbles. Although the multiplication table supplies the answer faster and eliminates the error-prone counting process, the result is the same in each case. If we have plenty of time and nothing else to do, and if we count very carefully, we can dispense with the multiplication table–but no one ever does so because speed and freedom from error are all-important.

And so it is with the personal computer. For secretaries and scientists alike, mechanical devices have given way to this all-purpose electronic tool. The personal computer can store entire libraries on its capacious disks and calculate

Arnold Newman, Life Magazine © 1983 Time Inc.

billions of times faster than we can without error. Nevertheless, once a computer is given information together with instructions for manipulating that information, the answer is implicit. We could start with the same information, employ the same manipulations, and reach the same inevitable answer, providing, of course, that we had enough time and were sufficiently careful to avoid error. But because the time needed to solve complex problems excludes this approach, we insist on using computers and, indeed, have built business systems so intricate that we can no longer do without them.

However, the spectre of GIGO–garbage in, garbage out–stalks us. If your name has ever been bulk-mangled in a piece of "personalized" mail, or if you've ever tapped in the wrong numbers on an adding machine, you've discovered that the inevitable answer can be explicitly wrong. The personal computer is as prone to this kind of error as any other problem-solving device and will hand you the wrong answer just as calmly. There is danger in trusting the computer, but so is there danger in trusting your finger to alight on the proper line in a multiplication table. The flaw, as always, lies with the human being.

There are many ways to check answers, but the best way to sift the gems from the garbage is simply recognizing when an answer looks wrong. Here the human brain tellingly outperforms the computer. Computers can solve astoundingly complex problems, but the human brain has an ability far beyond this–call it intuition, if you will.

You can feed dictionaries into a computer along with all the rules

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- ✓Turbo Pascal 3.0 w/BCD .... 59.
- ✓Turbo 8087 3.0 .... 59.
- ✓Turbo 8087 3.0 w/BCD .... 72.
- ✓Turbo Toolbox 1.0 .... 30.
- ✓Graphics Toolbox 1.0 .... 30.
- ✓Turbo Tutor 1.0 .... 19.
- ✓Superkey 1.0 .... 37.

Broderbund
- ✓Bank Street Writer .... 49.

Connecticut Software
- ✓Printer Boss 5.0 .... 99.
- ✓Sideline 5.0*(more features than Sideways)* 37.

Digital Research
- ✓GEM Desktop 1.1 .... 30.
- ✓GEM Draw 1.0 *(includes GEM Desktop)* 93.

FriendlySoft
- ✓FriendlyWriter 2.0 *(with FriendlySpeller)* 55.

Funk Software
- ✓Sideways 2.11 .... 37.

Harvard Software
- ✓Harvard Project Manager 1.1 .... 209.
- ✓Harvard Total Project Manager 1.0 .... 279.

Hayes
- ✓Smartcom II 2.1 .... 89.

IMSI
- ✓PC Paintbrush 2.8 .... 69.

Infocom
- ✓Cornerstone 1.0 .... 289.

Lifetree
- ✓Volkswriter Deluxe 2.2 *(with TextMerge)* 159.
- ✓Volkswriter Scientific 1.0 .... 289.

Living Videotext
- ✓ThinkTank 2.0 .... 109.

Micro Education (MECA)
- ✓Managing Your Money 1.52 .... 99.

Micropro
- ✓WordStar 3.31 .... 179.

PC Connection Software Special

expires September 30, 1985

SOFTWARE DIGEST RATINGS NEWSLETTER

This publication is unparalleled for its comprehensive, reliable evaluations. Its analyses and reviews are completely unbiased—they accept no advertising. If you are preparing to make a substantial investment in one or more software programs, we recommend you read SOFTWARE DIGEST's evaluation first. 1985's issues evaluate the following programs: Word Processors, File Management, Database Management, Spreadsheets, Graphics, Integrated Accounting, Project Management, Communications, Integrated Productivity.

Single copy (specify topic) $18.50
The cost of your first issue, $18.50, can be deducted from the price of a year subscription.
Year subscription (10 issues) $185.00
Actually includes 20 issues: the 10 previous issues, in a binder,and the 10 upcoming issues.

Hard disk recommended for Wordstar 2000 & Wordstar 2000 Plus
- ✓WordStar 2000 1.01 .... $259.
- ✓WordStar 2000 Plus 1.01 .... 299.

Microrim
- ✓R:base 4000 1.15 .... 259.
- ✓R:base 5000 1.0 369
- ✓Upgrade Kit to R:base 5000 .... 129.
- ✓Extended Report Writer 1.2 .... 85.
- ✓Clout 2.0 .... 135.

Microsoft
- ✓Multiplan 1.2 .... 125.
- ✓Microsoft Spell 1.0 .... 30.
- ✓Microsoft Word 2.0 .... 235.

Both of the following Microsoft mice now come with PC Paintbrush software
- ✓Microsoft Mouse with software 4.0 .... 135.
- ✓Microsoft Serial Mouse with software 4.0 135.
- ✓Microsoft Project 1.01 .... 155.
- ✓Microsoft Chart 1.01 .... 155.

Microstuf
- ✓Crosstalk XVI 3.5 .... 99.
- ✓Transporter 1.3 *(includes Crosstalk)* .... 169.

MultiMate International
- ✓MultiMate 3.3 .... call

PCsoftware
- ✓PCcrayon 3.0 .... 39.
- ✓Executive Picture Show 2.0 .... 139.

Peter Norton
- ✓Norton Utilities 3.0 .... 59.

Powerbase Systems
- ✓Powerbase 2.1 .... 269.

Rosesoft
- ✓Prokey 4.0 .... $89.

Satellite Software
- ✓WordPerfect 4.0 .... 239.

Software Group
- ✓Enable 1.1 .... call

Software Publishing
- ✓PFS:File B:01 .... 84.
- ✓PFS:Graph B:01 .... 84.
- ✓PFS:Plan A:01 .... 84.
- ✓PFS:Proof B:00 .... 59.
- ✓PFS:Report B:01 .... 77.
- ✓PFS:Write B:01 .... 84.

Virtual Combinatics
- Micro Cookbook .... 29.

Warner Software
- ✓The Desk Organizer 2.0 .... 69.

TRAINING

ATI

✓**SKILL BUILDER PROGRAMS**

Intro and How To Use:

Word Processing	MS-DOS (2.0)
Business Software	PC-DOS (2.1)
Data Bases	Home Accountant
Compaq	VW Deluxe
IBM-PC	Basic

.... *each* 32.

✓*TRAINING POWER PROGRAMS*

How to Use:

dBase II	dBase III	Lotus 1-2-3
MS Word	Easywriter II	Multimate
Multiplan	Supercalc 3	Framework
Symphony	Wordstar	TK!Solver

.... *each* 49.

- ✓Survival Kit *(includes Intro to the PC, Intro to PC-DOS, & Intro to Business Software)* 79.

Comprehensive Software
- ✓Intro to Personal Computing .... 39.
- ✓Intro to Databases .... 39.
- ✓Intro to Communications .... 39.
- ✓Intro to the Operating System (PC Tutor) 39.

Individual Software
- ✓The Instructor II .... 35.
- ✓Professor DOS .... 47.
- ✓Tutorial Set *(both items above)* .... 75.
- ✓Professor Pixel .... 47.
- ✓Typing Instructor .... 39.
- ✓Training for Lotus 1-2-3 .... 49.

Scarborough Systems
- MasterType .... 35.

EDUCATIONAL

Digital Research
- Diagnostic Test (PSAT) .... 14.
- OwlCat SAT *(15 hour)* .... 63.
- OwlCat SAT *(60 hour)* .... 169.

Spinnaker

Educational Games for Young Computer Users. *(All require graphics board)*
- Delta Drawing *(ages 4 to adult)* .... 27.
- President's Choice *(ages 13 to adult)* .... 27.

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dazzling dialogue, dy

Snooper Troops I *(ages 10 to adult)* .... $23.
Snooper Troops II *(ages 10 to adult)* ... 23.
Alphabet Zoo *(ages 3 to 8)* ..... 20.
Most Amazing Thing *(ages 10 & up)* ... 23.
Face Maker *(ages 3 to 8)* ..... 18.
Kids on Keys *(ages 3 to 9)* ..... 18.
Fraction Fever *(ages 7 to adult)* ..... 18.
Kinder Comp *(ages 3 to 8)* ..... 20.
Stone *(requires graphics board)*
My Letters,Numbers,Words *(ages 1 to 5)* 29.
Kids Stuff *(ages 3 to 8)* ..... 29.
Across the U.S.A. *(ages 5 and up)* ..... 22.

GAMES

Blue Chip
Millionaire ..... 32.
Tycoon ..... 32.
Baron ..... 32.
Broderbund
Lode Runner ..... 25.
FriendlySoft
FriendlyWare/PC Arcade ..... 35.
Hayden Software
Sargon III ..... 35.
Infocom
Difficulty levels shown in italics
Seastalker *(junior)* ..... 25.
Enchanter *(standard)* ..... 25.
the Witness *(standard)* ..... 25.
Planetfall *(standard)* ..... 25.
Cutthroat *(standard)* ..... 25.
Hitchhiker's Guide *(standard)* ..... 25.
Zork I *(standard)* ..... 25.
Zork II *(advanced)* ..... 29.
Zork III *(advanced)* ..... 29.
Infidel *(advanced)* ..... 29.
Sorcerer *(advanced)* ..... 29.
Suspect *(advanced)* ..... 29.
Deadline *(expert)* ..... 31.
Starcross *(expert)* ..... 31.
Suspended *(expert)* ..... 31.
Invisiclues (hint booklets) are available for most Infocom games. Specify game. 7.
Microsoft
Flight Simulator 2.12 *(now works on Hercules Mono Card)* ..... 32.
Origin Systems
Ultima III ..... 39.
PCSoftware
Armchair Quarterback ..... 27.
Chess 2001 ..... 27.
Championship Blackjack ..... 23.
Professional Software
Trivia Fever ..... 22.
Sir-Tech
Wizardry ..... 42.
Spectrum Holobyte
GATO ..... 27.
Sublogic
Night Mission Pinball ..... 29.

HARDWARE

AST Research *(For IBM-PC or XT)*
All AST Boards come with SuperDrive, SuperSpool, and one year warranty.
SixPakPlus 64k upgradeable to 384k, with clock calendar, serial and parallel ports & now includes Borland Sidekick version 1.5 (non-protected) *game port optional* $249.
MegaPlus II 64k upgradeable to 256k (or more with MegaPak) with clock calendar and serial port *(parallel, game, or second serial port optional)* ..... 249.
MegaPak 128k *(not upgradeable)* ..... 209.
MegaPak 256k ..... 339.
I/O Plus II with clock calendar and serial port *(parallel, game, or second serial port optional)* ..... 125.
Parallel, Game, or second Serial Port *for any AST board (specify board)* ..... 35.
Connectall *connector bracket (PC only)* 19.
AST-5251-12 ..... 529.
AST-5251-11 ..... 709.
AST-3780 ..... 589.
Reach Modem *(half card 300/1200 baud internal modem includes Crosstalk XVI)* 389.
Advantage 128k upgradeable to 1.5 Meg *(more with piggyback card)* with clock calendar, serial and parallel ports, *game port optional* ..... 399.
Amdek
Video 300G monitor *(green)* ..... 139.
Video 300A monitor *(amber)* ..... 149.
Video 310A monitor *(amber)* ..... 179.
Color 600 - RGB monitor ..... 399.
Compucable
Plastic Keyboard & Drive Cover Set .... 17.
IBM Mono Screen Enhancement ..... 17.
Curtis
ACCESSORIES
PC Pedestal *(for IBM Mono or Color)* ... 37.
PGS or Quadchrome Adapter for above 9.
Low Profile Tilt and Swivel Pedestal .... 37.
AD-2 Adapter for Portables ..... 15.
System Stand ..... 19.
System Stand for IBM-AT ..... 37.
Static Mat ..... 27.
The Crystal 150-watt ..... special
The Crystal 300-watt ..... special
CABLES
Extension Cables for IBM Mono Display 33.
Keyboard Extension Cable *(3 to 9 feet)* 27.
AC Plug Adapter *(any monitor to your PC)* 8.
Printer to IBM Cable *(specify printer)* ... 19.
Smartmodem-to-IBM Cable ..... 19.
SURGE SUPPRESSORS
All surge suppressors have an on/off switch.
Diamond *(6 outlets)* ..... 32.
Emerald *(6 outlets; 6 ft cord)* ..... 39.
Sapphire *(3 outlets; EMI/RFI filtered)* .... 52.
Ruby *(6 outlets; EMI/RFI filtered; 6 ft cord)* 59.
Epson
All Epson printers have built in graphics capability.
LX-80 ..... call
RX-100 ..... call
FX-85 *(replaces FX-80+)* ..... call
FX-185 *(replaces FX-180+)* ..... call
JX-80 ..... call
LQ-1500 *(letter quality dot matrix)* ..... call
Printer to IBM Cable (specify printer) ... 19.

PC Connection Hardware Special

expires September 30, 1985

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300-watt ..... 146.

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- Smartmodem 300 ..... $149.
- Smartmodem 1200 ..... 429.
- Smartmodem 1200B *(w/Smartcom II)* .. 369.
- Smartmodem 2400 ..... call
- Smartcom II 2.1 *(software)* ..... 89.
- *Curtis' Smartmodem-to-IBM Cable* .... 19.

Hercules
- Hercules Graphics Card *(parallel port)* 309.
- Hercules Color Card *(parallel port)* .... 169.
- Graph-X Software ..... 42.

IMSI
- PC Mouse w/PC Paintbrush 2.8 ..... 129.

Kensington Microware
- Masterpiece ..... 94.
- Printer/portable computer stand ..... 17.

key tronic
- Deluxe keyboard (KB 5151) ..... 169.
- AT Converter *(makes 5151 keyboards work with AT)* ..... 12.

Kraft
- Joystick ..... 35.

Maynard Electronics
- Floppy Drive Controller ..... 119.

Mouse Systems
- PC Mouse (w/software, pad, & PC Paint) 139.

NEC
- Pinwriter P2-3 *(IBM, 80 column)* ..... 559.
- Pinwriter P3-3 *(IBM, 132 column)* ..... 759.
- Spinwriter 2050 *(letter quality 17 cps)* .. 679.
- Spinwriter 3550 *(letter quality 32 cps)* 1099.
- Spinwriter 8850 *(letter quality 50 cps)* 1489.

Orchid Technologies

All Orchid Boards come with PCnet Drive (Ram disk), PCnet spool (print spooling), disk caching & partitioning.
- Blossom 64k upgradeable to 384k,with clock calendar, serial and parallel port. 199.
- PCnet Daughter Board (piggybacks to Blossom) with version 3.0 networking software ..... call
- PCnet Blossom 64k Blossom Board with the Daughter Board installed ..... call
- PC Turbo 186 w/128k ..... call
- PC Net *(stand alone card)* ..... call

Paradise Systems
- Modular Graphics Card ..... 275.
- Multidisplay Card ..... 195.
- 5-Pack (ØK expandable to 384k) w/clock and serial port ..... 169.

Princeton Graphics
- HX-12 RGB monitor *(690 x 240)* ..... call
- MAX-12E Amber monochrome monitor call
- SR-12 RGB Monitor *(690 x 480)* ..... call
- Scan Doubler Board for SR-12 ..... call

Quadram

Expanded Quadboard with clock calendar, parallel,serial & game port, I/O bracket, and Quadmaster software.
- 64k *upgradeable to 384k* ..... 199.
- 384k *(fully populated)* ..... 249.
- Microfazer Printer Buffer *(parallel) w/copy MP 64 (64k) upgradeable to 512k* ..... 159.
- Quadcolor I ..... 197.
- Quadchrome RGB Monitor ..... 469.

SMA (Systems Management)

PC-Documate Keyboard Templates *available for:*

DOS/Basic 1,1	Wordstar
DOS/Basic 2.0-2.1	Wordstar 2000
DOS 3.0-3.1	Turbo Pascal
Lotus 1-2-3	WordPerfect
Symphony	dBase II
Multiplan (IBM)	dBase III
Multiplan (Microsoft)	Framework
Volkswriter Deluxe	Multimate
Supercalc 3	

..... *each* 12.

Toshiba
- P351 printer ..... 1239.
- P1340 printer ..... call

VisiCorp
- Visi Mouse *(2 button Mouse Systems mouse, PC Paint 1.0 & pop-up menu software 3.0)* ..... 89.

WICO
- Joystick ..... 35.

DRIVES

All floppy drives are completely pre-tested and are supplied with a printout of the test results. They are shipped with complete step-by-step installation instructions. Drives are 320k/360k.

Control Data (CDC)
- (5¼") half-height drive (DS,DD) ..... 89.
- (5¼") full-height drive (DS,DD) ..... 99.

Free mounting bracket with each pair of half-heights.

IOMEGA
- Bernoulli Box 20 Meg ..... 2489.
- 10 Meg cartridge ..... 48.

Maynard Electronics
- Internal Hard Disk (10 Meg) with WS-1 Controller ..... 797.
- Internal Hard Disk (10 Meg) with WS-2 Controller ..... 969.

Tandon
- TM 100-2 (5¼") *full-height drive (DS,DD)* 109.
- 10 Meg Internal hard drive w/controller (complete package) ..... 479.

TEAC
- FD-55B (5¼") *half-height drive (DS,DD)* 109.

Free mounting bracket with each pair of half-heights.

MEMORY
- 64k Memory Upgrade Set for IBM-PC or XT system board ..... 10.
- 64k Memory Upgrade Set for any memory board *specify make of board* ..... 10.
- Install memory upgrades & run diagnostics *at time of board purchase only* ..... 10.
- 256k Memory Upgrade Set for any IBM-AT memory board ..... 49.
- 128k Memory Upgrade Set for AT system board ..... 49.

DISKS

Fuji
- Disks for IBM-AT (96-TPI) *Box of 10* .... 39.

MAXELL
- Disks for IBM-AT (96-TPI) *Box of 10* .... 45.

Verbatim
- Datalife Disks SS/DD *Box of 10* ..... 21.
- Datalife Disks DS/DD *Box of 10* ..... 25.
- Disks for IBM-AT (96-TPI) *Box of 10* .... 47.
- Disk Drive Analyzer ..... 19.
- **Flip Sort** *(holds 75 disks)* ..... 15.

INFORMATION SERVICES

Compuserve
- Compuserve Information Service *(includes subscription, manual, 5 hours of connect time, monthly publications)* .... 19.

Source Telecomputing
- The Source *(subscription & manual)* .... 39.

Microcom Internal 1200B PCjr/modem $259.

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of English grammar, all the exceptions to those rules, and all the idioms that lie outside the rules. The computer can then write idiomatic English, in some cases novels and even poetry, though the results would be thoroughly uninspired.

I don't know any but the simplest rules of English grammar, and I seldom consciously apply them. Nevertheless, I instinctively write correctly and, I like to think, in an interesting fashion. I know when something sounds right and when it doesn't, and I can tell the difference without hesitation, even when writing at breakneck speed. How do I do this? I haven't the faintest idea. And because I don't know how I do it, I cannot possibly program a computer to reproduce what I do. The human brain is not a number cruncher. It manipulates numbers with dreadful slowness, and without the aid of tools as simple as pencil and paper, it is more likely than not to make errors. Its expertise lies in intuition, insight, fantasy, imagination, and creativity. The human brain can invent and grasp situations it has never experienced or, on the basis of incomplete information and uncertain understanding, deduce at least reasonably correct answers. It's unlikely that a computer can do these things any more than a human can integrate complex equations in nanoseconds or instantly recall a month's worth of business transactions.

It is, of course, conceivable that computers will someday exhibit all the complexities of the human brain, but not in the foreseeable future. The human brain has 10 billion neurons and nearly 100 billion subsidiary cells connected in an astronomically complex wiring scheme. A neuron is itself an enormously intricate system of proteins and passageways.

Besides, why should we build a computer to do what humans already do so satisfactorily? Would we train a human from birth to do what even the simplest computers do so well? I think not.

The personal computer, then, in the course of its development, will remain a tool, ever more complex, and perhaps ever more able to question the instructions given it. Yet however complex, I doubt the computer will ever match the intuition and creative powers of the remarkable human mind.

In my opinion, the future will see computers and humans, each representing totally different forms of intelligence, working in cooperation rather than in competition and accomplishing more together than either could possibly achieve alone.

Isaac Asimov is the author of over 320 books including I, Robot, The Foundation Trilogy, *and* Asimov's Biographical Encyclopedia of Science and Technology.

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Experts on Call

Artificial intelligence is budding on personal computers, primarily in the form of expert systems–programs that take the facts you provide and supply limited solutions or predictions.

Janet Goldenberg

Purists may disdain them as dim-witted stepchildren of artificial intelligence (AI) research, but so-called expert systems are fast emerging as a power tool for decision makers–a major new category of program to stand alongside spreadsheets, data base managers, and word processors as essential productivity aids. Instead of crunching numbers or words as the others do, expert systems crunch facts and rules to mimic the analytic processes of human professionals. Although AI gurus question whether these programs are "intelligent" in the human sense (that is, able to understand what they know, come up with new thoughts, or engage in wide-ranging, fairly coherent conversation), expert systems have proven professionally competent in impressive ways.

MYCIN, developed at Stanford University in the mid-1970s, was the first computer program to rival human doctors in the diagnosis of bacterial diseases. *Prospector,* created at SRI International in the

LOAN

late 1970s by programmers working with a team of top geologists, is credited with discovering a large molybdenum deposit at Mount Tolman in Washington State.

The need to master complexity in an increasingly complex world–whether in professions like medicine or in newly deregulated industries like banking–is fast propelling these tools beyond university AI labs. In the next few years, say market watchers, expert systems (also known as advisory or knowledge-based systems) will function as everything from retail sales aids to foremen in robotic factories, from intelligent assistants for scientists to interactive encyclopedias.

As truly intelligent programs become established, many tasks now requiring human experts will be delegated to less highly trained practitioners, changing the expert's role from day-to-day decision maker to strategic planner and arbiter of difficult cases. For large companies these changes will bring savings in salary and training costs and may reduce expensive, perhaps disastrous, human errors. Small businesses will be able to buy "canned" expertise, which will help them compete with high-powered rivals. According to DM Data, a market research firm that tracks the AI industry, expert systems will be part of a $4.2 billion artificial intelligence industry that by 1990 will touch every aspect of commerce.

Migration to Microcomputers

Although large-scale expert systems have been proving themselves on minicomputers and mainframes for several years, AI developers are just waking up to the systems' potential for personal computers. While you can't yet buy many ready-made applications for the PC and compatibles (which are hampered by their modest speed and memory size), about a dozen tool kits let sophisticated users build their own small expert systems–without having to learn specialized programming languages such as LISP. Called shells or tools and selling for $50 to $15,000, these sophisticated software products supply all the components you need (except knowledge) to build a simple expert system in any field.

One such program is Texas Instruments' *Personal Consultant*, which runs on the TI Professional Computer; it is modeled on *MYCIN*. Says TI product development manager William Turpin, "We wrote in LISP so you don't have to." A leader in developing expert systems for personal computers, TI boasts that it is spending more on AI research than Japan is on its entire fifth-generation project.

Personal Consultant has already been put to commercial use. At Dallas's Infomart, a showplace for computer systems from many manufacturers, first-time computer buyers can sit at one of 13 workstations in the lobby and receive a free, 15-minute consultation that advises them on the right system for their needs and budget. This expert system, designed by Boeing Computer Services Company of Seattle

Small businesses will be able to buy 'canned' expertise, which will help them compete with high-powered rivals.

using *Personal Consultant*, gives buyers more in-depth guidance than the average salesperson could supply.

While many observers think that tools like these are the vanguard of a great wave of AI software for business, they agree that the existing products are still very limited. The average expert system shell available for the PC allows only a few hundred expert rules of thumb–enough to troubleshoot a malfunctioning air conditioner or another fairly simple machine–compared with the thousands of rules a mainframe computer can handle for problems as difficult as diagnosing an ailing jet plane.

"The problems that can be run in a 200-rule environment are really pretty small in comparison to all of the interesting problems," notes Larry Geisel, president of Carnegie Group, a research spin-off of Carnegie-Mellon University and a major developer of commercial AI applications. "The fact is that most problems you can solve with a 200-rule system you can already solve pretty well without AI."

And Bruce Johnson, partner in charge of AI at Arthur Andersen & Company, one of the Big Eight accounting firms, says that while the PC's ubiquity

makes it an appealing tool, the business problems he tackles have so far proved too challenging for it. "There are two difficulties," Johnson states. "One is that many problems, such as multiuser interaction in marketing applications, may require a centralized solution. The PC doesn't work for that type of problem. Second, when you find a problem that could be tackled with the PC, then you must look for a software product that will fit. What we're finding is that most of the software products today don't have the capacity to handle real problems, or that they don't let you interface with data bases or other software."

But with the introduction of the PC AT and the appearance of comparable machines such as Compaq's 286 models, the difference between personal computers and minicomputers is shrinking fast. Industry watchers predict that within about three years microcomputers will approach the power of today's $75,000 LISP and Symbolics machines (specialized minicomputers for AI development), making them increasingly attractive for AI applications.

One firm betting on this trend is Arity Corporation of Concord, Massachusetts. Headed by Peter Gabel, who was development manager of no less venerable a product than Lotus's *1-2-3*, Arity recently received a million dollars from Lotus and Boston's UST Capital Corporation for development of AI-based software for the PC. But rather than creating tools to build expert systems, Gabel's company is striking out for the next frontier: ready-made applications. Arity has already released a PC-based version of the AI language PROLOG, aimed at developers of AI software, and is working on several off-the-shelf applications.

Some observers believe that one of these products is an artificially intelligent variant of *1-2-3*, which would know how to help the user customize it. But Gabel denies this. "There certainly are a number of opportunities there, but we don't see those as the oportunities we'd really like to go after. We're building products that will incorporate a lot of AI technology–not so much expert systems as PC productivity tools that will focus on information management in general." Gabel won't say what these tools are exactly, but he hints at a new and flexible "knowledge base" manager that would surpass today's hidebound, record-oriented data base management programs.

Ghosts in the Machine

It's often hard to say what a top expert has that a mediocre expert lacks, but what all experts share is a storehouse of factual knowledge woven together by rules of thumb. For instance, a bank officer knows that an applicant's ability to repay a loan is often linked to his or her credit history, bank balance, and similar factors. By weighting and cross-referencing these criteria, the officer can reach a viable decision on whether to approve a particular loan.

This task could be automated with conventional computer languages such as COBOL or BASIC, because at some level every computer program is an expert system. But programs written in LISP or PROLOG, AI's main development languages, are far more powerful and flexible. Consisting of nests of statements and data that resemble a nightmarish algebra exam, AI programs can manipulate complex interrelationships more easily than can old-fashioned procedural programs. They are thus better able to leap between branches in a tree of knowledge, pass one set of assumptions on to another, and revamp their own contents without extensive reprogramming.

Because experts' reasoning processes tend to be similar across disciplines, however, expert systems are seldom written from scratch. Instead, programmers use generic shells, or frameworks, that supply the appropriate "consultation paradigm," which is usually diagnosis or prediction. These shells have two essential components, both invisible to the user but important to understand.

One, the knowledge base, consists of facts linked by IF . . . THEN rules. These are supplied by the person who builds the expert system, usually with the help of a programmer called a knowledge engineer. The practical rules-of-thumb, known as heuristics, narrow down a search through the knowledge base in much the same way that a human expert eliminates unpromising avenues of inquiry. The sophistication of the program and the speed and memory size of the computer determine how many rules the expert system can encompass. But size isn't necessarily critical. Many useful expert tasks–even relatively costly ones–can be expressed in just a few dozen rules.

Driving this fact-and-rule apparatus is the "inference engine," the part of the program that crunches logic. While humans draw conclusions by various methods–logic, association, imaginative leaps, and perhaps other ways not yet identified–most inference engines function at a primitive logical level, using principles familiar to every student of freshman symbolic logic. ("All men are mortal; Socrates is a man; therefore, Socrates is mortal" is a classic example of *modus ponens,* the most basic and frequently used syllogism.) This elementary approach isn't necessarily a handicap, since even thorny expert problems usually require only the simple matching of conditions and solutions.

Complex and irrational realms like the stock market are too chancy to model, at least in their entirety–especially on a PC.

Another task of the inference engine is to control the order of reasoning. The most common order is "backward chaining"–reasoning backward from a result such as "the car won't start" to figure out the causes. When chaining backward, the inference engine usually asks questions in an order that eliminates the most global, frequent, or easily cured ills ("Are you out of gas?") before proceeding to more technical or unlikely causes ("Has someone stolen the distributor cap?").

Also embedded in some inference engines is one of expert systems' most powerful features–the ability to draw conclusions from uncertain or sketchy data. This power to use "fuzzy sets" lets the computer transcend its usual obsession with certitude to make seat-of-the-pants guesses, much as humans do. By specifying rough "certainty factors" (expressed as percentages or as points on a graphic scale), a user can adjust the strength of an assumption from "true" or "false" to various shades of "maybe." ("If the suspect's car is at the crime scene, it is 70 percent certain he is still in the area" might be one such assumption.) When the program is run, the inference engine interpolates the certainty factors to come up with one or more weighted conclusions.

Shell Game

Tempting as this power is for prognosticators, at present only problems that are sufficiently empirical, such as those in engineering or medicine, or that involve structured selection, such as catalog searching and equipment configuration, are good candidates for expert systems. Complex and irrational realms like the stock market are too chancy to model, at least in their entirety–especially on a PC.

To judge whether a PC-based expert system shell might be appropriate for a task you'd like to perform, Teknowledge, developer of the expert systems tool kit *M.1* for the PC and of specialized applications for large companies, recommends giving your problem the "telephone test." Says Rosann Stach, Teknowledge's corporate development manager, "Think of something you can explain on the telephone in 15 minutes without using graphics or other visual aids; it'll probably fit on a PC. But if it takes 4 hours to explain (which means it probably requires several thousand rules), or if it requires sensory input such as temperature measurement, then it probably won't fit."

PC-based shells occupy several tiers of complexity and difficulty. Some virtually require that the system builder be a programmer, while others are accessible to casual users. But at run time, almost all

Choosing an Expert System Shell

Not all expert tasks can be modeled on a computer, no matter what the computer's size. At present, the best candidates for computerization are highly empirical tasks, such as weather forecasting or machine repair. Also suitable are structured selection problems such as equipment configuration or choice of a computer system.

Hardware. Although a few products will run on a PC or compatible with as little as 128K of RAM, most expert systems hit their stride around 640K, the upper range of PC memory. The shells themselves are large, and the data and rules you add also fill considerable space, making a hard disk desirable. Among personal computers, the PC AT and its compatibles come closest to the speed and RAM needed by full-scale expert systems. Even so, by current AI standards most programs that run on them are limited.

Size of knowledge base. Expert systems shells vary widely in the number of rules they can accommodate or create. Generally speaking, the more rules, the more powerful a program, although some sophisticated tasks can be handled quite well by a surprisingly small number of rules, perhaps only a few dozen. The hardware constraints of the PC and XT limit most rule bases to fewer than 500. By comparison, mainframe computers can handle several thousand rules. If your problem requires only a few dozen rules, however, a less expensive and less complex program for the PC might fill the bill.

Inference engine. Different tasks rely on different analytical models, such as diagnosis, prediction, control, repair, or instruction. No single program can be all things to all people. Currently, most PC-based expert-system shells tend toward diagnosis and planning. If you do other work, they may not suit your purposes. Likewise, some programs are forward chaining (they reason from present conditions to a likely outcome), although most are backward chaining (they reason from the outcome to its causes). Programs also vary in their ability to tolerate uncertainty. This capability can be valuable in activities such as prediction, where even the best estimates are rough or more than one possible answer exists.

Time and cost. Program cost, which varies from $50 to $15,000, is not necessarily linked to power or ease of use. Generally, the more complex and expensive tools require significant training to use, yet their results may not be any better than those achieved with a cheaper, easier-to-learn program—especially if the task is modest. Since both low-end and high-end products are generally used for modeling, a program with a limited range of features may be less confusing for a first-round effort. And the cost should be appropriate to the task. For example, a stock brokerage would probably not want to use a $200 PC-based shell to model a multimillion-dollar investment strategy, but a sole proprietor might find such a program useful for tax planning.

simulate natural-language question-and-answer sessions, using phrases the system builder has supplied. If a user doesn't understand the reasoning behind an inquiry, most programs will display the applicable rules on demand.

Deductive, rule-based systems like *M.1* are the most versatile types of shells, but they are also the most difficult to work with because they require the builder to formulate knowledge as IF ... THEN rules. This may present a challenge for people who have difficulty articulating what they know. Many products use menus to guide the development process, while some programs, including *M.1,* use more flexible but harder-to-learn command languages similar to *dBASE II*'s.

Enterprising developers are certain to create expert system modules and market 'run-time' versions of them—stand-alone programs that already contain data and do not require users to have the tool-kit software.

Whereas most programs force you to discover rules yourself, inductive systems like *Expert-Ease* and *RuleMaster* distill these rules from the case histories you enter—a boon for nonprogrammers. *Expert-Ease* has been used to find patterns in research data and to streamline manufacturing. One drawback to the inductive method, however, is that you must be sure the cases represent every applicable contingency (for example, the upper and lower income requirements for approving a home loan). If you don't have a clear idea of these criteria to begin with, you can never be sure you've entered enough examples.

A third category of program, generally called decision-modeling software, consists not of expert systems but of ready-made applications with some AI talents. These programs, including *Lightyear,* from Lightyear, Inc., of Santa Clara, California, and *Arborist,* from Texas Instruments of Dallas, evaluate the pros and cons of any alternative according to weights you supply. For example, they might help you compare different models of cars. Yet because they have no built-in knowledge about car buying, such programs couldn't tell you whether your choice was practical. Thus, the real value of these decision modelers may be to document and help analyze the criteria by which a decision was reached.

Apart from their value in introducing AI concepts, PC-based expert system shells are breaking ground in another area. With these products professionals can for the first time create simple applications without the aid of programmers—thus avoiding what AI luminary Edward Feigenbaum has called the "knowlege acquisition bottleneck." This phrase refers to the tedious process by which a programmer extracts an expert's knowledge and installs it in a computer program. To date, this task has been the most daunting and expensive aspect of expert system development, not least because programmers who are skilled at both programming and extracting knowledge are in short supply.

Louis Roth, manager of materials system research at Westinghouse's R&D division in Pittsburgh, Pennsylvania, reports that his group chose PC-based expert systems precisely because such programmers are hard to find. Working with several products—including *Personal Consultant, Expert-Ease,* and *M.1*—materials engineers at Westinghouse have been building their own small knowledge bases since late 1984. When complete, these components will be uploaded to a LISP machine and compiled by AI programmers into a large, cross-disciplinary advisory system. Westinghouse plans to use this system to give structural engineers a far more vivid understanding of the building materials they use.

"Under the old systems approach," Roth says, "we had to fight the experts tooth and nail to pull information out of them. There was a lot of resentment because they didn't want their brains put in a box." Now, with engineers designing their own expert systems, everybody profits. Westinghouse gains permanent "fingerprints" of the engineers' knowledge, and, Roth asserts, the engineers "develop a more coherent view of what they know and don't know, which helps them think more clearly."

Commercial software developers are likely to use the expert systems tool kits in a similar way. Just as a mini-industry has grown up around specific applications written with *dBASE II*, enterprising developers are certain to create expert system modules and market run-time versions of them–stand-alone programs that already contain data and do not require users to have the tool-kit software.

Limitations

For scientists, expert systems' potential to gain a wider view–to pool expertise and to cope with increasingly complex specialties–is one of the main attractions. "Our field is very complex, and it's hard to keep it all in your head," says Neil Pessall, a colleague of Roth's at Westinghouse who specializes in metal corrosion in nuclear steam generators. Far from feeling threatened by expert systems, he believes these programs will free him from having to memorize large bodies of information. "Eventually," Pessall notes, perhaps in jest, "an expert will be a person with a portable computer and a box of disks."

But seasoned AI programmers are rather more skeptical. Not every field of knowledge can be modeled on a computer, and it is costly, if not impossible, to model more than 80 or 90 percent of most specialized fields. What's more, most expert systems are still islands unto themselves, unable to link up with other software or data. Developers are just beginning to harness expert systems to software written in the C language, giving an AI boost to traditional computing tasks. But a heftier challenge is that of tying up to external data bases, which lack innate logical hooks (such as "a sloop *is a type of* sailboat") for the knowledge system to grasp. Until some way is found to automate the assignment of these hooks, massive data bases will have to be hand-edited to supply the missing links–a Herculean undertaking.

Perhaps more to the point, some observers wonder whether reliance on expert systems is even a good idea. Despite their mystique of infallibility, computerized experts are currently no more accurate than human ones, and they may never be. Will false confidence in intelligent machines make decision makers lazy and, worse yet, able to avoid responsibility for mistakes? Will use of these tools smooth over incompetence, letting mediocre performers masquerade as stars? "The big promise of expert systems was that thinking would no longer be necessary," software developer Gary Martins of Intelligent Software remarked at a recent AI conference. "You talk to experts, you frame the talk in IF . . . THEN rules, you put those rules in the knowledge base, and zing! out comes astonishing performance. Well, that's just palpably absurd."

"An expert system should never, ever be used as anything other than a tool," cautions Harvey Newquist, editor of *AI Trends*, an industry newsletter. "If a doctor tells you you're going to die in 15 minutes, you still want a second opinion."

As for PC-based systems, some critics claim that many are little better than high-priced novelties. Today's shells range in price from $15,000 for the PC AT version of *RuleMaster* to $49.95 for McGraw-Hill's new *MicroExpert*, yet the power they bestow is not all that disparate. "All of them have to be regarded as entry-level products," says Newquist. "Some are mere toys and can do little tiny things. Some are very practical for small applications. But you've got to remember that a PC is limited by how small it is. If you want something bigger, something that's going to analyze medical problems, for example, you're going to have to go up to a DEC VAX or an IBM 4300 [both minicomputers], or something larger."

Like Newquist, Martins cautions buyers not to be bamboozled by the trendiness of artificial intelligence. "There is a substantial niche for PC-based programs," he says. "But as that niche begins to be populated, you'll find really good products coming from the traditional PC suppliers, who will see that this market is becoming real and will jump in with good tools for $150 instead of fad tools for $15,000. The mythology is that all this stuff is based on some deep, heavy, esoteric science that only a few Ph.D.'s can understand. But the truth is, if you take the covers off those machines, there are some pretty simple-minded programs inside."

Janet Goldenberg is a freelance writer based in San Francisco.

(continues)

Expert System Shells

Exsys
Exsys, Inc.
P.O. Box 75158, Contract Station 14
Albuquerque, NM 87194
505/836-6674
List price: $200, demo disk $10
Requirements: for "small memory" version 128K, DOS 1.10 or 2.00; for "large memory" version 192K, DOS 2.00; one disk drive (hard disk recommended)

Comments: Exsys allows up to 400 rules with 128K and 3000 rules with 640K. It is menu-driven and designed for non-programmers; it tolerates uncertainty and can explain why a decision was made.

Expert-Ease
Human Edge Software Corp.
2445 Faber Pl.
Palo Alto, CA 94303
415/493-1593
Jeffrey Perrone & Assoc.
3685 17th St.
San Francisco, CA 94114
415/431-9562
List price: $695
Requirements: 128K, one disk drive (hard disk recommended)

Comments: Developed by Donald Michie, director of Scotland's Turing Institute, Expert-Ease is an outgrowth of Michie's quest to automate the knowledge-engineering process. Unlike most other shells, Expert-Ease works by induction, extracting rules from examples the system builder enters. It is menu-driven and easy for beginners to use but limited in application. (For example, it does not allow certainty factors.) Expert-Ease runs under the UCSD p-System and comes with a p-System utility for formatting data disks.

Insight 2
Level Five Research Inc.
4980 S. Hwy. A1A
Melbourne Beach, FL 32951
305/729-9046
List price: $495
Requirements: 128K (256K recommended), DOS 2.00, one disk drive

Comments: An expanded, upgraded version of Insight, Insight 2 has a Pascal interface that can manipulate data files in dBASE II. Both versions use a proprietary language called PRL (Production Rule Language) to formulate expert rules, which can then be applied through simple menus. Maximum rule base in both versions is 615 rules with 128K, 1800 rules with 256K, with certainty factors allowed.

KDS
KDS Corp.
932 Hunter Rd.
Wilmette, IL 60091
312/251-2621
List price: Development System $795, Playback Utility $150, Playback Module (for users of prefabricated applications) $495
Requirements: playback mode 192K, development mode 256K; DOS 2.00; two disk drives (hard disk recommended)

Comments: Written in assembly language, KDS allows for an exceptionally large rule base—up to 16,000 rules per knowledge module. Menu-driven, it lets you enter rules in conversational English and guides you through the process of distinguishing one IF ... THEN instance from another. It performs forward or backward chaining and can drive external programs in DOS.

Knowledge Engineering System (KES)
Software Architecture & Engineering, Inc.
1500 Wilson Blvd. #800
Arlington, VA 22209
703/276-7910
List price: $4000
Requirements: IBM PC XT or AT with 512K (640K preferred), 8087 math coprocessor

Comments: This rule-based, backward-chaining program can write knowledge bases that exceed available RAM, thus supporting relatively large prototype systems. A subset of the program, Micro-PS, is faster and will run with 128K.

M.1
Teknowledge Inc.
525 University Ave.
Palo Alto, CA 94301
415/327-6600
List price: $10,000, recommended training $2500, M.1a $2000
Requirements: 192K, DOS 2.00, two disk drives

Comments: Oriented toward programmers, M.1 is among the more powerful, flexible tools for creating small applications. It typically forms a maximum of about 200 backward-chaining rules using a dBASE-like command language. M.1 allows certainty factors and can show how decisions were made. Interface utilities can link M.1 to external

software or data bases or to information-gathering devices via an RS-232C port. M.1a, an evaluation package for nonprogrammers, can be used to create rudimentary applications.

MicroExpert
McGraw-Hill Book Co.
Professional & Reference Division
1221 Avenue of the Americas
New York, NY 10020
212/512-2000
List price: $49.95
Requirements: 128K, DOS 2.00, one disk drive

Comments: MicroExpert uses rules, which can be written with any standard word processor, to produce small, functioning expert systems that will tolerate uncertainty. A sample program included in the package deduces tree species from leaf types.

Personal Consultant
Texas Instruments, Inc.
Data Systems Group
P.O. Box 809063
Dallas, TX 75380
800/527-3500
List price: $3000, product training course $1500
Requirements: 512K, DOS 2.10, 10MB hard disk

Comments: This menu-driven development tool allows up to 400 rules, created through question-and-answer interaction. A built-in IQLISP module lets programmers link a system to standard DOS business software. Personal Consultant allows certainty factors and answers queries about its reasoning.

RuleMaster
Radian Corp.
8501 Mo-Pac Blvd.
P.O. Box 9948
Austin, TX 78766
512/454-4797
List price: for PC or XT version $5000, for AT version $15,000
Requirements: 256K; with PC XT, DOS 3.00 or PC/IX; with PC AT or compatible, DOS 3.00, PC/IX, or Xenix; with PC, two disk drives

Comments: This menu-driven tool lets nonprogrammers create rules from examples; advanced users can write rules from scratch using Radial, RuleMaster's proprietary development language. RuleMaster allows both backward- and forward-chaining inference. Systems will explain reasoning on demand and can handle uncertainty. RuleMaster accepts input from sensory devices, data bases, or any language running under UNIX—including FORTRAN, Pascal, C, LISP, or PROLOG.

TIMM-PC (The Intelligent Machine Model)
General Research Corp.
7655 Old Springhouse Rd.
McLean, VA 22102
703/893-5915
List price: $9500 including training (additional licenses available at a discount)
Requirements: 640K, 10MB hard disk, 8087 math coprocessor (80287 math coprocessor with PC AT)

Comments: Originally designed for minicomputers and mainframes, TIMM-PC guides nonprogrammers through question-and-answer sessions that elicit examples and information. From these, TIMM-PC deduces rules that a developer can modify until the system works properly. TIMM-PC handles uncertainty and can define unfamiliar terms. It allows 90 rules per expert system in the primary knowledge base, and can link any number of expert systems together, provided that their cumulative knowledge base does not exceed 500 rules.

Decision Modeling Software

Arborist
Texas Instruments, Inc.
Data Systems Group
P.O. Box 809063
Dallas, TX 75380
800/527-3500
List price: $595
Requirements: 512K, DOS 1.10 or 2.00, graphics controller, 10MB hard disk (8087 math coprocessor optional)

Comments: Not an expert system but an automated version of the decision tree analysis method taught at business schools, this menu-driven program allows graphic representation of branchings and can indicate certainty factors numerically or on a pie chart.

Lightyear
Lightyear, Inc.
1333 Lawrence Expwy.
Santa Clara, CA 95051
408/985-8811
List price: $495
Requirements: 192K, DOS 2.00, two disk drives

Comments: This menu-driven program lets you rank and compare strategic alternatives, using conditional branching and certainty factors. Certainty can be expressed in words, numbers, or on a graphic scale.

A Model for Peaceful Coexistence

Richard L. Nolan

An accomplished data processing analyst assesses the personal computer's place in the corporate scheme of things.

If you've ever had the pleasure of running a computer department, you probably know well that managing the machines is a business unto itself. All the principles of manufacturing, marketing, accounting, and research apply; you're also subject to such traditional business foibles as loss of control, noncompetitive costs, resistance to change, and complacency.

Data processing (DP) professionals–those among us charged with administering computer resources–now face our toughest leadership challenge: managing amid a technological sea change. This period of discontinuity, which commenced in the early 1980s, will in all probability last from five to seven years. Whatever their size or field of endeavor, organizations experience such dislocation as they move from the "DP Era" to the "Micro Era."

This transition occurs in reasonably well defined, predictable stages. In the model sketched in Figure 1, Stage IV–Integration–represents the Micro Era's first phase, during which organizations learn to manage such technologies as personal computing, computer-aided design, and office automation. The key challenge is fostering peaceful coexistence between established mainframe approaches and ascendant microcomputer strategies–and doing so, in some corporations, even as microcomputers attain critical mass. The period of overlap involves both recasting the DP department's function and giving business users responsibility for applications development and maintenance. For the DP organization, such a shift initially means decentralization.

Replacing a dominant technology with one that is improved but still evolving is scarcely a novel phenomenon. Precisely the same pattern characterized the aircraft industry during the early

1950s, as some companies recognized that the internal combustion engine wouldn't suit the next generation of airplanes. Boeing and Douglas made the transition to the turbojet before Lockheed, previously the industry leader. Foresight and insight enabled these two aircraft pioneers to reap early benefits from turbojet technology, and both dominated the commercial aircraft market throughout the 1960s and 1970s.

The race among organizations to absorb technology marks the course of history, from steam power stealing the wind from sailing ships to Michelin's radial tire technology supplanting bias ply. For today's managers the lesson concerns the importance of leadership and timing.

When DP departments attempt to serve newly enfranchised PC users, they plunge headlong into rough water, often losing control during the struggle to implement an alien and frequently misunderstood technology.

The winners will be companies that successfully manage their computer investments during this tumult. The flip side involves DP managers who react inappropriately to problems of hardware and software control. Some, for example, attempt to prevent the proliferation of personal computers by zealously duplicating PC software on mainframes. The enlightened approach entails assessing the unique attributes of the fresh technology and aligning it with the company's business objectives.

Ironically, the DP organization itself is often the main barrier to a smooth transition. Management information systems (MIS) managers understand the older, more mature technology, while newer technologies are by definition associated with risk control and management uncertainties.

Technological discontinuity is a known organizational issue–it doesn't explode on the scene spontaneously, without warning. To avert the negative consequences of change, the DP manager must keep an open mind and foster a similar outlook within the MIS department. Indeed, the entire DP community should encourage a

"learning" environment throughout the company and provide minimum control–but vigilantly monitor computing resources to ensure that DP control isn't abandoned altogether.

During the transition, senior management often depends on DP department leadership to choreograph a diverse array of technologies. Yet direct, top-level monitoring typically fails to accompany the leadership role. This responsibility without authority invariably hamstrings the corporate DP director, who must rely on sophisticated mechanisms such as executive steering committees, corporate strategic plans, and detailed negotiation to achieve something approaching harmony.

During this period of integration, micros and mainframes coexist, but fiefdoms persist. As microcomputers proliferate and pockets of technology open their contents to the company, the Integration stage begins to yield to the Architecture stage. That stage represents a maturing of technology; it's a period during which the company prepares a computer-based foundation for doing business–and comes to regard the word *computer* in its most generic sense. The terminology expands from mainframe parlance to all computer technologies. The organization begins to make decisions about which data bases and communications products are appropriate. While this evolution rarely means that all organizational units will report directly to an information systems department (where the seeds of proliferation took root), it usually triggers the hiring of a computer functional executive (CFE), who is assigned a leading role in the companywide coordination of computer technologies.

To succeed, the CFE must reshuffle the DP department, fashioning it into a central repository of essential expertise that can be shared among the company's organizational units. The reconstituted DP group should be charged with such functions as maintaining data bases for corporate finances, products, and customers. As a corporate utility, the DP department will also handle the communications that join the mainframes used for transaction processing, the PBXs (private branch exchanges) for voice communication, and the microcomputers that serve as workstations.

Finally, the microcomputer environment must mesh with, and find a secure niche in, the company's overall computer architecture for "doing business." In that way, peaceful coexistence among micros and mainframes can serve as a gateway to increased productivity. ●

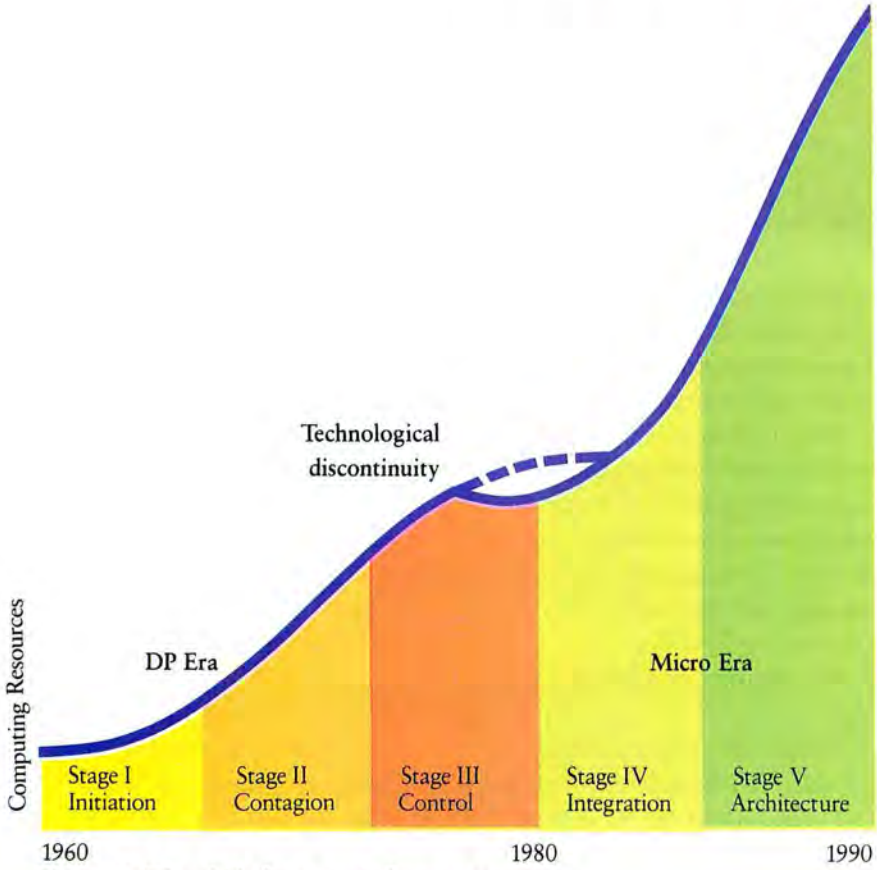
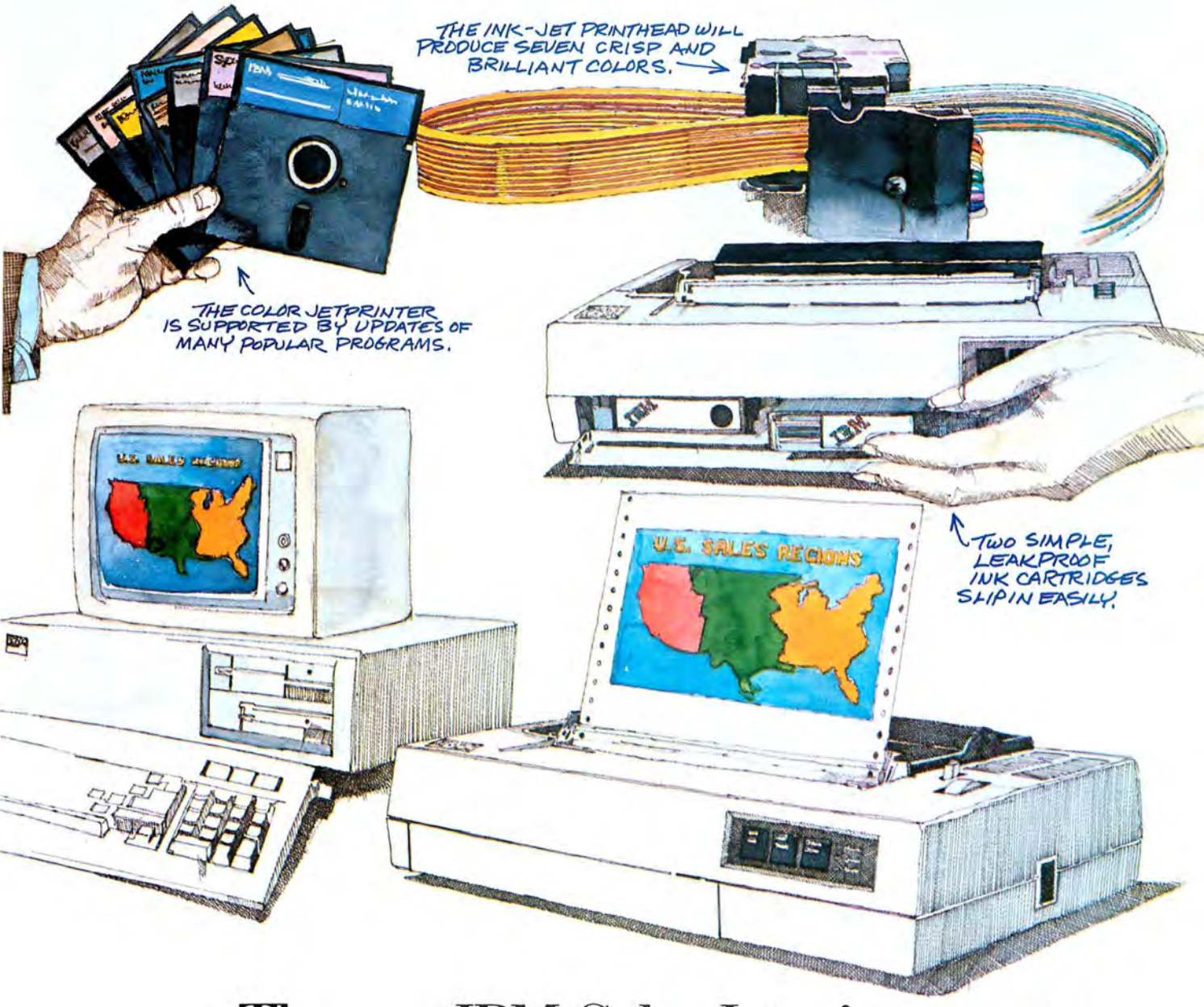


Figure 1: The shift from mainframes to micros often triggers a period of dislocation, as this schematic of the stages of computer growth indicates.

Richard L. Nolan heads Nolan, Norton & Company, a multinational management consulting firm based in Lexington, Massachusetts.



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Ted Nace

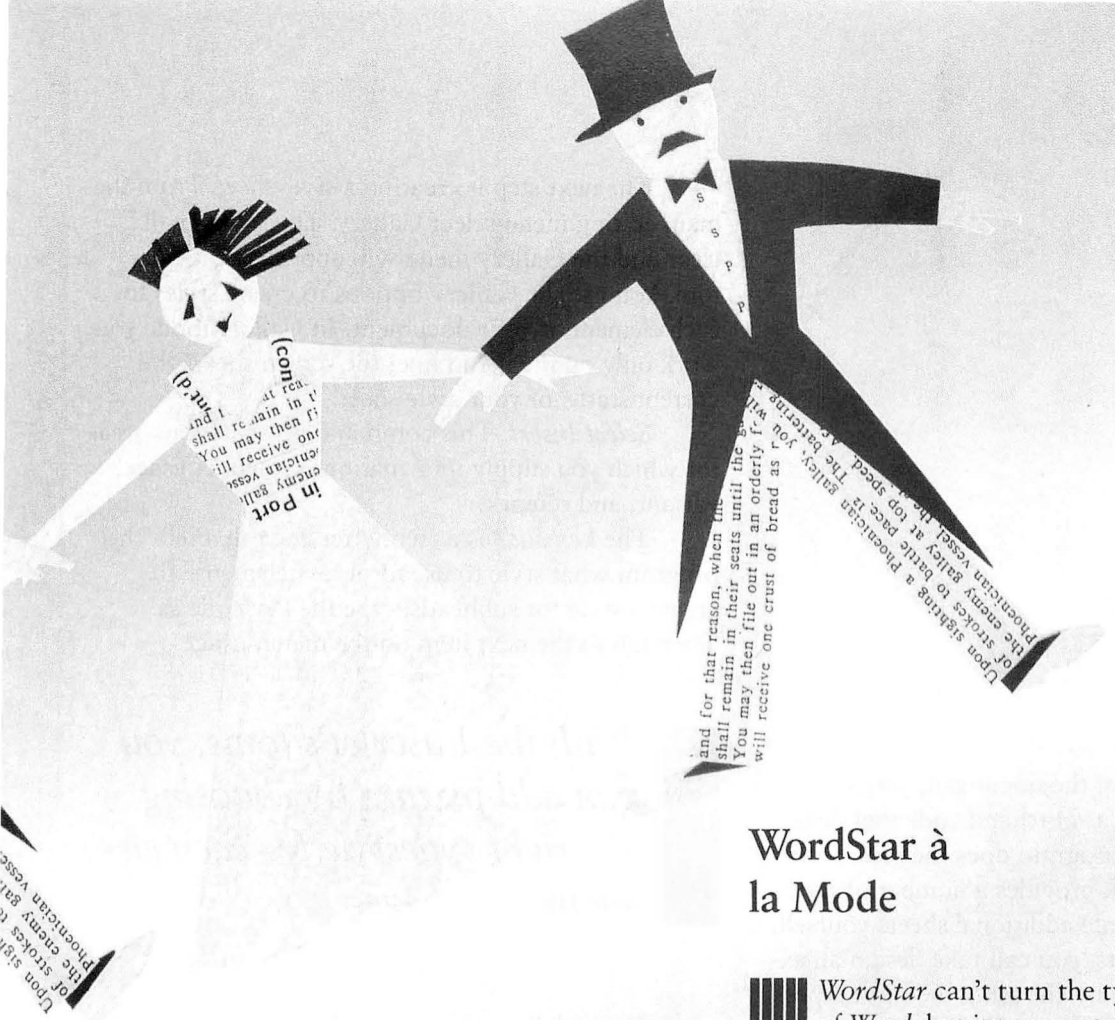
The Hewlett-Packard LaserJet is the first of a new generation of printers that are bringing a touch of typesetting to office desk tops. The LaserJet supplies a variety of proportionally spaced fonts that can spruce up your pages–if your word processor holds up its end.

Word processing programs are responsible for embedding codes in the text that give format instructions to the LaserJet. Almost any word processor can be configured to take advantage of laser printing; which one you use depends on how fancy you want to get. For simple documents such as letters and memos, a little tinkering with plain old *WordStar* will give you a variety of fonts that are as handy as the function keys.

To produce more sophisticated documents with such features as right justification and multicolumn pages, you'll need a program with powerful formatting capabilities. Many such programs are available, but *Microsoft Word* is the first designed from the ground up with laser printing in mind. A session with *Word* and the LaserJet hints at the future of office typesetting.

The following pair of articles will show how to get the most out of the LaserJet with *Microsoft Word* and *WordStar.*

Ted Nace is a freelance writer in Berkeley, California.



Setting the Style With Word

The LaserJet unleashes the page design possibilities latent in *Microsoft Word. Word* was introduced before the release of the HP LaserJet, but Microsoft anticipated the typographical powers of laser printers and planned the program accordingly. With *Word*'s style sheets and the LaserJet's fonts, you can create documents fit to be seen in the best company.

Word's style sheets use methods developed in professional typesetting to create the most effective and polished-looking documents with the least amount of effort. Once you decide how your document should look–whether you want paragraphs blocked or indented, headings centered or flush left, type boldface or light–you define those styles on a style sheet and forget about them while you type.

(continues on page 208)

WordStar à la Mode

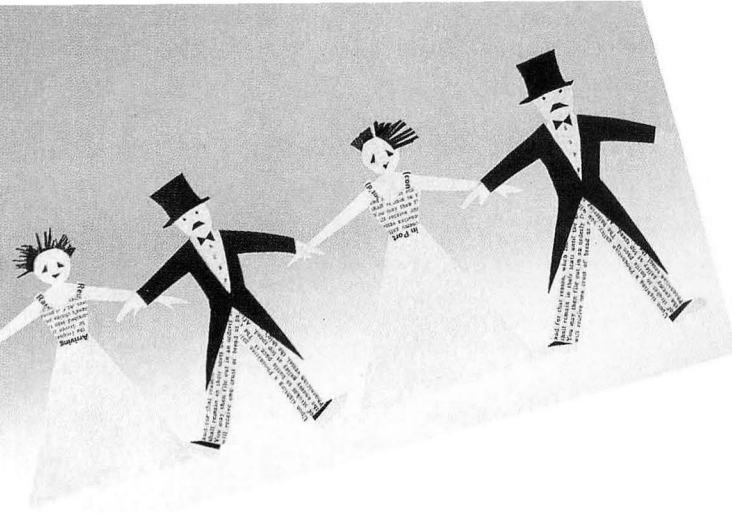
WordStar can't turn the typesetting somersaults of *Word,* but it too can take advantage of the LaserJet's changeable fonts. After completing the steps described below, you'll have two versions of *WordStar* you can easily switch between–one an unaltered version to use with a standard printer and one for special jobs using the LaserJet's 92286B proportional cartridge. You can rely on *WordStar*'s workaday power for all your in-house needs, then run your documents through the LaserJet to dress them up before sending them out.

Doubling Up

Before you begin, format a system disk (with the /S option of DOS's FORMAT command). Then copy the file MODE.COM from the DOS disk onto the new disk. Next, copy the following files from the the *WordStar* disk onto the new disk:

WS.COM
WSOVLY1.OVR
WINSTALL.OVR
WINSTALL.COM
WSMSGS.OVR
WS.INS

(continues on page 211)



Setting the Style With Word

(continued)

When it's time to format the document, you assign each element in the file a shorthand code that designates its style, and the program does the rest.

Word's utility disk provides a number of style sheets, and you can create additional sheets yourself. With the LaserJet's fonts, you can take design an extra step, adding pizzazz by choosing the right typestyle for each element on a page. Here's how.

Creating a Style

Look at the difference between the documents shown in Figures 1 and 3. Both contain the same information, but one presents it in more readable form by using a variety of formatting elements. These include varied left margins; centered elements; nonuniform vertical spacing; blocks of text aligned in tables; and different fonts for subheads, text, tables, and footnotes.

When using style sheets, you enter the text first and format it later. Begin by typing the document in Figure 1 exactly as shown and saving it. Do not use any extra tabs, spaces, or lines–the style sheet will take care of those. Any formatting you implement at this point would be incorporated into your document in addition to information from the style sheet.

The next step is creating a style sheet. From the main editing menu select Gallery. The screen will clear and the Gallery menu will appear at the bottom. You use the Gallery options to create styles for each element of your document. In Gallery mode you work only on the menu line; the screen shows the current status of your style sheet.

Select Insert. This command presents four areas for which you supply information: key code, usage, variant, and remark.

The *key code* is a two-letter code that tells the program what style to use for a text element. To create a style for subheads, type the key code **sh**. Then tab to the next item on the menu, usage.

With the LaserJet's fonts, you can add pizzazz by choosing the right typestyle for each element on a page.

Usage defines the text level the element occupies. *Word* divides all text elements into three categories: Division, Paragraph, and Character. *Division* formats control the page layout, including placement of headers and footnotes and number of columns to a page. *Paragraph* styles specify indentation, tabs, margins, justification, and typefaces for text elements such as paragraphs, headlines, footnote text, and tables–any element ending in <Enter>. *Character* styles identify the style of single characters. Select Paragraph as the usage for subheads. Then tab to the next item, variant.

The *variant* is the number *Word* assigns a style to distinguish between different elements that have the same usage, such as page headings and subheads, which are both paragraphs. In Figure 2, the variant is the number following the usage on the first line of each style. For example, Page Heading is variant 6 of the Paragraph usage category. *Word* will suggest a variant number; to accept the suggested number, just tab to the next item, remark.

The *remark* is strictly for your use, identifying different styles on the style sheet. It's helpful to capitalize remarks so they'll stand out. Type **SUBHEAD** and press **< Enter >**.

```
Galley Slave Instruction Manual - 6
2.2  Arriving in Port (cont'd)
and for that reason, when the ship arrives in port, all galley slaves
shall remain in their seats until the galley has come to a full stop.
You may then file out in an orderly fashion. At this time everyone
will receive one crust of bread as payment for the previous day's
work.
Table 2.2.3 shows your tasks during stays at port.

_____________________________________
Rowing position Task
Starboard fore  Patching holes with pitch
Starboard aft   Repainting fearsome designs
Port fore       Carrying food supplies
Port aft        Repairing pallets
table 2.2.3: tasks while in port

_____________________________________
2.3 Ramming Phoenician Vessels
Upon the sighting of a Phoenician galley, you will increase the
frequency of strokes to battle pace.12  The battering ram must be
driven into the enemy galley at top speed.  After the ship has smashed
into the Phoenician vessel, the ship's mate will unlock each slave's
chains and issue you a weapon so that you can fight for your lives. At
this point everyone shall commence jumping up and down and screaming:
"Kill! Kill!"
Galley Slave Tip: Think positive for hand-to-hand combat. Let your
pride show!
2.4 Rest Periods
All galley slaves are entitled to two rest periods per day in addition
to regular meal breaks. The rest periods are from 6:15 - 6:18 a.m. and
from 7:10 - 7:13 p.m.

_____________
12. Battle pace is defined as rowing like crazy.
```

Figure 1: During the initial entry of text that will be formatted by style sheets, you supply only the roughest formatting information, such as tabs and spaces between words. Type this page as shown.

```
1  PH Paragraph 6                                PAGE HEADING
       TMSRMN (roman a) 10/12 Italic. Flush left, space after 2 li. Tabs
       at: 0.5" (left flush).
2  SH Paragraph 1                                SUBHEAD
       HELV (modern i) 14/12. Flush left, space before 2 li, space after 1
       li. Tabs at: 0.5" (left flush).
3  MT Paragraph 3                                MAIN TEXT
       TMSRMN (roman a) 10/12. Justified, Left indent 0.5", right indent
       0.5", space after 1 li.
4  TL Paragraph 8                                UNDERLINING
       Courier (modern a) 12 Underlined Double underlined. Justified, Left
       indent 1", space after 1 li. Tabs at: 5" (right flush).
5  TC Paragraph 7                                TABLE COLUMN HEADS
       TMSRMN (roman a) 10/12 Bold. Flush left, Left indent 1.5", space
       before 1 li. Tabs at: 3.2" (left flush).
6  TT Paragraph 4                                TABLE TEXT
       TMSRMN (roman a) 8/12. Flush left, Left indent 1.5". Tabs at: 3.2"
       (left flush).
7  TH Paragraph 5                                TABLE HEADING
       TMSRMN (roman a) 10/12 Bold Uppercase. Justified, Left indent 1",
       space before 2 li. Tabs at: 5" (right flush).
8  FR Character 1                                FOOTNOTE REFERENCE
       TMSRMN (roman a) 8 Superscript.
9  GT Paragraph 9                                GALLEY SLAVE TIP
       TMSRMN (roman a) 10/12 Italic. Centered, Left indent 1.5", right
       indent 1.5", space after 1 li.
10 FT Paragraph 2                                FOOTNOTE TEXT
       TMSRMN (roman a) 8/12. Flush left.
11 S/ Division 1                                 STANDARD DIVISION
       Page break. Page length 11"; width 8.5". Folios Arabic. Top margin
       1"; bottom 1"; left 1.25"; right 1.25". Top running head at 0.5".
       Bottom running head at 0.5". Footnotes on same page.
```

Figure 2: The complete style sheet for the Galley Slave Instruction Manual

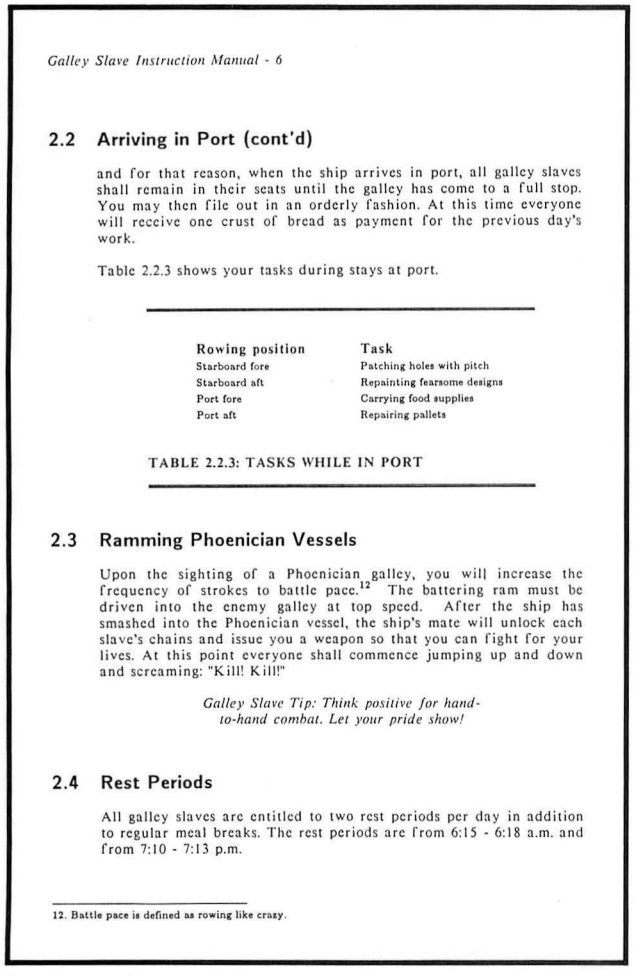
After you enter the remark, the style specifications will appear on the screen. Note that the second line of the style definition contains default information provided by *Word*. Your next step is to replace these defaults with a description of how this element should look. Select the Format option from the Gallery menu. *Word* will display a menu of settings that you must complete. For Paragraph usages, *Word* asks for Character, Paragraph, and Tab settings.

Select Paragraph. You'll use the defaults for the first three lines of options, so simply tab to 'space before' and type **2 li.** Tab to 'space after' and type **1 li.** These commands define the space surrounding the element. Press **< Enter >**.

Now select Format Tabs Set, type **.5"**, and press **< Enter >**. This defines a ½-inch indent for any tabs used in subheads.

To select a typeface for this style, select Format Character. Then tab to 'font name' and use **< CursorRight >** to reveal the choices. Use a cursor control key to highlight Helvetica. Then tab to 'font size' and press **< CursorRight >** to reveal the only choice, 14 point. Press **< Enter >**.

Now the subhead style is complete. Figure 2 shows a complete style sheet used to format the document in Figure 1; the style you just created appears as style 2. Create each style on the sheet the same way. When all the styles are defined, select Transfer Save from the Gallery menu and give the style sheet a name.



Galley Slave Instruction Manual - 6

2.2 Arriving in Port (cont'd)

and for that reason, when the ship arrives in port, all galley slaves shall remain in their seats until the galley has come to a full stop. You may then file out in an orderly fashion. At this time everyone will receive one crust of bread as payment for the previous day's work.

Table 2.2.3 shows your tasks during stays at port.

Rowing position	Task
Starboard fore	Patching holes with pitch
Starboard aft	Repainting fearsome designs
Port fore	Carrying food supplies
Port aft	Repairing pallets

TABLE 2.2.3: TASKS WHILE IN PORT

2.3 Ramming Phoenician Vessels

Upon the sighting of a Phoenician galley, you will increase the frequency of strokes to battle pace.[12] The battering ram must be driven into the enemy galley at top speed. After the ship has smashed into the Phoenician vessel, the ship's mate will unlock each slave's chains and issue you a weapon so that you can fight for your lives. At this point everyone shall commence jumping up and down and screaming: "Kill! Kill!"

Galley Slave Tip: Think positive for hand-to-hand combat. Let your pride show!

2.4 Rest Periods

All galley slaves are entitled to two rest periods per day in addition to regular meal breaks. The rest periods are from 6:15 - 6:18 a.m. and from 7:10 - 7:13 p.m.

12. Battle pace is defined as rowing like crazy.

Figure 3: By applying preset formats to each text element, you can easily create complex formats.

Applying Styles to Documents

Once you've created the document shown in Figure 1 and the style sheet shown in Figure 2, you can combine the two. The first step is to attach the style sheet to the document. To do this, select Format Style Sheet, press **< CursorRight >** to see the names of the style sheets on your disk, highlight your choice, and press **< Enter >**.

Next you must label each element in the document with the key code of the appropriate style. Before you do, though, select Window Options and then pick Yes for 'style bar' so that key codes will be displayed as you select them.

There are two ways to assign a style to a text element. The first is via the menu. To format a subhead, for instance, you would select Format Style Paragraph, use **< CursorRight >** to select variant 1, and press **< Enter >** to enter your choice. Alternatively, you can simply put the cursor on the subhead and type **< Alt > -sh.**

Once the subhead is labeled, *Word* knows to print it in 14-point Helvetica, flush left, preceded by two blank lines, and followed by one blank line. You can now move through the entire document, labeling each element with the appropriate style from the attached style sheet. When each part is labeled, print it on the LaserJet. The result will look like Figure 3.

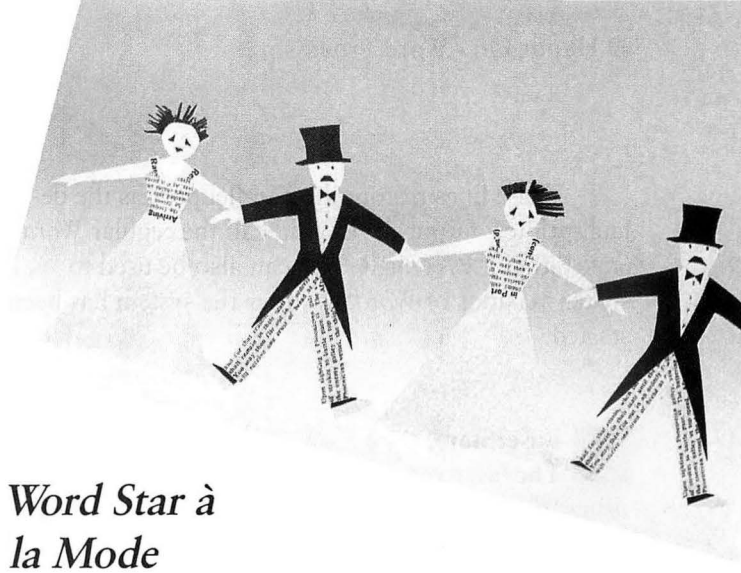
Practice Makes Perfect

Using style sheets may seem laborious at first, but with practice it becomes second nature. You'll soon find that creating documents is much easier when you separate the work of creating text from the job of formatting it. Most documents pass through several stages. In the first few rounds you're concerned with editing and proofreading. For this stage you can either use no style or create a very simple style, such as double-spaced Courier, for all text elements. When you finally format the document, the formats established in the style sheet will standardize elements within the document, producing a clean and professional piece. If you want to fine-tune certain elements, such as subhead indentation or table tabs, you can alter these details a single time in the style sheet rather than labor over individual elements throughout the document.

Translating the typographic power of laser printers and *Word* into professional-looking output takes some practice and creativity. But in return for your efforts, you'll gain control over the visual factors that are all too often the missing ingredient in written communications.

LaserJet
Hewlett-Packard
Personal Computer Group
11000 Wolfe Rd.
Cupertino, CA 95014
800/367-4772
List price: with one font cartridge $3495, extra cartridges $99 each
Requirements: one serial port

Microsoft Word, version 2.0
Microsoft Corp.
10700 Northup Way, Box 97200
Bellevue, WA 98009
800/426-9400, 206/828-8080
List price: $375
Requirements: 192K, two disk drives, DOS 2.00 or later version



Word Star à la Mode

(continued)

Use the new disk to make your changes. (This article assumes you're using a floppy disk system; you can also use the files on a hard disk if you have the original disks as a backup.) After you finish the modification procedure, the new disk will contain two versions of the WS.COM file–a laser printer version named LWS.COM and a regular version, RWS.COM–and three batch files: AUTOEXEC.BAT, L.BAT, and R.BAT.

When you start up, the AUTOEXEC.BAT file will ask which version of *WordStar* you want to use–the regular version or the laser version. After you type L or R, the L.BAT file or the R.BAT file will automatically configure the PC's printer port and activate either LWS.COM or WS.COM.

Batch Recipes

You can use *WordStar* itself to create the three batch files. Type **N** from *WordStar*'s main menu to create a nondocument (unformatted) file. When *WordStar* asks for the name of the file, type **autoexec.bat.** Then type the following file contents:

```
ECHO Which WordStar version do you want to use? LaserJet (L)
or regular (R)?
```

Save the AUTOEXEC.BAT file, then create another nondocument file and name it L.BAT. Type

```
mode com1:9600,n,8,1,p
mode lpt1: = com1:
lws
```

These lines set the parameters required for the PC to send data to the LaserJet through the serial port and call your LaserJet-tailored version of *WordStar.*

Save the L.BAT file and open a third nondocument file. Name it R.BAT and type

```
mode lpt1:
ws
```

These lines restore the parallel port as the default printer output device and call the regular *WordStar*. Either L.BAT or R.BAT can also be used to switch versions of *WordStar* after the system has been started.

LaserStar

The laser version of *WordStar* that you create using Winstall will differ from the regular version in several respects. It will automatically send an *initialization code* to the LaserJet prior to each printing job, causing the printer to use 10-point Times Roman until it receives the code for a different font. After printing ends, the program will send a *deinitialization code*, which resets the printer to its default font, 12-point Courier.

The first five function keys on the PC will be programmed with codes allowing you to switch between the five proportionally spaced fonts on the 92286B cartridge: Times Roman in 8-point, 10-point, 10-point italic, and 10-point bold; and 14.4-point Helvetica bold. Using Helvetica for headlines or titles, 10-point Times Roman for body text, and 8-point Times Roman for footnotes and tables produces professional-looking, readable documents.

Winstallation

The Winstall utility on the *WordStar* disk lets you customize the program. Codes and other information that you plug into Winstall to create "LaserStar"–the LaserJet version of *WordStar*–are summarized in Figure 1. To use Winstall, type **winstall ws.**

Winstall will ask what drive your *WordStar* files are located on. Type **A**:. When Winstall asks the name of the file to install, type **ws.com.** When you're asked for the name of the file for the installed version, type **lws.com.**

From the main Installation menu, select **D**, Custom Installation of Printers. This takes you to the Printer Installation menu. Select **C** (Printer Name), and type **HP LaserJet.**

When Winstall returns you to the Printer Installation menu, select **D**, Initialization. When prompted, enter the initialization code shown in Figure 1. Since the code is a sequence of hexadecimal numbers, precede each entry by a comma to distinguish it as hexadecimal. After the last number is entered, type a period and press **< Enter >** to finalize the change. Then enter the deinitialization code in the same manner.

Again at the Printer Installation menu, select **G** to display the Protocol menu and choose option **A**, Protocols Handled Outside WordStar.

From the Printer Installation menu select **O**, User-Defined Functions. *WordStar* allows you to define four printer functions according to your needs. Enter the hexadecimal codes shown in Figure 1 for ^PQ, ^PW, and ^PE. You can leave ^PR empty.

After returning to the Printer Installation menu, select **X** to return to the main Installation menu. Then select **E**, Menu of WordStar Features. From this menu select **S**, Function Keys.

You'll need to enter codes for five function keys and provide the names you want to appear on the menu. Figure 1 shows the codes, which can be entered as ASCII characters, and suggests function key labels.

Why insert the user-defined functions (^PQ, ^PW, and ^PE) into the function key codes instead of assigning the codes directly to the function keys? This seemingly roundabout method is necessary for two reasons. First, *WordStar* routinely discards any <Esc> (1B hex) characters it encounters unless they are "hidden" in the user-defined functions. Second, function keys can contain only six characters–too few to accommodate the lengthy codes required for switching between fonts.

After coding the function keys, type **X** to leave the Function Key menu, **X** to leave the Installation menu, and **X** again to leave Winstall. Finally, at the Exit Options menu press **A** to save your changes.

New Challenges

That's it. You now have a version of *WordStar* that lets you change fonts merely by pressing a single function key. Unfortunately, this new flexibility in changing typefaces leads to complications elsewhere, especially in setting margins.

Two types of margin problems can surface. The first is caused by the codes inserted in your text for switching fonts. Although the codes are not printed, they affect your margins because *WordStar* counts them as text characters.

The best solution to this problem is to make any font changes after the document is formatted. Once you establish the margins, turn off word wrap

Printer Installation Menu

C Printer name	HP LaserJet
D Initialization	
Initialization code	1B 28 30 55 1B 28 73 31 70 31 30 76 73 42
Deinitialization code	1B 28 38 55
G Protocol	A (none–handled outside WordStar)
O User-defined functions	
^PQ	1B 28 73
^PW	73 37 42
^PE	31 30 76

Menu of WordStar Features

S Function keys	Code	Description
A <F1>	^PQ^PEsB	TR10
B <F2>	^PQ8V	TR8
C <F3>	^PQ^PE1S	TR10it
D <F4>	^PQ^PE^PW	TR10bo
E <F5>	^PQ14V	Helv

Figure 1: A summary of WordStar modifications to create "LaserStar"

(**<Ctrl>-O W**) and insert the printer codes with the newly programmed function keys. The lines containing code will look too long on the screen but will print out correctly.

The other problem is the irregular left margin that may result when you use several typefaces in one document. This happens because font selection affects not only characters but also the width of spaces and margins. The width of the left margin is determined by the last font used. For example, if most of the text is in 10-point Times Roman but one line ends with a word in 8-point Times Roman, the next line will have too narrow a left margin since the margin is set for a smaller font. To prevent this problem, make sure that all lines end in the same font. If most of your text is in 10-point Times Roman, for example, press <F1> at the end of any lines that end in other fonts.

Because the LaserJet does not print in a small margin around the edges of the paper, you need to adjust the number of lines per page using three of *WordStar*'s dot commands: page length (.pl), bottom margin (.mb), and top margin (.mt). *WordStar*'s defaults for these three parameters are 65, 8, and 3, respectively. To achieve the same dimensions on the LaserJet, change the settings by typing the following dot commands at the beginning of each document, making sure that each dot is in the first column:

```
.pl 62
.mb 4
.mt 5
```

Experiment with varying margins and fonts to determine the best effects for each occasion. By tapping the power of the LaserJet, your *WordStar* documents can step out in style. You'll find the effect warrants the extra effort.

WordStar, version 3.3
MicroPro International
33 San Pablo Ave.
San Rafael, CA 94903
415/499-1200
List price: $350
Requirements: 64K, one disk drive

A New Way to Frame Projects

Having trouble keeping it all together? You could buy an expensive project management package, but for simple projects you can set up a scheduling system on Framework that's easily modified to suit your needs.

Arthur English and Richard Katz

For a business manager, project scheduling requires a great deal of patience and ingenuity. As a result, scheduling may be used only sporadically or applied in idiosyncratic ways. Yet project scheduling is often critical for realistic goal setting, effective teamwork, departmental coordination, and accurate budgeting.

A project schedule outlines the steps that must be accomplished to achieve a specific goal. In preparing such a schedule, you identify and represent work assignments as a series of separate work steps called *tasks* or *activities.* You then estimate each task's duration and beginning and ending dates.

Although project scheduling can be accomplished by rearranging pieces of paper on a bulletin board or marking a flowchart with a colored pen, the advent of project management programs for the PC makes it easy to change plans and recalculate dates and values quickly. For the first time, you can explore several different scenarios with a minimum of effort. However, not all projects require the bells and whistles offered by expensive project management programs. If you use *Framework* you will find that the FRED programming language, coupled with *Framework*'s spreadsheets, can provide a more than adequate project scheduler.

The Scheduler program in this article assists in planning the construction of a house but can be adapted to almost any project. The program consists of several FRED functions that control four linked *Framework* spreadsheets. The sample schedule in this article handles ten tasks and encompasses 150 total project days. This example requires about 70K of disk space and will run on an IBM PC or compatible with 384K of RAM. Some familiarity with *Framework* will be helpful for setting up the program.

Scheduling for Control

The primary function of a project scheduler is to list the tasks to be accomplished and the projected end dates for each task. Such a list, called a *task list* or *activity list,* is generally sufficient for managing a small project. However, for a project involving several people or several critical resources, a summary of tasks and end dates alone may not be sufficient as a control device.

A common tool for managing larger projects is a diagram called a *Gantt chart,* such as the one shown in Figure 5. With a Gantt chart you can see which tasks occur simultaneously, compare the

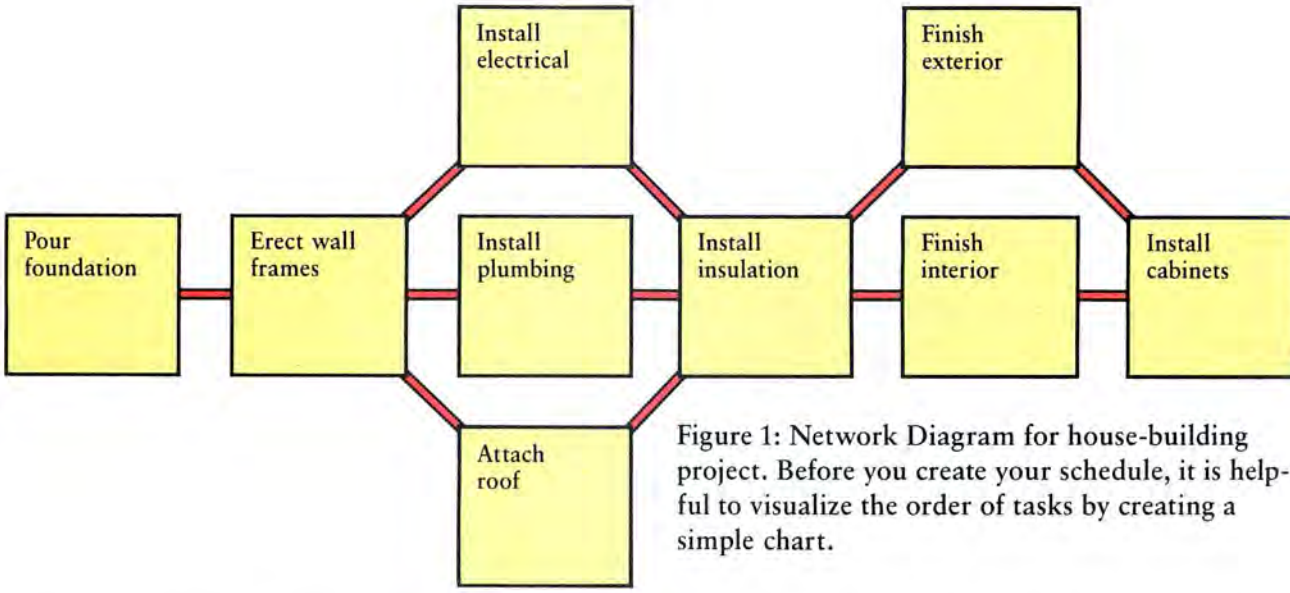


Figure 1: Network Diagram for house-building project. Before you create your schedule, it is helpful to visualize the order of tasks by creating a simple chart.

duration of various project segments, and flag resource bottlenecks. The Scheduler produces both an activity list and a Gantt chart much like those generated by commercial project management programs.

The FRED programming language, coupled with Framework's *spreadsheets, can provide a more than adequate project scheduler.*

Properly identifying and describing tasks is an important part of successful scheduling. This is especially true when new projects vary considerably from previous ones or when new workers or other resources are added to the equation. A rule of thumb is to focus on what a task is going to produce or achieve. In describing a task, use a simple imperative sentence–a single verb that describes the nature of the work, followed by the goal. For example, in building a house, the task of constructing wall frames might be described as Erect Wall Frames. Avoid task names like Woodworking or Carpentry, which are less specific and do not focus on what the task is supposed to accomplish.

When you create a schedule, be aware of which tasks depend on the completion of other tasks–you can't build the roof without first putting up walls. In scheduling parlance, when one task must be finished before another can begin, the first task is a *predecessor* of the second. To identify such dependencies, it is helpful to lay out the tasks of the project in a network diagram, as shown in Figure 1. You can create a diagram on paper or enter it in a separate *Framework* word frame using character graphics. A network diagram can't portray actual project time or resource usage, but it does help clarify task dependencies before you begin.

The time a task consumes on a schedule is called the task *duration*. Its most important component is usually direct labor, the amount of time that project workers spend on a task. But the estimate may also include other activities such as transportation, delivery and installation of equipment, chemical processes, and preparation of materials. These may have significant impact on a project's duration even though they require little or no direct labor.

Building the Outline

To begin creating the Scheduler program, press **<Ctrl>-C O** and set up an outline frame called Scheduler. Create the four spreadsheet frames in the Scheduler outline shown in Figure 2. In the first spreadsheet, Project Scheduling Parameters, you enter information that provides a start date for the

Activity List, defines the Calendar, and formats the Gantt Diagram. The second spreadsheet, the Activity List, is where you enter and change the start dates, durations, and dependencies of project tasks. Calculations initiated on the Activity List use data from the Calendar spreadsheet and return new values to the Activity List. As the final output of the program, the Gantt chart merely duplicates the data in the Activity List in graphic form.

Delete all the empty subheadings in the outline using the < **Del** > key. Set all calculations to manual (< **Ctrl** > **-N O M**) and set calculation order to natural (< **Ctrl** > **-N O N**). Use < **Ctrl** > **-C H** and < **Ctrl** > **-C W** to set the number of rows and columns. The Project Scheduling Parameters spreadsheet should be set up as 6 rows by 3 columns; the Activity List should be 30 rows by 8 columns; the Calendar should be 149 rows by one column; and the Gantt Diagram should be 31 rows by 3 columns.

The remaining frames in Figure 2 are functions written in FRED. Create a text frame with < **Ctrl** > **-C E** within the Scheduler outline for each function, and label them as shown in Figure 2. No hierarchy is required within the master Scheduler frame. Its only purpose is to keep the frames conveniently together.

When you are finished, move inside CalcCalendar, the first text frame. Press < **F2** > and < **F9** > to zoom to the area where formulas are entered. Then type in the formulas shown in Listing 1. Press < **GrayMinus** > to close the frame, open the CalcGanttHeads frame, and enter the FRED formulas in Listing 2. Continue to each remaining text frame, entering the formulas in Listings 3 through 7, respectively. Then press < **Ctrl** > **-D S** to save the Scheduler outline to disk.

```
1  Project Scheduling Parameters (S)
2  Activity List (S)
3  Calendar (S)
4  Gantt Diagram (S)
CalcCalendar (W)
CalcGanttHeads (W)
Dlookup (W)
DrawGantt (W)
GanttHeading1 (W)
GanttHeading2 (W)
Weekdaynum (W)
```

Figure 2: Scheduler Outline. The Scheduler program combines four Framework spreadsheets and seven FRED functions.

```
Scheduler.CalcGanttHeads:
   Gantt Diagram.B1:=@GanttHeading1(1),
   Gantt Diagram.B2:=@GanttHeading2(1),
   Gantt Diagram.C1:=@GanttHeading1(2),
   Gantt Diagram.C2:=@GanttHeading2(2)
```

Listing 2: CalcGanttHeads FRED formula

```
Scheduler.Dlookup:
   ; @DLOOKUP (@ITEM1)  - Returns the day number of date
   @Local(I,Found,Thisdate),
   @reset(Calendar.A1:Calendar.A149),
   I:=0,
   @while(@AND(I<149,Found=0),I:=I+1,
         Thisdate:=@Get(Calendar.A1:Calendar.A149),
         @IF(@ITEM1=Thisdate,Found:=I),
         @Next(Calendar.A1:Calendar.A149)
         ),
   Found
```

Listing 3: Dlookup FRED formula

Defining Scheduling Parameters

Move up to the border of the first spreadsheet frame, Project Scheduling Parameters, and press < **F2** > and < **F9** > to zoom to the formula section. Enter the following printer code:

@kp,@pa(0),@11(132),@st("{ESC}{015}")

Then open the frame and enter the headings and data shown in columns A and B of Figure 3. In the first four rows of column C enter the four formula strings that are grouped together in Listing 8. For the formulas that are several lines long, expand the spreadsheet cell by pressing < **F2** > and then < **F9** > .

```
Scheduler.CalcCalendar:
   ; Calculate the workday calendar
   @local(thisday, thisdate, addin, i, weekend),
   Calendar.a1:=Project Scheduling Parameters.C1,
   @if( Project Scheduling Parameters.B6<>"yes",weekend:=0, weekend:=1),
   i:=0,
   @reset(Calendar.A1:Calendar.A149),
   @While(I<149, I:=I+1,
         Thisdate:=@get(Calendar.A1:Calendar.A149),
         Thisday:=@Weekdaynum(thisdate),
         @IF( @and(weekend=0,Thisday>4),addin:=3,addin:=1),
         Thisdate:=@sumdate(thisdate,addin),
         @NEXT(Calendar.A1:Calendar.A149),
         @PUT(Calendar.A1:Calendar.A149,Thisdate),
         )
```

Listing 1: CalcCalendar FRED formula

```
  A                                                B                    C

1 Project Start Date ..............................3/5/85              Mar 3, 1985
2 Maximum Number of Weeks for Gantt Chart..........16                   28.....5....
3 Alternate Character to Highlight Tasks...........*                    Mar 5, 1985
4 Regular Character to for Tasks...................=                              3
5 Character to Use for Milestone...................^
6 Should weekends be counted as duration days?.....no                        262496
```

Figure 3: Project Scheduling Parameters. In this spreadsheet you list the start date, calendar guidelines, and formatting information for the Gantt chart.

The Project Scheduling Parameters frame defines the project start date and the days of the week to be included in the schedule. It also creates the headings for the Gantt chart and specifies the characters to be displayed. Cell B6 on the Parameters frame indicates whether the work schedule will include or exclude weekends. To exclude the weekends, type **no** in cell B6.

After you finish with the Parameters frame, save the outline and calculate it by pressing **< F5 >**. The date in cell C2 should then match the date in B1. To further verify that the code has been correctly entered, move to the Gantt Diagram and check that the start date on the upper left of the heading matches the date entered in the Parameters frame.

Setting the Calendar

The Scheduler uses a calendar of work days, contained in the spreadsheet frame labeled Calendar. To generate the calendar, exit the Parameters frame, move to the CalcCalendar frame, and press **< F5 >**. It should take about 2 or 3 minutes for the calendar to calculate. After the calculation has finished, move up to the Calendar frame and open it. A single-column list of consecutive dates should appear. If you want, you can scroll through the Calendar frame and eliminate the rows that contain holidays by pressing **< Ctrl > -E R.**

Creating the Activity List

The Activity List frame shows all the tasks to be done, time estimates in days, and start and completion dates. Open the frame and enter the headings for row 1, as shown in Figure 4. Type in the task names and time estimates for each task in columns A and B, rows 2 through 11, as they appear in Figure 4. Next enter the following formulas in cells C2 through H2:

```
Scheduler.DrawGantt:
   ;This Fred function draws the Gantt lines in the Gantt Chart for each
   ;activity in the Activity List frame.

   ;Define and initialize local variables
   @local(gantt_string, col_no, activity_name, start_date, end_date,
       critical_path, duration, print_char, offset_days, days_till_end,
       days_until_start, days_diff),
   col_no := @item1,
   activity_name := @item2,
   duration := @item3,
   start date := @item4,
   end date := @item5,
   critical_path := @item6,
   offset_days:= (col_no - 1) * (7 * 8),

   ;If this is not a valid line in the activity list, get out!
   @if(@not(@isalpha(activity_name)), @return (" ")),

   ;Figure out which character to use for drawing Gantt line based on
   ;Gantt parameters, duration, and critical path specifications.
   print_char := @mid(Project Scheduling Parameters.$B$4, 1, 1),
   @if(@isalpha(critical_path),
       @if(@mid(critical_path, 1, 1) = "y",
           print_char := @mid(Project Scheduling Parameters.$B$3, 1, 1))),
   @if(duration = 0,
       print_char := @mid(Project Scheduling Parameters.$B$5, 1, 1)),

   ;Construct Gantt line.
   days_till_end := @diffdate(end_date,
       @sumdate(Project Scheduling Parameters.$C$1, offset_days)),
   @if(days_till_end <= 0, @return( " ")),
   days_until_start := @diffdate(start_date,
       @sumdate(Project Scheduling Parameters.$C$1, offset_days)),
   @if(days_until_start > 0,
       days_diff := days_till_end - days_until_start + 1,
   ;else
       days_diff := days_till_end + 1),
   @if(days_until_start > 0,
       gantt_string := @rept(" ", days_until_start),
   ;else
       gantt_string := ""),

   @if(days_diff > 0,
       @return(gantt_string & @rept(print_char, days_diff))),
   @return(" "))
```

Listing 4: DrawGantt FRED formula

C2: **@Choose(G2,Calendar.$A$1: Calendar.$A$149)**
D2: **@Choose(H2,Calendar.$A$1: Calendar.$A$149)**
E2: **+Project Scheduling Parameters.$C$3**
G2: **+E2**
H2: **+F2+B2**

Now you need to copy these formulas into every row of the spreadsheet. Mark the row of cells from C2 to H2 with **< F6 >**, and then copy it into the block C3:H11 with the **< F8 >** key.

The task data for schedule calculations is entered in columns E, G, and H of the Activity List. Column G contains the start day, and column H contains the end day.

The numbers in Column E (labeled Predeces for *predecessors*) identifies the order in which tasks are to be done. When you want a task to follow one or more prior tasks, you enter the end day (from column H) of the prior task or tasks. For instance, the task called

```
Scheduler.GanttHeading1:
   ;This Fred function prints the top heading in the Gantt Chart frame.
   ;This heading shows the months for the period covered by the Gantt chart.

   ;Define local variables
   @local(str1,str2,start_date,diftime,offset_weeks,max_weeks,number_weeks),

   ;Determine column number from @item1, and calculate offset weeks.
   ;Eight weeks are printed for each column.
   offset_weeks := ((@item1 * 8) - 1) - 7,
   max_weeks := Project Scheduling Parameters.$B$2,
   start_date := @sumdate(Project Scheduling Parameters.$C$1, 7 * offset_weeks),
   @if(offset_weeks > max_weeks, @return),
   number_weeks := 0,
   str2 := "",

   ;Setup the heading line and put into str2.
   @while(@and(number_weeks < 8,
           (number_weeks + offset_weeks) <= max_weeks),
           @if(@and(@len(@date3(start_date)) = 5, @mid(@date3(start_date), 5, 1) < "8"),
           @list(
               str1 := @mid(@date1(start_date), 1, 3) & "'"
                   & @mid(@date2(start_date),7,2) & "        ",
               number_weeks := number_weeks + 1,
               start_date := @sumdate(start_date, 7),
           ),
       ;else
           @if(@or(@mid(@date3(start_date),5,2) < "15", @mid(@date3(start_date),5,1) > "7"),
               str1 := @mid(@date2(@sumdate(start_date, -7)), 8, 1) & "     ",
           ;else
               str1 := "       ")),
       str2 := str2 & str1,
       start_date := @sumdate(start_date, 7),
       number_weeks := number_weeks + 1
   ),
   @return(str2)
```

Listing 5: GanttHeading1 FRED formula

	A	B	C	D	E	F	G	H
1	Task Name	Days	Start Date	End Date	Predeces	CP?	Start Day	End Day
2	Pour foundation	15	Mar 5, 1985	Mar 26, 1985	3		3	18
3	Erect wall frames	5	Mar 26, 1985	Apr 2, 1985	18		18	23
4	Install plumbing	7	Apr 2, 1985	Apr 11, 1985	23	yes	23	30
5	Install wiring	5	Apr 2, 1985	Apr 9, 1985	23	yes	23	28
6	Attach roofing	6	Apr 2, 1985	Apr 10, 1985	23		23	29
7	Install insulation	8	Apr 11, 1985	Apr 23, 1985	30		30	38
8	Finish exterior	5	Apr 23, 1985	Apr 30, 1985	38		38	43
9	Finish interior	7	Apr 23, 1985	May 2, 1985	38	yes	38	45
10	Install fixtures	5	May 2, 1985	May 9, 1985	45	yes	45	50
11	Project complete	0	May 9, 1985	May 9, 1985	50		50	50

Figure 4: The Activity List displays task duration, start and end dates, and dependencies (which tasks must precede other tasks).

```
Scheduler.GanttHeading2:
   ;This Fred function prints the second heading in the Gantt Chart frame.
   ;This heading shows the days for the period covered by the Gantt chart.

   ;Define local variables
   @local(str1,str2,start_date,diftime,offset_weeks,max_weeks,number_weeks),

   :Determine column number from @item1, and calculate offset weeks.
   :Eight weeks are printed for each column.
   offset_weeks := ((@item1 * 8) - 1) - 7,
   max_weeks := Project Scheduling Parameters.$B$2,
   start_date := @sumdate(Project Scheduling Parameters.$C$1, 7 * offset_weeks),
   @if(offset_weeks > max_weeks, @return(" ")),
   number_weeks := 0,
   str2 := "",

   :Setup the heading line and put into str2.
   @while(@and(number_weeks < 8,
           (number_weeks + offset_weeks) <= max_weeks),
       @if(@len(@date3(start_date)) = 5,
           str1 := @mid(@date3(start_date), 5, 1) & ".....",
       ;else
           str1 := @mid(@date3(start_date),5,2) & "....."),
       str2 := str2 & str1,
       start_date := @sumdate(start_date, 7),
       number_weeks := number_weeks + 1
   ),
   @return(str2)
```

Listing 6: GanttHeading2 FRED formula

```
Scheduler.Weekdaynum:
   ; @weekdaynum[(@item1)] => daynumber

   ; @weekday will return the current day number if no parameters are
   ;   passed.
   ; Otherwise @weekday takes one item which must be a date value and returns
   ;   the day number      hal 7/84  R. Katz 1/85

   @local (checkdate, diffdate),
   checkdate := @if (@itemcount <> 0,  @item1, @today),

   diffdate := @mod(@diffdate(checkdate, @date(1984,1,1)),7),
   @if (diffdate < 0, diffdate := diffdate + 7),
   weekdaynum:=diffdate
```

Listing 7: Weekdaynum FRED formula

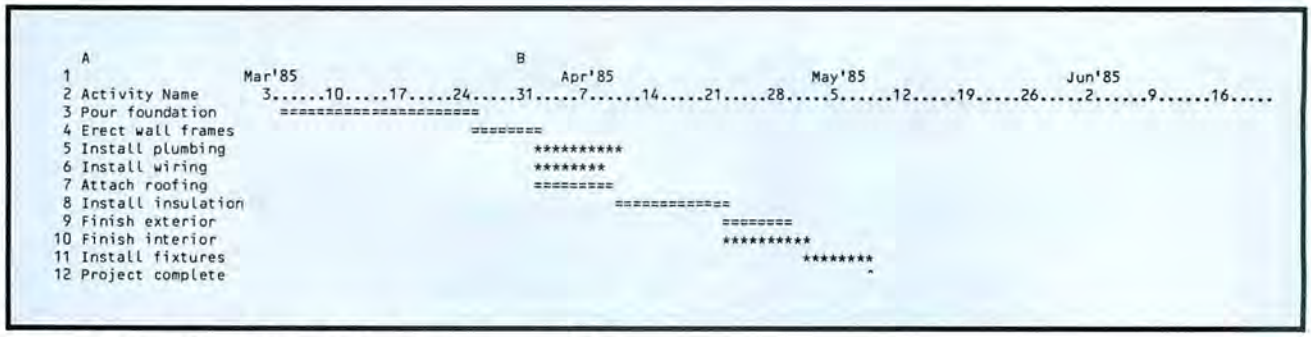


Figure 5: The Gantt chart is the final output of the Scheduler program. It shows the information listed on the Activity List in graphic form.

Erect Wall Frames on row 3 cannot start until the task called Pour Foundation on row 2 is complete. To define this relationship for the Scheduler, type **+H2** into cell E3. To calculate the schedule press **< F5 >**. The start date for Erect Wall Frames should be the same as the end date for Pour Foundation.

The tasks in rows 4, 5, and 6 can start only when the task on row 2 is complete, so enter **+H3** in cells E4, E5 and E6, and press **< F5 >** to calculate. The task on row 7 cannot start until both of the tasks on rows 4 and 5 have been completed. In this case both rows 4 and 5 are predecessors for row 7. In cell E7 enter the formula **@MAX(H4, H5)**. This tells the Scheduler to always use the latest of the two end days. The entries to complete the predecessors for the tasks on rows 8 through 11 are E8: **+H7**, E9: **+H7**, E10: **@MAX(E8,E9)**, and E11: **+H10**. When you're finished, press **< F5 >**.

Setting Up the Gantt Chart

Open the Gantt Diagram spreadsheet frame and lock column A in place with **< Ctrl > -E L**. Press **< F4 >** and set the width of column A to 20 characters. Then set column B to 56 characters. This width will make column B fill the rest of the screen. Set column C likewise. Then enter the following formulas in the spreadsheet cells in row 3.

A3: **@IF(@ISALPHA(Activity List.A2,Activity List.A2,@return(" "))**

B3: **@Drawgantt(1, Activity List.$A2, Activity List.$B2,Activity List.$C2, Activity List.$D2, Activity List.$F2)**

C3: **@Drawgantt(2, Activity List.$A2, Activity List.$B2,Activity List.$C2, Activity List.$D2, Activity List.$F2)**

Mark cells A3 through C3 with **< F6 >** and use **< F8 >** to copy the row to A4:C12. Save the outline and press **< F5 >** to calculate. The Gantt chart will begin to fill out on the screen starting from row 3. You can use the right and left cursor keys to switch the view between the first and second halves of the schedule in columns B and C. When you print the chart, it should look like Figure 5.

Notice that most task durations are represented by a series of equal signs. Any task that has a duration of 0 (such as Project Complete) is considered by the Scheduler to be a *milestone*, and appears in the Gantt chart as a caret (^).

If you like, you can use an alternate symbol to highlight a particularly critical task, to indicate completed tasks, or to reveal other information. In Figure 5 a string of asterisks is used to highlight tasks that are related to the interior of the house. To designate an alternate symbol, go back to the Activity List frame and enter **yes** in column F (labeled CP for *Critical Path*) for any task you want to highlight. Then reopen the Gantt Diagram and press **< F5 >**. Tasks designated *yes* will appear as a string of asterisks.

```
Scheduler.Project Scheduling Parameters.C1:
   @local(start_date, offset, index, date_index, yr, mo, day),
   @if(@not(@isalpha(B1)),@return ("No Start Date!")),
   index := 1,
   date_index := 1,
   @while(index <= @len(B1),
       @if(@mid(B1,index,1) = "/", date_index := date_index + 1,
           @list(
               @if(date_index = 1, (mo := (mo & @mid(B1,index,1)))),
               @if(date_index = 2, (day := (day & @mid(B1,index,1)))),
               @if(date_index = 3, (yr := (yr & @mid(B1,index,1))))
               )
           ),
       index := index + 1
       ),

   start_date := @date(@value(yr) + 1900, @value(mo), @value(day)),
   offset := @mod(@diffdate(start_date, @date(84, 1, 2)), 7),
   start_date := @sumdate(start_date, -offset),
   start_date

---

Scheduler.Project Scheduling Parameters.C2:
   @CalcGanttHeads

---

Scheduler.Project Scheduling Parameters.C3:
   @local(start_date, offset, index, date_index, yr, mo, day),
   @if(@not(@isalpha(B1)),@return ("No Start Date!")),
   index := 1,
   date_index := 1,
   @while(index <= @len(B1),
       @if(@mid(B1,index,1) = "/", date_index := date_index + 1,
           @list(
               @if(date_index = 1, (mo := (mo & @mid(B1,index,1)))),
               @if(date_index = 2, (day := (day & @mid(B1,index,1)))),
               @if(date_index = 3, (yr := (yr & @mid(B1,index,1))))
               )
           ),
       index := index + 1
       ),

   start_date := @date(@value(yr) + 1900, @value(mo), @value(day)),
   start_date

---

Scheduler.Project Scheduling Parameters.C4:
   @dlookup(C3)
```

Listing 8: Four FRED formulas for Project Scheduling Parameters

Printing the Schedule

You can print any spreadsheet or text frame by highlighting the frame border and pressing **< Ctrl > -P B**. If you have a dot matrix printer, it is a good idea to print the Gantt Diagram with the column widths set to 132 using compressed mode. To do this, highlight the border of the Gantt Diagram frame and open it with **< F2 >**. If you have an IBM or Epson printer, type in the formula **@kp,@po(0),@LL(132),@st("{015}")** and press **< Enter >**, followed by **< Ctrl > -P B**. The 015 code sets up compressed mode on any Epson-compatible printer. For other printers check your printer manual for the appropriate code.

Modifying the Scheduler

You now have a project scheduler that tracks the construction of a house. However, you can adapt this application to almost any project you have in mind. To set up your own project, enter *Framework* and load the file called SCHEDULE.FW onto the desktop. Open the Project Scheduling Parameters frame, and set the start date of your project in cell C1, using the MM/DD/YY format. Then press **< F5 >**.

Next, open the Activity List frame and enter the new task names and estimates in columns A and B. Enter the predecessors in column E, and press **< F5 >**. Then open the Gantt Diagram frame and press **< F5 >**.

The calendar is currently set up for 149 work days, but you can extend it to any length. First, add rows with **< Ctrl > -C R** at the bottom of the Calendar frame. Second, change 149 everywhere it occurs in the Dlookup and the CalcCalendar frames to the number of days you want reflected in the calendar. For example, to change the calendar days to 250, open up the Dlookup frame, and search and replace the numbers by typing **< Ctrl > -L R 149 < Enter >** 250 **< Enter >**. Then repeat this procedure on the CalcCalendar frame. After you make these changes, exit to the CalcCalendar frame and press **< F5 >**.

The Activity List frame currently contains ten tasks in rows 2 through 11. You can include additional task rows by copying the formulas from row 11 to the rows below. Remember to change the Gantt Diagram in the same way. You can also insert task rows in the middle of the Activity List, copying the formulas from the row above the new row. Then enter a predecessor in column E for the new rows you create.

It is a good idea to assign only tasks located on rows above as predecessors. If you assign tasks below as predecessors, be careful not to create a circular reference as this will cause errors in the calculations. Fortunately, if you have a circular reference, *Framework* will display the warning message 'CIRCULAR REFS:' and will show the name of the cell where the error occurred. If this happens, you need to change the cell references in column E, the predecessor column, and eliminate the references that occur in a loop.

The beauty of computerized scheduling is that you can modify the schedule at any time during the planning or even the implementation phase and quickly generate a new one to reflect changes. Sometimes after entering the initial dates and dependencies and calculating them, you can print out your Gantt chart and activity list and never have to run the program again. Yet, the best-laid plans are often bombarded with last-minute changes. If nothing else, when your brilliant plan turns into a hopeless disaster, with a project scheduler you can at least make it appear that you know what you're doing.

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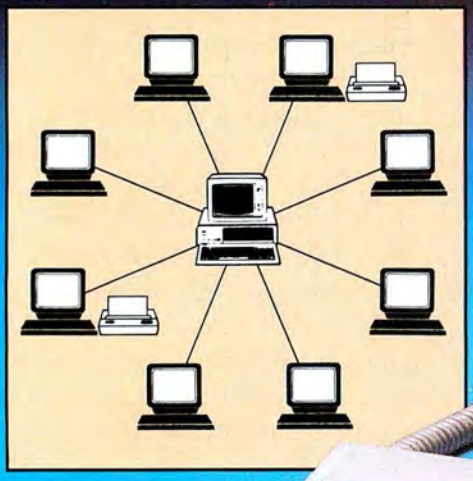

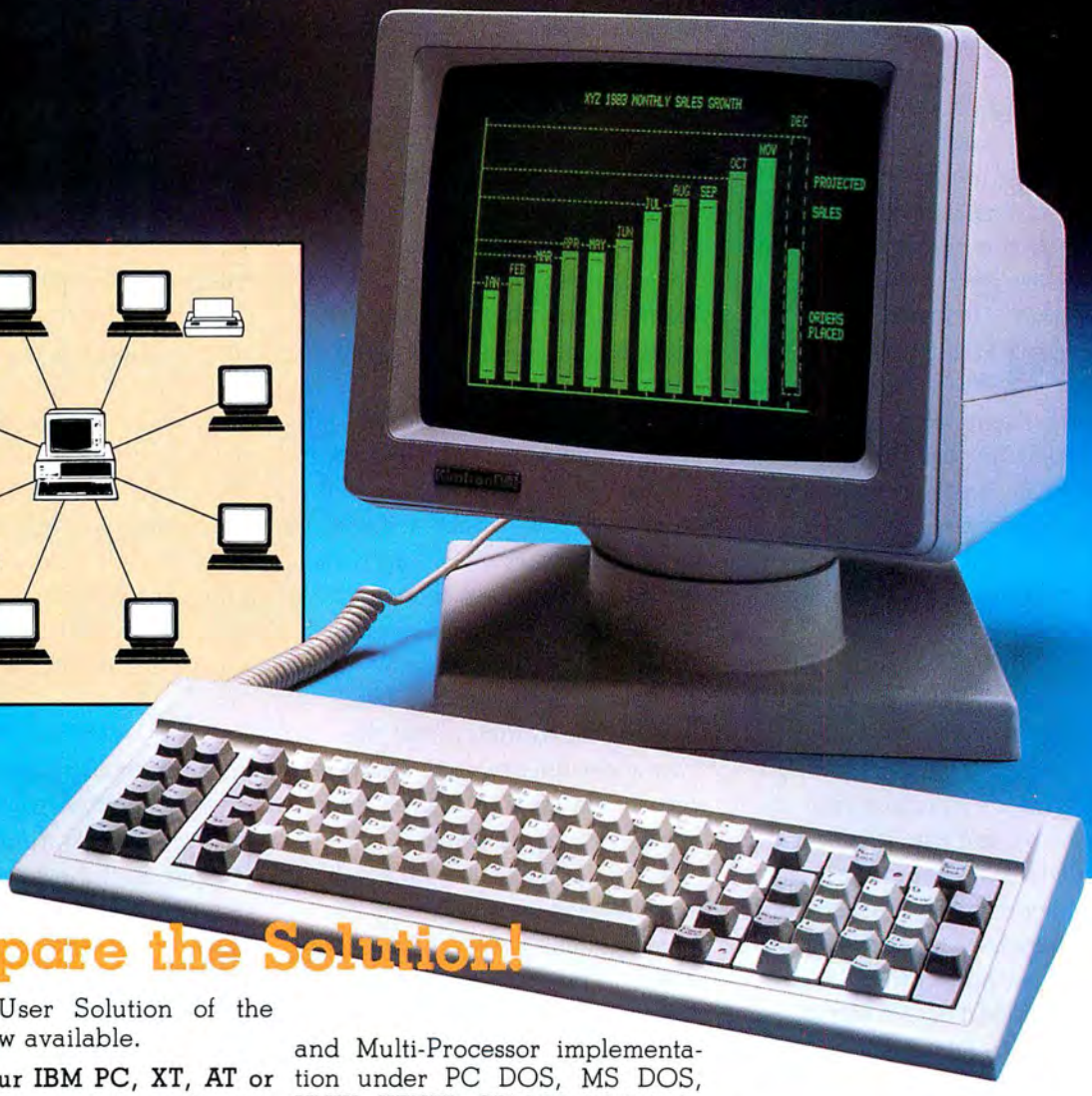

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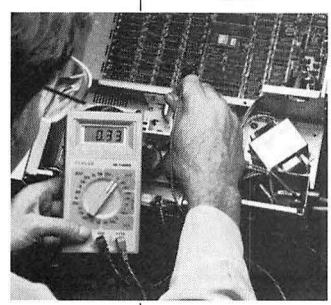

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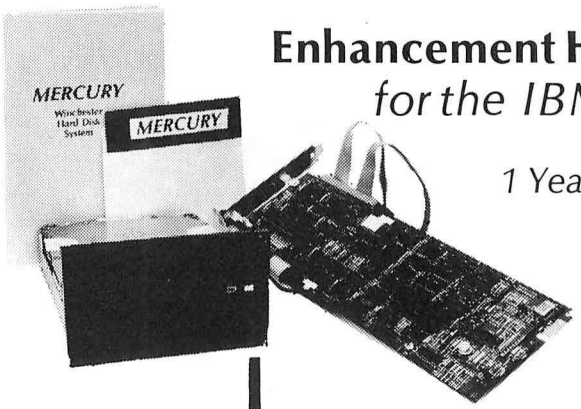

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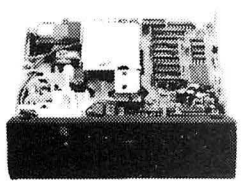

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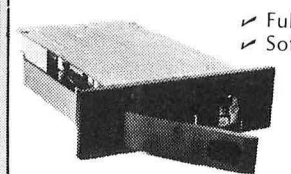

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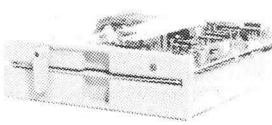

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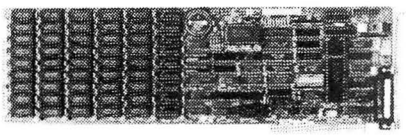

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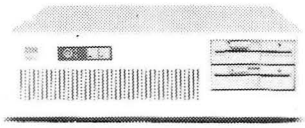

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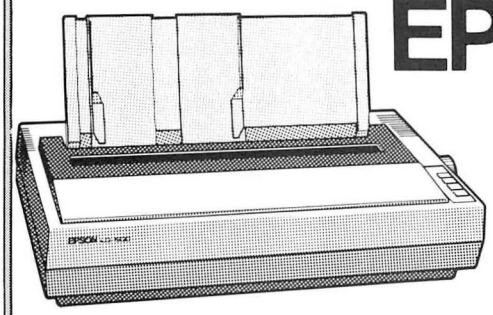

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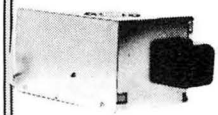

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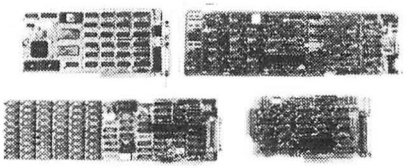

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From the Software Shelf

PC World offers first impressions of recent software releases

The born-again Idea Processor, a DOS forget-me-not, communications made easy, and getting your foot in the door, PC-style

Edited by Robert Luhn

Executive Writer/ Executive Filer

Amidst all the me-too word processors of the last few years, Idea Ware's *The Idea Processor* stood out as an innovator. Without sacrificing the standard word processing features required for serious office use, *The Idea Processor* did something new with words–it managed them. This unique ability was embodied in the program's Cardfile, a text data management system (TDMS) that allowed you to organize text files by assigning keywords, which could later be searched for using AND, OR, and NOT operators (see "A New Idea in Word Processing," *PCW*, Vol. 2, No. 11, and "Due Processing," *PCW*, January, 1985).

The bad news is that Idea Ware no longer markets *The Idea Processor*. The good news is that you can buy essentially the same package from Adam Osborne's Paperback Software International–and for $175 less.

Eric Mintz and the other crafty programmers at Idea Ware refined their program and split it into two modules, *Executive Writer* (the word processor) and *Executive Filer* (the Cardfile). The company licensed both programs to Paperback Software and then retreated to the countryside to do what it does best–programming.

Executive Writer and *Executive Filer* operate almost identically to *The Idea Processor*, with a few improvements. The programs now scroll horizontally to take advantage of the new 240-character spread. This greater margin enables you to capture and organize spreadsheets from *1-2-3*, *SuperCalc 3*, and other programs. Combining both *Executive Writer* and *Executive Filer* on one disk activates MailPrint–a utility not unlike *MailMerge*. *Executive Writer* and *Executive Filer* have also inherited *The Idea Processor*'s ability to import graphics from other programs (including PSI's *Draw-It*) and insert them into text.

Other improvements include *Executive Filer* help screens (conspicuously absent in *The Idea Processor*'s Cardfile) and on-screen display of justified right margins. Some command keystrokes have been changed, and both programs are measurably faster.

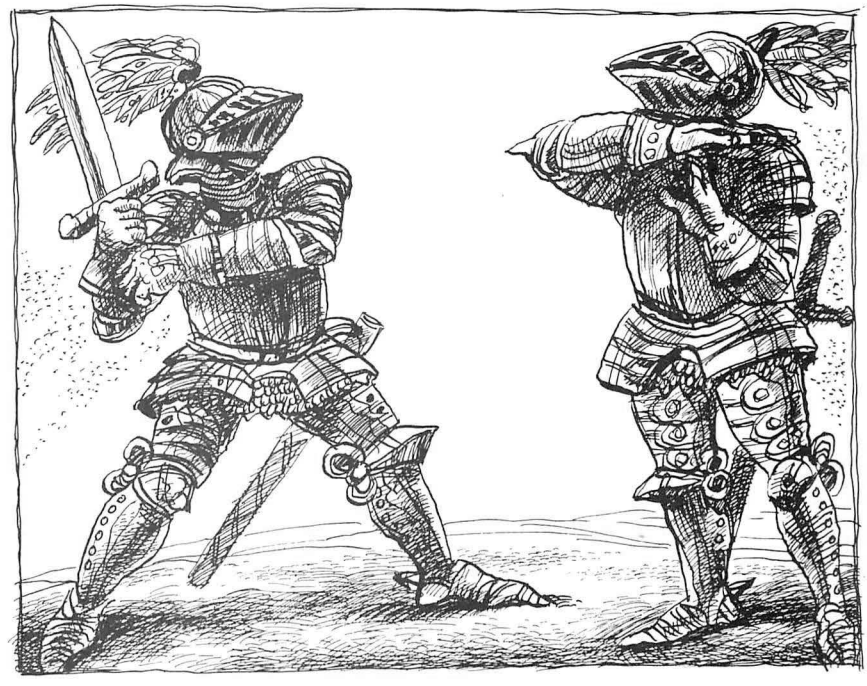
Like its predecessor, *Executive Writer* separates text editing from print formatting. Consequently, what you see is not necessarily what you get. Documents are always displayed single-spaced, the cursor's column-and-row location is not posted, and page breaks are not visible. But *Executive Writer*'s spartan on-screen environment should be weighed against the program's customizable printing formats and solid word processing functions, in particular footnoting and an undo command.

On its own, *Executive Filer* performs like an electronic card file system, handling simple data management tasks such as storing addresses. But *Executive Filer* also inherits the text data management features of *The Idea Processor*,

which are useful in brainstorming or in organizing a project. The keyword system retrieves related material (one screen at a time) stored in a document, spreadsheet, graphic, or even a program. But the TDMS seems a little lonely after its divorce from the word processor. You can type in, edit, and print text file information, but since *Executive Filer* lacks print formatting talents, you must use *Executive Writer* to construct the document. However, combine *Executive Filer* and *Executive Writer* on a single disk and you've got a team that can take full advantage of the TDMS to produce professional looking documents.

Although Paperback Software International is marketing *Executive Writer* and *Executive Filer* separately, it's the combination and the $120 price tag that pay off. *–Eric Brown and Wes Nihei*

Executive Writer
Executive Filer
Paperback Software Intl.
2612 Eighth St.
Berkeley, CA 94710
415/644-2117
List price: Executive Writer $69.95, Executive Filer $49.95
Requirements: Executive Writer 128K, Executive Filer 64K, both 192K; DOS 2.00; one disk drive
Both programs copy protected, unprotected disks available to registered users for $10 per program



The Art of Negotiating

I snatched *The Art of Negotiating* off the Software Shelf as soon as I spotted it. Although I'm a wily, even fierce combatant in everyday skirmishes, confront me with a higher authority who controls my paycheck and I turn to cornmeal mush. As I started *The Art of Negotiating*, I hoped it would be the chain mail I'd been looking for.

In using *The Art of Negotiating*, you anticipate future interactions, plotting your position while divining your opponent's stance. The program is naturally targeted at the business user; few consumers are likely to plunk down $495 solely to hash out amatory disputes, though no doubt many business users will secretly tinker away on personal relationships at the office.

I prepared for one business and one personal negotiation and found that the program worked equally well for both. My business scenario was modeled after a frustrating job interview I had experienced, in which negotiations over salary and working conditions quickly stalemated. I wondered if *The Art of Negotiating* could prevent such a deadlock, yielding more fruitful results. My personal negotiation centered around resolving a series of petty squabbles with my boyfriend.

I found *The Art of Negotiating* extremely easy to use. A cursory review of the program's clear, well-organized user manual shows you how to install the program and get started. On-line help screens explain program operations further. Particularly useful as you progress are optional printed summaries of

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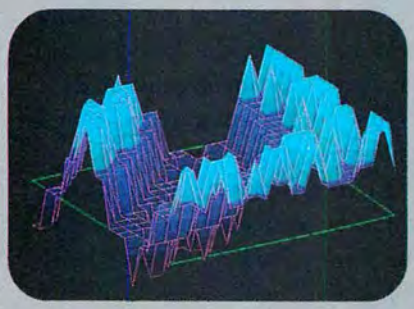

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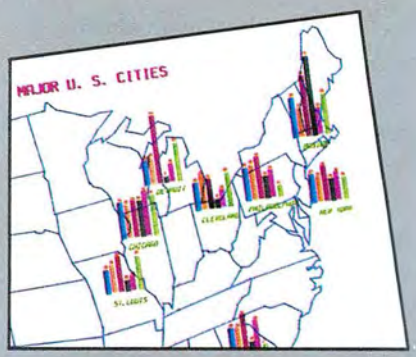

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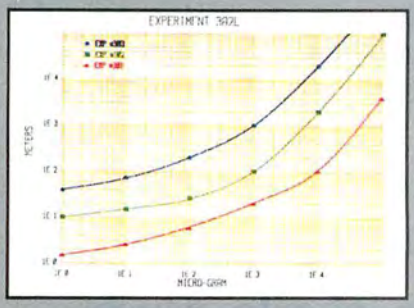

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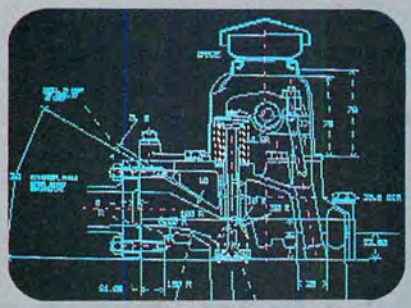

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work done with individual program modules or of the entire process. These reports list identified issues, terms, and your responses to the program.

The program is divided into eight sequential modules, which you are urged to use in order. The Subject Matter, Issues, and Fact Finding modules guide you in setting up the tedious underpinnings of the negotiation. The Subject Matter module asks you to define who is involved, what is being negotiated, each side's objectives (and their relative importance), and conflicting objectives. In the Issues module, you identify the issues at stake for both sides, restate them in more neutral terms at the program's nudging, and rate their importance. In the third module, you tag issues that involve disputed "facts," and attempt to discern their underlying assumptions.

Up to this point *The Art of Negotiating* seems dry and uninspired. But things quickly pick up when you grapple with Needs/Gambits, Climates, Strategies, and Agenda. In Needs/Gambits, you select each side's compelling basic human needs from a list; the program then prompts you to work for or against these needs with various schemes, or gambits, that you devise. In my job interview negotiation, I focused on my opponent's need for self-esteem using two gambits: one was to make him feel that he was clever in getting me to do something I didn't want to do; the other was to concede, with seeming reluctance, issues of little import while quietly pressing key demands.

In Climates, you list your feelings about the negotiation, then describe the climate (or environment) you desire, and speculate on the same for your opponent. The Strategies module gives you a varied general list of possible strategies, which the program will further define upon request. For example, you can try "bracketing"–posing unexpected demands that unmask your opponent's hidden position. In Agenda, you structure the negotiation according to a known agenda, a hidden one, or both.

"We need Bob's spreadsheet in our report. NOW!"

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Though using *The Art of Negotiating* may sound relatively simple, be prepared to ground yourself thoroughly in negotiation basics before you even load the program. Luckily the program includes famed negotiator Gerard Nierenberg's *Fundamentals of Negotiation*, a book that engagingly illuminates essential techniques–though unfortunately, it assumes that all of its readers are men. Nierenberg believes that in a good negotiation both sides benefit. However, that doesn't stop him from suggesting some cunning tricks and manipulations. The book is accompanied by a work text that contains exercises and hypothetical situations. Both books are vital to using the program effectively.

Even with proper preparation, the program's advice can sometimes seem facile or simply obscure. For example, the program at one point tersely suggested I 'use humor' to alter my opponent's perspective, but didn't explain how or why. It would help if such comments were not only fleshed out but more in touch with the tenor of the negotiation.

After sifting through my negotiation scenarios, I was ready to take on real life. I discovered that my attitude toward the business negotiation was considerably more flexible and my presentation much better planned. I was also thoroughly prepared for an upcoming personal negotiation. These PC-simulated negotiations took about 4 hours apiece to complete, not counting the hours spent reading both books. But being primed for crucial interactions is worth the cost in time and money. Machiavelli never had it so good. *–Peggy Nauts*

The Art of Negotiating, version 1.0
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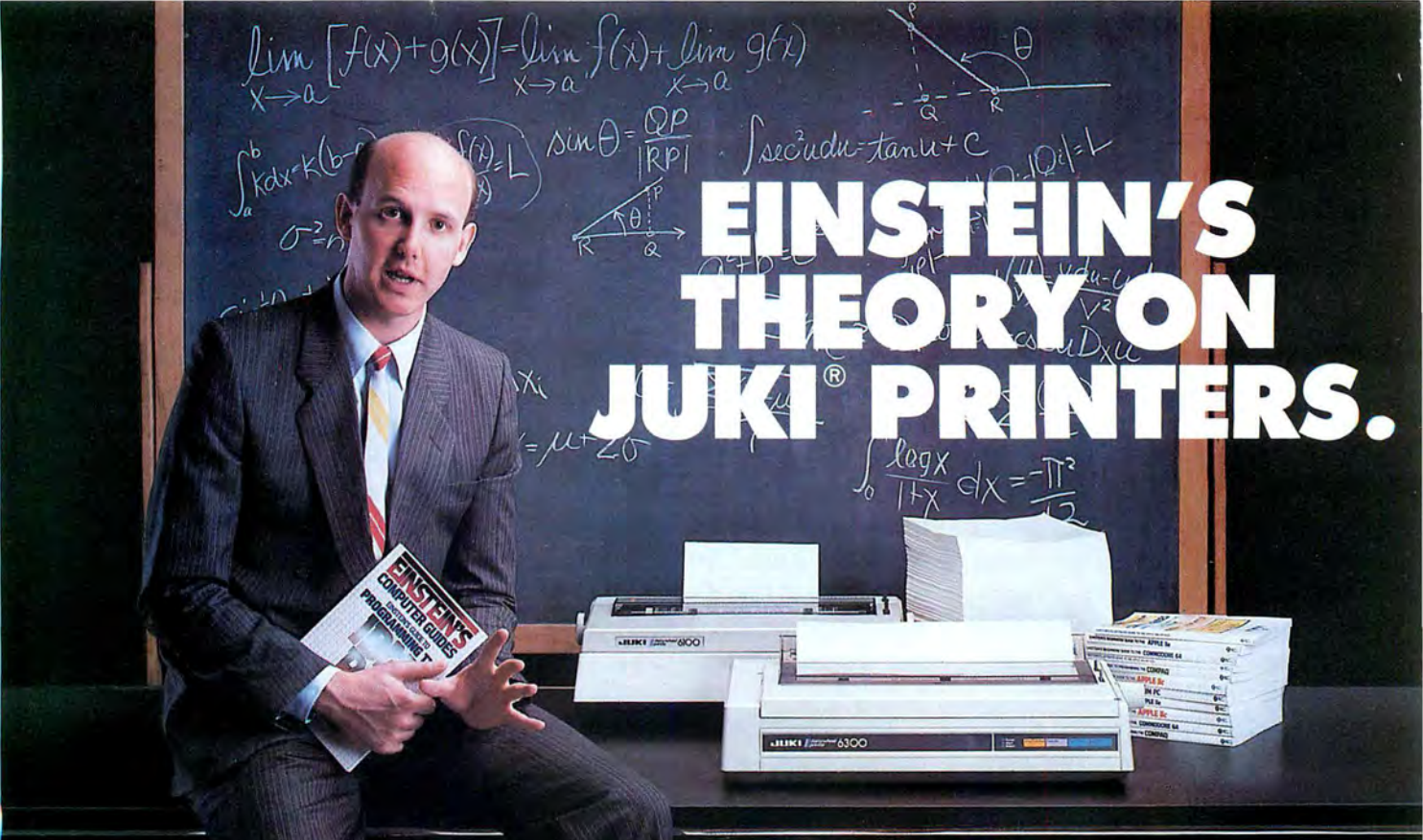

If you've seen "Einstein on Computers" on television, you know that Jeff Einstein knows a thing or two about computer printers. Author of EINSTEIN'S COMPUTER GUIDES, a best-selling series of computer books, and a nationally recognized computer authority, he knows quality printing when he sees it. So when Jeff Einstein says, *"JUKI® letter-quality printers are the ones I chose for my own office printing needs,"* take note!

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TallScreen

"Those who cannot remember the past are condemned to repeat it," said philosopher George Santayana, perhaps contemplating Zsa Zsa Gabor. Wise words–not only in human affairs but in computing. (Think of all the actions–the history, if you will–that the average PC user must repeat over and over again.) The creators of *TallScreen* must be ardent students of history, for they have created a memory-resident DOS "session manager," a program that records a history of issued DOS commands and responses and plays them back at the touch of a key. If you frequently use DOS commands, particularly complicated sequences for configuring hard disk systems, *TallScreen* can be a welcome helpmate.

You use the <PgUp> and <PgDn> keys to review a session history and edit it, much as you would use a text editor for a large file. <F10> recalls all DOS commands, not just the last one entered, while <F9> similarly keeps track of the drives and subdirectories used. Text captured by *TallScreen* can be used as further DOS input or saved to disk. If you mistakenly store the wrong DOS command in a sequence, you simply edit the erroneous command and execute the corrected string again. To edit a batch file, display the file

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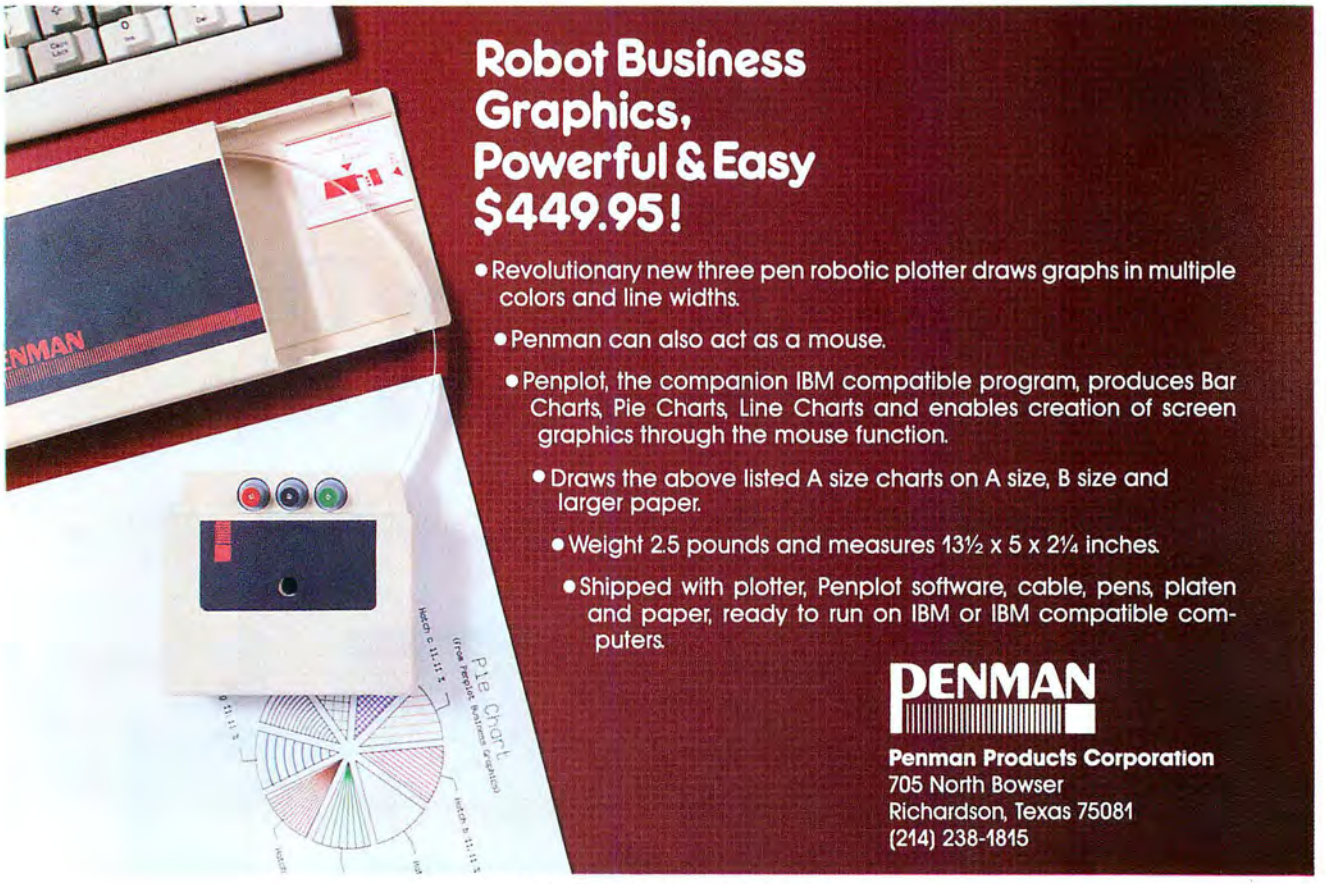

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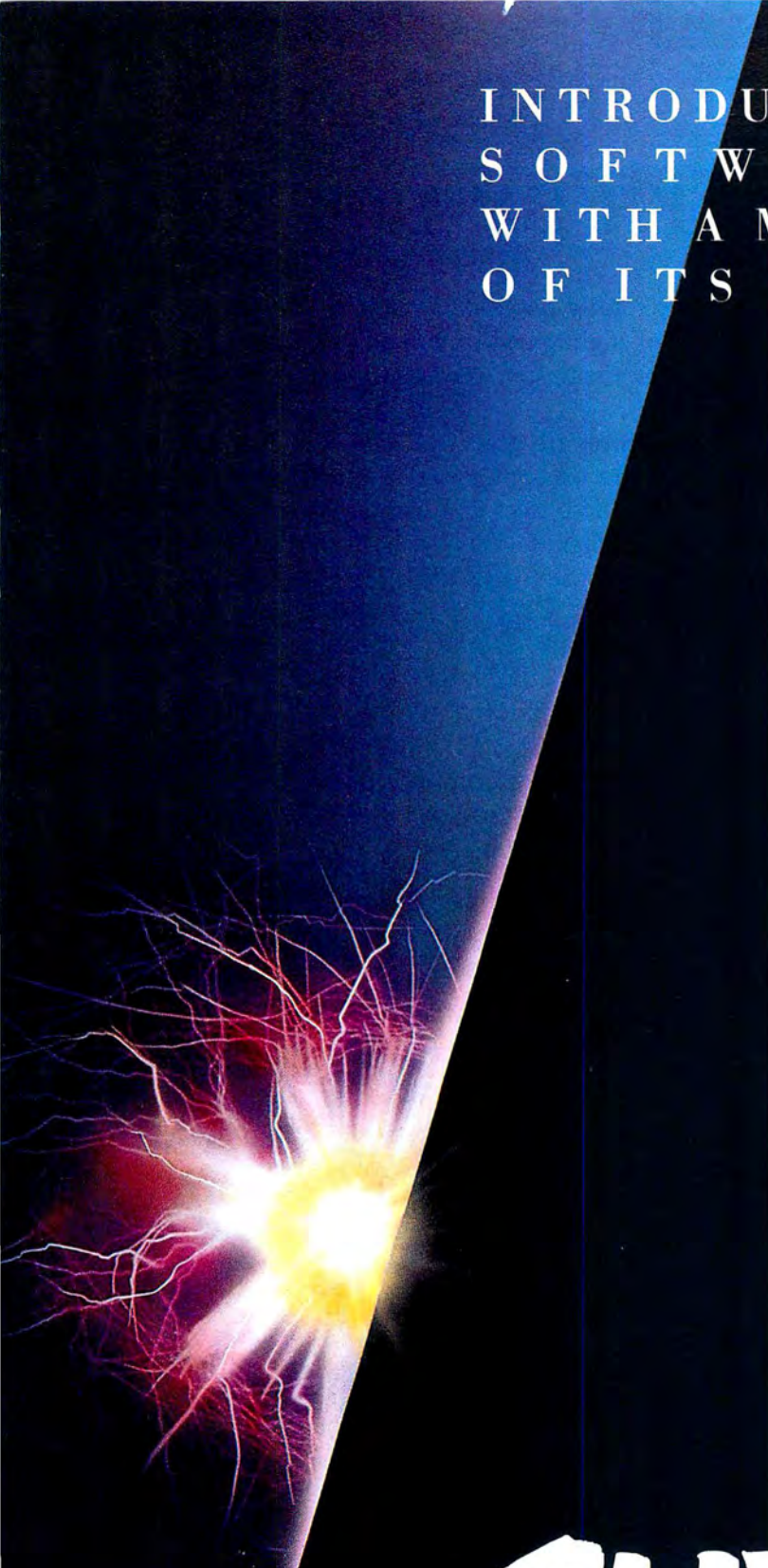

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with the TYPE command, press <PgUp>, edit the file, and save it back to disk. Of course, this brief sampling merely hints at *TallScreen*'s possibilities.

With *TallScreen*, you can enter multiple DOS commands on a single line, set screen attributes, and assign a repertoire of editing functions to keys of your choice. You can also set a half dozen program defaults–buffer sizes, help screens, and other values that customize a program's interface and functioning.

TallScreen's 44-page user manual is densely detailed but somewhat obscure about what *TallScreen* does and how it works. Fortunately, a thorough on-line tutorial (constructed entirely of batch files and *TallScreen* commands) shows you how the program works and some of the feats it can accomplish.

If you're a veteran DOS wrangler with memory to spare–*TallScreen* soaks up 64K–the program can provide some nifty solutions and shortcuts. Happily, *TallScreen* coexists with *SideKick* and *ProKey*, and the three make great partners. At $49.95, it's an excellent value.
–Andrew Fluegelman

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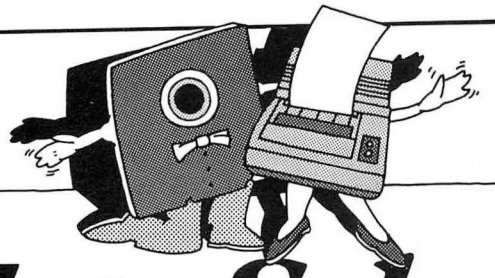

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pfs:access

Most communications initiates have good reason for traveling cautiously up and down the nation's data highways. Wending your way through the myriad of on-line services and data bases is not always informative or inexpensive. Just getting on line, either with a service or another PC, has its share of frustrations. Luckily, Software Publishing makes the trip easier with its latest version of *pfs:access,* a nearly effortless program aimed at those who are new to communications or have modest communications requirements.

If you have used other Software Publishing programs, you'll be comfortable with *access*'s look and its command conventions. Menus clearly list function key assignments; as with *pfs:write* and *pfs:file,* <Esc> always returns you to the last menu, while <Tab> always moves the cursor to the next line. If you're new to the *pfs:* family, you'll surely appreciate the program's simple installation, concise menus, clear prompts, thorough on-line help, and logical and consistent command structure.

access first presents the user with a no-nonsense main menu listing eight options. The first five options, also available in the previous version of the program, provide automated access to The Source,

(continues)

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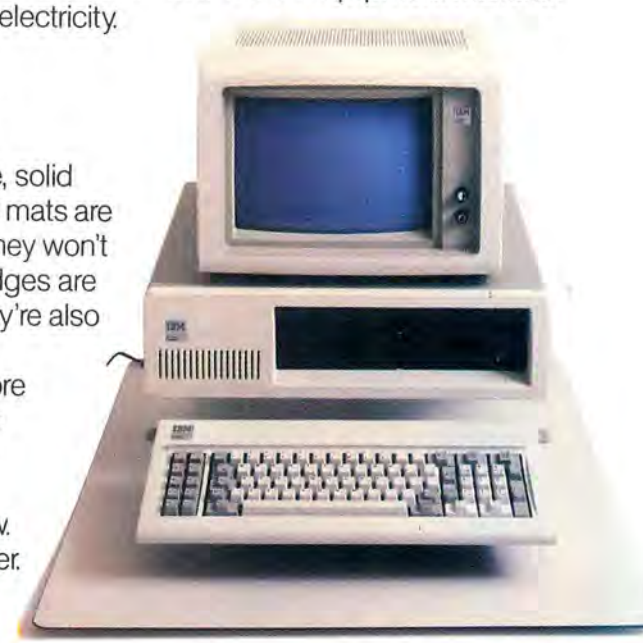

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CompuServe, MCI Mail, Dow Jones, and EasyLink. This release of *access* adds AT&T Mail (a long-distance network not yet introduced commercially) plus the functions 'Call another PC' and 'Allow remote access'.

'Allow remote access', easily the most significant addition, permits an unattended host PC using *access* to receive files and, in some cases, to be operated by a PC using *access* at the other end. *access* boils this complex process down into a few prompt-driven commands while simultaneously standing guard over your files. Two levels of password protection permit either limited or full file access. With the former, a remote PC calling up your system can read certain files; with the latter, files can be read, copied, and in some cases edited or deleted.

Like most PC communications programs, *access* uses the XMODEM error-checking protocol. Keep in mind that the program's default setting in this case is *off;* you must invoke XMODEM before you transmit to or receive files from a remote system. *access* will at least remind you to perform this task, but the requirement is nonetheless an inconvenience the program need not have inflicted.

access simplifies the logon process by automating the entry of phone numbers, user IDs, passwords, and obtuse security procedures. To set up an automatic logon sequence for MCI Mail, for example, you would select the MCI Mail option from the main menu,

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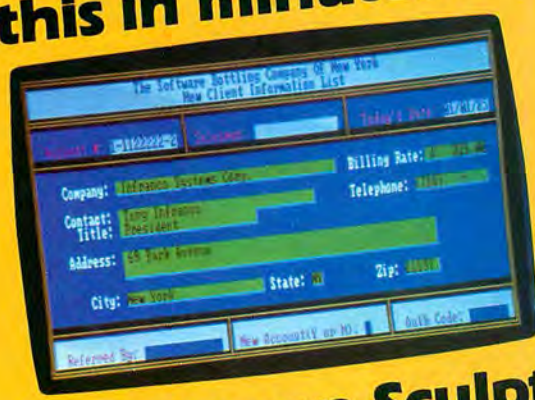

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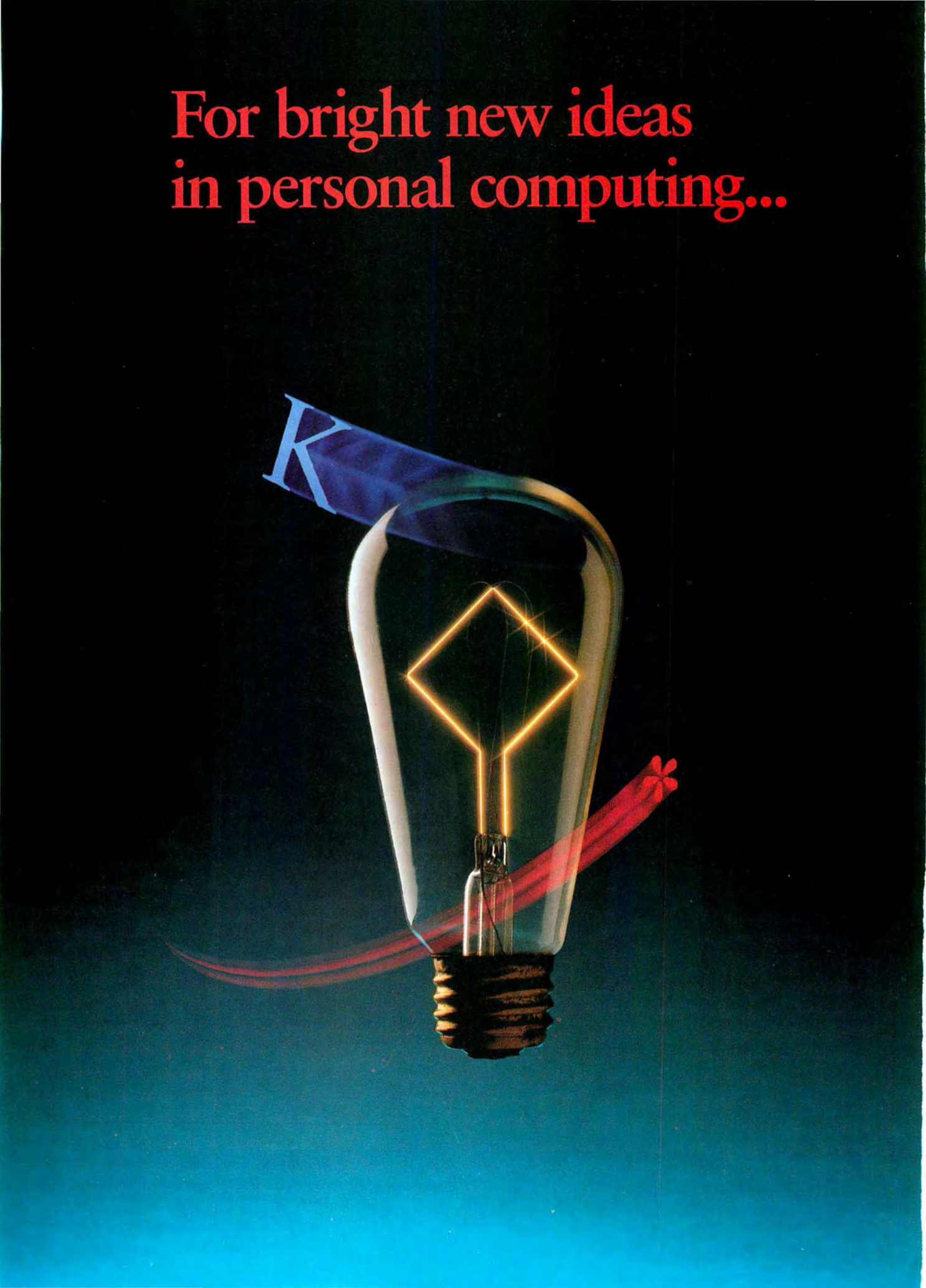

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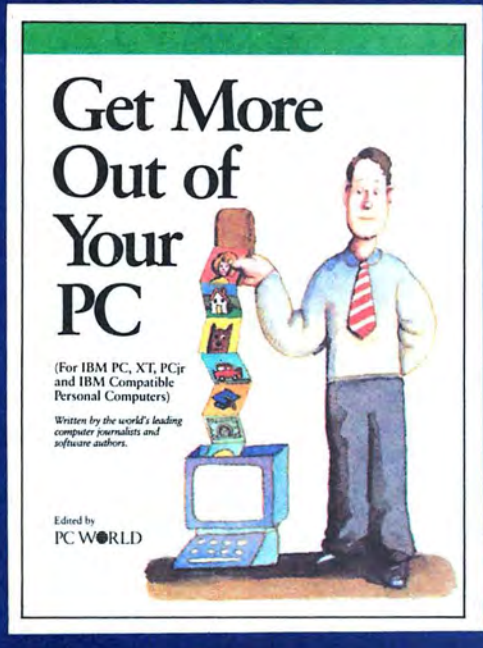

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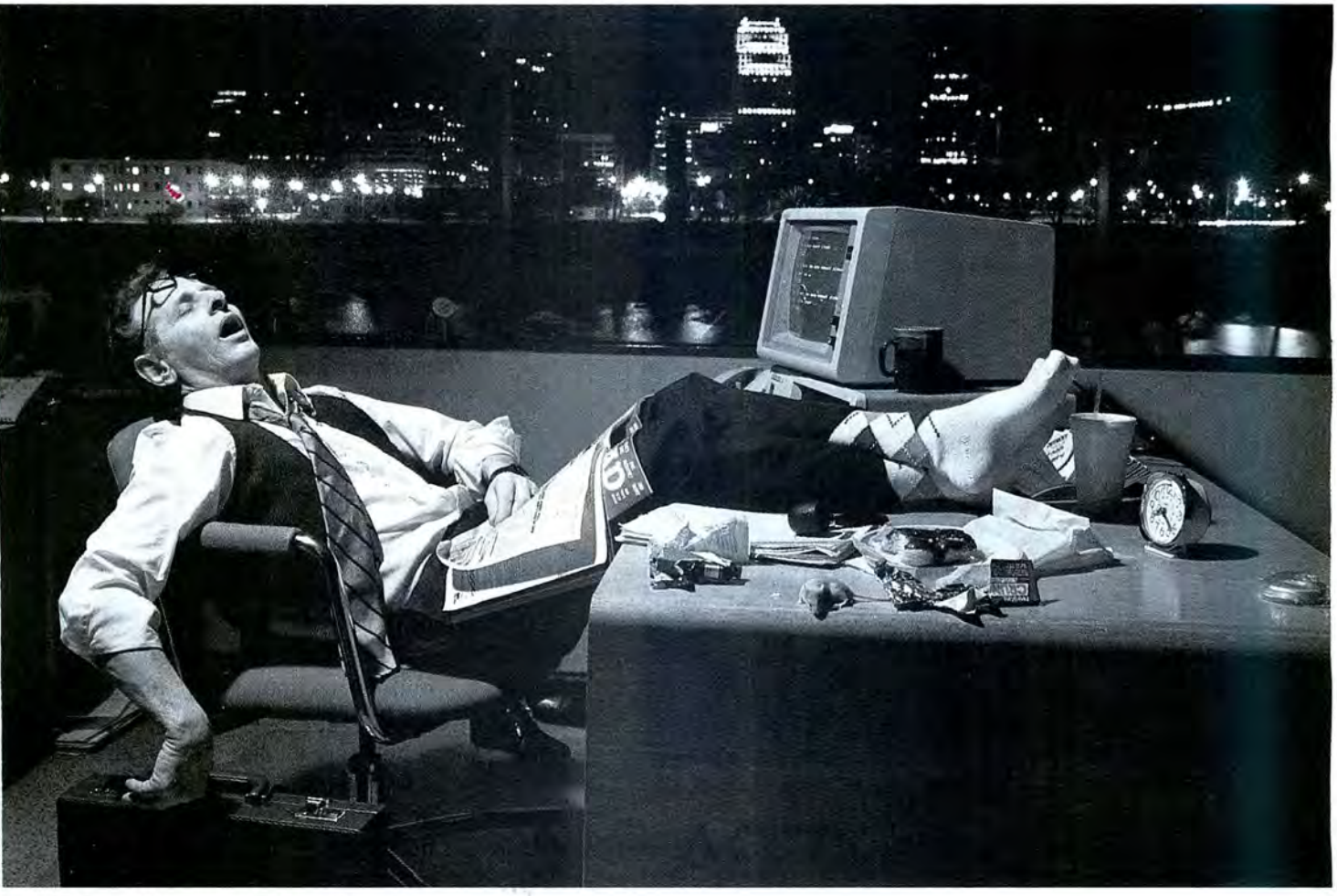

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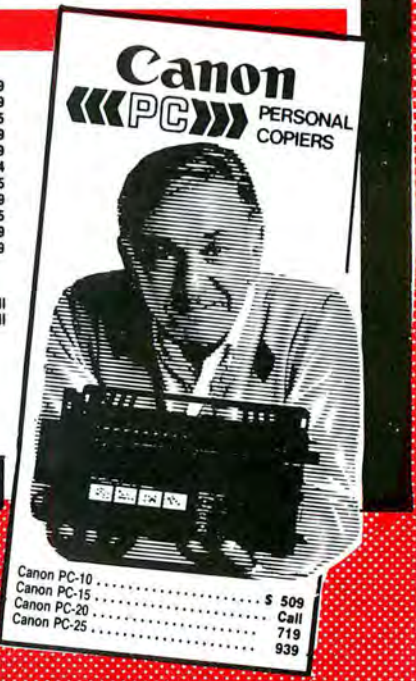

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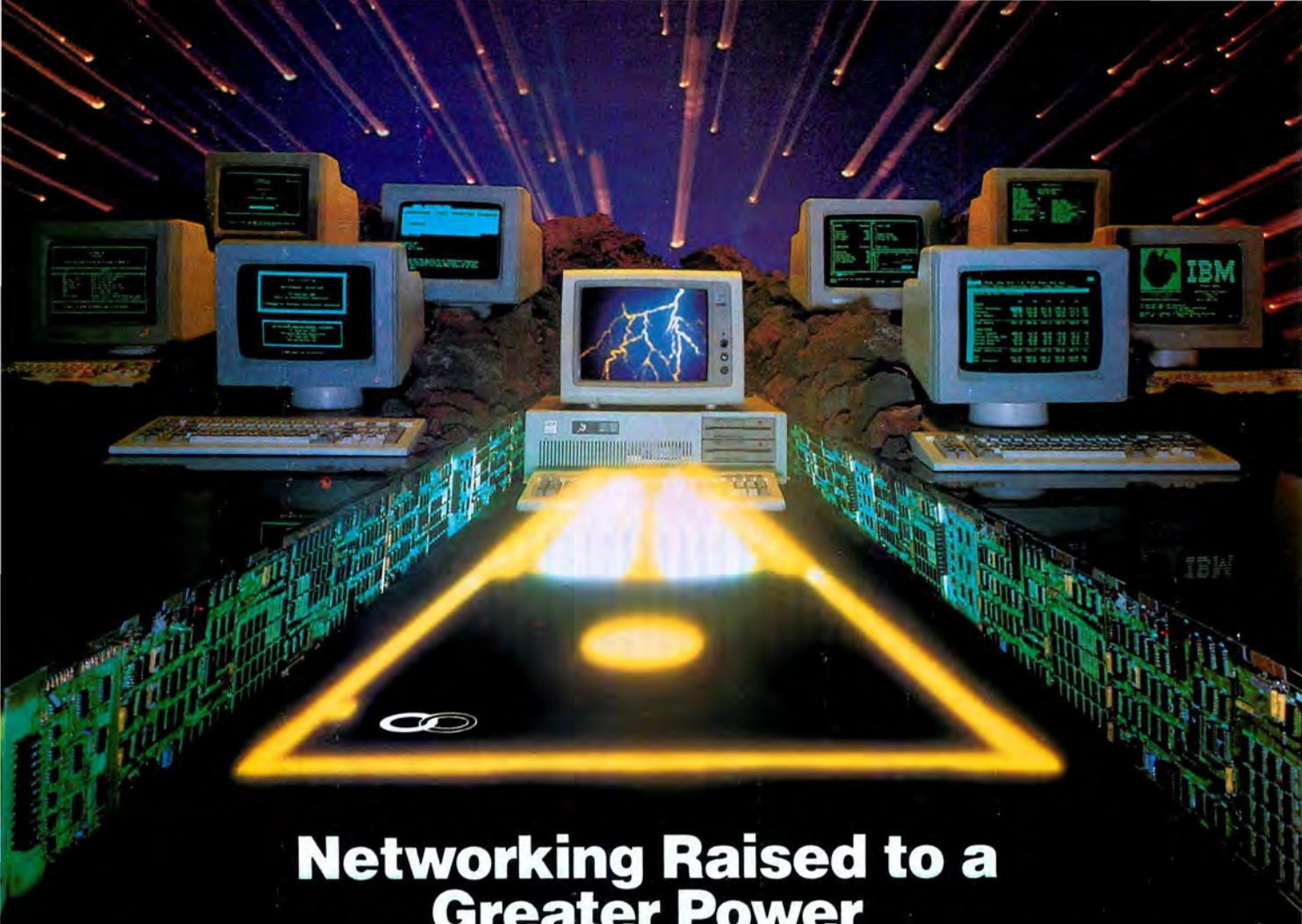

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Password: Communicate

Insights and information on the PC communications marketplace

This month: On-line query quarrels, Brits get bits, and the Great Bulletin Board Showdown

Edited by Robert Luhn

Trends

What You Know Won't Hurt You

Computer-induced traumas are typically minimized by careful preparation, cool headedness, and a willingness to admit defeat when the forces of entropy gang up on you. Delving into the on-line world, while not nearly so enervating, does call for a measure of preparation.

In the not-too-distant past, information professionals were resigned to hefting thick volumes of documentation and navigating the digital labyrinths created by Dialog Information Services, Mead Data Central, and other purveyors of on-line wisdom. Today, programs like *In-Search* and *Sci-Mate* and gateway computer systems like EasyNet help both professional and neophyte data base researchers obtain information quickly and cheaply. But which does a better job–software or computer gateways? The debate, if not actually raging, at least simmers under the banner of "user-friendliness."

Dr. Roger Summit, president of Dialog Information Services, thinks the knocks accorded Dialog's user interface are unwarranted. Not surprisingly, Summit contends that using Dialog, one of the premier data base services, is relatively simple. According to Summit, searches on Dialog require only four simple commands–Begin, Select, Display, and End. Boasts Summit, "A high school in Montgomery County, Maryland, found Dialog easy enough for students to use in researching their papers."

While duly noting Summit's defense, William T. Van Orden, director of marketing for NewsNet, maintains, "Effectively using systems like Dialog requires a training course." NewsNet, which provides on-line access to 275 industry newsletters, was expressly designed to be used without classroom instruction. Naturally, Van Orden believes that NewsNet's combination of simple commands, on-line help, and documentation "makes the system easier to use than most." Simplicity has its penalities, however–Van Orden admits that distilling a user interface to its essentials limits both the number and depth of services a data base can offer.

Summit suggests that the hardest part of using an information service is finding the right data base. Luckily, software aimed at simplifying and abbreviating this quest is appearing on the market. *In-Search*, a program designed for Dialog users, sifts data bases by class and category. Once the data bases are collated, an electronic card catalog displays the appropriate data bases to search. *In-Search* also provides automatic logon, off-screen composition of data base searches, clearly written documentation, and on-screen help (see "Gateways to On-Line Services," *PCW*, May 1985).

(continues)

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Dick Kollin, president of Telebase, provider of the EasyNet gateway, believes that in the mercurial world of on-line information *In-Search* users can quickly find themselves out in the cold. "Vendors, data bases, and services change their protocols constantly," says Kollin. Barbara Newlin, a consultant involved in the development of *In-Search*, counters that owners can easily revise their software through a free on-line update service.

EasyNet offers a consistent interface and a single set of commands for using the many services and data bases huddled under the EasyNet umbrella. You don't need to learn each service's unique command set or even worry about varying communications protocols. EasyNet queries the searcher about the information sought and, based on the answers given, suggests data bases that best fill the bill.

Their respective claims notwithstanding, the aforementioned professionals admit that effective on-line research requires time and experience. "The only thing that will help people in choosing a data base is familiarity with the data bases in question. And that comes from using them over a period of time," says Newlin. For Summit, "There's no real substitute for experience and practice. Searching will remain foreign until you do it." Even Kollin admits, "If you don't understand at least some fundamentals, because you haven't read the help screens or whatever, all we can do is turn you over to a 24-hour telephone operator."

Once again, the simple truism that knowledge is power is affirmed, though, in this case, knowing *how* to get to that knowledge is equally powerful.
–Art Wilcox

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PC Magazine
November 27, 1984

"It is setting new standards for quality and performance in the dot matrix arena."
Computers & Electronics Magazine
November 1984

On-Line

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PC-based telecommunications has opened up a vast new frontier. As in the Wild West, a state of virtual lawlessness has prevailed. But for system-busting hackers and other computerized miscreants (viewed by some as today's equivalent of pistol-packing outlaws), as well as for more benign bulletin board enthusiasts, a regulatory high noon may be close at hand.

The case *People vs. Tcimpidis* helped trigger the showdown, as faithful *PC World* readers may recall. When Pacific Bell security detected a stolen telephone-credit-card number on Tom Tcimpidis's bulletin board system (BBS) last fall, the Los Angeles system operator (SYSOP) was charged with a criminal misdemeanor. In addition, police carted off Tcimpidis's XT, modem, and related BBS paraphernalia. The incident marked the first-ever legal action involving a SYSOP and loosed a swarm of constitutional questions and ethical issues surrounding BBS activities.

The case was eventually dropped when the city attorney couldn't prove that Tcimpidis knew the source of the credit card number, believed to have been posted by an anonymous caller. But the incident let every user within dialing distance of a BBS know that the era of unbridled modems was over. In state legislatures and courts throughout the nation, the password these days is restraint.

The Tcimpidis case raised serious questions about First Amendment freedom-of-speech guarantees and Fourth Amendment safeguards against illegal search and seizure—issues with which legislators attempting to

(continues)

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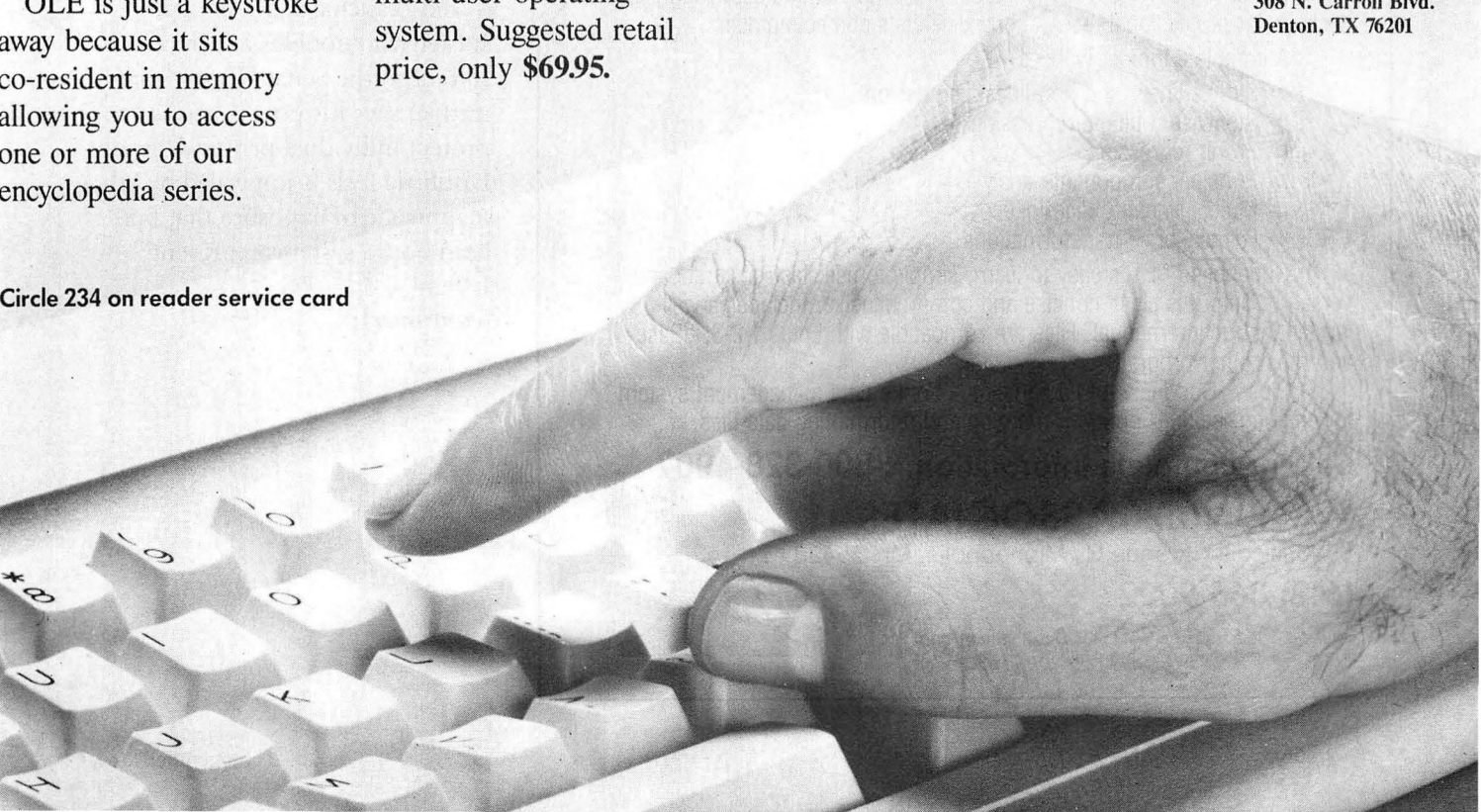

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regulate the freewheeling electronic medium continue to grapple.

In trendy California, which last gave the world fire-walking, the BBS crackdown is gathering momentum. Republican State Senator John Doolittle has introduced a bill to outlaw the placement of personal or private data on computer bulletin boards without the authorization of the individual or entity that "owns" the data. Doolittle opted for that proposed remedy after learning that *Newsweek* reporter Richard Sandza's credit rating had been ruined by hackers ticked off at a Sandza article on underground bulletin boards. The team broke into a TRW computer, obtained Sandza's credit card and Social Security numbers, and published them on bulletin boards nationwide. According to the Doolittle bill, SYSOPs who knowingly allow such information to be posted would be liable for prosecution.

Ted Blanchard, a Doolittle staffer who doubles as senior consultant to the Senate Rules Committee, says his boss is acting "to protect individual privacy," a right Doolittle feels is imperiled by "the magnitude of exposure that bulletin board systems represent."

(continues)

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On the other side of the aisle, Democratic assemblywoman Gwen Moore is taking a wholly different approach, one that suggests that constitutional rights may be in the eye of the beholder. Moore has introduced a state constitutional amendment that she claims will bring California into the computer age. The amendment extends to electronic communications, information systems, and data bases the same constitutional freedoms and privacy protections as those governing speech and press. It also gives computer data the same insulation against unlawful search and seizure accorded private homes and property. "In the future," she says, "all our information systems will be electronic, and they should have at least the same protections as personal papers in a file cabinet."

In Washington, Congress is endeavoring to control hacker intrusion into corporate and institutional data bases, but progress on protecting individual rights has lagged. For now, most of the legislative action remains on the periphery of the BBS world.

Representative Don Edwards (D-California), chairman of the House Judiciary Subcommittee on Constitutional Rights, has convened hearings to determine what categories of personal information the FBI can include in its National Crime Information Center (NCIC) network. Similarly, Representative Charles Schumer (D-New York) has drafted legislation to help states improve the accuracy of computerized criminal justice information fed to and extracted from the NCIC. Schumer is also sponsoring a bill to control the personal rental history data bases that landlords use to screen prospective tenants.

Hearings held under the aegis of Senator William Cohen (R-Maine) have probed the computer matching of records, a means that some state and federal agencies use to cross-check information in cases of suspected fraud. Last year, Cohen won passage of a measure that prohibits federal agencies from acting on such information without a hearing.

The might of the modem is only beginning to arouse politicians. Even as the debate over legal guidelines for PC-based telecommunications takes shape, there's no doubt that the sheriff is in town. —*Wes Nihei*

(continues)

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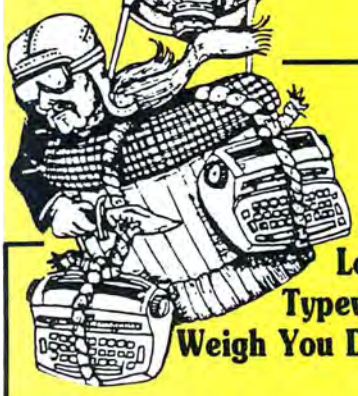

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Hayes Crosses the Big Pond

While American manufacturers and users alternately praise and damn the so-called Hayes "standard," let us consider a PC communications world without standards, such as now exists in Great Britain. British PC owners have found that although superior products abound, communications chaos prevails in the absence of electronic rules, however informal. But England's Tower of Babel is about to fall: The venerable Hayes Smartmodem 1200 has emigrated. Jonathan Angel, staff writer for London-based PC Business World, *reports:*

Most people involved with PC communications here will admit, if they're honest, that Britain lags far behind the United States. Online services cry out for subscribers; communications software written for one company's modem won't work on another's; and to top it off, many retail computer outlets don't even stock modems. Several elements contribute to this sad state of affairs, but the paramount factor is the lack of standards among British modem manufacturers.

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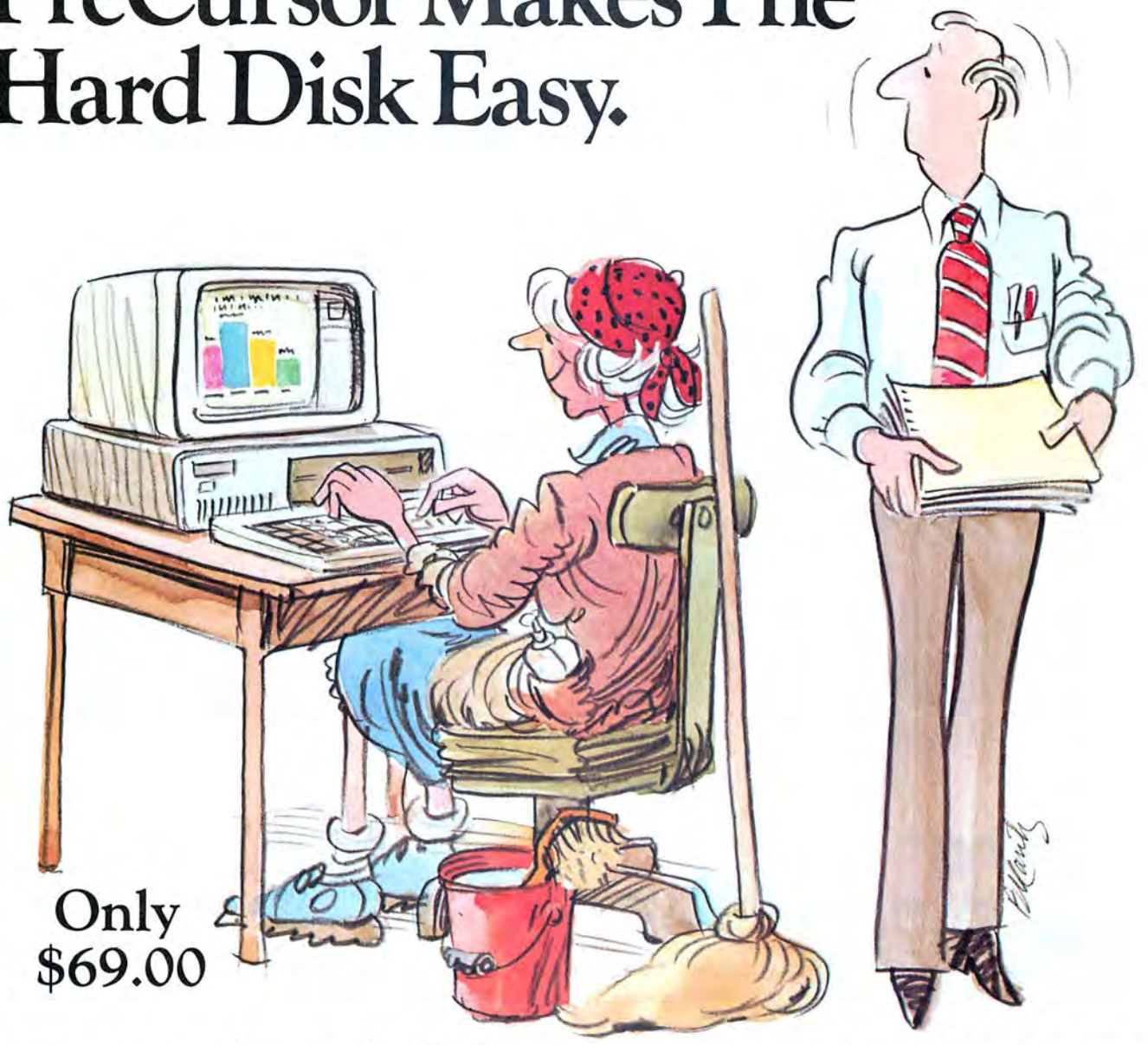

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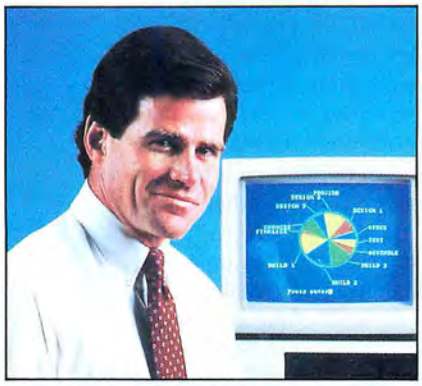

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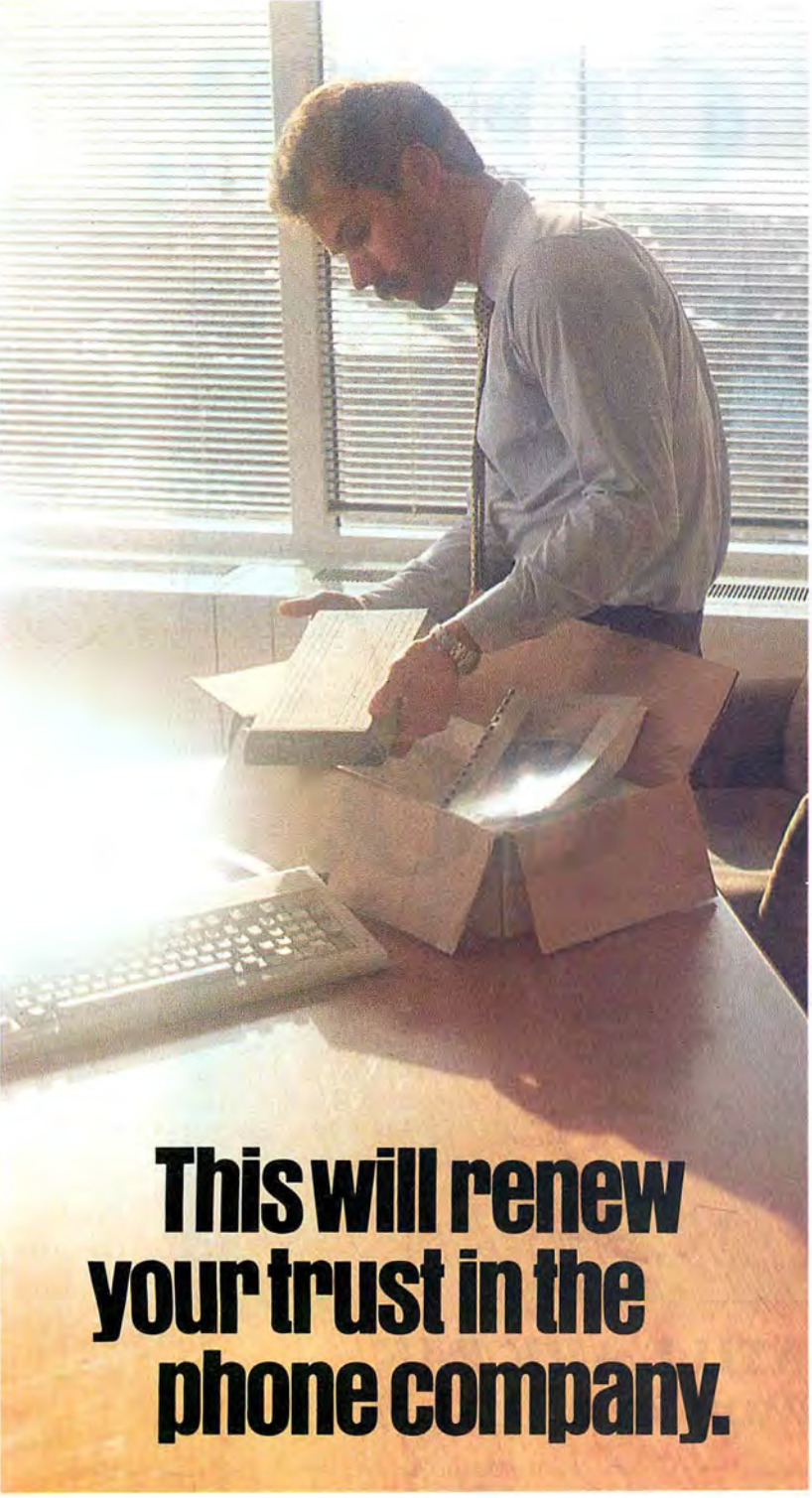

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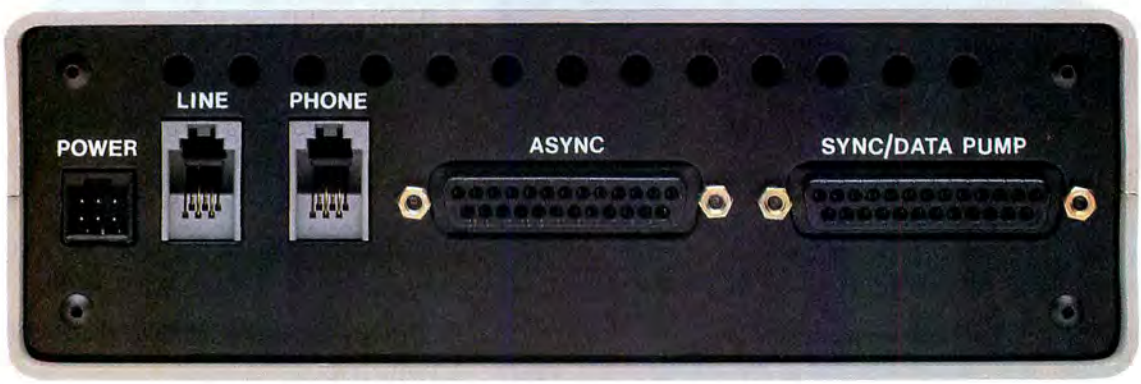

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ain. The Hayes standard consists of nothing more than the characters used for commands, plus rules for interpreting those commands. Because Hayes modems have sold so well in the States, almost every American communications vendor has adopted (sometimes grudgingly) the Hayes command set.

British modems, such as those sold by British Telecom and Racal, work roughly like Hayes modems but for some inexplicable reason use proprietary command sets. This communications separatism not only makes them incompatible with their Colonial cousins but makes PC-to-PC communication in Great Britain maddeningly frustrating. For years, queries about Hayes compatibility have met primarily with indifference on the part of companies and dealers that should have known better. The lack of foreign competition has helped foster this head-in-the-sand attitude among UK companies.

But this market Maginot Line has now been breached. The Smartmodem 1200–modified by Hayes to meet British electrical and telephone network standards–works with most popular British and American PC communications software. English modem manufacturers are already queuing up: Steebek Systems has adopted the Hayes command set for its entire modem line; Interlekt, another big player in this country, is selling the Hayes-compatible Berkeley modem. Other modem makers are expected to follow suit within a few months.

Internal Hayes-compatible modems are also likely to appear soon, but there is one snag: Britain's equivalent of the FCC licenses a PC and its modem as a single unit. Swap a modem from a PC to a Compaq and you're operating illegally. But legalities are the least of users' problems. Hayes's entry has made communications easier for all of us–and it has given British modem companies a good reason for pulling their heads out of the sand.

Art Wilcox is a telecommunications consultant and freelance writer based in San Francisco. Wes Nihei is Editorial Assistant for PC World.

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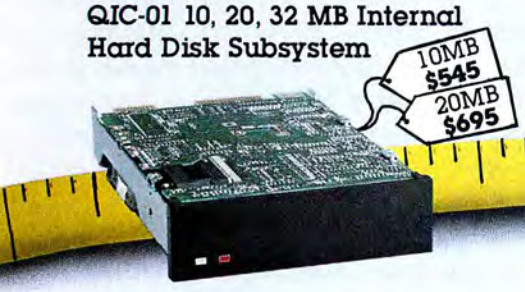
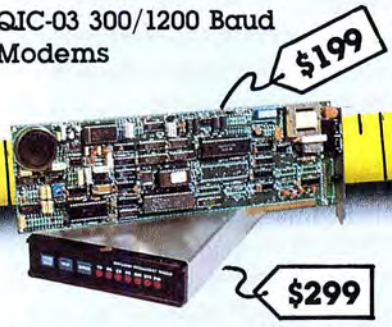
QIC-01 10, 20, 32 MB Internal Hard Disk Subsystem



This low power Microscience subsystem comes complete with controller, cables, drive, easy instructions. Fits inside your floppy slot. Compatible with DOS 2.0, 2.1, and 3.0 without any patches. 32 MB half-height w/controller, $1,295 ... 20 MB Drive for the PC AT, $895. Mounting hardware for Compaq is available. External 10 MB $695, external 20 MB $895.

QIC-03 300/1200 Baud Modems



Our modems are fully Hayes compatible with features such as low heat dissipation, low power consumption, software volume control for the speaker, and large-scale-integration "Modem on a chip" for high reliability. It also comes with communications software which lets you emulate VT100 or IBM 3101.
Half-size Internal $299.

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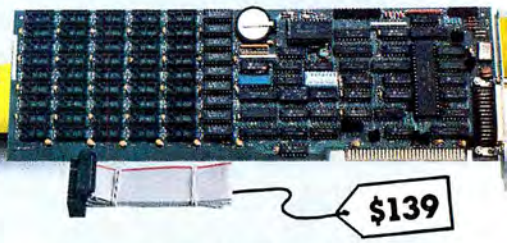

It gives you more than just added memory. It gives you **reliable** memory expansion (up to 384K), a serial port, a parallel port, a game port, and a battery back-up clock calendar. Includes RAM disk, print spooler, and clock utilities. (The 64K RAM set is only $15.) With 2 serial ports $175.

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"THE DAY I STOLE THE ACCOUNTANT'S COMPUTER"

by Suzanne Falter, copywriter

I'd been sitting at my typewriter for five years – writing, rewriting, and rewriting. One day, I'd finally had it. So I walked over to the accountant's desk, and stole his computer.

I plugged it in, and switched it on. It started to hum. The computer asked if I wanted to talk words or numbers. I opted for words. Then it offered me the choice of English, French, Spanish, or maybe Italian.

I chose English to save time. This program seemed to understand me, though I'd never spoken to a computer before. "*Move paragraph*" I'd say, and it would. We were talking like two adults, in nouns and verbs. And so, I wrote.

I edited. I deleted. I even switched paragraphs around. Then I hit the wrong button. Suddenly, the accountant's projected budget for '86 filled the screen with pie charts. Clearly, this was not just some little word processing program.

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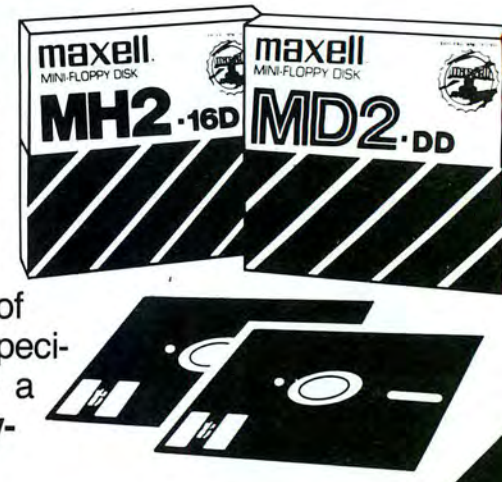

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Photo credit: Matt Herron

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Star-Dot-Star

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This month's tips and techniques cover dBASE II and dBASE III, 1-2-3, Symphony, Volkswriter, TopView, a batch file for back-ups, and more.

Edited by Steven Cook

dBASE III Function Keys

I was pleased to see that *dBASE III* has a SET FUNCTION command for defining the characters sent by function keys <F2> through <F10>. (Changing the value of function key <F1> is not allowed.) I use this facility to install menu selections via the function keys as demonstrated by the program DKEYS.

The first section of the program sets the values of function keys <F2> through <F7> to the letters A through F, representing the six functions presented by the menu. The value of function key <F8> is set to Z so that the program can recognize the <F8> key and indicate an error if it is pressed. <F9> and <F10> are set to quit and exit, respectively. After setting the function key values, the program displays the menu and waits for a keystroke. A CASE statement executes the selected function, then returns control to the menu.

Lyle Rich
San Diego, California

More dBASE II Color

The *dBASE II* color chart offered by Fritz Lang is helpful [*.*, *PCW*, June 1985], but I have an easier way to remember colors within *dBASE II*. The two parameters in the SET COLOR statement are for the GET text and the SAY text, respectively, and each may have any value from 0 to 255. The program DCOLORS displays all color combinations and the associated color values for the SET COLOR statement. Simply run the program whenever you need to determine a color combination.

John L. O'Boyle
West Hartford, Connecticut

Quick One-Liner

The following one-line batch file, CPY.BAT, copies files from the default disk drive to another drive, copying only those files that don't exist on the second drive.

```
for %%F in (%1) do if not exist %2%%F
   copy %%F %2
```

I use this batch file to back up newly created files from my hard disk. The batch file is invoked with the format CPY *filespec d:*. For example, the command CPY *.DOC A: copies all files with the extension .DOC from the default drive to drive A:.

Keep two points in mind when using this batch file. First, path names will not work with it unless the corresponding directories exist on both disks. Second, the source drive must be the default disk drive. Otherwise, the file works fine.

Amy Goebel
Alexandria, Virginia

Spreadsheet Audit

Many people do not realize that both *1-2-3* and *Symphony* can produce cell-by-cell printouts of worksheet formulas and data in the familiar row-and-column worksheet format. The effect is similar to that produced by commercial "spreadsheet auditing" programs.

In *1-2-3*, use the */Range Format Text* command and highlight the entire worksheet. You can then use normal print commands to generate a printed copy. You may wish to adjust the column widths to accommodate the formulas, which are generally longer than their computed results.

(continues)

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```
* Function key F1 not definable
SET FUNCTION 2 TO 'A'
SET FUNCTION 3 TO 'B'
SET FUNCTION 4 TO 'C'
SET FUNCTION 5 TO 'D'
SET FUNCTION 6 TO 'E'
SET FUNCTION 7 TO 'F'
SET FUNCTION 8 TO 'Z'
SET FUNCTION 9 TO 'Q'
SET FUNCTION 10 TO 'X'
SET TALK OFF
SET BELL OFF
STORE .t. TO cust_menu
CLEAR
DO WHILE cust_menu
  STORE ' ' TO func_sel
  @ 1,34 SAY "Customer Menu"
  @ 2,37 SAY DATE()
  @ 5,24 SAY 'F2    Open a New Customer Account'
  @ 7,24 SAY 'F3    Modify a Customer Account'
  @ 9,24 SAY 'F4    Display Customer Accounts'
  @ 11,24 SAY 'F5    Delete a Customer Account'
  @ 13,24 SAY 'F6    Print an Account Summary Report'
  @ 15,24 SAY 'F7    Print a Detailed Account Report'
  @ 17,24 SAY 'F9    Display Prior Menu'
  @ 19,24 SAY 'F10   Exit to DOS'
  @ 23,24 SAY 'Select Desired Option:'
  @ 23,48 SAY func_sel
  @ 23,48 GET func_sel
  READ
  DO CASE
    CASE fun_sel = 'A'
    DO newacc
    CASE fun_sel = 'B'
    DO modacc
    CASE fun_sel = 'C'
    DO dspacc
    CASE fun_sel = 'D'
    DO delacc
    CASE fun_sel = 'E'
    DO accsum
    CASE fun_sel = 'F'
    DO accdet
    CASE fun_sel = 'X'
    STORE .f. to cust_menu
    LOOP
    CASE func_sel = 'Q'
    QUIT
    ELSE
    @ 0,0 SAY CHR$(7)
  ENDCASE
  CLEAR
  ENDDO cust_menu
```

DKEYS: dBASE III program to demonstrate user-defined function keys

(continues)

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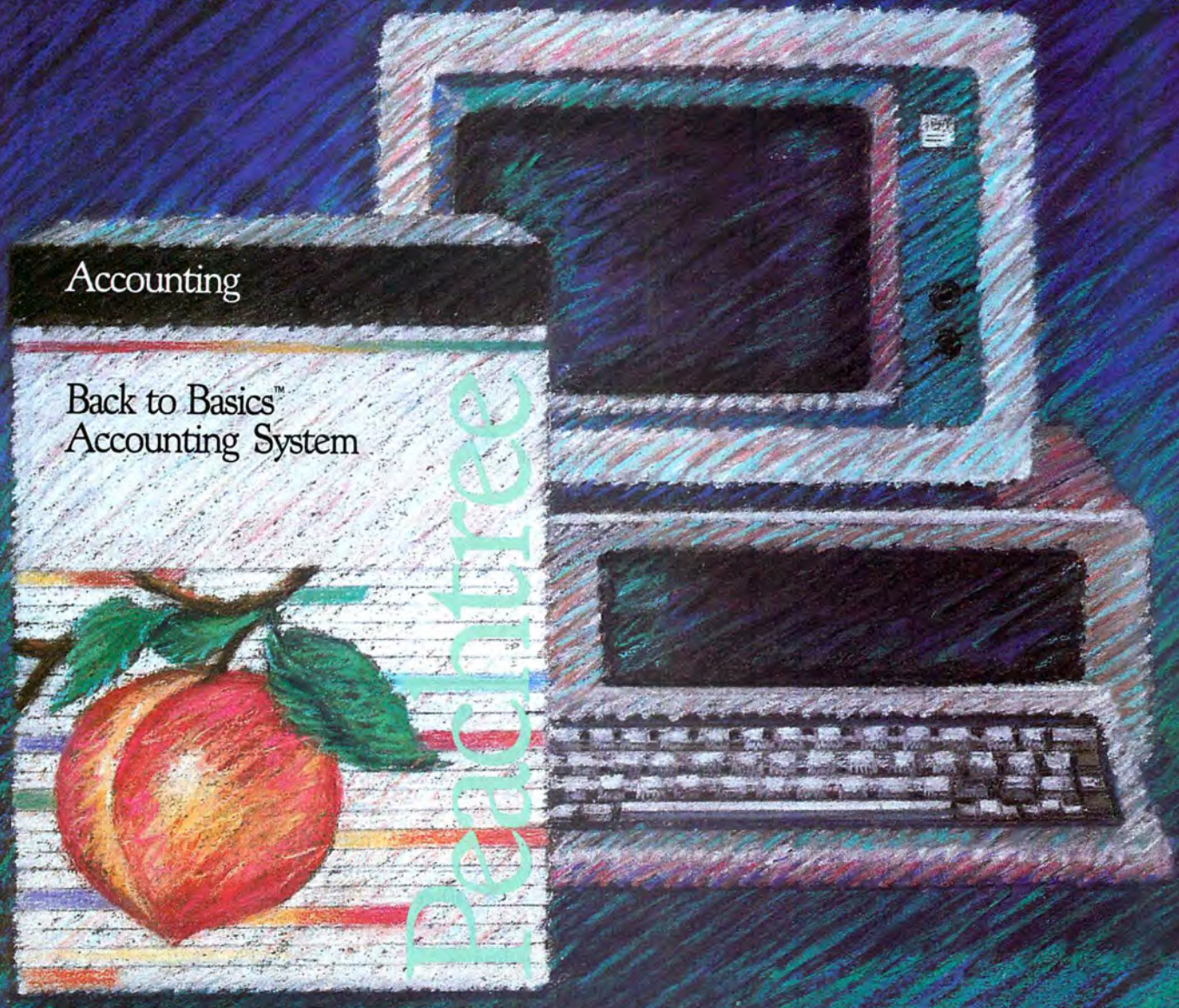

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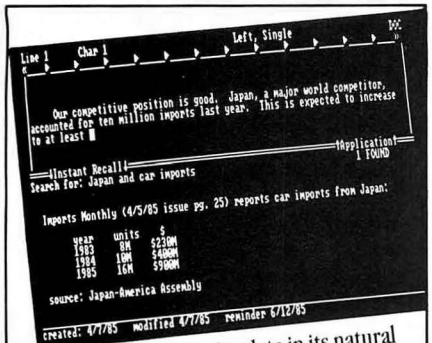
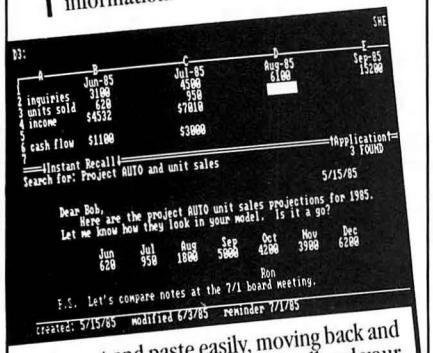


You enter and display data in its natural form, such as spreadsheets, text, tables, etc. And manage up to 2Mbytes of your information.



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```
*Display color combinations
SET ESCAPE ON
SET TALK OFF
SET ECHO OFF
SET SCREEN ON
SET FORMAT TO SCREEN
SET COLOR TO 10,10
STORE 0 TO X
STORE "X" to xyz
SET COLOR TO 14,14
        @ 6,0 ERASE
@ 3,18 SAY "dBASEII 'SET COLOR TO X,X' Options."
@ 6,0
DO WHILE X < 256
   SET COLOR TO X,X
   @ $,$+2 SAY "COLOR" + STR(X,4)
   IF X = 127
     DO WHILE XYZ > " "
        SET COLOR TO 14
        ACCEPT  "            C/R to See Blinking Colors!  " to xyz
     ENDDO
        STORE "X" to XYZ
        @ 6,0 ERASE
   ENDIF
   STORE X+1 TO X
ENDDO
DO WHILE XYZ > " "
   SET COLOR TO 139
   ACCEPT  "              ENTER (c/r) to End!  " to xyz
ENDDO
ERASE
QUIT
```

DCOLORS: dBASE II program to display screen color combinations

Symphony performs the same feat with the Menu Format Other Literal commands. Ranges, page numbers, and grid coordinates will not be printed but can easily be inserted with a text editor by directing the printout to a disk file.

Kelly Witsberger
Fort Lauderdale, Florida

Volkswriter Video

If you are using *Volkswriter Deluxe* with a color display, you can choose the screen colors for normal characters, page break line, underlined text, and so on, but not for subscript, superscript, boldface, shadow print, or the four font selections. I have found a way to sidestep this limitation by using the DEBUG program, which comes with DOS.

First, select the option you wish to change from the list shown in VOLKSDATA. Next to each option is the hexadecimal offset value you will need when making changes. Now select the color you would like for that option from COLORLIST. Each color has been assigned a number or letter, which you will need in addition to the offset value.

Place a copy of the *Volkswriter Deluxe* disk in drive B: and a copy of the DEBUG program in drive A:. At the A> prompt type the

(continues)

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Instead, we put the extra profit into our testing facilities. That's why Xerox guarantees our $395 10 megabyte hard disk for one year.

Xerox knows, as our customers know, that we have an extensive testing program. Here is what we contribute toward giving you the maximum hard disk performance.

Best Drives Available

First, we buy the best drives available. Sounds trite, doesn't it? I mean, a drive's a drive—right? Hardly. You should see some of the junk we get in our labs. Some have such high failure rates that we even questioned our own $10,000 hard disk tester. But when we tested other manufacturers' drives we were assured that our equipment was fine, which just confirmed that the bad hard disks were not only bad—they were real bad.

But that's just the weeding out process. We then take each drive that we've put through our tester and test it again with the controller you've requested. We call this a "tested pair."

DOS Doesn't Do It

In case you're thinking that all this is an unnecessary duplication of what DOS does for you, let me explain the disk facts of life.

If DOS did what you may think it is supposed to do when you format the disk, DOS would map around these bad areas. Unfortunately, DOS doesn't do this.

DOS 2.0 and 2.1 can't enter the bad tracks. DOS 3.0 can, but only on the IBM AT. Unfortunately, as the press has so well documentated, the AT's hard disk develops bad tracks later on.

We do what DOS can't

We believe the problem is so bad, we use a software program that performs a powerful test of your disk drive on all of the IBM or IBM compatible computers—PCs, XTs, and ATs. Our format takes hours to analyze the disk. But when we finish, you know that the bad tracks are really mapped out so you won't write good data that will disappear into a black hole. We even send you a printed statement of our test results.

Our software allows you to type in the bad track locations from the list supplied by the manufacturers, so you'll never write good data to them—even if DOS didn't identify them as bad. The software even lets you save the location of these bad sections to a file, so that you can reformat your disk without spending hours retesting.

We even include a program that will give you continuous comments on the status of your hard disk. No more waiting for that catastrophic failure.

Average Access Time

As you might suspect, some hard disks are faster than others in their ability to move from one track of data to another. The time it takes the hard disk to move one-half way between the beginning of the disk to the end is called the "average access time."

The first generation of 10 megabyte hard disks had average access times of 80-85 milliseconds (msec). But computer users love speed, and guess what—the average access time for the new 20 megabyte hard disk in the IBM AT is only 40 msec. (We sell an AT equivalent with only 30 msec access time!)

There are some legitimate reasons for the shorter access time. It's particularly helpful when there are multiple users on the same hard disk. It's also important when running a compiler. But remember, before you get too wrapped up in the access speed, there's always that ST 506 interface which won't let data transfer from the hard disk to the computer any faster than 5 megabits/second. We've bypassed that choke hole, too. If you want the functional equivalent of a Ferrari with a turbocharger, order our 10 Mbit per second 100 megabyte hard disk with 18 msec of average access speed.

Compatibility

To be sure that your hard disk is 100 percent compatible with the IBM XT you don't need to buy the same hard disk that's in the XT. You can't even be sure what brand hard disk it is because IBM, like Express Systems, goes into the marketplace and buys hard disks from several vendors. However, they buy their XT hard disk controller from only one vendor—the same one we do.

You can buy the IBM XT controller from IBM for $495 or you can buy from us, the functional equivalent, manufactured by the same company that makes it for IBM for only $195. Is it the exactly identical IBM XT controller? No, it's better. First, it takes less power, and secondly, it can control from 5 to 32 megabytes—the IBM controller can work with only 10 megabytes. It is 100 percent IBM XT compatible, and 100 percent is 100 percent. If you want to save a slot, we carry a version that lets you operate two hard disks and two floppy disk drives.

More than 32 Megabytes

You can operate with more than 32 megabytes (the limit of DOS) through the use of "device drivers." Express Systems can supply you with device drivers for our hard disks for over 32 megabytes formatted. But, if you don't have individual files, or databases that are large, you might want to consider one of our controllers that can divide our 65 megabyate (formatted) hard disk into two equal volumes of 32 megabytes each.

Reliability

We offer you a choice between iron oxide and plated media—the stuff that covers the hard disk and gives it its magnetic properties. Iron oxide is,—well, it's rust. If you inadvertently joust your disk, you may cause the low flying head to dig out some iron oxide. A little rust flake can ruin your whole day. Plated media is more resistant to damage, and if it happens, less data is lost.

We offer both types of hard disks. The iron oxide is older

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technology, and quite frankly, manufacturers understand it better. Their better understanding, combined with some of the special head locking mechanisms, gives us peace of mind when we sell you one.

Power

Hard disks consume power. Our small, half-high hard disks consume so little power that you can use them with your existing IBM PC power supply. If you plan to use lots of slots, you'll want to increase your power supply to be safe. We offer the same amount of power for your PC that comes in the XT.

Our Customers

Some folks just never feel comfortable buying mail order. They forget that Sears began as a mail order house or that IBM is now into mail order. But, if it helps, here is a *partial* list of customers who have felt comfortable to buy from us.

IBM	Sears
American Express	Honeywell
U.S. Army	MIT
AT&T (Bell Labs)	RCA
Bausch & Lomb	Lockheed
Xerox	Sperry

Easy to Install

If you're like most of us, raised on the boob tube rather than the Great Books, you'd rather see the movie than read the book. Well, now you can choose to read our installation manual or for only $9.95 more, you can get a VHS or Beta video cassette showing the simple steps for installation.

Warranty

We offer you a one year warranty on our hard disks—the same as IBM on the AT and 90 days on the tape drives. (It's all the manufacturer gives us.) If anything goes wrong with your tape or disk drive or hard disk, send it back in the box it came in. However, we have found that we can usually solve the problem over the phone. So call first for a return authorization number because we can't accept any returns without it.

Complete Hard Disk Kits

Formatted MB	Height	Plated Media	Average Access	Transfer Rate	PC or PC/XT	AT
10	½	no	85 msec	5 Mbits/s	$ 395	$ N/A
10	½	yes	85 msec	5 Mbits/s	$ 495	$ N/A
21	½	yes	85 msec	5 Mbits/s	$ 795	$ 595
21	Full	no	30 msec	5 Mbits/s	$ 1,535	$ 1,340
32	½	yes	85 msec	5 Mbits/s	$ 995	$ 795
32	Full	no	30 msec	5 Mbits/s	$ 1,775	$ 1,575
65	Full	no	30 msec	5 Mbits/s	$ 2,295	$ 2,070
100	Full	yes	18 msec	10 Mbits/s	$ 4,995	$ 4,995

Removable Hard Disk

10	½	no	90 msec	5 Mbits/s	$ 1,095	N/A

Tape Systems and Subsystems

Formatted Storage Capacity	Height	Data Transfer Rate (k/sec)	PC or PC/XT	AT
60 Mbytes	½	88	$ 995	$ 995
60 Mbytes Subsystem		88	$ 1,295	$ 1,295
21 Mbytes (unformatted) Start/stop Subsystem		24	$ 595	$ 595
26 Mbytes Floppy Tape® Subsystem		31	$ 749	$ 749

Controllers

All of our hard disk and tape controllers are available separately: Please call for prices.

Subsystem Chassis

Any of our disk or tape units are available in an external subsystem for an additional $250.00. You can mix & match any of our ½ high hard disks or tape drives together or add any single full height hard disk.

Tape Cartridges

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Power Supply

130 Watt Power supply **$75.00***
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*with the purchase of any drive

Comes complete

All Express Systems products come complete with the appropriate software, tape and/or hard disk controllers, and cables where required. Hard disks are formatted and tested with the PC DOS of your choice. All drive sizes are formatted capacities.

If your application requires a stacking kit, power splitter cables, daisy chain cable, or some other variation, we'll supply these items at a nominal charge. We even ship our hard disks with Command Assist™ an on- line DOS-like manual to give you help with your DOS commands.

More questions?

Because we spend so much attention on the front end with ensuring that our disks will arrive in working order, we have a customer service department that, unlike many of our competitors, has little to do. When you need us, you won't get a constant busy signal.

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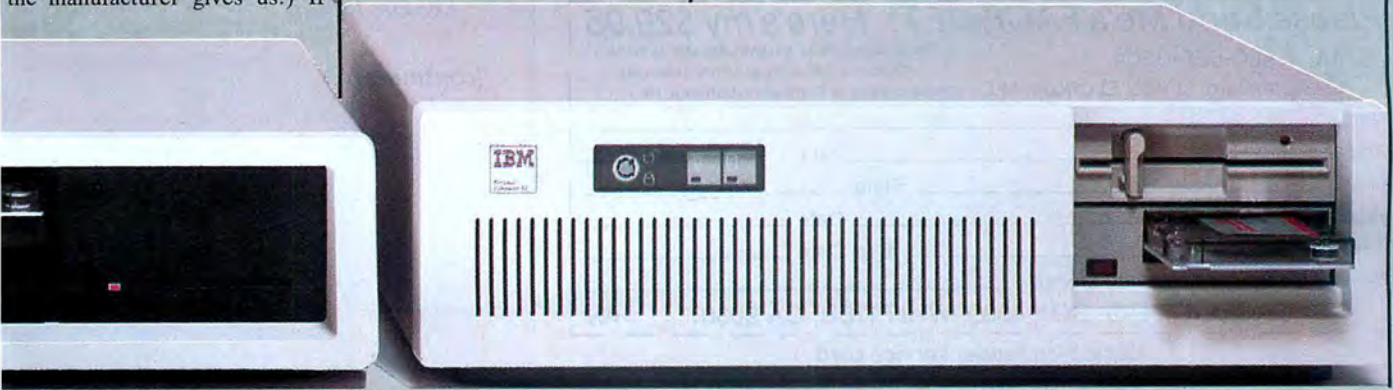

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Circle 9 on reader service card

Normal characters	120
Boldface	133
Underline	134
Superscript	137
Subscript	138
Shadow print	139
Font 2	13C
Font 3	13D
Font 4	13E
Status line	141
Page break line	142

VOLKSDATA: Offset values to change text colors on Volkswriter Deluxe

command **DEBUG B:VX.SYS < Enter >**. When you see a hyphen on the screen, type **E** followed by the offset value for the option you wish to change, a space, and the number or letter of the desired color. Press **< Enter >** to complete the line, and DEBUG will again display its hyphen prompt. Next, type **W** and press **< Enter >** to write the modification to disk, then type **Q** and press **< Enter >** to quit DEBUG and return to DOS.

That's it. The next time you run *Volkswriter,* the screen display will be customized to suit your preferences.

Howard Silver
Skokie, Illinois

(continues)

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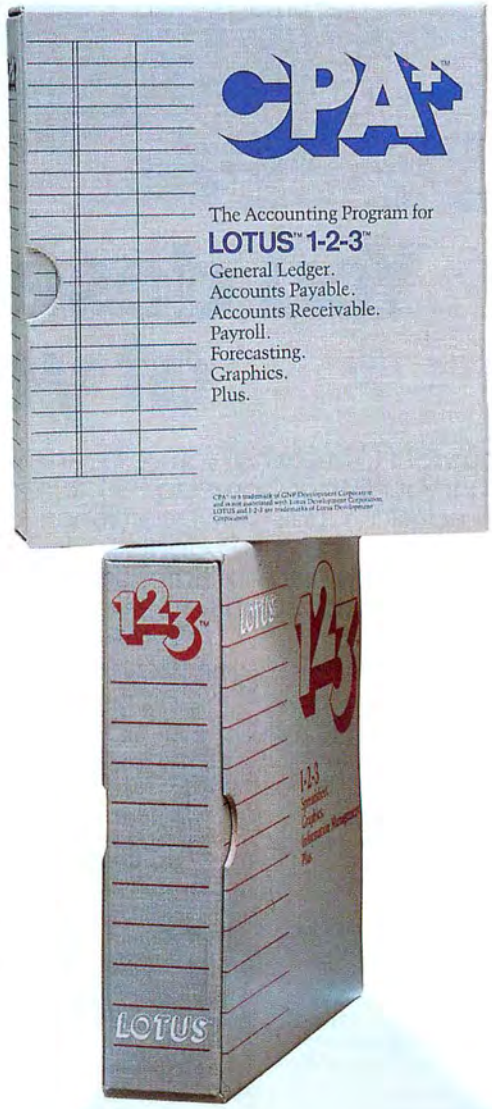
All of a sudden, all you need to know to keep your company's books is one name. CPA+.



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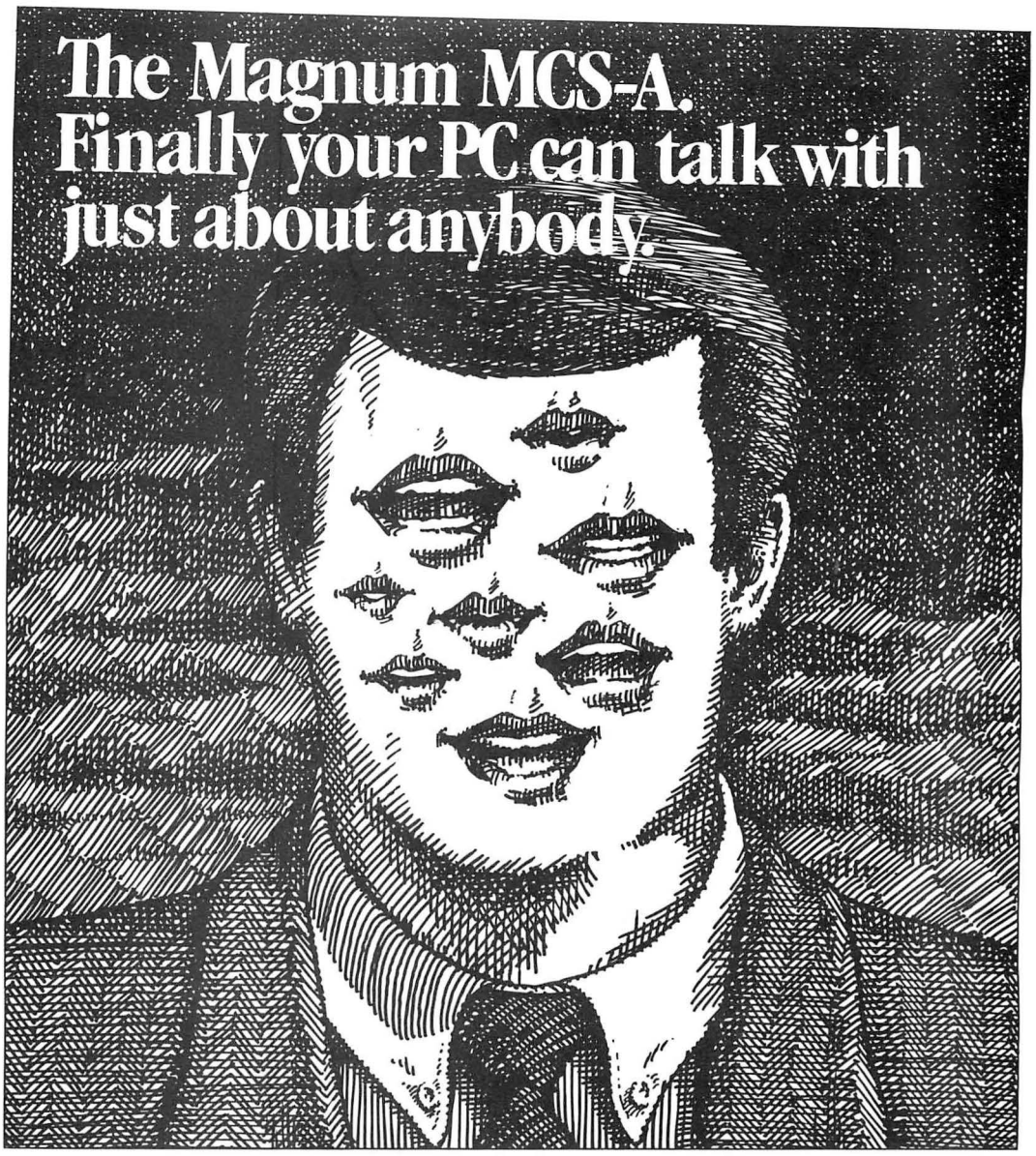
The Magnum MCS-A. Finally your PC can talk with just about anybody.



LIKE DEC VT-52 AND VT-100, IBM 3101-MOD 10/20, DG DASHER 210/211 AND MORE.

The Magnum MCS-A (Multi-functional Communications System-Asynchronous) gives your IBM PC or compatible something quite unheard of.

Unlimited terminal emulation capability. And total application flexibility.

So, not only are you able to talk with the popular terminals we've just mentioned, you're able to implement those additional emulations you need now. Or may need later on, even if they don't exist yet.

That's more than unlimited terminal emulation, come to think of it. That's the end of upgrade costs and reaction times, too.

The MCS-A incorporates TurboCom™, our innovative software package with proprietary translation mechanism. And it's TurboCom that delivers MCS-A's unlimited emulation capability and allows you enhanced file transfer control.

SPEAKING OF UNLIMITED EMULATION.

Let's take one example. With the MCS-A, your PC is now able to emulate a VT-100 standard terminal and receive a data file. Then, thanks to TurboCom, you can immediately change your emulation to another type terminal–say a 3101–and send the received file locally or via the phone system.

AND A WORD OR TWO ABOUT FILE TRANSFER APPLICATIONS.

Now, with the MCS-A on board, you'll be able to update a central, unattended PC's "old" data files with "new" data from either a local or remote user without jeopardizing other files on the unattended PC. On the flip side, you can transmit a predetermined file from an unattended PC to a designated remote or local user. The MCS-A's asynchronous system also allows you to exit TurboCom while maintaining a telephone line connection, locally process a just-received file, then reenter TurboCom and transmit that processed file back to the source computer.

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Enhancements include standard multifunction features (I/O ports, memory expansion, clock), plus TurboRam™ electronic diskette emulation and TurboSpool™ print spool program.

Yet, with all this exceptional enhancement to your PC, the MCS-A requires only one expansion slot. That's right, one!

WE'VE ALREADY SAID A MOUTHFUL.

But there are many more good reasons and some helpful data to consider about the MCS-A. Contact us now. Call 800-824-2748. (In Texas, call 800-833-8391). Or send us the coupon; attach your card if you prefer. Let's talk about how your PC can talk with just about anybody.

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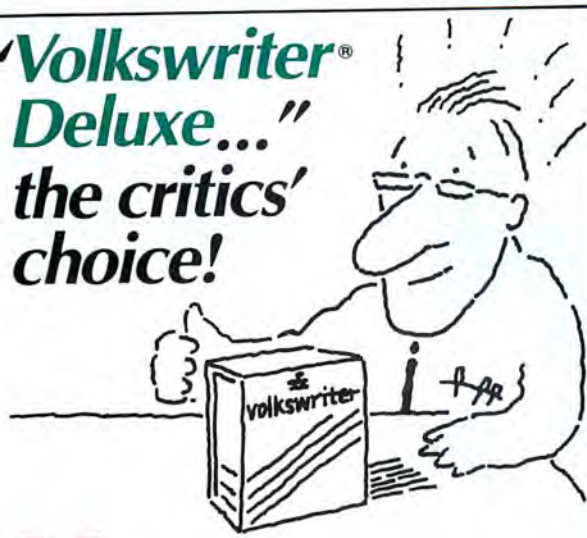

"Thirty word processing programs were reviewed ... no other program received a higher overall evaluation than Volkswriter Deluxe."
Software Digest Ratings Newsletter, January 1984

"If WordStar™ set a standard ... Volkswriter Deluxe sets a new standard for transparency, simplicity, and speed. You can learn Volkswriter in under an hour ... because it does so many things exactly the way you think they should be done."

"VOLKSWRITER DELUXE is the best buy in the IBM-PC™ writing tool arena."
Charles Spezzano, Whole Earth Software Review, January 15, 1984

"Volkswriter Deluxe ... a simple way to word processing power ... for writers who like to think."
Washington DC Capital PC User's Group Vol. 3, #4

"Lifetree ... provides exceptionally helpful and competent assistance to registered owners, and the company's update policies are excellent."

"In sum, this is a unique word-processing program."
John Lombardi, Reviewer, InfoWorld, April 16, 1984

We couldn't have said it better ourselves!

Suggested Retail Price: Volkswriter Deluxe $295 for the IBM-PC, PC compatibles, TI Professional™ and TRS-80 Model 2000™.

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File Moves in BASIC

Though not explicitly documented, the BASIC command NAME ... AS ... can be used to move files from one subdirectory to another. This technique replaces the commonly used two-step process of copying a file from the old directory to its new location, then deleting the original file. For example, the BASIC command NAME "\WP\FILES\SMITH-.LTR" AS "\LETTERS\AUG\SMITH.LTR" moves the file SMITH.LTR from the subdirectory \WP\FILES to the \LETTERS\AUG subdirectory.

Michael Cox
Huntington Beach, California

Editor's note: Although BASIC does not allow wild-card characters in the NAME AS command, you can write a BASIC program using this technique to move groups of files between subdirectories.

Quiet, Please!

IBM's *TopView* in a mouseless configuration must break all records for variety and sheer quantity of audible feedback. Each press of a cursor key causes an undercurrent of rumbling reminiscent of *BattleZone*, a video game classic.

(continues)

BUYERS GUIDE TO DESKTOP ORGANIZERS

A COMPARISON OF THE MOST POPULAR PRODUCTS

	PolyWindows DeskPlus	Sidekick	Spotlight
ROLODEX-TYPE FILES			
Variable Card Size	**YES**	NO Files	NO
Multiple Card Decks	**YES** (1-10)	NO Files	**YES**
Number Cards Per Desk	**RAM Limit**	NO Files	500 Max.
Max. Characters Per Card	**969**	NO Files	480
Search	**YES**	NO Files	**YES**
Auto Alphabetize	**YES**	NO Files	**YES**
Print Card or Deck	**YES**	NO Files	**YES**
CALENDAR			
Daily Notes	**YES**	NO	NO
Mark Important Days	**YES**	NO	NO
APPOINTMENT BOOKS			
Multiple Appt. Books	**YES** (1-10)	NO	NO
"Things To Do" List	**YES**	NO	NO
Print Appointment Book	**YES**	**YES**	**YES**
ALARM CLOCK			
Display Time	**YES**	NO Alarms	**YES**
Hourly Chimes	**YES**	NO Alarms	NO
Display Alarm Message	**YES**	NO Alarms	NO
Number of Alarms	**9**	NO Alarms	Many
CALCULATOR			
On-Screen Tape	**YES**	NO	NO
Printing Tape	**YES**	NO	NO
Percentage Function	**YES**	NO	**YES**
Display With Commas	**YES**	NO	NO
Floating/Fixed Decimals	**YES/Both**	Fixed	Floating
Memory	**YES**	**YES**	**YES**
Insert Result in Work	**YES**	**YES**	**YES**
Max. Display Digits	**15**	18	12
Exponential Notation	**YES**	NO	NO
★Binary/Hex/Octal	**YES**	**YES**	NO
★ASCII TABLE	**YES**	**YES**	NO
NOTEPAD			
Multiple Documents	**YES** (1-10)	NO	NO
Word Wrap	**YES**	**YES**	**YES**
Merge Files	**YES**	NO	NO
Change Margins	**YES**	**YES**	NO
Variable File Size	**YES**	**YES**	NO
File Size Limit	**64K**	50K	4.4K
Variable Window Size	**YES**	**YES**	NO
★Search & Replace	**YES**	**YES**	NO
★Block Moves	**YES**	**YES**	NO
★Auto Indenting	**YES**	**YES**	NO
★Page Break Display	**YES**	NO	**YES**
★Insert or Overtype Mode	**YES**	**YES**	**YES**
★Cut Sheet Printing	**YES**	NO	**YES**
Print Document	**YES**	**YES**	**YES**
Print Window Only	**YES**	**YES**	**YES**
Undelete Key(s)	**YES**	**YES**	NO
KEYBOARD ENHANCER			
Number Keys Redefined	**YES Up to 60**	NO Macros	NO Macros
Total Keystrokes	**YES** 2500	NO Macros	NO Macros
★GRABBER			
Cut & Paste between applications	**YES**	Import Only	NO
★DOS FUNCTIONS See copy	**YES**	NO	NO
★AUTO DIALER	**YES**	**YES**	NO
GENERAL CHARACTERISTICS			
100% Memory Resident	**YES**	NO	NO
Minimum Memory Used	**40,000**	61,300	77,200
Typical Memory Used	**50,000-75,000**	61,300	77,200
On-Line Help	**YES**	**YES**	**YES**
Moveable Windows	**YES**	**YES**	NO
Redefine Colors	**YES**	**YES**	**YES**
Expandable/Add Functions	**YES**	NO	NO
Can Remove Functions	**YES**	NO	NO
Integrated Interface	**Excellent**	Good	Good
Visual Appeal	**Excellent**	Fair	Poor
Speed	**Very Fast**	Fast	Slow
COST - PROTECTED	**$49.95**	$54.95	$75.00
COST - UNPROTECTED	**$84.95**	$84.95	NO/Not Avail.

★ NEW FEATURES see chart

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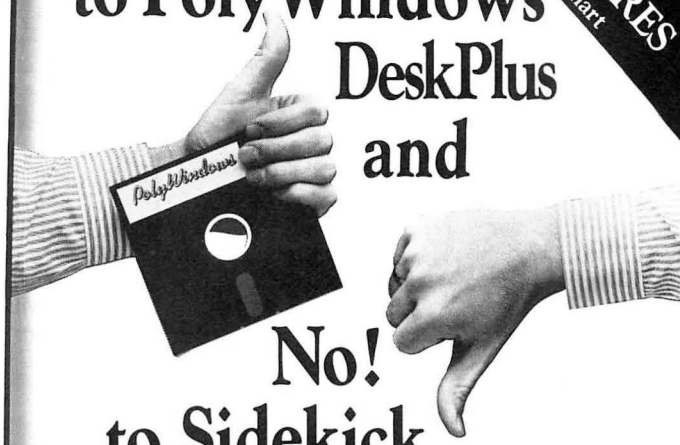

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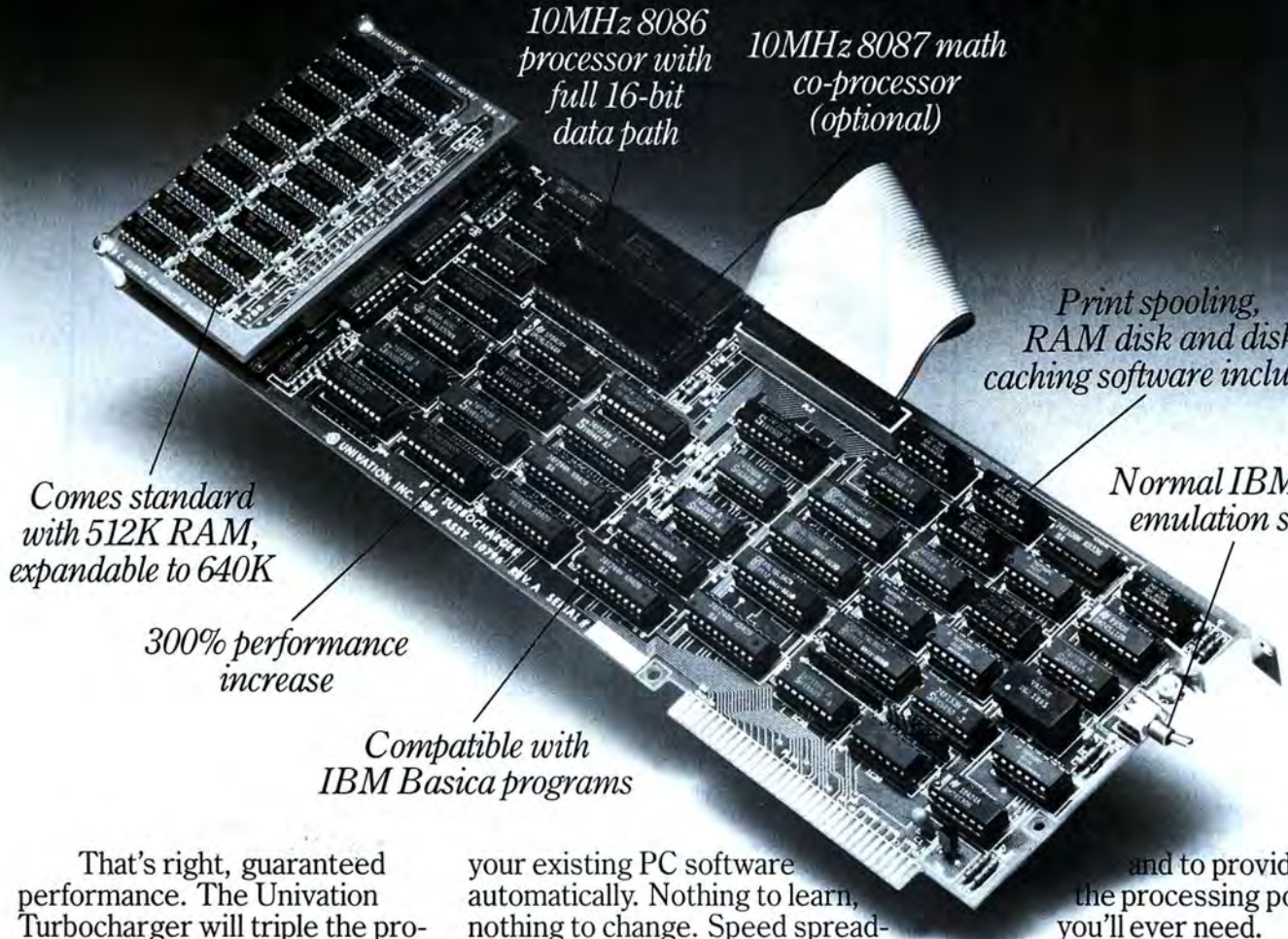

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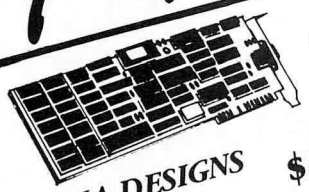

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•

Black	0	Gray	8
Blue	1	Light blue	9
Green	2	Light green	A
Cyan	3	Light cyan	B
Red	4	Light red	C
Magenta	5	Light magenta	D
Brown	6	Yellow	E
White	7	Bright white	F

COLORLIST: Values for various screen text colors

```
A>debug b:tv.com <Enter>
-u 5c03 <Enter>
xxxx:5C03 7412          JZ      5C17
xxxx:5C05 50            PUSH    AX
xxxx:5C06 B0B6          MOV     AL,B6
xxxx:5C08 E643          OUT     43,AL
xxxx:5C0A 58            POP     AX
xxxx:5C0B E642          OUT     42,AL
xxxx:5C0D 8AC4          MOV     AL,AH
xxxx:5C0F E642          OUT     42,AL
xxxx:5C11 E461          IN      AL,61
xxxx:5C13 0C03          OR      AL,03
xxxx:5C15 E661          OUT     61,AL
xxxx:5C17 83C304        ADD     BX,+04
xxxx:5C1A 81FBB25C      CMP     BX,5CB2
xxxx:5C1E 7503          JNZ     5C23
xxxx:5C20 BB325C        MOV     BX,5C32
-a 5c03 <Enter>
xxxx:5C03 jmp 5c17 <Enter>
xxxx:5C05 <Enter>
-w <Enter>
Writing A800 bytes
-q <Enter>
```

TOPGAG: Patch to eliminate TopView sound effects

(continues)

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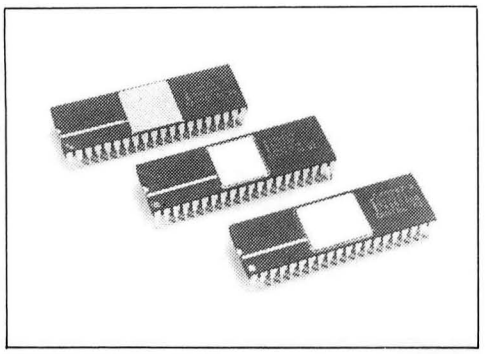

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- *Accrual or cash based*
- *13 periods*
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- *Allows multiple-postings per month*

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- *Two-part check printing allows multiple-postings for each check*
- *Allows multiple checking accounts*
- *Detailed payables and check journals*
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Even when the rumbling is toggled off by pressing the 5 on the numeric keypad, toggling into or out of *TopView* mode with the <Ctrl> key sets off more yammering. To silence *TopView* once and for all, put a copy of TV.COM into drive B: and a disk containing the DOS program DEBUG.COM into drive A:, then follow the steps shown in TOPGAG.

Wilson Smith
New York, New York

Editor's note: Please do not modify your only copy of TopView.

Format Finish

I've found that using the FORMAT program can waste a great deal of time, especially when I want to format an entire box of disks. Either I sit and stare at the screen while the disk drive whirs, or I turn my attention to something else, only to notice later that FORMAT has finished and is waiting for my response.

With a little modification, however, FORMAT can be made to beep each time it finishes formatting a disk. This frees you to do other things while FORMAT is running, yet attracts your attention when necessary so you don't lose any time between disks.

(continues)

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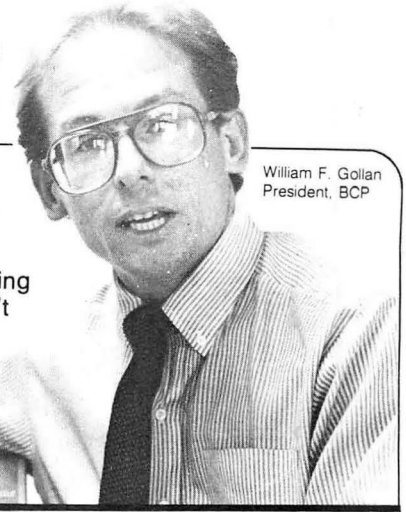

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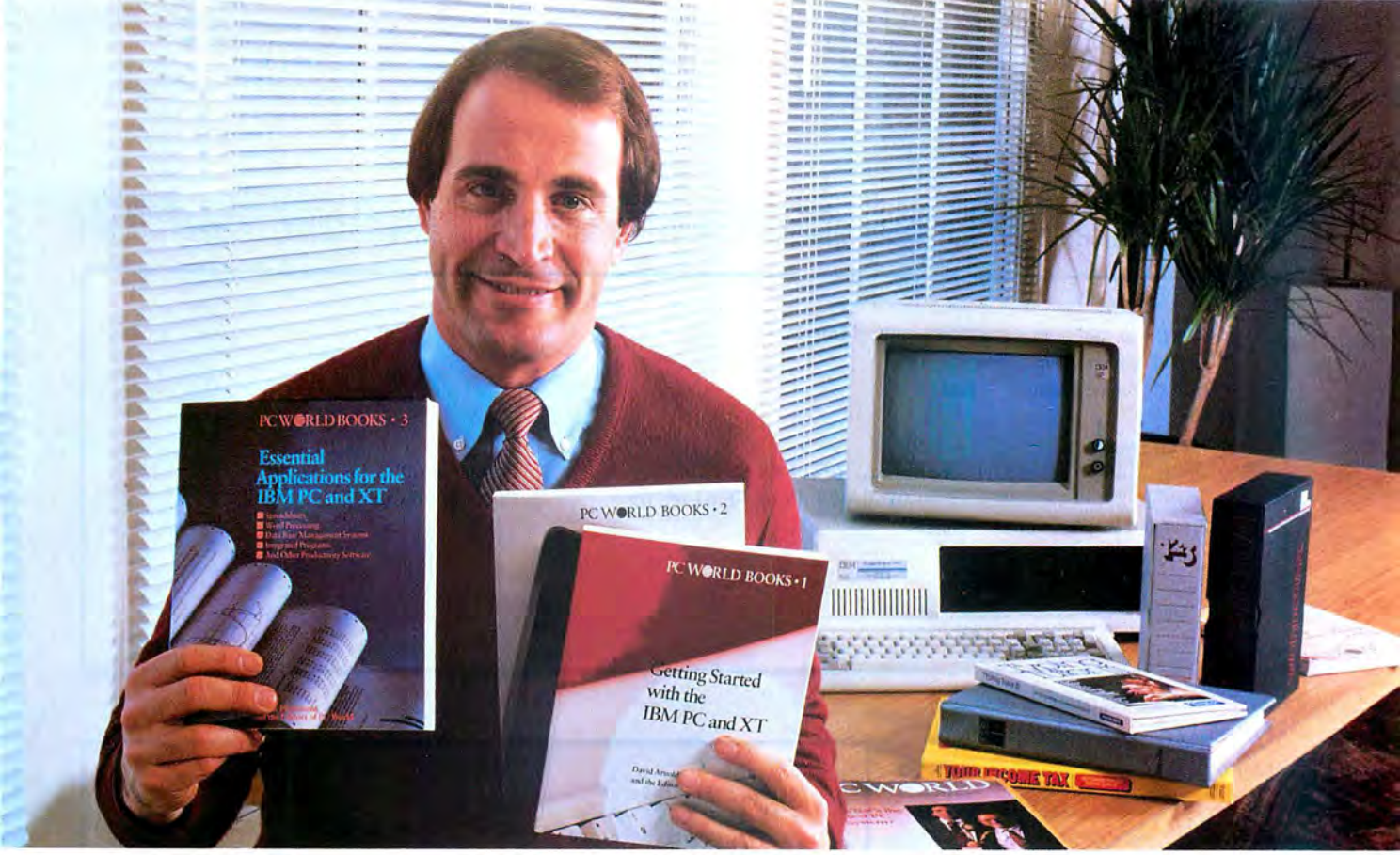

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```
A>copy a:format.com a:fmatbeep.com  < Enter >
A>debug fmatbeep.com  < Enter >
-s100 2000 "Format another"  < Enter >
xxxx:0F71
-d 0f71 L1f < Enter >
xxxx:0F71 46 6F 72 6D 61 74 20 61 6E 6F 74 68 65 72 20      Format another
xxxx:0F80 28 59 2F 4E 29 3F 24 0D 0A 24 49 6E 76 61 6C 69   (Y/N)?$..$Invali
-e 0f71 "Another (Y/N)?" 07 24  < Enter >
-w  < Enter >
Writing 1B00 bytes
-q  < Enter >
```

FMATBEEP: Steps to cause FORMAT.COM to beep when finished

I call the modified program FMATBEEP.COM. To create it, copy FORMAT.COM and DEBUG.COM onto a blank disk, put it into drive A:, and type in the steps as shown in FMATBEEP. This will replace the prompt 'Format another (Y/N)?' with the word 'Another?' and a beep.

Stephen Berg
Kailua, Hawaii

Editor's note: Be careful to type in the lines exactly as shown; pay special attention to uppercase and lowercase letters.

Turbo Screen Print

The program PRTSC.PAS demonstrates how to invoke the Print Screen function from within a Turbo Pascal program. The routine is very simple because it makes use of Turbo's INTR instruction. Note that in this case the argument RESULT is a dummy variable since the program doesn't need the contents of the CPU registers.

```
PROCEDURE Print_Screen;
  TYPE
      Registers = record
                    AX,BX,CX,DX,BP,SI,DI,DS,ES,Flags:INTEGER
                  end;

VAR
   Result: Registers;

BEGIN
  INTR (5,Result);
END;
```

PRTSC.PAS: Turbo Pascal program to print the contents of the screen

D. Emilio Grimaldo T.
Mobile, Alabama

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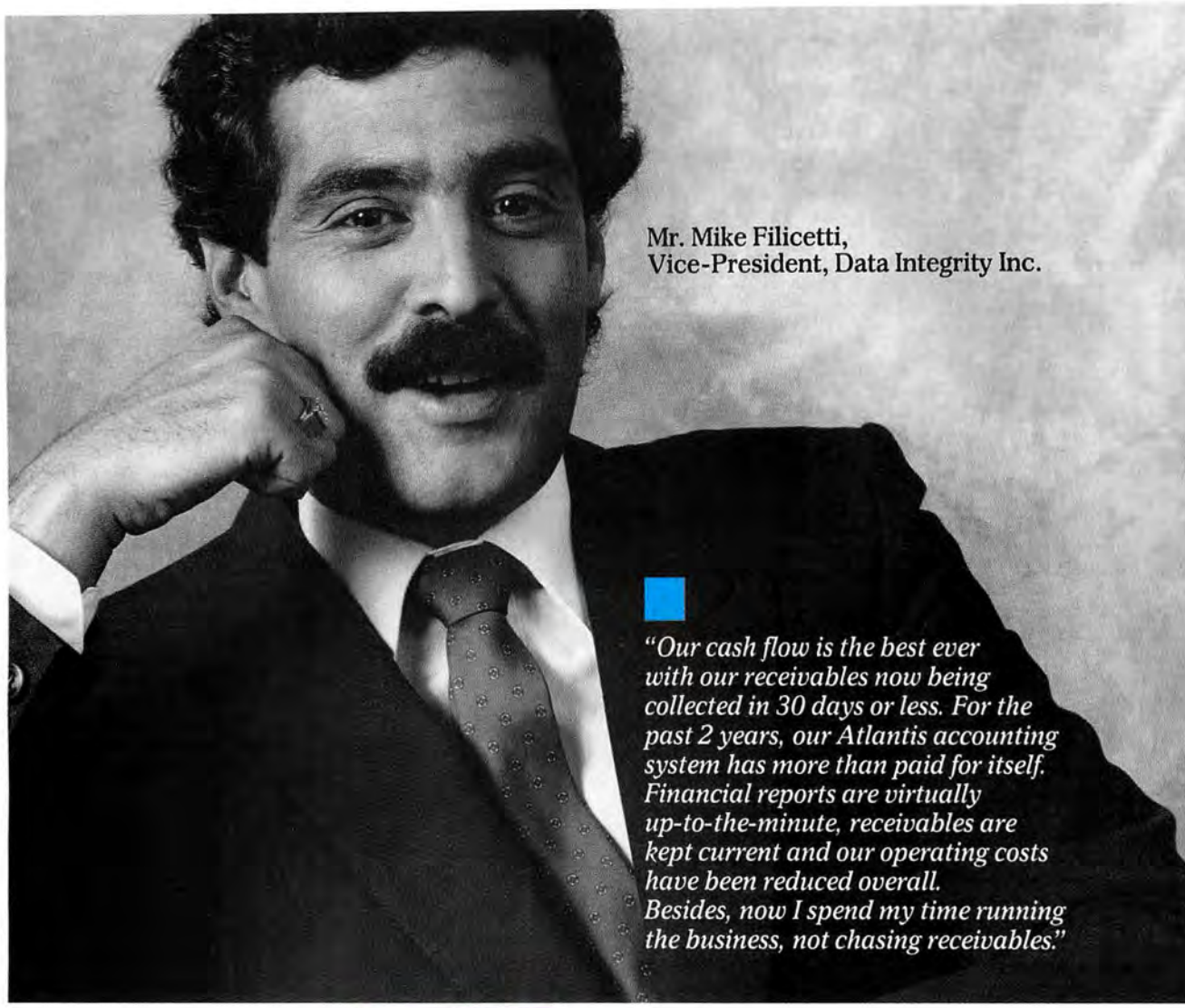

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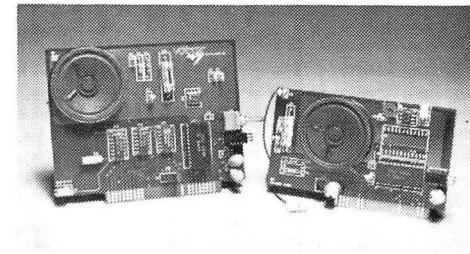

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How to cut diskette prices ...without cutting quality.

Now this discovery posed a dilemma: how to cut the price of diskettes without lowering the quality.

There are about 85 companies claiming to be "diskette" manufacturers.

Trouble is, most of them aren't manufacturers.

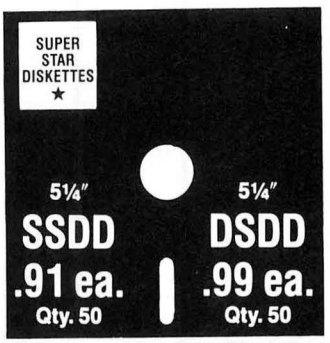
Rather they are fabricators or marketers, taking other company's components, possibly doing one or more steps of the processing themselves and pasting their labels on the finished product.

The new Eastman Kodak diskettes, for example, are one of these. So are IBM 5¼" diskettes. Same for DYSAN, Polaroid and many, many other familiar diskette brand names. Each of these diskettes is manufactured in whole or in part by another company!

So, we decided to act just like the big guys. That's how we would cut diskette prices...without lowering the quality.

We would go out and find smaller companies to manufacture a diskette to our specifications...specifications which are higher than most...and simply create our own "name brand" diskette.

Name brand diskettes that offered high quality at low prices.



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In our search for the low priced, high quality diskette of our dreams, we found something even more interesting.

We found that there are several manufacturers who don't give a hoot about the consumer market for their diskettes. They don't spend millions of dollars in advertising trying to get you, the computer user, to use their diskettes.

Instead, they concentrate their efforts on turning out the highest quality diskettes they can...because they sell them to the software publishers, computer manufacturers and other folks who (in turn) put their name on them...and sell them for much higher prices to you!

After all, when a software publisher or computer manufacturer or diskette marketer puts their name on a diskette, they want it to work time after time, everytime. (Especially software publishers who have the nasty habit of copy-protecting their originals!)

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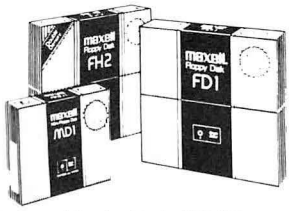

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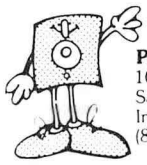

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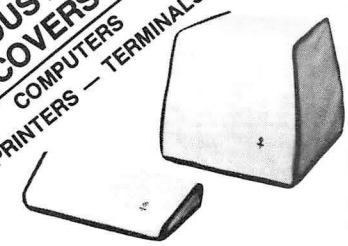

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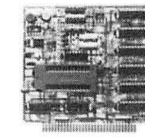

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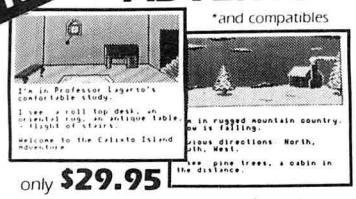

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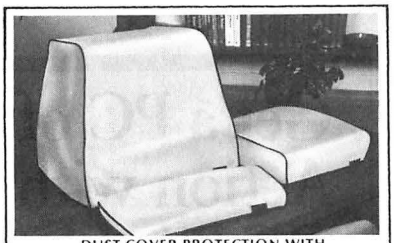

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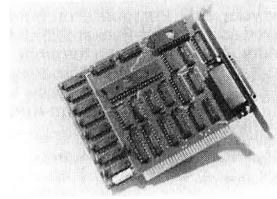

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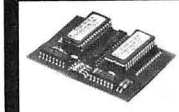

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Operating System Shell
Tom Sheldon, author & writer for *PC World* Magazine, has written a step-by-step guide that helps readers create & assemble an automated menu-driven directory structure for hard disk systems from DOS commands & batch files. Password schemes & multiple user systems discussed. Excellent tutorial & supplement to DOS manual. 80 pgs-illustrated. $9.95 + $1 ship. Visa/MC. *Tom Sheldon, 789 Casiano Dr., Santa Barbara, CA 93105, 805/687-0865/964-2480*

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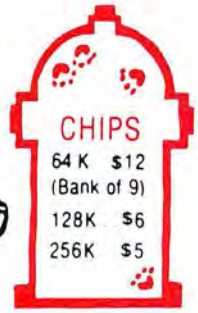

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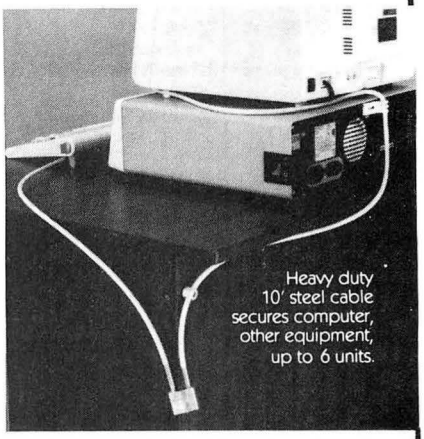

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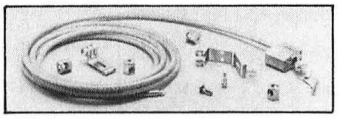

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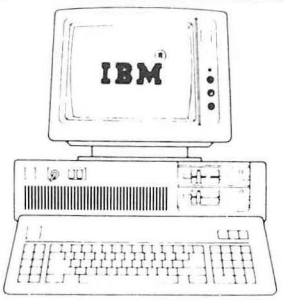
M PC 5k, 2 floppies	**IBM PC 20 + 20** 256k, 1 or 2 floppies 20MB HD & 20MB Backup	**IBM XT 10 + 10** 256k, 1 or 2 floppies 10MB HD & 10MB Backup		**IBM AT 20 + 20** 512k, 1 or 2 floppies 20MB HD & 20MB Backup	**COMPAQ DESKPRO 10 MB** 640k, 1 or 2 floppies	**COMPAQ PORTABLE 286** Custom Configurations
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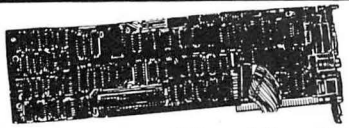
20 MB Int/Ext ... 'REDUCED' ~~$599/$749~~
40/60 MB Int/Ext ..... CALL
TALL GRASS NEW PC/T FORMAT
25/35 MB w/60 MB Backup ... $2599/$3399
50/80 MB w/60 MB Backup ... $4299/$5499
60 MB Tape Backup only ..... CALL
Controller ... $140 Cartridge (60 MB) ... $40
EVEREX 10/20 MB Int w/Cont ... $579/$699
EXCEL 4500 45MB B/U-Int/Ext ... $949/$999
APEX MEG-1000 100MB Tape B/U-EXT ... $1399
EXTERNAL EXPANSION SYSTEMS ..... CALL
INTERDYNE TAPE BACKUP
10 MB Int/Ext ... 'REDUCED' ~~$469/$649~~
20 MB Int/Ext ... 'REDUCED' ~~$569/$749~~
HARD DISKS/BACKUP FOR COMPAQ ..... CALL
IOMEGA Bernoulli Box 10 + 10 ..... CALL
AMPEX PC Megastore ..... CALL
EMULEX JAVELIN HD & BACKUP ..... CALL
PWR SUPPLY 130/150 Watts ..... ↓ ~~$89/$129~~

MULTI-FUNCTION CARDS



AST SIXPAK 0-K ... $239 384K ... $269
Rampage! ... CALL Advantage 0-K ... $379
ORCHID Blossom 0-K ... $169 384K ... $199
Conquest for IBM PC/XT (up to 2MB) ... CALL
Cram-RAM for IBM XT short slot (up to 2MB) ... CALL
Eccell for IBM AT (up to 4MB) ..... CALL
TECMAR Captain 0-K ... $179 384K ... $209
MAESTRO AT w/Treasure Chest ... Best Price
INTEL Above Board (up to 4MB) ..... CALL
PARADISE 5-Pack 0-K ... $159 384K ... $189
BT6 Plus w/64k ... $179 384K ... $205
IDS MF-100 0-K ... $179 384K ... $209
P/S/G Ports, Clock/Cal & Disk Emulation
QUADBOARD 0-K ... $189 384K ... $219
Silver Quadboard: 0-K to 640k ..... CALL
Gold Quadboard: Multifunction & Color ... CALL
Quadmeg-AT (up to 4 MB) ..... CALL
Quadport-AT/Expansion Kit ..... CALL
INSTALL RAM & test brd for PC/AT ... $20/$40

MONITORS

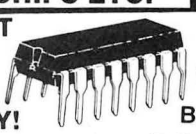
PGS MAX-12E/HX-12/HX-12E ... $169/$419/$499
HX-9/HX-9E/SR-12 ... $419/$499/$549
SR-12 w/Scan Doubler $699
SR-12 w/Sigma 400 ..... $999
TAXAN COMPOSIT 115 Green/116 Amber ... $129
MONO 121 Gr/122 Amb ..... $139/$149
COLOR 410 ... $289 COLOR 411 ... $299
COLOR 420 ... $359 COLOR 420L ... $369
COLOR 425 ... $369 COLOR 440 ... $489
COLOR 440 w/TAXAN 555 RGB Card ... $749
COLOR 440 w/Persyst BoB Brd $799
COLOR 440 w/Sigma 400 ..... $939
COLOR 440 w/Sigma 400 & PC Mouse ... $1039
AMDEK 300G/300A/310A(M) ... $139/$149/$159
COLOR 300/500/600 ... $239/$349/$419
710 ... $489 w/Tecmar Graphics Master ... $899
QUADRAM AMBERCHROME $149
ROLAND MB-142 14" Mono B/W $289
TECMAR Color ... $529 w/Graphics Master ... $939
TILT/SWIVEL Monitor Pedestal $30

DISPLAY CARDS

HERCULES MonoGraphics ... $279 Color ... $149
EVEREX The Edge ..... Best Price Ever
Graphics Edge ..... Even Better Price
AST Monograph Plus ..... $339/$369
Preview for Mono Graphics $279
Graphpack w/64k $549
PERSYST Short Color/Mini Mono ... $159/CALL
Color Combo: Multifunction & Color ... from $299
Mono Combo: Multifunction & Mono ... from $299
PERSYST BoB Board $339
PERSYST w/TAXAN 440 ..... $799
QUADRAM Quadcolor I $179
Gold Quadboard: Multifunction & Color ... CALL
STB Chauffer ..... CALL
PARADISE Modular Brd ..... from $269
ORCHID Turbo Graphics Controller ..... CALL
TECMAR Graphics Master $429
G Master w/TECMAR Color Monitor $939
G Master w/AMDEK 710 Color Monitor ... $899
GENOA Spectrum ..... Best Price
MYLEX Chairman $399
SIGMA COLOR 400 (specify Monitor) $479
COLOR 400 w/PGS SR-12 ..... $999
COLOR 400 w/TAXAN 440 ..... $939
3 Button PC Mouse w/PC Paint ... Add $100

CHIPS ETC.

HIGHEST QUALITY!



Major Brands

64K RAM Set ... $7 10+ Sets ... $6 50+ ... $5
128K RAM Set ... $35 10+ Sets ... $33 50+ ... $30
256K RAM Set ... $30 10+ Sets ... $28 50+ ... $25
8087-3 for IBM PC ... 'REDUCED' ~~$99~~
8087-2 for COMPAQ ... 'REDUCED' ... CALL
80287-3 for IBM AT ... 'REDUCED' ~~$239~~
ORCHID PCturbo w/128k ↓ ~~$549~~ 640k ... ~~$699~~
QUADRAM QUADsprint ... 'REDUCED' ~~$499~~
MICROWAY'S Fastbreak/# Smasher ..... CALL

MODEMS

EasyData 12B 300/1200 Bd Int w/PCTalk III ... $199
SmarTEAM 212A 1200 Bd Ext w/o sft ... $209
HAYES 1200 B w/SmartCom II $319
HAYES 1200 Ext. w/o Software $339
Smartcom II ... $89 NEW 2400 Bd Ext ... $589
HAYES Transet 1000 ..... CALL
POPCOM C-150 Int w/PFS:Access $289
POPCOM X-150 Ext w/PFS:Access $299
AST Reach! 1200 Bd short card w/Crosstalk ... $359
PROMETHEUS PROMODEM 1200 Ext $279
Options Processor ... $89 w/Modem ... $75
Alphanum Display ... $89 w/Modem ... $75
PROMODEM 1200 Ext + Both Options ... $419
PROMODEM 1200 B Int w/MITE software ... $249
QUADMODEM II shortcard w/Crosstalk XVI ... CALL
2400 Bd Upgrade Kit for Quadmodem II ... CALL
Ven-Tel Half Card w/Crosstalk XVI $379
1200 Plus Ext w/o software $349
BIZCOMP IntelliModem EXT $319
ST/XL/XT ..... $289/$319/$359
WATSON Integrated Voice Data Modem ... CALL
RIXON Complete Line ..... CALL
U.S. ROBOTICS Complete Line ..... CALL

SPECIAL ITEMS

DCA: IRMA, IRMAlette, IRMAline, IRMAprint Emulates 3278, 3279
CXI: PCOX Emulates 3274, 3278, 3279
FORTE: PJ Card Emulates 3278, 3279, 3287 3270PC, 278RJE, 3780RJE (Specify)
AST 3780, 5251/11, 5251/12, BSC, SNA, PCOX
ORCHID PCnet Plus Complete Line ..... CALL
OBERON OMNI READER Optical Character Reader w/IBM Interface Software ..... CALL
POLAROID Palette $1249
General Parametric's VideoShow ..... CALL
CHORUS PHOTOBASE/PC-EYE ..... CALL

MISC. ADD ONS

CABLE Parallel, 6ft ... $20 Serial, 6 ft ... $25
Keyboard Extension, 6 ft $10
FLOPPY Drive Controller $109
FLOPPY Controller w/P,S,G & Clock/Cal ... $199
HAYES Transet 1000 ..... CALL
MOUSE SYSTEMS PC Mouse w/PC Paint ... $129
MICROSOFT MOUSE w/PC Paintbrush Bus/Serial ..... $129/$139
KEYTRONIC KB 5151 ... $165 AT Upgrade Kit ... $15
KB 5153T w/Touch Pad ..... CALL
AB/ABC Switch Boxes ..... CALL
COMPUTER ACCESSORIES P 1-2-3 ..... $299
POWER DIRECTOR P2(5) ... $89 P12(6) ... $129
KENSINGTON Master Piece (5 outlets) $89
KENSINGTON Universal Printer Stand $20
PC Keyboard Storage Drawer $99
STANDBY PWR SUPPLY w/surge protection
200 Watts ... $269 300 Watts ... CALL
800 Watts (Sine Wave) $679
TILT/SWIVEL Monitor Pedestal $30
PWR SUPPLY 130/150 Watts ..... ↓ ~~$89/$129~~

CALL FOR OUR WEEKLY UNADVERTISED SPECIALS

MasterCard | AMERICAN EXPRESS | VISA

COMPANY POLICY: Min. order $100. Prices & availability subject to change. We ship UPS only. Shipping/handling charges vary. Prices reflect cash discount on prepaid orders. Add 1% for COD orders. 3% for MC/VISA & 5% for AMEX. COD requires cashiers check. All merchandise sold is new and all sales are final. Refused shipments subject to 20% charge (Min $50). Products shipped in factory cartons come with manufacturer warranty. For others, including IBM systems, call tech support for return auth. # for warranty repairs. Non-defective items returned as defective subject to 10% service charge (Min. $50). Not responsible for hardware or software compatibility of any product. No open acct PO's or foreign orders. No showroom, demonstrations or walk-in sales. Personal or company checks take 3 weeks to clear. FOR ADVANCE PAYMENTS or PICKUP, PLEASE CALL FIRST FOR WORKORDER #.

COMPUMAIL

805-987-7015

06-C CONSTITUTION AVE., CAMARILLO, CA 93010

WHEN ORDERING PLEASE REFER TO AD #W803

DISK WORLD! is proud to introduce the lowest-priced, LIFETIME-WARRANTY diskettes ever!

And they're BRAND NAME PRODUCT to boot!

5.25″ SSDD➡.79 ea. 5.25″ DSDD➡.89 ea.

5.25″ DSDD-HD➡$2.35 ea.

3.50″ SSDD➡$2.25 ea. 3.50″ DSDD➡$2.65 ea.

Based on multiples of 100 each.
Boxed in 10's with heavy-duty cardboard sleeves, user ID labels, reinforced hubs (where appropriate) and write-protect tabs.

Introducing Wabash Pinnacle Series Diskettes.

Two years ago, if you'd told me I'd be writing this ad, I would have laughed.

At that time, Wabash diskettes were synonymous with "s—t".

Just saying that quality control was poor would be charitable.

So much was wrong that DISK WORLD wouldn't sell them.

That was yesterday.

Kearney-National Inc., a $202-million division of a much larger company, came into Wabash.

Out went the old management, the old methods, the old production techniques...and in went a lot of new people, ideas, production lines and some really imaginative thinking.

The end result.

Today, I'm proud to offer you the Wabash Pinnacle Series of diskettes at the prices shown.

This isn't evolution in diskette manufacturing: it's revolution.

Here's what you get.

Wabash Pinnacle diskettes are
...certified 100% Error Free
...are coverd by a LIFETIME WARRANTY
...meet or exceed all industry specifications (by quite some distance)
...and are simply the best value in diskettes available today.

The torture test.

Considering Wabash's earlier dubious reputation, I wasn't exactly a true believer when their Director of Marketing came into my office with samples.

So I took a box at random, selected a disk, bent the thing every which way and slipped it into my IBM-PC.

It formatted. It booted. It stored and retrieved data.

That wasn't enough.

I gave samples of the diskettes to Curt Rostenbach and, in turn, to Tom Streit, both hackers of long experience and members of the Waukegan (Illinois) Apple Users Group.

Tom really went at it.

He took a quartz-halogen lamp, aimed it at the diskette until it started to smoke (and melt)...and then formatted, booted the diskette and stored and retrieved data!

The same terribly (and intentionally) mutilated diskette ran on an ITT, Corona and IBM.

Curt was nicer.

He simply bent the diskette every which way...and it still formatted, booted and ran on his Apple.

The best buy I've ever seen.

DISK WORLD!, Inc. sells more flexible magnetic media by mail-order than anyone else in the world.

I, as President of the corporation, won't tolerate a product with a failure rate of more than 1/1000th of 1 percent.

I also don't like companies who try to milk a "quality" or "premium" image for a higher price like Dysan and Verbatim did...until they failed.

As President of DISK WORLD!, Inc., my motto is simple: "the best diskette for the least amount of money."

Wabash is it.

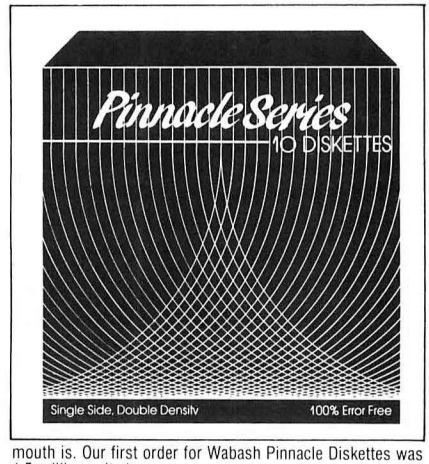
Right now, there is no better value than the Wabash Pinnacle Series of diskettes.

Granted, you have to buy a hundred at a time, but so what? Split the order with friends, relatives, co-workers or even your worst enemies.

The key thing is to get the most diskette for the money.

And this is it.

(Incidentally, as a corporation, we put our money where our mouth is. Our first order for Wabash Pinnacle Diskettes was 1.5-million units.)



That's an awful lot of faith and confidence.

But, then again, I have the diskette that Tom Streit literally melted...and kept on running.

The truth about $1.00 or less diskettes.

More and more ads are popping up offering diskettes for $1.00 or less.

By the same token, more and more people who were selling used cars a few months ago are now selling diskettes by mail.

We did a little survey of current ads for diskettes advertised for a dollar or less and did some analysis of the market and here's what we found as it applies to 5.25″ DSDD diskettes "supposedly" selling for a dollar or less.

VENDOR:	ADVERTISED LOW PRICE:	ACTUAL PRICE PER 100:	ACTUAL MFGR.:
Unitech	.89 ea.	.92 ea.	Unspecified.
Datatech	.99 ea.	.99 ea.	Unspecified.
Computer Club	.95 ea.	.98 ea.	Unspecified.
	.99 ea.	1.02 ea.	Unspecified.
Communications & Electronics	.49 ea.	.80 ea.	Unspecified.
Precision Data	.89 ea.	.93 ea.	Unspecified.
Diskette Connec.	.93 ea.	.93 ea.	Unspecified.
Comp Soft Serv.	.77 ea.	.77 ea. + shpg.	Unspecified.
Computer/Computer	.99 ea.	.99 ea.	Unspecified.
DISK WORLD	.89 ea.	.92 ea.	Wabash Datatech

The real truth about $1.00 or less diskettes.

It costs all diskette manufacturers about the same to produce a diskette. Some may charge more because they want to project a "premium quality" image, ala the late, lamented Dysan who bought their basic media from 3M.

Some charge less because they sell a sub-standard product...and we're not foolish enough to name names here.

But here's the truth about the $1.00 or less diskette market.

It falls into four categories:

1. The DISK WORLD's of the universe who simply are so big that they can buy first quality product in massive quantities and choose to pass on the savings to you. (Precision Data and Diskette Connection on **BRAND NAME** products also fall into this category.)

2. The people who buy "cosmos"...stuff from major manufacturers that usually hits quality control standards, but is cosmetically blemished and thus can't be packaged and sold under the manufacturer's own name.

3. "Duplicator Quality". Uncertified media, usually below manufacturer's own standards and frequently below ANSI and IBM standards. Sold on an "as-is" basis with the understanding that the manufacturer's name will never be divulged. Usually about a 20% reject rate...as compared to DISK WORLD's standard of less than 1/1000th of 1% reject/return rate. Next to garbage, this is the source of most diskettes advertised at a dollar or less.

They may work...and then again they may not. (Frankly, the odds at the Blackjack table in Las Vegas are more in your favor.)

4. Garbage. Stuff that shouldn't be sold at all. But some manufacturers are hurting for cash, so they sell it anyway. (After all, they want to meet their payroll. Look what happens when you don't: you become a Dysan or Verbatim. Lots of history, but no money.) More and more garbage is being dumped into the market as manufacturers become pressed for cash and are motivated into selling anything and everything they can manufacture. (Read the article in FORBES about Verbatim and its "Bonus" brand.)

Finally, the Taiwanese counterfeiters are moving into the act. Perfect duplicates of the packaging of major manufacturers with one exception: the quality isn't there.

The Critical Factor.

Only DISK WORLD!, Inc. offers fully brand-identified, LIFETIME-WARRANTY product for less than a dollar.

Every one else offering 5.25″ product for less than a buck doesn't tell you who makes it.

We do.

And that ought to tell you a lot right there.

Ordering & Shipping Instructions

SHIPPING: Wabash Pinnacle Diskettes are sold in multiples of 100 only. Shipping charges are $3.00 per 100, regardless of type or size.

PAYMENT: VISA, MASTERCARD and PREPAID orders accepted. Corporations rated 3A2 or better and government and quasi-government open accounts are accepted on a NET 15 basis.

C.O.D. orders are subject to a $5.00 special handling charge. (Sorry for the increase, but too many people have been refusing C.O.D. orders or using bad checks. It's a classic example of a few "bad eggs" making life more expensive for everyone else.)

APO, FPO, AK, HI & PR ORDERS: Include shipping as shown **and** an additional 5% of the total amount of the order to cover PAL and insurance.

No other non-continental U.S. orders are accepted.

TAXES: Illinois residents only, add 7%.

All orders subject to acceptance.
Not responsible for typographical errors.

ORDERS ONLY:
1-800-621-6827
(In Illinois: 1-312-256-7140)

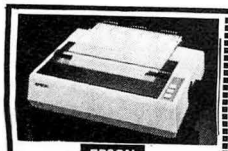
INQUIRIES & INFORMATION
1-312-256-7140

FOR FASTEST SERVICE, USE MCI MAIL:
Just address **"DISKWORLD"**
(24-hour shipping on any item in stock if you order via MCI MAIL.)

DISK WORLD!, Inc.

629 Green Bay Road
Wilmette, Illinois 60091

Circle 780 on reader service card



EPSON

RX-100, 100 cps, 132 column, friction & tractor feed . . . . . Call
FX-80+, 160 cps, 80 column . . . Call
FX-185 . . . . . Call
LX-80, 80 colume w/LQ mode . .$Call
Tractor for LX-80. . . . . $35
JX-80 color printer, 160 cps, 80 col. Call
LQ-1500, 200 cps, 136 col. 24-pin. Call
Parallel Interface for LQ-1500. . . $89
Serial Interface for LQ-1500. . . .$149
Tractor for LQ-1500 . . . . . $49
Cut-Sheet Feeders for LQ-1500 . $395

OKIDATA

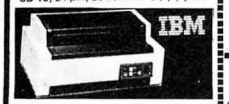
182P, 120 cps, 80 Col., Parallel . .$279
84P, 200 cps, 136 col. Parallel. . .$649
93P, 160cps, 136 col., parallel,Sale $495
192P, 160 cps, 80 col. Parallel . . $369
193P, 160 cps, 136 col. Parallel. . $549
2410P, 350 CPS, 136 col., friction & tractor, 2-color, (parallel) . .$1,995

C. ITOH

7500EP $199
8510AP $279
8510AP+ $325
1550BP+ $449
1550P $439
A10 . . . . . $459
F10, 40cps $849
F10, 55cps $999

STAR GEMINI

New *models available now with 11x17-dot resolution letter quality printing!*
SG-10, 120 cps, 80 col. 2K buffer Call
SG-15, above but 132 col., 16K. . Call
SD-10, 160 cps, 80 col. 2K buffer Call
SD-15, above but 132 col. 16K . . Call
SR-10, 200 cps, 80 col. 2K buffer Call
SR-15, above but 132 col., 16K. . Call
SB-10, 24-pin, 80 column . . . . .Call



IBM PC COLOR PRINTER

A high speed dot-matrix printer for graphics & text at speed up to 200 cps and up to 8 colors. . . . Sale! $1,795

IBM PROPRINTER

200cps dot matrix printer w/40cps LQ mode, 80 column, envelope or sheet paper can be loaded without removing continuous form. Parallel $520

IBM QUIETWRITER

60 cps, whisper quiet operation. Letter quality non-impact printing . . $1,295

IBM WHEEL PRINTER

25cps daisywheel printer, 132 column. w/tractor and sheet feeder . . . $1,595

H-P ThinkJet Ink Jet Printer

150 cps , 80 column, 11x12-dot text, 96 or 192x96-dot graphics . . . $425

H-P LASER PRINTER

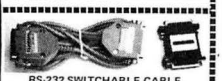
300 cps, quiet operation, serial . .$2,750

GENICOM 3404

General Electric's top-of-the-line dot matrix printer. 400 cps draft, 100 cps letter quality, 136 column, tractor feed, Digital display, programmable locally or remotely. Serial interface . . $1,995

TOSHIBA

P351, 240cps, 136 Col., 24-pin head. plug-in font cartridge,Para.. $1,175
P1340, 192cps, 80 Col., 24-pin . $575
Bi-directional Tractor $195



RS-232 SWITCHABLE CABLE

Solve the handshaking problem between computer and terminal. 10-position switch on each end. 6 ft. cable . . . $35

RS-232 SWITCHABLE GENDER CHANGER

Switchable male to female gender changer includes direct path mode, switchable direct path or crossable loop mode. 5-slide switches. $35

NEC SPINWRITER

3550 — 33 CPS, 203 col., proportional space, bi-directional, parallel. $1,049
2050 — Similar to 3550 but 19 cps $625
8850 - 55 cps, 203 col. parallel $1,565

DIABLO

Diablo 630 ECS/IBM, 40 cps daisy-wheel w/IBM PC tyoe stke. $1,650
Diablo 630 API, 40 cps daisywheel printer . . . . . *Sale Price* $1,499

JUKI

6100 — 18 cps, 13" platen, 2K buffer, buffer, parallel. $379
6300 — 40 cps, 132 col., 3K buffer.$699
Tractor $119

BROTHER

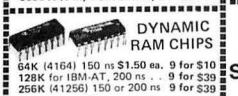
HR-15XL or Fortis DX-15XL . $CALL
HR-25 — 23cps daisywheel, para $Call
HR-35 — 36cps daisywheel, para $Call
DM-40 — 160cps, 24-pin dot matrix, 136 col., with tractor, para $CALL
Fortis DH45 — Dual head printer, 160 cps dot matrix, 36 cps daisywheel, Epson, Diablo compatible . . CALL
Tractor for 15XL/HR-25. . . . . $119
Keyboard for 15XL. $149
Cutsheet Feeder for HR-15/25 . .$189
SF-200 Sheet Feeder for DM-40 .$275

POWER SUPPLY

Replace the 65-watt in your IBM-PC with a bigger unit now!
135-WATT $95
150-WATT $115

DATA SWITCHES

High quality rotary selector switches direct the flow of data to and from computers, printers, modems, plotters, etc. Fully shielded beige metal housing. 2 amp capacity.
DB-2525-2V (1 in, 2 out), RS232 DB-25 female connectors. $95.00
DB-2525-4V (1 in, 4 out, Use pin 1 as common ground. $109.00
2525-X (1 in, 4 out or 2 in, 2 out)$119
CN-3636-3V (1 in, 3 out), Centronic 36-pin female connector $145.00
CN-3636-4V (1 in, 4 out), As above but with 4 outlets. $149.00
3636-X (1 in, 4 out or 2 in, 2 out)$159



DYNAMIC RAM CHIPS

64K (4164) 150 ns $1.50 ea. 9 for $10
128K for IBM-AT, 200 ns . . 9 for $39
256K (41256) 150 or 200 ns 9 for $39

8087 CHIP

Intel 8087-3 high speed math co-processor for IBM-PC & XT. $105
8087-2 chip for Compaq DeskPro.$149
80287-3 chip for IBM-AT $225

PLOTTER SALE

ROLAND

DXY-800— 8-pen, hi-speed 180mm/sec. IBM compatible. 11x17" paper . $Call
DXY-880 — Similar to 800, 8-pen, Hewlett Packard compatible. . . .$Call
Roland Transparency Kit — Comes w/ 50 sheets of acetate & 16 pens $call

HEWLETT PACKARD

7470A — 2-pen, 8½x11 paper size .$949
7475A — 6-pen, 11x17 paper size.$1595

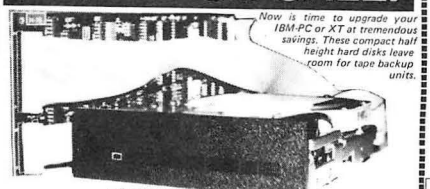
TAXAN

710S — 6-pen color plotter, Hewlett packard compatible. *Sale* $795

EPSON

HI-02 — 4-pen, with software . . $425

HARD DISK SALE!



Now is time to upgrade your IBM-PC or XT at tremendous savings. These compact half height hard disks leave room for tape backup units.

★ Famous brands.
★ Internal hard disks for IBM-PC and XT
★ Complete with controller card, cable & mounting hardware.
★ Boots directly from hard disk.
★ Low power consumption.

For AT&T 6300 or DeskPro—add $75

10 MB $439

20 MB $555

IRWIN 10-MB TAPE BACKUP

Internal half height unit. Direct connects to floppy controller card without taking up a slot. Complete w/$30 tape, software and instruction. $569

IBM compatible

5¼ DISK DRIVES

Teac 55B, half ht, 360K . . . Sale $99
Toshiba 4851, half ht., 360K .Sale $99
IBM full height drive, 360K . . . $169

$115 ea.
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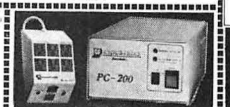

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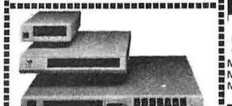

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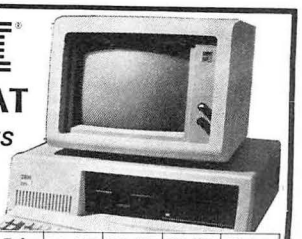

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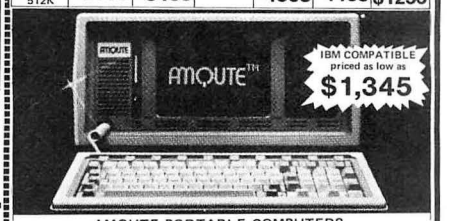

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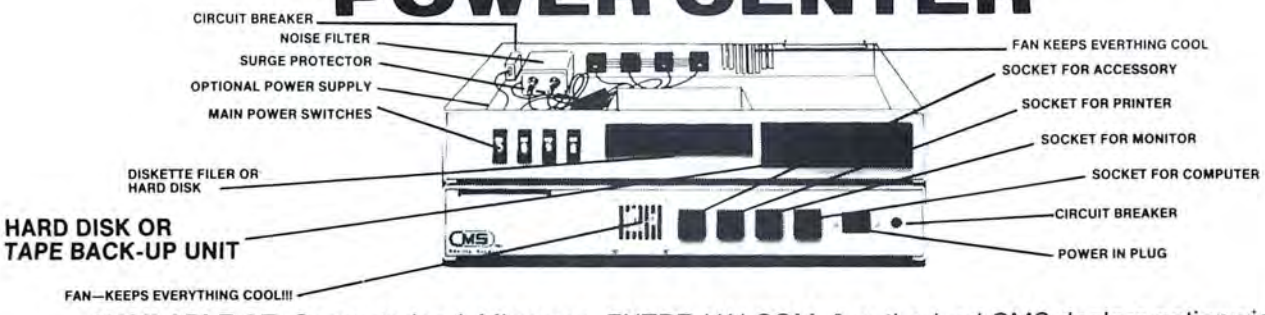

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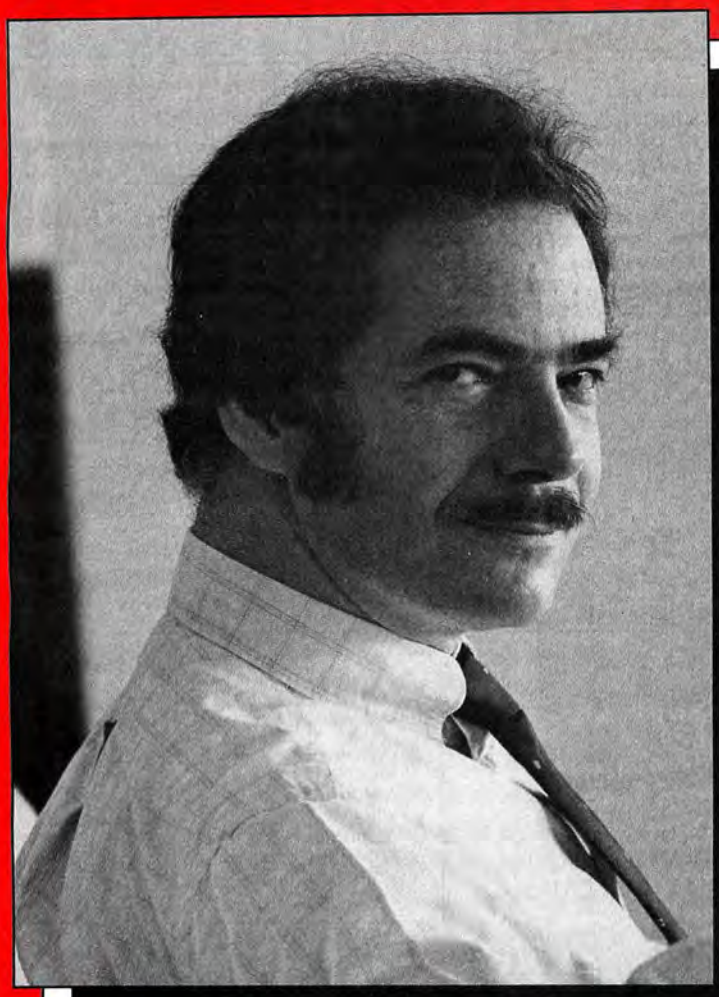

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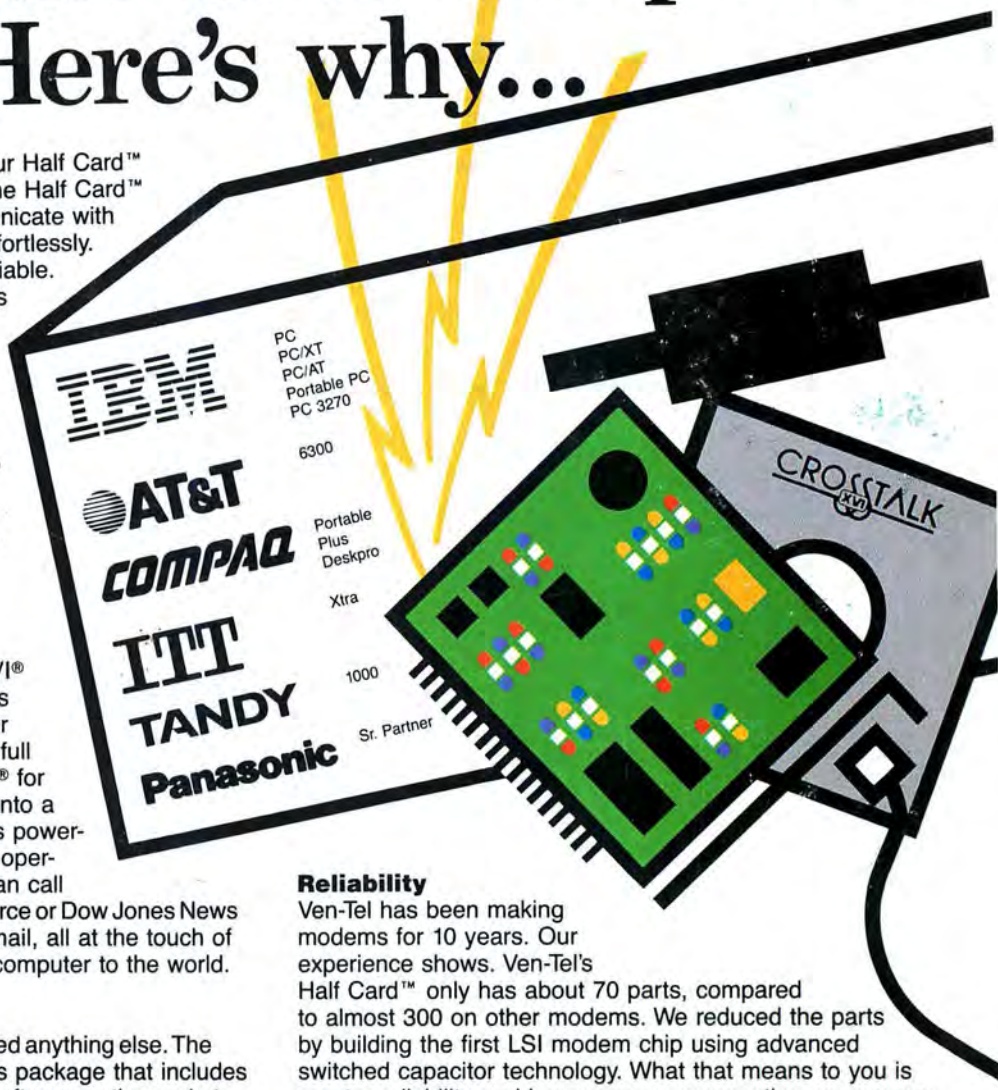

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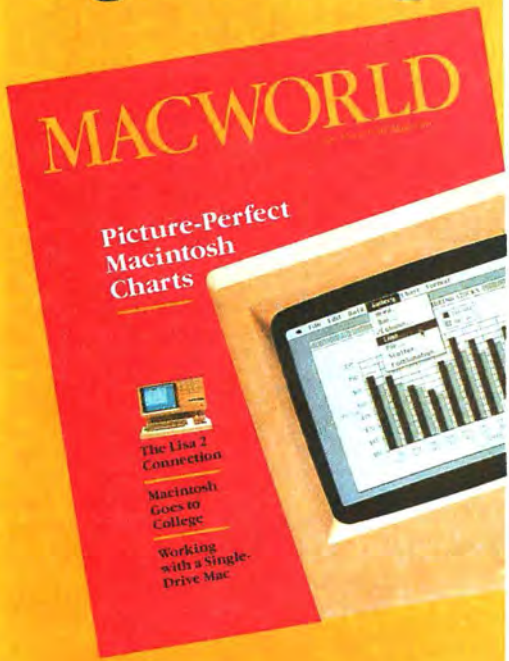

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